Study on the design of a monitoring framework of the EU One Health Action Plans against AMR and Council Recommendation on stepping up EU actions to combat antimicrobial resistance in a One Health approach

Final Report

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Acronyms and Abbreviations

Ab	Antibiotic
ADIS	Animal Diseases Information System
AMC	Antimicrobial consumption
AMR	Antimicrobial resistance
AMS	Antimicrobial stewardship
AMU	Antimicrobial use
ANIMUSE	ANImal antiMicrobial USE
ASU	Antimicrobials sales and use
ATC	Anatomical Therapeutic Chemical
BRG	Better Regulation Guidelines
BRT	Better Regulation Toolbox
BTSF	Better Training for Safer Food
CAP	Common agricultural policy
DDD	Defined daily doses
DG ENV	Directorate-General for Environment
DG MARE	Directorate-General for Maritime Affairs and Fisheries
DG RTD	Directorate-General for Research and Innovation
DG SANTE	Directorate General for Health & Food Safety
EAAD	European Antibiotic Awareness Day
EARS-NET	European Antimicrobial Resistance Surveillance Network
EARSS	European Antimicrobial Resistance Surveillance System
ECDC	European Centre for Disease Prevention and Control
ECHA	European Chemicals Agency
ECHI	European Core Health Indicators
EFSA	European Food Safety Authority
EFTA	European Free Trade Association
EMA	European Medicines Agency
EMFAF	European Maritime, Fisheries and Aquaculture Fund
ESAC-Net	European Surveillance of Antimicrobial Consumption Network
ESVAC	European Surveillance of Veterinary Antimicrobial Consumption
EU	European Union
EU JAMRAI	European Union Joint Action on Antimicrobial Resistance and Healthcare-Associated Infections
EWRS	Early Warning and Response System

EXPH	Expert Panel on effective ways of investing in health
FAO	Food and Agriculture Organisation
FAOSTAT	The Food and Agriculture Organization Corporate Statistical Database
FWD-Net	Food and Waterborne Diseases and Zoonoses Network
GAP-AMR	Global Action Plan on Antimicrobial Resistance
GARDP	Global Antibiotic Research and Development Partnership
GDPR	General Data Protection Regulation
GLASS	Global Antimicrobial Resistance and Use Surveillance System
HaDEA	European Health and Digital Executive Agency
HAI	Healthcare-Associated Infections
HERA	Health Emergency Preparedness and Response
IHR-SPAR	International Health Regulations States Parties Self-Assessment Annual Report
IL	Intervention logic
IPC	Infection Prevention and Control
JIACRA	Joint inter-agency antimicrobial consumption and resistance analysis
JPIAMR	Joint Programming Initiative on Antimicrobial Resistance
LTCF	Long-term care facilities
M&E	Monitoring and evaluation
MRSA	Methicillin-resistant Staphylococcus aureus
MS	Member State
NAP	National Action Plan
NGO	Non-governmental organization
OECD	Organisation for Economic Co-operation and Development
PPS	Point prevalence survey
OHN	One Health Network
RCER	Relevant, Credible, Easy to monitor, Robust
R&D&I	Research & development and incentives
SDG	Sustainable Development Goals
TrACCS	Tracking Antimicrobial Resistance (AMR) Country Self- Assessment Survey
UNEP	United Nations Environment Programme
WHO	World Health Organisation
WOAH	World Organisation for Animal Health (previously Organisation for Animal Health (OIE))

Abstract

This report outlines the design of a monitoring framework for the EU's 2017 One Health Action Plan against Antimicrobial Resistance (AMR) and the 2023 Council Recommendation on stepping up EU actions to combat antimicrobial resistance in a One Health approach. The framework is designed to evaluate the implementation, progress, and impact of these initiatives, integrating human, animal, and environmental health. It addresses varied legislative and non-legislative actions across the EU-27, Iceland, and Norway, providing a flexible and cost-effective system for monitoring AMR interventions.

The framework's development followed a structured methodology, involving desk research, the creation of intervention logic (IL) for both the Action Plan and Council Recommendation, and extensive stakeholder consultations. Indicators were selected based on relevance, feasibility, and data availability, ensuring that they align with EU and Member State priorities.

Executive Summary

The present Final Report presents the design of a comprehensive monitoring framework for the European Union's 2017 One Health Action Plan against Antimicrobial Resistance (AMR) and the 2023 Council Recommendation on stepping up EU action to combat AMR in a One Health approach. The framework is intended to track the implementation, progress, and impact of these initiatives, integrating human, animal, and environmental health. It ensures that EU actions on AMR are addressed holistically, reinforcing accountability and providing a robust system for evaluating the results and impact of actions addressing AMR across the EU.

The primary aim of this study was to design a cost-effective, adaptable monitoring framework that evaluates both the 2017 EU One Health Action Plan against AMR and the 2023 Council Recommendation. It covers legislative, non-legislative, and funding initiatives at the EU level, as well as national efforts in the EU-27, Iceland, and Norway. To support the design of the framework, the study addressed the key challenge of combining the Action Plan and Council Recommendation into a unified intervention logic (IL).

A pragmatic, flexible approach to indicator selection was employed to balance comprehensiveness with manageability. The study involved extensive consultations with stakeholders, streamlining indicators using existing data collection initiatives and proposing new indicators where existing ones were not available. The framework also accounts for future adaptations. This ensures that the framework can be applied as the policies and actions against AMR continue to be implemented, and is adaptable for evolving needs.

Methodological Approach

The development of the monitoring framework followed a structured four-step methodology:

1. **Desk research**: A comprehensive review of AMR-related frameworks, legislative documents, and funding programs provided the foundation for understanding the context and shaping the intervention logic.
2. **Development of Intervention Logic (IL)**: Separate ILs for the 2017 Action Plan and 2023 Council Recommendation were synthesised into a unified logic, ensuring a seamless integration of objectives and actions for coherent monitoring.
3. **Indicator selection**: Indicators were identified through desk research and refined via stakeholder interviews. This iterative process focused on selecting

indicators that are feasible, actionable, and relevant across the EU, Iceland, and Norway, covering outputs and outcomes, aligned with the IL.

4. **Stakeholder consultation**: Extensive consultations with the AMR One Health Network (OHN) were crucial in refining the indicators. Feedback from 63 respondents representing various EU countries, Iceland, and Norway, as well as EU agencies, civil society organisations and experts, led to revisions of indicators.

Guiding Principles

The development of the monitoring framework was guided by several key principles:

1. **Alignment with Intervention Logic**: Indicators are directly linked to the objectives of both the Action Plan and Council Recommendation, ensuring coherence in measuring progress.
2. **Comprehensive coverage**: It captures both EU and Member State responsibilities, ensuring accountability across all objectives and activities.
3. **Maximising existing data**: The framework leverages existing data sources to minimise duplication and administrative burden.
4. **Filling data gaps**: New qualitative and quantitative indicators are introduced where existing data is insufficient.
5. **Proportionality and efficiency**: The framework avoids unnecessary complexity, ensuring ease of monitoring and minimising costs.
6. **Flexibility and adaptability**: Core and optional indicators allow flexibility to adjust as new data emerges or circumstances change.
7. **Goal-oriented approach**: The monitoring framework tracks various actions that are influenced by contextual factors influencing AMR. Developments in a variety of areas such as resistance transmission, AMR awareness, antibiotic consumption, development of new antimicrobials, and effects of global actions need to be taken into account as actions are implemented to achieve the objectives of the AMR Action Plan and Council Recommendation.

Consultation and results

The consultation with OHN members conducted from 19 June to 9 August 2024, provided valuable insights into the proposed indicators, which were refined based on stakeholder feedback. Over 50% of respondents found the indicators credible, easy to monitor, and robust. Suggestions for additional indicators were reviewed, although not all were incorporated due to scope limitations.

Conclusions and recommendations

The monitoring framework offers a solid foundation for tracking AMR efforts across the EU, with specific recommendations for ensuring its long-term success:

1. **Periodical review**: A frequency for the revision and update of the framework should be agreed, so it reflects evolving monitoring needs.
2. **Shared responsibility**: Successful implementation requires collaboration between the European Commission, EU agencies, Member States and other stakeholders engaged in actions to combat AMR.
3. **Visibility of results**: Regular reporting of monitoring results to stakeholders will enhance transparency and engagement.
4. **Automation**: As data sources expand, automating data collection should be explored to reduce manual efforts and survey fatigue.

This framework serves as a critical tool for guiding EU efforts to combat AMR, with flexibility built in for continuous improvement and adaptation over time.

1. Introduction

This document constitutes the **Final Report** of the **Study on the design of a monitoring framework of the EU One Health Action Plans against AMR and Council Recommendation on stepping up EU actions to combat antimicrobial resistance in a One Health approach**. The report is structured as follows:

Table 1: Outline of the report

Section	Content
Abstract	Brief overview of the study
Executive summary	Synthesis of the main elements of the study and key features of the monitoring framework
Introduction	Description to the study and structure of the report
Methodology	Study methodology, including the objectives and scope, challenges and mitigation measures, data collection activities
Monitoring framework	Rationale and design principles underpinning the monitoring framework, overview of the proposed set of indicators
Annexes	Identified datasets (Annex 1) and bibliographic sources (Annex 2), combined intervention logic (Annex 3), consultation report (Annex 4), complete monitoring framework (Annex 5), indicator fiches (Annex 6), questionnaire for additional data collection (Annex 7)

2. Methodology

2.1. Objectives and scope

The objective of the study was to design a cost-effective monitoring framework to assess the effectiveness, progress and results achieved in implementing the **2017 EU One Health Action Plan against AMR** (hereafter referred to as the "AMR Action Plan") and the **2023 Council Recommendation on stepping up EU action to combat AMR in a One Health approach** (hereafter referred to as the "Council Recommendation on AMR"). The monitoring framework should cover all the EU actions (legislative, non-legislative and funding instruments), as well as all general and specific objectives, laid down in both initiatives. It should also cover national level actions in all EU-27 Member States, Iceland and Norway.

The EU has long been at the forefront in the fight against AMR, driven by the seriousness of the AMR problem and its impact on public health, healthcare-system sustainability, the wider economy, and global-health security. The first **EU One Health Action Plan against AMR** was introduced in 2011[1]. In 2017, the Commission adopted a revised Action Plan, which now serves as the core document guiding the EU's strategy and efforts to combat AMR and is the focus of this study[2]. Its key objectives are to preserve the possibility of effective treatment of infections; reduce the emergence and spread of AMR; and increase the development and availability of novel solutions and tools to detect, prevent and treat infectious diseases. These objectives are structured along three pillars: (1) making the EU a best practice region; (2) boosting research, development and innovation; and (3) shaping the global agenda. For each of these pillars, the European Commission (EC) has outlined specific inputs and activities to facilitate their achievement and long-term sustainability.

In April 2023, the Commission presented its proposal for a **Council Recommendation on stepping up EU action to combat AMR in a One Health approach**[3]. The Council

[1] European Commission, Communication from the Commission to the European Parliament and the Council on the Action plan against the rising threats from Antimicrobial Resistance, 15 November 2011, COM (2011) 748. Available at: https://ec.europa.eu/health/system/files/2020-01/communication_amr_2011_748_en_0.pdf

[2] European Commission, A European One Health Action Plan against Antimicrobial Resistance (AMR), June 2017. Available at: https://health.ec.europa.eu/system/files/2020-01/amr_2017_action-plan_0.pdf

[3] Commission proposal for a Council Recommendation on stepping up EU actions to combat antimicrobial resistance in a One Health approach, COM (2023) 191 final. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52023DC0191

Recommendation was adopted in June 2023[4], therefore extending and complementing the 2017 AMR Action Plan. As with the 2017 Action Plan, the Council Recommendation aims to prevent the emergence and spread of AMR pathogens, support research and technological innovation for the detection, prevention and treatment of infections, as well as to promote the development of new antimicrobials, alternatives to the use of antimicrobials and medical countermeasures to treat infections. To this effect, the Council Recommendation is structured along nine main objectives:

Figure 1: Objectives of the 2023 Council Recommendation

A detailed list of recommended actions, addressed to the Member States, the Commission or both, are specified under each objective. The Council Recommendation reinforces the One Health approach taken in the 2017 Action Plan by expanding the scope of actions to address AMR in each sector (human and animal health and the environment), as well as by promoting cooperation and coordination across the sectors. Moreover, it recommends concrete targets by Member State for reducing antimicrobial consumption in humans, as well as infection incidence rates, and reiterates the Farm to Fork Strategy and Zero Pollution Action Plan[5] target of reducing overall EU sales of antimicrobials for use in farmed animals and aquaculture[6].

[4] Council Recommendation on stepping up EU actions to combat antimicrobial resistance in a One Health approach. Available at: https://health.ec.europa.eu/publications/council-recommendation-stepping-eu-actions-combat-antimicrobial-resistance-one-health-approach_en

[5] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions Pathway to a Healthy Planet for All EU Action Plan: 'Towards Zero Pollution for Air, Water and Soil'. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52021DC0400

[6] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, A Farm to Fork Strategy for a

Building on lessons learned during the COVID-19 pandemic, the Council Recommendation also emphasises the importance of infection prevention and control (IPC) measures, vaccines, alternatives and medical countermeasures in human and animal health, as well as securing the accessibility and supply chain for antimicrobials to improve crisis preparedness and response.

The development of a monitoring framework to assess the implementation of the 2017 AMR Action Plan and the Council Recommendation, which is the focus of the present study, is one of the actions included in the Council Recommendation itself[7].

2.2. Challenges and mitigation strategies

Before describing the methodology in detail, we explain some challenges faced in the execution of the study and how they were addressed. At the end of the section we present the study's key performance metrics.

Integrating both the EU One Health Action Plan against AMR and the Council Recommendation into a unified intervention logic (IL): One of the first tasks of this study was to develop a combined IL for both initiatives. The two documents collectively pursue an extensive array of objectives and actions aimed at combating AMR from various angles. Developing the combined IL required meticulous attention to accurately portray a unified vision of the ambitions and pathways for change outlined in both documents, while also addressing specificities. For instance, while the implementation of the 2017 AMR Action Plan was well underway at the moment of this study, and efforts have been made to track progress on the actions, the Council Recommendation was in its nascent stages, with several actions in the Recommendation text still needing more specification or operationalisation. As outlined in Section 2.3.2, the study team's approach involved developing an IL for each initiative first, and then creating a combined IL which would reveal the interconnectedness of the two initiatives. This approach provided clarity not only on what each initiative pursued but also on how they were linked. It also aided the study team in prioritising actions and indicators for inclusion in the draft monitoring framework.

Complexity of the monitoring framework: The monitoring framework developed in this study covers numerous initiatives to combat AMR that stem from two

fair, healthy and environmentally-friendly food system, COM/2020/381 final. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52020DC0381

[7] Point 38 of the Council Recommendation: Develop a monitoring framework to assess the progress and results achieved in implementing the 2017 AMR Action Plan and this Recommendation.

documents[8] and that are implemented by both the EU and Member States. These initiatives are varied, heterogeneous, and at different stages of implementation (see point above). They also cover all sectors included in the One Health approach. To ensure that the monitoring framework was comprehensive enough but, at the same time, cost-effective and manageable, the study team took a systematic approach towards prioritising indicators and deciding what could be monitored and how. This was done through an iterative process which involved intensive desk research, continuous consultation with DG SANTE (which included the development of a feedback tool for DG SANTE to prioritise indicators and streamline the selection process) and interviews with relevant stakeholders from the Commission and EU agencies. The study team also took a pragmatic approach towards prioritising indicators that were being measured already by the EU, Member States and/or international organisations, while also incorporating new indicators that could potentially be measured in the future. Also, drawing from established monitoring frameworks like the GAP-AMR monitoring and evaluation (M&E) framework,[9] the study team proposed to include both *core* indicators and *optional* indicators in the framework. This approach ensured flexibility and adaptability to evolving monitoring needs and the incorporation of new data in the future.

Keeping the consultation manageable: Due to the relatively high number of indicators included in the monitoring framework, some compromises had to be made to keep the consultation manageable for stakeholders. For instance, after several iterations of the survey questionnaire and discussion with the Commission services, it was decided that respondents would be asked to assess each indicator against maximum four criteria (relevant, credible, easy to monitor and robust) and not five as initially proposed.[10] Moreover, as mentioned in Section 2.3.4, the consultation did not include all the indicators initially proposed, such as those under the "Targets" domain from the Council Recommendation, as these were already being monitored by the EU in collaboration with Member States.

[8] Adding to the complexity, in many cases the two documents are interconnected with other policy documents (e.g. Regulation (EU) 2016/429 (Animal Health Law), Regulation (EU) 2022/2371 on serious cross-border threats to health, Regulation (EU) 2019/6 on veterinary medicinal products, Farm to Fork Strategy, etc.). We had to review and revise these associated documents to understand the connections and grasp the broader context and implications of the actions in the Action Plan and Council Recommendations.

[9] World Health Organization (WHO), Food and Agriculture Organization of the United Nations (FAO) and World Organisation for Animal Health (OIE), Monitoring and evaluation of the global action plan on antimicrobial resistance: framework and recommended indicators, 2019. Available from: https://www.woah.org/app/uploads/2021/03/en-mande-gap-amr.pdf

[10] The fifth criterion was 'Accepted' which referred to the responsibility in collecting the data for a given indicator. Given that the proposed set of indicators did not have assigned responsibilities yet, this criterion was not made part of the assessment of indicators.

Key study metrics

Despite the challenges described, the following table provides an overview of the successful implementation of the study according to the contract's key performance metrics.[11]

Table 2: Study performance metrics

Elements of the study	Performance metrics	Results
Indicators	Number of indicators collected	**Outcome indicators:** 29 (1 optional) **Output indicators:** 67 (14 optional)
Consultations	Number of respondents to the written consultation	63
Interviews	Number of interviews	14
Frameworks	Number of monitoring frameworks reviewed	22

2.3. Methodology for the development of the framework

The methodology for developing the monitoring framework consisted of the following steps and activities:

1. Desk research and development of the intervention logic;
2. Identification and initial selection of indicators;
3. Consultation of members of the AMR One Health Network (OHN); and
4. Finalisation of the monitoring framework

In the next sections, we present these steps and activities with more detail.

2.3.1. Desk research

As a first step, the study team conducted a thorough desk review of existing AMR-related monitoring frameworks and databases (**Annex 1**), as well as of relevant

[11] Please note that these metrics are unrelated to the monitoring framework developed as part of this study.

bibliographic sources (**Annex 2**) that would provide context to the study and support the development of the intervention logic, including:

- **Legislative documents** (providing information on the policy context and goals);
- **Programme/ funding documentation** (providing information on AMR-related activities' inputs, outputs, outcomes and impacts both at EU and Member State level);
- **Relevant studies/ reports from EU institutions and international bodies, and/or commissioned by them** (providing information on contextual factors, existing indicators, data sources, and specific data to populate the monitoring framework);
- **Peer-reviewed literature** (providing suggestions of other possible indicators and data sources (existing or prospective, applied or applicable to AMR or other areas) and/or good practice examples).

2.3.2. Development of the intervention logic

The second step entailed the development of an intervention logic (IL) for both the 2017 AMR Action Plan and 2023 Council Recommendation (please refer to **Annex 3**). Developing an IL means putting in place key conceptual elements of how a given intervention (in this case, two interventions) is supposed to work. The IL therefore provides a comprehensive overview of the (expected) lifecycle of the intervention(s) in question, from inputs through to (expected) outputs, outcomes and impacts. It also provides an understanding of *what needs to be monitored.*

In developing the IL, the study team was mindful that the 2017 AMR Action Plan was at an advanced stage of implementation and that the Council Recommendation on AMR was at an initial stage with many of its actions still to be operationalised. Moreover, the 2017 AMR Action Plan and Council Recommendation each pursued an extensive list of actions, with their own implementation process and ways in which they would contribute to combatting AMR.

At the study inception, the study team worked first on a **separate ILs** for each of the initiatives in question. The IL for the 2017 AMR Action Plan had been developed already as part of a previous study[12], while the IL for the Council Recommendation was developed as part of the present study. The latter followed as much as possible the depiction of the IL of the 2017 Action Plan to show continuity between the two initiatives, as well as to facilitate the synthesis of the two into a general one. Thus,

[12] European Commission, Directorate-General for Health and Food Safety, Study on a future-proofing analysis of the 2017 AMR action plan – Final report, Publications Office of the European Union, 2023, https://data.europa.eu/doi/10.2875/636347

once the individual ILs had been established, the study team developed a **combined IL**, which is presented in **Annex 3.**

In the combined IL, there is a common set of **drivers, needs and impacts** for the two initiatives, as well as nine **general objectives** (G01 to G09), which are the nine "domains" covered in the final monitoring framework (see Section 3). Moreover, there are common **specific objectives,** showing that there is alignment between the two policy documents. The **inputs** necessary for the implementation of both initiatives are mainly EU and Member States' funding and human resources implementing the activities. The expected **activities** stemming from both initiatives were also mapped across the nine GOs (or domains), and all the articles of the Council Recommendation and all the activities listed in the Action Plan were reformulated as **output indicators**, which were linked to **outcome indicators**.

In terms of impact, this corresponds to the long-term effect of any given initiative, which is not completely under the control of the stakeholders implementing the initiative. Notably, even if successfully completed, individual actions might still not be sufficient to generate the expected impact. However, in conjunction with other contextual factors or other complementary initiatives, the expected impact may be realised. Consequently, an impact might not be attributable solely to the intervention in question. For these reasons, impact indicators can only be loosely linked to specific outputs and outcomes in terms of causality. Therefore, in the combined IL, the study team presented common **impact indicators** without explicitly linking them to specific output and outcome indicators.

2.3.3. Identification and selection of indicators

While developing the combined IL and screening existing AMR-related indicators and monitoring frameworks, the study team started compiling an initial list of indicators for the monitoring framework. This entailed a thorough and iterative process of identification, prioritisation, cleaning, and shortlisting of indicators which was based not only on desk research, but also on feedback from the following organisations and bodies:

- Directorate General for Health and Food Safety (DG SANTE), units dealing with: antimicrobial resistance (A.1), health security (B.2), veterinary medicines (D.4), animals (F.2), animal health (G.2), food hygiene, feed and fraud (G.5).
- DG Environment (ENV)
- DG Research and Innovation (RTD)
- DG Maritime Affairs and Fisheries (MARE)
- Health Emergency Preparedness and Response Authority (HERA)
- European Centre for Disease Prevention and Control (ECDC)

- European Food Safety Authority (EFSA)
- European Medicines Agency (EMA)
- Joint Action on Antimicrobial Resistance and Associated Infections (JAMRAI 2)

The interviews yielded valuable insights for the formulation of indicators. They also served to confirm that many actions outlined in the 2023 Council Recommendation were still in their initial stages. Due to the novelty of the actions, metrics were lacking, and accessible data sources were scarce.

In summary, the identification and initial selection of indicators for the monitoring framework entailed the following steps:

1. Development of a long list of indicators based on a detailed review of the text of the 2017 AMR Action Plan and 2023 Council Recommendation, as well as existing AMR-related monitoring frameworks and other bibliographic sources.
2. Screening, cleaning, prioritising, shortlisting and refining of indicators based on the feedback received during the interviews and discussions with DG SANTE Unit A.1.
3. Matching the indicators to the outputs, outcomes and impacts depicted in the combined IL.
4. Assessing indicators against a set of criteria aligned with the Better Regulation Tool #43 – section 2.2 (i.e., the 'RACER' rule[13] and other criteria related to attributability, availability, timeliness[14]) and removing from the list those that did not pass the test. In principle, an indicator was selected for inclusion if it:

   (i) measures a key part of the implementation of the initiative(s) or an outcome/impact;

   (ii) can be populated with meaningful and routinely collected data (i.e., sufficiently reliable data can be available at the right time, from the right organisations, and with the appropriate comparators);

   (iii) can be monitored regularly enough so that problems are addressed early;

   (iv) is useful/ relevant to the right audiences (e.g., the indicator results can be appreciated/ used by the Commission/ Member States);

   (v) In the context of this study, other specific considerations also informed the selection of indicators, such as:

[13] The criteria are outlined in section 2.2 of Tool #43 of the BRT, Op. Cit.

[14] Association of Public Health Observatories, The Good Indicators Guide, 2008. Raleigh, V. et al., Integrated care and support Pioneers: Indicators for measuring the quality of integrated care, 2014.

(vi) if it covers all 27 EU Member States, Norway and Iceland;

(vii) if it is within the control of the Commission and/or Member States (i.e. attributability);

(viii) if change is detectable within suitable timeframes;

(ix) if the extra data collection effort and cost may be justifiable (in cases where there is no or limited routinely collected data).

5. Cross-checking the validity of the shortlisted indicators against the IL (i.e., whether the proposed indicators measure what they claim to measure), as well as identify the need for additional indicators at input, output, outcome and/or impact level.

It is important to note that these steps were not conducted sequentially. Indeed, steps 3 to 5 were performed in parallel and iteratively, one final time after the consultation with the AMR One Health Network to incorporate its results (see Sections 2.3.4 and 2.3.5).

2.3.4. Consultation of the AMR One Health Network

Through the process described above, the study team arrived at an initial set of indicators for the monitoring framework. The next step of the study entailed the consultation of members of the AMR OHN on the appropriateness of this initial set of indicators.

On 19 June 2024, 156 members of the AMR OHN were invited to respond to an EUSurvey to give feedback on the appropriateness of outcome and output indicators under the nine domains derived from the AMR Action Plan and Council Recommendation, as depicted in the combined IL. Respondents were asked to assess the extent to which the proposed indicators could be considered:

- **Relevant**, when it contributes to measuring progress and results of the actions aimed at combating AMR under each specific domain;
- **Credible**, when it is unambiguous and easy to interpret, also for non-experts;
- **Easy to monitor,** when the data for the indicator can be collected at low cost / with acceptable administrative burden; and
- **Robust**, when it is reliable and provides meaningful evidence on the progress and/or results of the actions aimed at combating AMR under each specific domain.

Moreover, the survey contributed to collecting suggestions of potential gaps in the proposed list of indicators, as well as to distinguish between core and optional indicators. The full consultation report is presented in **Annex 4**.

The survey remained open for seven weeks, closing on 9 August 2024. By the end of the period, **63 responses**[15] were received, yielding a 40% response rate.

The survey included four sections, namely:

- Profiling questions – to understand the profile of respondents and filter the survey questions accordingly.
- Indicators validation questions – asking respondents to rate the indicators against a set of criteria.
- Classification of indicators – asking respondents to indicate whether the indicators proposed were to be considered core or optional[16].
- Gap-filling questions – aimed at collecting suggestions of additional indicators and/or revisions to the ones proposed.

It should be mentioned that not all the indicators identified by the study team were included in the consultation. In particular, it was agreed with DG SANTE that indicators linked to obligations that were already set in the EU legislative frameworks on AMR were not going to be included, as well as all the indicators proposed under the "Targets" domain (derived from the Council Recommendation), as they were already being monitored and assessed at Member State or EU level.

The invitation to the EUSurvey was sent together with a supporting document with detailed information on the purpose and content of the survey, as well as guidance to help stakeholders in completing the survey. The document also included a complete list of indicators (i.e. those included and not included in the consultation) and proposed metrics for each indicator.

Last, in the weeks before the launch of the survey (28 May 2024), the study team organised an online meeting for members of the AMR OHN to explain the context and purpose of the consultation, and the main topics on which they would be consulted. The online meeting was attended by 101 members of the AMR One Health Network.

[15] This result includes also the feedback provided via email by one national authority. One survey response was disqualified and not considered for analysis as deemed to be incomplete (i.e., no answers to any indicators' validation question were provided). After the closing of the survey, two additional contributions were received in written via email. Although these have not been included in the reporting of results of the survey, they were taken into consideration during the finalisation of the monitoring framework.

[16] 'Core' indicators are those considered critical and central for monitoring progress and results of actions to combat AMR under each specific domain. 'Optional' indicators may not be considered central today, but could be measured in the future, allowing the monitoring framework to adapt to new circumstances or data available.

2.3.5. Finalisation of the monitoring framework

The consultation exercise was successful in collecting relevant feedback on the proposed output and outcome indicators from representatives of most EU countries. The survey received high response rates from individual experts (80%) and average rates from national authorities (42%) and EU bodies/ agencies (50%). The response rate among EU and international organisations was slightly lower (29%). Respondents were well balanced in terms of geographical representation, with most respondents being from the EU countries (as well as from Iceland and Norway)[17]. Moreover, national authorities from 24 EU Member States responded to the survey, as well as three national authorities from Norway and one from Iceland. Finally, no responses were collected from Bulgaria, Latvia and Poland. The survey was also successful in collecting relevant feedback on the indicators under all the domains that were included in the survey[18].

In the assessment of the proposed output and outcome indicators, the study team asked respondents three types of questions:

- For output indicators:
  - Respondents assigned to each indicator a value between 1 to 5 across the RCER criteria described in Section 2.3.4[19], with 1 being the lowest possible score (i.e., not relevant, not credible, etc.) and 5 being the highest possible score (i.e., very relevant, very credible etc.).
  - Respondents classified the indicators as core or optional.
- For outcome indicators: respondents were asked to indicate whether each of the proposed indicators were relevant, credible, easy to monitor, and robust to a large extent, to some extent, to a moderate extent, to a limited extent, to a very limited extent.

As part of the analysis of the responses, an average score was calculated for each output indicator on the values between 1 and 5 that were assigned to them. The average score for the outcome indicators has been calculated by assigning a numerical value (point) to the various response options offered. In particular:

- To a large extent = 5 points
- To some extent = 4 points
- To a moderate extent = 3 points

[17] Belgium was the most represented country, due to the large number of NGOs and EU institutions or bodies responding to the survey that were based in this country.

[18] The Domain related to AMR Targets was not included in the consultation.

[19] This is, **R**elevant, **C**redible, **E**asy to monitor, and **R**obust.

- To a limited extent = 2 points
- To a very limited extent = 1 point

In this context, the "I don't know" answers have not been taken into consideration for the calculation of the average scores.

All the output indicators proposed in the Draft Monitoring Framework received an average score of over 3 out of a maximum of 5 points across all four RCER criteria. The survey responses suggest that the outcome and output indicators proposed are predominantly **relevant** for monitoring purposes, since only two out 46 output indicators received on average less than 4 points and all the outcome indicators were deemed as largely relevant for monitoring purposes. The survey results have shown slightly less consensus from stakeholders when assessing the other three criteria. When assessing the **credibility** of the indicators for monitoring purposes, more than half of the output indicators proposed received on average less than 4 points, although 73% of the outcome indicators received more than 4 points on average. The assessment of whether the proposed indicators were **easy to monitor** also received slightly less positive responses compared to their relevance: 87% of the output and 91% of the outcome indicators proposed received on average less than 4 points. For what concerns the **robustness** of the indicators proposed, the results show that 85% output and 77% outcome indicators proposed received on average less than 4 points.

Moreover, the results show a strong consensus from respondents towards the inclusion of the proposed output indicators as core indicators in the monitoring framework. In particular, 72% of the output indicators were deemed to be suitable for inclusion in the monitoring framework as 'core indicators' (i.e., those indicators for which more than 70% of respondents reported that they should be included in the monitoring framework as core indicators).

Some suggestions were made too regarding a few indicators that could be improved by making their definition more precise or more specific. In a few instances, stakeholders suggested other possible indicators, but these tended to be indicators that did not fall within the activities envisaged by the AMR Action Plan or Council Recommendation. All suggestions were considered in the revision and finalisation of the indicators, especially for the rewording of some indicators, but no new indicators have been added to the monitoring framework.

In summary, based on the results of the consultation:

- Indicators were reworded or aspects were clarified.
- Metrics were further refined, completed and new (potential) sources were identified.
- Indicators were classified as core and optional indicators.

In the next section we present the final framework of indicators developed in this study for the monitoring of the 2017 AMR Action Plan and 2023 Council Recommendation.

3. MONITORING FRAMEWORK

3.1. Principles guiding the development of the monitoring framework

According to the Better Regulation Guidelines (BRG) and Toolbox (BRT)[20], monitoring is a continuous and systematic process of data collection about an intervention. It generates information for future evaluation and impact assessments, while contributing to meet a general duty of accountability on public spending. At the base of a monitoring framework lie indicators, which are the quantitative and qualitative measures of the extent to which policy objectives are being attained. They can assist in the analysis and comparison of performance against set targets and contribute to determining and adjusting policy priorities and improving an intervention.

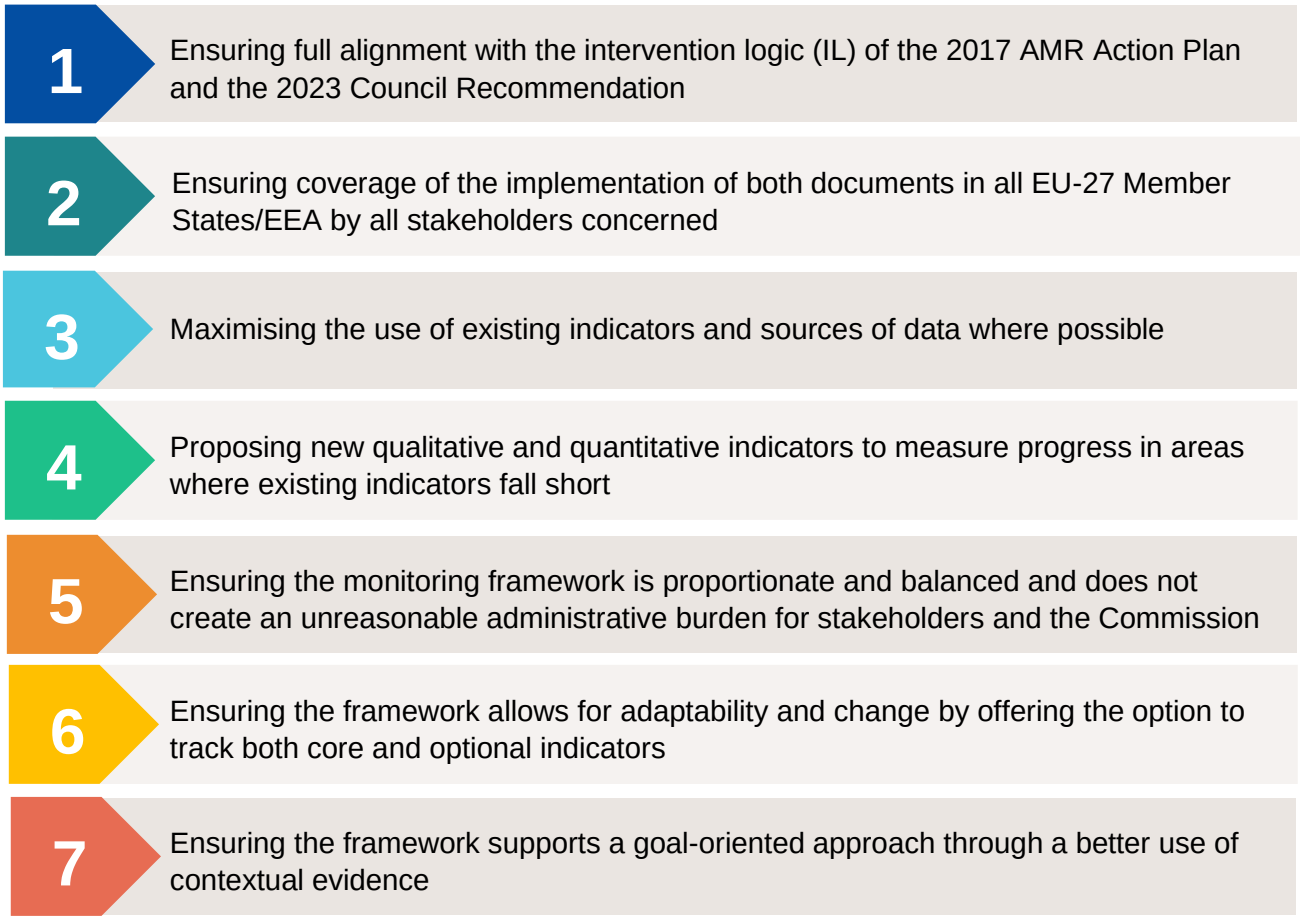
As stated before, the focus of this study has been on developing a cost-effective monitoring framework to track progress and results of the implementation of the 2017 Action Plan and the 2023 Council Recommendation on combating AMR. This meant providing a tool to help the Commission determine whether they, and the EU-27 Member States, have done or are doing what the documents set out. If the Commission's monitoring shows progress in relation to what the initiatives were set out to achieve, then future evaluations can examine the degree to which the 2017 Action Plan and the 2023 Council Recommendation have contributed to reducing deaths, ill-health, and disability from AMR.

