World Health Organization
South-East Asian Region

Third progress analysis of implementation of antimicrobial resistance national action plans in the WHO South-East Asia Region

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The valuable contributions of the national counterparts, in the fields of human health, animal health, plant health, agriculture and the environment, and the focal points in the quadripartite alliance (FAO, UNEP, WHO, WOAH), regarding issues, challenges and recommendations of the different focus areas in the NAPs-AMR, are much appreciated. This is especially so as the demands of the continuing COVID-19 pandemic response made the tasks even more challenging.

We also wish to thank all our colleagues at WHO country and regional offices, as well as WHO headquarters, for added review and insight, making this a truly corporate endeavour – so important for the time ahead.

Abbreviations and acronyms

AAHRDD	Aquatic Animal Health Research and Development Division
AAW	antimicrobial awareness week
ACT	artemisinin combination therapy
ADL	approved drug list
AGISAR	Advisory Group on Integrated Surveillance of Antimicrobial Resistance
AGP	antibiotic growth promotor
AIIMS	All India Institute of Medical Sciences
AMC	antimicrobial consumption
AMC/U	antimicrobial consumption and use
AMR	antimicrobial resistance
AMS	AMR stewardship
AMU	antimicrobial use
API	active pharmaceutical ingredient
AR	antibiotic residue
AWaRe	Access, Watch and Reserve
BARA	*Bangladesh* AMR Response Alliance
BQCLP	Bureau of Quality Control of Livestock Products
CAP	College of American Pathologists
CDC	Centers for Disease Control and Prevention
CDSCO	Central Drugs Standard Control Organization
CLSI	Clinical and Laboratory Standards Institute
CPD	continuing professional development
CVL	Central Veterinary Laboratory
DDA	Department of Drug Administration
DDC	Department of Disease Control
DGHS	Directorate General of Health Services

DGLAHS	Directorate General of Livestock and Animal Health Services
DIC	disease investigation center
DLD	Department of Livestock Development
DOF	Department of Fisheries
DPR Korea	Democratic People's Republic of Korea
EDM	essential drugs, medicine and medical products
EML	essential medicines list
EPI	expanded programme on immunization
EQ	external quality
EQA	external quality assessment
EQAS	external quality assurance system
EWS	early warning system(s)
FAO	Food and Agriculture Organization
GAP	global action plan
GAP-AMR	global action plan on antimicrobial resistance
GAVI	Global Alliance on Vaccines
GDP	gross domestic product
GLASS	Global Antimicrobial Resistance Surveillance System
GMP	good manufacturing practice
GPP	good pharmacy practice
HAI	health-care-associated infection
HiB	haemeophilus influenza B
HICC	Hospital Infection Control Committee
IAMM	Indian Association of Medical Microbiologists
ICMR	Indian Council of Medical Research
ICT	Information and communication technology
ICU	*intensive care unit*
IEC	information, education and communication
IEDCR	Institute of Epidemiology Disease Control and Research
IMCO	Inter Ministerial One Health Committee

INFAAR	Indian Network of Fisheries and Animal Research on AMR
IPC	infection prevention and control
JDWNRH	Jigme Dorji Wangchuk National Referral Hospital
KAP	knowledge, attitude and practice
M&E	monitoring and evaluation
MDR	multidrug-resistant
MDR-TB	multidrug-resistant tuberculosis
MFDA	Maldives Food and Drug Authority
MoH	Ministry of Health
MoHP	Ministry of Health and Population
MTaPS	Medicines, Technologies, and Pharmaceutical Services
NADFC	National Agency of Drug and Food Control
NAP-AMR	national action plan on antimicrobial resistance
NAP	national action plan
NARST	National Antimicrobial Resistance Surveillance Centre Thailand
NCC	National Coordination Centre
NIAH	National Institute of Animal Health
NIH	National Institutes for Health
NLEM	National List of Essential Medicines
NMRA	National Medicine Regulatory Authority
NPC	National Policy Committee
NRA	national regulatory authority
NRL	national reference laboratory
NSP	national strategic plan
NTWG	National Technical Working Group
OTC	over-the-counter
PCV	pneumococcal conjugate vaccine
PHA	Public Health Action
PMS	Project Management System
PPS	Point Prevalence Survey

PSA	Principal Scientific Adviser
RCDC	Royal Centre of Disease Control
RR-TB	rifampicin-resistant tuberculosis
SAAHRDC	Songkhla Aquatic Animal Health Research and Development Center
SEARN	South-East Asia Regional Network
SORT IT	Structured Operational Research and Training Initiative
STG	standard treatment guideline
TB	tuberculosis
TDR	Tropical Disease Research
TMID	Tropical Medicine and Infections Disease
ToR	terms of reference
TrACSS	Tripartite AMR Country Self-Assessment Surveys
TWG	Technical Working Group
UN	United Nations
UNEP	United Nations Environment Programme
UNICEF	United Nations International Children's Fund
USAID	United States Agency for International Development
WAAW	World Antimicrobial Awareness Week
WASH	water, sanitation and hygiene
WHO	World Health Organization
WHONET	Windows-based database software
WINSAR-D	WHO-IAMM Network for Surveillance of Antimicrobial Resistance - Delhi
WOAH	World Organization of Animal Health (formerly OIE)

Foreword

It is my pleasure to present the Third Situational or Progress Analysis of implementing national action plans (NAPs) to prevent and control antimicrobial resistance (AMR) in the WHO South-East Asia Region, 2022. Initially scheduled to be done in 2020, the analysis was rescheduled for 2021 due to the COVID-19 pandemic. Considering the pandemic, the results of the Third Progress Analysis clearly show significant progress compared with the previous analysis in 2018. For example, all countries in the South-East Asia Region endorsed respective NAPs in line with the Global Action Plan. These plans are being implemented using domestic or external resources. This reflects the Region's collective determination to prevent and control possible infections with resistant microbes, now and in the future.

The COVID-19 pandemic has caused much suffering but at the same time provided many lessons to be learnt. One lesson is to continue to implement, indeed intensify, implementation of NAPs within the priority health agendas of national governments. This is a must to help mitigate similar pandemics in the future, i.e. in tackling the silent epidemics of deadly infections with resistant microbes, which are difficult, and at times impossible, to treat.

Though the Third Progress Analysis shows notable progress, there are issues and challenges. The importance of effective coordination, communication, collaboration between sectors – for example the health, veterinary, agriculture and environmental sectors – cannot be overemphasized in our efforts to contain AMR. Safe disposal of medical or pharmaceutical waste from health-care facilities has a key role in the prevention and control of AMR, and regulations in this regard should be strictly adhered to.

Interventions related to the education of professionals and awareness generation among consumers for the prevention and control of AMR need to be evaluated for their effectiveness in terms of whether such interventions do bring about the desired behaviour change in the target audience, e.g. in the use of medicines including antimicrobials. Member States of the South-East Asia Region, in collaboration with WHO and partners, aim to enhance capacity and coordination of national surveillance systems for AMR as part of more efficient and responsive health systems, including functioning laboratory networks in the health, veterinary and environmental sectors.

Our efforts continue towards promoting rational use of antimicrobials among providers, consumers and communities, as well as towards strengthening surveillance systems for antimicrobial consumption and use. It is vital to coordinate the effective enforcement of regulating antimicrobial products from the production and distribution stages to usage at the national level.

Efforts to prevent and control AMR cannot be separated from related programmes and activities, including infection prevention and control (IPC), surveillance of health care-associated infections (HAI), water, sanitation and hygiene (WASH), essential drugs, medicines and medical products (EDM), and the Expanded Programme of Immunization (EPI). These relevant programmes, which have different ways of operation and organization, play a vital role in containing AMR. Hence, it is valuable to share progress analysis among these programmes.

Research and innovation related to AMR and rational use of antimicrobial medicines is spread across different institutions. It needs to be documented systematically and coordinated at the national level. National AMR research consortiums can inform policy by strengthening partnerships with research and academic institutions, by promoting implementation research and innovation to generate evidence, and by supporting effective implementation of NAPs-AMR.

I would like to thank our partners, FAO, UNEP and WOAH and others, for the continued collaboration and give a call to further intensify technical support for countries to strengthen awareness and education in the different sectors involved, including, in the spirit of the quadripartite alliance from 2022, in the environmental sector. On behalf of WHO and partners, I would like to express my sincere appreciation for the support provided by contributors, including the Fleming Fund of the United Kingdom of Great Britain & Northern Ireland, USAID, the Federal Ministry of Health of Germany, the Kingdom of Saudi Arabia, the European Union and others. Sustainable support encourages us in the long journey ahead.

Dr Poonam Khetrapal Singh
Regional Director
WHO South-East Asia Region

Executive summary

Antimicrobial resistance (AMR) is described as a situation when bacteria, viruses, fungi and parasites change over time and no longer respond to medicines, making infections harder or impossible to treat, and increasing the risk of disease spread, severe illness and death.[1] AMR in recent years has become a global priority in public health due to its widespread consequences and increasing occurrence from time to time. AMR has a formidable impact where the existing antibiotics and other antimicrobial medicines become ineffective, and infections become increasingly difficult or impossible to treat. Globally, approximately 4.95 million deaths were associated with antibacterial-resistant infections in 2019, including 1.27 million directly attributable deaths. If action is not taken systematically from now on, it is anticipated that in 2050 about 10 million people will be at risk annually due to infections with resistant microorganisms. AMR also has a serious impact on the economy.[2] If AMR prevention is not consistently and systematically undertaken, especially in the way how antimicrobials are used, it is estimated that AMR may cost, according to World Bank calculations, US$ 1 trillion annually in global gross domestic product shortfall after 2030.

WHO Global Strategy for Containment of Antimicrobial Resistance[3]

The World Health Organization has since long underscored the problem of AMR and its implications on health services as well as the community at large. A series of expert consultations were organized in the 1990s and 200s to deal with AMR-related problems and issues. These culminated in the development of the first guidelines, "WHO Global Strategy for Containment of Antimicrobial Resistance" in 2015. The strategy provides a framework of interventions to slow the emergence and reduce the spread of antimicrobial-resistant microorganisms through: (i) Reduction of the disease burden and the spread of infection; (ii) Improved access to appropriate antimicrobials; (iii) Improved use of antimicrobials; (iv) Strengthening of health systems and their surveillance capabilities; (v) Enforcement of regulations and legislation; and (vi) Enhanced development of appropriate new drugs and vaccines.

Therefore, WHO and other UN organizations, namely the Food Agricultural Organization of the United Nations (FAO) and the World Organization for Animal Health (WOAH), have a joint task of assessing risks at the human–animal–ecosystem interface, including conducting joint expert meetings on antimicrobial resistance to assess the human risks associated with the use of antimicrobials in food-producing animals. Since 2010, WHO has engaged in a global partnership with FAO and WOAH to prevent and contain AMR, namely the "Tripartite Partnership for One Health". This is intended to provide a strategic framework to ensure competent sharing of responsibilities to address health risks at the human–animal–environment interface.[4]

1 Antimicrobial resistance. World Health Organization, 2021 (https://www.who.int/news-room/fact-sheets/detail/antimicrobial-resistance, accessed December 2021).

2 New report calls for urgent action to avert antimicrobial resistance crisis. World Health Organization, 2019 (https://www.who.int/news/item/29-04-2019-new-report-calls-for-urgent-action-to-avert-antimicrobial-resistance-crisis, accessed December 2021).

3 WHO global strategy for containment of antimicrobial resistance. World Health Organization, 2001 (https://apps.who.int/iris/handle/10665/66860, accessed December 2021).

4 International partnership to address human–animal–environment health risks get a boost. World Organisation for Animal Health (WOAH), 2018 (https://www.oie.int/en/international-partnership-to-address-human-animal-environment-health-risks-gets-a-boost/, accessed December 2021).

Global Action Plan on Antimicrobial Resistance[5]

In 2015, a Global Action Plan on Antimicrobial Resistance (GAP-AMR) was adopted by all countries through decisions at the World Health Assembly of WHO, the Governing Conference of FAO and the Assembly of WOAH. The announcement of the GAP-AMR in 2015 was followed by advocacy initiatives at the global and regional levels by WHO and the Tripartite, calling for the development of comprehensive national action plans on antimicrobial resistance (NAPs-AMR) that were aligned to strategic objectives and were to be implemented using the "One Health" approach.

The objectives of the GAP-AMR reflect not only the functions and roles the health sector, but also of the agricultural and veterinary sectors. These are to:

- Improve awareness and understanding of AMR through effective communication, education and training;
- Strengthen the knowledge and evidence base through surveillance and research;
- Reduce the incidence of infection through effective sanitation, hygiene and infection prevention measures;
- Optimize the use of antimicrobial medicines in human and animal health; and
- Develop the economic case for sustainable investment that takes into account the needs of all countries and to increase investment in new medicines, diagnostic tools, vaccines and other interventions.

Currently, there are operating systems at the global and regional levels intended to monitor and facilitate progress in the implementation of NAPs to prevent and control AMR.

WHO Global Antimicrobial Resistance and Use Surveillance System[6]

The WHO Global Antimicrobial Resistance and Use Surveillance System (GLASS) was launched in 2015 with the aim to foster global monitoring of AMR and antimicrobial consumption and use (AMC/U) and to inform strategies to prevent and control AMR. GLASS is the first system that enables harmonized global reporting of official national data on AMR and antimicrobial consumption (AMC). GLASS has several technical modules, which include routine surveillance activities on AMR and AMC, focused surveillance of emerging resistance and AMR in connection with *Candida species pluralis (spp)*, and studies and surveys to estimate AMR burden and related drivers. A key new component of GLASS is the inclusion of AMC surveillance at the national level highlighted in the fourth GLASS report.

WHO and partner organizations FAO and WOAH also devised a monitoring system for the implementation of NAP-AMR since 2017. The annual Tripartite AMR country self-assessment survey (TrACSS) is a component of a broader approach for monitoring and evaluating the GAP-AMR. The last report was undertaken in 2021: *Monitoring Global Progress on Antimicrobial Resistance: TrACSS 2019–2020, Global Analysis Report.*[7] This fourth report, representing 115 countries, indicates that countries are moving

5 Global action plan on antimicrobial resistance. World Health Organization, 2015 (https://apps.who.int/iris/handle/10665/193736, accessed December 2021).

6 Global Antimicrobial Resistance and Use Surveillance System (GLASS). World Health Organization, 2015 (https://www.who.int/initiatives/glass, accessed December 2021).

7 Overview: Tripartite AMR Country Self-Assessment Survey (TrACSS) 2019–2020. World Health Organization, Food and Agriculture Organization, World Organisation for Animal Health, 2019 (https://www.who.int/publications/m/item/tripartite-amr-country-self-assessment-survey-(tracss)-2019-2020, accessed December 2021).

forward on key actions to help address AMR: the number of countries that have reached nationwide implementation on several indicators has increased, including an increase in the number of countries with developed NAPs and with functional multisectoral working groups on AMR.

In the South-East Asia Region, there is a regional system to monitor the progress of implementation of NAP-AMR with the "One Health" approach every two years. The first situational analysis of AMR was undertaken in 2016 and the second in 2018. These identified relevant actions undertaken during the past two years, assessed the implementation phases, noted impediments during the implementation and remedial actions that were needed. The Third One Health Situational Analysis of the Implementation of the NAP-AMR was due to be implemented in 2020 but on account of various reasons, mainly the COVID-19 pandemic, could be undertaken only in 2021.

Situational analysis of antimicrobial resistance in the South-East Asia Region, 2016[8]

The 2016 report is an account of the Region's progress in developing and implementing the NAPs to prevent and control AMR, and providing information to track what is going well, and identifying areas where extra efforts are needed. The information was collected using 20 indicators belonging to seven focus areas originally. The seven focus areas are: (i) National AMR plan and governance; (ii) Raising awareness; (iii) National AMR surveillance system; (iv) Rational use of antimicrobials and surveillance of use/sale (community-based); (v) Infection prevention and control (IPC); (vi) Research and innovation; and (vii) "One Health" engagement. An additional focus area was incorporated during the Second Situational Analysis in 2018, namely, (viii) Overarching coordination mechanism for "One Health" engagement (*see Annex 1*).

Situational analysis of antimicrobial resistance in the South-East Asia Region, 2018[9]

The Second Situational Analysis was carried out through two back-to-back meetings in Bangkok, to assess progress and identify gaps and challenges in implementing the NAP and suggest actionable recommendations for improvement. The participants of the meetings comprised country intersectoral teams, representatives from the National Medicine Regulatory Authority (NMRA) in countries, national referral laboratories, the antimicrobial stewardship (AMS) programme, national officers responsible for human and animal health and the environment sectors.

In addition, there were experts from FAO, WHO collaborating centres, the United Nations Environment Programme (UNEP) and WOAH from the Region. The review was carried out using the participatory guided discussions methodology, conducted jointly by the national counterparts and experts from FAO, UNEP, WHO and WOAH. The progress of implementation in every indicator was reviewed jointly, taking into account the available evidence and justification. The results noted significant progress across all focus areas compared with the earlier situational analysis in 2016.

8 Situational analysis on AMR in South-East Asia Region Report 2016. World Health Organization, 2016 (https://apps.who.int/iris/handle/10665/272873, accessed December 2021).

9 Situational Analysis of AMR in South-East Asia Region 2018: an update on two years implementation of national action plan. World Health Organization, 2018 (https://apps.who.int/iris/bitstream/handle/10665/327117/9789290227021-eng.pdf?sequence=1&isAllowed=y, accessed December 2021).

Third One Health situational analysis of the implementation of NAPs-AMR, 2021

This Third One Health Situational Analysis of the implementation of NAPs-AMR was undertaken during the course of 2021. Its objectives were to: (i) review progress in implementation of NAPs-AMR containment programmes using an expanded situational analysis tool; (ii) share experiences of good practice and lessons learnt in the 11 Member States; (iii) identify remaining gaps, barriers and challenges in implementation of NAPs-AMR and possible solutions; and (iv) suggest additions to updated NAPs and recommendations for effective implementation in the light of progress made through a more comprehensive "One Health" approach.

Methodology

The Third One Health Situational Analysis relied on electronic communication and virtual discussions as follows:

- A joint letter from FAO, WHO and WOAH was sent to the 11 Member States along with the tool in Excel format, requesting Member States to update the implementation of the NAP for the period of 2019–2021, by filling out the predesigned form.
- Progress on the implementation of the NAP was updated for the period of 2019–2021 by the national counterparts (health, veterinary agriculture and environmental sectors) in coordination with focal points in WHO Member States and the representatives from the Tripartite organizations and UNEP.

The analysis covers eight focus areas, namely (i) NAP and governance; (ii) Raising awareness; (iii) National AMR surveillance system; (iv) Rational use of antimicrobials and surveillance of use/sale (community-based); (v) Infection prevention and control (IPC); (vi) Research and innovation; (vii) One Health engagement; and (viii) Overarching coordination in One Health engagement.

There are 31 indicators in all those eight focus areas. The status of implementation in each of the 31 indicators is categorized into five phases, namely, Phase 1: Exploration and adoption; Phase 2: Programme installation; Phase 3: Initial implementation; Phase 4: Full operation; and Phase 5: Sustainable operation.

As in the previous situational analysis, Phase 3 or initial implementation is considered as a cut-off point in assessing progress covering all the 31 indicators. The decision on the phases of implementation, issues and challenges, and recommendations, were made jointly by the national counterparts and experts from the WHO/Tripartite organizations.

Email communications and virtual meetings were organized to discuss the activity reports from countries, focusing on what actions were implemented during the period, the phases of implementation, issues and challenges being faced, and recommendations proposed for improvement.

The methodology, however, has some limitations.

A face-to-face guided discussion can be very interactive and participatory where stakeholders, the national counterparts (health, veterinary and environmental sectors) and representatives of the Tripartite organizations could share their understanding and jointly make decisions on

the implementation phase, and on the related issues and challenges and recommendations for improvement. During virtual discussions, such in-depth group interactions to understand the dynamic of progress in countries could not be expected.

Each member or stakeholder may be occupied by other urgent tasks during this process, in particular addressing the on-going COVID19 pandemic.

Results

The Third One Health Situational Analysis 2021 on the implementation of NAPs-AMR on the prevention and control of AMR has observed significant progress in all 11 countries of the South-East Asia Region compared with the earlier situational analysis in 2018 and 2016. This was based on the overall country progress, the implementation status in each focus area and with each indicator, and the progress over the individual country profiles. The progress in the animal and agricultural sectors was found to be lagging compared with that in the human sector, while progress in the environmental sector was reported to be the least of all. There was indeed obvious variation in the overall country progress.

As with the previous situational analysis, Phase 3 or initial implementation was considered as a cut-off point in assessing progress. Three countries exhibited the highest percentage of indicators with implementation status of Phase 3 and above, namely Thailand (90%), Bhutan (83%) and DPR Korea (77%). Two countries exhibited less progress with the percentage of indicators of Phase 3 and above, or less than 50%, namely Maldives (32%) and Timor-Leste (48%). The median value of overall country progress in the Third Situational Analysis in 2021 for all countries of the Region was 64%, much higher compared with the Second Situational Analysis in 2018 of 40% and the First Situational Analysis in 2016 of 16%. None of the countries showed any backward slide in their implementation status during 2021 compared with the situational analysis in 2018.

The progress during the Third One Health Situational Analysis 2021 was also observed in all eight focus areas and indicators, wherein more countries were implementing actions in each respective indicators, namely the national AMR plan and governance, raising awareness, national AMR surveillance system, rational use of antimicrobials and surveillance of use/sale including AMS, IPC, research and innovation, One Health engagement, and overarching coordination mechanisms for One Health engagement.

No progress was observed on AMR awareness generation and education in the environmental sector, and the implementation of AMR early warning systems (EWS). Almost none of the countries managed to start a national programme in these areas as reported in the situational analyses in 2016, 2018 and 2021.

Conclusions

Significant progress has been noted in the implementation of NAPs-AMR in 11 countries of the South-East Asia Region in the Third One Health Situational Analysis in 2021, based on the assessment of overall country progress, implementation status in each focus area and indicator, and the individual country profile. The progress in the animal and agricultural sectors was found to be lagging compared with that in the human sector, while progress in the environmental sector was the least of all.

There was, indeed, obvious variation in the overall country progress. The progress in the implementation of NAP-AMR, as expressed by the median values of percentage of indicators having an implementation status phase of 3 and above, found in the Third Situational Analysis in 2021 for all countries of the Region was 64%, much higher than the Second Situational Analysis in 2018 (only 40%) and the First Situational Analysis in 2016 (only 16%). None of the countries showed any backward slide in their implementation status during 2021 compared with the situational analysis in 2018.

Progress during the Third One Health Situational Analysis 2021 was also observed in all eight focus areas and indicators, where more countries were implementing actions in each respective indicator, namely the national AMR plan and governance, raising awareness, national AMR surveillance system, rational use of antimicrobials and surveillance of use/sale including and AMS, IPC, research and innovation, One Health engagement and overarching coordination mechanisms for One Health engagement. However, no progress was observed with AMR awareness generation and education on AMR in the environmental sector, and the implementation of an AMR early warning system (EWS), wherein almost none of the countries managed to start a national programme in these areas during the situational analysis in 2021, 2018 and 2016.

Advocacy and educational campaigns in the environmental sector would need to be intensified, and practical guidelines and more technical support on the AMR EWS would be needed in the future. UNEP may encourage countries to include AMR issues in the national strategic plan to ensure government political support and its sustainability. Despite ongoing challenges due to the COVID-19 pandemic, prevention and control of AMR should remain a government priority programme to anticipate the occurrence of possible uncontrolled infections with resistant microbes of public health concern in the future.

Key recommendations across different focus areas to address AMR containment

(1) National action plans and governance

Recommendations

- *To identify the cost, existing funding and funding gap to incorporate step b y step into regular government budgets.*
- *To adopt framework and methodology for monitoring and evaluation incorporated in the existing NAP. Guidelines of the WHO headquarters are available for adaptation and adoption.*
- *To organize regular intersectoral coordination meetings at least every 6 months to evaluate the progress in all sectors.*
- *To strengthen leadership and coordination capacity of multisectoral coordination groups.*

(2) Raising awareness

Recommendations

- *To continue and to strengthen the coordination and cooperation between sectors beyond World Antimicrobial Awareness Week (WAAW), through monitoring and evaluation of progress in different sectors.*

- *To undertake awareness generation and education activities in the environmental sector including advocacy to high levels of the government to include and strengthen AMR in the national strategic plan in the Ministry of Environment.*
- *To measure the impact of awareness generation and education on the target audience, especially on the expected behaviour and practices in relation to prevention and control of AMR and use of AM.*

(3) National AMR surveillance system

Recommendations

- *To devise practical national guidelines for implementation of an integrated AMR surveillance and the laboratory networks for the human and animal sectors.*
- *To undertake training for laboratory staff involved in the AMR surveillance both for the human and animal sectors.*
- *To undertake needs assessment and develop practical guidelines to improve the laboratory capacity on EWS. A regional model on EWS may be considered by the regional Tripartite party.*

(4) Rational use of antimicrobials and surveillance of use or sale (community-based)

Recommendations

- *To promote rational use of medicines in the human and animal sectors through operational research on quality use of antimicrobials and implementation of the national list of essential medicines (NLEM) and treatment guidelines.*
- *To develop guidelines, advocate the implementation of AMS and measure the impact in all sectors.*
- *To scale up regular antimicrobial consumption surveillance activities at the national and facility level and a monitoring system for consumption of antimicrobials in both human and animal health.*
- *To strengthen the national regulatory authority (NRA) in enforcing regulation on the production, distribution and sale of antimicrobials in human and animal sectors including sale of agricultural feeds.*
- *To consolidate database on production and importation of AM though the NRA in all sectors.*
- *To devise guidelines, undertake training, implement and monitor AMS in health-care settings,*

(5) Infection prevention and control (IPC)

Recommendations

- *To devise guidelines and to implement IPC in hospital and primary care settings.*
- *To devise guidelines and reporting system for national health-care-associated infections (HAI) and AMR surveillance.*

- *To strengthen the implementation of water and sanitation and hygiene programme at health facilities.*
- *To develop a national coordination mechanism between different programmes, namely IPC, HAI surveillance, AMS and WASH, for instance through regular meetings.*
- *To improve national coverage of immunization especially on pneumococcal conjugate vaccine (PCV).*
- *To develop guidelines, initiate training and implement biosecurity measures among professionals and handlers in the veterinary sector*.

(6) Research and innovation

Recommendations

- *To develop a national AMR research consortium to strengthen partnerships with research/ academic institutions, civil society and other stakeholders, for resource mobilization and the development of evidence-based policies.*
- *To encourage research and innovation for generation of evidence to support the effective implementation of NAP-AMR.*
- *To accelerate the development of new antibiotics to tackle drug-resistant infections, to ensure sustainable access to treatments as well as regulatory control to ensure responsible rational use and affordability to all in need.*

(7) One Health engagement

Recommendations

- *To implement existing regulations to manufacturers, hospitals and other relevant institutions in disposing antimicrobials in the environment; disseminate and enforce the regulations and provide sanctions to those violating the regulation.*
- *To collaborate with research institutions to undertake research on measuring antimicrobial residue in the environment.*

(8) Coordination mechanism for One Health engagement

Recommendations

- *To strengthen the existing coordination mechanism between all relevant sectors, with enhanced engagement and involvement of the environment, food safety, education, aquaculture, animal and human health sectors (see Indicator 1).*
- *To establish coordination mechanisms for AMR-AMU surveillance and ensure the implementation of AMR containment across the relevant sectors; develop a platform for sharing and monitoring data regularly with stakeholders across all sectors to ensure evidence-based policy decisions.*

- *To continue and to strengthen the coordination and cooperation on awareness-raising activities between sectors beyond WAAW, through monitoring and evaluation of progress in different sectors (see Indicator 2).*
- *To measure the impact of awareness and education on the target audience, especially on the expected behaviour and practice in relation to prevention and control of AMR and use of AM (see Indicator 2).*
- *To undertake mapping of available resources from all sectors and coordinate the use of resources for relevant activities in different sectors.*

Recommendations to WHO, Tripartite organizations and other partners

WHO and partners would also need to intensify technical support for undertaking needs assessment, strengthening awareness creation and bolstering education in the environmental sector.

WHO and partner organizations would need to intensify countries' technical support as none of the countries managed to initiate and implement AMR EWS. This would need a systematic assessment on why the last three situational analyses (2016, 2018 and 2021) revealed that none of the countries managed to initiate EWS.

Recommendations

- *To intensify technical support for advocacy and training on improving active participation of the environmental sector in implementation of NAP-AMR.*
- *To intensify technical support for training in improving the capacity of undertaking AMR EWS.*

1

Context

AMR is a situation when bacteria, viruses, fungi and parasites change over time and no longer respond to medicines, making infections harder or impossible to treat and increasing the risk of disease spread, severe illness and death[10]. In recent years, AMR has become a global priority public health due to its consequences and increasing incidences from time to time. AMR has a formidable impact where the existing antibiotics and other antimicrobial medicines become ineffective, and infections become increasingly difficult or impossible to treat. Globally, it is approximately 4.95 million deaths associated with antibacterial-resistant infections, including 1.27 million directly attributable deaths in 2019, and if actions are not taken systematically from now on, it is anticipated that in 2050, 10 million people will be at risk annually due to infections with resistant microorganisms. AMR also has a serious impact on economy[11]. If AMR prevention is not consistently and systematically undertaken, especially in the way how antimicrobials are used, it is estimated that the loss of gross domestic product (GDP) could be as high as US$ 100 trillion annually.

The treatment cost of infections with resistant microbes becomes much more costly, manifolds increased compared to that for treating infections without resistance, e.g. the cost for treating multidrug-resistant tuberculosis (MDR-TB) or resistant malaria. MDR-TB requires treatment courses that are longer, less effective and far more expensive than those for non-resistant TB. Antibiotic-resistant *Mycobacterium tuberculosis* strains are threatening progress in containing the global TB epidemic. WHO estimates that, in 2018, there were about half a million new cases of rifampicin-resistant TB (RR-TB) identified globally, of which the vast majority have MDR-TB, a form of TB that is resistant to the two most powerful anti-TB drugs[12].

The emergence of drug-resistant parasites also poses one of the greatest threats to malaria control and results in increased malaria morbidity and mortality. Artemisinin-based combination therapies (ACTs) are currently the recommended first-line treatment for uncomplicated *P. falciparum* malaria and are used by most malaria-endemic countries. ACTs are a combination of an artemisinin component and

10 Antimicrobial resistance. World Health Organization, 2021 (https://www.who.int/news-room/fact-sheets/detail/antimicrobial-resistance, accessed December 2021).

11 New report calls for urgent action to avert antimicrobial resistance crisis. World Health Organization, 2019 (https://www.who.int/news/item/29-04-2019-new-report-calls-for-urgent-action-to-avert-antimicrobial-resistance-crisis, accessed December 2021).

12 Drug resistance in mycobacterium tuberculosis. World Health Organization, 2021 (https://www.who.int/news-room/fact-sheets/detail/antimicrobial-resistance, accessed December 2021).

a partner drug[13]. In South-East Asian countries, resistance to artemisinin and resistance to a number of the ACT partner drugs has been confirmed in Delta Mekong countries, including Cambodia, Lao People's Democratic Republic, Myanmar, Thailand and Viet Nam through studies conducted between 2001 and 2019. Development of resistance to antimalarials involves complex factors, but it might be associated with the distribution and use of fake and substandard antimalarial products[14], which are commonly found in the Delta Mekong countries.

During the past 2 years, the world has encountered the unforeseen COVID-19 pandemic crisis of the century. At the beginning, the health systems both in high-income as well as lower- and middle-income countries were not well prepared for the crisis and were taken by surprise. With this lesson in mind, AMR could become another emerging threat with permanent humanitarian and economic consequences if not dealt with decisively. AMR is a complex issue involving many factors, including the way how antimicrobials are produced, distributed and used in the communities. Overuse and indiscriminate use of antimicrobials have been implicated with the emergence of resistance. Needless to re-emphasize the need for well-coordinated and systematic measures to prevent and control AMR including its surveillance and management.

In 2020, WHO has identified 43 antibiotics and combinations with a new therapeutic entity in clinical development that address the WHO list of priority pathogens, of which only seven fulfil at least one of the innovation criteria and only two of these are active against the critical MDR Gram-negative bacteria[15]. Furthermore, a lack of access to quality antimicrobials remains a major issue. Antibiotic shortages are affecting countries of all levels of development and especially in their health-care systems[16]. They are becoming increasingly ineffective as drug-resistance spreads globally leading to infections that are more difficult or impossible to treat. New effective antibacterials are urgently needed. But if the way how people use antimicrobials is not changed from now on, the cycle of losing new effective antimicrobials will come back. The world will lose the battle against AMR from time to time, with a formidable impact on health and economy.

WHO Global Strategy for Containment of Antimicrobial Resistance[17]

WHO has long appreciated the problems of AMR and its implications on delivery of health services as well as on the community at large. Series of expert consultations were organized in the 1990s to deal with the AMR problems, which culminated in the development of the first guidelines, i.e. WHO Global Strategy for Containment of Antimicrobial Resistance. It provides a framework of interventions to slow the emergence and reduce the spread of antimicrobial-resistant microorganisms through:

13 Artemisinin resistance and artemisin-based combination therapy efficacy. World Health Organization, 2018 (https://apps.who.int/iris/bitstream/handle/10665/274362/WHO-CDS-GMP-2018.18-eng.pdf?ua=1, accessed December 2021).

14 Drug resistance in malaria parasites. World Health Organization, 2021 (https://www.who.int/news-room/fact-sheets/detail/antimicrobial-resistance, accessed December 2021).

15 Critically important antimicrobials for human medicine, 6th revision 2018. World Health Organization, 2019. (https://apps.who.int/iris/bitstream/handle/10665/312266/9789241515528-eng.pdf, accessed June 2022).

16 Shortage, stockout, and scarcity. Acces to medicine foundatioan, 2018 (https://accesstomedicinefoundation.org/media/atmf/Antibiotic-Shortages-Stockouts-and-Scarcity_Access-to-Medicine-Foundation_31-May-2018.pdf, accessed December 2021).

17 WHO global strategy for containment of antimicrobial resistance. World Health Organization, 2001 (https://apps.who.int/iris/handle/10665/66860, accessed December 2021).

- Reduction of the disease burden and the spread of infection
- Improving access to appropriate antimicrobials
- Improving use of antimicrobials
- Strengthening health systems and their surveillance capabilities
- Enforcing regulations and legislation
- Encouraging the development of appropriate new drugs and vaccines.

However, AMR is a complex issue that requires a coordinated multisectoral approach. The health sector alone could not bring any significant change, because in many countries antimicrobials are also widely used in the animal and agriculture sectors. There is an urgent need for intersectoral collaboration and coordination in dealing with the issue of AMR and the use of antimicrobials in the veterinary and agricultural sectors. The One Health approach brings together multiple sectors and stakeholders engaged in human, terrestrial and aquatic animal and plant health, food and feed production and the environment to communicate and work together in the design and implementation of programmes, policies, legislation and research to attain better public health outcomes.

Therefore, WHO and other UN organizations, namely FAO and the WOAH, work jointly on assessing risks at the human–animal–ecosystem interface, including AMR joint expert meetings to assess the human risks associated with the use of antimicrobials in food-producing animals. Since 2010, WHO has engaged in a global partnership with FAO and WOAH to prevent and contain AMR, namely Tripartite partnership for One Health. This is intended to provide a strategic framework to ensure sharing of responsibilities addressing health risks at the human–animal–environment interface[18].

Taking into account the importance of environmental issues in spreading resistance, the international partnership was later extended to UNEP to improve One Health[19]. The four entities, including the UNEP, as well as a number of key international experts, have agreed to set up a One Health High-Level Expert Council to collect, distribute and publicise reliable scientific information on the links between human, animal and environmental health. The aim is to assist public officials in making appropriate decisions to avoid future crises and to inform citizens.

Global Action Plan on Antimicrobial Resistance[20]

In 2015, a GAP-AMR was adopted by all countries through decisions in the World Health Assembly of the WHO, the FAO of the United Nations, Governing Conference and the World Assembly of WOAH. The announcement of the GAP-AMR in 2015 was followed by advocacy initiatives at the global and regional levels by WHO and the Tripartite organizations, calling for the development of

18 International partnership to address human-animal-environment health risks get a boost. World Organisation for Animal Health (WOAH), 2018 (https://www.oie.int/en/international-partnership-to-address-human-animal-environment-health-risks-gets-a-boost/, accessed June 2022).

19 UNEP Join three international organizations in expert panel to improve one health. UN Environment Program, 2020 (https://www.unep.org/news-and-stories/story/unep-joins-three-international-organizations-expert-panel-improve-one-health, accessed June 2022).

20 Global action plan on antimicrobial resistance. World Health Organization, 2015 (https://apps.who.int/iris/handle/10665/193736, accessed December 2021).

comprehensive NAPs-AMR that were aligned to strategic objectives and implemented following the One Health approach.

The objectives of the GAP-AMR reflect not only the functions and roles of the health sector, but also the agricultural and veterinary sectors.

- To improve awareness and understanding of AMR through effective communication, education and training;
- To strengthen the knowledge and evidence base through surveillance and research;
- To reduce the incidence of infection through effective sanitation, hygiene and infection prevention measures;
- To optimize the use of antimicrobial medicines in human and animal health; and
- To develop the economic case for sustainable investment that takes into account the needs of all countries and to increase investment in new medicines, diagnostic tools, vaccines and other interventions.

Member States are encouraged to have their own NAP in line with the GAP and implemented as part of their government's plan and budget. In the South-East Asia Region, the Regional Office for South-East Asia, in collaboration with Tripartite partners and UNEP, consistently provided support for Member States to develop and implement a NAP-AMR with the One Health approach, to prevent and contain AMR and systematically monitor its progress. The GAP was further endorsed by political leaders in 2016, when Heads of State issued a high-level political declaration on AMR (resolution A/RES/71/3) during the Seventy-first session of the United Nations General Assembly, committing them to implementing the GAP at the global, regional and national levels.

Currently, there are operating systems at the global and regional levels intended to monitor and facilitate the progress on the implementation of the NAPs on the prevention and control of AMR.

WHO Global Antimicrobial Resistance and Use Surveillance System[21]

The WHO GLASS was launched in 2015 with the aim to foster AMR including AMC/U monitoring globally and to inform strategies to prevent and control AMR. The WHO GLASS is the first system that enables harmonized global reporting of official national AMR and AMC data. GLASS has several technical modules, which include routine surveillance activities on AMR and AMC, focused surveillance of emerging resistance and AMR in Candida spp., and studies and surveys to estimate AMR burden and related drivers. A key new component in GLASS is the inclusion of AMC surveillance at the national level highlighted in this fourth GLASS report.

Since its launch, GLASS has expanded in scope and coverage and as of May 2021[22], 109 countries and territories worldwide have enrolled in it. The fourth GLASS report summarizes the 2019 data reported to WHO in 2020. It includes data on AMC surveillance from 15 countries and

21 Global antimicrobial resistance and use surveillance system (GLASS). World Health Organization, 2015 (https://www.who.int/initiatives/glass, accessed December 2021).

22 Global antimicrobial resistance and use surveillance system (GLASS) Global report. World Health Organization, 2021 (https://www.who.int/publications/i/item/9789240027336, accessed December 2021).

AMR data on 3 106 602 laboratory-confirmed infections reported by 24 803 surveillance sites in 70 countries, compared to the 507 923 infections and 729 surveillance sites reporting to the first data call in 2017. The report also describes developments over the past years of GLASS and other AMR surveillance programmes led by WHO, including resistance to anti-human immunodeficiency virus and anti-TB medicines, antimalarial drug efficacy.

Since 2017, WHO and partner organizations, FAO and WOAH, devised a monitoring system for the implementation of NAP-AMR. The annual TrACSS is a component of a broader approach for monitoring and evaluating the GAP-AMR. The last report undertaken in 2021 was "Monitoring Global Progress on Antimicrobial Resistance: TrACSS 2019–2020 Global Analysis Report[23]. This fourth report, collected from 115 countries, indicates that countries are moving forward on key actions to help address AMR, the number of countries that have reached nationwide implementation on several indicators has increased, including increases in the number of countries with developed NAPs, with functional multisectoral working groups on AMR.

In the South-East Asia Region, there is a regional system to monitor the progress on implementation of NAPs-AMR, with the One Health approach supposedly every two years. The first situational analysis of AMR was undertaken in 2016 and the second in 2018, identifying relevant actions undertaken during the past two years, assessing the implementation phases, identifying impediments during the implementation and the remedial actions to be taken. The Third One Health Situational Analysis of the Implementation of the NAPs-AMR, due to various reasons, including the COVID-19 pandemic, could only be undertaken in 2021.

Situational Analysis of Antimicrobial Resistance in the South-East Asia Region, 2016[24]

The 2016 report is an account of the Region's progress in developing and implementing the NAPs to prevent and control AMR, and providing information to track what is going well, and identifying areas where extra efforts are needed. The information was collected using 20 indicators belonging to seven focus areas. The seven focus areas are: (i) national AMR plan and governance; (ii) raising awareness; (iii) national AMR surveillance system; (iv) rational use of antimicrobials and surveillance of use/sale (community-based); (v) infection prevention and control (IPC), (vi) research and innovation, and (vii) One Health engagement. Additional focus areas were incorporated during the 2nd Situational Analysis in 2018, viz. (viii) overarching coordination mechanism for One Health engagement.

Based on the information collected, country profiles were developed to provide useful insights for national stakeholders from health, agriculture and veterinary, and environmental sectors. The regional roadmap for strengthening national AMR prevention and containment programme was also devised in the report to guide the Member States. The roadmap consisted of five phases of implementation, based on activities and actions taken on the NAPs as follows: Phase 1: Exploration and adoption;

23 Monitoring global progress on antimicrobial resistance: tripartite AMR country self-assessment survey (TrACSS) 2019–2020: global analysis report. World Health Organization, Food and Agriculture Organization of the United Nations, World Organisation for Animal Health, 2021 (https://apps.who.int/iris/handle/10665/340236, accessed June 2022).

24 Situational analysis on antimicrobial resistance in the South-East Asia Region: report 2016. World Health Organization, Regional Office for South-East Asia, 2017 (https://apps.who.int/iris/handle/10665/272873, accessed June 2022).

Phase 2: Programme installation; Phase 3: Initial implementation; Phase 4: Full operation; and Phase 5: Sustainable operation.

The situational analysis in 2016 involved 10 countries as Democratic People's Republic of Korea (DPR Korea) had not joined the project, involving national counterparts from health, agriculture, veterinary and environmental sectors as well as focal points of the Tripartite organizations, FAO, , WHO, WOAH. The above-mentioned data collection relied on joint review of the NAP-AMR, involving country stakeholders, representatives of professional associations and academics, WHO consultants from the Regional Office and partners. The joint team held a special workshop to discuss progress in each focus area and indicator.

From the 1st Situational Analysis, many valuable lessons could be learnt. AMR has become a priority government issue. All Member States of the South-East Asia Region have adopted the One Health approach by forming a multisectoral coordination group that includes policy-makers, practitioners and professionals from diverse fields who can address various aspects of the AMR containment programme. As of mid-2017, all but one country of the Region have developed or are in the process of finalizing the NAP for the containment of AMR. The majority of the Member States were in the initial phase of implementation. The WHO Regional Office for South-East Asia Region, in collaboration with partners, would provide support through evidence-based, customised technical guidance to all Member States, based on the findings of the situational analysis. WHO would be prepared to collaborate with Member States in conducting interventions within NAPs and demonstrate measurable impact.

Situational Analysis of Antimicrobial Resistance in the South-East Asia Region, 2018[25]

The 2nd Situational Analysis was carried out through two back-to-back meetings in Bangkok, to assess progress and to identify gaps and challenges in implementing the NAPs and to suggest actionable recommendations for improvement. The participants of the meeting comprised the country intersectoral team, representatives from the NMRA, national referral laboratory (NRL), the AMS, national officers responsible for human and animal health sectors, and the environmental sector. There were also experts from FAO, , UNEP WHO Collaborating Centres and WOAH in the Region. The review was carried out using the participatory-guided discussion methodology, conducted jointly by the national counterparts and experts from FAO, UNEP , WHO, and WOAH. The progress of implementation in every indicator was reviewed jointly, taking into account the available evidence and justification.

The indicators used in the review were basically the same with the ones used in the previous situational analysis, except that one focus area which was added, viz. overarching coordination in One Health engagement. Thus, altogether there were 30 indicators across eight focus areas: (i) national AMR plan and governance; (ii) raising awareness; (iii) national AMR surveillance system; (iv) rational use of antimicrobials and surveillance of use/sale (community-based); (v) infection prevention

25 Situational analysis of antimicrobial resistance in the South-East Asia Region, 2018. World Health Organization, 2019 (https://apps.who.int/iris/bitstream/handle/10665/327117/9789290227021-eng.pdf?sequence=1&isAllowed=y, accessed June 2022).

and control (IPC); (vi) research and innovation; (vii) One Health engagement; and (viii) coordination mechanism for One Health engagement.

The results noted significant progress across all focus areas compared to the earlier situational analysis in 2016. Based on all indicators, including the additional 10 indicators introduced in 2018, the median country progress in 2018 was 40% compared to 25% in 2016. Most of the original indicators (17 out of 20 original indicators, 85%) assessed in 2016 showed improvement in 2018, especially in sanitation and hygiene programmes in community settings (10 countries in 2018), raising of awareness among the general public (nine countries in 2018), education and training (nine countries in 2018), NAP-AMR and governance structure (eight countries), regulations dealing with antimicrobials and active pharmaceutical ingredients (APIs) (eight countries in 2018), strengthening of the national laboratory network, surveillance of antimicrobial use (AMU) and sale among humans, and regulation of over-the-counter (OTC) sale (seven countries for each indicator in 2018).

The challenges were obvious that the animal health sector has achieved less progress across focus areas and indicators, which potentially affect the One Health engagement and multisectoral collaboration, due to a lack of resources. The environmental sector was less integrated across focus areas and indicators of the One Health coordination system. AMR/AMU surveillance, IPC in health-care facilities, HAI surveillance and AMS in most countries of the Region have not reached initial implementation. EWS was not yet implemented in all countries. Most of the underlying causes were a lack of policies, standards and guidelines and their regulatory frameworks.

On the way forward, it was agreed that the Tripartite partners, FAO, WHO, WOAH plus UNEP, would continue providing support for implementation of NAPs-AMR with evidence-based technical guidance customised for each country, with the One Health approach, by

- Strengthening governance and multisectoral collaboration;
- Expanding awareness on AMR, targeting different sectors and community groups as well as academic curricula for students and training for professionals;
- Extending technical support and help in developing guidelines for robust surveillance implementation AMR/AMU from WHO and its Global Antimicrobial Resistance Surveillance System and the Tripartite partners;
- Standardizing and implementing IPC nationwide and involving hospital personnel, NGO and communities;
- Controlling irrational use and resale of antimicrobials, regulations for monitoring pharmacies and internet outlets, including and AMS;
- Controlling import of medical products intended for the public and animal health sectors through a regional regulatory cooperation South-East Asia Regional Network (SEARN); and
- Strengthening multisectoral collaboration through creation of a platform for joint planning, exchange of information and sharing of resources.

Third progress analysis of the implementation of NAPs-AMR

The objectives of the Third Situational Analysis included the following:

(1) Review progress in implementation of NAPs and national AMR containment programmes using an expanded situational analysis tool;

(2) Share experiences of good practice and lessons learnt in the 11 Member States of the South-East Asia Region;

(3) Identify remaining gaps, barriers and challenges in implementation of NAPs-AMR and possible solutions; and

(4) Suggest additions to updated NAPs and recommendations for effective implementation in the light of progress made through a more comprehensive One Health approach.

2

Methodology

The tool for the Third One Health Situational Analysis was similar to that used in the 2nd One Health Situational Analysis, except that one indicator was added in focus area 5 on IPC and AMS, with additional sub-indicator, 5.6. Biosecurity (IPC) in the animal sector (see Annex 1) The Third One Health Situational Analysis relied on communications and virtual discussions as follows:

- A joint letter from, FAO WHO and WOAH was sent to the 11 Member Sates along with the tool in the Excel Format, requesting the Member States to update the implementation of the NAP for 2019–2021 period, by filling out the predesigned form.
- Progress on the implementation of NAPs was updated for the period of 2019–2021, by the national counterparts (health, veterinary agriculture and environmental sectors) in coordination with WHO focal points and the representatives from Tripartite organizations and UNEP.
- The analysis covers eight focus areas, namely (i) national action plan and overnance; (ii) raising awareness; (iii) national AMR surveillance system; (iv) infection prevention and control (IPC) and WASH; (v) AMS and rational use of antimicrobials; (vi) research and innovation; (vii) One Health engagement; and (viii) overarching coordination in One Health.

  There are 31 indicators in all those eight focus areas. The status of implementation in each of the 31 indicators is categorized into five phases, namely, Phase 1: Exploration and adoption; Phase 2: Programme installation; Phase 3: Initial implementation; Phase 4: Full operation; and Phase 5: Sustainable operation.
- As in the previous situational analysis, phase 3 or initial implementation is considered as a cut-off point in assessing progress, covering all the 31 indicators. The decision on the phases of implementation, issues and challenges, and recommendations were made jointly by the national counterparts and experts from the WHO/Tripartite organizations.
- Email communication and virtual meetings were held to discuss the countries' activity reports, and focusing on what actions were implemented during the period, what were the phases of implementations, what issues and challenges were being faced and what recommendations were proposed for improvement.

The methodology, however, has some limitations.

- A face-to-face guided discussion can be interactive and participatory where stakeholders, the national counterparts (health, veterinary and environmental sectors), representatives of the Tripartite organizations could share their understanding and jointly make decisions on the implementation phase, issues and challenges and recommendations for improvement. More in-depth discussion could be achieved to understand the dynamic of progress in each country. During virtual discussion, in-depth group interaction to understand the dynamic of progress in countries could not be achieved as much as that in a face-to-face meeting. Moreover, the group interaction and participation during the virtual-guided discussion could be less intensive and less participatory.
- Each member or the stakeholder may be occupied by some other task, e.g. dealing with activities concerning the COVID-19 pandemic, so less time and concentration are dedicated for reporting relevant activities for the Third One Health progress analysis of the implementation of NAPs-AMR.

3

Results

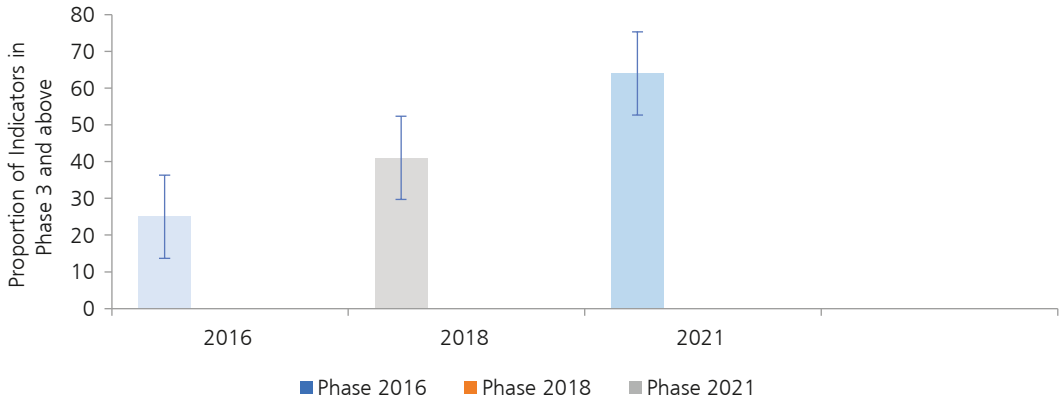
In December 2021, all the 11 countries of the South-East Asia Region finally submitted the countries' activity reports. The analysis was undertaken based on the data from all 11 countries. The NAPs-AMR implementation was reviewed following three different approaches, namely (A) Overall implementation status in countries; (B) Implementation status in each specific focus area and indicator; and (C) Individual country profiles.

A. Overall implementation status in countries

The overall implementation status in countries was estimated based on the percentage of indicators with implementation status phase of 3 and above. All 11 countries (100%) showed improvement in their country's progress as measured by the proportion of all indicators with implementation phases of 3 and above. None of them showed any backward slide in the implementation during the situational analysis in 2021 compared to the situational analysis in 2018, despite the occurrence of the COVID-19 pandemic during the last 2 years. Furthermore, of the 11 countries, three showed the highest progress, as measured by percentage of indicators exhibiting implementation phase of 3 or above, namely Bhutan (83%), DPR Korea (77%) and Thailand (90%).

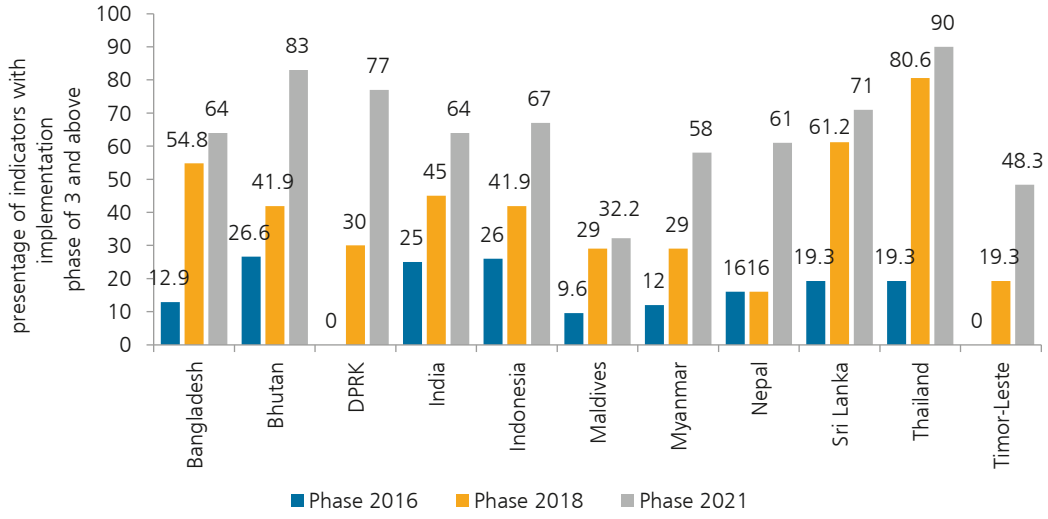
The median value of overall countries' implementation status obtained during the 2021 One Health Situational Analysis was 64%, with the least value of 32% for Maldives and the highest value of 90% for Thailand. Obviously, there was significant progress in implementation compared to the previous situational analysis in 2018 and 2016, where the median values were only 40% and 25%, respectively **(Fig. 1**).

Fig. 1. Overall country implementation status showing median values of percentage of indicators with implementation phases of 3 and above



The progress of implementation in each individual country could also be seen in Fig. 2, showing consistent improvement in the implementation phase from 2016 to 2021.

Fig. 2. Proportion of indicators with implementation phase 3 or above in each country from 2016 to 2021



Implementation status in specific focus areas

The implementation phase of each indicator in eight focus areas is summarized in Annex 2. No countries were observed to show initial implementation (implementation phase 3) in indicator **3.4** Early warning systems (EWS), and indicator **7.2** National surveillance of AR and AMR in wastewater from manufacture and use in the human, animal and fishery sectors.

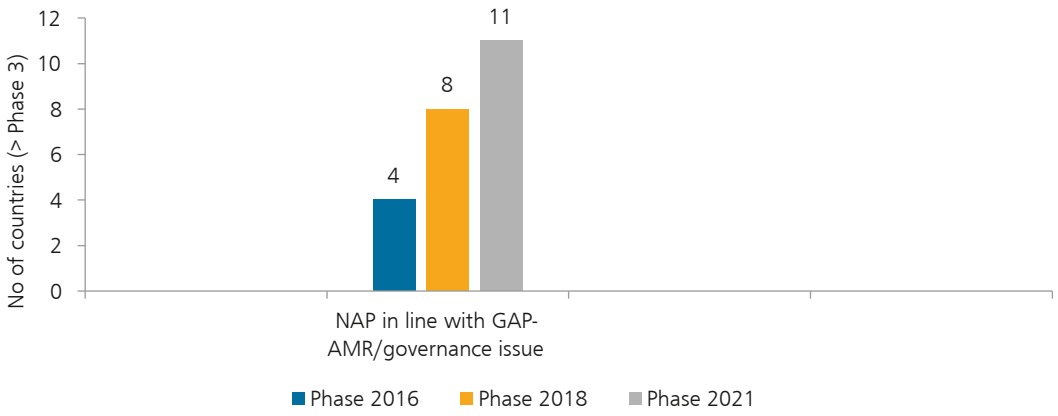
Focus area 1: National Action Plans in line with Global Action Plan

Indicator 1.1. NAP in line with the GAP-AMR/level of governance

All 11 countries (100%) of the South-East Asia Region have NAPs on prevention and control of AMR in line with the GAP. This is significant progress compared with the 2018 (72%) or 2016 (36%) situational analysis. Thus, they had the NAP with its operational plan and defined activities. Budgets were available for implementation, either from the government or from external sources. Most of the external funds came from the British Government through the Fleming Fund[26]. The recipient countries included Bangladesh, Bhutan, Indonesia, Myanmar, Nepal and Timor-Leste. Some funds also came from WHO country budgets. Timor-Leste had a NAP in line with the GAP which was pending government endorsement, but planned activities were already implemented using government funds and other external resources **(Fig. 3)**.

26 Improving Awareness and Understanding of AMR. Fleming Funds. 2018 [https://www.flemingfund.org/our-approach/our-activities/ , accessed Dec 2021).

Fig. 3. Number of countries with NAP-AMR in line with the Global Action Plan



Focus area 2: Raising awareness

There are four indicators in focus area 2 on Raising awareness, namely awareness campaigns for the public, education and training strategies for professionals in the human health sector, AMR awareness generation and education in the animal sector, and awareness generation and education in the environmental sector.

Indicator 2.1. Awareness campaigns for the public

In all 11 countries (100%), the government regularly led educational campaign on AMR prevention and control and directed to the general public. This was an improvement from the situational analysis in 2018 (81%) and 2016 (27%). The campaign for AMR has been undertaken regularly every year, especially during the WAAW. The WAAW has become a useful forum to engage all stakeholders in educational campaign from the human, veterinary and environmental sectors. There is an obvious need to extend and sustain the campaign activities beyond the WAAW throughout the year, and to measure the impact of the campaign on behavioural changes of the target audience in using antimicrobials.

Indicator 2.2. Education and training strategies for professionals in the human health sector

In all 11 countries (100%), training materials on AMR have been incorporated into the pre-service training curricula and in-service continuing professional development of health workers. Obviously, there was significant progress compared to the earlier situational analysis in 2018 (81%) and 2016 (18%).

The AMR-related training materials were also part of continuous professional development undertaken through national or institutional seminars or workshops. In Bangladesh, professionals were reached through workshops, training and seminars in all tiers of the health system including academic institutions. There are specific activities regarding education and training present in the NAP. The specific topic of AMR is in the process of being introduced in pharmacists'/medical curriculums. AMR training is conducted for health professionals.

In DPR Korea, AMR has been incorporated in the curricular for pre-service education in medical universities/colleges. Training on AMR is included in the reorientation programme of medical doctors and professionals and is conducted on a regular basis. Development of a standardized training package is planned.

In Indonesia, a joint AMR awareness raising and education campaign through seminars for students and faculties of veterinary medicine, medicine, pharmacy, and animal husbandry was conducted to improve the understanding and awareness of prudent and rational use of antibiotics in humans and animals. These seminars have been implemented with all 11 Indonesian veterinary faculties over the past three years.

Indicator 2.3. AMR awareness generation and education in the animal sector

In eight countries (72%) – Bangladesh, Bhutan, DPR Korea, Indonesia, Myanmar, Maldives, Sri Lanka and Thailand – materials related to AMR have been incorporated in the pre-service and in-service training of providers in the animal sector. India, Nepal and Timor-Leste had not implemented AMR-related issues in the pre-service and in-service training curricula of workers in the animal sector.

It was a significant development compared to the previous situational analysis, where only four countries (36%) – Bhutan, Indonesia, Sri Lanka and Thailand – incorporated AMR awareness in the training of providers in the animal sector in 2018, and none (0%) in 2016.

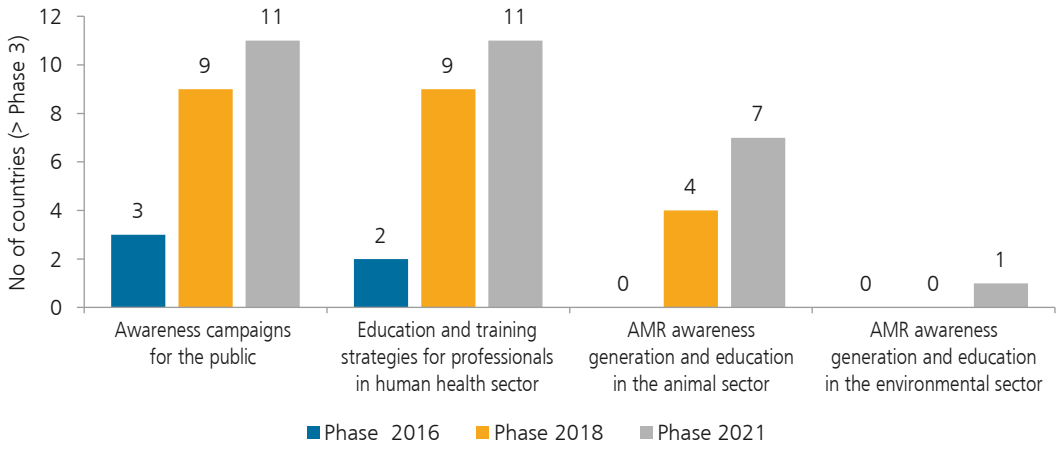
In Bangladesh, strategies have been formulated to raise awareness among veterinary professionals. Experts from the human and animal sectors are involved in training health-care professionals. A short user-friendly AMU guideline was formulated by *Bangladesh* AMR Response Alliance (BARA) in collaboration with government partners and development partners. Users of this guideline are mostly BARA members. In DPR Korea, AMR is covered in the curricula for graduating veterinarians and for veterinary professionals in some educational institutions.

Indicator 2.4. AMR awareness generation and education in the environmental sector

In contrast to the human and animal sectors as described above, materials related to AMR awareness generation and education in the environmental sector had not been implemented in most countries (90%) in 2021. Only in DPR Korea, these materials had been incorporated to some extent in the pre-service training of professionals of food production, food safety and environment.

Indeed, there is an obvious need to create awareness on AMR to the environmental sector, especially on the disposal of AM materials into the environment. It was true that little progress was noted in introducing AMR in the education of environmental sector. The introduction of AMR into the education of environmental sector as well as to the public remains a big challenge for most countries. This would require a systematic needs assessment approach.

Fig. 4. Raising awareness



Focus area 3: National AMR surveillance system

This focus area covers indicators on the national AMR surveillance system, national network of laboratories for humans, national network of laboratories for animals, and the EWS.

Indicator 3.1. National AMR human surveillance system

Ten countries (90%) – Bangladesh, Bhutan, India, Indonesia, DPR Korea, Myanmar, Nepal, Sri Lanka, Thailand and Timor-Leste – have established a national AMR human surveillance system. This is significant improvement compared to the situational analysis in 2018 (45%) and 2016 (27%).

In Indonesia, a national AMR surveillance platform and mechanism, the National Coordination Centre (NCC), and the NRL and sentinel sites were established in 2019. The national capacity was strengthened and expanded on AMR surveillance systems including enrolment and contribution of data to the GLASS in 2019. AMR surveillance guidelines have been developed, although not yet fully implemented.

In Maldives, due to excessive workload from COVID-19, submission of data to GLASS was not undertaken since 2020.

In Thailand, National Antimicrobial Resistance Surveillance Center Thailand (NARST) has long been operational. They also have enrolled in GLASS and shared their data for some years, and the AMR situation can be reported in the forms of national and local patterns.

The Sri Lanka National Human AMR Surveillance system has been established and contributed to GLASS since 2018. WHONET capacity building programmes for sentinel site staff was conducted again in 2021. Myanmar started using WHONET software to collect routine AMR data and report to GLASS since 2019. AMR surveillance sites were established including the NRL. The national AMR surveillance guideline was finalized in 2020 to guide the implementation of the surveillance system. Based on the experience in Myanmar, one of the important factors making the success in developing AMR surveillance network, is the availability of clear, practical local guidelines for implementation.

Indicator 3.2. Strengthening of the national laboratory network for humans

There was an established mechanism for the national laboratory network for humans in 10 countries (90%) – Bangladesh, Bhutan, DPR Korea, India, Indonesia, Myanmar, Nepal, Sri Lanka, Thailand and Timor-Leste. Such laboratory network did not exist yet in Maldives. This is notable progress compared to the situational analysis in 2018 (63%) and 2016 (27%).

In Bhutan, the Royal Centre of Disease Control (RCDC), under the Ministry of Health in Thimphu has been designated and functional as NRL for conducting national external quality assurance. The NRL, RCDC and Jigme Dorji Wangchuk National Referral Hospital (JDWNRH) have been participating in the external quality assurance system (EQAS), biosafety, biosecurity and AMR surveillance. In Nepal, standardized protocols/guidelines were updated, and annual trainings were conducted to build technical expertise in laboratory diagnostics, strengthen laboratory network, and augment data management capacity. The National Laboratory Network for Human Health in Timor-Leste was considered as a referral centre providing laboratory services across referral hospitals and community health centres.

Indicator 3.3. Strengthening of the national laboratory network in the animal sector

Five countries (45%) – Bhutan, Indonesia, Myanmar, Sri Lanka and Thailand – have established a national laboratory network for the animal sector. This is notable progress compared to the situational analysis in 2018 and 2016, where no countries had a national laboratory network in the animal sector.

In Indonesia, the establishment of a laboratory network for clinical AMR surveillance had been initiated by FAO during implementation of a pilot clinical AMR surveillance in 2019. Establishment of a laboratory network for clinical AMR surveillance would be continued using the Fleming Fund in 2021.

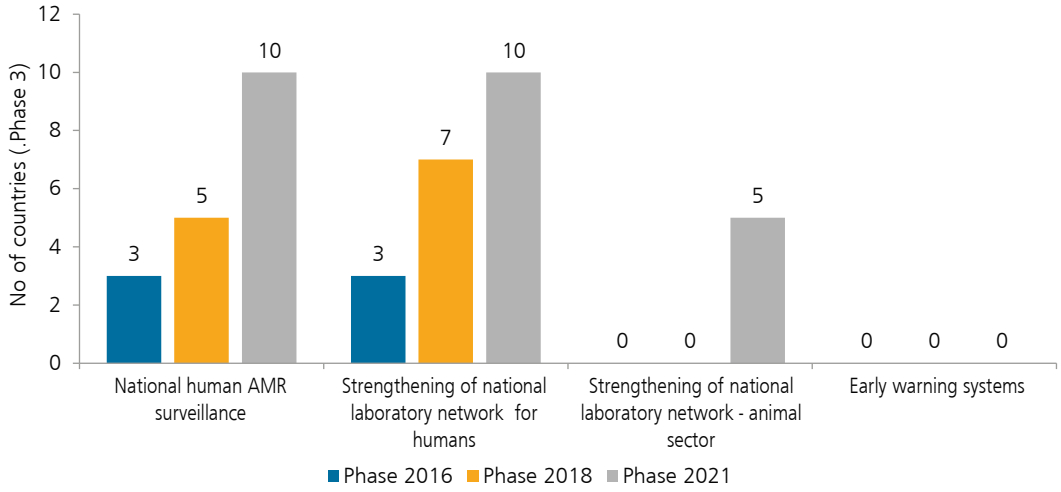
In Bangladesh, the NRL participated in the second round of three rounds of the External Quality (EQ) Asia proficiency test. Training was imparted to the microbiologists and project facilitators on WHONET. Sentinel sites of the first phase, along with the NRL, the Institute of Epidemiology Disease Control and Research (IEDCR) participated in the proficiency test run by the College of American Pathologists (CAP) (2016–2020)[27].

Indicator 3.4. Early warning systems

None of the countries were found to have reached the implementation status of phase 3, meaning that the AMR EWS was not yet implemented in all countries. This is a serious challenge to be dealt with in anticipating the possible occurrence of fatal infections with resistant microbes, which may become public health concern in the future. There is a need for local practical guidelines and training for laboratory staff.

27 The findings of Antimicrobial Resistance Surveillance in Bangladesh (2016–2020). MedRxiv preprint, 2021 (https://www.medrxiv.org/content/10.1101/2021.06.12.21251710v3.full.pdf, accessed June 2022).

Fig. 5. National AMR surveillance system



Focus area 4: Rational use of antimicrobials and surveillance of use/sale (community-based)

Indicator: Antimicrobial stewardship (AMS) in health-care settings

Eight countries (72%) – Bhutan, DPR Korea, India, Indonesia, Myanmar, Nepal, Thailand and Timor-Leste – have implemented AMS in health-care settings. This shows much progress compared to the situation in 2018 (18%) or 2016 (27%).