It was not up to this study to examine the longer-term results and impacts of the initiatives per se, as these are likely to be the focus of future studies. However, to assess impact afterwards, information on the baseline and progress of activities is needed. The monitoring framework that has been developed in this study will enable the Commission to collect monitoring evidence to confirm that "things are moving in the right direction" and that impacts can be delivered in the longer-term. More concretely, it will allow the Commission to identify whether: the initiatives are being implemented as expected; there are any implementation problems that require corrective actions; and further initiatives are required to ensure that objectives can be achieved.

The monitoring framework was based on the following principles, which consider the main guidelines outlined in Section 2.5 of Tool #43 of the BRT. Below we explain how these principles were applied in the monitoring framework that is presented in Section 3.

[20] Better Regulation Guidelines; Toolbox; SWD(2021) 350 final; July 2023. Available at: https://commission.europa.eu/law/law-making-process/planning-and-proposing-law/better-regulation/better-regulationguidelines-and-toolbox_en [last accessed in September 2024].

Figure 2: Design principles applied in the development of the monitoring framework



Principle 1: Ensuring full alignment with the intervention logic (IL) of the 2017 AMR Action Plan and the 2023 Council Recommendation

As explained in Section 2.3.2, the IL for both the AMR Action Plan and Council Recommendation (please refer to **Annex 3**) outlines a set of combined general objectives which were used to define nine domains for the monitoring framework: NAPs and national policies against AMR; Surveillance; Infection prevention and control; Antimicrobial stewardship; Targets; Awareness; RD&I and access to antimicrobials and countermeasures; Cooperation; and Global actions. Drawing from this, all the activities in the AMR Action Plan and articles of the Council Recommendation, which constitute the specific objectives and activities listed in the IL, were reformulated as either output or outcome indicators and were placed under the nine domains, showing alignment between the IL and the monitoring framework.

Principle 2: Ensuring coverage of the implementation of both documents in all EU-27 Member States/EEA by all stakeholders concerned

The monitoring framework covers all the different articles and activities included in both documents and to be implemented by both the European Commission and the EU-27 Member States/EEA. The monitoring framework therefore reflects the shared responsibility for implementing and monitoring the actions against AMR between the European Commission and Member States.

Principle 3: Maximising the use of existing indicators and sources of data where possible

The review of existing data arrangements and data sources constituted the starting point for the development of the monitoring framework. The review enabled the study team to use existing indicators and data collection frameworks related to AMR as much as possible (please refer to Section 2.3.5), minimising the risk of duplication and/or unnecessary extra indicators or data collection efforts. The assessment and incorporation, where relevant, of existing indicators and data sources was a continuous task of the study, as new information became available to the study team via interviews and consultation of stakeholders.

Principle 4: Proposing new qualitative and quantitative indicators to measure progress in areas where existing indicators fall short

The IL provided a basis for the assessment of existing indicators and identification of new indicators to ensure monitoring of all the activities and expected results of the documents in question. The study team identified several weaknesses and gaps of existing indicators, including them not being directly linked to the specific actions listed in the AMR Action Plan and/or Council Recommendation, or essentially not being sufficient to cover the specifics of the documents. The new indicators proposed have undergone a rigorous process of review and consultation with DG SANTE, HaDEA and members of the AMR One Health Network (OHN) to ensure that they add value, help to cover gaps, and are fit for purpose.

Principle 5: Ensuring the monitoring framework is proportionate and balanced and does not create an unreasonable administrative burden for stakeholders and the Commission

During the process of screening and shortlisting indicators, the study team has looked to keep indicators that are practicable and manageable and relatively easy to monitor. The results of the consultation with members of the AMR OHN have been useful in this respect (see Section 2.3.5). Moreover, the monitoring framework avoids generating unnecessary costs stemming from the collection of evidence. For instance,

as explained before, it uses existing indicators and data sources as much as possible. It also includes a set of optional indicators which can be measured in the future, when and if new data becomes available.

Principle 6: Ensuring the framework is adaptable and allows for adaptability and change by offering the option to track both core and optional indicators

The monitoring framework includes **core indicators** and **optional indicators**, in recognition of the need to keep the number of indicators realistic and feasible, without limiting its ambition. These make the framework adaptable and allow for change by offering the option of a broader performance assessment framework. Therefore, the optional indicators can be used according to specific circumstances and needs.

Principle 7: Ensuring the framework supports a goal-oriented approach through a better use of contextual evidence

The monitoring framework tracks developments in the contextual factors influencing AMR, for example, it includes indicators on the transmission of resistance in the environment, awareness of AMR, antibiotic consumption levels in humans, animals and agriculture, development of novel antimicrobials and other medical countermeasures, and global actions. Therefore, the framework makes use of relevant information from the context in which the goals for combating AMR were set. Developments in the contextual factors should help guide actions and decisions towards reaching the objectives of the AMR Action Plan and Council Recommendation.

3.2. Description of the monitoring framework

This section presents the monitoring framework developed as part of the study, containing **29 outcome indicators** (one of them optional) and **67 output indicators** (14 of them optional). The complete is presented in **Annex 5**. The framework includes a number for each indicator, its definition, the average score received in the consultation, the indicator type (core/optional, qualitative/quantitative, output/outcome), unit of measurement, the legal basis (Action Plan or Council Recommendation), the OH sector, frequency of measurement, proposed metrics, data sources and, for when existing data is not available, proposed data collection source. In addition, the fiches for all the outcome indicators proposed are presented in **Annex 6**.

The list of indicators under each domain is as follows:[21]

[21] Indicators in *Italic* are optional indicators.

Domain 1: NAPs and national policies against AMR

This domain focusses on the recommendation to Member States to adopt or update and implement high-quality National Action Plans against AMR based on the One Health approach. To this end, MS are encouraged to have NAPs in place by 14 June 2024 with certain recommended features, such as the allocation of appropriate human and financial resources for NAP implementation and the conduct of regular NAP evaluations whose results are considered as inputs in future NAPs. The indicators to measure this domain are as follows:

Indicator type and number	Indicator
NAP Outcome Indicator 01	Increase in the number of Member States implementing high quality NAPs (Note: The quality of NAPs refers to the potential improvements in terms of results linked to the output indicators proposed)
NAP Output Indicator 01	Level of NAP development and/or implementation in each Member State
NAP Output Indicator 02	Number of MS whose NAP outcomes are evaluated at least every 3 years & the evaluation is publicly available
NAP Output Indicator 03	Level of intersectoral coordination in the implementation of NAPs; sectors involved in the coordination in each Member State
NAP Output Indicator 04	Number of Member States whose NAP includes monitoring mechanisms, and the characteristics of their monitoring mechanism
NAP Output Indicator 05	Number of Member States whose NAP includes evidence-based measures to prevent, monitor and reduce the spread of AMR in the environment
NAP Output Indicator 06	*Level of human and financial resources allocated for the effective implementation of NAP*
NAP Output Indicator 07	Extent of EU support to the mobilisation of appropriate human and financial resources for the effective implementation of the National Action Plans

Domain 2: Surveillance

This domain encourages Member States to close existing surveillance and monitoring gaps and to ensure completeness of data on both AMR and antimicrobial consumption by 2030. It encourages actions aimed at improving surveillance in human and animal health and the environment as well as integrating surveillance across all sectors. It is subdivided as follows:

Surveillance of AMR in human health

Indicator type and number	Indicator
SURVEILLANCE Outcome Indicator 01	AMR surveillance status in humans in each Member State
SURVEILLANCE Output Indicator 01	Extent to which epidemiological surveillance in the EU is implemented according to Commission Implementing Decision (EU) 2018/945 on the communicable diseases and related special health issues to be covered by epidemiological surveillance as well as relevant case definitions
SURVEILLANCE Output Indicator 02	Number of Member States whose AMR surveillance of bacteria in humans includes all isolates from clinical microbiology laboratories (in addition to bloodstream and cerebrospinal fluid isolates (invasive isolates))
SURVEILLANCE Output Indicator 03	Number of Member States with national legislation requiring that infections caused by critical (high negative human health impact) multidrug-resistant organisms resistant to last line treatments are notifiable diseases (e.g. carbapenem-resistant *Acinetobacter baumannii*, carbapenem-resistant Enterobacteriaceae (e.g. *Klebsiella pneumoniae*, *Escherichia coli*) and *Candida auris*)
SURVEILLANCE Output Indicator 04	*Number of Member States with expanded surveillance in humans to pathogens with emerging or established AMR due to their exposure to substances in the environment, in particular those used in plant protection products or biocidal products*

Monitoring of antimicrobial consumption (AMC) in human health

Indicator type and number	Indicator
SURVEILLANCE Outcome Indicator 02	Extent of AMC monitoring in humans in each Member State (with the aim of achieving complete collection of AMC data for human health by 2030)
SURVEILLANCE Output Indicator 05	Extent (i.e., coverage, frequency, types of antimicrobials) of AMC monitoring implementation in Member States at: i) Community level; ii) Hospital level; iii) Long-term care facilities
SURVEILLANCE Output Indicator 06	Number of Member States which collect prescribing and/ or dispensing data on antimicrobials in humans

Surveillance of AMR in animals

Indicator type and number	Indicator
SURVEILLANCE Outcome Indicator 03	Extent of AMR surveillance in animals in each Member State
SURVEILLANCE Output Indicator 07	Extent to which monitoring and reporting of AMR is done in accordance with (Articles 1.4, 3 and 4 of) Commission Implementing Decision (EU) 2020/1729 on the monitoring and reporting of antimicrobial resistance in zoonotic and commensal bacteria

Surveillance of AMR in the environment

Indicator type and number	Indicator
SURVEILLANCE Outcome Indicator 04	Improved surveillance of AMR in the environment (water and/or soil) at EU level
SURVEILLANCE Output Indicator 08	Monitoring of the levels of pollution in water caused by antibiotics, antifungal, fungicide and plant protection products is done in accordance with the Watch List under the Water Framework Directive
SURVEILLANCE Output Indicator 09	*Levels of AMR in urban waste water as per the recast Urban Wastewater Treatment Directive surveillance obligations for agglomerations of 100,000 population equivalent and above*
SURVEILLANCE Output Indicator 10	*Extent to which EU Agencies and MS competent authorities consider risk of AMR in the assessment of active substances and products, respectively where relevant*

Integrated surveillance

Indicator type and number	Indicator
SURVEILLANCE Outcome Indicator 05	*Extent to which integrated surveillance of AMC & AMR is achieved at EU level*
SURVEILLANCE Output Indicator 11	*Number of Member States with any form of integrated and continuous systems for monitoring and surveillance of AMR and AMC encompassing human health, animal health, plant health, food, wastewater and the environment*

Domain 3: Infection Prevention and Control

This domain encourages a number of actions to ensure that Infection Prevention and Control measures in human and animal health are put in place and continuously

monitored with the objectives of reducing infection prevalence rates in healthcare settings and reducing disease outbreaks in animal populations.

Infection prevention and control (IPC) in the human health sector

Indicator type and number	Indicator
IPC Outcome Indicator 01	Reduction in infections acquired in healthcare settings (acute settings)
IPC Output Indicator 01	Extent to which Member Sates guarantee/ continuously provide training on IPC core competences for healthcare professionals in hospitals and in long-term care facilities
IPC Output Indicator 02	*Allocation of financial resources for IPC programmes in hospitals and long-term care facilities in each Member State*
IPC Output Indicator 03	Number of Member States conducting quality control of IPC measures in hospitals and in long-term care facilities
IPC Output Indicator 04	EC develops IPC guidelines in human health for hospitals and long-term care facilities
IPC Output Indicator 05	*State of infrastructure in healthcare facilities*
IPC Output Indicator 06	Extent to which clinical laboratories are able to provide high quality microbiological support to healthcare facilities

Vaccination programmes

Indicator type and number	Indicator
IPC Outcome Indicator 02	Percentage of target population covered by vaccines included in Member States' national vaccination programmes
IPC Output Indicator 07	National immunisation programmes are fully developed and implemented (on the basis of Council Recommendation of 7 December 2018 on Strengthened Cooperation against Vaccine Preventable Disease) in all Member States

Biosecurity and Infection prevention and control (IPC) in the animal health sector

Indicator type and number	Indicator
IPC Outcome Indicator 03	Reduction in animal disease outbreaks
IPC Output Indicator 08	Extent to which Member States promote the uptake of biosecurity and IPC measures in farms
IPC Output Indicator 09	*Amount of funding allocated/type of support provided to preventive actions against infectious diseases through the common agricultural policy (CAP)*
IPC Output Indicator 10	*Number of projects funded (and amount of funding provided) through the European Maritime, Fisheries and Aquaculture Fund (EMFAF) that are relevant to combat AMR*

Indicator type and number	Indicator
IPC Output Indicator 11	Extent to which Member States promote the uptake of biosecurity and IPC measures in aquaculture
IPC Output Indicator 12	Availability of vaccination programmes for food producing animals
IPC Output Indicator 13	*Number of Member States promoting the development and use of innovative feed additives to improve the physiological status of animals*
IPC Output Indicator 14	Number of Member State providing continuous training on IPC and biosecurity to personnel in veterinary practice, farms and aquaculture

AMR exposure in the environment

Indicator type and number	Indicator
IPC Outcome Indicator 04	Extent to which farms implement measures for good manure and sewage sludge management in each Member State
IPC Output Indicator 15	Uptake of good evidence-based manure management practices in agriculture in each Member State
IPC Output Indicator 16	Uptake of good evidence-based sewage sludge management practices in agriculture in each Member State

Domain 4: Antimicrobial Stewardship (AMS)

This domain encourages actions to ensure that AMS measures are put in place for human health to support the prudent use of antimicrobial agents in healthcare settings including the development of EU guidelines for the treatment of major common infections and for perioperative prophylaxis and the promotion of adherence to them by relevant professionals. Other encouraged actions include promotion of the use of diagnostic tests in in healthcare and veterinary practices and the development of programmes for the collection and safe disposal of antimicrobials.

AMS in the human health sector

Indicator type and number	Indicator
AMS Outcome Indicator 01	Extent to which AMS & prudent use of antimicrobials across healthcare settings has improved in each Member State

Indicator type and number	Indicator
AMS Output Indicator 01	EC develops EU guidelines for the treatment of major common infections in humans and for the perioperative prophylaxis in humans, which would include information on the use of adequate diagnostic tests, the need for antibiotics, the choice of the appropriate antibiotic (if needed), the dose and dose intervals, and the duration of treatment/prophylaxis
AMS Output Indicator 02	Extent of implementation of AMS measures addressed to health professionals in each Member State
AMS Output Indicator 03	*Extent of implementation of AMS measures addressed to community and hospital pharmacies in each Member State*
AMS Output Indicator 04	Extent to which diagnostic testing is available in medical practice in each Member State

AMS in the animal health sector

Indicator type and number	Indicator
AMS Outcome Indicator 02	Extent to which AMS & prudent use of antimicrobials in veterinary settings has improved in each Member State
AMS Output Indicator 05	Extent to which diagnostic testing is available in veterinary practice in each Member State
AMS Output Indicator 06	Volumes of sales and use of antibiotics for animals in each Member State

Collection & safe disposal of antimicrobials

Indicator type and number	Indicator
AMS Outcome Indicator 03	Improved collection & safe disposal of antimicrobials in relevant settings
AMS Output Indicator 07	Number of Member States having developed national programmes for the collection & safe disposal of antimicrobials from all relevant settings

Domain 5: Targets

This domain encourages Member States to take actions to ensure that by 2030, the total consumption of antibiotics in humans is reduced by 20% in the Union compared with the baseline year 2019, as well as a 50% reduction in overall EU sales of antimicrobials used for farm animals and aquaculture.

Indicator type and number	Indicator
TARGET Outcome Indicator 01	Reduction of 20% in EU in total consumption of antibiotics by humans
TARGET Output Indicator 01	Reduction in total consumption of antibiotics by humans in each MS as per target defined in Annex 1 of the Council Recommendation
TARGET Outcome Indicator 02	At least 65% of total AMC in humans belongs to the access group of ABs as defined in the AWaRe classification of WHO
TARGET Output Indicator 02	Total AMC in humans belonging to the access group of ABs as defined in the AWaRe classification of WHO reaches at least 65% in each MS, as per Annex 1 of the Council Recommendation
TARGET Outcome Indicator 03	Reduction of 15% in EU in total incidence of bloodstream infections with third-generation MRSA
TARGET Output Indicator 03	Reduction of in total incidence of bloodstream infections with third-generation MRSA in each MS as per target defined in Annex 1 of the Council Recommendation
TARGET Outcome Indicator 04	Reduction of 10% in EU in total incidence of bloodstream infections with third-generation cephalosporins-resistant Escherichia coli
TARGET Output Indicator 04	Reduction in total incidence of bloodstream infections with third-generation cephalosporins-resistant Escherichia coli in each as per MS target defined in Annex 1 of the Council Recommendation
TARGET Outcome Indicator 05	Reduction of 5% in EU in total incidence of bloodstream infections with third-generation carbapenem-resistant Klebsiella pneumoniae
TARGET Output Indicator 05	Reduction in total incidence of bloodstream infections with third-generation carbapenem-resistant Klebsiella pneumoniae in each MS as per target defined in Annex 1 of the Council Recommendation
TARGET Outcome Indicator 06	Reduction of 50% of the overall EU sales of antimicrobials used in farmed animals and in aquaculture

Domain 6: Awareness

This domain encourages MS to ensure that national educational programmes and curricula include mandatory cross-sectoral training and competences on AMR and related topics. It also encourages MS conduct awareness raising and communication activities on AMR and AMS for the general and targeted public and for relevant professionals as well as to coordinate such activities among each other and with relevant EU bodies and agencies.

Education and training

Indicator type and number	Indicator
AWARENESS Outcome Indicator 01	Improvement in the provision of AMR education and training to relevant professionals in human health, veterinary and agronomy sectors
AWARENESS Output Indicator 01	Extent to which national continuous education programmes and curricula for the disciplines below cover topics i. AMR, ii. IPC, iii. Environmental risks, iv. Biosecurity, v. antimicrobial stewardship [Disciplines: a. medicine, b. nursing, c. midwifery, d. pharmacy, e. dentistry, f. veterinary medicine, g. agriculture and agronomics, h. environmental and ecological sciences]
AWARENESS Output Indicator 02	Number and, where available, reach of information campaigns on AMR related issues conducted for professionals in human health, veterinary and agronomy sectors in each Member State
AWARENESS Output Indicator 03	EU support to Member States in continuous training and lifelong learning of the professionals in i) human health, ii) veterinary and iii) agronomy sectors, including via the BTSF platform

AMR awareness raising activities for the general public

Indicator type and number	Indicator
AWARENESS Outcome Indicator 02	Increase in the general public's knowledge of AMR in each Member State
AWARENESS Output Indicator 04	Number of awareness raising activities or communication campaigns on AMR related issues conducted at national level in each Member Sate for: i) large-scale for the general public; ii) targeted for specific groups
AWARENESS Output Indicator 05	*Extent to which MS coordinate national awareness raising activities and communication campaigns on AMR related issues with other MS, EC and EU agencies*
AWARENESS Output Indicator 06	Number and type of pan-European communication actions on AMR and AMS and amount of funding mobilised for them

Domain 7: R&D&I and access to antimicrobials and other AMR medical countermeasures

This domain encourages actions to support research and technological innovation with push incentives for the detection, prevention and treatment of infections in humans caused by antimicrobial resistant pathogens. It also encourages actions to

improve the accessibility to antimicrobials other medical countermeasures in humans by using pull incentives and by taking measures to support MS to reduce shortages. Other actions include measures to incentivise the development and placement on the

market of alternatives to the use of antimicrobials and of vaccines for animal health as well as support research aimed at improved understanding of AMR in the environment.

R&D&I for antimicrobials and other AMR medical countermeasures in the human health sector

Indicator type and number	Indicator
RDI Outcome Indicator 01	Number of new antibiotics and AMR medical countermeasures, or novel candidates in the pipeline, for human health, supported by EU funding instruments, in the R&D pipeline and/or authorised by the EU
RDI Output Indicator 01	Establishment of the European partnership on One Health AMR
RDI Output Indicator 02	Amount of EU funding and type of push funding instrument allocated for research and innovation for the detection, prevention and treatment of infections in humans caused by antimicrobial resistant pathogens
RDI Output Indicator 03	Establishment of a European-wide sustainable clinical research network
RDI Output Indicator 04	EU support provided for identification of priority AMR pathogens at EU and MS level, for mapping existing, upcoming and missing AMR medical countermeasures, and for defining target product profiles
RDI Output Indicator 05	Amount of EU funding allocated for translational research and late-stage development of AMR medical countermeasures, including clinical trials for antimicrobials
RDI Outcome Indicator 02	Expanded and stable access to antimicrobials in Member States
RDI Output Indicator 06	Establishment of the EU multi-country pull incentive scheme
RDI Output Indicator 07	Extent of support provided by EU bodies and agencies to Member States for the coordination of initiatives on manufacturing, procurement and stockpiling of antimicrobials

Access to antimicrobials

Indicator type and number	Indicator
RDI Outcome Indicator 03	Number of new antibiotics or alternatives to the use of antimicrobials and of vaccines for animal health in the R&D pipeline or brought to market, supported by EU funding
RDI Output Indicator 08	Number of projects/ organisations funded by the EU (and amount of funding allocated) to support the successful development and placement on the market of alternatives to the use of antimicrobials and of vaccines for animal health

AMR in the environment

Indicator type and number	Indicator
RDI Outcome Indicator 04	Improved understanding of AMR in the environment
RDI Output Indicator 09	Amount of funds made available (by type of funding instrument) to support research on AMR in the environment

Domain 8: Cooperation

This domain aims at improving the coordination of One Health responses to AMR among Member States as well as between MS and the EU and at EU level by encouraging cooperation and exchange of best practices in the context of the EU AMR One Health Network and other relevant fora.

Indicator type and number	Indicator
COOPERATION Outcome Indicator 01	Improved coordination of One Health responses to AMR among Member States, between Member States and EU agencies/bodies, and at EU level
COOPERATION Output Indicator 01	*Number of best practice exchange opportunities in the context of One Health AMR Network meetings or other relevant committees and working groups*
COOPERATION Output Indicator 02	The interagency AMR working group is established and functional

Domain 9: Global

This domain encourages MS and the Commission to advocate for the adoption of more ambitious international standards on combatting AMR and their implementation by third countries, coordinated global response to AMR and the continued recognition of combatting AMR as a political priority in international fora, and to support the strengthening of capacities of third countries to respond to AMR.

Global commitments

Indicator type and number	Indicator
GLOBAL Outcome Indicator 01	Global commitments and normative frameworks to tackle AMR are in line with EU positions and priorities
GLOBAL Output Indicator 01	Active EU participation in drafting and negotiating international standards and agreements relevant to AMR

International cooperation

Indicator type and number	Indicator
GLOBAL Outcome Indicator 02	Strengthened international cooperation and coordinated global response to AMR
GLOBAL Output Indicator 02	Active EU participation in international fora aimed at cooperating/coordinating a global response to AMR
GLOBAL Output Indicator 03	*MS reporting to international monitoring surveillance systems*

Capacity to address AMR

Indicator type and number	Indicator
GLOBAL Outcome Indicator 03	Contribution of the EU to strengthening capacities of third countries to tackle AMR
GLOBAL Output Indicator 04	Amount of funding and extent of technical support provided to third countries to build capacities to address AMR through support for implementation of international standards and action plans, trainings and R&D

3.3. Data sources and future data collection

As explained in Section 2, the monitoring framework has been developed to maximise existing data sources. Specifically, the datasets used include:

Table 3: Available datasets included in the proposed monitoring framework

Dataset	Coverage (within the scope of the study)	Data quality
Global Database for Tracking Antimicrobial Resistance (AMR) Country Self-Assessment Survey (**TrACSS**)	2017-2022	Medium. Relies on self-assessment by MS
Questionnaire of Implementing Regulation (EU) 2023/1808	2023	Medium. Data not publicly available, collected every three years and relies on self-assessment by MS

Dataset	Coverage (within the scope of the study)	Data quality
IHR States Parties Self-Assessment Annual Report (**SPAR**)	2017- 2023	Medium. Relies on self-assessment by MS
European Surveillance of Antimicrobial Consumption Network (ESAC-Net) data / antimicrobial consumption dashboard ("AMC dashboard") (**ECDC**)	2017-2021	High. Established data reporting from national competent authorities to ECDC
European Antimicrobial Resistance Surveillance Network (EARS-Net) data (**ECDC**)	2017-2022	High. Established data reporting from national competent authorities to ECDC
European Surveillance of Veterinary Antimicrobial Consumption (ESVAC) database (**EMA**)	2017-2022	High. Data collected from national competent authorities on voluntary basis
Antimicrobial Sales and Use (ASU) Platform (**EMA**)	From 2023 (but available end of 2024)	High. Established data reporting from national competent authorities to EMA
EU Animal Diseases Information System (**ADIS**)	2017-2023 (completed for the full year; 2024 weekly reports and updates)	High. Established data reporting to the European Commission.

Dataset	Coverage (within the scope of the study)	Data quality
Global Health Observatory, immunization and vaccine-preventable communicable diseases data (**WHO**)	2017-2023	High. Established data collection by WHO.
Vaccination against influenza of population aged 65 and over (**Eurostat**)	2017-2022	High. Data collected by Eurostat
Cordis	2017-2024	High. Database of research projects owned by the European Commission. Limitations in the use of the data (will rely on keyword searches).
Eurobarometer	2018 & 2022	High. Established pan-European survey of Public Opinion.

Existing indicators and data collection activities leave, however, important gaps that will need to be filled with purposedly data collection activities. Based on the number of indicators and feedback received in the consultation activities, we recommend disseminating a survey to Member States authorities (through the AMR One Health Network) every three years so authorities can self-assess themselves and track their progress in implementing the Council Recommendation. While self-assessments have some limitations in the robustness of the data collection, it will not heavily increase the administrative burden and will be aligned with other EU and global data collection methods already used in the framework, such as the Questionnaire of Implementing Regulation (EU) 2023/1808 and TrACCS or SPAR. A draft questionnaire is included in **Annex 7**.

4. CONCLUSIONS AND RECOMMENDATIONS

The development of a comprehensive monitoring framework for the EU's One Health Action Plan and the 2023 Council Recommendation against Antimicrobial Resistance (AMR) provides a robust, adaptable tool for tracking progress, ensuring accountability, and guiding future policy actions. By aligning with the intervention logic, leveraging existing data, and incorporating both core and optional indicators, the framework addresses the complex, multi-sectoral nature of AMR efforts across human, animal, and environmental health. The framework was developed by adopting a structured methodology, stakeholder consultations, and iterative refinements of the proposed indicators.

Below are specific recommendations for ensuring the continued utility of the monitoring framework. As emphasised by these practical recommendations, it is important that the framework developed and proposed in this study is a starting point and not the end of the process.

1. **We recommend that the different elements of the proposed monitoring framework are periodically reviewed and updated to ensure their utility**. As the recommendations on stepping up actions against AMR are implemented, monitoring needs are likely to change over time. Some elements, such as indicators, can prove to be ineffective, while new, more efficient monitoring opportunities/tools and datasets may become available in the future. Provided this is done transparently and periodically, issues such as comparability of indicators over time will be minimised and utility maximised. Similarly, baselines and targets may need to be developed from scratch based on the emergence of new data or amended. As such, the proposals made in this study for the indicators, should be tested and reviewed at regular intervals (e.g., every three years). The first year(s) of implementation should be treated as a pilot to see how the reporting of indicators works in practice. It is important to streamline the indicators wherever possible, based on their utility in practice, and consider reducing the overall number of indicators if deemed appropriate, given the high number of indicators in this framework. This will make the monitoring framework easier to manage. Similarly, after the first two-three years of implementation, the data collection tools proposed will need to be fine-tuned or improved to ensure maximal utility. We recommend that the tools are reviewed after every reporting period, in particular after the first one, when its strengths and potential weaknesses will have been experienced in practice.

2. **Shared responsibility for monitoring of the actions covered by the Council Recommendation, and those still ongoing under the Action Plan.** The framework will need the support of the Commission services and EU agencies that implement the different measures included in the 2017 Action Plan and 2023 Council Recommendation. For the successful implementation of the monitoring exercise, sustained engagement of the different relevant actors needs to be ensured.

3. **Make the results of the monitoring visible to stakeholders**, especially to members of the AMR One Health network and Commission services and EU agencies, who will contribute in providing monitoring data. A periodic presentation of the results of the monitoring framework could promote visibility and engagement.

4. **We recommend further exploring the automation of data gathering to the extent possible.** As new sources become available (e.g., EMA's ASU platform), automation in the collection of data and updating of the framework could be explored. Further automation in collecting self-reporting data from members of the AMR One Health Network could also be explored to reduce survey fatigue

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5. ANNEXES

5.1. Annex 1: Identified datasets, monitoring frameworks, tools and classification systems

The table below contains a list of datasets, monitoring frameworks and / or tools that are used in the AMR monitoring space to date at the global, European and national (non-EU) level that the study is reviewing as part of the study's Tasks 1 & 2.

Table 4: Reviewed datasets, monitoring frameworks, tools and classification systems

Name	Description	Outcome of review
GLOBAL		
Global Antimicrobial Resistance and Use Surveillance System (**GLASS**) Dashboard available at: https://worldhealthorg.shinyapps.io/glass-dashboard/_w_9d220a44/#!/amr	**Organisation:** World Health Organisation (WHO) **Years:** module dependent (see below) **Data coverage:** GLASS is a system made up of different technical modules relevant for surveillance. The modules comprise surveillance activities built on routinely available data (e.g., patient samples collected for clinical purposes or national sales of antimicrobials) to produce the following modules: • Antimicrobial Resistance surveillance (**GLASS-AMR**): annual data since 2016 covering 91 countries • Antimicrobial Consumption surveillance (**GLASS-AMC**): data collection began in 2019 and covers just 9 countries to date and focussed surveillance activities aimed at generating information for specific purposes, based on countries, territories and areas' needs[22]. Four other surveys and studies are in place[23].	Excluded (overlaps with EARS-NET data)

[22] Currently: a "GLASS-EAR module" supports prevention, detection, early warning, risk assessment and response and, in recognition of the growing threat of resistant fungal infections, "GLASS-Fungi" was initiated as a global collaboration for data on antifungal-resistant infections.

[23] looking at: surveillance of gonorrhoeae, One Health AMR surveillance (looking at successful implementation of a model for integrated multi sector surveillance), and two modules which relate to methods.

Name	Description	Outcome of review
Global Database for Tracking Antimicrobial Resistance (AMR) Country Self- Assessment Survey (**TrACSS**) Dashboard available at: https://amrcountryprogress.org/#/visualization-view	**Organisation:** WHO, Food and Agriculture Organization (FAO), World Organization on Animal Health (WOAH)[24], United Nations Environment Programme (UNEP). **Years:** 2017-2022 **Data coverage:** Annual survey monitoring country progress in implementing national actions plans adopted to implement the GAP-AMR since 2016. 166 countries responded to the latest survey in 2023. Links to GO1 of the Council Recommendation (the implementation of national action plans). TrACCS is an annual survey of countries' own assessment of their achievements vis-a-vis the first four objectives of the GAP-AMR, as well as contextual information. For example, it asks for an official view on whether the country has a formalised multi-sector approach (i.e. whether national authorities responsible for human health, animal health, plant health, food production, food safety, environment, animal production (including feed) have a formal approach to address AMR).	**Included**
IHR States Parties Self-Assessment Annual Report (**SPAR**)	**Organisation:** WHO **Year:** since 2017 **Data coverage**: Uses 35 indicators across 15 IHR capacities to evaluate countries' ability to detect, assess, notify, report, and respond to public health risks. Each capacity is measured by 1-3 indicators, further detailed by specific attributes.	**Included**
The global database on ANImal antiMicrobial USE (**ANIMUSE)** Online platform available here: https://amu.woah.org/amu-system-portal/home	**Organisation**: WOAH (formerly OIE) **Years**: since 2015 **Data coverage**: Amounts and reasons for antimicrobial use in animals since 2015. 157 countries reported in the latest round of data collection in 2022. Should be consulted in conjunction with GLASS, as the animal counterpart to the AMC module. The direct link with the present study is not obvious but could be used as an indicator at impact level and to indicate surveillance efforts (GO2) and enhanced cooperation (GO8)	Excluded

[24] Founded as OIE.