In Bhutan, AMS has been established in the national referral hospital and two regional referral hospitals. Guidelines and protocols were available in few hospitals and are in the process of implementation in different sites.

In Indonesia, AMR prevention and control in health-care settings was available, including its regulations and guidelines. Relevant committees existed in health-care settings both for referral (hospital) and primary health centres *(Puskesmas),* along with trained personnel.

In Myanmar, bacterial cultures and sensitivity testing were carried out in 30 public hospitals laboratories, and an annual antibiogramme for each specific hospital was developed. IPC guidelines were in place for hospitals with designated IPC focal points. WASH for health-care facility also includes AMR containment strategies. In DPR Korea, a national AMS strategy was reportedly developed, and a national list of essential medicines (NLEM) was updated adopting the AWaRe classification in 2019.

Indicator 4.1. A national AMR containment policy for control of human use of antimicrobials; AMS (see also 7.1)

Seven countries (63%) had an official AMR containment policy for control of human use of antimicrobials and AMS. These countries are Bhutan, DPR Korea, India, Maldives, Nepal, Thailand and Timor-Leste. This is significant progress compared to the situational analysis in 2018 (9%) where only Thailand had the official national AMR containment policy.

In Maldives, National AMR Policy 2019–2023 has been implemented, the stewardship programme was in the process of endorsement. The new EML with antibiotics AWaRe classification was in the process of endorsement serving as a basis of AM supply at health facilities.

The NLEM 2021 in Nepal has been endorsed by the government, with the AWaRe classification of antibiotics, serving for AM supply and use at health facilities.

In Thailand, a systems-based, integrated approach to addressing AMR in hospitals has been developed. The initiative requires organizational leadership with a strong governance mechanism to guide strategic, evidence-based actions to reduce AMR-related morbidity across disciplines, focused on infectious disease doctors, infection control nurses, clinical pharmacists and microbiology laboratory staff. Along with the development of an assessment tool for the systems-based, integrated antimicrobial management in hospitals, the initiative is currently being scaled up nationwide[28].

Indicator 4.2. NRA/NMRA

In all countries (100%), there was a functional NRA mandated to control the production, importation, sale and use of medicinal products including antimicrobials. An improvement compared to the situational analysis of 2018 (90%) and 2016 (63%). However, the capacity of enforcement of regulations could vary between countries, especially on the distribution, sale and quality surveillance of antimicrobials.

In Indonesia, the sampling and quality testing of antibiotics have been routinely undertaken. The National Agency of Drug and Food Control (NADFC) conducts pre- and post-marketing quality control of antimicrobial medicines as part of quality assurance activities. Good manufacturing practice (GMP) and good distribution practice (GDP) have already been performed on the production, distribution of medicines including antimicrobials. GPP has been implemented in health-care facilities. There was also a cyber patrol to control the online drug sale.

In Thailand, reclassification of antibiotics was prioritized as the first step by adopting the AWaRe concept for controlling the distribution of antibiotics. In Timor-Leste, capacity building on NRA/NMRA was ongoing. The NRA/NMRA was with limited capacity but with strategic planning already in place for capacity building and appropriate budgeting.

Indicator 4.3. Surveillance of AMC, use and sale among humans

Except in Myanmar, in all other 10 countries (90%), there was a functioning surveillance system for medicines use and sale among humans including antimicrobials, run by the NRA. This is notable progress compared to the situational analysis in 2018 (63%) and 2016 (27%). However, as of April 2022 only six countries had officially enrolled in the WHO GLASS-AMC module. These countries are Bangladesh, Bhutan, Indonesia, Maldives, Nepal and Timor-Leste.

Since 2017, Thailand published an annual report on Thailand One Health Report on AMC and AMR. The last report was in 2019 and the 2020 report was under way. The report covers the human

28 Thailand's national strategic plan on antimicrobial resistance: progress and challenges. World Health Organization, 2021 (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8381094/, accessed December 2021).

as well as animal sectors. Surveillance of AMC is extremely important, as containment of AMR would not be possible without controlling the consumption in both the human and animal sectors.

In Maldives and Nepal, antibiotic utilization data collected and antibiotic use analysis was done from 2016 to 2019 through WHO consultancy.

In DPR Korea, the monitoring of antimicrobials consumption was implemented at the national level. Monitoring and facility audit of antibiotic prescribing and appropriate use have been conducted on a regular basis. In Indonesia, AMU monitoring programme in humans, including antibiotics use in health centres (*Puskesmas*) was used as an indicator of rational use of medicine (for two diseases: non-pneumonia ARTI and acute diarrhoea), and routinely reported to the MoH.

Indicator 4.4. Regulation of finished antibiotic products and APIs

In 10 countries (90%) except in Timor-Leste, there was regulation controlling the production, importation, distribution, sale and use of antibiotics products and APIs, implemented by their NRA. This is significant progress compared to the situational analysis in 2018 (72%) and 2016 (27%). Thailand has fully implemented the regulation of the Drugs Act No. 6, B.E. 2562 (2019), regarding the licensing of medicines including antimicrobials.

The Health Minister's decree of Indonesia regulates that all pharmaceutical companies should report efficacy, safety and quality of medicines including finished antibiotic products and APIs for registration. This regulation is well functioning and followed by all pharmaceutical companies. The registration of the medicine system was in place and fully and effectively operational.

Indicator 4.5. Regulation of pharmacies regarding OTC sale and inappropriate sale of antibiotics and APIs

The regulation of pharmacies pertaining to OTC sale and inappropriate sale of antibiotics and APIs existed in nine countries (81%) – Bangladesh, Bhutan, India, Indonesia, DPR Korea, Maldives, Nepal, Sri Lanka and Thailand – and implemented by their NRAs**.** This was higher compared to the situation in 2018 (63%) and 2016 (36%); however, the enforcement of the regulations may vary across countries.

DPR Korea has a government supply system that supplies drugs to facilities and pharmacies, where all drugs are centrally procured. All facilities and pharmacies are owned by the government, hence the quality is ensured.

In Sri Lanka, the regulation of pharmacies follows the National Drug Act and implemented by the NMRA. As per the Drug Act, all antibiotics are supposed to be sold only by prescription; OTC dispensing is not permitted. There are strict regulations concerning the distribution and sale of antimicrobials. Appropriate action is taken for any un-authorized issuing of antimicrobials without prescriptions.

Thailand was in the process of reclassification of antibiotics, and will propose a roadmap of reclassification in a systematic way under the National Committee on AMR.

In Indonesia, law number 419/1949 on Prescription Drug and Ministerial Decree No 1331/2002 on Licensed Drug Store regulates antibiotics as prescription drugs which cannot be sold OTC.

Indicator 4.6. A national AMR containment policy and regulatory framework for control and registration of use in animals

In seven countries (63%) – Bangladesh, Bhutan, DPR Korea, India, Indonesia, Sri Lanka and Thailand – there was a national regulation for control and registration of use of medicines in the veterinary sector. This is an improvement compared to the situation in 2018 (45%) and 2016 (9%).

In India, national guidelines for use and sale of antibiotics have been developed; however, these are not aligned with WOAH and therefore not reported to WOAH. INFAAR (Indian Network of Fisheries and Animal Research on AMR) network has 22 laboratories in animal husbandry and fisheries. Colistin has been banned as a growth promoter in animals.

In 2018, the Ministry of Agriculture and Cooperatives in Thailand issued a regulation to control medicated feed under the Animal Feed Quality Control Act, 2015. This regulation aims to control the production, importation and sale of medicated feed and veterinary medicines for mixing in animal feed.

Indicator 4.7. National surveillance of AMR and use and sale of antimicrobials in the veterinary sector

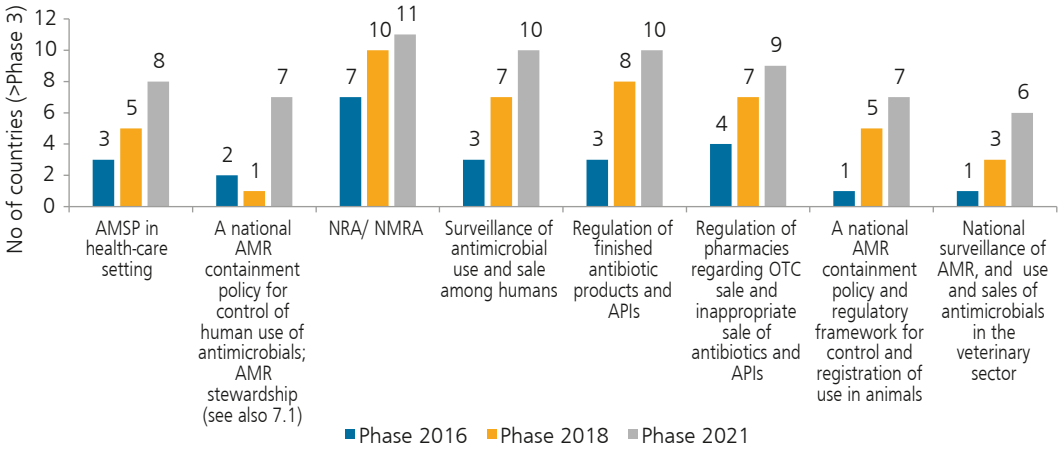
In six countries (54%) – Bhutan, DPR Korea, Indonesia, Nepal, Sri Lanka and Thailand – there was a national surveillance, on the use and sale of antimicrobials in the veterinary sector. Such regulation did not exist in Bangladesh, India, Maldives, Myanmar and Timor-Leste.

In Nepal, antibiotic sensitivity testing has been routinely done in veterinary laboratories for samples (milk, post-mortem samples, etc.). Sharing of the antibiotic sensitivity results has been done with the national public health laboratory (one-way sharing) and the Central Veterinary Laboratory (CVL) has been identified as the coordinating laboratory for AMR.

The National AMR Surveillance and Monitoring Programme in the Animal Health Sector in Sri Lanka has been devised currently and is being implemented. The plan indicates the target bacteria, sampling, and other relevant operational protocols. The Veterinary Research Institute is the designated national reference laboratory for this initiative, with 25 other regional laboratories providing support to the national programme.

In Thailand, the Department of Fisheries (DoF) has conducted the AMR surveillance programme for targeted bacteria isolated from pond water and economically important aquatic animal species (e.g. tilapia and whiteleg shrimp) from freshwater and brackish water aquaculture areas in 50 provinces in Thailand. The DoF has planned to develop guidelines on AMR surveillance in aquaculture, which is consistent with relevant international guidelines (FAO/WHO/WOAH). Bhutan conducted a point prevalence survey (PPS) on AMU in the national and two regional hospitals. A system for routine monitoring of AMU is being developed. They also enrolled in GLASS AMC.

Fig. 6. Rational use of antimicrobials and surveillance of use/sale (community-based)



Focus area 5: Infection prevention and control (IPC)

Indicator 5.2. IPC programme in health-care settings

Ten countries (90%) – Bangladesh, Bhutan, DPR Korea, India, Indonesia, Myanmar, Nepal, Sri Lanka, Thailand and Timor-Leste – have implemented IPC programme in their health-care settings. This is significant progress compared to the previous situational analysis in 2018 (45%) and 2016 (45%). Such a programme did not exist yet in Maldives.

In India, a national patient safety framework/IPC was implemented in selected health-care facilities.

Thailand has a significant step in the development of IPC programmes in hospitals in 2019 when the Department of Disease Control (DDC) utilized the Communicable Disease Act B.E. 2558 (2015) to implement IPC programmes in hospitals.

In DPR Korea, a national IPC policy aligned with AMR was developed and implemented in health facilities.

In Nepal, an IPC committee was established in the country's hospitals. The national IPC guideline was in the process of development.

Indicator 5.3. National health-care-associated infections (HCAI) and related AMR surveillance

Six countries (54%) – Bhutan, DPR Korea, Indonesia, Myanmar, Sri Lanka and Thailand – had a monitoring system for HAIs and AMR. The remaining countries – Bangladesh, Maldives, Nepal, Sri Lanka and Timor-Leste – have not implemented a monitoring system. Tis is an improvement compared to 2018 (45%) and 2016 (9%).

Every public hospital in Myanmar has its own Hospital Infection Control Committee (HICC) and the implementing team comprises Medical Superintendent, operating theatre and ICU in-charge, microbiologist, and nurse. Basic IPC facilities at hospitals and laboratories and a Technical Working Group (TWG) IPC would be in the One Health approach.

In 2018, the scope of the HAI surveillance system in Thailand was expanded to include AMR and data were collected from approximately 600 hospitals to develop and upgrade the HAI surveillance system into an HAI and AMR surveillance system.

Indicator 5.4. Sanitation and hygiene

In all countries (100%), sanitation and hygiene programme have been implemented. During the COVID-19 pandemic the hand washing programme was enforced at all health facilities and hospitals. In Bangladesh, WASH system strengthening in hospitals is being implemented. In Maldives, following the on-going pandemic situation, a nationwide campaign on hand hygiene was initiated. Proper hand-wash technique was taught through all media channels and social media.

In Nepal, the WASH programme was implemented as a sanitation campaign. National IPC and WASH and environmental health standards exist but are not fully implemented and still need improvements. Data were available, showing communities, schools and health-care facilities with limited availability of safe water. Guidelines and training were implemented.

Indicator 5.5. Vaccination

All 11 countries (100%) of the Region have implemented pneumococcal conjugate vaccination (PCV) to prevent pneumococcal infection. This is notable progress compared to the situational analysis in 2018 (54%) and 2016 (0%).

In Indonesia, the PCV Immunization Demonstration Programme was initially implemented from 2017 to 2019 in West Nusa Tenggara and Bangka Belitung Provinces. In June 2021, the programme was scaled up nationwide with support from the Global Alliance of Vaccine (GAVI), United Nations International Children's Fund (UNICEF) and partners[29]. The country also received 1.6 million doses of the vaccine procured through the GAVI Pneumococcal Advanced Market Commitment mechanism.

The EPI system in DPR Korea was reportedly well established. Nationwide information, education and communication (IEC) activities were conducted on a regular basis to increase social awareness, interest and attendance to vaccination, monitoring system was well developed. Hence, the EPI coverage was sustained at a high level.

In Maldives, the national immunization programme is ongoing despite the pandemic and access to safe water is ensured for the Maldives population.

Disease burden is reviewed periodically in Sri Lanka. Based on that, vaccines are introduced to the immunization programme. The national EPI immunization coverage is 100%. PCV is available in the private sector to individuals but is not included in the EPI schedule.

29 Indonesia introduces pneumococcal conjugate vaccine (PCV) across the country. UNICEF, 2021 (https://www.unicef.org/press-releases/indonesia-introduces-pneumococcal-conjugate-vaccine-pcv-across-country, accessed December 2021).

Indicator 5.6. Biosecurity (IPC) in the animal sector

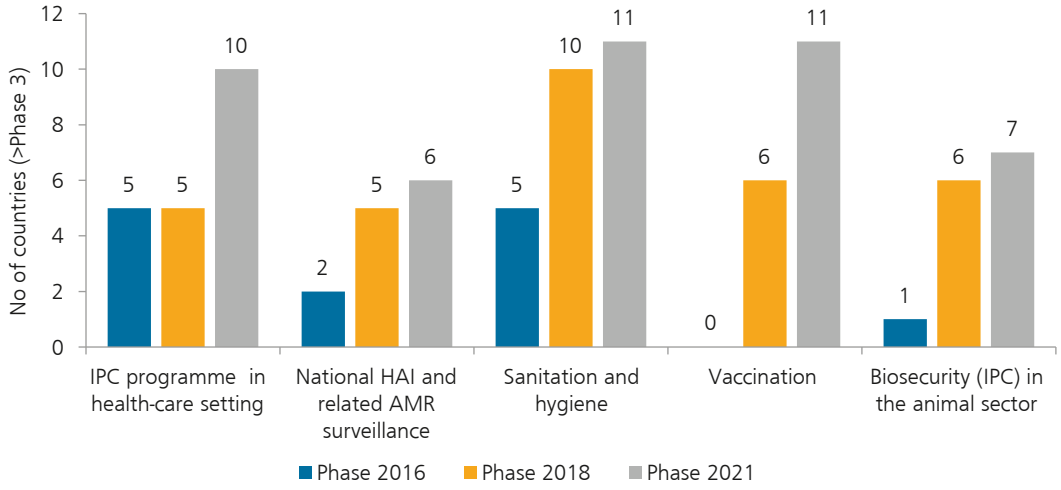
Seven countries (63%) – Bangladesh, DPR Korea, India, Indonesia, Nepal, Sri Lanka and Thailand – have implemented biosecurity measures in the animal sector. This is significant progress compared to the situational analysis in 2018 (54%) and 2016 (9%).

Training for small- and medium-sized farms in Indonesia have been done. Antibiotic Growth Promotor (AGP) has been banned, and farmers are required to apply biosecurity.

In Sri Lanka, policies, strategies and guidelines were developed with a focus on poultry only. Audit of breeder farms for biosecurity was carried out and guidelines for outbreak response in place with supportive legislations.

In Thailand, biosecurity practices are implemented on livestock and aquaculture farms, which include sanitation, animal management, feed management, facility maintenance, waste management and disposal of dead animals.

Fig. 7. Infection prevention and control



Focus area 6: Research and development

Indicator 6.1. R&D and innovation on AMR prevention and containment and research funding

Three countries (27%) – Bhutan, Myanmar and Thailand – have officially embarked on research and innovation on AMR and improving rational use of medicines. This is an improvement compared to the situational analysis in 2018 (18%) and 2016 (0%).

In Bhutan, operational research is being carried out by Fleming Fellows on the AMR, AMU and AMC patterns in the country.

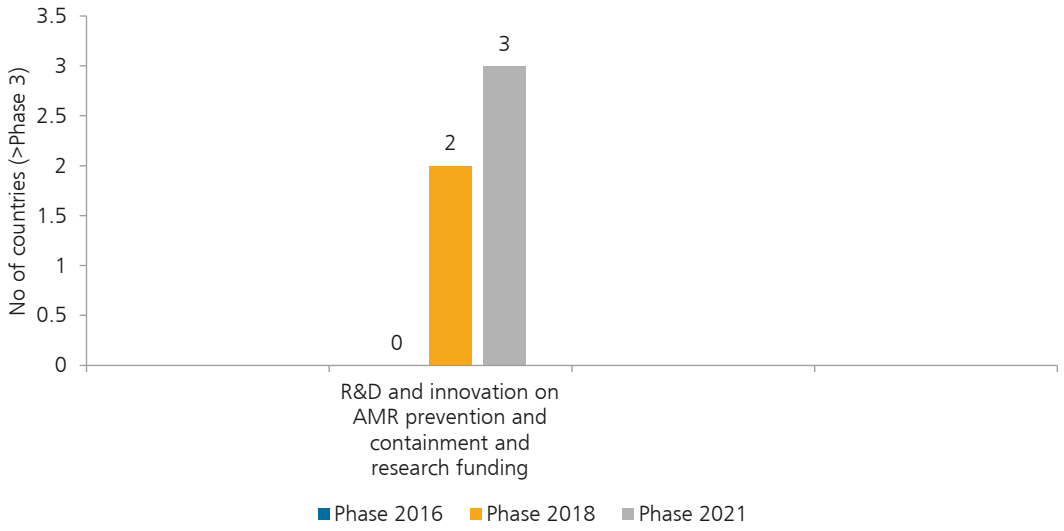
In Thailand, some relevant activities are implemented acording to the Country Cooperation Strategy Programme on AMR. These include for example, researching/mapping using point prevalence survey on AMU in hospitals. The National Guideline for assessing the Integrated Antimicrobial Resistance Management in hospital is being developed. Research consortium, dynamic research

programmes are ongoing thanks to government-led agenda (National Forum on AMR). The NAP outlines a plan to foster R&D and innovation on AMR prevention and containment. Funds have been secured from domestic and international donors.

Nepal hosted the AMR Structured Operational Research and Training IniTiative (SORT IT) course with support from the Ministry of Health and Population (MoHP). SORT IT is a global partnership coordinated by Tropical Disease Research (TDR) – The Special Programme for Research and Training in Tropical Diseases, and various partners who support countries to build sustainable capacity to conduct and publish operational research and use the evidence for informed decision-making to improve public health.

The NAP outlines research and development activities for AMR surveillance in Myanmar. Several research activities have been undertaken with the One Health approach. The country has devised AMR research agenda, prioritized across sectors, conducted six priority research areas in 2020 and funds are secured. Operational research is being carried out by Fleming Fellows on the AMR, AMU and AMC pattern in the country.

Fig. 8. Research and innovation



Focus area 7: One Health engagement

Indicator 7.1. A national AMR containment policy and regulatory framework to control the release of AR and AMR into the environment and management therein

Three countries (27%) – Indonesia, Sri Lanka and Thailand – have a national AMR containment policy and regulatory framework to control the release of AR into the environment. This is notable progress compared with 0% in 2018 and 2016, respectively.

In Indonesia, Health Minister's decree regulates good manufacturing practice (GMP) and the National Agency of Drug and Food Control (NADFC) issued the guideline that includes preventing disposal of residues including antimicrobials to the environment.

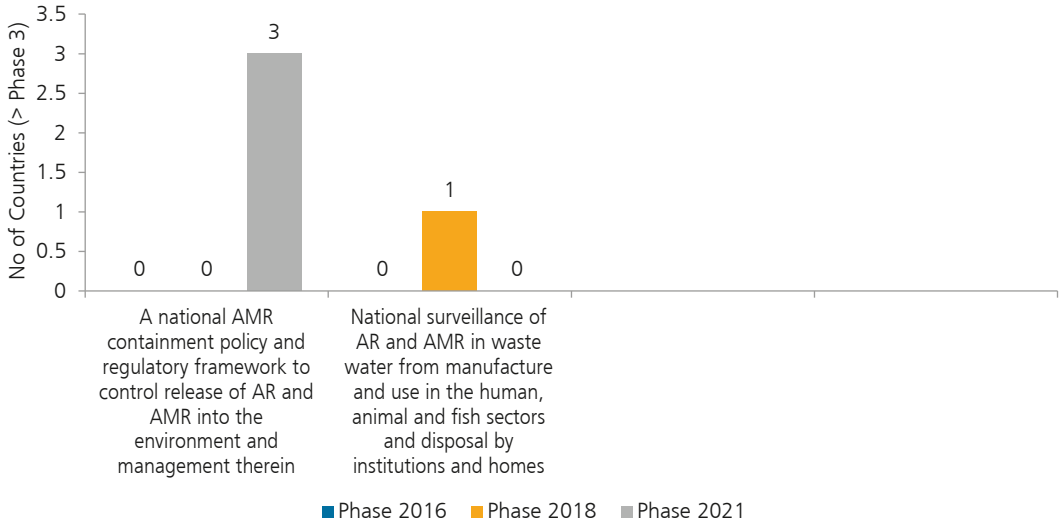
In Sri Lanka, a national policy to reduce antimicrobial waste generation has been formulated. Regulations are in place to control AR emissions from antimicrobial manufacturers, hospitals and wastewater treatment plants. Environmental protection policy (licence) is renewed annually, and environmental impact assessment is mandatory for new projects.

The existing policy to address AMR in the environmental sector was done by inclusion of the Ministry of Natural Resources and Environment into the One Health AMR committee. Thailand has the framework of integrated AMR surveillance under the One Health approach including AMR surveillance in the environment.

Indicator 7.2. National surveillance of AR and AMR in wastewater from manufacture and use in the human, animal and fishery sectors and disposal by institutions and homes

None of the countries have a national surveillance of AR and AMR in wastewater from manufacture and use in the human, animal and fishery sectors.

Fig. 9. One Health engagement



Focus area 8: Overarching coordination mechanisms for One Health engagement

Indicator 8.1. Overarching AMR coordination mechanism

In nine countries (81%) – Bangladesh, Bhutan, DPR Korea, India, Myanmar, Nepal, Sri Lanka, Thailand and Timor-Leste – there was already a functioning One Health coordination mechanism. This is notable progress compared to 2018 (27%) and 2016 (0%) One Health Situational Analysis. Under the Multisector Steering Committee and the National Technical Working Committee, different Technical Working Committees have been formed with respective pillars of the strategic objectives for NAP-AMR.

In Bhutan, there is a multisectoral national steering committee as well as a national technical committee on AMR, led by the Ministry of Health with defined terms of reference for various stakeholders. AMR technical committee currently includes members from the animal and human health sectors; they report to the Inter Ministerial One Health Committee (IMCO). This Inter Ministerial One Health Committee organizes all One Health activities.

In Sri Lanka, an overarching AMR coordination has been ensured by establishing a National Advisory Committee on AMR and the NAP implementation strengthening team on the basis of a multisectoral approach.

Thailand developed Thailand's NAP for tackling the problem of AMR in an integrated and coherent manner under the One Health approach. The **National Policy Committee** on Antimicrobial (NPC-AMR) is the national governance mechanism for the National Strategic Plan on Antimicrobial resistance (NSP-AMR) implementation, steering and supervising collaborative actions among agencies and stakeholders across sectors to ensure an orchestrated and effective implementation of NSP-AMR[30]

In Indonesia, presidential instruction No. 4/2019 supports the development of a fully functional cross-sectoral coordination mechanism for AMR control, which also demonstrates strong commitment of the Indonesian government to ensure implementation of an integrated AMR approach through partnership of several sectors. The Ministry of Health (MoH) is assigned as the coordinator and Ministry of Agriculture and Ministry of Marine and Fishery are members of the coordination mechanism. The organizational structure is not yet materialized and the MoH has been assigned as coordinator for routine activities for all sectors.

Similarly, in Maldives a national coordination committee has been established since 2016, but there was no legal provision to implement it.

Indicator 8.2. Inclusion and engagement of all relevant sectors in the NAP-AMR

In nine countries (81%) – Bangladesh, Bhutan, India, Indonesia, Myanmar, Nepal, Sri Lanka, Thailand and Timor-Leste – there was engagement from all sectors in the implementation of the NAP-AMR. This is notable development compared with that in 2018 (27%) and 2016 (0%).

In Bangladesh, the NAP-AMR engages human health, animal health, drug administration for humans and animals, plant health, civil society, and the private sector (primarily Pharmaceutical and Chemists' Associations) and WASH.

In Nepal, the national AMR coordination committee is in the process of ensuring representation in the federal context. A national AMR multisectoral committee has been proposed with representation from the Ministries of Food, Environment, Education, Information Technology and Finance, and the National Health Research Council, civil society and the private sector.

In Thailand, the NAP-AMR includes and engages various sectors, including human health, animal health, agriculture, environment, food safety, food production, WASH, trade and civil society for the containment of AMR.

Indicator 8.3. A platform and/or mechanism to share AMU monitoring data from relevant sectors

In five countries (45%) – Bangladesh, Bhutan, DPR Korea, Indonesia and Thailand – there was a mechanism for sharing AMU monitoring data from all sectors. This is small progress compared to 2018 (27%).

30 Thailand's national strategic plan on antimicrobial resistance: progress and challenges. World Health Organization, 2021 (https://apps.who.int/iris/bitstream/handle/10665/344873/PMC8381094.pdf?sequence=1&isAllowed=y, accessed December 2021).

In Bhutan, the NRA monitors AMU in the human and animal sectors. A multisectoral expert committee led a survey on AMC. AMU monitoring is considered a priority and should be set up with the Fleming Fund. They also sent reports to WOAH based on the procurement figures for animal health. For human health, a majority of AMC is in the public sector, which was available from procurement division-enrolled in GLASS-AMC. A system to monitor AMU is being developed, and there was an informal exchange of information between the sectors but there was no policy for decision-making.

In Indonesia, the Ministry of Agriculture conducts the monitoring of AMU of the livestock by sampling. The MoH regularly conducts the monitoring of AMU at primary health centres. Although some universities and institutions conduct studies in hospitals, but this is not reported to the MoH.

In Bangladesh, the NRA monitors AMU in the human and animal sectors. A multisectoral expert committee is leading a survey on antimicrobial consumption. A Task Force to Monitor AMC/AMU in Bangladesh is functioning and having regular meetings.

Indicator 8.4. A platform and/or mechanism to share AMR surveillance data from relevant sectors

In only two countries (18%) – Bhutan and Thailand – there was a functioning mechanism for sharing AMR surveillance from all relevant sectors. This is not so much progress compared to 2018 (0%) and 2016 (0%).

Bhutan AMR surveillance strategy has been developed. A platform for sharing the data is in place. Analysis of data on AMR for human health is in progress. AMR surveillance and data generation in animal health are in progress. The AGISAR project is currently under way.

In Thailand, the One Health approach is applied to all levels of AMR governance structures such as the national AMR strategic committee and working groups with multisectoral planning and implementation. A framework on AMR surveillance under the One Health approach has been developed to monitor AMR and antimicrobial residues throughout human, food chain and the environment. Data platform for multisectoral AMR surveillance including human, food, animal, and environmental has been developed based on WHONET. The plant sector has reported no risk of AMR contamination.

Indicator 8.5. AAW is nationally coordinated and celebrated with involvement of and contributions from relevant sectors

In all countries (100%), the WAAW has been celebrated regularly involving all relevant sectors targeted to professionals as well as communities. This can be an area for engaging all sectors in NAP-AMR advocacy and implementation for all sectors. This is much progress compared to that in 2018 (63%) and 2016 (0%).

In Sri Lanka, the MoH in collaboration with the WHO and the Sri Lanka College of Microbiologists organized three webinars on AMR awareness during WAAW 2021. The first webinar was for the general practitioners, which was organized in collaboration with the College of General Practitioners. The second was organized for the pharmacy owners and pharmacists and the third was for preventive and curative health-care staff, and for the medical, nursing and pharmacy students. Messages were circulated through social media platforms, FB pages, Viber groups, etc. The communication team of WHO country office supported the social media campaign. The majority of posts were based on key messages related to antibiotic use and aimed community awareness.

In Maldives, WAAW activities involving all sectors were carried out successfully in 2019. Awareness-creation activities were organized targeting health-care workers, students and the general public including those in the islands. However, activities for WAAW 2020 were focused only through media due to COVID-19.

In Myanmar, during 2020, IEC materials related to IPC were distributed to COVID-19 cases and people in quarantine centres to increase their awareness on AMR and IPC. The first nationwide AMR and antibiotics awareness survey was conducted in 2020 and the national report was released during the WAAW 2020. Awareness-creation activities for the general public were undertaken by dissemination of AMR public health messages through national TV and radio channels, distribution of IEC materials to the general public and medical professionals. The Myanmar Medical Association led nationwide health talks on AMR, awareness-raising activities targeting doctors.

In Nepal, WAAW has been celebrated jointly by the human and animal health sectors in collaboration with FAO and WHO. Most activities are conducted in Kathmandu. The animal and human sectors celebrate in coordination with each other. Civil societies organizations (CSOs) are also involved. Activities include programmes on national TV, panel discussions, drawing competition and participation from the academia.

Indicator 8.6. A mechanism for co-sharing of resources for AMR initiatives

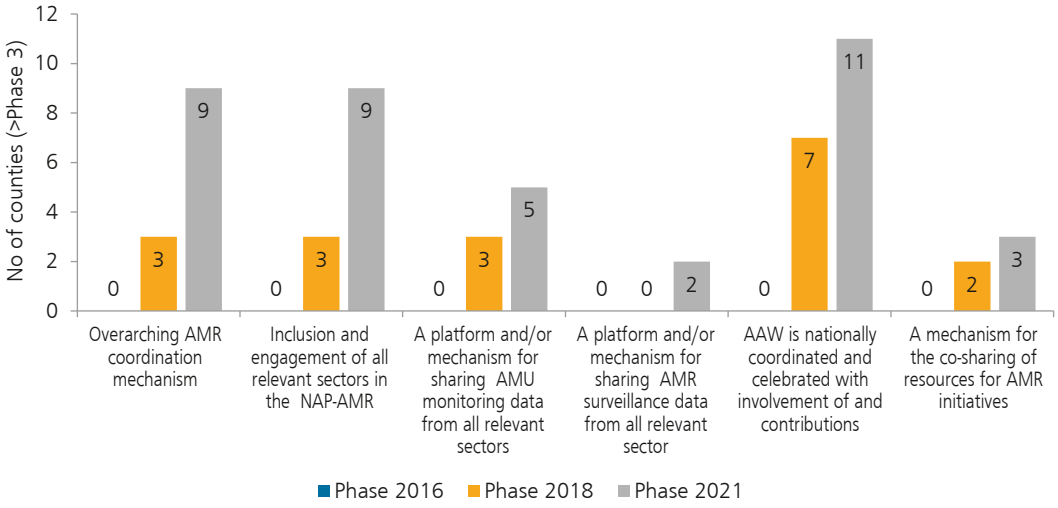
In three countries (27%) – Bangladesh, Bhutan and Thailand – there was a mechanism to co-share the available resources by different stakeholders. This is notable progress compared to 2018 (18%) and 2016 (0%). More consistent advocacies are needed to identify existing resources and share with different sectors for AMR-related activities (Fig. 10).

In Bangladesh, trainings were organized by the health sector for capacity-building of experts from various sectors, and awareness-building activities for all stakeholders funded by the MoH, under the mechanism of co-sharing of resources.

In Bhutan, the committee meeting includes members from both the human and animal health sectors. Resources are shared in conducting trainings on biosafety, biosecurity, biorepository, etc.

In Thailand, the One Health approach is applied to all levels of AMR governance structure such as the national AMR strategic committee and working groups with multisectoral planning and implementation.

Fig. 10. Overarching coordination mechanisms for One Health engagement



B. Country profiles

The profile of each individual country shows the implementation status in each indicator across all focus areas, issues and challenges, and recommendations for the way forward. Achievements and lessons learnt from each country were briefly highlighted in the profile. Although progress has been varied in different countries, none of the countries showed any backward slide in the implementation of their NAP-AMR. As mentioned above, none of the countries have a monitoring system for AR in wastewater (indicator 7.2) and the EWS for AMR (indicator 3.4). (**Annex 3**)

4

Conclusions

Significant progress has been noted in the implementation of the NAP-AMR of 11 countries of the South-East Asia Region during the Third One Health Situational Analysis in 2021. This is based on the assessment of overall country progress, implementation status in each focus area and indicator, and the individual country profile. The progress in the animal and agricultural sectors was found to be lagging compared to the human sector, while progress in the environmental sector was the least of all. There was, indeed, obvious variation in the overall country progress.

The progress in the implementation of NAP-AMR, as expressed by the median values of percentage of indicators having implementation status of 3 and above, found during the Third Situational Analysis in 2021 for all countries of the Region was 64%, much better compared to the 2nd Situational Analysis in 2018 of only 40% and the 1st Situational Analysis in 2016 of 16%. None of the countries showed any backward slide in their implementation status during 2021 compared to the situational analysis in 2018.

The Third progress analysis in 2021 also observed progress in all eight focus areas and indicators, where more were countries implementing actions in respective indicators, namely the National AMR Plan and Governance, Raising Awareness, National AMR Surveillance System, Rational Use of Antimicrobials and Surveillance of Use/Sale including Antimicrobial Stewardship, IPC, Research and Innovation, One Health Engagement and Coordination Mechanism for One Health Engagement.

However, no progress was observed in the AMR awareness generation and education in the environmental sector, and the implementation of AMR EWS, where almost none of the countries managed to start a national programme in these areas during the situational analysis in 2021, 2018 and 2016. Advocacy and educational campaigns in the environmental sector would need to be intensified, and practical guidelines and more technical support for AMR EWS would be needed in the future. Despite on-going challenges due to the COVID-19 pandemic, prevention and control of AMR should remain the government priority programme to anticipate the occurrence of possible deadly infections with resistant microbes of public health concern in the future.

5

Recommendations and the way forward

The Third One Health Situational Analysis for the NAP-AMR implementation progress 2021 have found notable achievements across eight focus areas in all countries. There were issues and challenges where additional efforts and improvement need to be focused on the way forward. Such improvement efforts should consistently follow the strategic framework which was originally built in the 1st Situational Analysis of AMR in 2016, providing clear guidelines for Member States, WHO, Tripartite organizations and other partners on the way forward. As mentioned earlier, the Roadmap for Action on AMR in the South-East Asia Region consists of different phases of action, namely Phase One – Exploration and Adoption; Phase Two – Programme Installation; Phase Three – Initial Implementation; Phase IV – Full Operation; and Phase V – Sustainable Operation.

Key recommendations across different focus areas to address AMR containment in the South-East Asia Region

(1) National Action Plans and Governance

- All countries obviously have a NAP on the prevention and control of AMR with defined plan and activities and implemented using available funding, either from external, internal or both sources. The cost of planned activities needs to be estimated and incorporated step by step into the government regular budget as an exit strategy if the external funding dries up.
- Despite the occurrence of the COVID-19 pandemic, it is important that prevention and control of AMR is kept as a government priority to prevent possible incidence of major outbreak of infections with resistant microbes in the future.
- Relevant activities have been identified and implemented by national counterparts from the health, animal, agriculture and environmental sectors. There was also a need for undertaking systematic monitoring and evaluation. The intersectoral coordination needs to be improved through a regular coordination meeting.

Recommendations

- *To estimate the cost of planned activities and start incorporating the cost step by step into the regular government budget.*
- *To adopt a framework and methodology for monitoring and evaluation and incorporate it in the existing NAP. Guidelines from WHO headquarters are available for adaptation and adoption.*
- *To organize regular intersectoral coordination meetings at least every 6 months to evaluate the progress in all sectors.*

(2) Raising awareness

Raising awareness and education among the general public, professionals from human, veterinary, agricultural and environmental sectors have been consistently undertaken in all countries, especially during the World Antimicrobial Awareness Week (WAAW). The WAAW has become a forum for coordinating planned activities of different sectors. There was a need to expand this coordination and cooperation between sectors beyond WAAW and strengthening the existing coordination mechanism of the intersectoral committee.

While relevant activities on raising awareness and education among the general public and professionals in the human, animal, agricultural and environmental sectors, have improved significantly, the question remains whether these awareness and education campaigns have any significant impact on the target audience, especially on the expected behaviour and practice in relation to prevention and control of AMR.

Recommendations

- *To continue and to strengthen the coordination and cooperation between sectors beyond WAAW throughout the year, through monitoring and evaluation of progress in different sectors.*
- *To undertake awareness generation and education activities in the environmental sector including advocacy to high levels of the government to include and strengthen AMR in the national strategic plan in the Ministry of Environment.*
- *To measure the impact of awareness generation and education on the target audience, especially on the expected behaviour and practice in relation to prevention and control of AMR and use of AM.*

(3) National AMR surveillance systems

In almost all countries, the AMR Surveillance System has significantly improved during the past 3 years, especially in the human sector. There was significant progress also in the animal sector, but it is still behind the human sector. However, none of the countries managed to implement AMR EWS. This would need a systematic assessment why during the last three Situational Analysis (2016, 2018 and 2021), none of the countries managed to initiate EWS.

WHO has developed a web-based IT module as part of its GLASS IT platform, allowing novel AMR discoveries to be shared in a rapid and secured manner. The GLASS-EAR module provides a space where experts can share information regarding emerging AMR events to assess their importance, facilitate early information sharing, and stimulate epidemiological and microbiological discussion for coordinated actions31.

Recommendations

- *To devise practical national guidelines for implementation of an integrated AMR surveillance and the laboratory networks for the human and animal sectors.*
- *To undertake training for laboratory staff involved in the AMR surveillance for both the human and animal sectors.*
- *To undertake needs assessment and develop practical guidelines to improve the laboratory capacity on EWS. A regional model on EWS may be considered by the regional Tripartite Party.*

(4) Rational use of antimicrobials and surveillance of use or sale (community-based)

The problems of irrational use of medicines including antimicrobials are commonly encountered among providers in health facilities and among consumers in the community. Not all countries are implementing the national AMS strategy for promoting rational use of medicines. A new way of classifying antibiotics (AWaRe) has been adopted by some countries in 2019 for the selection and use of antibiotics. The COVID-19 pandemic has to some extent delayed the implementation of AMS in some countries.

The NRA has implemented regulation of medicines where OTC sale and use of antimicrobials was not permitted. The NRA has also implemented a quality assurance system for medicines as well as quality surveillance, but the enforcement capacities varied from country to country. A regulatory authority and system are in place for the manufacture, sale and distribution of antibiotics, and inspection is implemented, but the capacity for the enforcement of policies and regulation is limited. The NRA regulates all aspects of antibiotic manufacture, import, storage and sale despite lack of capacity including human and physical resources.

In some countries, the national AMS has the requirement to set up antimicrobial stewardship in health-care facilities, specifying the composition of AMS team and their terms of reference (ToR). Once implemented, the ToR would be followed by all institutions when developing their own antimicrobial stewardship based on their needs, facilities and capacity. Standard protocols and guidelines are available at (limited) referral hospitals.

31 *Emerging antimicrobial resistance reporting framework*. *World Health Organization*, *2018, Licence*: *CC* BY-*NC-SA 3.0 IGO* (http://apps.who.int/iris/bitstream/handle/10665/274956/9789241514590-eng.pdf?ua=1, accessed December 2021).

Recommendations

- *To promote rational use of medicines in the human and animal sectors through operational research on rational use of antimicrobials and implementation of the new AWaRe classification for antibiotics.*
- *To develop guidelines, advocate the implementation of antimicrobial stewardship and measure the impact in all sectors,*
- *To strengthen the regulatory authority for medicines in enforcing regulation on the production, distribution and sale of antimicrobials in the human sector including sale of antimicrobial products.*
- *To consolidate the database on production and import of antimicrobials through the NRA in all sectors.*
- *To strengthen the NRA to regulate the production, distribution and use of antimicrobials, including use of antimicrobials in animal and agricultural feed.*
- *To devise guidelines, undertake training, implement and monitor AMS in health-care settings.*

(5) Infection prevention and control (IPC)

IPC is a practical, evidence-based approach whose aim is to prevent patients and health workers from being harmed by avoidable infections. Preventing HAIs avoids this unnecessary harm and at times even death, saves money, reduces the spread of AMR and supports high-quality, integrated, people-centred health services. No country, no health-care facility, even within the most advanced and sophisticated health-care systems, can claim to be free of the problem of HAIs. The need for an IPC programme, nationally and at the facility level is clearly reinforced within the WHO 100 Core Health Indicators list[32]. The IPC programme and capacity-building plans have been implemented in selected health-care facilities in some countries. A national IPC plan/policy needs to be developed and implemented. Awareness campaign, monitoring and supervision of IPC practices need to be implemented extensively.

Health-care-associated infections (HCAIs) are inections that occur while receiving health care, developed in hospital or other health-care facilities that first appear 48 hours or more after hospital admission, or within 30 days after having received health care. Few public and private facilities have an HAI surveillance programme but data are often not centralized at the national level[33].

Safe drinking water, sanitation and hygiene are crucial to human health and well-being. Safe WASH is not only a prerequisite to health, but contributes to livelihoods, school attendance and dignity and helps to create resilient communities living in healthy environments. Evidence suggests that improving service levels towards safely managed drinking water or sanitation such as regulated piped water or connections to sewers with wastewater treatment can dramatically

32 Infection prevention and control. World Health Organization, 2021 (https://www.who.int/teams/integrated-health-services/infection-prevention-control/about, accessed December 2021).

33 Health care-associated infections – an overview. 2018 (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6245375/, acccessed December 2021).

improve health by reducing deaths due to diarrhoeal disease[34]. Otherwise, it can can pose a risk to farm animals, other animals, humans, or the safety and quality of food products[35].

WHO recommends inclusion of PCVs in childhood immunization and national EPI programmes, particularly in countries with high childhood mortality due to *pneumococcus*. Bangladesh, Nepal and Myanmar introduced PCV. India is planning to introduce PCV on a state-by-state basis[36].

Recommendations

- *To devise guidelines and to implement IPC in health-care settings.*
- *To devise guidelines and a reporting system for national HAI and AMR surveillance.*
- *To strengthen implementation of the sanitation and hygiene programme at health facilities.*
- *To develop a national coordination mechanism between different programmes, namely IPC, HAI surveillance, AMS and WASH, for instance through regular meetings.*
- *To improve national coverage of immunization especially on PCV.*
- *To develop guidelines, initiate training and implement biosecurity measures among professionals and handlers in the veterinary sector*.

(6) Research and innovation

In three countries – Bhutan, Myanmar and Thailand – research and innovation on AMR and improving rational use of medicines are being officially conducted. However, research and innovation related to AMR and use of medicines might have been conducted by research and academic institutions, and they are scattered in different institutions and not systematically coordinated or documented at the national level. Furthermore, research might have been conducted but is not focusing on the implementation of the NAP-AMR.

Recommendations

- *To develop a national AMR research consortium to strengthen partnerships with research/ academic institutions, civil society and other stakeholders, for resource mobilization and development of evidence-based policies.*
- *To encourage research and innovation for generation of evidence to support the effective implementation of NAPs-AMR.*

(7) One Health engagement

In Indonesia, Sri Lanka and Thailand, there is a clear national policy and regulation on the AR and AMR disposal in the environment. The release of AR from manufacturing units is well regulated by the existing policies. There was evidence for implementation of policy or regulations but there is limited capacity for monitoring. There is already an integrated AMR surveillance of

34 Water, sanitation and hygiene (WASH). World Health Organization, 2021 (https://www.who.int/health-topics/water-sanitation-and-hygiene-wash, accessed December 2021).

35 Biosecurity. Department of Agriculture, Environment, and Rural Affairs [website] (https://www.daera-ni.gov.uk/articles/biosecurity, accessed December 2021).

36 Pneumococcal conjugate vaccine (PCV). World Health Organization, 2021 (https://www.who.int/southeastasia/activities/pneumococcal-conjugate-vaccine-(pcv), accessed December 2021).

environment in AMR One Health framework. At the same time, there was no specific regulation or national policy on surveillance of release of antibiotic residue and AMR into the environment, or policy for a water management system. Even if a policy is in place in due course, capacity for surveillance of waste generation and environment is limited and requires further development.

Recommendations

- *To implement existing regulations to manufacturers, hospitals and other relevant institutions in disposing AM in the environment; disseminate and enforce the regulations and provide sanctions to those violating the regulations.*
- *To collaborate with research institutions to undertake research on measuring AM residue in the environment.*

(8) Coordination mechanism for One Health engagement

A One Health coordination mechanism at all levels of the AMR governance structure is in place in most countries, for planning and implementation. The NAP-AMR includes and engages various sectors, including human health, animal health, agriculture, environment, food safety, food production, WASH, trade and civil society for the containment of AMR. A national AMR coordination committee was established at the national level, comprising different technical areas such as subcommittees on education, awareness, surveillance, AMU, research and innovation, and an expert group on IPC, which includes focal points from the private sector.

Project-based AMR surveillance was often conducted in the veterinary sector. AMR surveillance activities are usually limited in the human health sector. There was a need for mechanism/ platform for sharing of data among various sectors. An inter-ministerial secretariat for One Health is in place, with a need to strengthen involvement of stakeholders.

Te WAAW is celebrated annually with multisectoral participation, including scientific seminars targeting experts from various sectors. Campaigns are organized regularly for awareness generation among professionals and communities supporting the human and animal sectors. The WAAW is celebrated in collaboration with quatripartite alliance (FAO, UNEP, WHO, WOAH).

Recommendations

- *To strengthen the existing coordination mechanism between all relevant sectors, with enhanced engagement and involvement of the environment, food safety, education, aquaculture, and animal and human health sectors (indicator 1).*
- *To establish coordinated mechanisms for AMR/AMU surveillance and ensure the implementation of AMR containment across the relevant sectors; develop a platform for sharing and monitoring data regularly with stakeholders across all sectors to ensure evidence-based policy decisions.*
- *To continue and to strengthen the coordination and cooperation between sectors beyond the WAAW, through monitoring and evaluation of progress in different sectors (indicator 2).*

- *To measure the impact of awareness and education on the target audience, especially on the expected behaviour and practice in relation to prevention and control of AMR and use of AM (indicator 2).*
- *To undertake mapping of available resources from all sectors and coordinate the use of resources for relevant activities in different sectors.*

WHO, quatripartite and other partners

WHO and partners would also need to provide technical support for undertaking needs assessment, strengthening awareness creation and education in the environmental sector.

WHO and partner organizations would need to intensify technical support for countries as none has managed to initiate and implement AMR EWS. This would need a systematic assessment why during the last three situational analyses (2016, 2018 and 2021), none of the countries managed to initiate EWS.

Recommendations

- *To intensify technical support for advocacy and training on improving active participation of the environmental sector on NAP-AMR implementation.*
- *To intensify technical support for training in improving the capacity of undertaking AMR EWS.*

Annexes

Annex 1

List of focus areas and indicators assessed

Focus area	Indicator		2016	2018	2021
National AMR plan and governance	1.1	NAP in line with GAP-AMR/governance issue	Y	Y	Y
Raising awareness	2.1	Awareness campaigns for the public	Y	Y	Y
	2.2	Education and training strategies for professionals in the human health sector	Y	Y	Y
	2.3	AMR awareness generation and education in the animal sector	N	Y	Y
	2.4	AMR awareness generation and education in the environmental sector	N	Y	Y
National AMR surveillance system	3.1	National human AMR surveillance	Y	Y	Y
	3.2	Strengthening of the national laboratory network for humans	Y	Y	Y
	3.3	Strengthening of the national laboratory network in the animal sector	Y	N	Y
	3.4	Early warning systems (EWS)	N	Y	Y
Rational use of antimicrobials and surveillance of use/sale (community-based)	4.1	A national AMR containment policy for control of human use of antimicrobials; antimicrobial stewardship (see also 7.1)	Y	Y	Y
	4.2	NRA/NMRA	Y	Y	Y
	4.3	Surveillance of antimicrobial use and sale among humans	Y	Y	Y
	4.4	Regulation of finished antibiotic products and APIs	Y	Y	Y
	4.5	Regulation of pharmacies regarding OTC sale and inappropriate sale of antibiotics and APIs	Y	Y	Y
	4.6	A national AMR containment policy and regulatory framework for control and registration of use in animals	N	Y	Y
	4.7	National surveillance of AMR and use and sale of antimicrobials in the veterinary sector	N	Y	Y
Infection prevention and control	5.1	AMS in health-care settings	Y	Y	Y
	5.2	IPC programme in health-care settings	Y	Y	Y
	5.3	National HAI and related AMR surveillance	Y	Y	Y
	5.4	Sanitation and hygiene	Y	Y	Y
	5.5	Vaccination	N	Y	Y
	5.6	Biosecurity (IPC) in the animal sector	N	Y	Y

Focus area	Indicator		2016	2018	2021
Research and innovation	6.1	R&D and innovation on AMR prevention and containment and research funding	Y	Y	Y
One Health engagement	7.1	A national AMR containment policy and regulatory framework to control the release of AR and AMR into the environment and management therein	Y	Y	Y
	7.2	National surveillance of AR and AMR in wastewater from manufacture and use in the human, animal and fishery sectors and disposal by institutions and home National surveillance of AR and AMR in wastewater from manufacture and use in the human, animal and fishery sectors and disposal by institutions and home	Y	Y	Y
Overarching coordination mechanisms for One Health engagement	8.1	Overarching AMR coordination mechanism	N	Y	Y
	8.2	Inclusion and engagement of all relevant sectors in the NAP-AMR	N	Y	Y
	8.3	A platform and/or mechanism for sharing AMU monitoring data from all relevant sectors	N	Y	Y
	8.4	A platform and/or mechanism for sharing AMR surveillance data from all relevant sectors	N	Y	Y
	8.5	AAW is nationally coordinated and celebrated with involvement of and contributions from all relevant sectors	N	Y	Y
	8.6	A mechanism for co-sharing of resources for AMR initiatives	N	Y	Y

Annex 2

Phases of implementation of indicators in eight focus areas for Member States of the South-East Asia Region during the progress analysis review of AMR in 2021–2022

No.	Focus area and sub-indicators	Bangladesh			Bhutan			DPR Korea			India			Indonesia			Maldives			Myanmar			Nepal			Sri Lanka			Thailand			Timor-Leste		
		2021	2018	2016	2021	2018	2016	2021	2018	2016	2021	2018	2016	2021	2018	2016	2021	2018	2016	2021	2018	2016	2021	2018	2016	2021	2018	2016	2021	2018	2016	2021	2018	2016
1. National AMR plan and governance																																		
1.1	NAP in line with GAP-AMR/ governance issue	3	3	2	4	3	3	4	3	NA	3	3	2	4	2	3	4	4	2	3	3	2	3	2	2	3	4	3	5	5	3	3	2	2
A.2 Raising awareness																																		
2.1	Awareness campaigns for the public	4	4	3	4	4	3	4	3	NA	3	2	2	4	4	3	3	3	2	5	3	2	3	2	2	4	4	2	4	4	2	4	4	2
2.2	Education and training strategies for proffesionals in the human health sector	3	3	1	3	3	2	4	2	NA	3	3	2	3	3	3	3	3	1	3	3	2	3	1	2	4	3	1	3	5	3	4	3	1
2.3	AMR awareness generation and education in the animal sector	3	2	2	3	3	2	3	1	NA	2	1	2	3	3	1	1	1	1	3	1	1	2	1	1	3	3	1	4	4	2	2	1	1
2.4	AMR awareness generation and education in the environmental sector	2	1	NA	1	1	NA	3	1	NA	2	1	NA	1	1	NA	2	2	NA	2	1	NA	1	1	NA	1	1	NA	2	2	NA	1	1	NA

No.	Focus area and sub-indicators	Bangladesh			Bhutan			DPR Korea			India			Indonesia			Maldives			Myanmar			Nepal			Sri Lanka			Thailand			Timor-Leste		
		2021	2018	2016	2021	2018	2016	2021	2018	2016	2021	2018	2016	2021	2018	2016	2021	2018	2016	2021	2018	2016	2021	2018	2016	2021	2018	2016	2021	2018	2016	2021	2018	2016
3. National AMR surveillance system																																		
3.1	National human AMR surveillance	3	3	2	3	2	2	3	2	NA	3	3	2	3	2	2	2	2	2	5	2	2	4	4	3	5	4	3	5	5	3	3	2	1
3.2	Strengthening of the national laboratory network for humans	3	3	2	4	3	3	4	1	NA	3	4	2	3	1	1	2	2	1	5	4	2	4	3	3	5	5	2	5	5	4	3	1	1
3.3	Strengthening of the national laboratory in the animal sector	2	1	1	3	NA	NA	2	NA	NA	NA	NA	NA	3	NA	NA	1	NA	NA	3	NA	NA	1	NA	NA	3	NA	NA	3	NA	NA	2	NA	NA
3.4	Early warning systems (EWS)	1	1	1	1	1	2	2	1	NA	2	2	2	1	1	NA	1	1	1	2	1	1	1	1	2	1	1	1	2	2	1	1	1	1
4. Rational use of antmicrobials and surveillance of use/sale (community-based)																																		
4.1	National AMR containment policy for control of human use of antimicrobials; antimicrobial stewardship (see also 7.1)	2	2	1	3	2	2	4	2	NA	3	2	3	2	2	4	3	2	2	2	1	1	4	1	2	2	2	2	3	3	2	3	2	1
4.2	NRA/NMRA	4	4	3	4	4	5	4	3	NA	4	4	4	5	5	4	4	4	3	4	3	3	4	4	3	4	4	3	4	3	2	3	2	1
4.3	Surveillance of antimicrobial use and sale among humans	3	3	2	3	2	1	4	3	NA	3	3	3	4	3	3	3	3	2	2	2	2	3	1	3	3	3	1	4	4	2	3	2	1
4.4	Regulation of finished antibiotic products and APIs	4	4	3	4	4	4	5	3	NA	4	4	4	5	5	NA	4	4	2	3	2	2	3	2	2	3	3	2	4	4	2	1	1	2

No.	Focus area and sub-indicators	Bangladesh			Bhutan			DPR Korea			India			Indonesia			Maldives			Myanmar			Nepal			Sri Lanka			Thailand			Timor-Leste		
		2021	2018	2016	2021	2018	2016	2021	2018	2016	2021	2018	2016	2021	2018	2016	2021	2018	2016	2021	2018	2016	2021	2018	2016	2021	2018	2016	2021	2018	2016	2021	2018	2016
4.5	Regulation of pharmacies regarding OTC sale and inappropriate sale of antibiotics and APIs	4	4	3	5	5	5	5	1	NA	4	4	4	4	4	NA	4	4	2	2	2	2	3	2	3	4	4	2	4	4	2	2	2	1
4.6	A national AMR containment policy and regulatory framework for control and registration of use in animals	4	4	2	3	3	2	3	1	NA	3	2	2	3	3	2	2	1	2	2	1	1	2	1	2	4	4	3	3	3	2	1	1	1
4.7	National surveillance of AMR, and use and sale of antimicrobials in the veterinary sector	2	AMU-2 AMR-2	2	3	AMU-2 AMR-2	1	3	AMU-1 AMR-1	NA	AMU-1 AMR-2	AMU-1 AMR-2	1	AMU-3 AMR-3	AMU-3 AMR-3	2	2	AMU-1 AMR-2	3	AMU-2 AMR-2	AMU-1 AMR-1	3	AMU-3 AMR-3	AMU-1 AMR-2	2	AMU-3 AMR-3	AMU-2 AMR-3	1	AMU-4 AMR-3	AMU-3 AMR-3	2	AMU-2 AMR-2	AMU-1 AMR-1	1
5. Infection prevention and control																																		
5.1	AMS in health-care settings	2	2	2	3	2	2	3	2	NA	3	1	3	3	3	3	1	1	1	3	2	2	3	1	2	2	2	1	4	4	3	3	1	1
5.2	IPC programme in health-care settings	3	2	2	3	2	3	4	3	NA	3	3	3	3	3	3	2	2	2	3	2	3	3	1	1	3	4	3	4	3	2	3	1	1
5.3	National HAI and related AMR surveillance	2	2	2	3	2	4	4	3	NA	3	3	3	2	2	2	1	1	2	3	3	1	2	1	1	3	4	2	4	4	2	1	1	1
5.4	Sanitation and hygiene	4	4	1	4	5	5	5	5	NA	3	3	4	4	4	NA	4	4	2	4	2	3	4	4	2	5	4	4	4	4	3	3	3	2
5.5	Vaccination	4	4	NA	4	1	NA	5	1	NA	3	3	NA	3	2	NA	2	1	NA	5	4	NA	3	2	NA	5	3	NA	3	3	NA	4	4	NA
5.6	Biosecurity (IPC) in the animal sector	3	3	2	2	2	2	3	3	NA	3	3	2	4	4	3	1	1	1	1	1	2	3	2	1	3	3	2	5	5	2	2	1	1

No.	Focus area and sub-indicators	Bangladesh			Bhutan			DPR Korea			India			Indonesia			Maldives			Myanmar			Nepal			Sri Lanka			Thailand			Timor-Leste		
		2021	2018	2016	2021	2018	2016	2021	2018	2016	2021	2018	2016	2021	2018	2016	2021	2018	2016	2021	2018	2016	2021	2018	2016	2021	2018	2016	2021	2018	2016	2021	2018	2016
6. Research and innovation																																		
6.1	R&D and innovation on AMR prevention and containment and research funding	2	2	2	3	2	2	2	1	NA	2	2	2	2	2	2	2	2	1	5	3	2	2	1	1	2	2	1	4	4	1	2	1	1
7. One Health engagement																																		
7.1	A national AMR containment policy and regulatory framework to control release of AR and AMR into the environment and management therein	2	1	NA	1	1	NA	2	1	NA	2	1	NA	5	1	NA	1	1	NA	2	1	NA	1	1	NA	3	2	NA	3	2	NA	1	1	NA
7.2	National surveillance of AR and AMR in wastewater from manufacture and use in the human, animal and fishery sectors and disposal by institutions and homes	2	3	NA	1	1	NA	2	1	NA	2	1+	NA	1	1	NA	1	1	NA	1	1	NA	1	1	NA	1	1	NA	2	1+	NA	1	1	NA
8. Overarching coordination mechanisms for One Health engagement																																		
8.1	Overarching AMR coordination mechanism	3	4	NA	4	4	NA	3	2	NA	3	2	NA	2	1	NA	2	2	NA	3	2	NA	3	2	NA	3	2	NA	5	4	NA	3	1	NA

No.	Focus area and sub-indicators	Bangladesh			Bhutan			DPR Korea			India			Indonesia			Maldives			Myanmar			Nepal			Sri Lanka			Thailand			Timor-Leste		
		2021	2018	2016	2021	2018	2016	2021	2018	2016	2021	2018	2016	2021	2018	2016	2021	2018	2016	2021	2018	2016	2021	2018	2016	2021	2018	2016	2021	2018	2016	2021	2018	2016
8.2	Inclusion and engagement of all relevant sectors in the NAP-AMR	3	2	NA	3	2	NA	3	1	NA	3	3	NA	2	2	NA	2	2	NA	3	2	NA	3	2	NA	3	2	NA	5	5	NA	3	3	NA
8.3	A platform and/or mechanism for sharing AMU monitoring data from all relevant sectors	3	4	NA	4	2	NA	3	1	NA	1	1	NA	4	1	NA	1	1	NA	2	1	NA	2	1	NA	2	3	NA	4	3	NA	2	1	NA
8.4	A platform and/or mechanism for sharing AMR surveillance data from all relevant sectors	2	2	NA	3	1	NA	2	1	NA	1	2	NA	2	2	NA	1	1	NA	2	2	NA	2	2	NA	2	2	NA	4	2	NA	1	1	NA
8.5	AAW is nationally coordinated and celebrated with involvement of and contributions from all relevant sectors	4	4	NA	4	3	NA	3	1	NA	3	1	NA	4	1	NA	3	3	NA	5	5	NA	3	3	NA	3	2	NA	5	5	NA	4	3	NA
8.6	A mechanism for co-sharing of resources for AMR initiatives	3	1	NA	3	1	NA	1	1	NA	1	1	NA	2	1	NA	2	2	NA	1	1	NA	1	1	NA	2	3	NA	5	3	NA	1	1	NA

Annex 3

Country profiles

Bangladesh

Focus area and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
1. National AMR plan and governance					
1.1 NAP in line with GAP-AMR/ governance issue	2	3	3	The NAP is in line with the GAP-AMR, developed and approved at the ministerial and Secretariat levels. There is a functional multisectoral AMR national steering committee and national technical committee, with defined terms of reference of various stakeholders. Currently, most of the funding is allocated from the government through an operational plan to implement NAP. Some development partners including the Fleming Fund, USAID, MTaPS, US CDC, FAO and WHO also provide some funds for specific activities mostly for AMR surveillance.	To enforce policies and regulations to support smooth implementation of NAP-AMR. Ensure adequate budgetary provisions in operational plans developed for various AMR containment activities.
A.2 Raising awareness					
2.1 Awareness campaigns for the public	3	4	4	Nationwide government-led campaigns, targeting public and professionals, are conducted during the AAW. Awareness-raising activities are conducted primarily during the AAW and there is limited focus on the generation of awareness throughout the year.	To promote collaboration among all relevant stakeholders to conduct nationwide campaigns for the generation of awareness of AMR among the population. To continue awareness-raising activities beyond the AAW through various possible means. To undertake impact evaluation on the target audience.

Focus area and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
2.2 Education and training strategies for professionals	1	3	3	The NAP has specific activities regarding education and training. The specific topic of AMR is in the process of being introduced in pharmacists'/medical curriculums. AMR training is conducted for health professionals.	To develop specific communication strategies targeting behavioural change and make plans to evaluate the impact of awareness-raising activities. Bangladesh should consider revising the medical and veterinary curriculums to focus on AMR issues. Design and implement specific courses for continuous professional development of health experts both in the human and animal sectors.
2.3 AMR awareness generation and education in the animal sector	2	2	3	Strategies have been formulated to raise awareness among veterinary professionals. Experts from the human and animal sectors are involved in training health-care professionals.	To formulate strategies targeting different groups engaged in animal handling, with an emphasis on behavioural change for prudent AMU in animals.
2.4 AMR awareness generation and education in the environmental sector	NA	1	2	There is no policy/strategy on AMR concerning waste to ensure environmental safety. The NRA policies focus on the safe disposal of waste from manufacture. Guidelines are in place for the management of hospital waste.	To develop a communication strategy for awareness generation and education in the environmental sector.
3. National AMR surveillance system					
3.1 National human AMR surveillance	2	3	3	The national reference laboratory follows the CLSI as a reference standard and supports the laboratory network. Conventional microbiological methods are followed in laboratory diagnostics and the laboratory network; molecular methods are yet to be adopted. National external quality assurance has not been established.	To further expandand nationwide adoption of human AMR surveillance, it is essential to develop an accountability framework with a reporting mechanism, and ensure the availability of adequate funds for AMR activities across various sectors.

Focus area and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
3.2 Strengthening of the national laboratory network for humans	2	3	3	The national reference laboratory follows the CLSI as a reference standard and supports the laboratory network. Conventional microbiological methods are followed in laboratory diagnostics and the laboratory network; molecular methods are yet to be adopted. National external quality assurance has not been established.	To focus on capacity-building for laboratory diagnostics and ensure the availability of infrastructure and adequate reagents. Standardize laboratory surveillance by establishing national external quality assurance mechanisms.
3.3 Strengthening of the national laboratory network in the animal sector	1	1	2		
3.4 Early warning systems (EWS)	1	1	1		To plan to establish EWS and consider developing the molecular detection capacity of the laboratory network supporting AMR surveillance.
4. Rational use of antimicrobials and surveillance of use/sale (community-based)					
4.1 A national AMR containment policy for control of human use of antimicrobials; antimicrobial stewardship (see also 7.1)	1	2	2	An AMS has been planned and is under development.	To develop comprehensive AMS guidelines, covering training material and tools to monitor antimicrobial use in the human health sector.
4.2 NRA/ NMRA	3	4	4	The NRA is fully functional and a national drug policy is in place.	To promote regulatory cooperation on AMR in SEARN for the import of medical products, and quality assurance of the laboratory network. Develop an API analysis system.
4.3 Surveillance of antimicrobial use and sale among humans	2	3	3	Guidelines have been developed to survey AMU in humans. Antimicrobial manufacturing data are collected under regular monitoring by the NMRA.	To develop a national AMR containment policy and establish an AMU monitoring system to control AMU in humans. Expedite the completion of the antimicrobial consumption survey and develop operational plans to monitor the use and sale of antimicrobials in the human health sector.

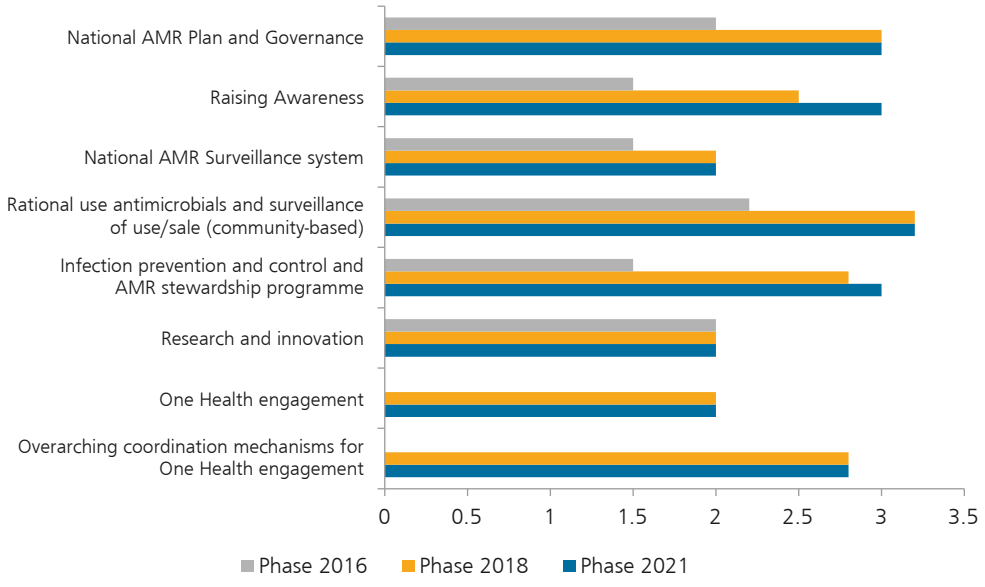
Focus area and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
4.4 Regulation of finished antibiotic products and APIs	3	4	4	The NRA is fully functional and inspection is carried out, but the capacity for the enforcement of the regulations is limited.	To provide adequate human and financial resources to strengthen the regulatory capacity of the NRA to conduct pre- and post-marketing surveillance, and enforce regulations on finished products and APIs to support GMP.
4.5 Regulation of pharmacies regarding OTC sale and inappropriate sale of antibiotics and APIs	3	4	4	A model pharmacy regulation system is in place and documents the list of drugs for OTC sale. The national drug policy provides for sale of antimicrobials on prescription only; however, there is limited capacity for the enforcement of regulation.	To regulate inappropriate sale of antibiotics and APIs, consider advanced IT solutions to manage referral, prescription and the drug-dispensing system.
4.6 A national AMR containment policy and regulatory framework for control and registration of use in animals	2	4	4	The national drug policy addresses AMR and a legal framework prohibits the use of antimircobials in animal feed. Regulatory frameworks have been implemented with some monitoring but the capacity for enforcement is limited.	To develop an AMR containment policy and tools to implement and monitor AMR containment in the animal sector. Ensure that there are adequate funds for AMR containment in the veterinary sector.
4.7 National surveillance of AMR, and use and sale of antimicrobials in the veterinary sector	2	AMU-2 AMR-2	2	Guidelines have been developed to survey antimicrobial use in the human and animal sectors. The capacity for surveillance of AMU and AMR is limited.	To develop operational plans for antimicrobial use and sale in the animal sector. Strengthen the inspection system for monitoring the implementation of the AMR containment policy in the animal sector.
5. Infection prevention and control					
5.1 AMS in health-care settings	2	2	2		To develop coherence and an integrated AMS, IPC and surveillance of HAI. Need to strengthen facility-based committees for AMS. There is ToR for the committee; however, these are not active.
5.2 IPC programme in health-care settings	2	2	3		To ensure regular monitoring from local health authority. Develop a pltaform to share self-assessment checklist with answers.