Name	Description	Outcome of review
The Global Observatory on Health R&D, and it is sub module on R&D in AMR Dashboard available at: https://dashboard.globalamrhub.org/reports/investments/overview	**Organisation**: WHO **Years**: since 2017 **Data coverage**: The Dynamic Dashboard continuously collects and presents information on AMR R&D investments across the One Health spectrum. It presents information on investments from public and not-for profit private funders into AMR R&D related to human bacterial infections and animal pathogens.	Excluded
WHO Global IPC (Infection, Prevention and Control) Portal See online portal here: https://ipcportal.who.int/	**Organisation**: WHO **Years**: portal live since 2021 **Data coverage**: this is a resource for health workers, and professionals working in the field of infection prevention and control (IPC). It supports situational analysis, track progress and understand how to make improvements to IPC at the national and facility levels, in accordance with validated WHO standards and implementation materials. The results give insights into gaps in IPC measures. It covers 194 countries across 6 regions.	Yes, excluded (dataset is not publicly available)
Food and Agriculture Organization Corporate Statistical Database (FAOSTAT) https://www.fao.org/faostat/en/%3F%23data#data	**Organisation**: FAO **Years**: from 1961 **Data coverage**: Food and agriculture data for over 245 countries and territories and covers all FAO regional groupings. The database provides data on six domains including the food security and nutrition domain which provides statistics of dietary related data (24 nutrients in total).It gives data on all forms of malnutrition and estimates on the number of people who are unable to afford a healthy diet. The statistics are presented at the national level for all data sources and by geographic areas. This data include information on the use of pesticides which could be useful context for the study.	Excluded

Name	Description	Outcome of review
Sustainable Development Goals (SDG) For more information, see: https://sdgs.un.org/goals and https://unstats.un.org/sdgs/report/2023/	**Organisation**: UN **Year**: since 2017 **Data coverage:** The global indicator framework includes 231 unique indicators across the 17 SDGs. The subjects covered range from ending poverty to strengthening the means of implementation and revitalise the Global Partnership for Sustainable Development Finance. The SDGs provide context indicators for the underlying risks and drivers of AMR. For instance, GAP-AMR refers to SDG6, SDG3.b.3 and SDG 12.4. The organisation and presentation of the SDGs can also provide inspiration for the development of the framework.	Excluded
International Classification of Diseases – 11th revision (ICD-11) See: https://icd.who.int/en	**Organisation**: WHO **Year**: ICD -11 has been active since 2022, the ICD has a long history dating back to the 19th century, see History of the development of the ICD (who.int) **Data coverage:** The ICD provides a common language for recording, reporting and monitoring diseases. This allows the world to compare and share data in a consistent and standard way – between hospitals, regions and countries and over periods of time. It facilitates the collection and storage of data for analysis and evidence-based decision-making. It is primarily used by physicians, nurses, other providers, researchers, health information managers and coders, health information technology workers, policy-makers, insurers and patient organisations.	Excluded
Antimicrobial Testing Leadership and Surveillance "ATLAS" Database access via: https://atlas-surveillance.com/#/login	**Organisation:** Pfizer (private economic operator) **Year:** 2022 (updated 6-8 months) **Data coverage**: a database (from 73 countries) of antimicrobial surveillance data from different surveillance programmes around the world.	Excluded
Community for Open Antimicrobial Drug Discovery (CO-ADD) https://db.co-add.org/screening-data/	**Organisation:** University of Queensland **Year:** 2020 **Data coverage:** Chemical structures and antimicrobial activity data. The data is used to screen compounds for antimicrobial activity for academic research groups. CO-ADD's goal is to find new, diverse compounds to combat the AMR crisis in screening chemical compounds for antimicrobial activity. These data are for scientists working on discovering new antimicrobials. They are unlikely to be useful for the monitoring framework but it will be reviewed more closely.	Excluded
EUROPEAN		

Name	Description	Outcome of review
Antimicrobial consumption dashboard ("AMC dashboard") See dashboard here: https://qap.ecdc.europa.eu/public/extensions/AMC2_Dashboard/AMC2_Dashboard.html#data-source-tab	**Organisation:** European Centre for Disease Prevention and Control (ECDC) **Year**: 1997-2021 **Data coverage:** Surveillance data on antimicrobial consumption in European countries (EEA) based on the "The European Surveillance System" TESSy, according to the European Surveillance of Antimicrobial Consumption Network (ESAC-Net) reporting protocol. ESAC-Net is a network of national surveillance systems from the EU and EEA/EFTA countries. It collects and analyses data on antimicrobial consumption both in the community and in the hospital sector. The management and coordination of ESAC-Net was transferred to the ECDC in 2011.	**Included**
Surveillance Atlas of Infectious Diseases Interactive dashboard here: http://atlas.ecdc.europa.eu/public/index.aspx	**Organisation:** European Centre for Disease Prevention and Control (ECDC) **Year**: 2007 - 2022 **Data coverage**: The Surveillance Atlas of Infectious Diseases is a tool that interacts with the latest available data on monitored infectious diseases. The information contained in the dataset provided through ATLAS draw on data from TESSy and EARS-Net. These data can be manipulated to illustrate AMR (different strains).	**Included**
EpiPulse - the European surveillance portal for infectious diseases https://www.ecdc.europa.eu/en/publications-data/epipulse-european-surveillance-portal-infectious-diseases	**Organisation:** European Centre for Disease Prevention and Control (ECDC) **Year:** 2017-2021 **Data coverage:** The portal is designed for healthcare professionals. It facilitates collection, analysis and dissemination of indicator- and event-based surveillance data on infectious diseases and associated health issues, including global epidemic intelligence, whole-genome sequencing, and health determinants.	Excluded
European Surveillance of Veterinary Antimicrobial Consumption (ESVAC) database https://esvacbi.ema.europa.eu/analytics/saw.dll?PortalPages	**Organisation:** European Medicines Agency (EMA) **Year:** 2005 - 2022 **Data coverage:** This system collects information on how antimicrobial medicines are used in animals from 31 EU and EEA/EFTA countries, maintains an interactive database and publishes annual reports on the volume of sales of veterinary antimicrobial medicinal products.	**Included**

Name	Description	Outcome of review
Antimicrobial Sales and Use Platform https://www.ema.europa.eu/en/veterinary-regulatory-overview/antimicrobial-resistance-veterinary-medicine/antimicrobial-sales-use-platform	**Organisation:** European Medicines Agency (EMA) **Year**: from 2023 (available from end of 2024) **Data coverage:** As of January 2024, all Member States in the European Union (EU) and European Economic Area (EEA) must submit data annually to the Antimicrobial Sales and Use (ASU) Platform. This new obligation was introduced by the Veterinary Medicinal Products Regulation (Regulation (EU) 2019/6) as one of the measures to fight antimicrobial resistance.	**To be included** (once data becomes available)
Dashboard on Indicators of Antimicrobial Resistance https://www.efsa.europa.eu/en/microstrategy/dashboard-indicators-antimicrobial-resistance	**Organisation:** European Food Safety Authority (EFSA) **Year**: from 2014-2015 to 2021-2022 (biannual) **Data coverage:** This dashboard provides data on complete susceptibility in indicator E. coli from animals and prevalence of ESBL and/or AmpC-producing E. coli in the main food-producing animal populations and in carcase/meat samples monitored.	[Inclusion/ exclusion to be confirmed]
European Health Information Gateway https://gateway.euro.who.int/en/datasets/amr/	**Organisation:** World Health Organisation (WHO) **Year**: 2017 - **Data coverage:** The WHO's European Health Information Gateway includes a module on AMR (among other health indicators). In the AMR module, data from two separate data sources are combined[25] to provide an indication of the resistance patterns presents in clinical settings.	Excluded (data overlaps with EARS-Net)
The European Core Health Indicators (ECHI)[26] ECHI data tool: https://webgate.ec.europa.eu/dyna/echi/	**Organisation:** European Commission and EU Member States **Year:** 2004 -2019 **Data coverage:** Indicators cover demographic and socio-economic indicators, health status indicators, determinants of health indicators, and health interventions (screenings, hospital beds, vaccinations etc.)	Excluded

[25] Central Asian and Eastern European Surveillance of Antimicrobial Resistance (CAESAR) network and the European Centre for Disease Prevention and Control (ECDC) European Antimicrobial Resistance Surveillance Network (EARS-Net).

[26] Formerly European Community Health Indicators.

Name	Description	Outcome of review
Eurostat Health Data Self-reported vaccination against influenza by sex, age, income quintile, educational attainment level, and degree of urbanisation https://ec.europa.eu/eurostat/data/database	**Organisation:** Eurostat **Year:** Since 2014 **Data coverage:** Indicators cover demographic and socio-economic indicators.	**Included**
Consumption of antibiotics in the community and hospital sectors https://ec.europa.eu/eurostat/data/database	**Organisation:** Eurostat **Year:** 2013-2022 **Data coverage:** This indicator tracks antimicrobial consumption in community and hospital settings, measured as defined daily doses (DDD) per 1,000 inhabitants per day. It focuses on antibacterials classified under the Anatomical Therapeutic Chemical (ATC) code J01.	Excluded
Waterbase - Water Quality ICM Data Hub https://www.eea.europa.eu/en/datahub/datahubitem-view/fbf3717c-cd7b-4785-933a-d0cf510542e1	**Organisation:** European Environment Agency (EEA) **Year:** 2000-2023 **Data coverage:** Covers data on the status, quality, and quantity of Europe's rivers, lakes, groundwater, and coastal waters. It includes emissions to surface waters from pollution sources.	[Inclusion/ exclusion to be confirmed]

5.2. Annex 2: Bibliographic sources

Table 5: List of bibliographic sources

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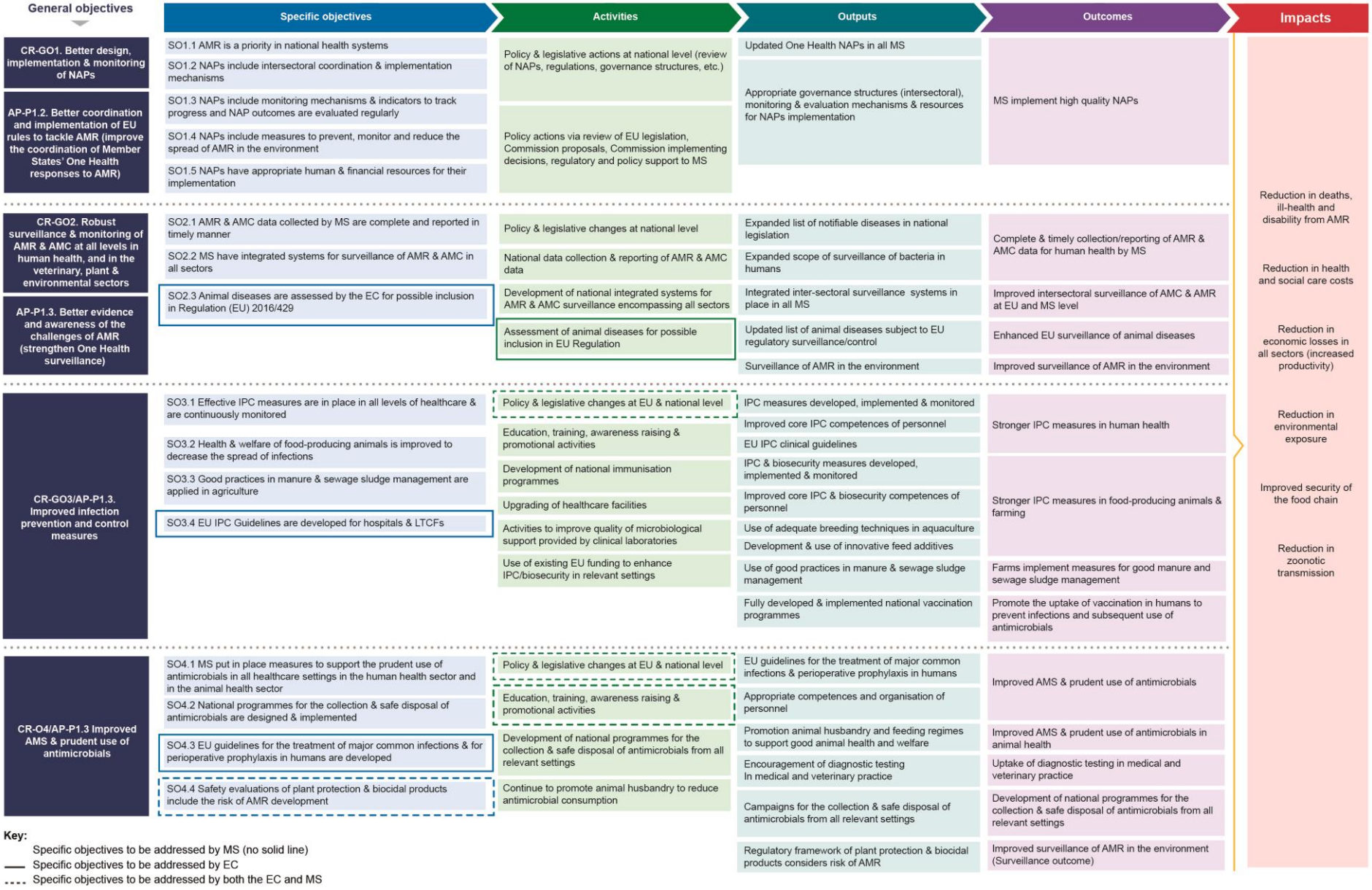
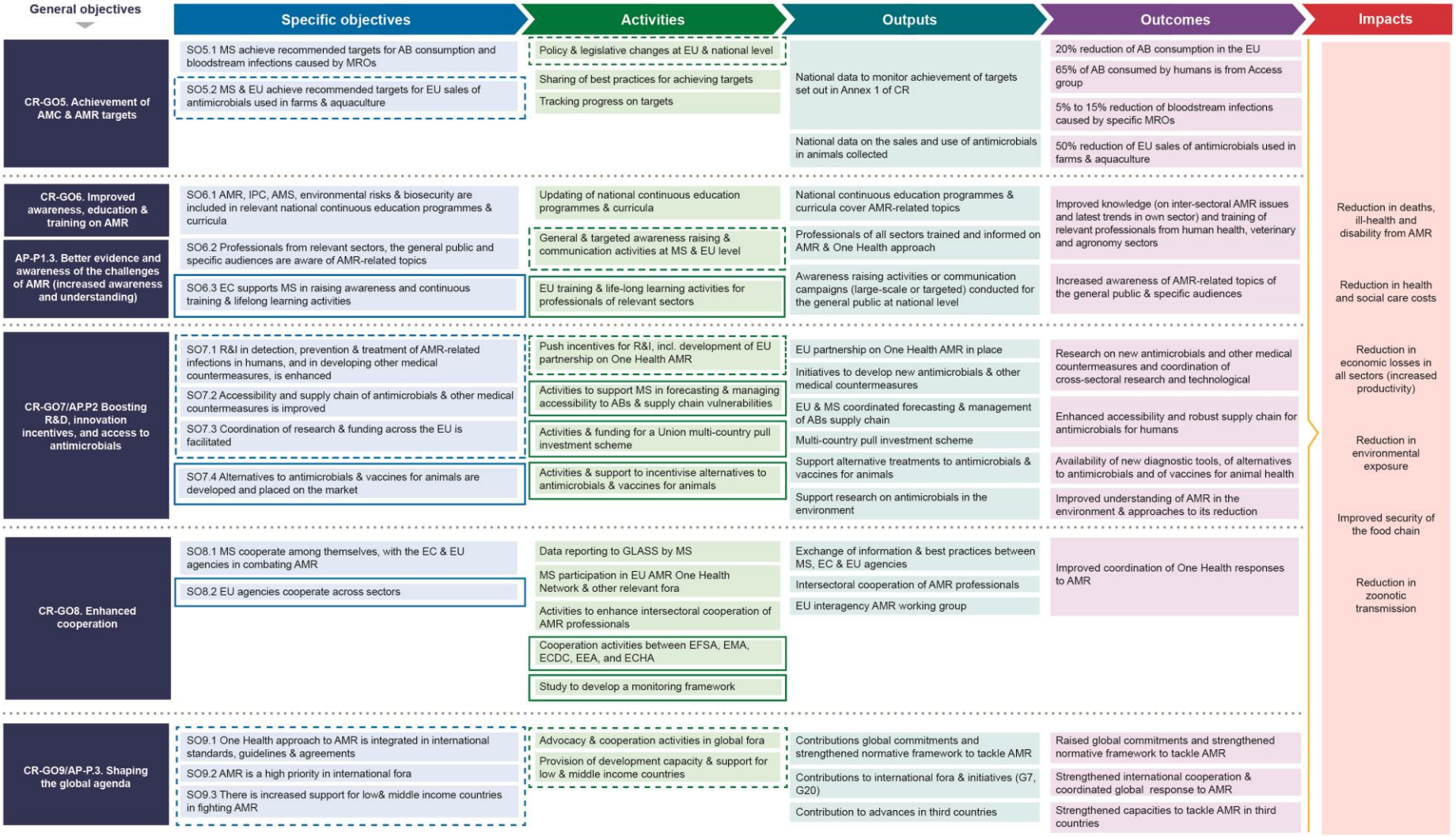
5.3. Annex 3: Combined IL underpinning the monitoring framework





Drivers
Increasing number of infections & deaths attributable to AMR
Inadequate design, implementation & monitoring of NAPs
Supply chain challenges & issues with antibiotics accessibility
Gaps in data & knowledge on AMR and its drivers
Insufficient IPC measures & gaps in compliance/adherence
Insufficient traning & lack of knowledge among the public and professionals in all relevant sectors
New antibiotics insufficient to tackle the increasing emergence/spread of AMR

Needs
Enhanced collaboration between the One Health sectors, countries & globally
Better integrated One Health approach in NAPs & adequate governance structures, monitoring mechanisms & resources
Improved comparability of data & integrated systems for the surveillance of AMR & AMC across sectors
Enhanced monitoring, data collection & research on the role of the environment in AMR
Cross-sectoral training & competence courses on AMR & related topics for professionals in all relevant sectors
Provision of higher standards for IPC and AMS, especially in healthcare settings
AMR & AMC targets in human health at EU & MS level
Address market failure & promote the development of & accessibility to new & old antibiotics, diagnostics & vaccines

5.4. Annex 4: Consultation report (Deliverable 3)

1.1. INTRODUCTION

In the context of the "**Study on the design of a monitoring framework of the EU One Health Action Plans against AMR and Council Recommendation on stepping up EU actions to combat antimicrobial resistance in a One Health approach",** all members of the AMR One Health Network (OHN) were invited to respond to an online survey to give feedback on a preliminary list of indicators to be included in a monitoring framework that will help the Commission to track the progress and results of the EU and Member States' actions to combat AMR.

In particular, the survey was aimed at gathering feedback on the appropriateness of a set of outcome and output[27] indicators under eight domains derived from the Council Recommendation. Respondents were asked to assess the extent to which the proposed indicators can be considered relevant, credible, easy to monitor and robust. Moreover, the survey contributed to collecting suggestions of potential gaps in the proposed list of indicators, as well as to distinguish between core and optional indicators.

The survey, conducted via EUSurvey, was distributed by the Commission services to 156 members of the AMR OHN on June 19, 2024. To encourage participation, two reminders were sent out on July 24 and August 1, 2024. The survey remained open for seven weeks, closing on August 9, 2024. By the end of the period, **63 responses[28]** were received, yielding a 40% response rate.

1.2. PROFILE OF RESPONDENTS

As illustrated in Figure 3 and Figure 4 below, the profile of survey respondents reflected the membership of the AMR OHN, with most responses (i.e., 44 responses) coming from national authorities from EU Member States (as well as from Iceland and Norway), followed by EU organisations. Among EU organisations (12 respondents, 19%), most were trade and business associations (5 respondents), followed by NGOs

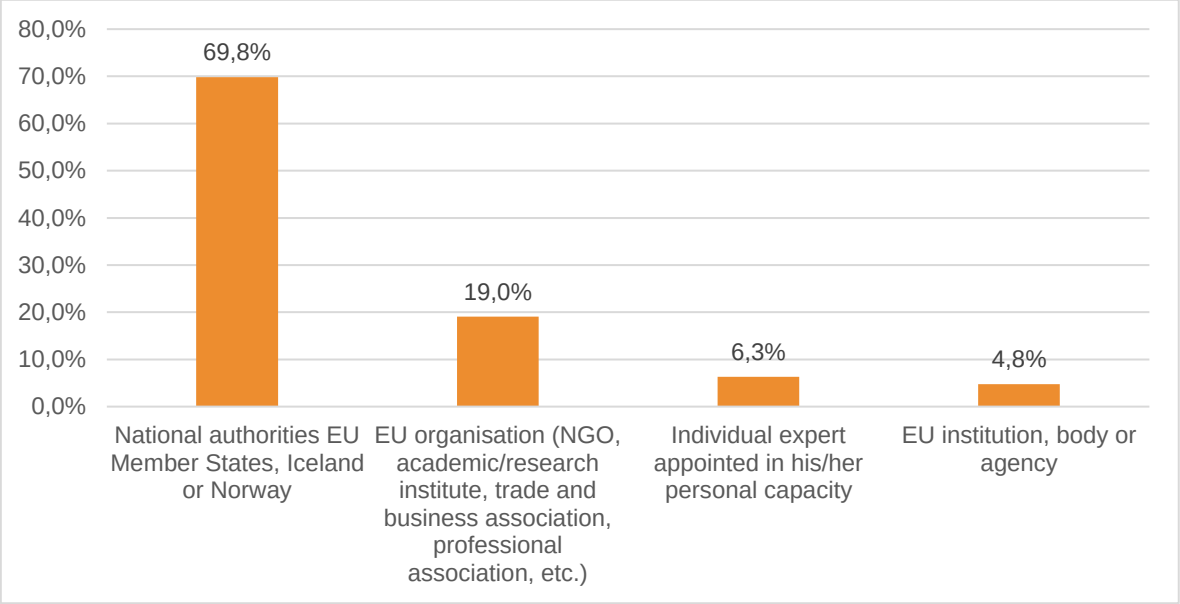
[27] Output is the concrete direct result deriving from the implemented activities, while outcome represents the mid-term results of the intervention, which is influenced by external factors and the intervention's context.

[28] This result includes also the feedback provided via email by one national authority. One survey response was disqualified and not considered for analysis as deemed to be incomplete (i.e., no answers to any indicators' validation question were provided).

(4 respondents). One respondent worked in academia, and one worked in a professional association[29].

If we look at the response rate for each stakeholder group[30], the results show that the survey received high response rates from individual experts (80%, 4 out of 5 invited respondents) and average rates from national authorities (42%, 44 out of 104 invited respondents) and EU institutions, bodies or agencies (50%, 3 out 6 invited respondents). The response rate among EU and international organisations was slightly lower (29%, 12 out of 41 invited respondents).

Figure 3: Share of respondents by type of stakeholder [n=63]

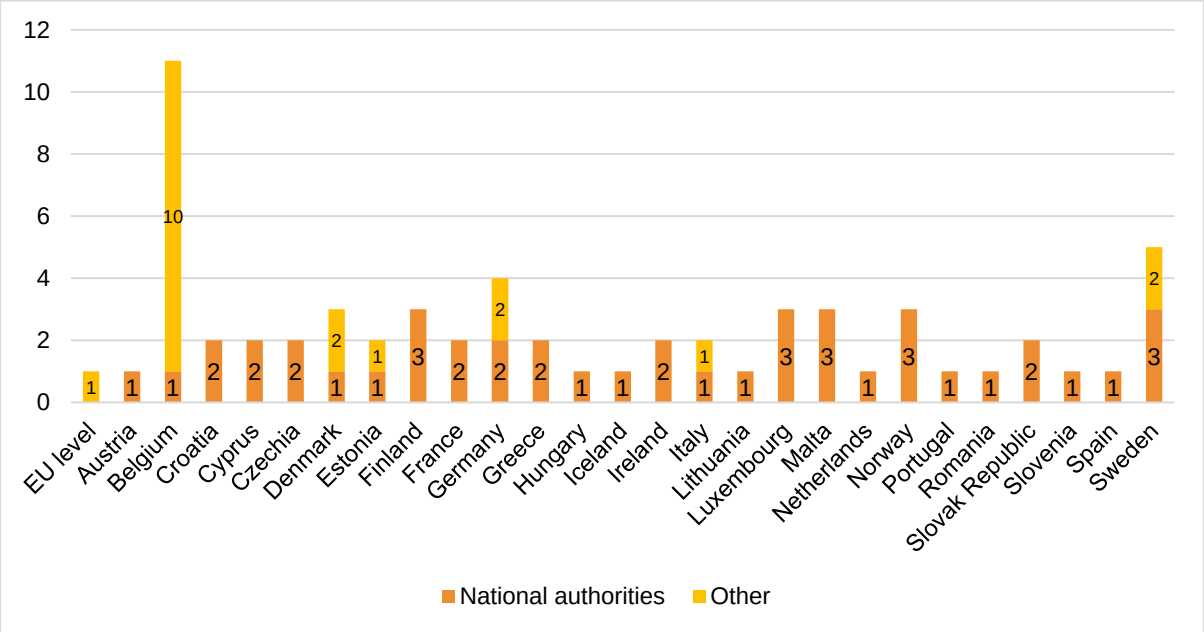


As illustrated in the Figure 4 below, respondents were well balanced in terms of geographical representation, with most respondents being from the EU countries (as well as from Iceland and Norway). Belgium was the most represented country, due to the large number of NGOs and EU institutions or bodies responding to the survey that were based in this country. Moreover, national authorities from 24 EU Member States responded to the survey, as well as 3 national authorities from Norway and one from Iceland. Finally, no responses were collected from Bulgaria, Latvia and Poland.

[29] One respondent did not specify the type of EU organisation, thus leaving the question blank.

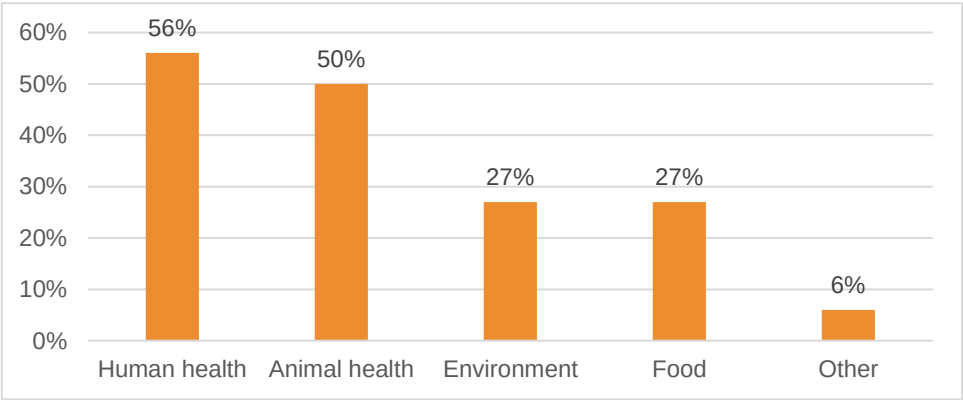
[30] The response rate for each stakeholder group was calculated from the total number of contacts in each stakeholders group that received an invitation to complete the survey.

Figure 4: Total number of respondents per country and from national authorities [n=63]



As shown in Figure 5, respondents were also well balanced in terms of the One Health sectors represented in the OHN, with 56% of respondents covering the human health sector and 50% the animal health one. Over one fourth of respondents covered the environment and food health sectors. Among those who selected 'Other' (4), two reported to be involved in the feed / animal feed sector, one in patient care and another one said to be involved at cross-sectoral level[31]. Moreover, nearly half of respondents (44%, 28 respondents) reported to work in two different One Health sectors, while 17% of the overall number of respondents (i.e., 11 respondents) reported to work in three different One Health sectors. Finally, 3% of the total respondents (i.e., 2 respondents) worked in four different One Health sectors and only one respondent reported to work in all the One Health sectors (human health, animal health, environment, food), as well as in another sector (i.e., 'patient care').

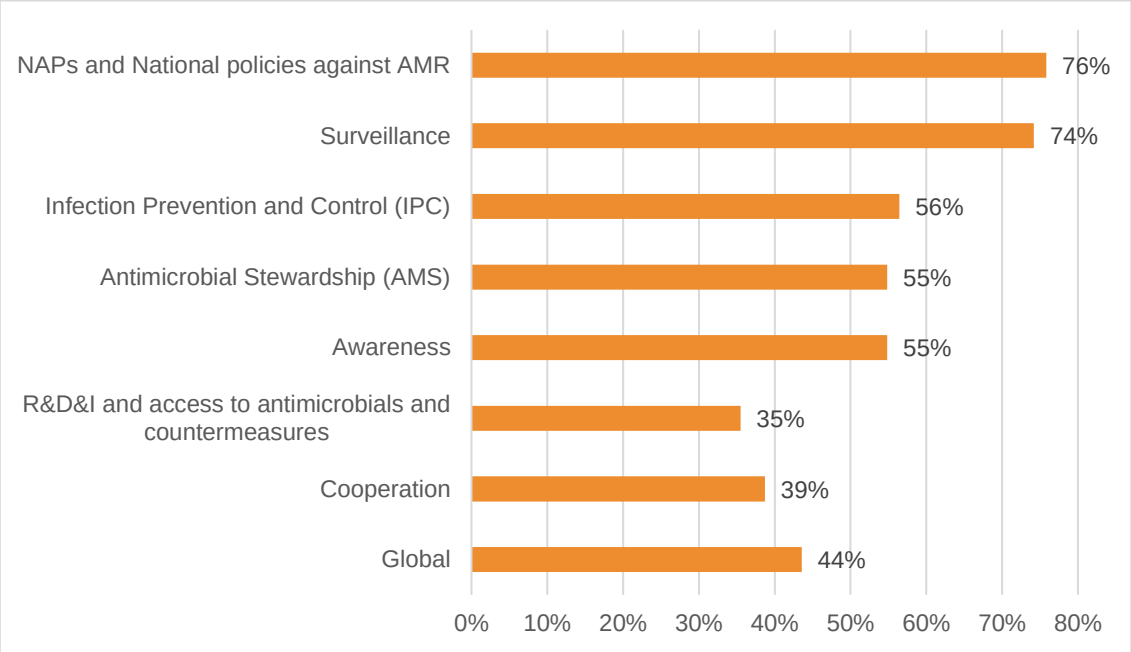
Figure 5: Share of respondents by One Health sector [n=63]



[31] Respondents could select more than one One Health sector; hence, the sum of the percentages for each sector is over 100%.

As shown in Figure 6 below, most respondents selected Domains 1 (NAPs) and 2 (Surveillance) as the most relevant for them, based on their expertise. However, the survey was successful in collecting relevant feedback on the indicators under all the domains that were included in the survey[32].

Figure 6: Share of respondents by domain [n=63]



1.3. RESULTS PER DOMAIN

The following sub-sections illustrate the survey results per domain, providing a descriptive overview of the scoring and feedback provided for each output and outcome indicator. We also report on the feedback provided in the open-ended questions under each relevant domain. The tables below include the average results per criterion for each output / group of output indicators, as well as an indication of the share of respondents reporting that the specific output indicator should be considered as a 'core' indicator. The figures below provide additionally an overview of the respondents' feedback on the extent to which each outcome indicator is considered to be relevant, credible, easy to monitor and robust.[33]

[32] The Domain related to AMR Targets was not included in the consultation.

[33] As outlined in the survey questionnaire, each indicator is considered: Relevant, when it contributes to measuring progress and results of the actions aimed at combating AMR under each specific domain; Credible when it is unambiguous and easy to interpret, also for non-experts; Easy to monitor when the data for the indicator can be collected at low cost / with acceptable administrative burden; and Robust when it is reliable and provides meaningful evidence on the progress and/or results of the actions aimed at combating AMR under each specific domain.

1.3.1. NAPs and national policies against AMR

The questions under the domain about NAPs and national policies against AMR were asked to **all respondents** (who indicated expertise in this domain), regardless of their specific One Health sector expertise. There was generally a high consensus on the relevance of the output (Table 6) and outcome (Figure 7) indicators; however, in the open questions a few stakeholders pointed out that the output indicators could be improved by making their definition more precise (e.g., by explaining what is meant by 'high-quality') or by making them more specific (e.g., by defining levels or stages of 'NAP development').

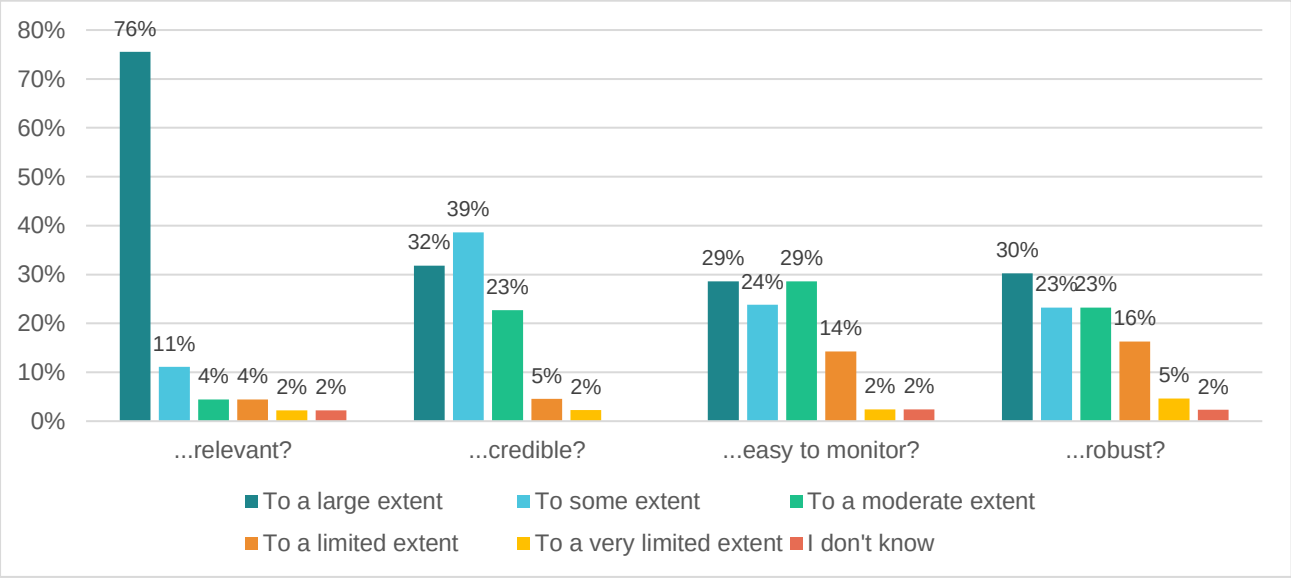
A relative majority of respondents reported that there were no indicators missing under this domain (55%), while 38% of them reported that they did not know whether any indicator was missing. Three respondents suggested additional indicators to be considered for this domain: two suggested the inclusion of indicators relating to the level of cooperation with stakeholders for establishing and implementing NAPs or in decision-making on NAPs, and one suggested including an indicator relating to the frequency of NAPs updates (e.g., every three years).

Table 6: For each of the proposed output indicators, please indicate whether they are… [Average score of a 5 points scale, with 1 being the lowest score and 5 the highest score]

	…relevant	…credible	…easy to monitor	…robust	Share of respondents that considered it a 'core indicator'
Extent of NAP development and/or implementation in each Member State [n=40]	**4,8**	**3,8**	**3,7**	**3,7**	**100%**
Extent to which NAP outcomes are evaluated at least every 3 years & evaluation publicly available in each Member State [n=41]	**4,5**	**4,0**	**3,9**	**3,7**	**80%**
Extent of intersectoral coordination in the implementation of NAPs; sectors involved in the coordination in each Member State [n=39]	**4,6**	**3,8**	**3,6**	**3,4**	**73%**
Number of Member States whose NAP includes monitoring mechanisms, and the characteristics of their monitoring mechanism [n=40]	**4,2**	**4,0**	**4,0**	**3,9**	**77%**

	…relevant	…credible	…easy to monitor	…robust	Share of respondents that considered it a 'core indicator'
Number of Member States whose NAP includes evidence-based measures to prevent, monitor and reduce the spread of AMR in the environment [n=41]	**4,2**	**3,6**	**3,3**	**3,4**	**72%**
Extent of human and financial resources allocated for the effective implementation of NAP [n=40]	**4,2**	**3,7**	**3,6**	**3,6**	**67%**

Figure 7: To what extent the outcome indicator "Increase in the number of Member States implementing high quality NAPs" is… [n=45]



1.3.2. Surveillance

In this section we present first the results for Surveillance in the human health sector, followed by those for the environment sector.[34]

The questions related to the output indicators (Table 7 and Table 8) and outcome indicators (Figure 8 and Figure 9) proposed for surveillance in the human health sector were asked only to those who selected **human health** as their specific One Health sector and surveillance as relevant domain. In general, there was a large consensus

[34] The output and outcome indicators covering surveillance in the animal health sector that have been proposed in the Draft monitoring framework have not been included in the survey.

on the appropriateness of the output and outcome indicators proposed for the surveillance of human health, with only a couple of respondents suggesting that two additional indicators could be proposed, one focused on the levels of antibiotic-resistant bacteria (ARB) and antibiotic-resistant genes (ARG), and another on the number of Member States whose AMR surveillance of bacteria includes both sentinel and continuous surveillance of AMR in human health.