Focus area and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
5.3 National HAI and related AMR surveillance	2	2	2		To initiate national HAI surveillance. Develop policy/ guidelines and build capacity for HAI. Expand this across the country in a step-wise manner.
5.4 Sanitation and hygiene	1	4	4	There is a national campaign to improve sanitation and hygiene in communities through the WASH programme. Data on access to safely managed water are available.	As IPC, regular monitoring from the local health auhotiry needs to be ensured.
5.5 Vaccination	NA	4	4	PCV and haemeophilus influenza B (HiB) vaccine are included in the expanded programme of immunization (EPI). Typhoid vaccine is not included. The national indicators for vaccine coverage are good. Hepatitis B vaccine is provided from the CDC programme of DGHS.	The Member States should consider developing a vaccination policy in the context of AMR prevalence and practices.
5.6 Biosecurity (IPC) in the animal sector	2	3	3	Biosecurity measures have been initiated in the poultry sector following bird flu outbreaks.	To develop guidelines to support biosecurity measures in other animal sectors; and enhance awareness in and diagnostic support for the veterinary sector.
6. Research and innovation					
6.1 R&D and innovation on AMR prevention and containment and research funding	2	2	2	Policies have been framed and there are plans to foster research and innovation on AMR.	To encourage R&D and innovation for generation of evidence to support the effective implementation of NAP-AMR.
7. One Health engagement					
7.1 A national AMR containment policy and regulatory framework to control the release of AR and AMR into the environment and management therein	NA	1	2	Under the national regulations, policies are in place for monitoring waste/wastewater from antibiotic manufacturers. It is mandatory to process waste before releasing it into the environment. Effluent treatment plants are compulsory and expired anitmicrobials are destroyed by incineration. However, there is no specific policy aimed at reducing AR and AMR in the environment.	There is a need to expand policies, have an operational plan including a monitoring and evaluation (M&E) system to assess AMR and AR load in waste and wastewater generated by all relevant sectors.

Focus area and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
7.2 National surveillance of AR and AMR in wastewater from manufacture and use in the human, animal and fishery sectors and disposal by institutions and homes	NA	3	2	Policies are in place for monitoring waste and wastewater from antibiotic manufacture under the National Regulatory of Drugs. Need to expand policies, operational plan including the M&E system to all relevant sectors such as human, animal and fisheries.	To develop a national policy directed at the reduction of AR and AMR waste generation supported by operational plans to assess AR/ antimicrobial load in waste and wastewater from relevant sectors.
8. Coordination mechanisms for One Health engagement					
8.1 Overarching AMR coordination mechanism	NA	4	3	There is a multisectoral national steering committee as well as a national technical committee on AMR, led by the MoH, with defined terms of reference (ToR) for various stakeholders.	To strengthen the existing coordination mechanism between all relevant sectors, with enhanced engagement and involvement of the environment, food safety, education, aquaculture, and animal and human health sectors.
8.2 Inclusion and engagement of all relevant sectors in the NAP-AMR	NA	2	3	The NAP-AMR engages human health, animal health, drug administration for humans and animals, plant health, civil society, and the private sector (primarily pharmaceutical and chemists' associations), and WASH.	To include and engage all relevant sectors in the NAP-AMR.
8.3 A platform and/or mechanism for sharing AMU monitoring data from all relevant sectors	NA	4	3	The NRA monitors AMU in the human and animal sectors. A multisectoral expert committee is leading a survey on antimicrobial consumption.	To establish coordinated mechanisms for AMR/AMU surveillance and ensure the implementation of AMR containment across the relevant sectors. Provide a platform for sharing monitoring data regularly with national and international stakeholders across all sectors to ensure evidence-based policy decisions.
8.4 A platform and/or mechanism for sharing AMR surveillance data from all relevant sectors	NA	2	2	An interministerial secretariat for One Health engagement is in place, but there is a need to strengthen the involvement of various stakeholders. Though there is an AMR surveillance mechanism for the human sector, there is none for the animal sector. The food safety surveillance system is functional.	

Focus area and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
8.5 AAW is nationally coordinated and celebrated with involvement of and contributions from all relevant sectors	NA	4	4	AAW is celebrated annually with multisectoral participation, including scientific seminars targeting experts from various sectors. Campaigns are organized regularly for awareness generation among pharmacists supporting the human and animal sectors.	To conduct an assessment of the impact of awareness-generation activities, with the involvement of and contributions from all relevant sectors. Promote active participation of various sectors to ensure that AAW is nationally coordinated and celebrated.
8.6 A mechanism for co-sharing of resources for AMR initiatives	NA	1	3	Trainings organized by the health sector for capacity-building of experts from various sectors and awareness-generation activities, funded by the MoH, for all stakeholders are some initiatives under the mechanism of co-sharing of resources.	To identify resources and establish a mechanism for co-sharing of resources for AMR initiatives.

Fig. A1. Progress analysis of AMR prevention and containment in Bangladesh, 2016–2021



The figure shows an average of phase-grading for all indicators in different focus areas, purely for pictorial representation

Achievements and lessons learnt

- Bangladesh has 64% of all indicators with implementation phase of 3 and above, showing notable progress compared to the situational analysis in 2018 (54.8%) and in 2016 (12.9%).
- The NRA is fully functional and inspections were carried out regularly. The national drug policy addresses AMR and a legal framework prohibits the use of antimicrobial in animal

feed. Regulatory frameworks have been implemented with some monitoring but the capacity for enforcement needs strengthening.

- A national campaign is conducted to improve sanitation and hygiene in communities through the WASH programme. Data on access to safely managed water are available.
- PCV and haemophilus influenza B (HiB) vaccine are included in the expanded programme of immunization (EPI). The national indicators for vaccine coverage are good. Hepatitis B vaccine is provided from the CDC programme of the DGHS.
- AAW is celebrated annually with multisectoral participation, including scientific seminars targeting experts from various sectors. Campaigns are organized regularly for awareness generation among pharmacists supporting the human and animal sectors.

Bhutan

Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
1. National AMR plan and governance					
1.1 NAP in line with GPA-AMR/ governance issue	3	3	4	A comprehensive NAP for 2018–2022, in line with GAP-AMR, has been launched since November 2017. Bhutan has been awarded the Fleming Fund Grant for NAP implementation and it has significantly improved the governance and laboratory capacity in the AMR surveillance. Due to the COVID-19 pandemic most of the activties were delayed and could not be conducted, therefore applied for extension of the Fleming Fund Project. Additionally, Bhutan has also applied for Country Grant-2 and Fellowships under the Fleming Fund Project.	To maintain strong political will and commitment to support AMR activities. To continue building ownership of AMR implementation by regulatory authorities. To reactivate the implementation of NAP-AMR activities.
2. Raising awareness					
2.1 Awareness campaigns for the public	3	4	4	There is no comprehensive strategy to evaluate the impact of awareness campaign. No KAP study to measure the baseline.	To consider developing a comprehensive strategic plan to evaluate antibiotic literacy and behaviour among the public through a baseline survey, followed by a targeted campaign to enhance awareness. To start undertaking a KAP study among the providers and the communities as baseline.

Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
2.2 Education and training strategies for professionals	2	3	3	AMR-related issues in induction training for health professionals and in-training modules on the rational use of drugs are implemented for awareness of AMR. More details on AMR strategies as part of the One Health strategy need to be incorporated into the curriculum. AMR and AMS training modules have been developed and in-service trainings have been planned for the health professionals.	To take measures to revise and update all health professional curriculums with a focus on AMR/AMS; also include guidance on competency evaluation. AMR and AMS training modules have been developed and in-service trainings have been planned for the health professionals. Field-test, evaluate and implement the improved curricula of health professionals.
2.3 AMR awareness generation and education in the animal sector	2	3	3	Guidelines for the use of antibiotics in livestock were developed in 2017. A national consultative and awareness workshop on AMR for livestock was conducted. The College of Natural Resources is the apex centre for training para-professionals who support activities of veterinarians in the animal sector. Training programmes on AMU and AMR are being developed by the animal health sector.	To develop specific training programmes for para-professionals on AMU and AMR. There is a need to develop messages and channels of delivery for the generation of awareness, specifically among farmers. Field-test, evaluate and implement training programme on AMU and AMR as part of the One Health strategy in the animal sector.
2.4 AMR awareness generation and education in the environmental sector	NA	1	1	There is a need to recognize the importance of the environmental sector by framing policies or targeted communication strategies to ensure the safe disposal of pharmaceuticals in the environment. The environmental sector yet to be involved in the AMR network.	To foster the inclusion of the environmental sector in the implementation of NAP and involve the environmental sector in the AMR network.

Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
3. National AMR surveillance system					
3.1 National human AMR surveillance	2	2	3	Guidelines have been prepared but implementation is in progress; health professionals getting trained under the Fleming Fellowship. Health professionals getting trained on AMR surveillance at Peter Doherty under the Fleming Fellowship grant. Data management training and report preparation is in progress.	To set up systems for linking microbiological and epidemiological findings. The Member States should consider using systems such as WHONET for robust data collection and analysis. Streamline data-sharing modalities to ensure regular and timely availability of all information with policy-makers.
3.2 Strengthening of the national laboratory network for humans	3	3	4	The national AMR reference laboratory is functional, with a quality-assured laboratory network at a few centres, and selected sites are participating in EQAS. The CLSI for standardized microbiological laboratory procedures are being followed. GLASS enrolment is under progress. NRL identified and functional. NRL providing EQAS to the surveillance site laboratories.	To maintain the highest standards in laboratory procedures, the Member States should focus on capacity-building of laboratory staff and data-handling experts. Surveillance site laboratories recommended to send AMR isolates to NRL for bio-repository. Extension of microbiology laboratory to other bigger hospitals.
3.3 Strengthening of the national laboratory network in the animal sector	NA	NA	3	National Reference Laboratory identified and quality assured laboratory networks developed only at afew surveillance sites (two RLDC laboratories)	To extend microbiology laboratory to other regional sites.
3.4 Early warning systems (EWS)	2	1	1	Efforts are ongoing to establish EWS, prepare a list of priority AMR bacteria and verify identified AMR organisms at the earliest.	To develop expertise for EWS and verify identified AMR organisms at the earliest.
4. Rational use of antimicrobials and surveillance of use/sale (community-based)					
4.1 A national AMR containment policy for control of human use of antimicrobials; antimicrobial stewardship (see also 7.1)	2	2	3	The AMS has been developed and insitituted at all three regional hospitals. Training of health professionals from these three hospitals is in progress. An application for National Antibiotic guideline has also been developed. The pandemic has delayed activities under the AMS, particularly auditing of the AMS and antibiotic guidleine use.	Auditing tools for AMS and antibiotic guideline in progress. Need to strengthen the use local data in the development of NEML and Antibiotic guidleines. To reactivate activities under AMS, including auditing the AMS and the use of antibiotic guidelines.

Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
4.2 NRA/ NMRA	5	4	4	Tools for quality assurance and registration of antibiotics are in place and inspection is implemented, but the capacity for the enforcement of policies and regulation is limited.	To promote regulatory cooperation with SEARN on AMR for imports of medical products (medicines, devices and diagnostics) and regulatory cooperation in laboratories. To strengthen the regulatory capacity of the NRA in terms of registration, post-marketing surveillance and testing of antimicrobials. To improve enforcement of regulation pertaining to the production, distribution/sale and use of antimicrobials.
4.3 Surveillance of antimicrobial use and sale among humans	1	2	3	A national policy and plan have been developed for surveillance of the use of antimicrobials and surveillance is conducted twice a year to capture seasonal variation in few individual facilities. AMC/AMU strategy developed; training programmes conducted for measuring AMC and doing PPS; national reports on AMC/AMU yet to be generated.	To develop the NRA's capacity to monitor antibiotic consumption, with a focus on meticulous data analysis.
4.4 Regulation of finished antibiotic products and APIs	4	4	4	A regulatory authority and system are in place for the manufacture, sale and distribution of antibiotics, and inspection is implemented, but the capacity for the enforcement of policies and regulation is limited.	Capacity-building of the NRA and advocacy for the implementation of regulation for dossier evaluation in antibiotic products and GMP inspection are necessary. To improve enforcement of regulation pertaining to the production, distribution/sale and use of antimicrobials.
4.5 Regulation of pharmacies regarding OTC sale and inappropriate sale of antibiotics and APIs	5	5	5	A regulatory authority and system are in place, and are fully effective and operational.	To build the capacity of NRA and provide adequate human and financial resources for the control of sale of antibiotics, including e-pharmacy sales.

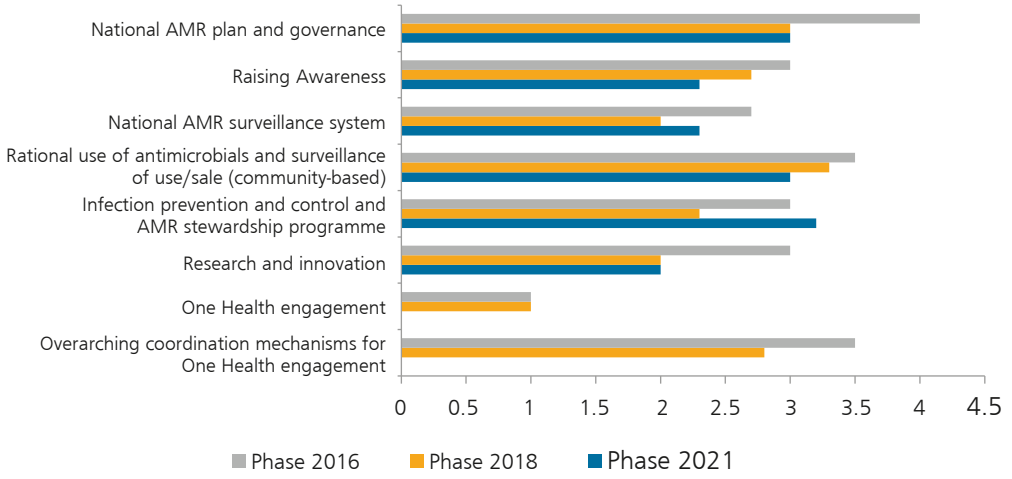
Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
4.6 A national AMR containment policy and regulatory framework for control and registration of use in animals	2	3	3	The Medicine Act of Bhutan, 2003 and Bhutan Medicines Rules and Regulation, 2012 require that all medicines, including antimicrobials which are imported into the country, are registered with NMRA/NRA. It also classifies all antimicrobials as prescription-only drugs. Regulatory enforcement is in place and is carried out by the regulatory authority. Thus initial implementation policies and regulatory frameworks have been implemented, but there is limited capacity for monitoring registration and AMU.	To assess the status of AMR surveillance system in the animal sector and develop structured national AMR surveillance plan for the sector, with a focus on coordinated policy on usage of critical antibiotics among both humans and animals. Develop specific training programmes for para-professionals on AMU and AMR.
4.7 National surveillance of AMR, and use and sale of antimicrobials in the veterinary sector	1	AMU-2 AMR-2	3	Limited information is available on the use and sale of antimicrobials at the national level in the veterinary sector. According to the national policy, information on the use of antimicrobials in the veterinary sector has been annually contributed to the WOAH database since 2015.	To develop operational plans for antimicrobial use and sale in the animal sector. Strengthen the inspection system for monitoring the implementation of the AMR containment policy in the animal sector.
5. Infection prevention and control					
5.1 AMS in health-care settings	2	2	3	The AMS has been established only at the national and two regional hospitals. Standard protocols and guidelines are available at limited referral hospitals. Laboratory capacity has been strengthened to support AMS. There is a felt need for the regulation of drugs available OTC across porous international borders and the generation of mass awareness regarding AMR.	To ensure the availability of SOPs and guidelines and strengthen laboratory capacity in health-care facilities to support national AMS.
5.2 IPC programme in health-care settings	3	2	3	The national IPC committee has developed reporting formats and a checklist for monitoring systems for IPC. WASH assessment is conducted in select health facilities.	To prepare guidelines on a training and reporting system for data management. Integrate IPC with AMS in health-care settings.

Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
5.3 National HAI and related AMR surveillance	4	2	3	Few facilities have HAI surveillance and data are not centralized at the national level. It is the need of the hour to build capacity to have certified IPC nurses, strengthen laboratory capacity and streamline data flow, along with data analysis. PPS in AMU (in-patient) conducted in the national and two regional hospitals.	To develop a national AMR containment policy and establish a national system for monitoring antimicrobial use.
5.4 Sanitation and hygiene	5	5	4	Health-care facilities have a WASH programme to improve sanitation and hygiene. Access to safely managed water supply or sanitation services is high.	To enhance compliance to sanitation and hygiene activities promoted nationwide under the WASH programme.
5.5 Vaccination	NA	1	4	Vaccination coverage is 96% at the national level. No formal campaign has been planned for sanitation and hygiene and vaccination.	To conduct advocacy to link AMR and vaccination practices.
5.6 Biosecurity (IPC) in the animal sector	2	2	2	Biosecurity policies, guidelines and strategies have been developed, but these are more generic and do not cover all aspects of IPC in the animal sector. Animal health professionals will be undergoing farm bio-security training (1 year) under the Fleming Fellowship scheme.	To develop guidelines to support biosecurity measures in other animal sectors; and enhance awareness in and diagnostic support for the veterinary sector.
6. Research and innovation					
6.1 R&D and innovation on AMR prevention and containment and research funding	2	2	3	Policies have been framed and there are plans to foster research and innovation on AMR.	To encourage R&D and innovation for generation of evidence to support the effective implementation of NAP-AMR.
7. One Health engagement					
7.1 A national AMR containment policy and regulatory framework to control the release of AR and AMR into the environment and management therein	NA	1	1	There is no specific policy to control the release of antimicrobial residue (AR) and AMR into the environment. The existing guidelines for wastewater and waste disposal do not specify indicators to assess the quantum of disposed pharmaceuticals in waste generated by human and animal use.	To develop policies and targeted strategies on AMR in waste to ensure the safe disposal of pharmaceuticals in the environment.

Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
7.2 National surveillance of AR and AMR in wastewater from manufacture and use in the human, animal and fishery sectors and disposal by institutions and homes	NA	1	1	Guidelines for wastewater and waste disposal do not specify indicators for assessing the quantum of disposed pharmaceuticals in waste generated by human/animal use. Also, there is no specific policy to control the release of AR and AMR into the environment.	To develop policies and targeted strategies on AMR in waste to ensure the safe disposal of pharmaceuticals in the environment.
8. Overarching coordination mechanisms for One Health engagement					
8.1 Overarching AMR coordination mechanism	NA	4	4	There is a multisectoral national steering committee as well as a national technical committee on AMR, led by the MoH, with defined terms of reference (ToR) for various stakeholders.	To strengthen the existing coordination mechanism between all relevant sectors, with enhanced engagement and involvement of the environment, food safety, education, aquaculture, and animal and human health sectors.
8.2 Inclusion and engagement of all relevant sectors in the NAP-AMR	NA	2	3	The NAP-AMR engages human health, animal health, drug administration for humans and animals, plant health, civil society, private sector (pharmaceutical and chemists' associations), and WASH.	To include and engage all relevant sectors in the NAP-AMR.
8.3 A platform and/or mechanism for sharing AMU monitoring data from all relevant sectors	NA	2	4	The NRA monitors AMU in the human and animal sectors. A multisectoral expert committee is leading a survey on antimicrobial consumption.	To establish coordinated mechanisms for AMR/AMU surveillance and ensure the implementation of AMR containment across the relevant sectors. Provide a platform for sharing monitoring data regularly with national and international stakeholders across all sectors to ensure evidence-based policy decisions.

Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
8.4 A platform and/or mechanism for sharing AMR surveillance data from all relevant sectors	NA	1	3	An interministerial secretariat for One Health is in place, but there is a need to strengthen the involvement of various stakeholders. AMR surveillance in human and animal health is in progress. Laboratories in both human and animal health strengthened to carry out AMR surveillance; AMR data analysis in human health under progress; AMR surveillance in animal health (in chicken meat from farms and meat shops) in progress.	To undertake a regular meeting involving all sectors to share the AMR surveillance data within the framework of the One Health strategy. 6 monthly reports on AMR need to be generated and shared to formulate evidence-based interventions.
8.5 AAW is nationally coordinated and celebrated with involvement of and contributions from all relevant sectors	NA	3	4	AAW is celebrated annually with multisectoral participation, including scientific seminars targeting experts from various sectors. Campaigns are organized regularly for awareness generation among pharmacists supporting the human and animal sectors.	To conduct an assessment of the impact of awareness-generation activities, with the involvement of and contributions from all relevant sectors. Promote active participation of various sectors to ensure that AAW is nationally coordinated and celebrated.
8.6 A mechanism for co-sharing of resources for AMR initiatives	NA	1	3	Trainings organized by the health sector for capacity-building of experts from various sectors and awareness-generation activities, funded by the MoH, for all stakeholders are some initiatives under the mechanism of co-sharing of resources. Committee meeting are conducted jointly. Trainings applicable to both human and animal health are conducted jointly. Equipment and consumables are shared for AMR surveillance.	To identify resources and establish a mechanism for co-sharing of resources for AMR initiatives.

Fig. A2. Progress analysis of AMR prevention and containment in Bhutan, 2016-2021



The figure shows an average of phase-grading for all indicators in different focus areas, purely for pictorial representation.

Achievements and lessons learnt

- Overall, Bhutan has 83% of all indicators with implementation phase of 3 and above, meaning that there was significant progress compared to the situational analysis in 2018 (41.9%) and 2016 (26.6%).
- Bhutan has a comprehensive NAP (2018–2022), in line with the GAP since 2017, implemented with the One Health approach, strengthening partnership between the human and animal sectors where both sectors are involved in the AMR governance decision.
- AMR surveillance units are instituted in different sites facilitating implementation of relevant activities at the institutional level and monitoring the use of antimicrobials. External quality assessment (EQA) schemes are in place.
- A regulatory authority and system are in place for the manufacture, sale and distribution of antibiotics, and inspection is implemented to ensure quality of antimicrobial products.
- The antimicrobial classification AWaRe has been adopted and implemented in the selection of antimicrobials, improving rational use of antimicrobials in human health.

Democratic People's Republic of Korea

Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
1. National AMR plan and governance					
1.1 NAP in line with GAP-AMR/ governance issue	NA	3	4	The NAP is in line with GAP-AMR and has been developed with defined activities. A national multisectoral committee on AMR has been established. Operational plan has been established and rolled out.	To continue the implementation of NAP-AMR and include the plan into the government budget; develop and implement monitoring and evaluation system.

Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
A2. Raising awareness					
2.1 Awareness campaigns for the public	NA	3	4	Nationwide, government-led antibiotic awarenss campaings targetting the public and health professionals have been conducted.	To continue utilizing the WAAW for advocacy to all sectors targeting professionals and communities. To evaluate the impact of advocacy and educational campaign on the target audience, both professionals and communities.
2.2 Education and training strategies for professionals in the human health sector	NA	2	4	AMR is incorported in education of medical universities and covered in continuous in-service training programme for medical professionals and health workers on a regular basis.	To keep updating the AMR educational/ training materials for pre-service and in-service training of medical professionals and health workers; evaluate the impact of intervention on its target in the human health sector.
2.3 AMR awareness generation and education in the animal sector	NA	1	3	Activities for raising awareness regarding AMR in the animal sector have been planned and being implemented.	To expand the introduction of AMR in the training curricula of veterinarians to more educational institutions. To continue and strengthen raising awareness activities in the animal sector; best utilize the WAAW for improving AMR awareness among veterinarians and communities.
2.4 AMR awareness generation and education in the environmental sector	NA	1	3	AMR in some pre-service training for professionals of food production, food safety and the environment.	To continue and strengthen the involvement of the environmental sector in the advocacy and training on AMR.
3. National AMR surveillance system					
3.1 National human AMR surveillance	NA	2	3	The national guideline on AMR surveillance system has been developed with clearly defined objectives, ToRs and tools for data collection and reporting. An AMR surveillance system is in place with limited number of surveillance sites.	To strengthen and expand the existing human AMR surveillance system through improvement of human resource capacity, using the national guidelines.

Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
3.2 Strengthening of the national laboratory network for humans	NA	1	4	A laboratory network for AMR surveillance has been developed and the EQA system is in place.	To strengthen the existing laboratory network with quality assurance system and implement the use of national laboratory manuals in line with international standards.
3.3 Strengthening of the national laboratory network in the animal sector	NA	NA	2	A national reference laboratory in the animal sector is identified. Developing the capacity of national laboratory network is planned.	To improve the capacity of the National Laboratory Network and formalize the laboratory network.
3.4 Early warning systems (EWS)	NA	1	2	A framework for EWS is being developed.	To identify common conditions which may become public health concerns in the event of AMR emergence.
4. Rational use of antimicrobials and surveillance of use/sale (community-based)					
4.1 A national AMR containment policy for control of human use of antimicrobials; antimicrobial stewardship (see also 7.1)	NA	2	4	A national AMR programme is developed.	To develop and implement monitoring and evaluation system for antimicrobial stewardship programme.
4.2 NRA/ NMRA	NA	3	4	The NRA is existing and operational.	To strengthen the post-marketing quality surveillance of medicines including antimicrobials.
4.3 Surveillance of antimicrobial use and sale among humans	NA	3	4	Monitoring consumption of antimcirbials at the national level is implemented. Monitoring and facility audit of antibiotic prescribing and appropriate use are conducted on a regular basis. Updating of standard guideline for monitoring of AMC/AMU in line with global standard is planned.	To undertake regular AM consumption and use and provide feedback to prescribers and health managers for improvement.
4.4 Regulation of finished antibiotic products and APIs	NA	3	5	The NRA regulates all aspects of antibiotic manufacture, import, storage and sale despite lack of capacity including human and physical resources.	To enforce regulation in the distribution, sale and use of antimicrobials.

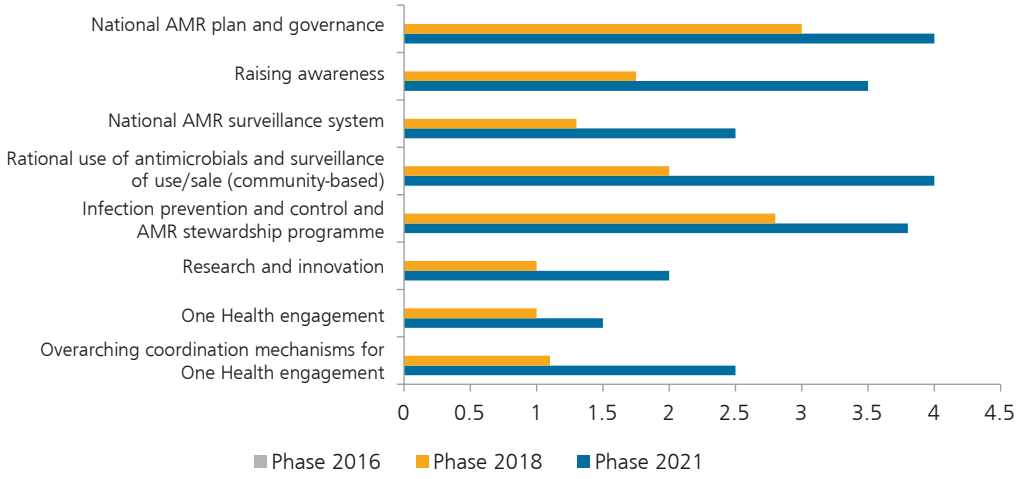
Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
4.5 Regulation of pharmacies regarding OTC sale and inappropriate sale of antibiotics and APIs	NA	1	5	The government supplies drugs to facilities and pharmacies; drugs are centrally procured. All facilities and pharmacies are government-owned, which ensures quality. However, sale of drugs without prescription remains a challenge	To enforce regulation in the distribution and sale of prescription medicines including antimicrobials. To strengthen quality surveillance of medicines in public and private facilities; strengthen measures to combat substandard and counterfeit products.
4.6 A national AMR containment policy and regulatory framework for control and registration of use in animals	NA	1	3	There is a national guideline and legislation covering some aspects of antimicrobial use in the animal sector.	To implement and enforce the existing regulation of antimicrobial sale, distribution and use in the animal sector.
4.7 National surveillance of AMR, and use and sale of antimicrobials in the veterinary sector	NA	AMU-1 AMR-1	3	There is a guideline for surveillance of AMR in the animal/verterinary sector and some AMR data are collected. But the national guidelines for AMR surveillance and monitoring of antimicrobial use in the animal sector are not aligned with WOAH.	To revise guidelines for sale, distribution and use of antimicrobials and align with the international standard (WOAH). To implement guidelines for AMR surveillance in the animal sector.
5. Infection prevention and control					
5.1 AMS in health-care settings	NA	2	3	A national AMS strategy is developed and the national essential medicine list is updated adopting the AwaRe classificaiton in 2019.	To implement the national AMS in health-care settings; implement the AwaRe classification of AM in the supply and use of antimicrobials at health facilities.
5.2 IPC programme in health-care settings	NA	3	4	Trainings on IPC have been conducted regularly in all health-care facilities. IPC programme has been implemented in all health-care facilities and nationwide trainings, awareness campaings, monitoring and supervision of IPC practices have been implemented extensively since 2020.	To continue and strengthen the implementation of IPC in health-care facilities and best utilizing the momentum of preventive measures and control of the COVID-19 pandemic.

Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
5.3 National HAI and related AMR surveillance	NA	3	4	Centralized data on HAI are available from many hospitals but capacity of data management and analysis needs to be further developed.	To improve capacity for data management of HAI and AMR surveillance.
5.4 Sanitation and hygiene	NA	5	5	Complete nationwide coverage has been ensured with respect to sanitation and hygiene and safe water supply in institutions, hospitals, communities and schools. This is seen as a success model that can be replicated and upscaled across the country.	To document and disseminate information on the success in improving hygiene, sanitation and access to clean water.
5.5 Vaccination	NA	1	5	The EPI system is well established, IEC activities are conducted on a regular basis to increase social awareness, interest and attendance to vaccination, monitoring system is developed well, thus EPI coverage is sustained at a high level.	To develop and implement an effective monitoring and evaluation system.
5.6 Biosecurity (IPC) in the animal sector	NA	3	3	General guidelines for biosecurity in the animal sector are implemented, and there are regular reporting mechanisms and a system to monitor compliance. National epizootic disease monitoring with specimen referral systems have been operationalized.	To continue and strengthen the implementation of biosecurity measures in the animal sector.
6. Research and innovation					
6.1 R&D and innovation on AMR prevention and containment and research funding	NA	1	2	There is a plan to conduct research for developing the economic base for sustainable investment.	To develop information materials for research on AMR prevention and control. To encourage research institutions to embark on specific studies focusing on AMR.
7. One Health engagement					
7.1 A national AMR containment policy and regulatory framework to control the release of AR and AMR into the environment and management therein	NA	1	2	Regulations in place for controlling AR emissions from antimicrobial manufacturers and hospitals into the environment.	To develop guidelines for implementation of the existing regulations to manufacturers, hospitals and other relevant institutions. To disseminate those to manufacturers, hospitals and other relevant institutions.

Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
7.2 National surveillance of AR and AMR in wastewater from manufacture and use in the human, animal and fishery sectors and disposal by institutions and homes	NA	1	2	A policy is in place, however capacity for surveillance of waste generation and environement is limited and needs to be further developed.	To develop guidelines for the implementation of the existing regulations to manufacturers, hospitals and other relevant institutions. To disseminate those to manufacturers, hospitals and other relevant institutions.
8. Overarching coordination mechanisms for One Health engagement					
8.1 Overarching AMR coordination mechanism	NA	2	3	A national coordinating committee is established and the committee reports to the National Cabinet. Sectors involved: human, animal, environment, education, food safety, mass media. The plant sector is not included. Roles and responsibility (ToR) of stakeholders are clearly defined and a multisectoral working group is functional.	To undertake regular coordination meeting and involve the agriculture sector; develop and monitoring and evaluation framework for all sectors.
8.2 Inclusion and engagement of all relevant sectors in the NAP-AMR	NA	1	3	The NAP-AMR engages stakeholders from various sectors, such as human health, animal, environment, education, quality control committees for medicine, food and mass media.	To undertake regular coordination meetings and involve agriculture sector; develop a monitoring and evaluation framework for all sectors.
8.3 A platform and/or mechanism for sharing AMU monitoring data from all relevant sectors	NA	1	3	Data from different sectores are collected and intermittently shared.	To develop a national database for AMU consumption/use and regularize sharing of information involving all relevant sectors.
8.4 A platform and/or mechanism for sharing AMR surveillance data from all relevant sectors	NA	1	2	The national AMR surveillance system and guideline are developed involving human health and animal health sectors.	To initiate pilot implementation in some selected institutions.

Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
8.5 AAW is nationally coordinated and celebrated with involvement of and contributions from all relevant sectors	NA	1	3	IEC campaigns are activley conducted on the occasion of AAW since 2018 involving different sectors (human health, mass media, education, etc.).	To expand WAAW activities to cover wider areas and best utilize the events for advocacy and education in all sectors.
8.6 A mechanism for co-sharing of resources for AMR initiatives	NA	1	1	No specific resources have been identified for AMR. WASH and IPC initiatives have been identified for co-sharing of resources to conduct AMR-related activities.	To undertake mapping of possible resources for AMR activities.

Fig. A3. Progress analysis of AMR prevention and containment in DPR Korea, 2016-2021



The figure shows an average of phase-grading for all indicators in different focus areas, purely for pictorial representation

Achievements and lessons learnt

- During 2021, DPR Korea reported 77% of indicators with implementation phase of 3 and above, meaning that the majority of indicators have been at the stage of early implementation or more. This would appear to be progress compared to the earlier progress report of 2018 (30%).
- AMR has reportedly been incorporated in pre-service education of medical universities and covered in continuous in-service training programme for medical professionals and health workers on a regular basis.
- The NRL for AMR has been designated and is reportedly functional, participating in the EQA scheme for bacterial identification and susceptibility testing since 2019.