Table 7: For each of the proposed output indicators, please indicate whether they are… [Average score of a 5 points scale, with 1 being the lowest score and 5 the highest score]

	…relevant	…credible	…easy to monitor	…robust	Share of respondents that considered it a 'core indicator'
Number of Member States whose AMR surveillance of bacteria in humans includes all isolates from clinical microbiology laboratories (in addition to bloodstream and cerebrospinal fluid isolates (invasive isolates)) [n=27]	**4,6**	**4,1**	**3,7**	**4,1**	**82%**
Number of Member States with national legislation requiring that infections caused by critical (high negative human health impact) multidrug-resistant organisms resistant to last line treatments are notifiable diseases (e.g. carbapenem-resistant Acinetobacter baumannii, carbapenem- resistant Enterobacteriaceae (e.g. Klebsiella pneumoniae, Escherichia coli) and Candida auris) [n=27]	**4,6**	**4,5**	**4,6**	**4,1**	**93%**
Number of Member States with expanded surveillance in humans to pathogens with emerging or established AMR due to their exposure to substances in the environment, in particular those used in plant protection products or biocidal products [n=27]	**4,0**	**3,3**	**2,9**	**3,4**	**36%**

Figure 8: To what extent the outcome indicator "Extent of AMR surveillance in humans in each Member State (with the aim of obtaining AMR data for all levels of care by 2030 i.e. community, hospitals and long-term care facilities)." is… [n=39]

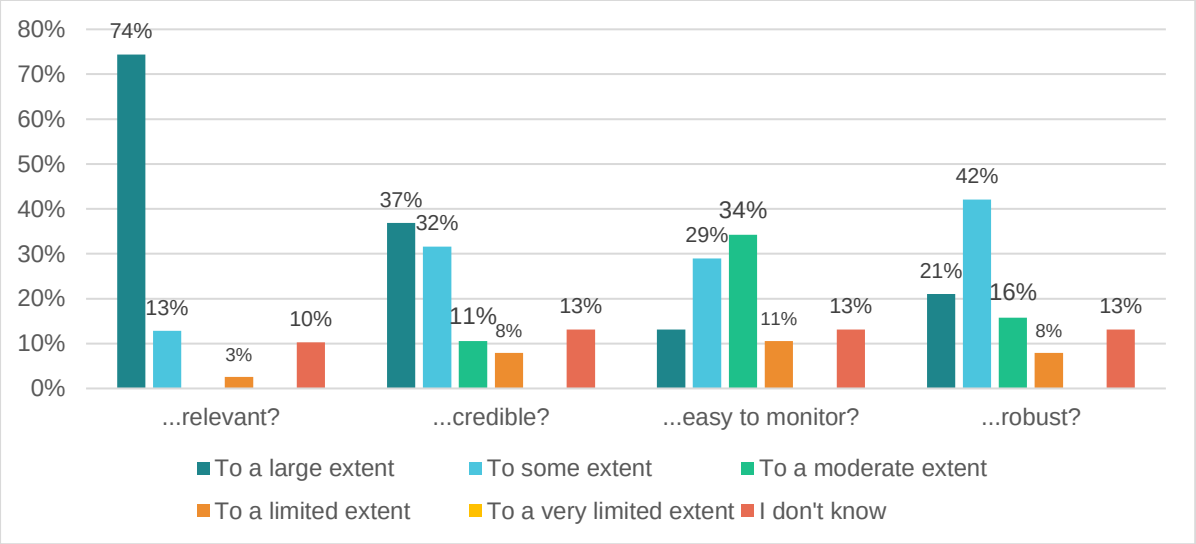
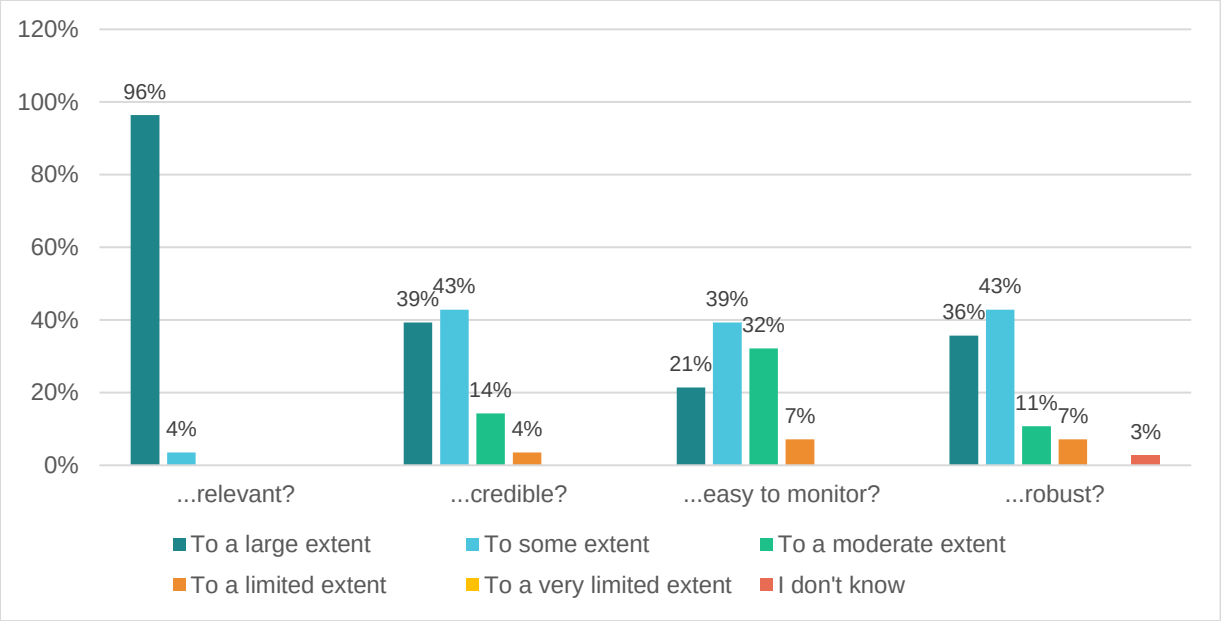


Table 8: For each of the proposed output indicators, please indicate whether they are… [Average score of a 5 points scale, with 1 being the lowest score and 5 the highest score]

	…relevant	…credible	…easy to monitor	…robust	Share of respondents that considered it a 'core indicator'
Extent (i.e., coverage, frequency, types of antimicrobials) of AMC surveillance implementation in Member States at: i) Community level; ii) Hospital level; iii) Long-term care facilities [n=27]	**5,0**	**4,1**	**3,7**	**4,1**	**100%**
Number of Member States which collect prescribing and/ or dispensing data on antimicrobials in humans [n=27]	**4,6**	**4,1**	**4,0**	**3,8**	**70%**

Figure 9: To what extent the outcome indicator "Extent of AMC surveillance in humans in each Member State (with the aim of achieving complete collection of AMC data for human health by 2030)" is… [n=28]



The results included in Table 9 and Figure 10 relate to the questions relevant only to respondents from the **environment** sector. One stakeholder suggested including a specific indicator to track antibiotic-resistant bacteria (ARB) and antibiotic resistance genes (ARG) levels in the environment, since the indicator focusing on *levels of pollution caused by antibiotics, antifungal, fungicide and plant protection products* (i.e. first indicator in Table 4) would be only partially relevant for AMR monitoring due to the fact that their concentration in surface waters is generally negligible, according to the consulted stakeholder.

Table 9: For each of the proposed output indicators, please indicate whether they are… [Average score of a 5 points scale, with 1 being the lowest score and 5 the highest score]

	…relevant	…credible	…easy to monitor	…robust	Share of respondents that considered it a 'core indicator'
Levels of pollution in surface water caused by antibiotics, antifungal, fungicide and plant protection products included in the Watch List under the Water Framework Directive [n=10]	**4,3**	**3,4**	**3,4**	**3,5**	**71%**

	…relevant	…credible	…easy to monitor	…robust	Share of respondents that considered it a 'core indicator'
Extent to which national regulatory frameworks of plant protection & biocidal products considers risk of AMR [n=10]	**4,4**	**3,7**	**3,0**	**3,7**	**43%**

Figure 10: To what extent the outcome indicator "Improved surveillance of AMR in the environment (water and/or soil) at EU level" is… [n=14]

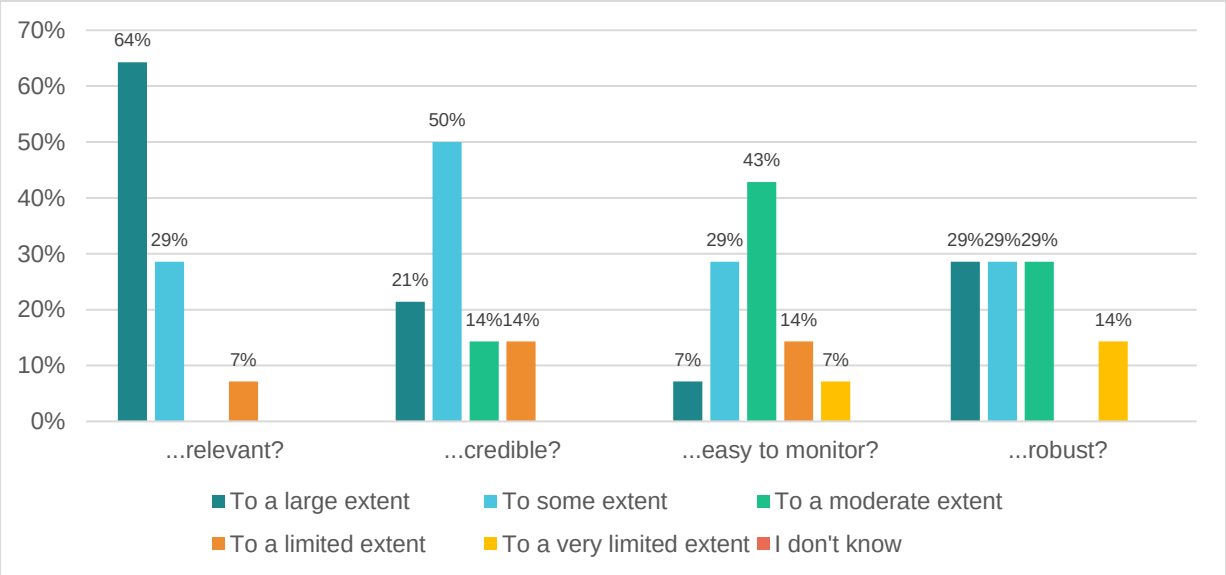


Table 10 and Figure 11 provide the results of the questions relevant to respondents covering all the One Health sectors in the Surveillance domain. One stakeholder suggested that the output indicator proposed could be made more precise and credible by clarifying the meaning of '*some form of integrated and continuous systems of surveillance'*, e.g., whether it would require an ad-hoc report with a standardised methodology for data collection across Member States.

Table 10: For the proposed output indicator, please indicate whether it is… [Average score of a 5 points scale, with 1 being the lowest score and 5 the highest score]

	…relevant	…credible	…easy to monitor	…robust	Share of respondents that considered it a 'core indicator'
Number of Member States with some form of integrated and continuous systems of surveillance of AMR and AMC encompassing human health, animal health, plant health, food, wastewater and the environment [n=40]	**4,5**	**3,7**	**3,2**	**3,5**	**67%**

For what concerns the outcome indicator proposed for the Surveillance domain (see below), three stakeholders suggested adding an indicator measuring whether Member States produce an annual One Health surveillance report on AMR and AMC, as well as the percentage of Member States implementing standardised protocols for AMR and AMC data collection, as this would ensure consistency and comparability of data within the EU.

Figure 11: To what extent the outcome indicator "Extent to which integrated surveillance of AMC & AMR is achieved at EU level" is… [n=47]

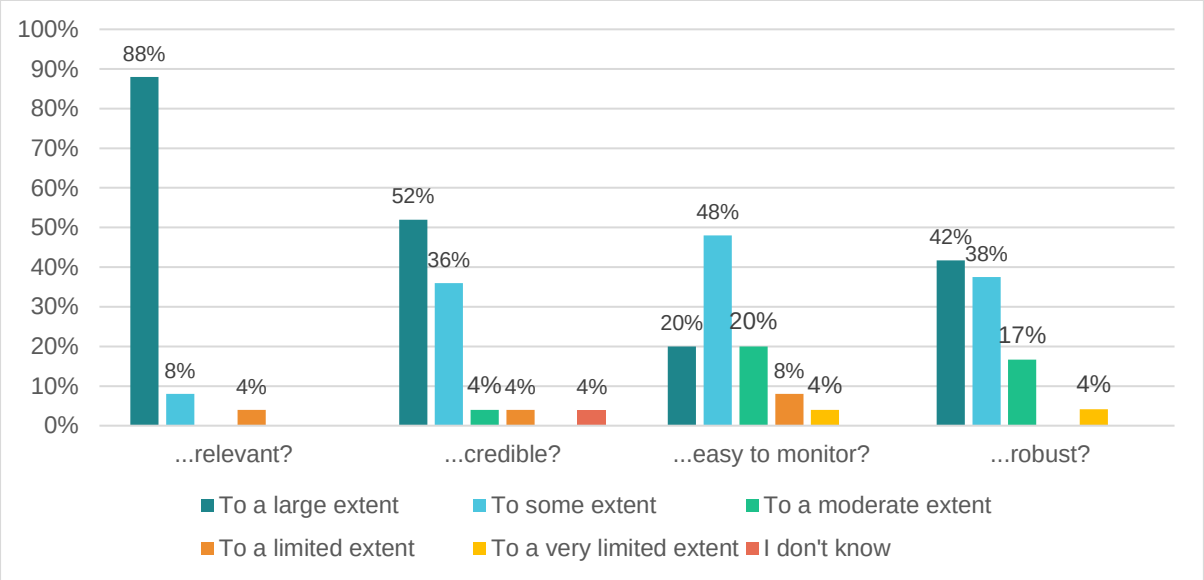
1.3.3. Infection Prevention and Control (IPC)

The results presented in Table 11 and Table 12 (output indicators), as well as those in Figure 12 and Figure 13 (outcome indicators) relate to indicators proposed for the **human** health sector under the IPC domain. This includes also an indicator on vaccination programmes for humans.

Table 11: For each of the proposed output indicators, please indicate whether they are… [Average score of a 5 points scale, with 1 being the lowest score and 5 the highest score]

	…relevant	…credible	…easy to monitor	…robust	Share of respondents that considered it a 'core indicator'
Extent to which Member Sates guarantee/ continuously provide training on IPC core competences for healthcare professionals in hospitals and in long-term care facilities [n=24]	**4,8**	**4,1**	**3,6**	**3,9**	**87%**
Level of financial resources for IPC programmes in hospitals and long-term care facilities in each Member State [n=24]	**4,4**	**3,8**	**3,2**	**3,7**	**58%**
Number of Member States conducting quality control of IPC measures in hospitals and in long-term care facilities [n=24]	**4,6**	**3,8**	**3,5**	**3,7**	**71%**
State of infrastructure in healthcare facilities (to track improvement over time in infrastructure, materials and equipment for IPC in MS) [n=24]	**4,5**	**3,7**	**3,1**	**3,5**	**42%**
Extent to which clinical laboratories are able to provide microbiological support to healthcare facilities [n=24]	**4,7**	**4,1**	**3,9**	**4,0**	**79%**

Figure 12: To what extent the outcome indicator "Reduction in prevalence of infections acquired in healthcare settings (acute settings, long-term care facilities)." is… [n=25]



In relation to vaccination programmes for **humans**, seven stakeholders suggested additional or revised output and outcome indicators. In particular, it was mentioned that the indicators should be focusing on vaccines that have a specific impact on AMR and/or AMC, e.g., pneumococcal vaccination in children, seasonal influenza vaccination and COVID-19 vaccination. Moreover, one stakeholder mentioned that one of the indicators could cover also vaccination levels among health professionals.

Table 12: For the proposed output indicator, please indicate whether it is… [Average score of a 5 points scale, with 1 being the lowest score and 5 the highest score]

	…relevant	…credible	…easy to monitor	…robust	Share of respondents that considered it a 'core indicator'
National immunisation programmes are fully developed and implemented (on the basis of Council Recommendation of 7 December 2018 on Strengthened Cooperation against Vaccine Preventable Disease) in all Member States [n=23]	4,7	4,4	4,1	4,4	91%

Figure 13: To what extent the outcome indicator "Percentage of target population covered by vaccines included in Member States' national vaccination programmes" is… [n=23]

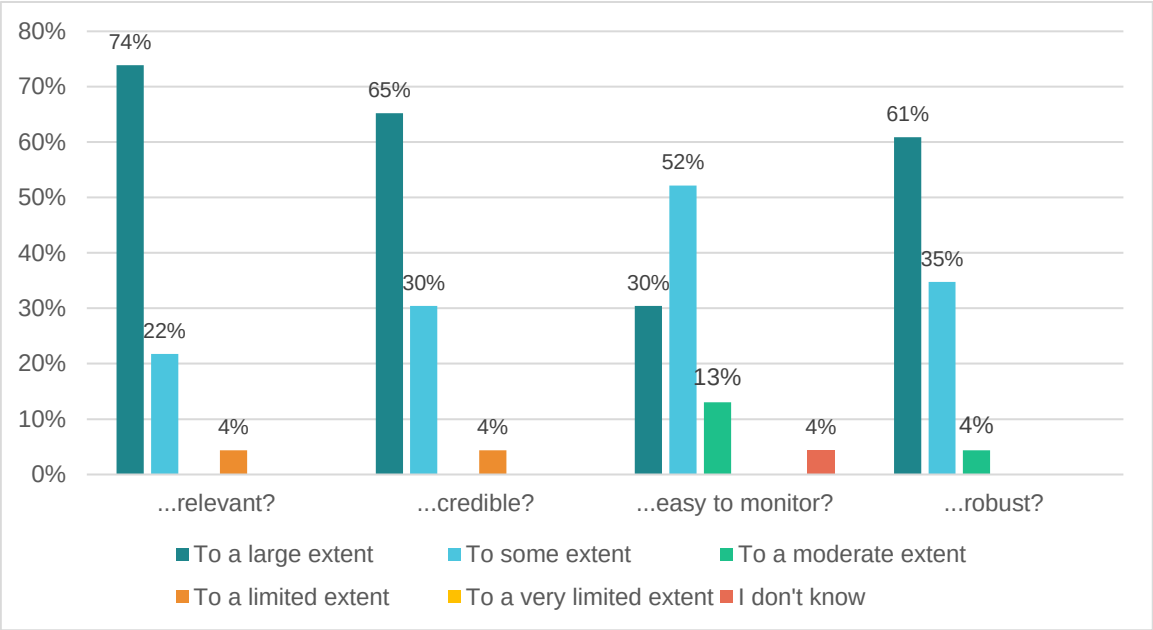


Table 13 and Figure 14 provide the results of questions related to the indicators addressing biosecurity and IPC in the **animal health sector**. One stakeholder mentioned that the output indicator related to the amount of funding allocated to preventive actions through the common agricultural policy (CAP) (second output indicator in Table 8) was too broad and very difficult to monitor due to the large scope of activities that could be funded. Similarly, the output indicator measuring the number of Member States providing continuous training on IPC and biosecurity (last output indicator in Table 8) was also considered too difficult to monitor due to the variety of training initiatives that could be possibly implemented on IPC and biosecurity. It was suggested that this indicator could be made more credible by defining more clearly what training on IPC and biosecurity entails.

Three stakeholders mentioned that additional indicators should be considered or highlighted potential revisions to the proposed indicators. Two stakeholders argued that, in addition to the promotion of vaccination programmes or biosecurity and IPC measures, additional indicators could focus on the level of uptake / coverage of vaccination in animals and of biosecurity programmes or IPC measures. Finally, one stakeholder mentioned the need to add indicators covering: i) availability of guidance for professionals (veterinarians and farmers) for IPC; ii) the number of actions to reduce nosocomial infections in veterinary medicine; and iii) the potential impact of climate change on the evolution of IPC.

Table 13: For each of the proposed output indicators, please indicate whether they are… [Average score of a 5 points scale, with 1 being the lowest score and 5 the highest score]

	…relevant	…credible	…easy to monitor	…robust	Share of respondents that considered it a 'core indicator'
Extent to which Member States promote the uptake of biosecurity and IPC measures in farms [n=15]	**4,7**	**3,9**	**3,2**	**3,5**	**87%**
Amount of funding allocated/type of support provided to preventive actions against infectious diseases through the common agricultural policy (CAP) [n=15]	**4,7**	**3,8**	**4,2**	**3,4**	**67%**
Extent to which Member States promote the uptake of biosecurity and IPC measures in aquaculture [n=15]	**4,7**	**3,9**	**3,3**	**3,3**	**80%**
Number of Member States promoting the use of vaccination in animals [n=16]	**4,7**	**3,9**	**3,8**	**3,6**	**73%**
Number of Member States promoting the development and use of innovative feed additives to improve the physiological status of animals [n=15]	**3,7**	**3,1**	**3,1**	**2,8**	**13%**
Number of Member State providing continuous training on IPC and biosecurity to personnel in veterinary practice, farms and aquaculture [n=16]	**4,8**	**4,4**	**3,6**	**3,7**	**80%**

Figure 14: To what extent the outcome indicator "Reduction in animal disease outbreaks" is… [n=15]

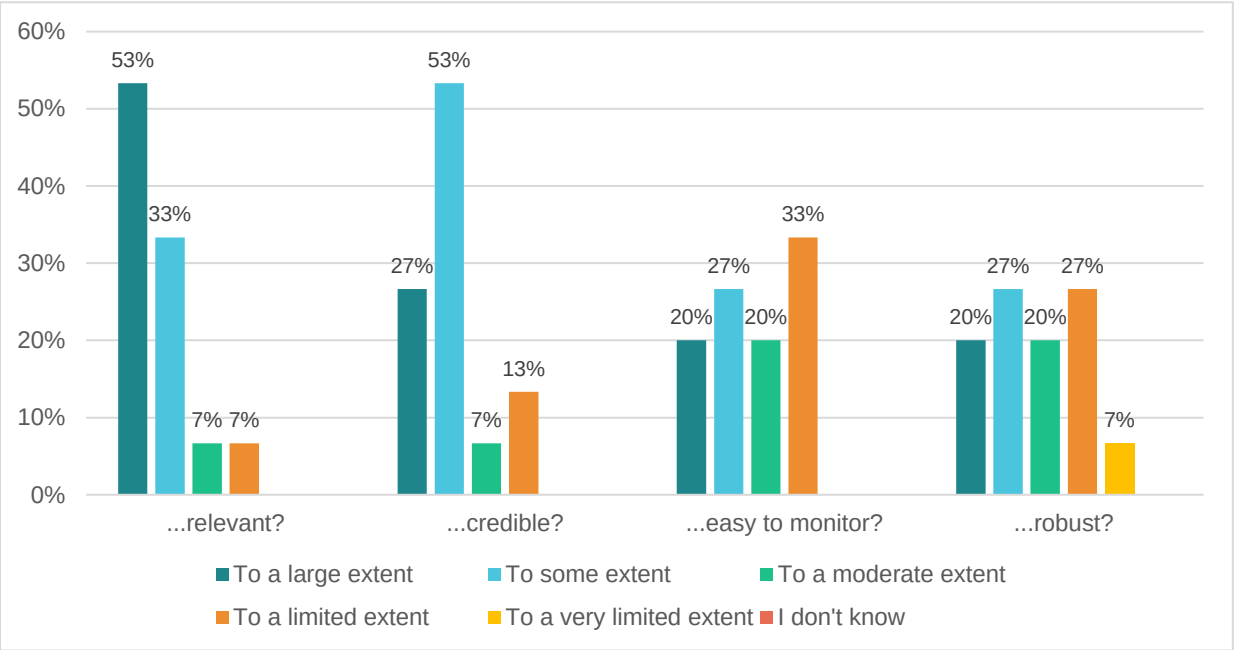
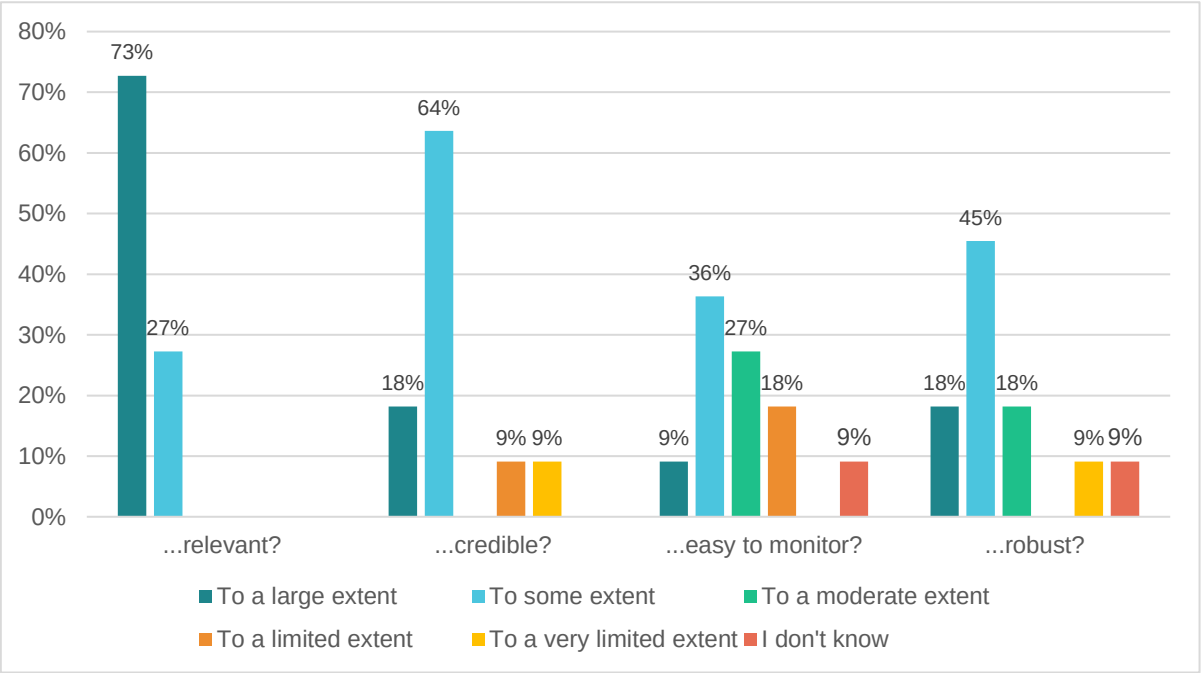


Table 14 and Figure 15 provide an overview of the results in the field of AMR exposure in the **environment**. Two respondents suggested additional indicators to be considered in this area, i.e., the uptake of evidence-based practices aimed at increasing levels of water recycling and reuse, and the adoption of practices at national level for the monitoring of wastewater and environmental surveillance.

Table 14: For each of the proposed output indicators, please indicate whether they are… [Average score of a 5 points scale, with 1 being the lowest score and 5 the highest score]

	…relevant	…credible	…easy to monitor	…robust	Share of respondents that considered it a 'core indicator'
Uptake of good evidence-based manure management practices in agriculture in each Member State [n=11]	**4,8**	**4,1**	**3,4**	**3,8**	**82%**
Uptake of good evidence-based sewage sludge management practices in agriculture in each Member State [n=11]	**4,8**	**4,1**	**3,5**	**3,8**	**73%**

Figure 15: Extent to which farms implement measures for good manure and sewage sludge management in each Member State" is… [n=11]



1.3.4. Antimicrobial Stewardship (AMS)

In this section we present first the results for the indicators under the domain on Antimicrobial Stewardship (AMS) related to the human health sector, followed by those for the animal health sector.

In the **human health** sector (Table 15 and Figure 16), no respondent suggested additional indicators to be covered in this area. However, one suggested some changes to the first output indicator mentioned in Table 15 to better align it with the TrACCS question 3.6. The suggestion was to replace '*AMS measures'* with '*national AMS programmes*' and to remove '*addressed to health professionals'* since the AMS programmes shall cover also health settings and not only professionals. A similar comment was made for the second output indicator, where the suggestion was also to replace '*AMS measures'* with '*AMS programmes*'.

Table 15: For each of the proposed output indicators, please indicate whether they are… [Average score of a 5 points scale, with 1 being the lowest score and 5 the highest score]

	…relevant	…credible	…easy to monitor	…robust	Share of respondents that considered it a 'core indicator'
Extent of implementation of AMS measures addressed to health professionals in each Member State [n=22]	**4,9**	**4,0**	**3,5**	**3,9**	**100%**
Extent of implementation of AMS measures addressed to community and hospital pharmacies in each Member State [n=22]	**4,4**	**3,8**	**3,1**	**3,7**	**67%**
Extent to which diagnostic testing is available in medical practice in each Member State [n=22]	**4,8**	**4,0**	**3,7**	**3,9**	**86%**

Figure 16: To what extent the outcome indicator "Extent to which AMS & prudent use of antimicrobials across healthcare settings has improved in each Member State" is… [n=22]

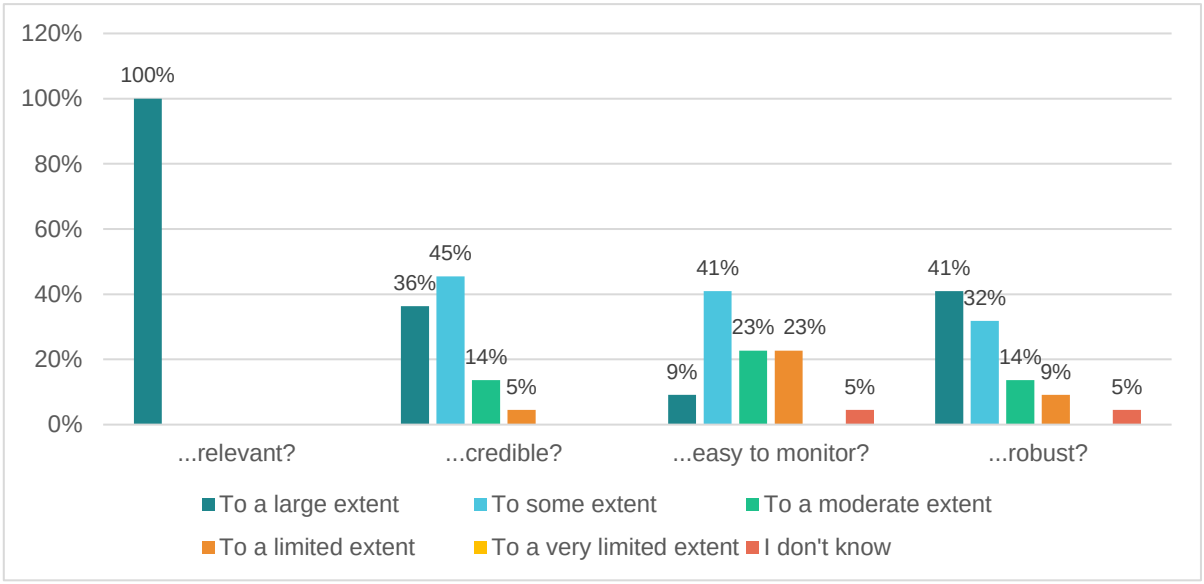


Table 16 and Figure 17 cover indicators relevant to AMS in the **animal health** sector. Some respondents from this sector mentioned that additional indicators could be considered, e.g.: i) the extent to which stewardship programmes are available; ii) the extent to which information on indication for antimicrobial use and related feedback is collected; iii) the levels of use or the sales of diagnostic tests; iv) the share of antimicrobial testing based on diagnostic testing; and, v) the availability of veterinary antimicrobial treatment guidelines. Finally, the output indicator in the table below was

considered by one stakeholder as particularly useful but at the same time difficult to monitor due to the lack of data.

Table 16: For the proposed output indicator, please indicate whether it is… [Average score of a 5 points scale, with 1 being the lowest score and 5 the highest score]

	…relevant	…credible	…easy to monitor	…robust	Share of respondents that considered it a 'core indicator'
Extent to which diagnostic testing is available in veterinary practice in each Member State [n=17]	**4,9**	**4,1**	**3,4**	**3,3**	**76%**

Figure 17: To what extent the outcome indicator "Extent to which AMS & prudent use of antimicrobials in veterinary settings has improved in each Member State" is…

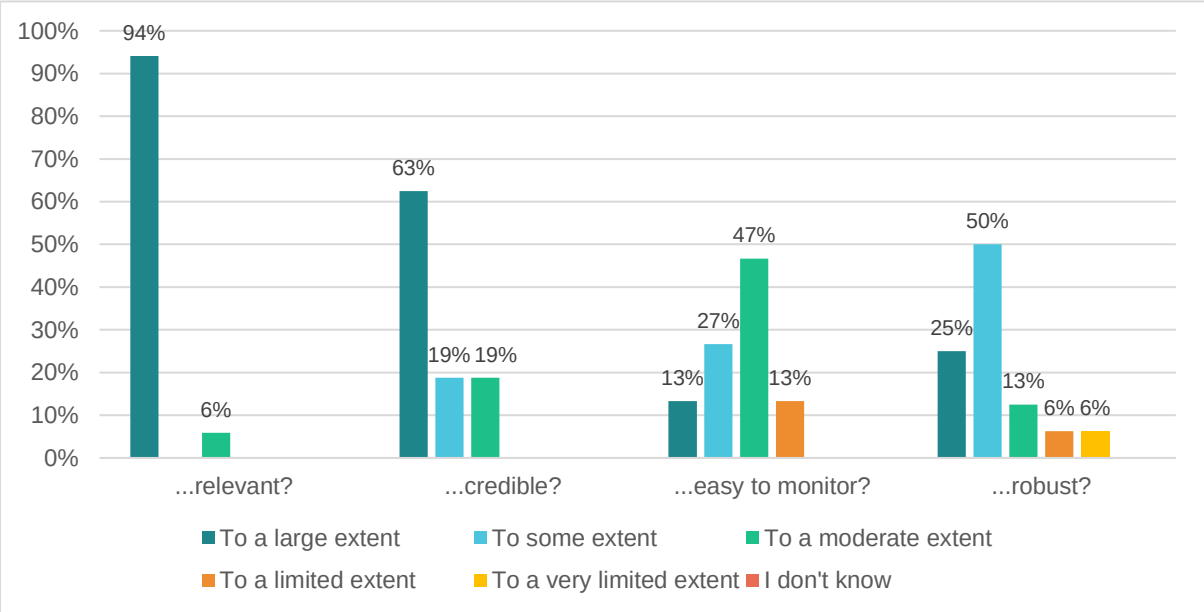
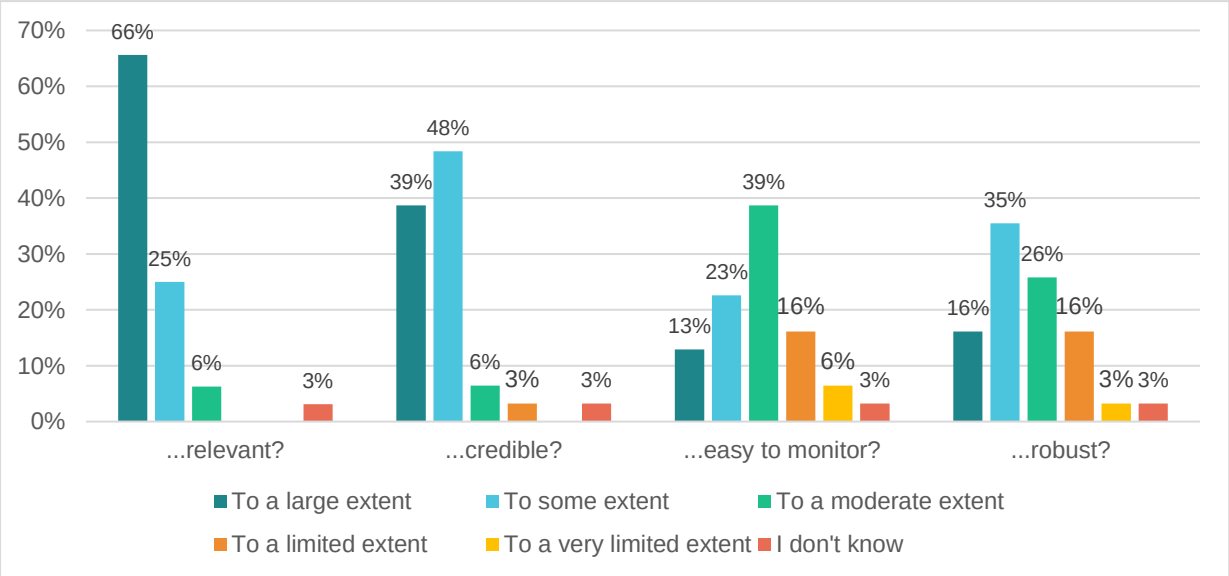


Table 17 and Figure 18 cover output and outcome indicators related to the **collection and safe disposal of antimicrobials**, which is relevant to all the One Health sectors and therefore to all the respondents who selected AMS as their relevant domain. One respondent mentioned that the output indicator proposed could be made more precise by clarifying whether the safe disposal of antimicrobials refers to their quantity. Another stakeholder mentioned that more emphasis could be placed on the harmful disposal of antimicrobials in private households or community settings. Similarly, one stakeholder mentioned the need to distinguish between the safe disposal of antimicrobials across various sectors, i.e., in pharmacies, communities, etc. Finally one stakeholder pointed out the need to include one indicator tracking the efforts to reduce residues of medicines in wastewater.

Table 17: For the proposed output indicator, please indicate whether it is… [Average score of a 5 points scale, with 1 being the lowest score and 5 the highest score]

	…relevant	…credible	…easy to monitor	…robust	Share of respondents that considered it a 'core indicator'
Number of Member States having developed national programmes for the collection & safe disposal of antimicrobials from all relevant settings; uptake of the programme (where measured) [n=30]	**4,6**	**4,2**	**3,6**	**3,6**	**83%**

Figure 18: To what extent the outcome indicator "Improved collection & safe disposal of antimicrobials in relevant settings" is…



1.3.5. Awareness

The output and outcome indicators proposed under the Awareness domain were relevant to all the One Health sectors; therefore, they were asked to **all the respondents** that selected this domain. The large majority of respondents reported that no indicators were missing under this domain, However, seven respondents (23%) mentioned that additional indicators could be considered, for example, indicators aimed at: i) evaluating the impact of the European Antibiotic Awareness Day (EAAD) through stakeholder engagement metrics (i.e., number of stakeholders engaged, impact on public awareness, etc.); ii) taking into consideration Eurobarometer data and relevant indicators in relation to general public's awareness; iii) assessing to what extent communication campaigns are regularly evaluated and

what their impact on the general public is; and, iv) identifying the number of campaigns organised in collaboration with patient organisations.