- A national policy on AMR governance has been developed and reportedly implemented in health facilities nationwide. A National Essential Medicines List has been reportedly updated in 2019, adopting the WHO AWaRe classification for antimicrobials and used as a basis for the selection and supply of medicines to health facilities.
- Regulation on the OTC sale and inappropriate sale of antimicrobials is reportedly implemented, with the public sector supplies of drugs to facilities and pharmacies, which are owned by the government.

India

Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
1. National AMR plan and governance					
1.1 NAP in line with GAP-AMR, governance issue	2	3	3	The NAP is in line with the GAP-AMR, governance mechanisms on AMR have been established and revised recently; a phased approach has been adopted for implementation, beginning with surveillance and IPC. WHO presneted policy options for AMR containment at the PM's Science Technology and Innvations Advisory Council meeting in 2021, co-chaired by PSA and NITI Aayog.	There is a need for stronger advocacy with policy-makers in non-human sectors to prioritize AMR and allocate separate funds for AMR activities in different sectors.
A2. Raising awareness					
2.1 Awareness campaigns for the public	2	2	3	Some government-led activities have been conducted in parts of the country to raise awareness of AMR. WHO partnered with NGOs and student associations for raising AMR awareness. WHO organized a national public awareness survey, which is ongoing.	To develop a national strategy for mass awareness and conduct a survey to assess the impact of the awareness campaigns on the knowledge, attitude and practices of the public. The efficacy of the redline campaign, an innovative approach for antimicrobial containment in India, should be evaluated. There is a need for secure sustainable funds and political commitment to support generation of awareness across all sectors.

Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
2.2 Education and training strategies for professionals in the human health sector	2	3	3	AMR forms a part of continuous professional development courses for health-care professionals. The Medical, Nursing and Pharmacy Council has been set up to review medical training and curriculum.	To build awareness of the containment of AMR among professionals of the human health sector, it is recommended that awareness programmes, workshops and training for basic health staff be reviewed and developed. As the topic of AMR is included in the curriculum and continuous professional training, it is important to develop a competency framework as a way forward.
2.3 AMR awareness generation and education in the animal sector	2	1	2	There is no national strategy for the generation of awareness of AMR in the animal sector. The veterinary curriculum has been modified to include topics in microbiology that emphasize AMR. There are limited activities for raising awareness, such as training for veterinarians.	To develop a strategy and guidelines on raising awareness among veterinarians of the prudent use of antimicrobials. Align awareness campaigns with regulatory framework. Focus on the use of mass communication techniques and the social media platform to reach farmers in far-flung areas. Initiate the inclusion of AMR-related issues in the curriculum for veterinary professionals.
2.4 AMR awareness generation and education in the environmental sector	NA	1	2	There are no targeted communication strategies on AMR in waste. Guidelines for AR monitoring are being developed.	To create awareness of efficient management of biological waste products, including manure, in the context of AMR containment. Strengthen community-level management of the disposal system for unused/expired antimicrobials on farms and in households.

Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
3. National AMR surveillance system					
3.1 National human AMR surveillance	2	3	3	An AMR surveillance network, including a large number of tertiary hospitals in the public sector and a limited number of private hospitals, has been established. It contributes data to GLASS. The surveillance is yet to be sensitive and representative. Also, its contribution to GLASS is limited. WHONET used in NCDC, MAHASAR, KARS-NET and WINSAR-D networks. ICMR has online data collection and analysis portal.	For human AMR surveillance to be representative of the country, additional sites especially through state surveillance networks may be added.
3.2 Strengthening of the national laboratory network for humans	2	4	3	A national laboratory network has been established. CLSI has been adopted as the reference standard and EQAS has been set up at all surveillance sites. All networks have SOPs for AST and data management.	To develop standardized protocols for diagnostic stewardship and laboratory quality management systems. Organize trainings for laboratory networks for AMR containment.
3.3 Strengthening of the national laboratory network in the animal sector	NA	NA	NA		
3.4 Early warning systems (EWS)	2	2	2	A list of priority AMR bacteria has been drawn up and molecular methods are available. However, reporting to GLASS-EAR is still in the initial phase.	To operationalize EWS, align the three national repositories of AMR strains and set up auto-generation of alerts, using a real-time IT-based AMR data management platform.
4. Rational use of antimicrobials and surveillance of use/sale (community-based)					
4.1 A national AMR containment policy for control of human use of antimicrobials; antimicrobial stewardship (see also 7.1)	3	2	3	AMS activities are ongoing.	To develop national guidelines for AMS. This should include monitoring tools to assess the impact of training and explore web-based training and resources to conduct nationwide training on stewardship.

Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
4.2 NRA/ NMRA	4	4	4	The Drug Controller General of India and Central Drugs Standard Control Organization (CDSCO) is the NRA. Tools for quality assurance and registration of antibiotics are in place, and inspection is implemented. However, the capacity for enforcement of policies and regulation is limited.	To promote regulatory cooperation on AMR in SEARN for imports of medical products (medicines, devices and diagnostics) and regulatory cooperation in the laboratory network.
4.3 Surveillance of antimicrobial use and sale among humans	3	3	3	Sale of antimicrobials at the national level have not been monitored. Monitoring of use is limited to few health facilities that are not representative.	To establish AMU surveillance in the human health sector, it is crucial to develop a national AMU monitoring system with technical assistance from the development partners. Member States should consider organizing a national workshop on surveillance of antibiotic consumption using the tool prepared.
4.4 Regulation of finished antibiotic products and APIs	4	4	4	The CDSCO is the regulatory authority. Inspection is implemented, but there is limited capacity for enforcement of policies and regulation.	To enhance engagement with the department of pharmaceuticals and get the CDSCO to conduct an assessment to generate evidence on the quality of drugs, and to support good manufacturing practices.
4.5 Regulation of pharmacies regarding OTC sale and inappropriate sale of antibiotics and APIs	4	4	4	The CDSCO is the regulatory authority in place. Inspection is implemented, but there is limited capacity for enforcement of policies and regulation.	To strengthen the regulatory capacity of the NRA to implement regulation of OTC sale and inappropriate sale of antibiotics and enforce regulations pertaining to finished products and APIs.

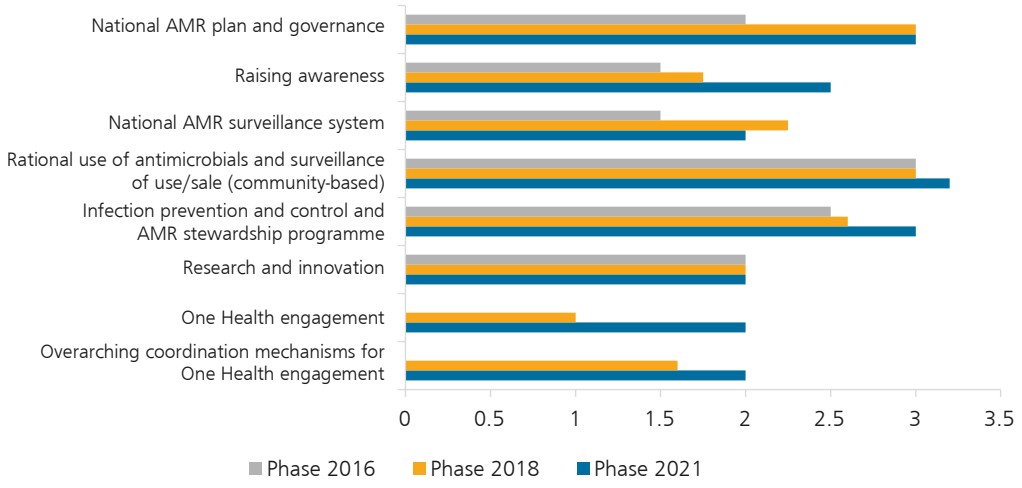
Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
4.6 A national AMR containment policy and regulatory framework for control and registration of use in animals	2	2	3	A national plan on AMU has been developed by the NMRA for the veterinary sector. A regulatory framework for the registration of products and AMU in the animal sector has been developed, but is not being implemented.	To develop a regulatory framework under the Drugs and Cosmetics Act to control the use of antimicrobials in the animal sector. To initiate national surveillance of AMU and sale in the veterinary sector, advocate establishing a drug supply chain from the manufacturer to distribution outlets. This should also include import information. Strengthen laboratory diagnostics and infrastructure for AMR surveillance.
4.7 National surveillance of AMR, and use and sale of antimicrobials in the veterinary sector	1	AMU 1 AMR 2	AMR-2 AMU-1	There are no policy/ guidelines for surveillance of antimicrobial sale and AMU. There is a limited capacity for AMR surveillance in the animal sector. An Indian network of fisheries and animal research on AMR has been established. SOPs in place and WHONET used for data analysis.	Same as 4.6 above
5. Infection prevention and control					
5.1 AMS in health-care settings	3	1	3	There is no national comprehensive policy for antimicrobial stewardship. Standard treatment guidelines and IPC guidelines have been developed.	To establish a national IPC programme, and integrate AMS and HAI surveillance with the IPC programme in health-care facilities. Build the capacity of nursing staff so that they can successfully implement the IPC programme nationwide. The Member States should work towards convergence of the surveillance conducted for AMR, AMU and HAI.
5.2 IPC programme in health-care settings	3	3	3	A national patient safety framework /IPC is implemented in selected health-care facilities.	Same as 5.1 above
5.3 National HAI and related AMR surveillance	3	3	3	AIIMS-ICMR HAI surveillance network sharing regular reports. Few public and private facilities have HAI surveillance and share data with bodies at the national level.	Same as 5.1 above

Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
5.4 Sanitation and hygiene	4	3	3	Policies/campaigns to improve sanitation and hygiene are implemented nationally. Data on safely managed water supply or sanitation services exist, and access to these is improving.	For the promotion of sanitation and hygiene, it is advisable to strengthen the implementation of WASH through IPC arrangements at health facilities. Emphasize promotion, along with M&E of the Swacch Bharat Abhiyaan and Kayalap, which have been recognized as good practices. Member States should promote routine immunization and include AMR as a topic of discussion for the immunization technical advisory group.
5.5 Vaccination	NA	3	3	PCV 13 has been implemented partially under Mission Indradhanush. Typhoid and PCV are used extensively in the private sector.	To continue routine immunization activities across the nation and expand the PCV vaccination programme to areas with a high burden of disease.
5.6 Biosecurity (IPC) in the animal sector	2	3	3	A biosecurity manual is being followed by public and limited private facilities in the animal sector, particularly the poultry set-up. Training for the animal sector, such as the fisheries department, is well established.	An online reporting mechanism has been developed. To ensure biosecurity in the animal sector, it is essential to develop a national biosecurity manual with good husbandry practices, ensure monitoring compliance and harmonize national AMR containment activities.
6. Research and innovation					
6.1 R&D and innovation on AMR prevention and containment and research funding	2	2	2	The NAP outlines research and development policies. There are various R&D activities under way, in collaboration with international agencies and development partners. AMR Innovation hub launched recently by C-CAMP, with oversight of Office of Principal Scientific Advisor to the Goverment of India.	To develop an AMR research consortium to strengthen partnerships with research/ academic institutions, civil society and other stakeholders, for resource mobilization and the development of evidence-based policies. The research activities to focus on the impact on the assessment of AMR containment initiatives to support NAP-AMR implementation.

Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
7. One Health engagement					
7.1 A national AMR containment policy and regulatory framework to control the release of AR and AMR into the environment and management therein	NA	1	2	Biomedical waste management guidelines exist and guidelines to reduce AR in industrial effluent are still in pipeline. No regulations have been developed to control AR emissions from antimicrobial manufacturers, hospitals and wastewater treatment plants.	To expedite the finalization of standards to control the release of AR and AMR into the environment and include the same in the national AMR containment policy. Review private sector initiatives and involvement in reducing AR in effluents.
7.2 National surveillance of AR and AMR in wastewater from manufacture and use in human, animal, fishery sectors and disposal by institutions and homes	NA	1+	2	The policy guidelines are weak and evidence linking AMR and the environment is limited.	National surveillance of AM residues and AMR in wastewater requires establishing a national authority for the containment of AMR and bridge the gap in the impact of AMR in the environment.
8. Coordination mechanisms for One Health engagement					
8.1 Overarching AMR coordination mechanism	NA	2	3	Multisectoral AMR coordination committees were established with participation of relevant sectors, including human and animal health, food safety, environment and civil society at the national level and in three states.	To establish multisectoral committee for AMR coordination by engaging relevant stakeholders including environment, food safety, agriculture, WASH across the country including at the state level.
8.2 Inclusion and engagement of all relevant sectors in the NAP-AMR	NA	3	3	The NAP-AMR provides for the inclusion and engagement of relevant sectors such as food, animal husbandry, dairy, fisheries, environment, civil society and education and research development.	Same as 8.1
8.3 A platform to share AMU monitoring from relevant sectors	NA	1	1	NAP-AMR plans to monitor AMU at the national and state levels.	To develop multisectoral integrated monitoring and surveillance mechanisms for the use and sale of antimicrobials in the human, animal and plant sectors.

Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
8.4 A platform and/or mechanism for sharing AMR surveillance data from all relevant sectors	NA	2	1	In the human health sector, a system is in place for AMR surveillance reports. In the animal health and food sectors, AMR surveillance is in early phase of development. There is no platform for sharing of data between sectors.	To enable evidence-based policy decisions, it is of paramount importance to streamline data flow and develop platforms for regular sharing of AMR surveillance and AMU-sales data with national and international stakeholders across relevant sectors.
8.5 WAAW is nationally coordinated and celebrated with involvement and contributions from relevant sectors	NA	1	3	WAAW is celebrated primarily in the human health sector. There are plans to establish linkages with WASH, animal and evironment sectors.	To build synergies among all relevant sectors to organize a nationally coordinated AAW with a focus on standardized and uniform communication strategies aimed at behavioural change.
8.6 A mechanism for co-sharing of resources for AMR initiatives	NA	1	1	No formal mechanism has been established for co-sharing of resources for AMR initiatives in the country.	Member States to map available resources, develop operational plans and establish mechanism to co-share resources for AMR initiatives.

Fig. A4. Progress analysis of AMR prevention and containment in India, 2016–2021



The figure shows an average of phase-grading for all indicators in different focus areas, purely for pictorial representation

Achievements and lessons learnt

- India reported 64% of 31 indicators with implementation phase of 3 and above during the 3rd Situational Analysis for NAP-AMR implementation progress in 2021 – significant progress compared to 2018 (45%) and 2016 (25%).
- India had NAP is in line with the GAP-AMR, governance mechanisms on AMR established and revised recently adopting a phased approach, beginning with surveillance and IPC for implementation in 2021, co-chaired by PSA and NITI Aayog.
- The Drug Controller General of India and Central Drugs Standard Control Organization (CDSCO) are the NRA which implemented quality assurance and surveillance and registration of medicines including antimicrobials with inspection system implemented.
- A national patient safety framework and IPC is implemented in selected health facilities.
- The AIIMS-ICMR HAI surveillance network sharing regular reports. Few public and private facilities have HAI surveillance and share data with bodies at the national level.

Indonesia

Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
1. National AMR plan and governance					
1.1 NAP in line with GAP-AMR, governance	3	2	4	NAP is in line with GAP-AMR, developed with multisec-toral collaboration (MoH, MoA, MoE, Mof Marine and Fishery, National Agency of Food and Drug Control, Coordinating Ministry of Human Development and Culture, national AMR committee, professional organizations, private sector, CSOs) supported by FAO, WHO,WOAH. Even though endorsement is still in process, all planned activities have been carried out by each sector.	To ensure the NAP to be endorsed soon and all budget components continue to be in place.
A. 2 Raising awareness					

Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
2.1 Awareness campaigns for public	3	4	4	Public awareness campaigns on the prudent use of antimicrobials have been conducted with a focus on health professionals working in the human and animal health sectors, students and farmers. Nationwide dissemination of information and educational material for increasing public awareness and knowledge, through the print, electronic, and social media have been conducted nationwide. AAW is organized regularly by the MoH and MoA, with support from development partners in the health sector.	Efforts should be made to continue and expand the public awareness campaign at the community level and evolve a methodology to assess the impact of public awareness campaigns regularly.
2.2 Education and training strategies for proffesionals in the human health sector	3	3	3	AMR has been included in scientific seminars, workshops, and training and technical assistance sessions for health-care professionals organized by professional organizations (human and animal sectors), hospital associations and hospital accreditation commission. AMR has been included in veterinary students Curricula. No auditing done yet.	Continue to educate and train professionals in human health, include AMR in the curriculum for all health professionals, including medical, pharmacists, technicians, nurses, and continuous professional development courses. To carry out KAP exercises pre- and post-training to assess the impact of training.

Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
2.3 AMR awareness generation and education in the animal sector	1	3	3	AMR awareness programmes have been developed and piloted in some pre-service veterinary training and a few special courses for veterinary faculty, both in the public and private sectors. The webinars for farmers and technical services material including situation of AMR in Indonesia and how to use antibiotics prudently and responsibly in related sectors, among farmers and stakeholders from the poultry association.	Stronger advocacy with academia and professional organizations/ associations is required for the generation of AMR awareness in the animal sector so that the subject of AMR is included in the curriculum and continuous professional development courses for veterinarian and farming professionals. Adopt a multisectoral approach by involving marine and agricultural sectors to generate awareness of efficient management of wastewater, medical waste (antimicrobials) in the context of AMR. Engage farmers association and veterinary association to involve in spreading awareness of AMR to members.
2.4 AMR awareness eneration and education in the environmental sector	NA	1	1	No policies/communication strategies have been developed to limit the disposal of antimicrobials in the environment and to monitor the impact of AMR in waste.	To enhance engagement of the environmental sector and link the existing policies with AMR-related issues to make evidence-based policy decisions. The Member States should conduct national surveillance with technical support from development partners to generate a country profile of AR and AMR in the environment and identify indicators for monitoring AR and AMR in wastewater from relevant sectors.

Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
3. National AMR surveillance system					
3.1 National human AMR surveillance	2	2	3	Under MoH decree, one NCC, two NRLs and 20 sentinel sites assigned. The Global Integrated Survey on EsBL producing *E. coli*, or the Tricycle Project, started in November 2018 with the aim to strengthen the AMR surveillance system globally/in Indonesia and promote integrated surveillance across the human, animal and environmental sectors using the One Health approach. This pilot project has been completed and generated substantial recommendations for related ministries and sectors.	To implement the AMR surveillance guidelines in 20 sentinel sites and two NRLs.
3.2 Strengthening of the national laboratory network for humans	1	1	3	All sentinel sites participated on national external quality assurance (EQA) for AMR, organized by national reference laboratory. The two NRLs participated in International EQA for identification and susceptibility testing.	To establish a national network of EQA health laboratories in all sentinel sites.

Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
3.3 Strengthening of the national laboratory in the animal sector	NA	NA	3	Establihment of laboratory network for clinical AMR surveillance had been initiated by FAO during implementation of pilot clinical AMR surveillance in 2019. Establishment of a laboratory network for clinical AMR surveillance is continuing with support of the Fleming Fund in 2021 and 2022. FAO involved three laboratories in pilot clinical AMR surveilllance: disease investigation center (DIC) in Yogyakarta-Central Java, animal health laboratory in Malang-East Java, veterinary public health laboratory in Pati-Central Java. The laboratory in Malang and the laboratory in Pati were assigned to collect diseased layer poultry and submitted the samples to DIC for isolation, identifiation, and AST. Related laboratory trainings and technologies to conduct automated AST were provided by FAO to increase capacity of laboratory staff in conducting AMR test for bacterial pathogens. The Fleming Fund and WHO currently involve another DIC and other laboratories in West Java to conduct clinical AMR surveillance in diseased layer poultry. Capacity building and technologies will be provided for the laboratory to increase their capacity in detection and AST of target pathogens.	There is a need for strengthening capacity of more veterinary laboratories to conduct isolation and identification and AST for target pathogen from livestock using international standards. Collections of bacterial pathogens archived in veterinary laboratories in Indonesia should be tested for their susceptibility against antimicrobials. AST of bacterial pathogens will help in the establishement of clinical breakpoints for pathogens in animals.
3.4 Early warning systems (EWS)	NA	1	1	Plan to develop dashboard on AMR in human and animal health is available. There is no AMR-specific EWARS. Disease-specific warning systems (for TB, HIV) have been developed.	To develop a plan to establish EWS for emerging resistance on a national scale and expand the list of priority.

Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
4. Rational use of antimicrobials and surveillance of use/sale (community-based)					
4.1 A national AMR containmment policy for control of human use of antimicrobials; antimicrobial stewardship (see also 7.1)	4	2	2	Antimicrobial stewardship guidelines are not yet available for human and animal health. A national AMS has been planned and is under development. There is a list of essential medicines and a national formulary which places restrictions on AMU in health-care facilities.	To strengthen the implementation of the AMS nationwide, update the guidelines on AMU. Explore the introduction of prescription audit, feedback mechanisms and expansion of the AMS to private health-care facilities. This will receive direct attention inder the MPTF project.
4.2 NRA/NMRA	4	5	5	The NADFC conducts pre- and post-marketing control of antimicrobial medicines as part of quality assurance activities. The NADFC enforces GMP, good distribution practices (GDP) and good pharmacy practice (GPP), particularly to ensure quality standards, production, distribution and management of medicines in health-care facilities. There is a cyber patrol to control online sale of drugs.	To promote regulatory cooperation on AMR in SEARN for the import of medical products (medicines, devices and diagnostics) and regulatory cooperation in the laboratory network. Ensure availability of adequate financial resources, trained workforce at NRA for optimal performance and support implementation of NAP-AMR.
4.3 Surveillance of antimicrobial use and sale among humans	3	3	4	Antibiotic use data at the individual hospital level are collected from a small sample in some referral hospitals. No established analysis with national AMR lab-based surveillance.	AMU surveys are conducted in a representative sample of facilities and link with national AMR surveillance.
4.4 Regulation of finished antibiotic products and APIs	NA	5	5	New government instruction on Implementation of Risk-Based Business Licensing highlighted about pharmaceutical service standards and good management of drugs and drug ingredients for drug delivery activities and drug ingredients. This regulation has been disseminated to pharmaceutical companies and services. Public hearing has been conducted before the issue of this new regulation.	To strengthen the NRA's capacity to maintain regulatory control of finished antibiotic products, APIs and OTC sale of antibiotics.

Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
4.5 Regulation of pharmacies regarding OTC sale and inappropriate sale of antibiotics and APIs	NA	4	4	Law enforcement and policy implementation should be improved by active involvement of professional organizations and local authorities. A regulatory authority and system are in place. Inspection is implemented, but there is limited capacity for the enforcement of regulation. Pharmaceutical standard for drug stores has not been regulated and issued.	To finalize regulations for online sale of medicines. National regulatory authority inspection/ enforcement need to be strengthened.
4.6 A national AMR containment policy and regulatory framework for control and registration of use in animals	2	3	3	Policies and regulations have been established on AMU in the livestock and animal health sector, but there is limited capacity for monitoring registration and AMU. The colistin was banned for animal use in Indonesia due to its importance for human. Colistin was identified as Highest Priority importance antibiotics in the WHO importance list of antibiotics because of the increasing usage of colistin to treat serious infections in humans in many parts of the world. The technical guidance for medicated feed regulate drugs use (including antimicrobials) in feed, requirements of feed, drugs mixing (including antimicrobials) procedures in the feed, monitoring of feed quality and safety, and also reporting.	The Member States may consider including the assessment of biosecurity measures during routine inspections. To focus on biosecurity in the animal sector, it is suggested that awareness campaigns be conducted for small-scale farmers, and concepts of biosecurity be included in continuous professional development courses for veterinarians and audit learning after training. Ensure sustainability by providing adequate human and financial resources.
4.7 National surveillance of AMR, and use and sale of antimicrobials in the veterinary sector	2	AMU 3 AMR 3	AMR 3 AMU 3	Surveillance of the sale, distribution and use of antibiotics is limited and not yet integrated. Surveys of antibiotic sales were based on data on the import and production of antibiotics, while no comprehensive correlation survey has been conducted between sales data and usage data. A national strategy is being developed on AMR surveillance in the veterinary sector and capacity-building.	Same as 7.1 above
5. Infection prevention and control					

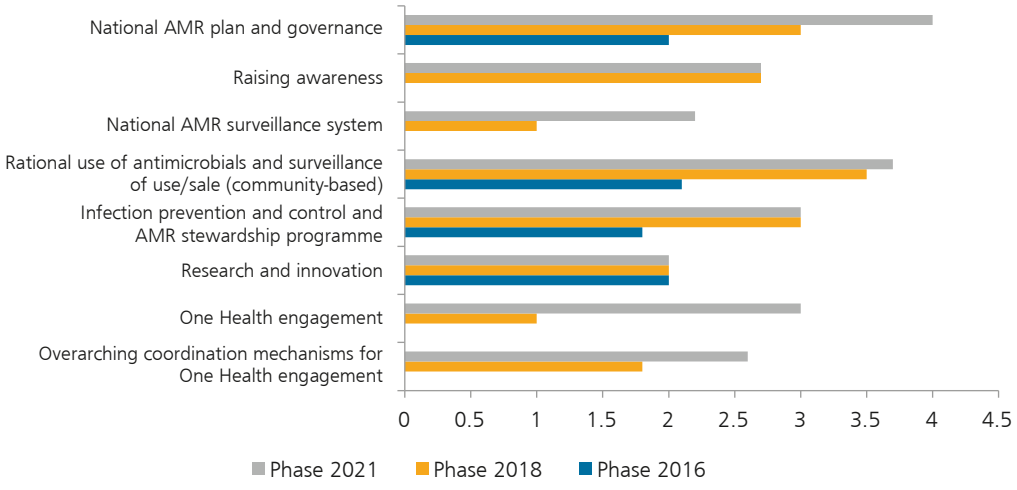
Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
5.1 AMS in the health-care settings	3	3	3	There are no national policy/ guidelines on stewardship. National IPC-AMR plans aligned. IPC-AMR plans implemented in limited number of health-care settings.	To develop a national policy on AMS, allocating an adequate budget and using sufficient human resources for national implementation. Inappropriate antimicrobial prescribing by health professionals is still high; weak implementation of AMS practices. This needs to be improved.
5.2 IPC programme in health-care settings	3	3	3	An IPC programme is implemented in select health-care facilities. It includes the rational use of antibiotics, guidelines, standard and transmission precautions, education and training, HAI surveillance and capacity-building plans.	Suboptimal implementation of IPC measures and IPC activities in health- care facilities; inadequate monitoring and analysis of IPC-related data. In consultation with technical experts, prepare guidelines on training and a reporting system for data management, and integrate IPC with AMS in health-care settings.
5.3 National HAI and related AMR surveillance	2	2	2	Few public and private facilities have HAI surveillance. Data are not centralized at the national level. Not mentioned in the NAP-AMR 2020–2024.	To prepare specific technical guidelines for HAI and standardize HAI-related AMR surveillance in the country. To support HAI surveillance, it is essential to set up a laboratory network with close monitoring and supportive supervision to maintain the highest performance standards.
5.4 Sanitation and hygiene	NA	4	4	A policy/WASH campaign to improve sanitation and hygiene is implemented at a large scale. Data on safely managed water supply or sanitation services exist, but access to these data is medium.	The Member States should strengthen their sanitation and hygiene campaign, consider a detailed survey on WASH in health-care settings and build advocacy for the nationwide expansion of the WASH programme.
5.5 Vaccination	NA	2	3	PCV has been introduced in all provinces of the country in 2021. In general, there is vaccination coverage of more than 90%. Not mentioned in NAP-AMR 2020–2024.	To continue routine immunization activities across the nation and conduct evidence-based expansion of the PCV vaccination programme to provinces with a high disease burden.

Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
5.6 Biosecurity (IPC) in the animal sector	3	4	4	Continuous professional development in AMR and alternative biosecurity measures and regular audit of learning are being carried out. Though M&E mechanisms are functional, their contribution is suboptimal for improving the capacity of the system and ensuring sustainability. Forty-three layer poultry farms by 2020 had recieved NKV certification	To continue training for biosecurity and develop assessment for biosecurity implementation in the farm. To develop biosecurity manual to standardize the minimum biosecurity that should be implemented in farms.
6. Research and innovation					
6.1 R&D and innovation on AMR prevention and containment and research funding	2	2	2	Policies have been planned and the existing structure proposes to foster research and innovation on AMR.	To strengthen coordination and collaboration among various stakeholders and laboratory networks to formulate a coherent R&D policy and ensure the availability of technical and financial funds, to conduct targeted research on AMR.
7. One Health Engagement					
7.1 A national AMR containment policy and regulatory framework to control the release of AR and AMR into the environment its management.	NA	1	5	Health Minister's decree regulates good manufacturing practice (GMP) and the NADFC issued the guideline that includes prevention of residue including AR to the environment. But the involvement of the Ministry of Environment in the AMR policy has to be established.	To advocate the integral role of the Ministry of Environment in developing policy and a regulatory framework for AMR containment and management.
7.2 National surveillance of AR and AMR in wastewater from manufacture and use in the human, animal and fishery sectors and disposal by institutions and homes	NA	1	1	Though the environmental sector is engaged in AMR activities, there are no regulations on AR and AMR monitoring in the environment. DGLAHS and FAO had strengthened capacity of AMR reference laboratory in the Ministry of Agriculture to conduct detection of bacteria and AMR genes using the whole genome sequencing technology. Results of this pilot study will be used to reinforce the regulation for slaughterhouse wastewater management.	To strengthen community-level management of the antimicrobial disposal system of unused antimicrobials at the farm or household level. It is recommended to conduct further studies on effective and efficient wastewater treatment in slaugtherhouse to reduce the disemination of AMR from slaughtering facility to environment.
8. Coordination mechanism for One Health engagement					

Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
8.1 Coordination mechanism for One Health	NA	1	2	The NAP outlines a multisectoral coordination mechanism, but the organizational structure is yet to be implemented, although in routine activities, the MoH coordinates all concerned ministries and sectors.	To enhance multisectoral collaboration, involvement and engagement of all relevant sectors, there is a need to set up a coordination committee and have the NAP-AMR endorsed by the government.
8.2 Inclusion and engagement of all relevant sectors in the NAP-AMR	NA	2	2	Revised NAP-AMR 2020–2024 provides for inclusion and engagement of various sectors, including the human health, animal health, food safety, environmental sectors.	Further engagement of plant health, food production in the coordination and activities implementation.
8.3 A platform and/or mechanism for sharing AMU monitoring data from all relevant sectors	NA	1	4	No platform and mechanism for sharing AMU data among the relevant sectors.	To develop multisectoral integrated monitoring and surveillance mechanisms for the use and or consumption of antimicrobials in the human, animal and plant sectors.
8.4 A platform to share AMR surveillance data from relevant sectors	NA	2	2	Currently, there is no existing mechanism for AMR surveillance data sharing between all relevant sectors. The Ministry of Agriculture conducts AMR surveillance of livestock and data from the national reference laboratory is shared with the central government.	Sustain and scale up the existing tricycle project activity to enable evidence-based policy decisions in the three sectors. Develop platform and or mechanism for sharing AMR data in the Tricycle Project and expand to other pathogen data. This is to enable evidence-based policy decisions, it is of paramount importance to streamline data flow and develop platforms for regular sharing of AMR surveillance data with all national and international stakeholders across relevant sectors.

Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
8.5 AAW is nationally coordinated and celebrated with involvement of and contributions from all relevant sectors	NA	1	4	AAW activity is nationally coordinated, but no coordinated campaign beyond WAAW.	To plan a coordinated campaign on AMR beyond WAAW. Review awareness campaign activities for better output in the future activities. Develop communication strategy for targeted audience/community. Need more involvement of the environmental sector.
8.6 A mechanism for co-sharing of resources for AMR initiatives	NA	1	2	There is no sharing of resources for AMR activities with the One Health approach from different ministries/sectors.	Ministries and sectors should refer to the NAP on AMR when developing ministerial annual workplan and coordinate with related ministry to co- sharing fund/human resource/ infrastructure and execute the activities.

Fig. A5. Progress analysis of AMR prevention and containment in Indonesia, 2016–2021



The figure shows an average of phase-grading for indicators in different focus areas.

Achievements and lessons learnt

- Indonesia reported 67% of 31 indicators across focus areas with implementation phase of 3 and above, already in the early implementation. This is significant progress compared to the situational analysis in 2018 (41.9%) and 2016 (25.8%).
- Indonesia has revised its NAP 2020–2024 with multisectoral coordination (MoH, MoA, MoE, Ministry of Marine and Fishery, National Agency of Food and Drug Control, Coordinating

Ministry of Human Development and Culture, National AMR committee, professional organizations, private sectors and CSOs), along with detailed plan and cost, and supported by FAO, WHO, and WOAH. Official endorsement is still in process, all planned activities have been carried out by each sector.

- Public awareness campaigns through the Community Movement on Smart Use of Medicines (GeMa CerMat) programme, prioritized in AMR and prudent use of antibiotics. AMR has been incorporated in the teaching curricula of professionals in the human and veterinary sectors.
- Enforcement of the existing regulation on Prescription Drugs that antimicrobials are prescription drugs and cannot be sold OTC. Cyber patrol for online drug stores is carried out and actively reports on stores that sell antibiotics without prescription and or inappropriate sale to the Communication and information ministry for action.
- Enforcement of the existing ministerial decree regulating good manufacturing practice (GMP) including prevention of disposal of residue including AR to environment; where the National Agency for Food and Drug Control develop guideline and monitor the implementation.