Table 18: For each of the proposed output indicators, please indicate whether they are… [Average score of a 5 points scale, with 1 being the lowest score and 5 the highest score]

	…relevant	…credible	…easy to monitor	…robust	Share of respondents that considered it a 'core indicator'
Extent to which national continuous education programmes and curricula for the disciplines below cover topics: i. AMR, ii. IPC, iii. Environmental risks, iv. Biosecurity, v. Antimicrobial stewardship [Disciplines: a. medicine, b. nursing, c. midwifery, d. pharmacy, e. dentistry, f. veterinary medicine, g. agriculture and agronomics, h. environmental and ecological sciences] (n=33)	**4,7**	**4,5**	**3,6**	**3,9**	**97%**
Number (and, where available, reach) of communication campaign(s) on the collection of safe disposals of antimicrobials targeting human health and veterinary professionals in each Member State (n=32)	**4,0**	**3,7**	**3,5**	**3,3**	**50%**
Number and, where available, reach of information campaigns on AMR related issues conducted for professionals in human health, veterinary and agronomy sectors in each Member State (n=32)	**4,4**	**3,9**	**3,7**	**3,6**	**72%**

Figure 19: To what extent the outcome indicator "Improved provision of AMR education and training to relevant professionals in human health, veterinary and agronomy" is… [n=34]

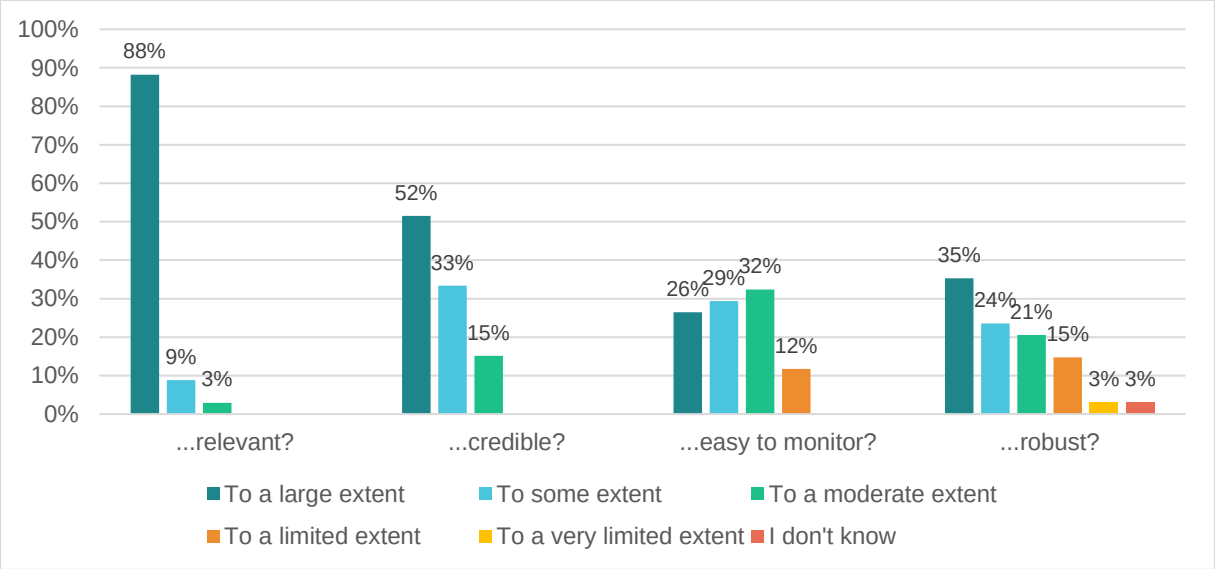
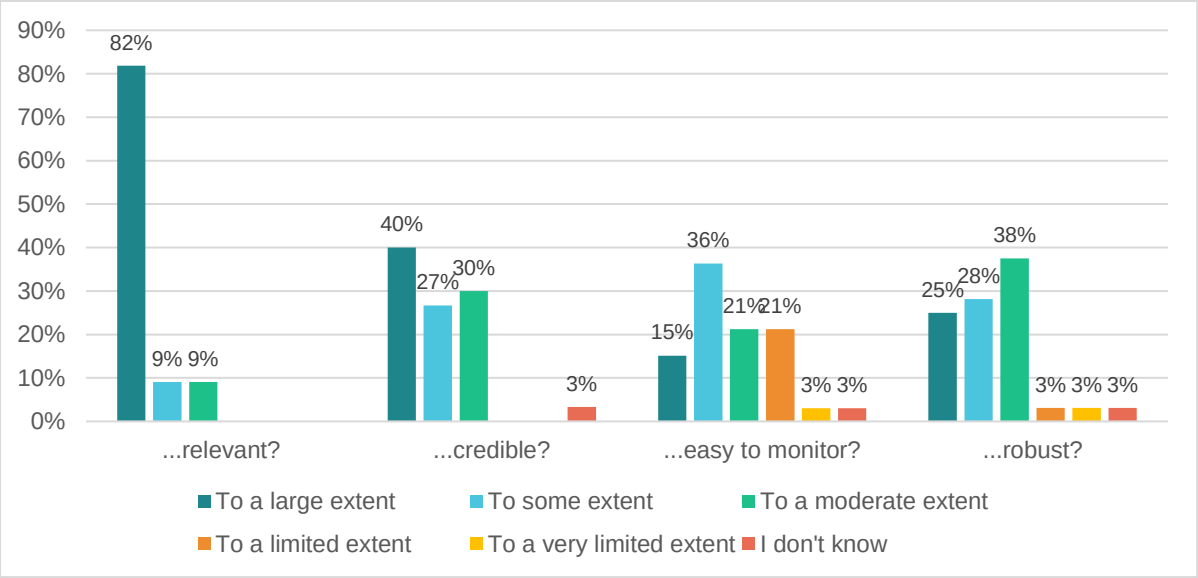


Table 19: For each of the proposed output indicators, please indicate whether they are… [Average score of a 5 points scale, with 1 being the lowest score and 5 the highest score]

	…relevant	…credible	…easy to monitor	…robust	Share of respondents that considered it a 'core indicator'
Number and, where available, reach of communication campaign(s) on AMR related issues for the public on the existence of programmes for the collection and safe disposal of antimicrobials in each Member State (n=33)	**4,7**	**4,5**	**3,6**	**3,9**	**49%**
Number of awareness raising activities or communication campaigns on AMR related issues conducted at national level in each Member Sate for: i) large-scale for the general public; ii) targeted for the general public; iii) targeted for specific groups (n=32)	**4,0**	**3,7**	**3,5**	**3,3**	**91%**

	…relevant	…credible	…easy to monitor	…robust	Share of respondents that considered it a 'core indicator'
Extent to which Member States coordinate national awareness raising activities and communication campaigns on AMR related issues with other Member States, EC and EU agencies (n=32)	**4,4**	**3,9**	**3,7**	**3,6**	**39%**

Figure 20: To what extent the outcome indicator "Increase in the general public's knowledge of AMR in each Member State" is… [n=33]



1.3.6. RD&I and Access

In this section we present the results for the indicators under the Research, Development and Innovation (RD&I) domain related to human health, animal health and the environment sectors.

The results presented in Table 20 and Table 21 (output indicators) and Figure 21 and Figure 22 (outcome indicators) cover RD&I for antimicrobials and other AMR medical countermeasures in the **human health** sector, as well as access to antimicrobials. Nine respondents suggested that additional indicators could be considered, for example, they highlighted the need to monitor whether the allocated funds were also being effectively used to reach the intended objectives. Another stakeholder mentioned the need to consider an indicator on the potential availability of existing and new antimicrobials in the market, as well as the number of clinical trials for novel antimicrobials performed in the EU. Finally, one respondent mentioned the need to

monitor whether the number of AMEG class D[35] antibiotic preparations in the market has been maintained or has decreased.

Table 20: For each of the proposed output indicators, please indicate whether they are… [Average score of a 5 points scale, with 1 being the lowest score and 5 the highest score]

	…relevant	…credible	…easy to monitor	…robust	Share of respondents that considered it a 'core indicator'
Amount of EU funding (and type of funding instrument) allocated to projects supporting research and technological innovation with push incentives for the detection, prevention and treatment of infections in humans caused by antimicrobial resistant pathogens (n=15)	**4,5**	**4,4**	**4,3**	**4,2**	**87%**
Amount of EU funding allocated for translational research and late-stage development of AMR medical countermeasures, including clinical trials for antimicrobials (n=15)	**4,5**	**4,5**	**4,3**	**4,2**	**80%**

[35] In line with EMA's Categorisation of antibiotics used in animals, Antimicrobial Advice Ad Hoc Expert Group (AMEG) Class D (Prudence) refer to "antibiotics that should be used as first line treatments, whenever possible. These antibiotics can be used in animals in a prudent manner. This means that unnecessary use and long treatment periods should be avoided, and group treatment should be restricted to situations where individual treatment is not feasible". See: https://www.ema.europa.eu/en/documents/press-release/categorisation-antibiotics-used-animals-promotes-responsible-use-protect-public-and-animal-health_en.pdf

Figure 21: To what extent the outcome indicator "Number of new antimicrobials and AMR medical countermeasures for human health in the R&D pipeline or brought to market supported by EU funding instruments" is… [n=15]

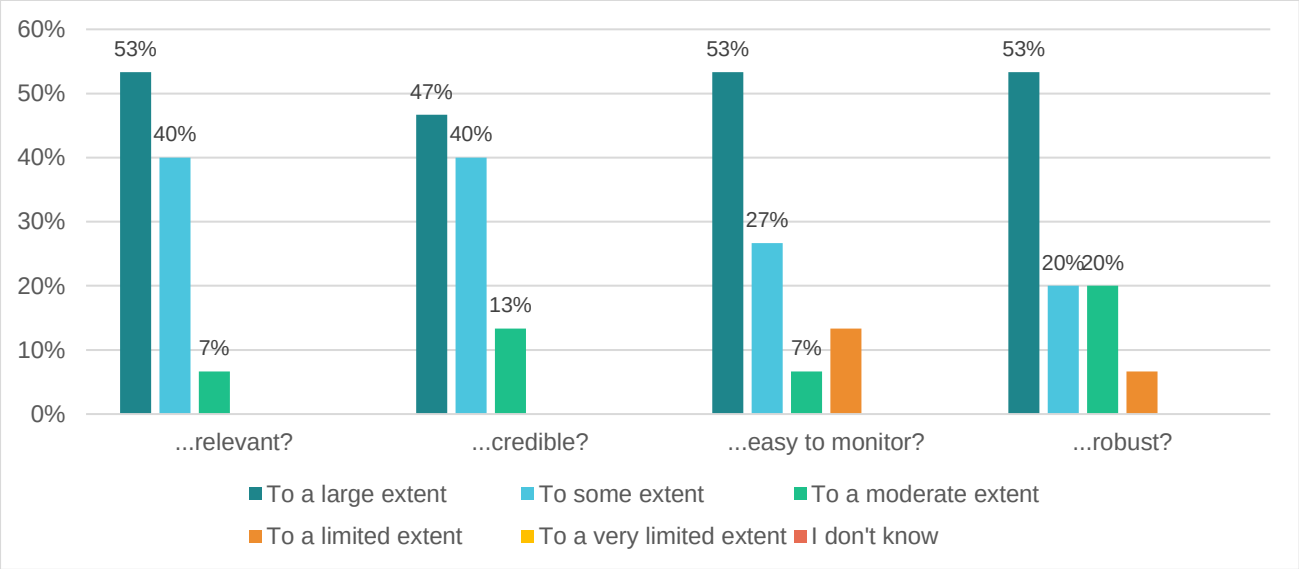


Table 21: For the proposed output indicator, please indicate whether it is… [Average score of a 5 points scale, with 1 being the lowest score and 5 the highest score]

	…relevant	…credible	…easy to monitor	…robust	Share of respondents that considered it a 'core indicator'
Extent of support provided by EU bodies and agencies to Member States for the coordination of initiatives on manufacturing, procurement and stockpiling of antimicrobials (n=16)	**4,6**	**4,1**	**3,8**	**3,5**	**88%**

One respondent mentioned that the outcome indicator aimed at monitoring the *expanded and stable access to antimicrobials* (see Figure 22) could be more clearly defined, as it would be quite complicated to measure it for all the different population groups. Moreover, another respondent mentioned that there could be an additional indicator aimed at tracking the number of reported unstable accesses (due to lack of supply) per year.

Figure 22: To what extent the outcome indicator "Expanded and stable access to antimicrobials in Member States" is… [n=16]

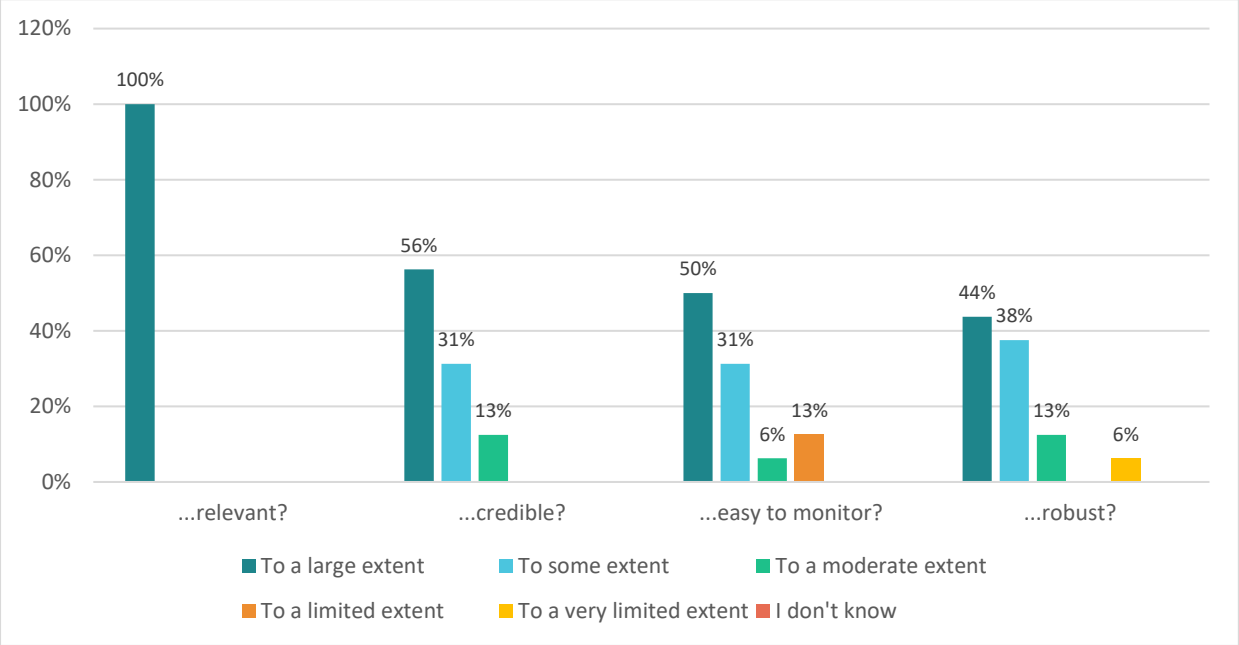
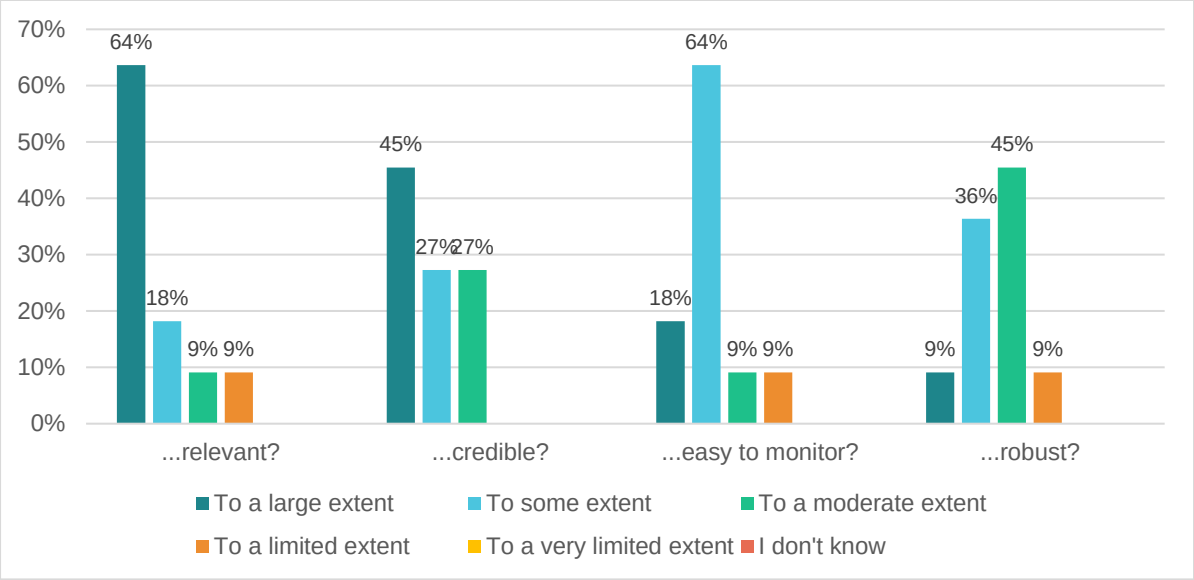


Table 22 and Figure 23 below focus on indicators for the **animal health** sector in the R&D&I domain. Four stakeholders suggested additional indicators related to ensuring the evaluation of access to specific substances and products for animal medicines, as well as the number of research projects financed by Member States or by the EU and aimed at developing alternatives to antibiotics, new antibiotics or vaccines.

Table 22: For the proposed output indicator, please indicate whether it is… [Average score of a 5 points scale, with 1 being the lowest score and 5 the highest score]

	…relevant	…credible	…easy to monitor	…robust	Share of respondents that considered it a 'core indicator'
Number of projects / organisations funded by the EU (and amount of funding allocated) to support the successful development and placement on the market of alternatives to antimicrobials and of vaccines for animal health (n=11)	**4,5**	**3,8**	**4,2**	**3,5**	**82%**

Figure 23: To what extent the outcome indicator "Number of alternatives to antimicrobials and of vaccines for animal health in the R&D pipeline or brought to market, supported by EU funding" is…[n=11]

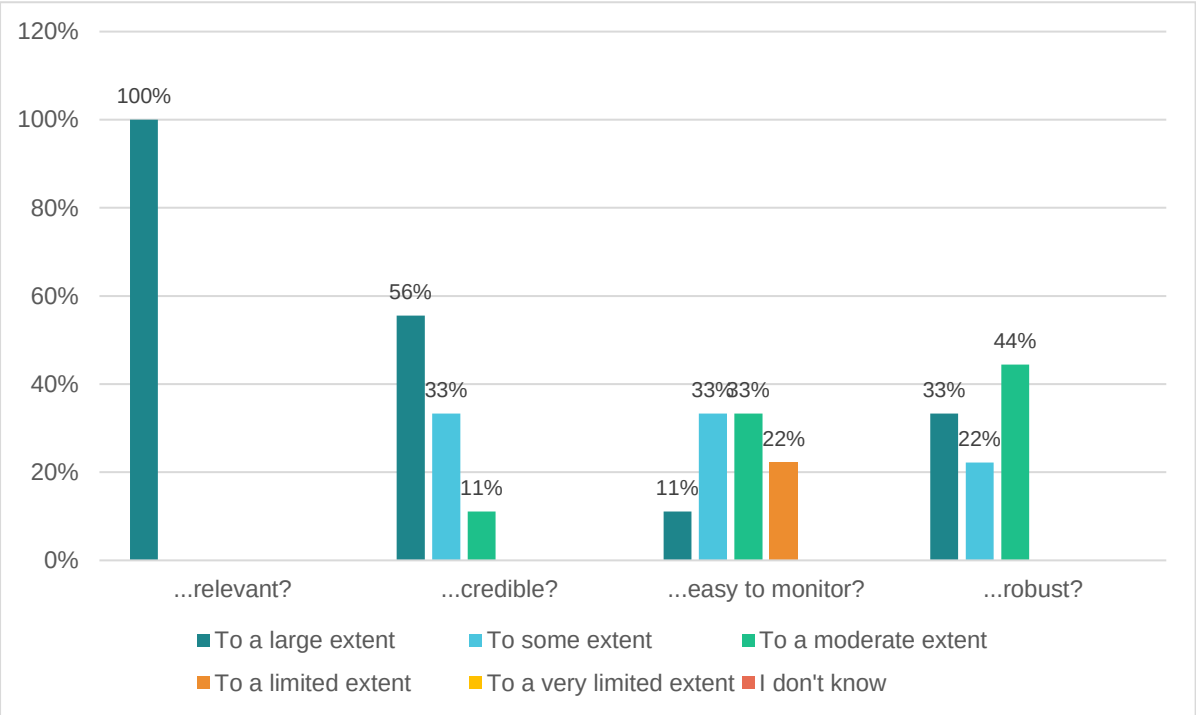


In relation to the output and outcome indicators under this domain that were relevant only to those involved in the **environment** sector, one stakeholder said an additional indicator may be needed aimed at keeping track of the amount of funding available to explore the relationship between concentration of antibiotics in water courses and the risk of resistance in humans. In particular, these types of research outputs could potentially contribute: i) to quantify the risks for human health and ii) to suggest appropriate actions to address this issue.

Table 23: For the proposed output indicator, please indicate whether it is… [Average score of a 5 points scale, with 1 being the lowest score and 5 the highest score]

	…relevant	…credible	…easy to monitor	…robust	Share of respondents that considered it a 'core indicator'
Amount of funds made available (by type of funding instrument) to support research on antimicrobials and AMR pathogens in the environment (n=9)	**4,9**	**4,5**	**3,8**	**3,9**	**100%**

Figure 24: To what extent the outcome indicator "Improved understanding of AMR in the environment & approaches to its reduction" is… [n=9]



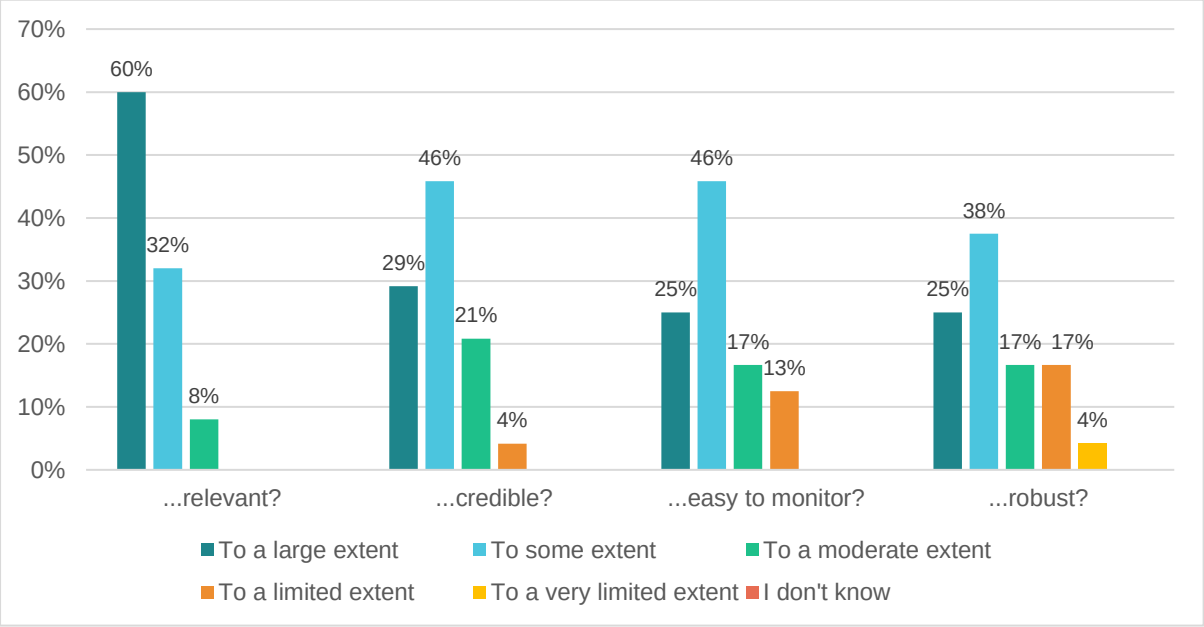
1.3.7. Cooperation

The output and outcome indicators included under this domain were relevant to **all the respondents** that selected this specific domain, regardless of their One Health sector of specialisation. One respondent mentioned that an additional indicator could be considered, linking 'cooperation' with the integrated system of surveillance indicator proposed for the Surveillance domain (Section 1.3.2), due to the need of having a strong cooperation process between the various One Health sectors. Finally, another stakeholder mentioned the need to better define '*best practice exchange opportunities'*, for instance by replacing them with concrete initiatives led through a One Health approach.

Table 24: For the proposed output indicator, please indicate whether it is… [Average score of a 5 points scale, with 1 being the lowest score and 5 the highest score]

	…relevant	…credible	…easy to monitor	…robust	Share of respondents that considered it a 'core indicator'
Number of best practice exchange opportunities in the context of One Health AMR Network meetings or other relevant committees and working groups (n=25)	**4,4**	**3,8**	**3,9**	**3,6**	**56%**

Figure 25: "Improved coordination of One Health responses to AMR among Member States and between Member States and EU agencies/bodies" is… [n=24]



1.3.8. Global

The output and outcome indicators aimed at monitoring global commitments, international cooperation efforts and the capacity of third countries to address AMR were addressed to **all the respondents** that selected the global domain, regardless of their One Health sector. Three respondents suggested additional indicators that could be considered under this domain, e.g.: i) number of joint research projects, initiatives and partnerships between Member States and with the EU and ii) number of projects or initiatives exported in third countries. Finally, a couple of respondents suggested that instead of focusing on the amount of funding provided to third countries for AMR (Table 27), it would be more useful to assess the outcomes of that funding.

Table 25: For the proposed output indicator, please indicate whether it is… [Average score of a 5 points scale, with 1 being the lowest score and 5 the highest score]

	…relevant	…credible	…easy to monitor	…robust	Share of respondents that considered it a 'core indicator'
Active EU participation in drafting and negotiating international standards and agreements relevant to AMR (n=26)	**4,8**	**4,2**	**3,7**	**3,7**	**88%**

Figure 26: To what extent the outcome indicator "Extent to which global commitments and strengthened normative framework to tackle AMR are raised in line with EU positions and priorities" is… [n=28]

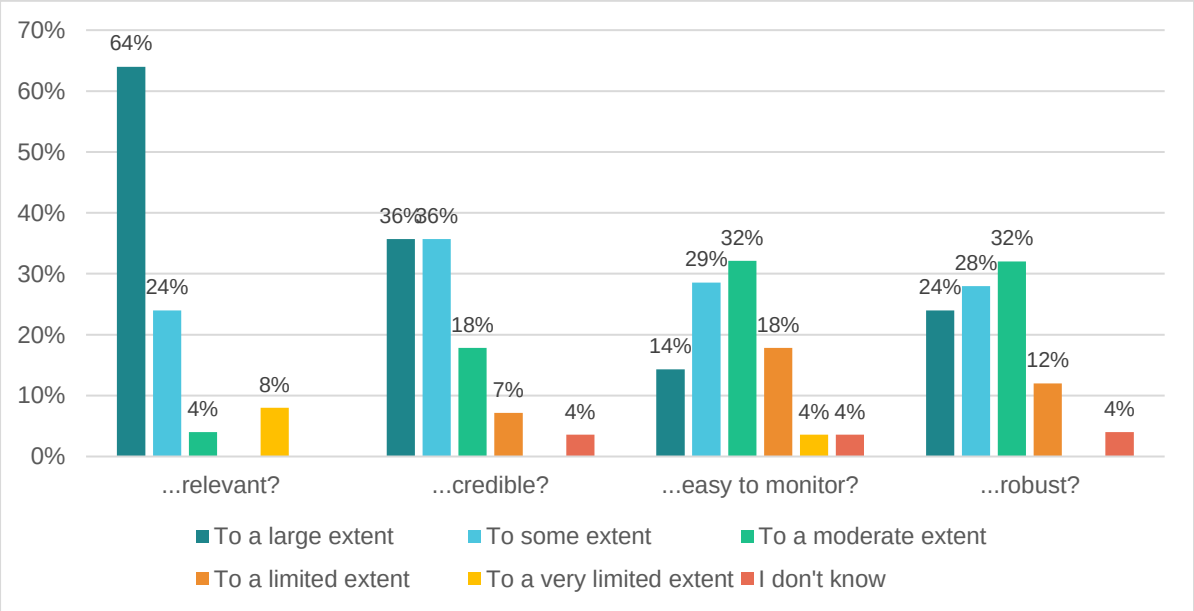


Table 26: For the proposed output indicator, please indicate whether it is… [Average score of a 5 points scale, with 1 being the lowest score and 5 the highest score]

	…relevant	…credible	…easy to monitor	…robust	Share of respondents that considered it a 'core indicator'
Active EU participation in international fora aimed at cooperating/coordinating a global response to AMR (n=26)	**4,7**	**4,3**	**3,8**	**3,7**	**92%**

Figure 27: To what extent the outcome indicator "Strengthened international cooperation and coordinated global response to AMR" is… [n=29]

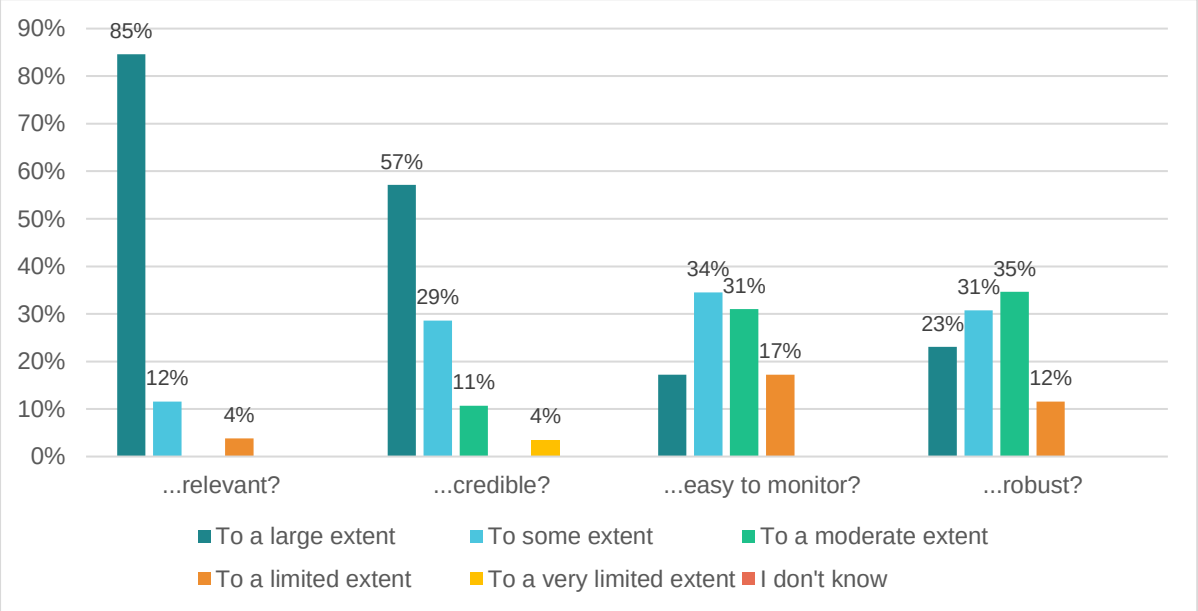
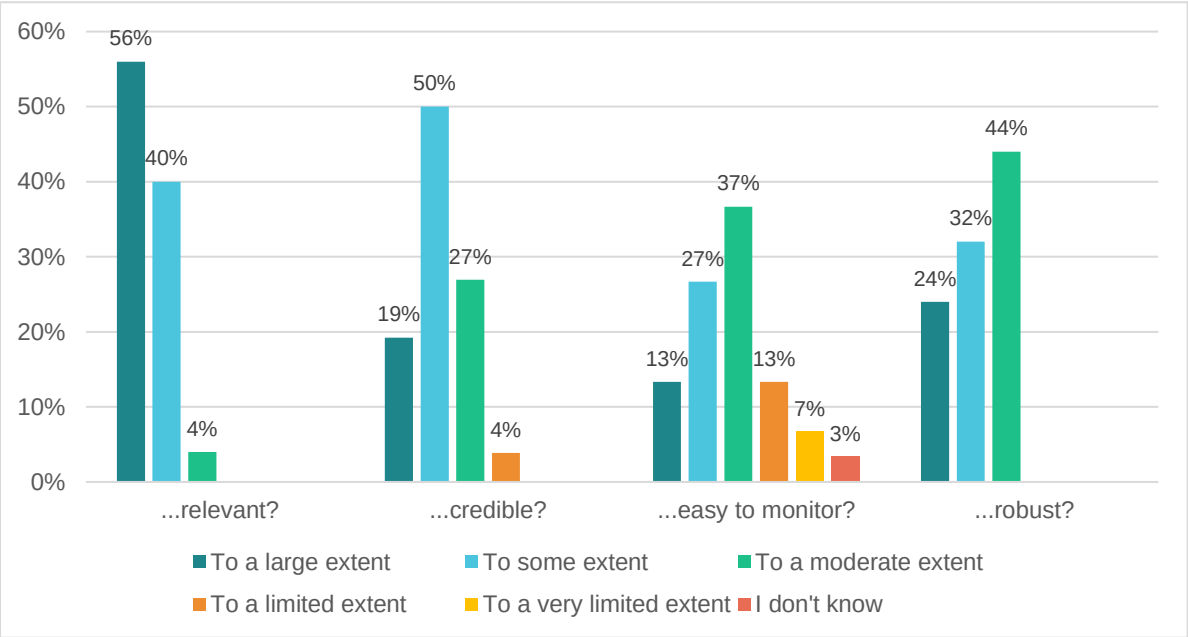


Table 27: For the proposed output indicator, please indicate whether it is… [Average score of a 5 points scale, with 1 being the lowest score and 5 the highest score]

	…relevant	…credible	…easy to monitor	…robust	Share of respondents that considered it a 'core indicator'
Amount of funding and extent of technical support provided to third countries to build capacities to address AMR through support for implementation of international standards and action plans and trainings (n=25)	**4,3**	**3,9**	**3,5**	**3,7**	**77%**

Figure 28: To what extent the outcome indicator "Contribution of the EU to strengthening capacities of third countries to tackle AMR" is… [n=30]



1.3.9. Conclusions

Overall, the consultation exercise was successful in collecting relevant feedback on the framework's output and outcome indicators from representatives of most EU countries. The feedback collected, contributed to refine, streamline and finalise the monitoring framework proposed at an earlier stage of this study.

The analysis of the survey shows that **all output indicators proposed in the Draft Monitoring Framework received an average score of over 3 out of a maximum of 5 points across all four RCER criteria.** The survey responses suggest that the proposed outcome and output indicators are predominantly **relevant** for monitoring purposes, since only two, out of 46 output indicators, received on average less than 4 points and all the outcome indicators were deemed as largely relevant for monitoring purposes.

The survey results have shown slightly less consensus from stakeholders when assessing the other three criteria. When assessing the **credibility** of the indicators for monitoring purposes, more than half of the proposed output indicators received on average less than 4 points, although 73% of the outcome indicators received on average more than 4 points. The assessment of whether the proposed indicators were **easy to monitor** also received slightly less positive responses compared to their relevance: 87% of the proposed output and 91% of the outcome indicators received on average less than 4 points. In respect to the **robustness** of the proposed indicators, the results show that 85% of proposed output and 77% of proposed outcome indicators received on average less than 4 points.

Moreover, the results show a strong consensus from respondents towards the inclusion of the proposed output indicators, as core indicators in the monitoring framework. In particular, 72% of the output indicators were deemed to be suitable for inclusion in the monitoring framework as ‘core indicators’(i.e., more than 70% of respondents suggested to include them as core indicators in the monitoring framework).

5.5. Annex 5: Complete monitoring framework[36]

Indicator type and number	Indicator	Type of indicator			Unit of measurement	Basis	Sector	Frequency of measurement	Proposed metrics	Data source	Proposed data collection source
		Core/ Optional	**Qualitative/ Quantitative**	**Output/ Outcome**							
NAPs and National policies against AMR											
NAP Outcome Indicator 01	Increase in the number of Member States implementing high quality NAPs	Core	Quantitative	Outcome	Number of (#)	CR Point 1	All	Every 3 years	Number of MS which register improvement on the results of at least one of the linked output indicators: 01, 03, 04, 05, 06	Monitoring framework	
NAP Output Indicator 01	Level of NAP development and/or implementation in each Member State	Core	Qualitative	Output	Level	CR Point 1	All	Annual	Levels A-E Q2.3: Country progress with development of a national action plan on AMR Country progress with development of a national action plan on AMR (TrACCS 2023)	Global Database for Tracking Antimicrobial Resistance (AMR) Country Self-Assessment Survey (TrACSS)[37]	Retrieval of publicly available information
NAP Output Indicator 02	Number of MS whose NAP outcomes are evaluated at least every 3 years & the evaluation is publicly available	Core	Quantitative	Output	Number of	CR Point 3	All	Every 3 years	Number of countries with status of Yes/No Yes indicates both conditions are met (NAP evaluated at least every 3 years AND evaluation published)	[No data source identified]	Self-reporting by MS (survey)

[36] CR = Council Recommendation on stepping up actions to combat antimicrobial resistance in a One Health approach; AP = A European One Health Action Plan against Antimicrobial Resistance

[37] https://amrcountryprogress.org/#/download-responses

Indicator type and number	Indicator	Type of indicator			Unit of measurement	Basis	Sector	Frequency of measurement	Proposed metrics	Data source	Proposed data collection source
		Core/ Optional	**Qualitative/ Quantitative**	**Output/ Outcome**							
NAP Output Indicator 03	Level of intersectoral coordination in the implementation of NAPs; sectors involved in the coordination in each Member State	Core	Qualitative	Output	Level	CR Point 1b	All	Annual	Levels A-E Q2.1: Multi-sector and One Health collaboration/coordination; Q2.2 sectors involved (TrACCS 2023)	TrACSS	Retrieval of publicly available information
NAP Output Indicator 04	Number of Member States whose NAP includes monitoring mechanisms, and the characteristics of their monitoring mechanism	Core	Quantitative	Output	Number of (#)	CR Point 1c	All	Every 3 years	MS reaching level 5 QB12.3: Does your Member State have national indicators or targets to measure national progress on AMR (including antimicrobial consumption/use) and/or HAIs? Please, provide a description of the indicators/targets or a hyperlink to where they can be found in the comments section	Questionnaire of Commission Implementing Regulation (EU) 2023/1808 setting out the template for the provision of information on prevention, preparedness and response planning in relation to serious cross-border threats to health in accordance with Regulation (EU) 2022/2371[38]	EC

[38] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32023R1808

Indicator type and number	Indicator	Type of indicator			Unit of measurement	Basis	Sector	Frequency of measurement	Proposed metrics	Data source	Proposed data collection source
		Core/ Optional	**Qualitative/ Quantitative**	**Output/ Outcome**							
NAP Output Indicator 05	Number of Member States whose NAP includes evidence-based measures to prevent, monitor and reduce the spread of AMR in the environment	Core	Quantitative	Output	Number of (#)	CR Point 1e	Environment	Every 3 years	Yes/No; description of measures included	[No data source identified]	Self-reporting by MS (survey)
NAP Output Indicator 06	*Level of human and financial resources allocated for the effective implementation of NAP*	*Optional*	*Qualitative*	*Output*	*Level*	*CR Point 2*	*All*	*Every 3 years*	*Levels 1-5 QB12.2: What resources are allocated to the implementation of the NAP on AMR?*	*Questionnaire of Implementing Regulation (EU) 2023/1808*	*EC*
NAP Output Indicator 07	Extent of EU support to the mobilisation of appropriate human and financial resources for the effective implementation of the National Action Plans	Core	Both	Output	Euro (€)	CR Point 2	All	Annual	1) Amount of funding provided by EC to the implementation of NAPs	EC	EC
					Number of (#)				2) number of joint EC-ECDC visits and MS visited out of number of visits requested by MS	EC	
					Euro (€)				3) amount of co-funding to WHO, to support MS (or countries in the European region) in implementing WHO roadmap	EC	
Surveillance											
SURVEILLANCE Outcome Indicator 01	AMR surveillance status in humans in each Member State	Core	Qualitative	Outcome	Level			Every 3 years	Levels 1-5 QB.12.8: Regarding the surveillance of AMR, please indicate your Member State's corresponding level below	Questionnaire of Implementing Regulation (EU) 2023/1808	EC

Indicator type and number	Indicator	Type of indicator			Unit of measurement	Basis	Sector	Frequency of measurement	Proposed metrics	Data source	Proposed data collection source
		Core/ Optional	**Qualitative/ Quantitative**	**Output/ Outcome**							
SURVEILLANCE Output Indicator 01	Extent to which epidemiological surveillance in the EU is implemented according to Commission Implementing Decision (EU) 2018/945 on the communicable diseases and related special health issues to be covered by epidemiological surveillance as well as relevant case definitions	Core	Qualitative	Output	Status	APP1SO1.1	Human	Annual	Estimated population coverage (%) Geographical representativeness (High, medium, low) Hospital representativeness (High, medium, low) Isolate representativeness (High, medium, low)	ECDC AMR surveillance reports (Table 2, 2022)[39]	Retrieval of publicly available information
SURVEILLANCE Output Indicator 02	Number of Member States whose AMR surveillance of bacteria in humans includes all isolates from clinical microbiology laboratories (in addition to bloodstream and cerebrospinal fluid isolates (invasive isolates))	Core	Quantitative	Output	Number of (#)	CR Point 5a	Human	Every 3 years	List of isolates included in surveillance in each Member State	[No data source identified]	Self-reporting by MS (survey)

[39] https://www.ecdc.europa.eu/sites/default/files/documents/AER-antimicrobial-resistance.pdf

Indicator type and number	Indicator	Type of indicator			Unit of measurement	Basis	Sector	Frequency of measurement	Proposed metrics	Data source	Proposed data collection source
		Core/ Optional	**Qualitative/ Quantitative**	**Output/ Outcome**							
SURVEILLANCE Output Indicator 03	Number of Member States with national legislation requiring that infections caused by critical (high negative human health impact) multidrug-resistant organisms resistant to last line treatments are notifiable diseases (e.g. carbapenem-resistant *Acinetobacter baumannii*, carbapenem-resistant Enterobacteriaceae (e.g. *Klebsiella pneumoniae*, *Escherichia coli*) and *Candida auris*)	Core	Quantitative	Output	Number of (#)	CR Point 5b	Human	Every 3 years	Expanded list of notifiable diseases through national legislation; List of diseases that are in each Member State	[No data source identified]	Self-reporting by MS (survey)
SURVEILLANCE Output Indicator 04	*Number of Member States with expanded surveillance in humans to pathogens with emerging or established AMR due to their exposure to substances in the environment, in particular those used in plant protection products or biocidal products*	*Optional*	*Quantitative*	*Output*	*Number of (#)*	*CR Point 5c*	*Human*	*Every 3 years*	*Expanded list of pathogens surveyed in each MS: Yes/No; list of pathogens surveyed in each MS*	*[No data source identified]*	*Self-reporting by MS (survey)*

Indicator type and number	Indicator	Type of indicator			Unit of measurement	Basis	Sector	Frequency of measurement	Proposed metrics	Data source	Proposed data collection source
		Core/ Optional	**Qualitative/ Quantitative**	**Output/ Outcome**							
SURVEILLANCE Outcome Indicator 02	Extent of AMC monitoring in humans in each Member State (with the aim of achieving complete collection of AMC data for human health by 2030)	Core	Qualitative	Outcome	Level	CR Point 5	Human	Annual	Levels 1-5 Q 3.2 National monitoring system for consumption and rational use of antimicrobials in human health (TrACCS 2023)	TrACSS	Retrieval of publicly available information
SURVEILLANCE Output Indicator 05	Extent (i.e., coverage, frequency, types of antimicrobials) of AMC monitoring implementation in Member States at: i) Community level; ii) Hospital level; iii) Long-term care facilities	Core	Qualitative	Output	Extent of	CR Point 5	Human	Every 3 years	1) AMC monitoring implemented/ not implemented at community level, at i) hospital level, ii) at long-term care facilities level;	[No data source identified]	Self-reporting by MS (survey)
								Every 3 years	2) Coverage (e.g. antibiotics, antivirals, fungicides) and frequency (e.g. real-time, monthly, quarterly, annual, etc) of AMC monitoring system	[No data source identified]	Self-reporting by MS (survey)
SURVEILLANCE Output Indicator 06	Number of Member States which collect prescribing and/ or dispensing data on antimicrobials in humans	Core	Quantitative	Output	Number of (#)	CR Point 5d	Human	Every 3 years	Number of MS collecting a) prescribing and/or b) dispensing data from: i) prescribers; ii) pharmacists; iii) others; format/ systems used (e.g. EU level digital infrastructure)	[No data source identified]	Self-reporting by MS (survey)
SURVEILLANCE Outcome Indicator 03	Extent of AMR surveillance in animals in each Member State	Core	Qualitative	Outcome	Level	CR Point 6	Animal	Annual	Levels A-E Q4.7 National surveillance system for antimicrobial resistance (AMR) in live terrestrial animals (TrACCS 2023)	TrACSS	Retrieval of publicly available information

Indicator type and number	Indicator	Type of indicator			Unit of measurement	Basis	Sector	Frequency of measurement	Proposed metrics	Data source	Proposed data collection source
		Core/ Optional	**Qualitative/ Quantitative**	**Output/ Outcome**							
SURVEILLANCE Output Indicator 07	Extent to which monitoring and reporting of AMR is done in accordance with (Articles 1.4, 3 and 4 of) Commission Implementing Decision (EU) 2020/1729 on the monitoring and reporting of antimicrobial resistance in zoonotic and commensal bacteria	Core	Qualitative	Output	Status	AP P1 SO1.1	Animal	Every 3 years	Reporting is done in accordance to Commission Implementing Decision (EU) 2020/179 (as reported by EFSA) (yes/no)	EFSA[40]	Retrieval of publicly available information
			Qualitative		Extent of			Every 3 years	Results of Commission's audits/controls on AMR monitoring	EC	Request to DG SANTE
SURVEILLANCE Outcome Indicator 04	Improved surveillance of AMR in the environment (water and/or soil) at EU level	Core	Qualitative	Outcome	Status	AP P1 SO1.1	Environment	Annual	Yes/No Q6.3 Is there a system for regular monitoring (passive surveillance) of antimicrobial compounds and their metabolites (or residues) and resistant bacteria or antimicrobial resistance genes (ARGs) in water quality; types of water (TrACCS 2023)	TrACSS	Retrieval of publicly available information

[40] https://www.efsa.europa.eu/en/efsajournal/pub/8583

Indicator type and number	Indicator	Type of indicator			Unit of measurement	Basis	Sector	Frequency of measurement	Proposed metrics	Data source	Proposed data collection source
		Core/ Optional	**Qualitative/ Quantitative**	**Output/ Outcome**							
SURVEILLANCE Output Indicator 08	Monitoring of the levels of pollution in water caused by antibiotics, antifungal, fungicide and plant protection products is done in accordance with the Watch List under the Water Framework Directive	Core	Qualitative	Output	Status	AP P1 SO1.1	Environment	Every 3 years	Under the Water Framework Directive, specific products posing a risk to AMR are assessed in the regular review of the list of substances, including the feasibility of monitoring antimicrobial resistant microorganisms and antimicrobial resistance genes (Yes/No): 1) Second Watch List (2018): amoxicillin, ciprofloxacin 2) Third Watch List (2020): sulfamethoxazole, trimethoprim, clotrimazole, fluconazole, miconazole 3) Fourth Watch List (2022): clindamycin, cefalexin, ofloxacin, copper and copper oxide 4) Fifth Watch List (2024): in progress	JRC reports[41]	Retrieval of publicly available information
			Qualitative		Status				Number of incidences concerning pollutants above, MS in which incidence(s) occurred, area(s) affected [e.g., km2, or other available metrics]	WISE-Freshwater Information System (https://water.europa.eu/freshwater) Waterbase - Water Quality ICM Data Hub[42]	Request to EEA, or retrieval of publicly available information

[41] https://publications.jrc.ec.europa.eu/repository/handle/JRC111198; https://publications.jrc.ec.europa.eu/repository/handle/JRC121346; https://publications.jrc.ec.europa.eu/repository/handle/JRC130252

[42] https://www.eea.europa.eu/en/datahub/datahubitem-view/fbf3717c-cd7b-4785-933a-d0cf510542e

Indicator type and number	Indicator	Type of indicator			Unit of measurement	Basis	Sector	Frequency of measurement	Proposed metrics	Data source	Proposed data collection source
		Core/ Optional	**Qualitative/ Quantitative**	**Output/ Outcome**							
SURVEILLANCE Output Indicator 09	*Levels of AMR in urban waste water as per the recast Urban Wastewater Treatment Directive surveillance obligations for agglomerations of 100,000 population equivalent and above*	*Optional*	*N/A*	*Output*	*N/A*	*AP P1 SO1.1*	*Environment*	*N/A*	*Cannot be implemented at this stage*	*EC*	*EC*
SURVEILLANCE Output Indicator 10	*Extent to which EU Agencies and MS competent authorities consider risk of AMR in the assessment of active substances and products, respectively where relevant*	*Optional*	*Qualitative*	*Output*	*Status*	*CR Point 14*	*Environment*	*Every 3 years*	*Yes/No; Safety evaluation includes risk of AMR*	*[No data source identified]*	*Self-reporting by MS (survey) EU Agencies*
SURVEILLANCE Outcome Indicator 05	*Extent to which integrated surveillance of AMC & AMR is achieved at EU level*	*Optional*	*Qualitative*	*Outcome*	*Status*	*CR Point 5e*	*All*	*Every 3 years*	*Assessment on progress towards integrated systems in Member States based on results of SURVEILLANCE Output Indicator 11 over time*	*Monitoring framework*	
SURVEILLANCE Output Indicator 11	*Number of Member States with any form of integrated and continuous systems for monitoring and surveillance of AMR*	*Optional*	*Qualitative*	*Output*	*Status*	*CR Point 5e*	*All*	*Every 3 years*	*1) MS reaching level 5 QB.12.8: Regarding the surveillance of AMR, please indicate your Member State's corresponding level below*	*Questionnaire of Implementing Regulation (EU) 2023/1808*	*EC*

Indicator type and number	Indicator	Type of indicator			Unit of measurement	Basis	Sector	Frequency of measurement	Proposed metrics	Data source	Proposed data collection source
		Core/ Optional	Qualitative/ Quantitative	Output/ Outcome							
	and AMC encompassing human health, animal health, plant health, food, wastewater and the environment		*Qualitative*		*Status*			*Annual*	*2) Yes/No Q2.13 Has the country established or starting the implementation of an Integrated Surveillance System for Antimicrobial Resistance; If yes, which sectors integrated (TrACCS 2023)*	*TrACSS*	*Retrieval of publicly available information*
			Qualitative		*Status*			*Every 3 years*	*3) MS publish an annual One Health surveillance report on AMR and AMC (yes/no)* *4) MS implement standardized protocol for AMR and AMC (yes/no)*	*[No data source identified]*	*Self-reporting by MS (survey)*
Infection Prevention and Control											
IPC Outcome Indicator 01	Reduction in infections acquired in healthcare settings (acute settings)	Core	Quantitative	Outcome	Percentage	CR Point 7	Human	Every 5 years	1) Estimation of incidence of patients acquiring at least one HAI in acute care hospitals in the EU/EEA (Estimated HAI incidence)	ECDC, Point prevalence survey of healthcare-associated infections and antimicrobial use in European acute care hospitals[43]	Retrieval of publicly available information: 2022-2023 PPS Report Table 21
			Quantitative		Number				2) Estimation of the number of all types of HAIs with antimicrobial-resistant bacteria per year in acute care hospitals in EU/EEA (Country-weighted HAI incidence (estimated))		2022-2023 PPS Report Table 23

[43] https://www.ecdc.europa.eu/en/publications-data/PPS-HAI-AMR-acute-care-europe-2022-2023

Indicator type and number	Indicator	Type of indicator			Unit of measurement	Basis	Sector	Frequency of measurement	Proposed metrics	Data source	Proposed data collection source
		Core/ Optional	**Qualitative/ Quantitative**	**Output/ Outcome**							
IPC Output Indicator 01	Extent to which Member Sates guarantee/ continuously provide training on IPC core competences for healthcare professionals in hospitals and in long-term care facilities	Core	Qualitative	Output	Level	CR Point 7	Human	Annual	Levels D & E Q3.5 on IPC programmes in place according to WHO IPC component guidelines (TrACCS) and/or Level 4 or 5 in section C9.1 (SPAR)	TrACSS SPAR[44]	Retrieval of publicly available information
IPC Output Indicator 02	*Allocation of financial resources for IPC programmes in hospitals and long-term care facilities in each Member State*	*Optional*	*Quantitative*	*Output*	*Euro*	*CR Point 7*	*Human*	*Every 3 years*	*1) Financial resources allocated to IPC programmes in hospitals 2) Financial resources allocated to IPC programmes in LTCFs*	*[No data source identified]*	*Self-reporting by MS (survey)*
IPC Output Indicator 03	Number of Member States conducting quality control of IPC measures in hospitals and in long-term care facilities	Core	Qualitative	Output	Level	CR Point 7	Human	Every 3 years	Coverage and types of quality control measures conducted in MS	[No data source identified]	Self-reporting by MS (survey)
IPC Output Indicator 04	EC develops IPC guidelines in human health for hospitals and long-term care facilities	Core	Qualitative	Output	Status	CR Point 7/ Point 10	Human	Annual	Not started, in progress, completed	EC	EC
IPC Output Indicator 05	*State of infrastructure in healthcare facilities*	*Optional*	*Qualitative*	*Output*	*Level*	*CR Point 7*	*Human*	*Annual*	*Levels 1-5 Indicator C9.3 Safe environments in health facilities (SPAR)*	*SPAR*	*Retrieval of publicly available information*

[44] https://iris.who.int/bitstream/handle/10665/350218/9789240040120-eng.pdf?sequence=1

Indicator type and number	Indicator	Type of indicator			Unit of measurement	Basis	Sector	Frequency of measurement	Proposed metrics	Data source	Proposed data collection source
		Core/ Optional	**Qualitative/ Quantitative**	**Output/ Outcome**							
IPC Output Indicator 06	Extent to which clinical laboratories are able to provide high quality microbiological support to healthcare facilities	Core	Qualitative	Output	Level	CR Point 7	Human	Annual	Levels 1-5 Indicator C4.4 Laboratory testing capacity modalities (SPAR)	SPAR	Retrieval of publicly available information
IPC Outcome Indicator 02	Percentage of target population covered by vaccines included in Member States' national vaccination programmes	Core	Quantitative	Outcome	Percentage	AP P1 SO1.3	Human	Annual	1) Vaccination coverage of vaccines that have a specific impact on AMR and AMC: i) pneumococcal conjugate vaccination in children below 1 year old, ii) Hib (Hib3) immunization coverage among 1-year-olds, iii) measles-containing-vaccine second-dose (MCV2) immunization coverage by the locally recommended age, iv) rotavirus in children below 1 year old, v) diphtheria tetanus toxoid and pertussis (DTP3) immunization coverage among 1-year-olds	WHO[45]	Retrieval of publicly available information
			Quantitative	Outcome	Percentage		Human	Annual	2) Vaccination against influenza in over 65 years old (annual, percentage)	Eurostat[46]	Retrieval of publicly available information

[45] https://www.who.int/data/gho/data/themes/immunization

[46] https://ec.europa.eu/eurostat/databrowser/view/hlth_ps_immu/default/table?lang=en&category=hlth.hlth_care.hlth_prev

Indicator type and number	Indicator	Type of indicator			Unit of measurement	Basis	Sector	Frequency of measurement	Proposed metrics	Data source	Proposed data collection source
		Core/ Optional	**Qualitative/ Quantitative**	**Output/ Outcome**							
IPC Output Indicator 07	National immunisation programmes are fully developed and implemented (on the basis of Council Recommendation of 7 December 2018 on Strengthened Cooperation against Vaccine Preventable Disease) in all Member States	Core	Qualitative	Output	Status	CR Point 7	Human	Every 3 years	Publication of vaccination schedule is available on ECDC website for each MS (Yes/No)	ECDC Vaccine scheduler[47]	Retrieval of publicly available information
IPC Outcome Indicator 03	Reduction in animal disease outbreaks	Core	Quantitative	Outcome	Number	CR Point 8	Animal	Annual	Number of outbreaks per disease per country per year ADIS	ADIS[48]	Retrieval of publicly available information
IPC Output Indicator 08	Extent to which Member States promote the uptake of biosecurity and IPC measures in farms	Core	Qualitative	Output	Level	CR Point 8	Animal	Annual	Levels A-E Q4.9: Biosecurity and good animal husbandry practices to reduce the use of antimicrobials and minimize development and transmission of AMR in terrestrial animal production (TrACCS 2023)	TrACSS	Retrieval of publicly available information

[47] https://vaccine-schedule.ecdc.europa.eu

[48] https://webgate.ec.europa.eu/tracesnt/adis/public/notification

Indicator type and number	Indicator	Type of indicator			Unit of measurement	Basis	Sector	Frequency of measurement	Proposed metrics	Data source	Proposed data collection source
		Core/ Optional	**Qualitative/ Quantitative**	**Output/ Outcome**							
IPC Output Indicator 09	*Amount of funding allocated/type of support provided to preventive actions against infectious diseases through the common agricultural policy (CAP)*	*Optional*	*Quantitative*	*Output*	*Euro*	*CR Point 8*	*Animal*	*Every 3 years*	*Relevant CAP expenditure under SO9 provided by EC or obtained from existing sources*	*EC*	*Request to DG AGRI*
IPC Output Indicator 10	*Number of projects funded (and amount of funding provided) through the European Maritime, Fisheries and Aquaculture Fund (EMFAF) that are relevant to combat AMR*	*Optional*	*Quantitative*	*Output*	*Number*	*CR Point 8*	*Animal*	*Every 3 years*	*Number of projects addressing AMR that are included in the EMFAF national programmes*	*EC*	*Request to DG MARE*
IPC Output Indicator 11	Extent to which Member States promote the uptake of biosecurity and IPC measures in aquaculture	Core	Qualitative	Output	Level	CR Point 8	Animal	Annual	Levels A-E Q4.10 Biosecurity and good animal husbandry practices to reduce the use of antimicrobials and minimize development and transmission of AMR in aquatic animal production (TrACCS 2023)	TrACSS	Retrieval of publicly available information
IPC Output Indicator 12	Availability of vaccination programmes for food producing animals	Core	Both	Output	Type Percentage Number	CR* Point 8	Animal	Every 3 years	Availability of vaccination programmes for food-producing animals in each MS (yes/no); If "yes", where available, types of activities promoting vaccination in animals; and uptake of vaccination in animals	[No data source identified]	Self-reporting by MS (survey)

Indicator type and number	Indicator	Type of indicator			Unit of measurement	Basis	Sector	Frequency of measurement	Proposed metrics	Data source	Proposed data collection source
		Core/ Optional	**Qualitative/ Quantitative**	**Output/ Outcome**							
IPC Output Indicator 13	*Number of Member States promoting the development and use of innovative feed additives to improve the physiological status of animals*	*Optional*	*Both*	*Output*	*Type Percentage Number*	*CR Point 8*	*Animal*	*Every 3 years*	*Number of Member States implementing-activities promoting the development and use of innovative feed additives to improve the physiological status of animals in each MS (yes/no) If yes, where available, types of activities*	*[No data source identified]*	*Self-reporting by MS (survey)*
IPC Output Indicator 14	Number of Member State providing continuous training on IPC and biosecurity to personnel in veterinary practice, farms and aquaculture	Core	Both	Output	Topics Number Percentage	CR Point 8	Animal	Every 3 years	Implementation of trainings in each MS (yes/no) If yes, if available, number of trainings, number of trainees, topics covered on continuous training on IPC and biosecurity for personnel in veterinary practice, farms and aquaculture (Estimate of) Percentage of the target population participating in at least one training on IPC and biosecurity, if available	[No data source identified]	Self-reporting by MS (survey)
IPC Outcome Indicator 04	Extent to which farms implement measures for good manure and sewage sludge management in each Member State	Core	Qualitative	Outcome	Extent of	CR Point 9	Environment	Every 3 years	Assessment based on results of associated Output Indicators 15&16- Number of countries answering Yes to both output indicators	Monitoring framework	
IPC Output Indicator 15	Uptake of good evidence-based manure management practices in agriculture in each Member State	Core	Qualitative	Output	Extent of	CR Point 9	Environment	Every 3 years	Extent of implementation of good manure management practices to reduce environmental exposure to substances with antimicrobial properties and to AMR determinants in agriculture	[No data source identified]	Self-reporting by MS (survey)

Indicator type and number	Indicator	Type of indicator			Unit of measurement	Basis	Sector	Frequency of measurement	Proposed metrics	Data source	Proposed data collection source
		Core/ Optional	**Qualitative/ Quantitative**	**Output/ Outcome**							
IPC Output Indicator 16	Uptake of good evidence-based sewage sludge management practices in agriculture in each Member State	Core	Qualitative	Output	Extent of	CR Point 9	Environment	Every 3 years	Extent of implementation of good sewage sludge management practices to reduce environmental exposure to substances with antimicrobial properties and to AMR determinants in agriculture	[No data source identified]	Self-reporting by MS (survey)
Antimicrobial Stewardship											
AMS Outcome Indicator 01	Extent to which AMS & prudent use of antimicrobials across healthcare settings has improved in each Member State	Core	Qualitative	Outcome	Level	CR Point 11	Human	Every 3 years	Levels 1-5 QB12.7 Regarding the optimal use of antimicrobial medicines in human health, please indicate your Member State's corresponding level below (primary and secondary care)	Questionnaire of Implementing Regulation (EU) 2023/1808	EC

Indicator type and number	Indicator	Type of indicator			Unit of measurement	Basis	Sector	Frequency of measurement	Proposed metrics	Data source	Proposed data collection source
		Core/ Optional	**Qualitative/ Quantitative**	**Output/ Outcome**							
AMS Output Indicator 01	EC develops EU guidelines for the treatment of major common infections in humans and for the perioperative prophylaxis in humans, which would include information on the use of adequate diagnostic tests, the need for antibiotics, the choice of the appropriate antibiotic (if needed), the dose and dose intervals, and the duration of treatment/prophylaxis	Core	Qualitative	Output	Status	CR Point 13	Human	Annual	Stage 1: guidelines not started, Stage 2: guidelines in progress, Stage 3: guidelines completed	EC	Request to DG SANTE
AMS Output Indicator 02	Extent of implementation of AMS measures addressed to health professionals in each Member State	Core	Qualitative	Output	Level	CR Point 11	Human	Annual	Levels A-E Q3.6: Optimizing antimicrobial use in human health (TrACCS 2023)	TrACSS	Retrieval of publicly available information
AMS Output Indicator 03	*Extent of implementation of AMS measures addressed to community and hospital pharmacies in each Member State*	*Optional*	*Qualitative*	*Output*	*Level*	*CR Point 11*	*Human*	*Every 3 years*	*National/regional plans or strategies to implement AMS measures prudent use of antimicrobials for community and hospital pharmacies*	*[No data source identified]*	*Self-reporting by MS (survey)*

Indicator type and number	Indicator	Type of indicator			Unit of measurement	Basis	Sector	Frequency of measurement	Proposed metrics	Data source	Proposed data collection source
		Core/ Optional	**Qualitative/ Quantitative**	**Output/ Outcome**							
AMS Output Indicator 04	Extent to which diagnostic testing is available in medical practice in each Member State	Core	Qualitative	Output	Level	CR Point 11	Human	Every 3 years	Measures taken to encourage and support the uptake of diagnostic tests in medical practice	[No data source identified]	Self-reporting by MS (survey)
AMS Outcome Indicator 02	Extent to which AMS & prudent use of antimicrobials in veterinary settings has improved in each Member State	Core	Qualitative	Outcome	Level	AP** P1 SO1.3	Animal	Annual	Levels A-E, Q.4.11. Optimizing antimicrobial use in terrestrial animal health; Q4.12 Optimizing antimicrobial use in aquatic animal health (TrACCS 2023)	TrACSS	Retrieval of publicly available information
AMS Output Indicator 05	Extent to which diagnostic testing is available in veterinary practice in each Member State	Core	Qualitative	Output	Level	AP P1 SO1.3	Animal	Annual	Levels A-E, Q5.4 National AMR Laboratory network in animal health and food safety sectors a-d on laboratories animal/food sector; c) Relevance of diagnostic (bacteriology) techniques used by laboratories included in the AMR surveillance system in the animal health and food safety sectors (TrACCS 2023)	TrACSS	Retrieval of publicly available information
AMS Output Indicator 06	Volumes of sales and use of antibiotics for animals in each Member State	Core	Quantitative	Output	Tonnes (sales) mg/kg or DDDvet (use)	AP P1 SO1.3	Animal	Annual	Volumes of sales and use across EU MS	EMA, ASU Platform[49]	Retrieval of publicly available information or request to EMA

[49] https://www.ema.europa.eu/en/veterinary-regulatory-overview/antimicrobial-resistance-veterinary-medicine/antimicrobial-sales-use-platform

Indicator type and number	Indicator	Type of indicator			Unit of measurement	Basis	Sector	Frequency of measurement	Proposed metrics	Data source	Proposed data collection source
		Core/ Optional	**Qualitative/ Quantitative**	**Output/ Outcome**							
AMS Outcome Indicator 03	Improved collection & safe disposal of antimicrobials in relevant settings	Core	Both	Outcome	Extent of Quantitative metrics as measured in each national programme	CR Point 12	All	Every 3 years	Qualitative self-assessment about extent of improvements Metrics on uptake data from national programmes, where available, for: community, hospitals and long-term care facilities, farms, veterinary medicine providers, veterinary premises and manufacturing facilities of antimicrobials.	[No data source identified]	Self-reporting by MS (survey)
AMS Output Indicator 07	Number of Member States having developed national programmes for the collection & safe disposal of antimicrobials from all relevant settings	Core	Both	Output	Number Status	CR Point 12	All	Every 3 years	Established national programmes, where available, for: i) community (yes/no), ii) hospitals (yes/no) iii) long-term care facilities (yes/no), iv) farms (yes/no), v) veterinary medicine providers (yes/no), vi) veterinary premises (yes/no) and vii) manufacturing facilities of antimicrobials by MS (yes/no)	[No data source identified]	Self-reporting by MS (survey)
Targets											
TARGET Outcome Indicator 01	Reduction of 20% in EU in total consumption of antibiotics by humans	Core	Quantitative	Outcome	Number	CR Point 15	Human	Annual	Change in total consumption between current and previous year measured in DDD per 1000 inhabitants per day	ECDC ESAC-Net[50]	Retrieval of publicly available information

[50] https://qap.ecdc.europa.eu/public/extensions/AMC2_Dashboard/AMC2_Dashboard.html#eu-consumption-tab

Indicator type and number	Indicator	Type of indicator			Unit of measurement	Basis	Sector	Frequency of measurement	Proposed metrics	Data source	Proposed data collection source
		Core/ Optional	**Qualitative/ Quantitative**	**Output/ Outcome**							
TARGET Output Indicator 01	Reduction in total consumption of antibiotics by humans in each MS as per target defined in Annex 1 of the Council Recommendation	Core	Quantitative	Output	Number	CR Point 15	Human	Annual	Change in total consumption between current and previous year measured in DDD per 1000 inhabitants per day	ECDC ESAC-Net	Retrieval of publicly available information
TARGET Outcome Indicator 02	At least 65% of total AMC in humans belongs to the access group of ABs as defined in the AWaRe classification of WHO	Core	Quantitative	Outcome	Percentage	CR Point 16	Human	Annual	Percentage of consumption of Access group antibiotics out of consumption of all antibiotics (Access, Watch, Reserve, Unclassified) listed in the AWaRe classification	ECDC ESAC-Net	Retrieval of publicly available information
TARGET Output Indicator 02	Total AMC in humans belonging to the access group of ABs as defined in the AWaRe classification of WHO reaches at least 65% in each MS, as per Annex 1 of the Council Recommendation	Core	Quantitative	Output	Percentage	CR Point 16	Human	Annual	Percentage of consumption of Access group antibiotics out of consumption of all antibiotics (Access, Watch, Reserve, Unclassified) listed in the AWaRe classification	ECDC ESAC-Net	Retrieval of publicly available information
TARGET Outcome Indicator 03	Reduction of 15% in EU in total incidence of bloodstream infections with third-generation MRSA	Core	Quantitative	Outcome	Number	CR Point 17	Human	Annual	Number per 100 000 population	ECDC Antimicrobial resistance in the EU/EEA (EARS-Net) - Annual epidemiological report for 2022[51]	Retrieval of publicly available information

[51] https://www.ecdc.europa.eu/en/publications-data/surveillance-antimicrobial-resistance-europe-2022

Indicator type and number	Indicator	Type of indicator			Unit of measurement	Basis	Sector	Frequency of measurement	Proposed metrics	Data source	Proposed data collection source
		Core/ Optional	**Qualitative/ Quantitative**	**Output/ Outcome**							
TARGET Output Indicator 03	Reduction of in total incidence of bloodstream infections with third-generation MRSA in each MS as per target defined in Annex 1 of the Council Recommendation	Core	Quantitative	Output	Number	CR Point 17	Human	Annual	Number per 100 000 population	ECDC Antimicrobial resistance in the EU/EEA (EARS-Net) - Annual epidemiological report for 2022	Retrieval of publicly available information
TARGET Outcome Indicator 04	Reduction of 10% in EU in total incidence of bloodstream infections with third-generation cephalosporins-resistant Escherichia coli	Core	Quantitative	Outcome	Number	CR Point 18	Human	Annual	Number per 100 000 population	ECDC Antimicrobial resistance in the EU/EEA (EARS-Net) - Annual epidemiological report for 2022	Retrieval of publicly available information
TARGET Output Indicator 04	Reduction in total incidence of bloodstream infections with third-generation cephalosporins-resistant Escherichia coli in each as per MS target defined in Annex 1 of the Council Recommendation	Core	Quantitative	Output	Number	CR Point 18	Human	Annual	Number per 100 000 population	ECDC Antimicrobial resistance in the EU/EEA (EARS-Net) - Annual epidemiological report for 2022	Retrieval of publicly available information

Indicator type and number	Indicator	Type of indicator			Unit of measurement	Basis	Sector	Frequency of measurement	Proposed metrics	Data source	Proposed data collection source
		Core/ Optional	**Qualitative/ Quantitative**	**Output/ Outcome**							
TARGET Outcome Indicator 05	Reduction of 5% in EU in total incidence of bloodstream infections with third-generation carbapenem-resistant Klebsiella pneumoniae	Core	Quantitative	Outcome	Number	CR Point 19	Human	Annual	Number per 100 000 population	ECDC Antimicrobial resistance in the EU/EEA (EARS-Net) - Annual epidemiological report for 2022	Retrieval of publicly available information
TARGET Output Indicator 05	Reduction in total incidence of bloodstream infections with third-generation carbapenem-resistant Klebsiella pneumoniae in each MS as per target defined in Annex 1 of the Council Recommendation	Core	Quantitative	Output	Number	CR Point 19	Human	Annual	Number per 100 000 population	ECDC Antimicrobial resistance in the EU/EEA (EARS-Net) - Annual epidemiological report for 2022	Retrieval of publicly available information
TARGET Outcome Indicator 06	Reduction of 50% of the overall EU sales of antimicrobials used in farmed animals and in aquaculture	Core	Quantitative	Outcome	Percentage	CR Point 21	Animal	Annual	% sales tonnes of active ingredient	EMA, ASU Platform (prior to 2023 ESVAC database)	Retrieval of publicly available information
Awareness											

Indicator type and number	Indicator	Type of indicator			Unit of measurement	Basis	Sector	Frequency of measurement	Proposed metrics	Data source	Proposed data collection source
		Core/ Optional	**Qualitative/ Quantitative**	**Output/ Outcome**							
AWARENESS Outcome Indicator 01	Improvement in the provision of AMR education and training to relevant professionals in human health, veterinary and agronomy sectors	Core	Qualitative	Outcome	Level	CR Point 22	All	Annual	Member States reporting improvement on the following existing indicators (TrACCS 2023): Q3.1 Training and professional education on AMR in the human health sector Level A-E; Q4.1 Training and professional education on AMR in the veterinary sector Level A-E; Q4.2 Training and professional education on AMR in the aquatic animal health sector Level A-E; Q5.1 Training and professional education on AMR provided to the agriculture (animal and plant), food production, food safety and the environment sectors Level A-E	TrACSS	Retrieval of publicly available information