Maldives

Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
1. National AMR plan and governance					
1.1 NAP in line with GAP-AMR/ governance issue	2	4	4	Activities planned for 2019 have been conducted, however due to the COVID-19 pandemic the planned activities were postponed. Online meetings for TSC subcommittee on AMR Awareness and Education conducted. A high level ministerial steering committee for AMR established and meetings to be initiated. (NEW)	To prioritize endorsement of the NAP-AMR by all ministries concerned, including agriculture, fisheries and environment, along with the animal and human health sectors. Step up targeted advocacy with policy-level decision-makers to mobilize resources and create synergies with the existing programmes for AMR containment.
A2. Raising awareness					

Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
2.1 Awareness campaigns for the public	2	3	3	Several awareness activities especially targetted for the WAAW 2019 was conducted in the capital and islands. The activities involved health professionals, students, media and the general public. However, due to the COVID-19 pandemic situation, WAAW 2020 was mainly focused on media events. An online Youth Art Challenge was held during WAAW 2020 and winners of the challenge awarded prizes. Development of a Communication Plan (2020) to strategically conduct AMR awareness programmes throughout the country. (NEW)	To strengthen colloboration with stakeholders to ensure implementation of the One Health approach in AMR Awareness and Education strategies. (NEW)
2.2 Education and training strategies for professionals in the human health sector	1	3	3	Due to the COVID-19 pandemic as all technical health-care professionals were working for the National Health Emergency Center for COVID-19 response.	To develop a specific curriculum for health-care professionals, including experts in the fishery, plant and environmental sectors.
2.3 AMR awareness generation and education in the animal sector	1	1	1	The AMR awareness TV programme delayed to 2021 due to the worsening situation of COVID-19. MNU to conduct a baseline KAP survey to understand the AMR awareness among farmers, vendors, veterinary practitioners. Survey delayed to 2021 due to the pandemic. (NEW)	To continue advocacy and awareness activities for farmers, pet owners and health professionals in the veterinary sector.
2.4 AMR awareness generation and education in the environmental sector	NA	2	2	The national AMR containment policy addresses awareness and education of the environmental sector. Active participation of representatives from the Ministry of Environment in Technical Subcommittee on AMR Awareness and Education facilitates the contribution from the Ministry of Enviroment. Planned awareness activities could not be conducted due to the COVID-19 situation.	To increase the involvement of the environmental sector to address waste management and envionment exposure to antimicrobials. (NEW)
3. National AMR surveillance system					
3.1 National human AMR surveillance	2	2	2	Due to excessive workload from COVID-19 testing, data entry was halted. This backlog to be attended and completed by 2021.	To strengthen the IT sector to support national human AMR surveillance.

Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
3.2 Strengthening of the national laboratory network for humans	1	2	2	Based on the situational analysis, laboratories will be identified to establish a surveillance network and bridge the gap in reporting. (NEW)	To develop surveillance framework to ensure comprehensive AMR reporting throughout the country and identify risk early on. (NEW)
3.3 Strengthening of the national laboratory network in the animal sector	NA	NA	1	Assessment for laboratory completed and equipment for laboratory identified. (NEW)	To strengthen coordination and collaboration between stakeholders. (NEW)
3.4 Early warning systems (EWS)	1	1	1	There are no EWS.	To build capacity for the molecular verification of identified AMR organisms to establish EWS.
4. Rational use of antimicrobials and surveillance of use/sale (community-based)					
4.1 A national AMR containment policy for control of human use of antimicrobials; antimicrobial stewardship (see 7.1)	2	2	3	The national AMS is in endorsement stage. Implementation to begin in 2021. Standard treatment guidelines (STGs) have not yet been developed. Development of STGs planned for 2022.	To strengthen support from management from all Health-care facilities for the implementation of AMS. (NEW)
4.2 NRA-NMRA	3	4	4	Tools for quality assurance and registration of antibiotics are in place and inspection implemented, but the capacity for the enforcement of policies and regulation is limited.	To ensure availability of adequate financial resources and trained workforce for the Food and Drug Authority to support the implementation of the NAP-AMR optimally.
4.3 Surveillance of antimicrobial use and sale among humans	2	3	3	Due to COVID-19 situation, travelling restrictions amidst lockdown and movement restrictions, regular inspections of pharmacies both in the capital and islands not conducted. Prescription audit was not conducted and usage during this period not monitored. Establishement of a National AMR Surveillance Framework with governance structure needed to ensure the proper representation of members in AUSC. The development of this framework has been delayed to 2022 due to the COVID-19 pandemic.	To identify resources for capacity building and establishing systematic surveillance of AMU and sale in humans.

Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
4.4 Regulation of finished antibiotic products and APIs	2	4	4	A regulatory authority and system are in place and inspection is implemented, but the capacity for the enforcement of policies and regulation is limited. Maldives Food and Drug Authority (MFDA) is the regulatory authority. There is country legislation for antibiotic for human use. Inspection at ports of entry, post-marketing surveillance and complaints, ADR reporting are all investigated by MFDA. Samples for suspected products and surveillance purposes are tested. Samples are usually sent to a designated laboratory for quality testing. Products that have failed these tests have been withdrawn and taken off the market.	To strengthen capacity of NRA to implement regulation of OTC and inappropriate sale of antibiotics and enforce regulations on finished products and APIs.
4.5 Regulation of pharmacies regarding OTC sale and inappropriate sale of antibiotics and APIs	2	4	4	Updated approved drug list (ADL) published monthly with drug schedules, with antibiotics to be sold based on these schedules. Curbing OTC sale of antibiotics still a challenge as several pharmacies practice sale without prescription. OTC drug list is included in the approved drug list (latest published September 2021). Once AMR regulation is implemented, all antibiotcs will have a signatory orange dot for easy identification of antimicrobials. Awareness programme for all pharmacists conducted in 2019 and event for 2020 was postponed due to COVID-19. (NEW)	To strengthen capacity of NRA to implement regulation of OTC and inappropriate sale of antibiotics and enforce regulations on finished products and APIs. Additionally, legal support in expediting the development and enforcement of new regualation. (NEW)
4.6 A national AMR containment policy and regulatory framework for control and registration of use in animals	2	1	2	Human medicines regulated through the Medicines Regulation and AMR Containment Policy. Following the development of Veterinary Regulatory Guidelines and Standards, existing gaps in the plant and animal health area can be attended. (NEW)	To streamline data generated from AMR/AMU surveillance and develop mechanisms for systematic data sharing with national and international stakeholders.

Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
4.7 National surveillance of AMR, and use and sales of antimicrobials in the veterinary sector	3	AMU 1 AMR 2	2	There is no system for collecting data on AMU in animals. No reports have been submitted to the WOAH on AMU in the animal sector due to the non-availability of data. The AMR containment policy includes AMR surveillance in animals. However, no activities have been conducted for want of infrastructure, skilled workforce, guidelines and SOP for laboratory activites in the animal sector. The laboratory capacity with respect to food and water is limited. An aquaculture centre with laboratory facilities is being developed.	Member States should establish a mechanism for the collection and analysis of data on AMU in the veterinary sector at the national level.
5. Infection prevention and control					
5.1 AMS in health-care settings	1	1	1	The national AMS has the requirement for the set up a stewardship programme in health-care facilities, composition of AMS team and their ToR. Once implemented, this will be followed by each instituition when developing their own AMS programme based on their facilities and cpacity.	To expedite the preparation of national guidelines for the IPC programme and integrate AMS and HAI surveillance with the IPC programme at health-care facilities. Set up drug and therapeutics committees in hospitals and plan trainings for capacity-building or retaining and/or recruiting of infectioncontrol specialist.
5.2 IPC programme in health-care settings	2	2	2	Work is ongoing for the fnalization of the IPC guidelines and workshop to train stakeholders on it. However, much of the work has been delayed due to COVID-19.	A national committee needs to be set up to elaborate policy and strengthen laboratory capacity to support IPC in health-care settings.

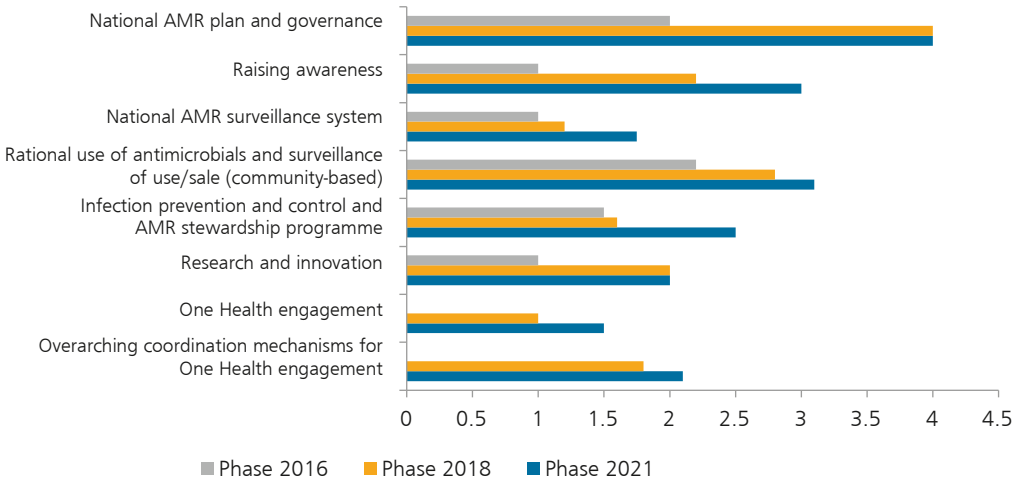
Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
5.3 National HAI and related AMR surveillance	2	1	1	Endorsement of antimicrobial stewardship programme and National IPC guideline National AMR Surveillance Framework to be developed through technical expertise procured through WHO. This activity has been postponed for 2022.	To establish a specific HAI surveillance system with guidelines, including M&E aspects.
5.4 Sanitation and hygiene	2	4	4	Awareness on hand hygiene and proper handwashing was conducted via media.	To strengthen the surveillance of wastewater for microbial content and antibiotic residue. Promote WASH activities nationwide.
5.5 Vaccination	NA	1	2	Plans are under way to introduce PCV in 2018. A low incidence of typhoid was reported by the disease surveillance system, so typhoid vaccination is not being considered.	To introduce PCV as planned.
5.6 Biosecurity (IPC) in the animal sector	1	1	1	There are no AMR-specific biosecurity policies, though general guidelines on biosecurity (for poultry, small ruminants but not aquaculture) have been developed and partially implemented.	Biosecurity guidelines specific to AMR in the animal sector, including aquaculture, should be developed. The Member States should consider the inclusion of biosecurity measures in inspection services and visits.
6. Research and innovation					
6.1 R&D and innovation on AMR prevention and containment and research funding	1	2	2	Policies have been framed and the existing structure has a plan to foster R&D.	To promote R&D to understand the baseline AMU/AMR status in the country. Develop innovative measures to reduce contamination by cross-border microorganisms.
7. One Health engagement					

Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
7.1 A national AMR containment policy and regulatory framework to control the release of AR and AMR into the environment and management therein	NA	1	1	To strengthen commitment from relevant government agencies, the high-level National AMR Steering Committee has been endorsed. Additionally, the National AMR Committee and Technical Subcommittees are in the process of review to include all relevant stakeholders in the process. High level representation from the Ministry of Envirnment to be obtained in this process. Controlling and minimizing the release of AR and AMR release into the environment to be incoporated in regulations especially within the water and snitation components. (NEW)	With technical assistance, develop solutions for waste management and the release of AR and AMR in the environment.
7.2 National surveillance of AR and AMR in wastewater from manufacture and use in the human, animal and fishery sectors and disposal by institutions and homes	NA	1	1	The Ministry of Environment is part of the national coordinating committee and technical subcommittees on AMR. Close collaboration exists between the Ministry of Health, Ministry of Fisheries, Marine Resources and Agriculture and Ministry of Environment. However, more effort needs to be placed in developing mechanisms for surveillance of wastewater for AMR and development of resistance monitored. Testing capacity for wastewater to be developed to begin a baseline understanding of the situation in the country.	To develop mechanisms for the disposal of waste generated from AMU to ensure environmental safety. Link the existing environmental policies and regulations with AMR containment.
8. Coordination mechanisms for One Health engagement					

Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
8.1 AMR coordination mechanism	NA	2	2	A national AMR coordination committee was established in 2016. It comprises subcommittees on education, awareness, surveillance, AMU, research and innovation, and an expert group on IPC, which includes representatives from the private sector. AMR steering committee approved with ministerial level participation from the education, environment, agriculture and fisheries, finance and health sectors.	To develop collaborative mechanisms with relevant stakeholders to build legal framework for controlling antimicrobial use in the agriculture, aquaculture and veterinary sectors.
8.2 Inclusion and engagement of all relevant sectors in the NAP-AMR	NA	2	2	The NAP-AMR provides for the inclusion and engagement of the health, education, environment, agriculture and fisheries, finance, food safety sectors and WASH.	Same as 8.1
8.3 A platform and/or mechanism for sharing AMU monitoring data from all relevant sectors	NA	1	1	Estimates on AMU in the human sector can be made by extrapolation of the import database as all medicines are imported.	To establish mechanisms for the systematic sharing of AMR surveillance/AMU monitoring data among all relevant stakeholders.
8.4 A platform and/or mechanism for sharing AMR surveillance data from all relevant sector	NA	1	1	AMR surveillance data from a few tertiary hospitals have been shared on WHONET. No structured surveillance set up for the animal, fisheries, agriculture, food and environmental sectors.	Same as 8.3
8.5. WAAW is nationally coordinated and celebrated with involvement of and contributions from all relevant sectors	NA	3	3	WAAW 2019 activities involving all sectors were carried out successfully. Awareness activities targetting health-care workers, students and general public including islands. However, activities for WAAW 2020 were focused only through media due to COVID-19. A youth art challenge was also conducted virtually. The competition was very successful with over 40 submissions. Winners of the competition were awarded prize. (NEW)	To strengthen support among stakeholders for commitment to successfully conduct WAAW activities.

Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
8.6 A mechanism for co-sharing of resources for AMR initiatives	NA	2	2	The initial mapping of responsibilities and identification of stakeholders was conducted, but as a mapping of financial resources was not carried out, there is no co-sharing of resources for AMR initiative.	The Member States should map available resources, develop operational plans and establish a mechanism for co-sharing of resources for AMR initiatives.

Fig. A6. Progress analysis of AMR prevention and containment in Maldives, 2016–2021



The figure shows an average of phase-grading for indicators in different focus areas.

Achievements and lessons learnt

- During the 3rd progress analysis, Maldives reported 32.2% of indicators with the implementation phase of 3 and above, compared to 2018 (29%) and 2016 (9.6%). Most staff and resources have been utilized for the COVID-19 pandemic.
- The High-level National AMR Steering Committee Endorsed by the President Office and National AMR Committee revised.
- Development of a Communication Plan (2020) to strategically conduct AMR awareness programmes throughout the country. An online Youth Art Challenge was held during WAAW 2020 and winners of the challenge awarded prizes.
- A new classification of antibiotics, AWaRe, has been adopted in the National Essential Medicines List, as a basis for selection and use at the health facilities.
- A nationwide campaign on hand hygiene has been initiated during the COVID-19 pandemic. A proper hand wash technique was taught to all through media channels and social media.
- AMS initiative endorsed.

Myanmar

Focus and Indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/Comments	Recommendations
1. National AMR plan and governance					
1.1 NAP in line with GAP-AMR, governance issue	2	3	3	The activities in the NAP are implemented annually; national multisectoral and national technical committee meet regularly with the One Health approach.	The activities should be monitored systematically using a framework for M&E with adequate resources.
A2. Raising awareness					
2.1 Awareness campaigns for the public	2	3	5	AMR awareness campaigns for the public and professionals are conducted through collaborative efforts of the One Health strategy. Awareness campaigns need to be focused on the evidence from the awareness survey.	To develop, field-test a comprehensive national strategy for national awareness of AMR To secure sustainable funds and support from ministries other than health for conducting campaigns and generating awareness of evolving AMR. Awareness campaigns should be planned and organized based on the evidence from the awareness survey. This should be continued in 2021 and onwards. Assessment of the impact of awareness campaigns in the community and professionals should be continued.

Focus and Indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/Comments	Recommendations
2.2 Education and training strategies for profesionals in the human health sector	2	3	3 (no regular audit of learning)	topics are included in some pre-service, in-service and other continuing professional development training courses for human health professionals. Health professionals need to understand the awareness level on AMR and antibiotics among the general population to provide appropriate information to the patients.	To conduct awareness programmes, training and workshops for all health professionals. There is a need for regular continuous medical education programmes to keep professionals up to date. Proritize building of AMR concepts for in-service health professionals and revise the medical curriculum to focus on AMR. Health professionals need to understand the knowledge, attitude, practice and awarness level on AMR and antibiotics among the general population to provide appropriate information to the patients for their behavioural changes
2.3 AMR awareness generation and education in the animal sector	1	1	3	AMR topics and prudent use of antimicrobial agents are covered in core curricula for graduating veterinarians and for veterinary paraprofessionals in some educational institutions.	To develop and field-test awareness campaign of AMU and AMR among animal handlers.
2.4 AMR awareness generation and education in the environmental sector	NA	1	2	Communication strategies are part of the National Action Plan for AMR.	To involve and engage the Ministry of Natural Resources and Environment Conservation is imperative for comprehensive AMR containment efforts. To keep communicate, collaborate and coordinate with Ministry of Natural Resources and Environment Conservation for waste disposal and handling of antimicrobial residues.

Focus and Indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/Comments	Recommendations
3. National AMR surveillance system					
3.1 National human AMR surveillance	2	2	5	Seven AMR surveillance sites have been established and registered and regularly reported to GLASS. Strengthen surveillance data management training conducted in WHONET. National surveillance guideline is finalized. Both AMR surveillance sites and non-surveillance sites are requried to understand the gaps on AMR surveillance in Myanmar.	To strengthen human AMR surveillance, streamline data management and set up a mechanism for regular and timely sharing of human AMR data with hospitals and national and international stakeholders. National AMR data, including antibiogram, should be monitored and utilized for the development of the national AMS guidelines. More resources should be assigned in sentinel sites. To strengthen data reporting including data quality, data consistency and clinical data involvment.
3.2 Strengthening of the national laboratory network for humans	2	4	5	A national reference laboratory has been set up with the CLSI as a refence standard and to support the laboratory network. EQA scheme of CRE and MRSA result is successfully submitted and pass with acceptable grade. Approved capacity of NHL to identify multi-drug resistance bacteria.	To achieve and maintain the highest standards in laboratory performance, laboratory accreditation practices should be established and ensure the availability of the latest CLSI guidelines in the nation's laboratory network. To maintain operational system for training programmes for laboratory staff.
3.3 Strengthening of the national laboratory network in the animal sector	NA	NA	3	The overall antimicrobials use in the animal sector is regularly collected and reported to the WOAH. The National reference laboratory is established, and surveillance site is functioning. Quality assurance mechanism is in place.	To develop and field-test a national surveillance of AMU in the animal sector.

Focus and Indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/Comments	Recommendations
3.4 Early warning systems (EWS)	1	1	2	No EWS are available. EWS are essential to prevent the spread of specific resistant microbial infections with the possible impact on mortality.	To develop and field-test an early warning system with the use of the latest technology to support epidemiological data analysis and to build the molecular diagnostic capacity of the laboratory network.
4. Rational use of antimicrobials and surveillance of use/sale (community-based)					
4.1 A national AMR containmment policy for control of human use of antimicrobials; antimicrobial stewardship (see also 7.1)	1	1	2	There is no comprehensive policy pertaining to AMR containment and control of human use of antimicrobials. There is no policy on antimicrobial stewardship either. There is improved utilization of microbiology laboratory services in clinical decision-making in accordance with WHO guidelines.	To promote regulatory cooperation in SEARN on AMR for import in medical products, and quality assurance of the laboratory network. To develop an API analysis system. To strengthen the regulatory capacity of the NRA to implement regulations on OTC and inappropriate sale of antibiotics, and enforce regulations on finished products and APIs. To strengthen the coordination mechanism between clinicians and microbiology laboratories. To adopt the WHO AWaRe classification on antibiotics in the National Essential Medicine List. To develop and field-test a monitoring system of consumption and use of antimicrobials in health facilities.
4.2 NRA/NMRA	3	3	4	The enforcement activities and market control on antimicrobial sales and distribution of the NRA need to be strengthened in term of capacity and resources.	Same as 4.1 Enforcement of regulatory activities should be strengthened.

Focus and Indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/Comments	Recommendations
4.3 Surveillance of antimicrobial use and sale among humans	2	2	2	There is a need to develop and implement guidelines on the surveillance of the use and/ or sale of antimicrobials in humans. A national policy and plan on surveillance of use of antimicrobials for the human health sector are under development.	Same as 4.1. National surveilance system for antimicrobial use/sale should be established.
4.4 Regulation of finished antibiotic products and APIs	2	2	3	There is a guideline for antimalarials regulation, use and post-marketing surveillance in place. FDA inspectors are trained in states/regions for supervision and moniotring to drug sellers. A regulatory authority and system are in place and inspection is implemented but there is limited capacity for enforcement of policies and regulation.	Same as 4.1
4.5 Regulation of pharmacies regarding OTC sale and inappropriate sale of antibiotics and APIs	2	2	2	Regulation of pharmacies regarding OTC and the inappropriate sale of antibiotics is in place, but there is limited capacity for implementation.	Same as 4.1. A system needs to be set up leveraging practices from programmes such as malaria.
4.6 A national AMR containment policy and regulatory framework for control and registration of use in animals	1	1	2	There is no national policy to reduce AMU in the animal or fisheries sector. Developed guidelines for prescription and sale of antibiotics in animals	To develop a policy/ guidelines for AMR and AMU surveillance in the animal sector. To identify resources, ensure the availability of infrastructure and organize training for initiating AMR surveillance in the veterinary sector. To expedite the finalization of animal feed under the drug law to provide a legal framework for the use of antimicrobials in the animal sector.

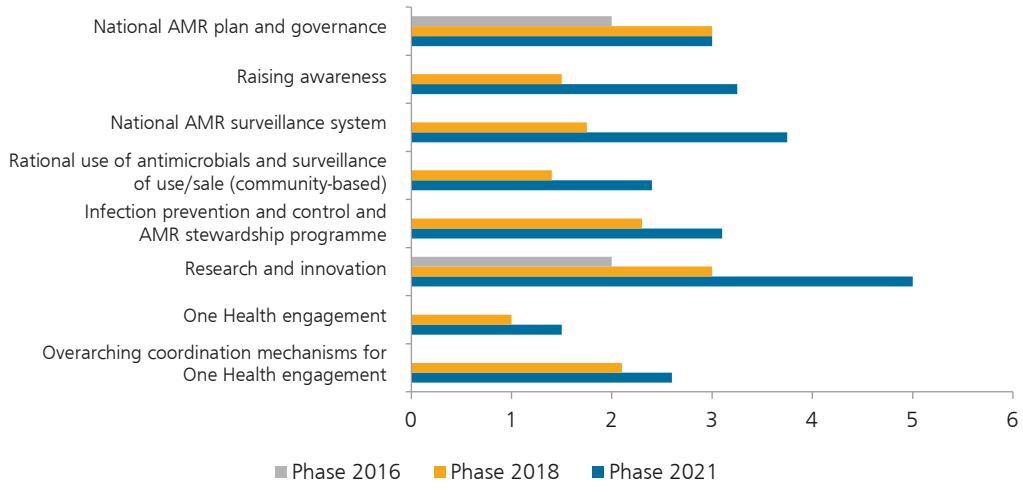
Focus and Indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/Comments	Recommendations
4.7 National surveillance of AMR, and use and sale of antimicrobials in the veterinary sector	1	AMU-1 AMR-1	AMR 2 AMU 2	Project-based AMU/AMR surveillance is being conducted in a limited manner. There is no policy for AMU/AMR surveillance. The draft animal feed law is yet to be finalized. The NAP outlines surveillance and monitoring activities, however these are yet to be implemented.	Same as 7.1. AMU/AMR surveillance system is needed in relevant sectors
5. Infection prevention and control					
5.1 AMS in health-care settings	2	2	3	There is no national antimicrobial stewardship programme. Guideline on National AMS and Utilization Programme is under development Project-based AMS programme implemented in few hospitals in Yangon.	To develop AMS policy/ guidelines; and organize training/ workshops to promote the concept of AMS in health-care settings.
5.2 IPC programme in health-care settings	3	2	3	National IPC guidelines have been developed, and all hospitals have a hospital infection control committee. They also have basic IPC facilities, including laboratory support. The implementation of IPC guidelines is limited due to constraints of resources.	To establish an IPC programme with a dedicated trained staff at the national level and strengthen the hospital infection control committees. Scale up IPC in all hospitals.
5.3 National HAI and related AMR surveillance	1	3	3	Limited surveillance is being conducted in some health-care facilities in accordance with the SOPs and guidelines developed for HAI surveillance.	To consider the development of a national policy, allocating adequate human resources and funds to ensure the sustainability of activities initiated under HAI and related AMR surveillance.
5.4 Sanitation and hygiene	3	2	4	WASH activities are conducted in communities. There are limited data on safe water supply and sanitation services. Policy or campaign to improve sanitation and hygiene is implemented at a large scale. Data are available on WASH.	To enhance compliance with sanitation and hygiene activities promoted nationwide under the WASH programme.

Focus and Indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/Comments	Recommendations
5.5 Vaccination	NA	4	5	PCV 13 and HPV have been included in the EPI programme since 2016. There are no plans to include the typhoid Vi vaccine. Immunization is full scale with the M&E system is in place.	Advocacy is required to link AMR and vaccination practices.
5.6 Biosecurity (IPC) in the animal sector	1	1	1	Biosecurity policies, strategies and guidelines have not been prepared.	To develop a biosecurity policy. Finalize and endorse guidelines on animal husbandry practices with a focus on backyard as well as commercial farms.
6. Research and innovation					
6.1 R&D and innovation on AMR prevention and containment and research funding	2	3	5	The NAP outlines R&D activities for AMR surveillance. Several research activities have been undertaken in the One Health approach. The country has lead AMR research agenda, prioritized across sectors, conducted six priority research areas in 2020 and funds are secured.	To establish a technical working group to develop operational research plans in line with AMR research agenda that support implementation of NAP-AMR. To mobilize resources to ensure sustainable funds for R&D and innovation.
7. One Health engagement					
7.1 A national AMR containment policy and regulatory framework to control the release of AR and AMR into the environment and management therein	NA	1	2	Guidelines and SOPs for health-care waste management include pharmaceutical waste management, but these are not yet focused on AR or AMR. Organized two working group meetings with NHL, MOALI and WHO to finalize the Tricycle project proposal. Measure of One Health indicators of AMR in the community ("ESBL Ec Tricycle AMR surveillance project").	To review current regulations on wastewater control and initiate a survey to assess the status of antibiotic residue and AMR at different locations in the country.

Focus and Indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/Comments	Recommendations
7.2 National surveillance of AR and AMR in wastewater from manufacture and use in the human, animal and fishery sectors and disposal by institutions and homes	NA	1	1	No provision for monitoring AR and AMR in the environment. The Ministry of Natural Resources and Environmental Conservation is yet to be involved in AMR activities.	To develop guidelines to enhance the engagement of the environmental sector in the surveillance of AR and AMR in wastewater from various sources.
8. Coordination mechanisms for One Health engagement					
8.1 AMR coordination mechanism	NA	2	3	AMR coordination mechanism exists, with the national multisectoral steering committee, national coordination committee and five technical working groups established and functional until early 2021. Joint working of relevant sectors for combating AMR.	To make the participation of various sectors more organized by avoiding duplication of activities by various committees. A system of data sharing needs to be developed.
8.2 Inclusion and engagement of relevant sectors in the NAP-AMR	NA	2	3	The human health, animal health, plant health, food production, food safety, environment, WASH, trade and private sectors, as well as the civil society are included and engaged in the implementation of the NAP-AMR. Joint working of relevant sectors for combating AMR.	Engagement of the environmental, plant and food sectors should be strengthened. Yearly multisectoral evaluation meeting to be organized with relevant sectors for identifying the gaps and ways forward.
8.3 A platform and/or mechanism for sharing AMU monitoring data from all relevant sectors	NA	1	2	There is no policy, mechanism or platform for sharing of AMU data among the relevant sectors. AMU monitoring data are shared ad hoc from the animal health sector in meetings and trainings.	To set up a platform for the regular sharing of data among the relevant sectors for evidence-based decision-making at the national and international levels.

Focus and Indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/Comments	Recommendations
8.4 A platform and/or mechanism for sharing AMR surveillance data from all relevant sectors	NA	2	2	Project-based AMR surveillance is conducted in the veterinary sector. AMR surveillance activities are limited in the human health sector. There is no mechanism/ platform for sharing of data among various sectors. AMR surveillance data are shared ad hoc from the human health sector in meetings and trainings.	Human health surveillance data should be regularly shared with all the relevant sectors. Animal health surveillance should be established at the national level and pilot projects in the veterinary sector should be scaled up for animal health surveillance to be a nationwide activity.
8.5 AAW is nationally coordinated and celebrated with involvement of and contributions from all relevant sectors	NA	5	5	The health sector leads awareness activities, with contributions from other relevant sectors (agriculture, livestock, irrigation, WASH, education, information and defence) for the general public and health professionals at the national level. The agriculture sector contributed by organizing field trips to enhance the understanding of AMR.	For AAW, operationalize the technical group formed and enhance the engagement of sectors such as plant, environment and defence in various activities To continue to organize more events for awareness of AMR.
8.6 A mechanism for co-sharing of resources for AMR initiatives	NA	1	1	A mechanism for co-sharing of resources is yet to be developed.	To map the resources available to develop operational plans and establish a mechanism for co-sharing of resources for AMR initiatives.

Fig. A7. Progress analysis of AMR prevention and containment in Myanmar, 2016–2021



The figure shows an average of phase-grading for all indicators in different focus areas.

Achievements and lessons learnt

- Myanmar has achieved good progress during the 3rd progress analysis until early 2021, where the percentage of indicators with implementation phase of 3 and above was 58% compared to that in 2018 (29%) and in 2016 (12%).
- AMR awareness campaigns for the public and professionals are conducted through collaborative efforts of the One Health strategy, and AMR topics included in some pre-service, in-service and other continuing professional development training courses for human health professionals as well as veterinary professionals.
- Develop national AMR surveillance system both for the humans and for veterinary sectors, among others development AMR Surveillance Guidelines for humans, establishment of EQA scheme regularly, establishment of the national AMR surveillance network and sites for humans, establishment of AMR surveillance network for veterinary and existing monitoring of AM use in humans, as well as in veterinary sectors.
- The NAP outlines research and development activities for AMR surveillance. Several research activities have been undertaken in the One Health approach, Myanmar led development of AMR research agenda 2019–2021, prioritized across sectors, conducted six priority research in 2020 with funding are secured.
- SORT IT, the *structured operational research and training initiative* for AMR was successfully introduced in Myanmar during 2019 through to early 2021, with the support of WHO, especially TDR-HQ,
- PCV and HPV have been included in the EPI programme; immunization is in full scale with M&E system is in place.

Nepal

Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
1. National AMR plan and governance					
1.1 NAP in line with GAP-AMR/ governance issue	2	2	3	The technical document of the NAP-AMR is aligned with the GAP-AMR. It is under review for alignment of the operational plans detailed activities along with the budgeting and costing across all the four sectors, viz. human, animal, food and environment. The National Technical Working Group on AMR (NTWC-AMR) and High Level Multi-sector Steering Committee have been formed and are functional.	To plan budget for NAP-AMR implementation should be integrated into the government regular budget and other source of funding. To develop and implement monitoring and evaluation system.

Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
A2. Raising awareness					
2.1 Awareness campaigns for the public	2	2	3	There is limited or small-scale antimicrobial resistance awareness campaign targeting some but not all relevant stakeholders. Some government-led activities, including WAAW, are conducted in parts of the country to raise awareness of AMR.	To expand the awareness-raising activities to professionals and communities in the health, animal, agriculture and environmental sectors using WAAW as entry points.
2.2 Education and training strategies for professionals in the human health sector	2	1	3	Training of health professionals is being done which also falls under the NAP-AMR Strategic Objective 1. The curriculum of medical universities is under revision to focus on AMR. (NEW)	To continue updating and implementing the AMR training curricula of health-care providers, during pre-service training, induction training and continuing professional development. This should also include materials for rational use of antimicrobials
2.3 AMR awareness generation and education in the animal sector	1	1	2	Awareness activities are conducted by different stakeholders but no concerted effort has been made.	To raise awareness activities should also be directed to the appropriate target audience at the animal sector.
2.4 AMR awareness generation and education in the environmental sector	NA	1	1	The environmental sector has not been engaged in the AMR activities.	To initiate high level advocacy to the environmental sector through the existing mechanism of AMR intersectoral coordination.
3. National AMR surveillance system					
3.1 National human AMR surveillance	3	4	4	Standardized human AMR surveillance has been initiated. There is still need to improve data management to ensure timeliness and completeness, and regular analysis.	To strengthen the capacity of the existing human AMR surveillance through human resource training, improved quality surveillance and better data management.
3.2 Strengthening of the national laboratory network for humans	3	3	4	The national public health laboratory has been identified as the National Reference Laboratory and the National Coordination Center for AMR surveillance. A quality assured laboratory network of both public and private sector facilities has been established at various sites.	To strengthen the capacity of the existing human AMR surveillance through human resource training, improved quality surveillance and better data management.

Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
3.3 Strengthening of the national laboratory network in the animal sector	NA	NA	1	The national laboratory network for the animal sector does not exist.	To sensitize and initiate the national laboratory network for the animal sector from the existing laboratories.
3.4 Early warning systems (EWS)	2	1	1	There is no system in place for AMR integration with the EWS.	To identify resistant microbes with high potentials becoming public health concerns; undertake testing at certain sentinel facilities.
4. Rational use of antimicrobials and surveillance of use/sale (community-based)					
4.1 A national AMR containment policy for control of human use of antimicrobials; antimicrobial stewardship (see also 7.1)	2	1	4	Drug standard regulation restricts over-the-counter (OTC) sale and use of antimicrobials and the National Drug Policy also outlines prudent use of antibiotics so we cannot say there is no policy and regulations. A national list of essential drugs is available and standard treatment protocols are followed for some diseases (TB, malaria, HIV, leprosy).	To develop antimicrobial guidelines based on the WHO AWaRe Classification and the National List of Essential Medicines 2021; implement at hospital and health centre facilities.
4.2 NRA/ NMRA	3	4	4	The Department of Drug Administration (DDA) monitors the regulation of medicines. However, there is inadequate monitoring of rational use of antibiotics.	To initiate the implementation of monitoring system of antimicrobial sale and use.
4.3 Surveillance of antimicrobial use and sale among humans	3	1	3	There are no guidelines for surveillance of the use and/or sale of antimicrobials.	To develop guideline and implement monitoring system of antimicrobial sales and use.
4.4 Regulation of finished antibiotic products and APIs	2	2	3	Regulation is limited. However, strategic planning is under way for capacity-building and appropriate budgeting. Post-marketing surveillance to access the quality of drug in market for all category of medicine is there, DDA conducts post-marketing surveillance programme to assess the quality of marketed medicines including antibiotics.	To initiate regulation of the sale, distribution and use of antimicrobials. To continue and expand the quality surveillance of antimicrobials and other medicines.