Indicator type and number	Indicator	Type of indicator			Unit of measurement	Basis	Sector	Frequency of measurement	Proposed metrics	Data source	Proposed data collection source
		Core/ Optional	**Qualitative/ Quantitative**	**Output/ Outcome**							
AWARENESS Output Indicator 01	Extent to which national continuous education programmes and curricula for the disciplines below cover topics i. AMR, ii. IPC, iii. Environmental risks, iv. Biosecurity, v. antimicrobial stewardship [Disciplines: a. medicine, b. nursing, c. midwifery, d. pharmacy, e. dentistry, f. veterinary medicine, g. agriculture and agronomics, h. environmental and ecological sciences]	Core	Quantitative	Output	Number of (#)	CR Point 22	All	Every 3 years	Number of topics (i.-v.) covered as mandatory in national continuous education programmes and curricula for a-h in each MS	[No data source identified]	Self-reporting by MS (survey)
AWARENESS Output Indicator 02	Number and, where available, reach of information campaigns on AMR related issues conducted for professionals in human health, veterinary and agronomy sectors in each Member State	Core	Quantitative	Output	Number of (#)	CR Point 24	All	Every 3 years	1) Number of information campaigns for each professional sector; 2) (Estimated) Number of professionals reached in each information campaign	[No data source identified]	Self-reporting by MS (survey)
AWARENESS Output Indicator 03	EU support to Member States in continuous training and lifelong learning of the professionals	Core	Quantitative	Output	Number of (#)	CR Point 27	All	Every 3 years	1) BTSF initiative – training on AMR topics: number of trainings conducted per year; number of participants; geographical distribution of participants;	EC, ECDC, EFSA	Request to EC, ECDC and EFSA

Indicator type and number	Indicator	Type of indicator			Unit of measurement	Basis	Sector	Frequency of measurement	Proposed metrics	Data source	Proposed data collection source
		Core/ Optional	**Qualitative/ Quantitative**	**Output/ Outcome**							
	in i) human health, ii) veterinary and iii) agronomy sectors, including via the BTSF platform		Quantitative	Output	Number of (#)			Every 3 years	2) BTSF Academy: analytics on views of online courses/materials		
			Quantitative	Output	Number of (#)			Every 3 years	3) Training offered on the implementation of the VMP Regulation – number of trainings conducted per year in person and online; number of participants; geographical distribution of participants;		
			Quantitative	Output	Number of (#)			Every 3 years	4) Training on the good husbandry practices, including aquaculture		
			Quantitative	Output	Number of (#)			Every 3 years	5) ECDC Virtual Academy (EVA) – analytics on AMR courses; number of new courses developed		
			Quantitative	Output	Number of (#)			Every 3 years	6) Other AMR-related training		
AWARENESS Outcome Indicator 02	Increase in the general public's knowledge of AMR in each Member State	Core	Quantitative	Outcome	Percentage	CR Point 24	Human	Every 3-4 years	Percentage of respondents in the Special Eurobarometer on AMR who answered all four AMR-knowledge questions correctly (Question QC5R in Special Eurobarometer 522)	Eurobarometer 2018[52] Eurobarometer 2022[53]	Retrieval of publicly available information

[52] https://data.europa.eu/data/datasets/s2190_90_1_478_eng?locale=en

[53] https://data.europa.eu/data/datasets/s2632_97_1_sp522_eng?locale=en

Indicator type and number	Indicator	Type of indicator			Unit of measurement	Basis	Sector	Frequency of measurement	Proposed metrics	Data source	Proposed data collection source
		Core/ Optional	**Qualitative/ Quantitative**	**Output/ Outcome**							
AWARENESS Output Indicator 04	Number of awareness raising activities or communication campaigns on AMR related issues conducted at national level in each Member Sate for: i) large-scale for the general public; ii) targeted for specific groups	Core	Quantitative	Output	Number	CR Point 24	Human	Every 3 years	1) Number of awareness raising activities and large-scale communication campaigns to general public or specific population groups; 2) If available, (estimated) number of people reached in each activity or campaign 3) If available, any other impact metrics from the evaluation of the activity/campaign	[No data source identified]	Self-reporting by MS (survey)
AWARENESS Output Indicator 05	*Extent to which MS coordinate national awareness raising activities and communication campaigns on AMR related issues with other MS, EC and EU agencies*	*Optional*	*Quantitative*	*Output*	*Number*	*CR Point 25*	*All*	*Every 3 years*	*Number of awareness raising activities and communication campaigns coordinated with at least one MS, EC or EU agency*	*[No data source identified]*	*Self-reporting by MS (survey)*
AWARENESS Output Indicator 06	Number and type of pan-European communication actions on AMR and AMS and amount of funding mobilised for them	Core	Quantitative	Output	Number Euro	CR Point 26	All	Annual	Number of pan-European awareness-raising and communication actions conducted (e.g. EAAD); amount of funding mobilized for them	EC, EU agencies	Request to relevant EC services and EU agencies
R&D&I and access to antimicrobials and other AMR medical countermeasures											
RDI Outcome Indicator 01	Number of new antibiotics and AMR medical countermeasures, or novel candidates in the pipeline, for	Core	Quantitative	Outcome	Number of (#)	CR Point 28	Human	Annual	Number of concepts, prototypes and products (antimicrobials, alternative therapies, diagnostic tests, vaccines for human health) supported through EU funding instruments	EC, EMA	Request to EMA and relevant EU services

Indicator type and number	Indicator	Type of indicator			Unit of measurement	Basis	Sector	Frequency of measurement	Proposed metrics	Data source	Proposed data collection source
		Core/ Optional	**Qualitative/ Quantitative**	**Output/ Outcome**							
	human health, supported by EU funding instruments, in the R&D pipeline and/or authorised by the EU		Quantitative	Outcome	Number of (#)			Annual	Number of products successfully reaching Stage (1,2, and/or 3) clinical trials		
			Quantitative	Outcome	Number of (#)			Annual	Number of patents filed, publications, networks created, questions regarding authorisation applications to EMA, applications for market authorisations and successful authorisations		
RDI Output Indicator 01	Establishment of the European partnership on One Health AMR	Core	Qualitative	Output	Stage	CR Point 28	Human	Annual	Stage 1: Call launched in April 2024; Stage 2: deadline for applications Sept 2024; Stage 3: selection procedure completed; Stage 4: partnership launched	EC	Request to relevant EC services
RDI Output Indicator 02	Amount of EU funding and type of push funding instrument allocated for research and innovation for the detection, prevention and treatment of infections in humans caused by antimicrobial resistant pathogens	Core	Quantitative	Output	Euro (€)	CR Point 28	Human	Annual	Amount of funding allocated to projects related to AMR by funding instrument (Horizon 2020, Horizon Europe, EU4Health, European Partnership on One Health AMR, etc.) and purpose (basic science/preclinical research, development of antimicrobials, diagnostic tests, vaccines) for human health	EC/HaDEA Cordis (H2020, HE)[54]	Retrieval of publicly available information or request to relevant EC services
RDI Output Indicator 03	Establishment of a European-wide sustainable clinical research network	Core	Qualitative	Output	Stage	AP P2 SO2. 1	Human	Complete	European-wide sustainable clinical research network established - Yes	EC	

[54] https://cordis.europa.eu/projects

Indicator type and number	Indicator	Type of indicator			Unit of measurement	Basis	Sector	Frequency of measurement	Proposed metrics	Data source	Proposed data collection source
		Core/ Optional	**Qualitative/ Quantitative**	**Output/ Outcome**							
RDI Output Indicator 04	EU support provided for identification of priority AMR pathogens at EU and MS level, for mapping existing, upcoming and missing AMR medical countermeasures, and for defining target product profiles	Core	Quantitative	Output	Euro (€) Number of	CR Point 29a	Human	Annual	1) Amount of funding and number of studies/analyses carried out for identification of priority AMR pathogens at EU and MS level 2) Amount of funding and number of studies/analyses carried out for mapping existing, upcoming and missing AMR medical countermeasures 3) Amount of funding and number of studies/analyses carried out for defining target product profiles	EC	Request to relevant EC services
RDI Output Indicator 05	Amount of EU funding allocated for translational research and late-stage development of AMR medical countermeasures, including clinical trials for antimicrobials	Core	Quantitative	Output	Euro (€)	CR Point 29b	Human	Annual	Amount of funding allocated to projects related to AMR by funding instrument (Horizon Europe, EU4Health, etc.) and purpose (development of antimicrobials, diagnostic tests, vaccines) for human health	EC	Request to relevant EC services
RDI Outcome Indicator 02	Expanded and stable access to antimicrobials in Member States	Core	Quantitative	Outcome	Number of (#)	CR Point 29	Human	Annual	Metrics on shortages from the European Monitoring Shortages Platform (set up by EMA and expected to be operational after 2025) e.g., if available, number of antimicrobials medicinal products experiencing shortages or reduction in the time for which the shortage was experienced	EMA/EC European Monitoring Shortages Platform	Retrieval of publicly available information or request to EMA
RDI Output	Establishment of the EU multi-country pull incentive scheme	Core	Qualitative	Output	Status	CR Point 30	Human	Annual	No/In progress/Yes	EC	Request to relevant EC services

Indicator type and number	Indicator	Type of indicator			Unit of measurement	Basis	Sector	Frequency of measurement	Proposed metrics	Data source	Proposed data collection source
		Core/ Optional	**Qualitative/ Quantitative**	**Output/ Outcome**							
Indicator 06			Quantitative	Output	Euro (€)			Annual	If/when scheme already established, amount of funds made available and number of products funded	EC	Request to relevant EC services
RDI Output Indicator 07	Extent of support provided by EU bodies and agencies to Member States for the coordination of initiatives on manufacturing, procurement and stockpiling of antimicrobials	Core	Quantitative	Output	Euro (€)	CR Point 29c-d	Human	Annual	Amount of funds and availability of mechanisms for coordination	EC	Request to relevant EC services
RDI Outcome Indicator 03	Number of new antibiotics or alternatives to the use of antimicrobials and of vaccines for animal health in the R&D pipeline or brought to market, supported by EU funding	Core	Quantitative	Outcome	Number of (#)	CR Point 33	Animal	Annual	Number of a) new antibiotics whose development at early-stage research is supported through EU funding instruments	EC/EMA	Request to HERA/EMA
			Quantitative	Outcome	Number of (#)				Number of b) alternatives to the use of antimicrobials whose development at early-stage research is supported through EU funding instruments		
			Quantitative	Outcome	Number of (#)				Number of c) vaccines for animal health whose development at early-stage research is supported through EU funding instruments;		
			Quantitative	Outcome	Number of (#)				Number of a) and b) products successfully reaching Stage (1,2, and/or 3) clinical trials		
			Quantitative	Outcome	Number of (#)				Number of applications for market authorizations and successful authorizations		

Indicator type and number	Indicator	Type of indicator			Unit of measurement	Basis	Sector	Frequency of measurement	Proposed metrics	Data source	Proposed data collection source
		Core/ Optional	**Qualitative/ Quantitative**	**Output/ Outcome**							
RDI Output Indicator 08	Number of projects/ organisations funded by the EU (and amount of funding allocated) to support the successful development and placement on the market of alternatives to the use of antimicrobials and of vaccines for animal health	Core	Quantitative	Output	Euro (€)	CR Point 33	Animal	Annual	Amount of funding allocated to research on the development of a) alternatives to the use of antimicrobials and b) vaccines for animal health; Number of projects/ organisations funded for a) and b)	EC/EMA	Request to HERA/EMA
			Quantitative	Output	Euro (€)			Annual	Amount of funding allocated for placing on the market of alternatives to the use of antimicrobials and vaccines for animal health; number of projects/ organisations funded		
RDI Outcome Indicator 04	Improved understanding of AMR in the environment	Core	Quantitative	Outcome	Number of (#)	AP P2 SO2.6	Environment	Every 3-4 years	Number of scientific opinions and studies related to AMR in the environment commissioned by the EC and relevant EU agencies	ECDC/EEA/EFSA/ECHA/EMA/EC	Request to ECDC/EEA/EFSA/ECHA/EMA/EC
RDI Output Indicator 09	Amount of funds made available (by type of funding instrument) to support research on AMR in the environment	Core	Quantitative	Output	Euro (€)	AP P2 SO2.6	Environment	Every 3-4 years	Amount of funding (by funding instrument or commissioned by EU agencies) and number of projects funded	EC and relevant EU agencies	Request to relevant EC services and EU agencies
Cooperation											
COOPERATION Outcome Indicator 01	Improved coordination of One Health responses to AMR among Member States, between Member States and EU agencies/bodies, and at EU level	Core	Qualitative	Outcome	Extent of	CR Point 35	All	Annual	Self-assessment on extent of coordination among MS	MS	Self-assessment by MS
			Qualitative	Outcome	Extent of			Annual	Self-assessment on extent of coordination between MS and EU	MS, EU	Self-assessment by members of AMR One Health Network

Indicator type and number	Indicator	Type of indicator			Unit of measurement	Basis	Sector	Frequency of measurement	Proposed metrics	Data source	Proposed data collection source
		Core/ Optional	**Qualitative/ Quantitative**	**Output/ Outcome**							
			Qualitative	Outcome	Extent of			Annual	Self-assessment on extent of coordination among EU agencies and bodies	EC and relevant EU agencies	Self-assessment by EC and relevant EU agencies
COOPERATION Output Indicator 01	*Number of best practice exchange opportunities in the context of One Health AMR Network meetings or other relevant committees and working groups*	*Optional*	*Quantitative*	*Output*	*Number of (#)*	*CR Point 35b & 35c, CR Point 21*	*All*	*Every 3 years*	*Number of MS reporting best practices in OHN meetings (Best practices could include, among others, i) adherence of healthcare professionals to prudent use guidelines, ii) proven effective measures to raise awareness, iii) use of indicators set up to reach of targets under the Council Recommendation, iv) NAPs and their evaluations/implementation reports)*	*EC*	*Self-reporting by EC*
COOPERATION Output Indicator 02	The interagency AMR working group is established and functional	Core	Qualitative	Output	Status	CR Point 37	All	Annual	Interagency AMR working group is established: No/In progress/Yes	EC	Self-reporting by EC and EU Agencies
			Qualitative	Output	Status				Interagency AMR working group holds regular meetings; Yes/No		
Global											
GLOBAL Outcome Indicator 01	Global commitments and normative frameworks to tackle AMR are in line with EU positions and priorities	Core	Qualitative	Outcome	Extent of	CR Point 39	All	Every 2 years	Qualitative self-assessment about the extent to which the EU were successful to raise global commitments/have the EU position reflected in the final outcome of international standards or agreements (levels: significant, moderate, limited, none)	EC	Self-assessment by relevant EC services

Indicator type and number	Indicator	Type of indicator			Unit of measurement	Basis	Sector	Frequency of measurement	Proposed metrics	Data source	Proposed data collection source
		Core/ Optional	**Qualitative/ Quantitative**	**Output/ Outcome**							
GLOBAL Output Indicator 01	Active EU participation in drafting and negotiating international standards and agreements relevant to AMR	Core	Qualitative	Output	Extent of	CR Point 39a.	All	Every 2 years	1) Animal health – Extent of EU contribution toward agreement on stricter WOAH standards and guidelines on the responsible and prudent use of antimicrobials agents in veterinary medicine (levels: significant, moderate, limited, none)	EC	Self-assessment by relevant EC services
			Qualitative	Output	Extent of	& CR Point 39b.		Every 2 years	2) Plant health - Extent of EU contribution toward development of IPPC guidance on the prudent use of antimicrobials agents for phytosanitary purposes (levels: significant, moderate, limited, none)		
			Qualitative	Output	Extent of	& CR Point 41		Every 2 years	3) Human health – Extent of EU contribution toward inclusion of concrete and relevant provisions on AMR following a One Health approach in a potential WHO international agreement on pandemic prevention, preparedness and response (levels: significant, moderate, limited, none)		
			Qualitative	Output	Status	CR Point 44		Complete	4) UNGA High level meeting on AMR - Yes Political Declaration of the High-level Meeting on Antimicrobial Resistance adopted - Yes		

Indicator type and number	Indicator	Type of indicator			Unit of measurement	Basis	Sector	Frequency of measurement	Proposed metrics	Data source	Proposed data collection source
		Core/ Optional	Qualitative/ Quantitative	Output/ Outcome							
			Qualitative	Output	Extent of	& CR Point 42		Every 2 years	5) Environment - Extent of EU contribution toward the development of WHO guidance on the application of good manufacturing practices to waste and wastewater management in the context of antimicrobial production (levels: significant, moderate, limited, none)		
GLOBAL Outcome Indicator 02	Strengthened international cooperation and coordinated global response to AMR	Core		Outcome		CR Point 40, 43-45 & AP P3 SO3.1	All	Every 2 years	Qualitative self-assessment about the extent to which international cooperation is strengthened	EC	Self-assessment by relevant EC services
GLOBAL Output Indicator 02	Active EU participation in international fora aimed at cooperating/coordinating a global response to AMR	Core	Qualitative	Output	Extent of	CR Point 40, 43-45 & AP P3 SO3.1	All	Every 2 years	1) Extent of contribution to maintaining AMR as a high priority in G7 and G20 meetings and advocacy on AMR issues (to a great extent/to some extent/to a small extent/not at all)	EC	Self-assessment by relevant EC services
			Qualitative	Output	Status				2) Commitment by G7 and G20 countries to fairly share the financial burden arising from push and pull incentives to address AMR: yes/in progress/no		
			Qualitative	Output	Extent of				3) Extent of contribution to the biennial ministerial conference (follow-up to the Political Declaration of the High-level Meeting on Antimicrobial Resistance adopted at UNGA 2024) (to a great extent/to some extent/to a small extent/not at all)		

Indicator type and number	Indicator	Type of indicator			Unit of measurement	Basis	Sector	Frequency of measurement	Proposed metrics	Data source	Proposed data collection source
		Core/ Optional	**Qualitative/ Quantitative**	**Output/ Outcome**							
			Qualitative	Output	Euro (€)				4) Extent of financial contribution to the Quadripartite' s AMR Multi-Stakeholder Partnership Platform		
			Qualitative	Output	Extent of				International harmonisation of technical standards and bilateral regulatory convergence between EU and third countries promoted (through ICH and VICH, bilateral trade agreements and bilateral engagement with key countries): to a great extent/to some extent/to a small extent/not at all		
			Qualitative	Output	Extent of				5) Reinforced technical cooperation with the Quadripartite in key areas such as, for example, the WHO Global Action Plan on AMR (e.g. the development of monitoring systems under the WHO Global Antimicrobial Resistance Surveillance System (GLASS), awareness-raising, infection prevention and control): to a great extent/to some extent/to a small extent/not at all		
			Qualitative	Output	Extent of				6) Ongoing collaboration within the Transatlantic Taskforce on Antimicrobial Resistance (TATFAR) strengthened: to a great extent/to some extent/to a small extent/not at all		
GLOBAL	*MS reporting to international*	*Optional*	*Quantitative*	*Output*	*Percentage*		*Human*	*Every 2 years*	*1) Enrolment of EU/EEA MS in GLASS AMR (% complete)*	*GLASS*[55]	*Retrieval of publicly*

[55] https://www.who.int/initiatives/glass/country-participation

Indicator type and number	Indicator	Type of indicator			Unit of measurement	Basis	Sector	Frequency of measurement	Proposed metrics	Data source	Proposed data collection source
		Core/ Optional	**Qualitative/ Quantitative**	**Output/ Outcome**							
Output Indicator 03	*monitoring surveillance systems*		Quantitative	Output	Percentage	*CR Point 34*			*2) Enrolment of EU/EEA MS in GLASS AMC (% complete)*	GLASS	*available information*
			Quantitative	*Output*	*Percentage*		*Animal*	*Every 2 years*	*3) Enrolment of EU/EEA MS in ANIMUSE (% complete)*	*ANIMUSE*[56]	*Retrieval of publicly available information*
GLOBAL Outcome Indicator 03	Contribution of the EU to strengthening capacities of third countries to tackle AMR	Core		Outcome		CR Point 46	All	Every 2 years	Qualitative self-assessment about the extent to which EU actions support stronger capacities to tackle AMR in third countries	EC	Self-assessment by relevant EC services
GLOBAL Output Indicator 04	Amount of funding and extent of technical support provided to third countries to build capacities to address AMR through support for implementation of international standards and action plans, trainings and R&D	Core	Qualitative	Output	Extent of	CR Point 46	All	Every 2 years	1) Extent of support provided for improved implementation of international standards by third countries	EC	Self-reporting by relevant EC services
			Quantitative	Output	Euro (€)				2) Amount of funding allocated for the engagement of the Team Europe Initiative with Africa on sustainable Health security using One Health approach		
			Quantitative	Output	Euro (€)				3) Amount of funding allocated to support the implementation of AMR OH NAPs in low- and middle- income countries through the UN AMR Multi-Partner Trust Fund		

[56] https://amu.woah.org/amu-system-portal/amu-data

Indicator type and number	Indicator	Type of indicator			Unit of measurement	Basis	Sector	Frequency of measurement	Proposed metrics	Data source	Proposed data collection source
		Core/ Optional	**Qualitative/ Quantitative**	**Output/ Outcome**							
			Quantitative	Output	Euro (€)				4) Amount of funding allocated to tackling infectious diseases and AMR in low- and middle-income countries through i) Global Health EDCTP3 JU; ii) ICARS, GARDP and ReAct		
			Qualitative	Output	Extent of				5) Extent of bilateral engagement with (potential) candidate and ENP countries to build capacity and ensure harmonisation and uptake of EU standards on AMR		
			Quantitative	Output	Euro (€)				6) Amount of funding allocated for R&D, including R&D capacity building, related to AMR		
			Quantitative	Output	Euro (€)				7) Amount of funding allocated, number of trainings, number of trainees attending workshops organised for third countries under the BTSF initiative in relation to AMR		

5.6. Annex 6: Outcome indicator fiches

The fiches provide information on the following:

- General/Specific objective
- Indicator
- Sector(s) addressed
- Definition
- Type of indicator (quantitative/qualitative)
- Unit of measurement
- Entity responsible for data reporting
- Data source(s) (incl. Link, if available)
- Frequency of measurement
- Baseline
- Target
- Data quality rating

Indicator Fiche 29: NAP Outcome Indicator 1

General / specific objective (1)	Domain 1: National Action Plans (NAPs) General Objective: CR-GO1. Better design, implementation and monitoring of NAPs / AP-P.1.2. Better coordination and implementation of EU rules to tackle AMR (Improve the coordination of MS One Health responses to AMR) Specific Objective: SO1.1. – SO1.6
Indicator (2)	NAP Outcome Indicator 1: Increase in the number of Member States implementing high quality NAPs (Note: The quality of NAPs refers to the potential improvements in terms of results linked to the output indicators proposed)
Sector addressed (3)	All
Definition (4)	Number of MS which register improvement on the results of at least one of the linked output indicators: 01, 03, 04, 05, 06
Type of indicator (qualitative/quantitative) (5)	Quantitative
Unit of measurement (6)	Number of
Entity responsible for data reporting (7)	Member States
Data source (incl. link, if available) (8)	Monitoring framework
Frequency of measurement (9)	Measured every three years
Baseline (10)	n/a
Target (11)	27 EU Member States, Iceland and Norway achieving the highest levels in the TrACCS categorisation on all five associated output indicators
Data quality rating (12)	Medium

Indicator Fiche 30: SURVEILLANCE Outcome Indicator 1

General / specific objective (1)	Domain 2: SURVEILLANCE General Objective: CR-GO2. Robust surveillance and monitoring of AMR & AMC at all levels in human health and in the veterinary, plant and environmental sectors / AP-P1.3. Better evidence and awareness of the challenges of AMR (strengthen One Health Surveillance and reporting on AMR and antimicrobial use) Specific Objective SO2.1: AMR and AMC data collected by MS are complete and reported in a timely manner
Indicator (2)	SURVEILLANCE Outcome Indicator 1: AMR surveillance status in humans in each Member State
Sector addressed (3)	Human health
Definition (4)	Surveillance status is assigned a value (level) from 1-5 for each MS Levels 1-5 QB.12.8: Regarding the surveillance of AMR, please indicate your Member State's corresponding level below
Type of indicator (qualitative/quantitative) (5)	Qualitative
Unit of measurement (6)	Extent of
Entity responsible for data reporting (7)	EC
Data source (incl. link, if available) (8)	Questionnaire of Implementing Regulation (EU) 2023/1808
Frequency of measurement (9)	Measured every 3 years
Baseline (10)	n/a
Target (11)	n/a
Data quality rating (12)	Medium

Indicator Fiche 31: SURVEILLANCE Outcome Indicator 2

General / specific objective (1)	Domain 2: SURVEILLANCE General Objective: CR-GO2. Robust surveillance and monitoring of AMR & AMC at all levels in human health and in the veterinary, plant and environmental sectors / AP-P1.3. Better evidence and awareness of the challenges of AMR (strengthen One Health Surveillance and reporting on AMR and antimicrobial use) Specific Objective SO2.1: AMR and AMC data collected by MS are complete and reported in a timely manner
Indicator (2)	SURVEILLANCE Outcome Indicator 2: Extent of AMC monitoring in humans in each Member State (with the aim of achieving complete collection of AMC data for human health by 2030)
Sector addressed (3)	Human health
Definition (4)	Levels 1-5 Q 3.2 National monitoring system for consumption and rational use of antimicrobials in human health
Type of indicator (qualitative/quantitative) (5)	Qualitative
Unit of measurement (6)	Extent of
Entity responsible for data reporting (7)	Member States
Data source (incl. link, if available) (8)	Global Database for Tracking Antimicrobial Resistance (AMR) Country Self- Assessment Survey (**TrACSS**), https://amrcountryprogress.org/#/map-view
Frequency of measurement (9)	Measured on a yearly basis
Baseline (10)	n/a
Target (11)	Complete collection of AMC data for human health by 2030
Data quality rating (12)	Medium

Indicator Fiche 32: SURVEILLANCE Outcome Indicator 3

General / specific objective (1)	Domain 2: SURVEILLANCE General Objective: CR-GO2. Robust surveillance and monitoring of AMR & AMC at all levels in human health and in the veterinary, plant and environmental sectors / AP-P1.3. Better evidence and awareness of the challenges of AMR (strengthen One Health Surveillance and reporting on AMR and antimicrobial use) Specific Objective SO2.1: AMR and AMC data collected by MS are complete and reported in a timely manner
Indicator (2)	SURVEILLANCE Outcome Indicator 3: Extent of AMR surveillance in animals in each Member State
Sector addressed (3)	Animal health
Definition (4)	Levels A-E Q4.7 National surveillance system for antimicrobial resistance (AMR) in live terrestrial animals
Type of indicator (qualitative/quantitative) (5)	Qualitative
Unit of measurement (6)	Level
Entity responsible for data reporting (7)	Member States
Data source (incl. link, if available) (8)	TrACCS
Frequency of measurement (9)	Measured on a yearly basis
Baseline (10)	n/a
Target (11)	All MS/Iceland/Norway achieve highest level in Q4.7 TrACCS
Data quality rating (12)	Medium

Indicator Fiche 33: SURVEILLANCE Outcome Indicator 4

General / specific objective (1)	Domain 2: SURVEILLANCE General Objective: CR-GO2. Robust surveillance and monitoring of AMR & AMC at all levels in human health and in the veterinary, plant and environmental sectors / AP-P1.3. Better evidence and awareness of the challenges of AMR (strengthen One Health Surveillance and reporting on AMR and antimicrobial use) Specific Objective SO2.1: AMR and AMC data collected by MS are complete and reported in a timely manner
Indicator (2)	SURVEILLANCE Outcome Indicator 4: Improved surveillance of AMR in the environment (water and/or soil) at EU level
Sector addressed (3)	Environment
Definition (4)	Yes/No Q6.3 Is there a system for regular monitoring (passive surveillance) of antimicrobial compounds and their metabolites (or residues) and resistant bacteria or antimicrobial resistance genes (ARGs) in water quality; types of water
Type of indicator (qualitative/quantitative) (5)	Qualitative
Unit of measurement (6)	Status (yes/no)
Entity responsible for data reporting (7)	Member States
Data source (incl. link, if available) (8)	TrACCS 2023
Frequency of measurement (9)	Measured on a yearly basis
Baseline (10)	n/a
Target (11)	All 27 Member States, Iceland and Norway achieve “yes” status
Data quality rating (12)	Medium

Indicator Fiche 34: SURVEILLANCE Outcome Indicator 5

General / specific objective (1)	Domain 2: SURVEILLANCE General Objective: CR-GO2. Robust surveillance and monitoring of AMR & AMC at all levels in human health and in the veterinary, plant and environmental sectors / AP-P1.3. Better evidence and awareness of the challenges of AMR (strengthen One Health Surveillance and reporting on AMR and antimicrobial use) Specific Objective SO2.2: MS have integrated systems for surveillance of AMR and AMC in all sectors
Indicator (2)	SURVEILLANCE Outcome Indicator 5: Extent to which integrated surveillance of AMC & AMR is achieved at EU level
Sector addressed (3)	All
Definition (4)	Assessment on progress towards integrated systems in Member States based on results of SURVEILLANCE Output Indicator 12 over time
Type of indicator (qualitative/quantitative) (5)	Qualitative
Unit of measurement (6)	Status
Entity responsible for data reporting (7)	Member States
Data source (incl. link, if available) (8)	Monitoring Framework
Frequency of measurement (9)	Measured every 3 years
Baseline (10)	n/a
Target (11)	n/a
Data quality rating (12)	Medium

Indicator Fiche 35: IPC Outcome Indicator 1

General / specific objective (1)	Domain 3: Infection Prevention and Control (IPC) General Objective: CR-GO3 / AP-P1.3. Improved infection prevention and control measures Specific Objective SO3.1: Effective IPC measures are in place in all levels of healthcare and are continuously monitored
Indicator (2)	IPC Outcome Indicator 1: Reduction in infections acquired in healthcare settings (acute settings)
Sector addressed (3)	Human health
Definition (4)	Estimation of incidence of patients acquiring at least one HAI per year in acute care hospitals in EU/EEA Estimation of the number of all types of HAIs with antimicrobial-resistant bacteria per year in acute care hospitals in EU/EEA
Type of indicator (qualitative/quantitative) (5)	Quantitative
Unit of measurement (6)	Rate Percentage
Entity responsible for data reporting (7)	ECDC
Data source (incl. link, if available) (8)	ECDC Surveillance Report: Point prevalence survey of healthcare associated infections and antimicrobial use in European acute care hospitals 2022-2023 Report, Table 21 and Table 23 https://www.ecdc.europa.eu/en/publications-data/PPS-HAI-AMR-acute-care-europe-2022-2023 2016-2017 Report, Table 22 and Table 24 https://www.ecdc.europa.eu/sites/default/files/documents/healthcare-associated--infections-antimicrobial-use-point-prevalence-survey-2016-2017.pdf
Frequency of measurement (9)	Every 5 years
Baseline (10)	n/a
Target (11)	Year-on-year decrease
Data quality rating (12)	High

Indicator Fiche 36: IPC Outcome Indicator 2

General / specific objective (1)	Domain 3: Infection Prevention and Control (IPC) General Objective: CR-GO3 / AP-P1.3. Improved infection prevention and control measures Specific Objective SO3.1: Effective IPC measures are in place in all levels of healthcare and are continuously monitored
Indicator (2)	IPC Outcome Indicator 2: Percentage of target population covered by vaccines included in Member States' national vaccination programmes
Sector addressed (3)	Human health
Definition (4)	Vaccination coverage of vaccines that have a specific impact on AMR and AMC: pneumococcal conjugate vaccination in children below 1 year old, Hib (Hib3) immunization coverage among 1-year-olds, measles-containing-vaccine second-dose (MCV2) immunization coverage by the locally recommended age, rotavirus in children below 1 year old, diphtheria tetanus toxoid and pertussis (DTP3) immunization coverage among 1-year-olds (Source WHO) Vaccination against influenza in over 65 year olds (annual, percentage) (Source Eurostat)
Type of indicator (qualitative/quantitative) (5)	Quantitative
Unit of measurement (6)	Percentage
Entity responsible for data reporting (7)	Member States
Data source (incl. link, if available) (8)	WHO https://www.who.int/data/gho/data/themes/immunization Eurostat https://ec.europa.eu/eurostat/databrowser/view/hlth_ps_immu/default/table?lang=en&category=hlth.hlth_care.hlth_prev
Frequency of measurement (9)	Measured on a yearly basis
Baseline (10)	n/a
Target (11)	n/a
Data quality rating (12)	High/medium/low

Indicator Fiche 37: IPC Outcome Indicator 3

General / specific objective (1)	Domain 3: Infection Prevention and Control (IPC) General Objective: CR-GO3 / AP-P1.3. Improved infection prevention and control measures Specific Objective SO3.2: Health and welfare of food-producing animals is improved to decrease the spread of infections
Indicator (2)	IPC Outcome Indicator 3: Reduction in animal disease outbreaks
Sector addressed (3)	Animal health
Definition (4)	Number of outbreaks per disease per country per year (ADIS)
Type of indicator (qualitative/quantitative) (5)	Quantitative
Unit of measurement (6)	Number
Entity responsible for data reporting (7)	Varies depending on source
Data source (incl. link, if available) (8)	ADIS https://webgate.ec.europa.eu/tracesnt/adis/public/notification
Frequency of measurement (9)	Measured on a yearly basis
Baseline (10)	n/a
Target (11)	Year-on-year decrease
Data quality rating (12)	High/medium/low

Indicator Fiche 38: IPC Outcome Indicator 4

General / specific objective (1)	Domain 3: Infection Prevention and Control (IPC) General Objective: CR-GO3 / AP-P1.3. Improved infection prevention and control measures Specific Objective SO3.3: Good practices in manure and sewage sludge management are applied in agriculture
Indicator (2)	IPC Outcome Indicator 4: Extent to which farms implement measures for good manure and sewage sludge management in each Member State
Sector addressed (3)	Environment
Definition (4)	Assessment based on results of associated Output Indicators 15&16- Number of countries answering Yes to both output indicators
Type of indicator (qualitative/quantitative) (5)	Qualitative
Unit of measurement (6)	Extent of
Entity responsible for data reporting (7)	Member States
Data source (incl. link, if available) (8)	Self-assessment survey to Member States
Frequency of measurement (9)	Measured every 3 years
Baseline (10)	n/a
Target (11)	n/a
Data quality rating (12)	Medium

Indicator Fiche 39: AMS Outcome Indicator 1

General / specific objective (1)	Domain 4: Antimicrobial stewardship (AMS) General Objective: CR-GO4 / AP-P1.3. Improved antimicrobial stewardship and prudent use of antimicrobials Specific Objective SO4.1: MS put in place measures to support the prudent use of antimicrobials in all healthcare settings in the human health sector and in the animal health sector
Indicator (2)	AMS Outcome Indicator 1: Extent to which AMS & prudent use of antimicrobials across healthcare settings has improved in each Member State
Sector addressed (3)	Human health
Definition (4)	For each country: Levels 1-5 QB12.7 Regarding the optimal use of antimicrobial medicines in human health, please indicate your Member State's corresponding level below (primary and secondary care) For EU as a whole: number of countries that have gone up at least one level since last measurement
Type of indicator (qualitative/quantitative) (5)	Qualitative
Unit of measurement (6)	Level
Entity responsible for data reporting (7)	Member States
Data source (incl. link, if available) (8)	Questionnaire of Implementing Regulation (EU) 2023/1808
Frequency of measurement (9)	Measured every three years
Baseline (10)	n/a
Target (11)	All MS, Iceland and Norway reach the highest level
Data quality rating (12)	Medium

Indicator Fiche 40: AMS Outcome Indicator 2

General / specific objective (1)	Domain 4: Antimicrobial stewardship (AMS) General Objective: CR-GO4 / AP-P1.3. Improved antimicrobial stewardship and prudent use of antimicrobials Specific Objective SO4.1:MS put in place measures to support the prudent use of antimicrobials in all healthcare settings in the human health sector and in the animal health sector
Indicator (2)	AMS Outcome Indicator 2: Extent to which AMS & prudent use of antimicrobials in veterinary settings has improved in each Member State
Sector addressed (3)	Animal health
Definition (4)	For each country: Levels A-E, Q.4.11. Optimizing antimicrobial use in terrestrial animal health; Q4.12 Optimizing antimicrobial use in aquatic animal health For the EU as a whole: Number of countries that have gone up at least one level since last measurement
Type of indicator (qualitative/quantitative) (5)	Qualitative
Unit of measurement (6)	Level
Entity responsible for data reporting (7)	Member States
Data source (incl. link, if available) (8)	TrACCS 2023
Frequency of measurement (9)	Measured on a yearly basis
Baseline (10)	n/a
Target (11)	All Member States, Iceland and Norway achieve the highest level
Data quality rating (12)	Medium

Indicator Fiche 41: AMS Outcome Indicator 3

General / specific objective (1)	Domain 4: Antimicrobial stewardship (AMS) General Objective: CR-GO4 / AP-P1.3. Improved antimicrobial stewardship and prudent use of antimicrobials Specific Objective SO4.2: National programmes for the collection and safe disposal of antimicrobials are designed and implemented
Indicator (2)	AMS Outcome Indicator 3: Improved collection & safe disposal of antimicrobials in relevant settings
Sector addressed (3)	All

Definition (4)	Qualitative self-assessment on the extent of improvement of national programmes
	If available, uptake metrics, as defined in national programmes, by country (e.g. number of participating entities, volume of disposed products).
	Level of disaggregation, where available, for:
	- Human health sector by
	  ○ community,
	  ○ hospitals,
	  ○ long-term care facilities
	- Animal health sector by
	  ○ farms,
	  ○ veterinary medicine providers,
	  ○ veterinary premises
	- manufacturing facilities of antimicrobials.

Type of indicator (qualitative/quantitative) (5)	Qualitative Quantitative
Unit of measurement (6)	Extent of If available, quantitative metrics
Entity responsible for data reporting (7)	Member States
Data source (incl. link, if available) (8)	Self-reporting by Member States (survey)
Frequency of measurement (9)	Measured every three years
Baseline (10)	n/a
Target (11)	n/a
Data quality rating (12)	Medium

Indicator Fiche 42: TARGET Outcome Indicator 1

General / specific objective (1)	Domain 5: Targets General Objective: CR-GO5 Achievement of AMR and AMC targets Specific Objective SO5.1: MS achieve recommended targets for antibiotic consumption and bloodstream infections caused by MROs
Indicator (2)	TARGET Outcome Indicator 1: Reduction of 20% in EU in total consumption of antibiotics by humans
Sector addressed (3)	Human health
Definition (4)	For MS: Percentage reduction in consumption across the EU as a whole; Consumption defined as total consumption of antibiotics in the community and, hospital sectors combined, including long-term care facilities (DDD per 1 000 inhabitants per day) For the EU: Number of MS that have reached the target in a given year
Type of indicator (qualitative/quantitative) (5)	Quantitative
Unit of measurement (6)	Percentage
Entity responsible for data reporting (7)	ECDC
Data source (incl. link, if available) (8)	European Surveillance of Antimicrobial Consumption Network (ESAC-Net) https://qap.ecdc.europa.eu/public/extensions/AMC2_Dashboard/AMC2_Dashboard.html#eu-consumption-tab Population data from Eurostat
Frequency of measurement (9)	Measured on a yearly basis
Baseline (10)	Consumption in 2019
Target (11)	20% reduction by 2030 27 MS reaching their respective target in a given year
Data quality rating (12)	High

Indicator Fiche 43: TARGET Outcome Indicator 2

General / specific objective (1)	Domain 5: Targets General Objective: CR-GO5 Achievement of AMR and AMC targets Specific Objective SO5.1: MS achieve recommended targets for antibiotic consumption and bloodstream infections caused by MROs
Indicator (2)	TARGET Outcome Indicator 2: At least 65% of total AMC in humans belongs to the access group of ABs as defined in the AWaRe classification of WHO
Sector addressed (3)	Human health
Definition (4)	For each MS: Percentage of consumption of Access group antibiotics out of consumption of all antibiotics (Access, Watch, Reserve, Unclassified) listed in the AWaRe classification For the EU: Number of MS that have reached the target in a given year
Type of indicator (qualitative/quantitative) (5)	Quantitative
Unit of measurement (6)	Percentage
Entity responsible for data reporting (7)	ECDC
Data source (incl. link, if available) (8)	European Surveillance of Antimicrobial Consumption Network (ESAC-Net) https://qap.ecdc.europa.eu/public/extensions/AMC2_Dashboard/AMC2_Dashboard.html#who-aware-tab Population data from Eurostat
Frequency of measurement (9)	Measured on a yearly basis
Baseline (10)	Percentage in 2019
Target (11)	For each MS: At least 65% by 2030 For the EU: 27 MS reaching the target in a given year
Data quality rating (12)	High

Indicator Fiche 44: TARGET Outcome Indicator 3

General / specific objective (1)	Domain 5: Targets General Objective: CR-GO5 Achievement of AMR and AMC targets Specific Objective SO5.1: MS achieve recommended targets for antibiotic consumption and bloodstream infections caused by MROs
Indicator (2)	TARGET Outcome Indicator 3: Reduction of 15% in EU in total incidence of bloodstream infections with third-generation MRSA
Sector addressed (3)	Human health
Definition (4)	Incidence of methicillin-resistant Staphylococcus aureus (MRSA) bloodstream infections (number of bloodstream infections per 100 000 population)
Type of indicator (qualitative/quantitative) (5)	Quantitative
Unit of measurement (6)	Number per 100 000 population
Entity responsible for data reporting (7)	ECDC
Data source (incl. link, if available) (8)	European Antimicrobial Resistance Surveillance Network (EARS-Net) Antimicrobial resistance in the EU/EEA (EARS-Net) - Annual epidemiological report for 2022 https://www.ecdc.europa.eu/en/publications-data/surveillance-antimicrobial-resistance-europe-2022 Population data from Eurostat
Frequency of measurement (9)	Measured on a yearly basis
Baseline (10)	Incidence levels in 2019
Target (11)	15% by 2030 27 MS reaching their respective target in a given year
Data quality rating (12)	High

Indicator Fiche 45: TARGET Outcome Indicator 4

General / specific objective (1)	Domain 5: Targets General Objective: CR-GO5 Achievement of AMR and AMC targets Specific Objective SO5.1: MS achieve recommended targets for antibiotic consumption and bloodstream infections caused by MROs
Indicator (2)	TARGET Outcome Indicator 4: Reduction of 10% in EU in total incidence of bloodstream infections with third-generation cephalosporins-resistant Escherichia coli
Sector addressed (3)	Human health
Definition (4)	Percentage reduction in the incidence of third-generation cephalosporin-resistant Escherichia coli bloodstream infections (number per 100 000 population) Number of MS reaching their respective target in a given year
Type of indicator (qualitative/quantitative) (5)	Quantitative
Unit of measurement (6)	number per 100 000 population
Entity responsible for data reporting (7)	ECDC
Data source (incl. link, if available) (8)	European Antimicrobial Resistance Surveillance Network (EARS-Net) Antimicrobial resistance in the EU/EEA (EARS-Net) - Annual epidemiological report for 2022 https://www.ecdc.europa.eu/en/publications-data/surveillance-antimicrobial-resistance-europe-2022
Frequency of measurement (9)	Measured on a yearly basis
Baseline (10)	Incidence levels in 2019
Target (11)	10% by 2030 27 MS reaching their respective target in a given year
Data quality rating (12)	High

Indicator Fiche 46: TARGET Outcome Indicator 5

General / specific objective (1)	Domain 5: Targets General Objective: CR-GO5 Achievement of AMR and AMC targets Specific Objective SO5.2: MS and EU achieve recommended targets for EU sales of antimicrobials used in farms and aquaculture
Indicator (2)	TARGET Outcome Indicator 5: Reduction of 5% in EU in total incidence of bloodstream infections with third-generation carbapenem-resistant Klebsiella pneumoniae
Sector addressed (3)	Human health
Definition (4)	Percentage reduction in incidence of carbapenem-resistant Klebsiella pneumoniae bloodstream infections (number per 100 000 population)
Type of indicator (qualitative/quantitative) (5)	Quantitative
Unit of measurement (6)	number per 100 000 population
Entity responsible for data reporting (7)	ECDC
Data source (incl. link, if available) (8)	European Antimicrobial Resistance Surveillance Network (EARS-Net) Antimicrobial resistance in the EU/EEA (EARS-Net) - Annual epidemiological report for 2022 https://www.ecdc.europa.eu/en/publications-data/surveillance-antimicrobial-resistance-europe-2022
Frequency of measurement (9)	Measured on a yearly basis
Baseline (10)	Incidence levels in 2019
Target (11)	5% by 2030
Data quality rating (12)	High

Indicator Fiche 47: TARGET Outcome Indicator 6

General / specific objective (1)	Domain 5: Targets General Objective: CR-GO5 Achievement of AMR and AMC targets Specific Objective SO5.2: MS and EU achieve recommended targets for EU sales of antimicrobials used in farms and aquaculture
Indicator (2)	TARGET Outcome Indicator 6: Reduction of 50% of the overall EU sales of antimicrobials used in farmed animals and in aquaculture
Sector addressed (3)	Animal health
Definition (4)	Percent reduction of overall EU sales of antimicrobials used in farmed animals and in aquaculture measured in tonnes of active ingredient
Type of indicator (qualitative/quantitative) (5)	Quantitative
Unit of measurement (6)	Percentage
Entity responsible for data reporting (7)	EMA
Data source (incl. link, if available) (8)	EMA, ASU Platform https://www.ema.europa.eu/en/veterinary-regulatory-overview/antimicrobial-resistance-veterinary-medicine/antimicrobial-sales-use-platform Prior to 2023: ESVAC database
Frequency of measurement (9)	Measured on a yearly basis
Baseline (10)	Sales levels in 2018
Target (11)	50% by 2030
Data quality rating (12)	High

Indicator Fiche 48: AWARENESS Outcome Indicator 1

General / specific objective (1)	Domain 5: AWARENESS General Objective: CR-GO6 Improved awareness, education and training of AMR / AP1.3. Better evidence and awareness of the challenges of AMR (increased awareness and understanding) Specific Objective SO6.1: AMR, IPC, AMS, environmental risk and biosecurity are included in relevant national continuous education programmes & curricula
Indicator (2)	AWARENESS Outcome Indicator 1: Improvement in the provision of AMR education and training to relevant professionals in human health, veterinary and agronomy sectors
Sector addressed (3)	All
Definition (4)	Member States reporting improvement on the following existing indicators measured on a scale with Levels A-E (TrACCS 2023): - Human health: Q3.1 Training and professional education on AMR in the human health sector; - Animal health: Q4.1 Training and professional education on AMR in the veterinary sector; Q4.2 Training and professional education on AMR in the aquatic animal health sector Level A-E; - Environment: Q5.1 Training and professional education on AMR provided to the agriculture (animal and plant), food production, food safety and the environment sectors
Type of indicator (qualitative/quantitative) (5)	Qualitative
Unit of measurement (6)	Levels
Entity responsible for data reporting (7)	Member States
Data source (incl. link, if available) (8)	TrACCS
Frequency of measurement (9)	Measured on a yearly basis
Baseline (10)	n/a
Target (11)	All MS, Iceland and Norway achieve the highest level on the TrACCS scale
Data quality rating (12)	Medium

Indicator Fiche 49: AWARENESS Outcome Indicator 2

General / specific objective (1)	Domain 5: AWARENESS General Objective: CR-GO6 Improved awareness, education and training of AMR / AP1.3. Better evidence and awareness of the challenges of AMR (increased awareness and understanding) Specific Objective SO6.2: Professionals from relevant sectors, the general public and specific audiences are aware of AMR-related topics
Indicator (2)	AWARENESS Outcome Indicator 2: Increase in the general public's knowledge of AMR in each Member State
Sector addressed (3)	Human health
Definition (4)	Percentage of respondents in the Special Eurobarometer on AMR who answered all four AMR-knowledge questions correctly (Question QC5R in Special Eurobarometer 522) Number of countries where knowledge of AMR improved compared to last measurement
Type of indicator (qualitative/quantitative) (5)	Quantitative
Unit of measurement (6)	Percentage
Entity responsible for data reporting (7)	EC
Data source (incl. link, if available) (8)	Special Eurobarometer 522: Antimicrobial Resistance https://europa.eu/eurobarometer/api/deliverable/download/file?deliverableId=84696 Special Eurobarometer 522 Dataset: https://data.europa.eu/data/datasets/s2632_97_1_sp522_eng?locale=en
Frequency of measurement (9)	Frequency of publication of the Special Eurobarometer (every 3-4 years)
Baseline (10)	n/a
Target (11)	n/a
Data quality rating (12)	High

Indicator Fiche 50: RDI Outcome Indicator 1

General / specific objective (1)	Domain 7: Research, Development & Innovation (RDI) General Objective: CR-GO7/AP.P2 Boosting R&D, innovation incentives, and access to antimicrobials Specific Objective SO7.1: R&I in detection, prevention, and treatment of AMR-related infections in humans, and in developing other countermeasures, is enhanced
Indicator (2)	RDI Outcome Indicator 1: Number of new antibiotics and AMR medical countermeasures, or novel candidates in the pipeline, for human health, supported by EU funding instruments, in the R&D pipeline or authorised by the EU
Sector addressed (3)	Human health

Definition (4)	Number of concepts, prototypes and products supported through EU funding instruments,
	- Where possible, disaggregated by type:
	  ○ antimicrobials,
	  ○ alternative therapies,
	  ○ diagnostic tests,
	  ○ vaccines for human health
	- where possible, disaggregated by their status
	  ○ in the R&D pipeline
	  ○ authorised in the EU
	Number of products (according to the disaggregation above) successfully reaching Stage (1,2, and/or 3) clinical trials
	Number of patents filed, publications, networks created, questions regarding authorisation applications to EMA, applications for market authorisations and successful authorisations

Type of indicator (qualitative/quantitative) (5)	Quantitative
Unit of measurement (6)	Number
Entity responsible for data reporting (7)	EMA/EC
Data source (incl. link, if available) (8)	n/a
Frequency of measurement (9)	Measured on a yearly basis
Baseline (10)	n/a
Target (11)	n/a
Data quality rating (12)	tbd - High/medium/low

Indicator Fiche 51: RDI Outcome Indicator 2

General / specific objective (1)	Domain 7: Research, Development & Innovation (RDI) General Objective: CR-GO7/AP.P2 Boosting R&D, innovation incentives, and access to antimicrobials Specific Objective SO7.2: Accessibility and supply chain of antimicrobials and other medical countermeasures is improved
Indicator (2)	RDI Outcome Indicator 2: Expanded and stable access to antimicrobials in Member States
Sector addressed (3)	Human health
Definition (4)	Metrics on shortages from the European Monitoring Shortages Platform (set up by EMA and expected to be operational after 2025) e.g., if available, number of antimicrobials medicinal products experiencing shortages or reduction in the time for which the shortage was experienced Antimicrobials for which data is to be collected are those listed in the most recent version of the Union list of critical medicines https://www.ema.europa.eu/en/documents/other/union-list-critical-medicines-version-1_en.xlsx
Type of indicator (qualitative/quantitative) (5)	Quantitative
Unit of measurement (6)	Number
Entity responsible for data reporting (7)	EMA/EC
Data source (incl. link, if available) (8)	European Monitoring Shortages Platform (for shortages and when it goes live) https://www.ema.europa.eu/en/human-regulatory-overview/post-authorisation/medicine-shortages-availability-issues/european-shortages-monitoring-platform
Frequency of measurement (9)	Measured on a yearly basis
Baseline (10)	n/a
Target (11)	n/a
Data quality rating (12)	tbd - High/medium/low

Indicator Fiche 52: RDI Outcome Indicator 3

General / specific objective (1)	Domain 7: Research, Development & Innovation (RDI) General Objective: CR-GO7/AP.P2 Boosting R&D, innovation incentives, and access to antimicrobials Specific Objective SO7.4: Alternatives to antimicrobials & vaccines for animals are developed and placed on the market
Indicator (2)	RDI Outcome Indicator 3: Number of new antibiotics or alternatives to the use of antimicrobials and of vaccines for animal health in the R&D pipeline or brought to market, supported by EU funding
Sector addressed (3)	Animal health
Definition (4)	Number of a) alternatives to the use of antimicrobials whose development at early-stage research is supported through EU funding instruments Number of b) vaccines for animal health whose development at early-stage research is supported through EU funding instruments; Number of a) and b) products successfully reaching Stage (1,2, and/or 3) clinical trials Number of applications for market authorisations and successful authorisations
Type of indicator (qualitative/quantitative) (5)	Quantitative
Unit of measurement (6)	Number
Entity responsible for data reporting (7)	EMA/EC
Data source (incl. link, if available) (8)	n/a
Frequency of measurement (9)	Measured on a yearly basis
Baseline (10)	n/a
Target (11)	n/a
Data quality rating (12)	tbd - High/medium/low

Indicator Fiche 53: RDI Outcome Indicator 4

General / specific objective (1)	Domain 7: Research, Development and Innovation (RDI) General Objective: CR-GO7/AP.P2 Boosting R&D, innovation incentives, and access to antimicrobials Specific Objective: AP P2.6: Close knowledge gaps on AMR in the environment and how to prevent transmission
Indicator (2)	RDI Outcome Indicator 4: Improved understanding of AMR in the environment
Sector addressed (3)	Environment
Definition (4)	Number of scientific opinions and studies related to AMR in the environment commissioned by the EC and relevant EU agencies
Type of indicator (qualitative/quantitative) (5)	Quantitative
Unit of measurement (6)	Number of
Entity responsible for data reporting (7)	EEA/EFSA/ECHA/EC
Data source (incl. link, if available) (8)	n/a
Frequency of measurement (9)	Measured every 3-4 years
Baseline (10)	n/a
Target (11)	n/a
Data quality rating (12)	High/medium/low

Indicator Fiche 54: COOPERATION Outcome Indicator 1

General / specific objective (1)	Domain 8: Cooperation General Objective 8: Enhanced cooperation Specific Objective 8.1: MS cooperate among themselves, with the EC & EU agencies in combating AMR
Indicator (2)	COOPERATION Outcome Indicator 1: Improved coordination of One Health responses to AMR among Member States and between Member States and EU agencies/bodies
Sector addressed (3)	All
Definition (4)	Self-assessment on extent of coordination among MS, between MS and EU, and among EU agencies and bodies
Type of indicator (qualitative/quantitative) (5)	Qualitative
Unit of measurement (6)	Extent of
Entity responsible for data reporting (7)	EC
Data source (incl. link, if available) (8)	Survey of Member States, members of the AMR One Health Network, and EC and relevant EU agencies
Frequency of measurement (9)	Measured on a yearly basis
Baseline (10)	n/a
Target (11)	n/a
Data quality rating (12)	Medium

Indicator Fiche 55: GLOBAL Outcome Indicator 1

General / specific objective (1)	Domain 9: Global General Objective 9: Shaping the global agenda Specific Objective 9.1: One Health approach to AMR is integrated in international, standards, guidelines and agreements
Indicator (2)	GLOBAL Outcome Indicator 1: Global commitments and normative frameworks to tackle AMR are in line with EU positions and priorities
Sector addressed (3)	All
Definition (4)	Qualitative self-assessment about the extent to which the EU were successful to raise global commitments/have the EU position reflected in the final outcome of international standards or agreements (levels: significant, moderate, limited, none)
Type of indicator (qualitative/quantitative) (5)	Qualitative
Unit of measurement (6)	Extent of [significant, moderate, limited, none]
Entity responsible for data reporting (7)	EC
Data source (incl. link, if available) (8)	n/a
Frequency of measurement (9)	Measured on a yearly basis
Baseline (10)	n/a
Target (11)	n/a
Data quality rating (12)	Medium

Indicator Fiche 56: GLOBAL Outcome Indicator 2

General / specific objective (1)	Domain 9: GLOBAL General Objective 9: Shaping the global agenda Specific Objective 9.2: AMR is a high priority in international fora
Indicator (2)	GLOBAL Outcome Indicator 2: Strengthened international cooperation and coordinated global response to AMR
Sector addressed (3)	All
Definition (4)	Qualitative self-assessment about the extent to which international cooperation is strengthened
Type of indicator (qualitative/quantitative) (5)	Qualitative
Unit of measurement (6)	Extent of [significant, moderate, limited, none]
Entity responsible for data reporting (7)	EC
Data source (incl. link, if available) (8)	n/a
Frequency of measurement (9)	Measured on a yearly basis
Baseline (10)	n/a
Target (11)	n/a
Data quality rating (12)	Medium

Indicator Fiche 57: GLOBAL Outcome Indicator 3

General / specific objective (1)	Domain 9: GLOBAL General Objective 9: Shaping the global agenda Specific Objective 9.3: There is increased support for low and middle income countries in fighting AMR
Indicator (2)	GLOBAL Outcome Indicator 3: Contribution of the EU to strengthening capacities of third countries to tackle AMR
Sector addressed (3)	All
Definition (4)	Qualitative self-assessment about the extent to which EU actions support stronger capacities to tackle AMR in third countries (levels: significant, moderate, limited, none)
Type of indicator (qualitative/quantitative) (5)	Qualitative
Unit of measurement (6)	Extent of [significant, moderate, limited, none]
Entity responsible for data reporting (7)	EC
Data source (incl. link, if available) (8)	n/a
Frequency of measurement (9)	Measured on a yearly basis
Baseline (10)	n/a
Target (11)	n/a
Data quality rating (12)	Medium

5.7. Annex 7: Questionnaire for additional data collection

As elaborated in Section 3.3., for some indicators included in the framework, no existing data sources could be identified. Therefore, it is proposed that additional data collection is undertaken to gather information on those indicators. Table 28 presents a list of the indicators for which data will need to be collected via a self-reporting survey to the Member States and the corresponding survey questions. It is recommended that the survey is administered every three years. The rationale for this frequency is to avoid unnecessary burden for national administrations while also allowing sufficient time for changes at the national level to take place.

Table 28: Questionnaire for a survey targeting Member States

Indicator type and number	Indicator	Proposed question(s)
NAPs and National policies against AMR		
NAP Output Indicator 02	Number of MS whose NAP outcomes are evaluated at least every 3 years & the evaluation is publicly available	• If your NAP was adopted (or last evaluated) more than three years ago, please indicate whether it has been evaluated (again). • Has the latest evaluation been made public?
NAP Output Indicator 05	Number of Member States whose NAP includes evidence-based measures to prevent, monitor and reduce the spread of AMR in the environment	• Does your NAP include evidence-based measures to prevent, monitor and reduce the spread of AMR in the environment?
Surveillance		
SURVEILLANCE Output Indicator 02	Number of Member States whose AMR surveillance of bacteria in humans includes all isolates from clinical microbiology laboratories (in addition to bloodstream and cerebrospinal fluid isolates (invasive isolates))	• Please indicate whether the AMR surveillance of bacteria in humans in your country includes all isolates from clinical microbiology laboratories (in addition to bloodstream and cerebrospinal fluid isolates (invasive isolates)).

Indicator type and number	Indicator	Proposed question(s)
SURVEILLANCE Output Indicator 03	Number of Member States with national legislation requiring that infections caused by critical (high negative human health impact) multidrug-resistant organisms resistant to last line treatments are notifiable diseases (e.g. carbapenem-resistant *Acinetobacter baumannii*, carbapenem-resistant Enterobacteriaceae (e.g. *Klebsiella pneumoniae*, *Escherichia coli*) and *Candida auris*)	• Please indicate whether there is legislation in your country requiring that infections caused by critical (high negative human health impact) multidrug-resistant organisms resistant to last line treatments are notifiable diseases
SURVEILLANCE Output Indicator 04	Number of Member States with expanded surveillance in humans to pathogens with emerging or established AMR due to their exposure to substances in the environment, in particular those used in plant protection products or biocidal products	• Please indicate whether surveillance in humans in your country includes pathogens with emerging or established AMR due to their exposure to substances in the environment, in particular those used in plant protection products or biocidal products
SURVEILLANCE Output Indicator 05	Extent (i.e., coverage, frequency, types of antimicrobials) of AMC monitoring implementation in Member States at: i) Community level; ii) Hospital level; iii) Long-term care facilities	• Does your country implement AMC monitoring at i. community level ii. hospital level, iii. long-term care facilities level; • If yes, for each level, please indicate the coverage of the AMC monitoring system: i. antibiotics ii. antivirals iii. fungicides • If yes, for each level, please indicate the monitoring frequency: i. real-time ii. monthly iii. quarterly iv. annual
SURVEILLANCE Output Indicator 06	Number of Member States which collect prescribing and/or dispensing data on antimicrobials in humans	• Please indicate whether in your country prescribing data for antibiotics is collected from: i. prescribers ii. pharmacists iii. others • Please indicate whether in your country dispensing data for antibiotics is collected from: i. prescribers ii. pharmacists iii. others • Please briefly describe the format or systems used

Indicator type and number	Indicator	Proposed question(s)
SURVEILLANCE Output Indicator 10	Extent to which EU Agencies and MS competent authorities consider risk of AMR in the assessment of active substances and products, respectively where relevant	• Do the relevant competent authorities in your country consider the risk of AMR in the assessment of active substances and products? • If so, please indicate how and provide additional relevant information
SURVEILLANCE Output Indicator 11	Number of Member States with any form of integrated and continuous systems for monitoring and surveillance of AMR and AMC encompassing human health, animal health, plant health, food, wastewater and the environment	• Please indicate whether an annual One Health surveillance report on AMR and AMC is published in your country. • Please indicate whether a standardized protocol for AMR and AMC is implemented in your country
Infection Prevention and Control (IPC)		
IPC Output Indicator 02	Allocation of financial resources for IPC programmes in hospitals and long-term care facilities in each Member State	• Please provide (an estimate of) the financial resources allocated to IPC programmes in hospitals • Please provide (an estimate of) the financial resources allocated to IPC programmes in LTCFs
IPC Output Indicator 03	Number of Member States conducting quality control of IPC measures in hospitals and in long-term care facilities	• Please indicate whether national guidelines/recommendations on IPC for hospitals and LTCF include quality control or quality management measures • If available, please provide information on the types and coverage of quality control of IPC measures conducted in hospitals and LTCFs
IPC Output Indicator 12	Availability of vaccination programmes for food producing animals	• Please indicate whether vaccination programmes for food-producing animals exist in your country • If yes, please provide more information on the number and types of activities promoting vaccination in food-producing animals • If available, please provide information on the uptake of vaccination in food-producing animals
IPC Output Indicator 13	Number of Member States promoting the development and use of innovative feed additives to improve the physiological status of animals	• Please indicate whether the development and use of innovative feed additives to improve the physiological status of animals is promoted in your country • If yes, where available, please indicate the number and types of activities

Indicator type and number	Indicator	Proposed question(s)
IPC Output Indicator 14	Number of Member State providing continuous training on IPC and biosecurity to personnel in veterinary practice, farms and aquaculture	• Please indicate whether continuous training on IPC and biosecurity for personnel in veterinary practice, farms and aquaculture is implemented in your country • If yes, please provide information on the number of trainings, number of trainees, and topics covered • If data is available, please provide (an estimate of) the percentage of the target population participating in at least one training on IPC and biosecurity
IPC Output Indicator 15	Uptake of good evidence-based manure management practices in agriculture in each Member State	• Please indicate the extent to which good manure management practices to reduce environmental exposure to substances with antimicrobial properties and to AMR determinants in agriculture are implemented in your country
IPC Output Indicator 16	Uptake of good evidence-based sewage sludge management practices in agriculture in each Member State	• Please indicate the extent to which good sewage sludge management practices to reduce environmental exposure to substances with antimicrobial properties and to AMR determinants in agriculture are implemented in your country
Antimicrobial Stewardship (AMS)		
AMS Output Indicator 03	Extent of implementation of AMS measures addressed to community and hospital pharmacies in each Member State	• Please indicate whether national/regional plans/strategies or other measures exists to ensure the adherence of hospital and community pharmacists to guidelines for the prudent use of antimicrobials • If yes, please specify what they include
AMS Output Indicator 04	Extent to which diagnostic testing is available in medical practice in each Member State	• Please provide information on the measures taken in your country to encourage support and uptake of diagnostic tests in medical practice
AMS Outcome Indicator 03	Improved collection & safe disposal of antimicrobials in relevant settings	• If your country has (a) national programme(s) for the collection and safe disposal of antimicrobials, please indicate the extent to which there have been improvements to it in the following settings: i) community ii) hospitals iii) long-term care facilities iv) farms v) veterinary medicine providers vi) veterinary premises vii) manufacturing facilities of antimicrobials by MS • If available, please provide metrics on uptake of the programme(s)

Indicator type and number	Indicator	Proposed question(s)
AMS Output Indicator 08	Number of Member States having developed national programmes for the collection & safe disposal of antimicrobials from all relevant settings	• Please indicate whether national programmes for the collection & safe disposal of antimicrobials in the following settings exist in your country: i) community ii) hospitals iii) long-term care facilities iv) farms v) veterinary medicine providers vi) veterinary premises vii) manufacturing facilities of antimicrobials by MS
Awareness		
AWARENESS Output Indicator 01	Extent to which national continuous education programmes and curricula for the disciplines below cover topics i. AMR, ii. IPC, iii. Environmental risks, iv. Biosecurity, v. antimicrobial stewardship [Disciplines: a. medicine, b. nursing, c. midwifery, d. pharmacy, e. dentistry, f. veterinary medicine, g. agriculture and agronomics, h. environmental and ecological sciences]	• Please indicate whether national continuous education programmes and curricula for the disciplines a.-h. (a. medicine, b. nursing, c. midwifery, d. pharmacy, e. dentistry, f. veterinary medicine, g. agriculture and agronomics, h. environmental and ecological sciences) cover the following topics i. AMR, ii. IPC, iii. Environmental risks, iv. Biosecurity, v. antimicrobial stewardship • Please provide any additional clarification, if needed
AWARENESS Output Indicator 02	Number and, where available, reach of information campaigns on AMR related issues conducted for professionals in human health, veterinary and agronomy sectors in each Member State	• Please indicate the number of information campaigns conducted for professionals in the i. human health sector ii. veterinary sector iii. agronomy sector • Please indicate the (estimated) number of professionals reached in each information campaign • Please include any other impact metrics, if available
AWARENESS Output Indicator 04	Number of awareness raising activities or communication campaigns on AMR related issues conducted at national level in each Member Sate for: i) large-scale for the general public; ii) targeted for specific groups	• Please indicate the number of awareness-raising activities and large-scale communication campaigns to: i. general public ii. specific population groups; • If available, please indicate the (estimated) number of people reached in each activity or campaign • If available, please provide any other impact metrics from the evaluation of the activity/campaign

Indicator type and number	Indicator	Proposed question(s)
AWARENESS Output Indicator 05	Extent to which MS coordinate national awareness raising activities and communication campaigns on AMR related issues with other MS, EC and EU agencies	• Has your country coordinated an AMR awareness raising campaign or a communication activity with another MS, EC or an EU agency? • If so, please describe the campaign/activity and indicate the MS or EU institution/agency with which it was coordinated
Cooperation		
COOPERATION Outcome Indicator 01	Improved coordination of One Health responses to AMR among Member States, between Member States and EU agencies/bodies, and at EU level	• Please indicate the extent to which coordination of One Health responses to AMR *between Member States* has improved over the last three years? • Please indicate the extent to which coordination of One Health responses to AMR *between your country and EU agencies and bodies* has improved over the last three years?

Table 29 presents the set of indicators for which data is not publicly available but could be collected from the relevant EC services and EU agencies.

Table 29: Indicators subject to data collection from EC and relevant EU agencies

Indicator type and number	Indicator	Data source
NAP Output Indicator 07	Extent of EU support to the mobilisation of appropriate human and financial resources for the effective implementation of the National Action Plans (CR Point 2)	EC
SURVEILLANCE Output Indicator 08	Extent to which monitoring and reporting of AMR is done in accordance with (Articles 1.4, 3 and 4 of) Commission Implementing Decision (EU) 2020/1729 on the monitoring and reporting of antimicrobial resistance in zoonotic and commensal bacteria	EC (regarding results of Commission audits/controls)
SURVEILLANCE Output Indicator 10	Extent to which EU Agencies and MS competent authorities consider risk of AMR in the assessment of active substances and products, respectively where relevant	EU Agencies
IPC Output Indicator 04	EC develops IPC guidelines in human health for hospitals and long-term care facilities	EC
IPC Output Indicator 09	Amount of funding allocated/ type of support provided to preventive actions against infectious diseases through the common agricultural policy (CAP)	EC
IPC Output Indicator 10	Number of projects funded (and amount of funding provided) through the European Maritime, Fisheries and Aquaculture Fund (EMFAF) that are relevant to combat AMR	EC

Indicator type and number	Indicator	Data source
AMS Output Indicator 01	EC develops EU guidelines for the treatment of major common infections in humans and for the perioperative prophylaxis in humans, which would include information on the use of adequate diagnostic tests, the need for antibiotics, the choice of the appropriate antibiotic (if needed), the dose and dose intervals, and the duration of treatment/prophylaxis	EC
AWARENESS Output Indicator 03	Number and type of trainings, number of trainees per topic, and amount of funding mobilised by the EU to support Member States in continuous training and lifelong learning of the professionals in i) human health, ii) veterinary and iii) agronomy sectors, including the BTSF platform	EC, ECDC, EFSA
AWARENESS Output Indicator 06	Number and type of pan-European communication actions on AMR and AMS and amount of funding mobilised for them	EC, EU agencies
RDI Outcome Indicator 01	Number of new antibiotics and AMR medical countermeasures, or novel candidates in the pipeline, for human health, supported by EU funding instruments, in the R&D pipeline and/or authorised by the EU	EC, EMA
RDI Output Indicator 01	Establishment of the European partnership on One Health AMR	EC
RDI Output Indicator 02	Amount of EU funding and type of push funding instrument allocated for research and innovation for the detection, prevention and treatment of infections in humans caused by antimicrobial resistant pathogens	EC/HaDEA
RDI Output Indicator 03	Establishment of a European-wide sustainable clinical research network	EC
RDI Output Indicator 04	EU support provided for identification of priority AMR pathogens at EU and MS level, for mapping existing, upcoming and missing AMR medical countermeasures, and for defining target product profiles;	EC
RDI Output Indicator 05	Amount of EU funding allocated for translational research and late-stage development of AMR medical countermeasures, including clinical trials for antimicrobials	EC
RDI Outcome Indicator 02	Expanded and stable access to antimicrobials in Member States	EMA/EC
RDI Output Indicator 06	Establishment of the EU multi-country pull incentive scheme	EC
RDI Output Indicator 07	Extent of support provided by EU bodies and agencies to Member States for the coordination of initiatives on manufacturing, procurement and stockpiling of antimicrobials	EC
RDI Outcome Indicator 03	Number of alternatives to the use of antimicrobials and of vaccines for animal health in the R&D pipeline or brought to market, supported by EU funding	EC/EMA

Indicator type and number	Indicator	Data source
RDI Output Indicator 08	Number of projects/ organisations funded by the EU (and amount of funding allocated) to support the successful development and placement on the market of new antibiotics or alternatives to the use of antimicrobials and of vaccines for animal health	EC/EMA
RDI Outcome Indicator 04	Improved understanding of AMR in the environment	EEA/EFSA/ECHA /EMA/EC
RDI Output Indicator 09	Amount of funds made available (by type of funding instrument) to support research on AMR in the environment	EEA/EFSA/ECHA /EMA/EC
COOPERATION Outcome Indicator 01	Improved coordination of One Health responses to AMR among Member States, between Member States and EU agencies/bodies, and at EU level	EC and relevant EU agencies
COOPERATION Output Indicator 01	Number of best practice exchange opportunities in the context of One Health AMR Network meetings or other relevant committees and working groups	EC (e.g., One Health AMR Network agenda/minutes)
COOPERATION Output Indicator 02	The interagency AMR working group is established and functional	EC
GLOBAL Outcome Indicator 01	Global commitments and normative frameworks to tackle AMR are in line with EU positions and priorities	EC
GLOBAL Output Indicator 01	Active EU participation in drafting and negotiating international standards and agreements relevant to AMR	EC
GLOBAL Outcome Indicator 02	Strengthened international cooperation and coordinated global response to AMR	EC
GLOBAL Output Indicator 02	Active EU participation in international fora aimed at cooperating/coordinating a global response to AMR	EC
GLOBAL Outcome Indicator 03	Contribution of the EU to strengthening capacities of third countries to tackle AMR	EC
GLOBAL Outcome Indicator 04	Amount of funding and extent of technical support provided to third countries to build capacities to address AMR through support for implementation of international standards and action plans, trainings and R&D	EC

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