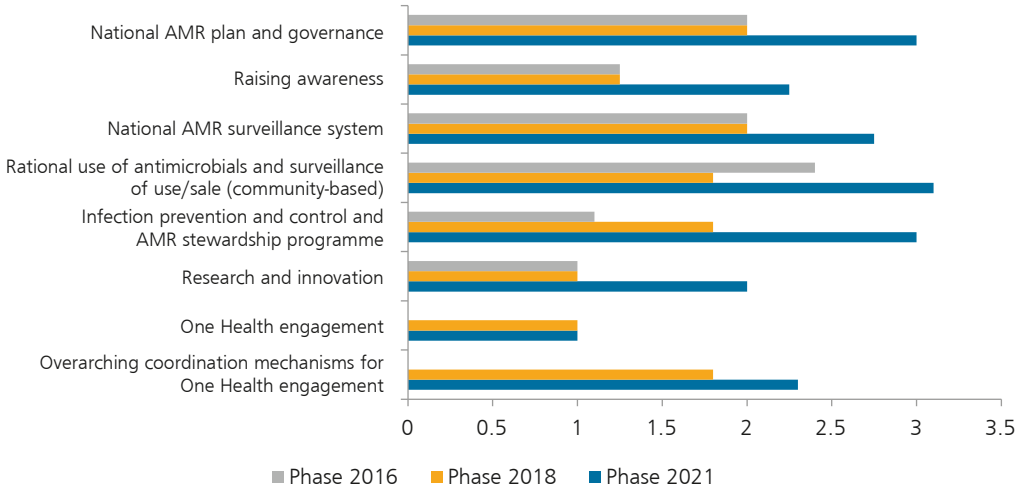
Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
4.5 Regulation of pharmacies regarding OTC sale and inappropriate sale of antibiotics and APIs	3	2	3	Regulation exists. However, there is inadequate monitoring by regulatory authority due to lack of proper planning, limited human resources.	To initiate monitoring of sale, distribution and use of antimicrobials.
4.6 A national AMR containment policy and regulatory framework for control and registration of use in animals	2	1	2	There is no national policy or plan to reduce AMU in the veterinary/ fisheries sector. A regulatory framework has been developed for the control and registration of use in the animal sector, but it has not been implemented.	To start coordination between health/NMRA, regulatory authorities of the animal, fisheries and environmental sectors to reduce the use of antimicrobials in veterinary and fisheries.
4.7 National surveillance of AMR, and use and sale of antimicrobials in the veterinary sector	2	AMU 1 AMR 2	AMR-3 AMU-3	In terms of optimizing antimicrobial use in animal health, the national legislation covers some aspects of national manufacture, import, marketing authorization, control of safety, quality and efficacy and distribution of antimicrobial products. (NEW) The information shared with the WOAH global database on the use of antimicrobials in the animal sector is primarily based on the supplies/sales data on the import of antibiotics.	To initiate a monitoring mechanism of antimicrobials distribution, sale and use. To participate in the sharing of AMR surveillance, including the consumption of antimicrobials in the WOAH global data base.
5. Infection prevention and control					
5.1 AMS in health-care settings (see 4.1 for information)	2	1	3	The country's antibiotic stewardship strategies are still at the facility level. There is no national antimicrobial stewardship policy, or operational plan available or approved.	To expand AMS at health facilities; develop and implement a national AMS programme with funding; monitor the implementation.
5.2 IPC programme in health-care settings	1	1	3	Infection control committees have been set up in all hospitals, but standard treatment guidelines need to be updated.	To update guidelines for IPC control, undertake training on IPC and formulate a national IPC programme and monitor implementation.

Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
5.3 National HAI and related AMR surveillance	1	1	2	There is no policy in this sphere. The national plan and guidelines to mandate hospitals for HAI surveillance are limited. Few public and private hospitals have HAI surveillance, and there is no mechanism for centralized data reporting.	To expand HAI surveillance to more public and private hospitals. To develop and implement a centralized monitoring mechanism.
5.4 Sanitation and hygiene	2	4	4	A policy on improving sanitation and hygiene is implemented on a large scale, with campaigns being held regularly.	To continue and expand WASH programme and monitor implementation, especially in the wake of the COVID-19 pandemic.
5.5 Vaccination	NA	2	3	The PCV 10 and HiB vaccines are part of the national immunization programme, while the introduction of the typhoid vaccine is in the pilot phase.	To develop a monitoring system for the national immunization programme and improve its quality assurance.
5.6 Biosecurity (IPC) in the animal sector	1	2	3	Biosecurity strategies and guidelines have been developed. Training is conducted to build the capacity of farmers, and owners of commercial poultry farms and hatcheries as per the directives of the Ministry of Agriculture.	To strengthen biosecurity measures with advocacy and training and monitor its implementation among professionals and farmers.
6. Research and innovation					
6.1 R&D and innovation on AMR prevention and containment and research funding	1	1	2	The NAP plans to foster R&D on AMR but no technical committee or working group has been formed to support it. Also, there are no dedicated funds to promote innovation. Ensure the availability of funds to conduct targeted research focused on AMR.	To encourage research focusing on AMR and intervention research to improve quality use of antimicrobials. Allocate funds for research on AMR.
7. One Health engagement					
7.1 A national AMR containment policy and regulatory framework to control the release of AR and AMR into the environment and management therein	NA	1	1	There is no specific regulation, national policy to control the release of antibiotic residue and AMR into the environment. Nor is there any regulation or policy for a water management system.	To initiate intersectoral consultation on the medical waste disposal in the environment including antimicrobials.

Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
7.2 National surveillance of AR and AMR in wastewater from manufacture and use in the human, animal and fishery sectors and disposal by institutions and homes	NA	1	1	There is no national policy for surveillance of AR/AMR in waste and the environment. An ad hoc study is being conducted for antibiotic levels in fisheries.	To initiate intersectoral consultation on the medical waste disposal in the environment including antimicrobials.
8. Coordination mechanisms for One Health engagement					
8.1 AMR coordination mechanism	NA	2	3	A national AMR coordination committee established, but needs to be adapted considering the federal context and adminisrative restructiring, to make it more inlcusive with relevant stakeholders.	To develop a coordination mechanism involving all relevant stakeholders at the national level.
8.2 Inclusion and engagement of all relevant sectors in the NAP-AMR	NA	2	3	The national AMR coordination committee is in process of ensuring representativeness in the federal context. (NEW) A national AMR multisectoral committee has been proposed with representation from the ministries of food, environment, education, information technology and finance, and the National Health Research Council, civil society and private sector.	To develop a coordination mechanism involving all relevant stakeholders at the national level. To undertake a regular coordination mechanism. To monitor progress of implementation of NAP-AMR. To allocate funding for One Health activities.
8.3 A platform to share AMU monitoring data from relevant sectors	NA	1	2	There is no policy/ mechanism/ platform for sharing of AMU data among the relevant sectors. No information on AMU is available from the human health sector for want of guidelines. Limited information related to the animal sector is gathered from procurement data. There is no sharing mechanism.	To identify available data on AMU in all sectors and initiate data sharing.
8.4 A platform to share AMR surveillance data from relevant sectors	NA	2	2	There is a platform for sharing of data on animal health with the national reference laboratory for human health.	To identify available data on AMR in all sectors and initiate data sharing from the human and animal sectors.

Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
8.5 WAAW is nationally coordinated and celebrated with involvement of and contributions from relevant sectors	NA	3	3	WAAW is celebrated jointly by the human and animal health sectors in collaboration with FAO and WHO. Most activities are conducted in Kathmandu.	To continue to best utilize WAAW for campaign and advocacy to all sectors, both professionals and communities; expand WAAW activities in the districts.
8.6 A mechanism for co-sharing of resources for AMR initiatives	NA	1	1	No mechanism for co-sharing of resources on AMR.	To map the planned activities for NAP-AMR, identify the needs of resources; identify possible resources that can be available in each sector.

Fig. A8. Progress analysis of AMR prevention and containment in Nepal, 2016–2021



The figure shows an average of phase-grading for indicators in different focus areas.

Achievements and lessons learnt

- During the 2021 progress analysis, Nepal reported 61% of indicators with implementation phase of 3 or above – significant progress compared to the situational analysis in 2018 (16%) and in 2016 (16%).
- Training curriculum of health professionals has been revised to include AMR issues.
- Standardized human AMR surveillance has been initiated, although still on a voluntary basis involving 26 sites (public/private) covering all provinces of the country.
- Periodic training of laboratory personnel conducted every year together with monitoring visits of the AMR surveillance sites; standardized protocols, guidelines are updated, and annual trainings conducted to build technical expertise in laboratory diagnostics, strengthen the laboratory network and data management capacity.

- The National List of Essential Medicines (NLEM), 2021 has been endorsed by the government, including the AWaRe classification of antibiotics. Medicine regulation restricts OTC sale and use of AM.
- ESBL E.C tricycle project protocol for Nepal, adapted in December 2019, was postponed due to the pandemic. In September 2021, the project was revived and implemented using a One Health approach to address bacterial resistance in human health, animal health and food chain, and the environment.
- The Regional and National *Structured Operational Research Training Initiatives (SORT IT) for AMR* was successfully concluded by the end of 2021. This training programme on tackling AMR through operational research was supported by TDR-HQ (the Special Programme for Research and Training in Tropical Diseases, WHO), and implementing partners. A total of 18 Nepalese candidates from the public and private sectors have been trained for operational research. Additionally, 18 research studies from both regional and national SORT IT courses have been published in two renowned journals, viz. *Tropical Medicine and Infectious Disease* (TMID) and *Public Health Action* (PHA).

Sri Lanka

Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
1. National AMR plan and governance					
1.1 NAP in line with GAP-AMR/ governance issue	3	4	3	GAP-aligned action plan* including an operational plan with defined activities and respective budget is available.	To strengthen the implementation of NAP-AMR, ensure that it is endorsed by all ministries concerned, including environment and food safety, along with the human and animal health sectors. Develop a regular monitoring framework for the assessment of the impact of AMR surveillance systems.
2. Raising awareness					
2.1 Awareness campaigns for the public	2	4	4	Nationwide, government-led antibiotic awareness campaign targeting the general public OR professionals.**	To continue with activities for the generation of awareness among the public and evaluate the effectiveness of the campaigns with a focus on behavioural change. Consider external evaluation for the assessment of the impact. The Member States may conduct studies among farmers to identify the existing practices and customize communication strategies accordingly.

Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
2.2 Education and training strategies for professionals in the human health sector	1	3	3	AMR in some pre-service training and/or some special courses OR Continuous professional development and regular audit of learning.	Education and training programmes should continue to focus on building AMR concepts with regular updates. Develop strategies to monitor and evaluate the quality of workshops/ courses/ training conducted for laboratory technicians, nurses and other paramedical professionals and experts.
2.3 AMR awareness generation and education in the animal sector	1	3	3	AMR in some pre-service training and/or some special courses OR Continuous professional development and regular audit of learning.	To create awareness among animal handlers on AMU and AMR using mass media channels and social media platforms.
2.4 AMR awareness generation and education in the environmental sector	NA	1	1	No policies or targeted communication strategies on AMR in waste or only planned (for antibiotic manufacturers, hospitals, wastewater treatment institutions, farmers).	Environmental awareness programmes should include messages on AMR. There is a need to link AMR with the existing environment protection licensing system in the country
3. National AMR surveillance system					
3.1 National human AMR surveillance	3	4	5	National AMR surveillance regularly assessed and adjusted; and contributing to GLASS.	To continue with the ongoing activities related to human AMR surveillance and document progress in an annual report. Build capacity for data management, expand the use of WHONET and contribute regularly to GLASS. Annual reporting and implementation of the next steps of the NSP.
3.2 Strengthening of the national laboratory network for humans	2	5	5	Laboratory network established, EQA measures in place, and demonstrated capacity of reference laboratory for research.	To strengthen laboratory-supported human AMR surveillance, build technical expertise and progress towards accreditation standards in laboratory performance.

Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
3.3 Strengthening of the national laboratory network in the animal sector	NA	NA	2	No national network has been developed.	To establish a national network with regional laboratories.
3.4 Early warning systems (EWS)	1	1	1	No EWS have been established.	To establish EWS, enhance the capacity of the laboratory network for molecular detection and explore the use of advanced software for data analysis and alert generation.
4. Rational use of antimicrobials and surveillance of use/sale (community-based)					
4.1 A national AMR containment policy for control of human use of antimicrobials; antimicrobial stewardship (see 7.1)	2	2	2	National AMS initiative is planned and under development.	To implement the national AMS. Participate in Regional collaboration and the exchange of information on antimicrobials utilization.
4.2 NRA/ NMRA	3	4	4	Competent and functional NRA/NMRA with capacity to ensuring/enforcing antibiotic quality standards and taking measures against substandard products and Inspecting pharmacies.	To promote regulatory cooperation on the import of medical products and AMR in SEARN; ensure quality assurance of the laboratory network and develop an API analysis system.
4.3 Surveillance of antimicrobial use and sale among humans	1	3	3	National policy and plan on surveillance of use of antimicrobials under development or developed and approved but not implemented (surveillance in individual facilities and national level sales).	To develop a national AMR containment policy and establish a national AMU monitoring system to control the use of antimicrobials in humans. Expedite the completion of the national survey on antibiotic consumption.
4.4 Regulation of finished antibiotic products and APIs	2	3	3	There is a regulatory authority and a system for oversight with a limited functional capability. APIs of registered local products are permitted to be imported through a licence system.	To provide adequate human and financial resources to strengthen regulatory capacity of the NRA to conduct pre- and post-marketing surveillance and enforce regulations on finished products and APIs.

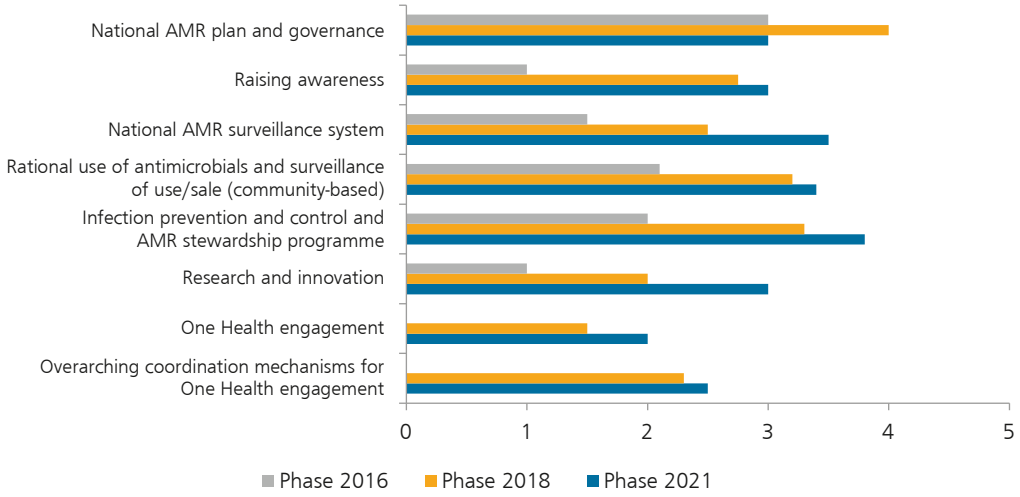
Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
4.5 Regulation of pharmacies regarding OTC sale and inappropriate sale of antibiotics and APIs	2	4	4	There is a regulatory authority and a system. Inspection is implemented, but the capacity for the enforcement of regulation is limited. OTC dispensing of medicines is prohibited.	To regulate the inappropriate sale of antibiotics and APIs, consider advanced IT solutions to manage the referral, prescription and drug dispensing systems.
4.6 A national AMR containment policy and regulatory framework for control and registration of use in animals	3	4	4	AMS implemented by relevant institutions. Regulations for antimicrobial use and availability implemented in limited capacity.	Add into a national AMR containment policy and support national surveillance of AMU and sales, in the veterinary sector. tis important to prepare national guidelines for the collection, analysis and timely sharing of data on AMR and AMU with national and international stakeholders across all relevant sectors.
4.7 National surveillance of AMR, and use and sale of antimicrobials in the veterinary sector	1	AMU 2 AMR 3	AMR-3 AMU-3	There is limited capacity for surveillance of the AMR and sale and use of antimicrobials in the animal sector. Aggregated data of active ingredients based on import data are shared with the WOAH.	The Member State should conduct systematic assessment of the AMR surveillance system, build laboratory capacity and ensure the availability of funds to continue AMR-containment initiatives in the veterinary sector.
5. Infection prevention and control					
5.1 AMS in health-care settings	1	2	2	National AMS planned and is under development.	To ensure the availability of SOPs and guidelines and strengthen the laboratory capacity at health-care facilities to support the national AMS.
5.2 IPC programme in health-care settings	3	4	3	IPC programme and capacity building plans implemented in selected HCS.	To provide adequate human and financial resources for the IPC programme in health-care settings and evaluate implementation status periodically.
5.3 National HAI and related AMR surveillance	2	4	3	Few public and private facilities have HAI surveillance but data not centralized at the national level.	To conduct HAI surveillance in tandem with human AMR/AMU surveillance in health-care facilities.

Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
5.4 Sanitation and hygiene	4	4	4	The policy on improving sanitation and hygiene is implemented on a large scale, with regular campaigns. There are data on safe water supply and sanitation services, and access to them is medium.	To promote measures to enhance compliance with sanitation and hygiene standards and collect baseline data to confirm the status of safe water supply across the country.
5.5 Vaccination	NA	3	5	Formal campaign to enhance vaccination is implemented on a large scale and associated with M&E system.	To advocate for the inclusion of PCV in routine immunization and monitor trends of AMR to update disease burden estimates for evidence-based introduction of vaccines.
5.6 Biosecurity (IPC) in the animal sector	2	3	3	Training on AMR and alternative biosecurity measures has been started for professionals in the animal sector. Existing strategies and guidelines focused primarily on poultry farming.	To strengthen biosecurity measures, harmonize guidelines across the animal sector, introduce an audit system that is applicable to different kinds of livestock and evaluate the impact of generating awareness in the veterinary sector.
6. Research and innovation					
6.1 R&D and innovation on AMR prevention and containment and research funding	1	2	2	No policies fostering research environment although capacity exists for research.	Plan targeted research projects to provide baseline data on AMR/AMU in the human, animal and environmental sectors to support implementation and M&E of NAPAMR. There is a need to explore and approach national and international funding agencies for sustainable funds to conduct research.

Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
7. One Health engagement					
7.1 A national AMR containment policy and regulatory framework to control the release of AR and AMR into the environment and management therein	NA	2	3	Develop guidelines to enhance the engagement of the environmental sector and implement the national policy on waste management. tis crucial to establish surveillance of AR and AMR in wastewater from the human and animal sectors.	To expedite the finalization of standards to control the release of AR and AMR into the environment and include the same in the national AMR containment policy. Review private sector initiatives and their involvement in reducing AR in effluents.
7.2 National surveillance of AR and AMR in wastewater from manufacture and use in the human, animal, fishery sectors and disposal by institutions and homes	NA	1	1	Same as 7.1	National surveillance of AR and AMR in wastewater requires establishing a national authority for the containment of AMR and bridge the gap in the impact of AMR in the environment.
8. Coordination mechanisms for One Health engagement					
8.1 AMR coordination mechanism	NA	2	3	Overarching AMR coordination has been ensured by establishing a national advisory committee on AMR and the NAP implementation strengthening team on the basis of a multisectoral approach.	To strengthen the coordination mechanism between relevant sectors with enhanced engagement and involvement of the environment, food safety, education, aquaculture, and animal and human health sectors.
8.2 Inclusion and engagement of all relevant sectors in the NAP-AMR	NA	2	3	Multisectoral working group(s) is (are) functional, with clear terms of reference; regular meetings, and funding for working group(s). Activities and reporting/ accountability arrangements are defined.	Same as 8.1

Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
8.3 A platform and/or mechanism for sharing AMU monitoring data from all relevant sectors	NA	3	2	Ad hoc	To establish coordinated mechanisms for AMR-AMU surveillance and implement AMR containment across relevant sectors. Provide a platform for sharing of monitoring data regularly with national and international stakeholders across all sectors to ensure evidence-based policy decisions.
8.4 A platform and/or mechanism for sharing AMR surveillance data from relevant sectors	NA	2	2	Method to identify existing resources	Same as 8.3
8.5 WAAW is nationally coordinated and celebrated with involvement of and contributions from all relevant sectors	NA	2	3	WAAW activities are led by the human health sector, with the involvement of the animal health, food safety and environmental sectors. However, national-level coordination is still weak.	Carry out impact assessment of activities for the generation of awareness conducted with the involvement of and contributions from relevant sectors.
8.6 A mechanism for co-sharing of resources for AMR initiatives	NA	3	2	Method to identify existing resources	To identify resources and establish a mechanism for co-sharing of resources for AMR initiatives.

Fig. A9. Progress analysis of AMR prevention and containment in Sri Lanka, 2016–2021



The figure shows an average of phase-grading for all indicators in different focus areas.

Achievements and lessons learnt

- Sri Lanka reported 71% of indicators with the implementation phase of 3 and above during the 3rd progress analysis in 2021 – an improvement compared to the 2nd progress analysis in 2018 (61.2%) and even more compared to the 1st analysis in 2016 (19.3%).
- The multisectoral approach is expanded to include environment and food safety sectors with representations in the National Advisory Committee for AMR.
- Nationwide AMR awareness government-led campaign targeted to the general public and professionals. Introduction of AMR into the pre-service training and continuing professional development of human health personnel, and, to some extent, animal health personnel.
- Establishment of national AMR surveillance system with EQA scheme for human health.
- Competent and functional NRA/NMRA with capacity to enforce antibiotic quality standards and taking measures against substandard products.
- IPC programme and capacity building plans continue to be implemented
- Policy on improving sanitation and hygiene implemented on a large scale, with regular campaigns.
- National EPI immunization coverage reportedly 100%, with campaign to enhance vaccination is implemented on a large scale, along with established M&E system.

Thailand

Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
1. National AMR plan and governance					
1.1 NAP in line with GAP-AMR/ governance issue	3	5	5	An operational plan is being rolled out and scaled up. It outlines defined activities with their respective budgets. However, implementation and sustained coverage are challenging.	
A2. Raising awareness					
2.1 Awareness campaigns for the public	2	4	4	Nationwide, government-led campaigns are held to raise awareness of antibiotics among the public and professionals. Nationwide, government civil society academic and professional association-led campaigns are held to raise awareness of antibiotics among the public and professionals in the human and animals sectors.	To adopt a nationally coordinated multisectoral approach for mass awareness. Prepare a national strategy for awareness generation with mechanisms to assess the impact of the awareness-generation campaigns on the public. Focus on communication risk analysis to avoid miscommunication, especially in the animal sector.
2.2 Education and training strategies for proffesionals in the human health sector	3	5	3	AMR has been incorporated in the pre-service training programmes for all relevant cadres. Regular continuing professional development training is conducted for health professionals. AMR in some pre-service training and/or some special courses or continuous professional development and regular audit of learning professionals.	To continue the implementation of the existing education and training strategies for professionals in the human and animal health sectors.
2.3 AMR awareness generation and education in the animal sector	2	4	4	The curriculum for veterinary training has been revised to include AMR. Awareness-generation campaigns with a multisectoral approach and a focus on the animal sector are being conducted.	To continue the implementation of the existing education and training strategies for professionals.

Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
2.4 AMR awareness eneration and education in the environmental sector	NA	2	2	A policy and targeted communication strategies have been formulated primarily for the management of waste from the pharmaceutical sector. Quality surveillance of surface water is conducted quarterly for coliform count, but it is not related to AMR. Policies or targeted communication strategies developed (for institutions listed in Phase Exploration and Adoption).	To focus on raising AMR awareness, and organize trainings and workshops for professionals in the environmental sector.
3. National AMR surveillance system					
3.1 National human AMR surveillance	3	5	5	A national AMR surveillance programme is functional to monitor AMR trends accurately and in a timely fashion. It has been contributing data to GLASS since 2017. The National Antimicrobial Resistance Surveillance Centre (NARST) has been functional since 1997.	To strengthen human AMR surveillance, increase the number of sites contributing to GLASS, improve the efficacy of the information management system and promote the utilization of the data by policy-makers and health-care providers.
3.2 Strengthening of the national laboratory network for humans	4	5	5	The laboratory network comprises 97 laboratories nationwide from the public and private sectors. The National Institute for Health (NIH) serves as the national reference laboratory. This, as well as a few network laboratories, have ISO151189 certification, which ensures the maintenance of the highest standards of quality. EQA measures are in place and operated by NARST. Research is the core mandate of the NIH and research-related activities are supported by well-established infrastructure, equipment, human resources and budget.	To strengthen laboratory-supported human AMR surveillance, build technical expertise and progress towards accreditation standards in laboratory performance. Strengthen laboratory-supported AMR surveillance and maintain technical expertise by regular capacity-building. Build international collaboration to provide opportunities for crosslearning by sharing experience, knowledge and technologies.

Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
3.3 Strengthening of the national laboratory network in the animal sector	NA	NA	3	The laboratory network comprises nine laboratories of DLD. The National Institute of Animal Health (NIAH) serves as the national reference laboratory for animal health and Bureau of Quality Control of Livestock Products (BQCLP) serves as the national reference laboratory for food safety from animal products. Most of the network laboratories have ISO/IEC 17025: 2017 certified. The national laboratories attend EQA programme with WHO (EQAS by DTU) and FAO (PTAST by CU). For the aquatic animal sector, DOF has established national laboratory for aquatic animal health and AMR surveillance at the Aquatic Animal Health Reserach and Development Division (AAHRDD) in Bangkok. Currently, DOF is in the process of developing another national laboratory at Songkhla Aquatic Animal Health Reserach and Development Center (SAAHRDC) in Songkhla province.	To strengthen laboratory standard in animal AMR surveillance (terrestrial and aquatic animals) and laboratory capacity. Build a national network of animal laboratories covering relevant institutes (government, universitites and private sectors) including building international collaboration to develop expertise by sharing experience, data, knowledge and technologies. To strengthen laboratory standard and capacity for AMR surveillance in animal (terrestrial and aquatic animals). Build a national laboratory network for the animal sector that covers relevant institutes (government, universitites and private sectors), including building international collaboration to develop expertise by sharing experience, data, knowledge and technologies. Human resources and budget for infrastructure and equipment are required in AMR laboratory networks to expand the capacity for activities.

Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
3.4 Early warning systems (EWS)	1	2	2	The systems planned for early warning of emerging AMR are in line with international standards. Pilot EWS have been initiated in some hospitals (not in place yet). *Note: the methodology of surveillance was adopted to monitoring alert and report the organisms under surveillance to the Division of Epidemiology in some public hospitals and six pilot hospitals.*	To set up a national committee to establish EWS as per international standards.
4. Rational use of antimicrobials and surveillance of use/sale (community-based)					
4.1 A national AMR containmment policy for control of human use of antimicrobials; antimicrobial stewardship (see also 7.1)	2	3	3	A national AMS has been developed. It includes tools to implement and monitor the progress and impact.	To expedite finalization of the national antibiotic policy. The policy should cover treatment guidelines, including prescription requirements, and restrictions on sale by private pharmacies. Intensify multidisciplinary capacity-building for AMS in hospitals. The key challenges in implementing of ATB regulation were contrary to social norms among the Thai population and farmers regarding ease of access to antimicrobials and the effect on health service providers and pharmaceutical businesses in terms of production, importation, and distribution.
4.2 NRA/NMRA	2	3	4	Tools for quality assurance and registration of antibiotics are in place and inspection is implemented, but the capacity for the enforcement of policies and regulation is limited.	To promote regulatory cooperation in SEARN on AMR for the import of medical products and regulatory cooperation in the laboratory network.

Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
4.3 Surveillance of antimicrobial use and sale among humans	2	4	4	Mechanisms are in place for the regular collection of data on antimicrobial sale at the national level. AMU data are collected by a few health-care facilities, but it is not a representative sample. The linking of AMU data analysis with the national laboratory-based AMR surveillance is weak.	To develop operational plans to conduct regular surveillance of AMU and sale in the human sector. Complete the antibiotic consumption survey in the human sector and share results to support policy decisions.
4.4 Regulation of finished antibiotic products and APIs	2	4	4	A regulatory authority and system are in place and inspection is implemented but the capacity for the enforcement of policies and regulation is limited.	To strengthen the capacity of the NRA for dossier review and antibiotic registration; conducting post-marketing surveys for quality assurance, and implementing regulations on finished products and API.
4.5 Regulation of pharmacies regarding OTC sale and inappropriate sale of antibiotics and APIs	2	4	4	A regulatory authority and system are in place and inspection is implemented, but the capacity for the enforcement of policies and regulation is limited.	To promote regulatory cooperation in SEARN on AMR for the import of medical products and regulatory cooperation in the laboratory network.
4.6 A national AMR containment policy and regulatory framework for control and registration of use in animals	2	3	3	Policies and/or regulatory frameworks have been implemented, but there is limited capacity for the monitoring of registration and AMU in the animal sector.	To develop policy guidelines for AMR and AMU surveillance in the animal sector. Identify resources, ensure availability of infrastructure and organize training for initiating AMR surveillance in the veterinary sector. Expedite finalization of animal feeds under drug law to provide a legal framework for use of antimicrobials in the animal sector.

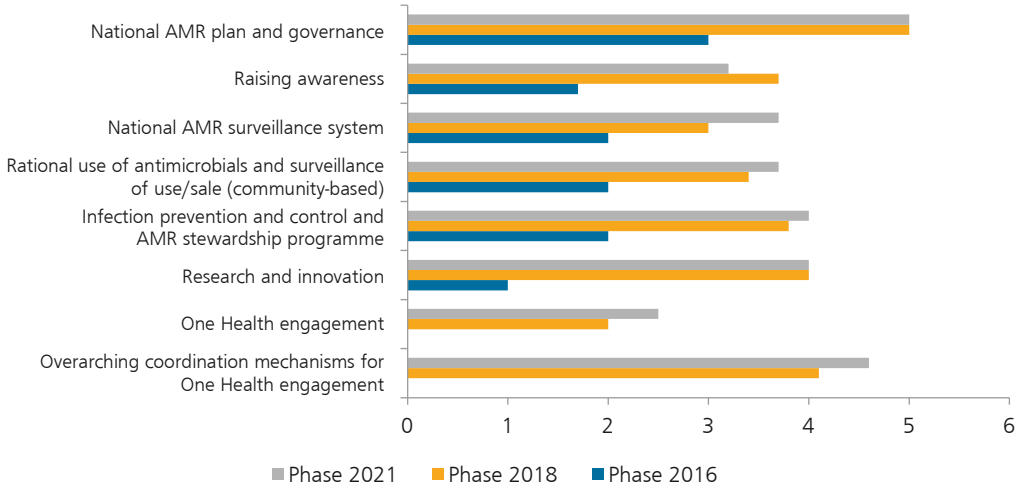
Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
4.7 National surveillance of AMR, and use and sale of antimicrobials in the veterinary sector	2	AMU 3 AMR 3	AMR 3 AMU 4	A national surveillance system for the use and sale of antimicrobials in the veterinary sector has been set up. Guidelines on the collection of AMU data need to be developed. Information is shared annually with the WOAH on the basis of estimates of sale of antimicrobials.	To strengthen existing AMR surveillance by reviewing guidelines to involve food production, food safety and veterinary R&D. Develop guidelines on AMU data collection in the animal sector, including aquaculture, to establish a national surveillance of the use and sale of antimicrobials.
5. Infection prevention and control					
5.1 AMS in health-care settings	3	4	4	The national policy and operational plan are weak. SOPs, guidelines and protocols, with limited updates, are available at only some hospitals.	To finalize guidelines, monitoring tools and mechanisms for systematic feedback of laboratory findings to physicians.
5.2 IPC programme in health-care settings	2	3	4	The IPC programme and capacity-building plans have been implemented in select health-care facilities with limited monitoring. A national IPC plan/policy is under development. IPC programme and capacity building plans implemented nationwide.	To ensure adequate resources, including hospital infrastructure for the isolation of patients upon detection of AMR.
5.3 National HAI and related AMR surveillance	2	4	4	The IPC programme and capacity-building plans have been implemented nationwide.	Focus on capacity-building of infectious disease experts, nurses and pharmacists to support surveillance of HAI.
5.4 Sanitation and hygiene	3	4	4	The policy on improving sanitation and hygiene is implemented on a large scale through regular campaigns.	To standardize reporting and collation of data on hand hygiene to strengthen the sanitation and hygiene practices.
5.5 Vaccination	NA	3	3	PCV 13 is not mandatory under the EPI schedule. A cost–benefit analysis is planned for evidence generation and stronger advocacy.	To consider the inclusion of PCV in the EPI schedule on the basis of a disease burden assessment and in the context of AMR containment.

Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
5.6 Biosecurity (IPC) in the animal sector	2	5	5	The national guidelines have limited reference to biosecurity. They outline disease control, disinfection check and standard farm care for large-scale commercial farms, industries and biosecurity measures for slaughter houses. It is proposed to include AMR in the existing guidelines.	To develop guidelines on animal rearing without antibiotics. Enhance awareness and diagnostic support and formulate a registration system for backyard farming.
6. Research and innovation					
6.1 R&D and innovation on AMR prevention and containment and research funding	1	4	4	Research consortium, dynamic research programmes are ongoing thanks to government led agenda (National forun on AMR). The NAP outlines a plan to foster R&D and innovation on AMR prevention and containment. Funds have been secured from domestic and international sources.	To continue research activities to support the implementation of the NAP-AMR.
7. One Health engagement					
7.1 A national AMR containment policy and regulatory framework to control the release of AR and AMR into the environment and management therein	NA	2	3	There is no national policy on AR and AMR disposal in the environment. However, the release of AR from manufacturing units is well regulated by the existing policies. Evidence of implementation of policy or regulations but limited capacity for monitoring.	To develop a regulatory framework to control the release of AR and AMR in the environment. There is a need to address the knowledge gap regarding the cumulative long-term impact of releasing AMR organisms into the environment (both terrestrial and marine systems).
7.2 National surveillance of AR and AMR in wastewater from manufacture and use in the human, animal and fishery sectors and disposal by institutions and homes	NA	1+	2	Although there are mechanisms to monitor the environment, these are not AMR-specific. AMR surveillance of the environment has already been integrated in the One Health framework.	Same as 7.1

Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
8. Coordination mechanisms for One Health engagement					
8.1 AMR coordination mechanism	NA	4	5	The One Health approach is followed at all levels of the AMR governance structure, such as the national AMR strategic committee and multisectoral working groups for planning and implementation.	To strengthen AMR coordination between relevant sectors, include the plant and agriculture sectors.
8.2 Inclusion and engagement of all relevant sectors in the NAP-AMR	NA	5	5	The NAP-AMR includes and engages various sectors, including human health, animal health, agriculture, environment, food safety, food production, WASH, trade and civil society for the containment of AMR.	Same as 8.1
8.3 A platform and/or mechanism for sharing AMU monitoring data from all relevant sectors	NA	3	4	Databases of wholesale and production of antimicrobials in the human and animal health sectors are available. The system allows monitoring of AMU data. THAISAC is a platform developed to share AMU monitoring data between human and animal health sectors. The animal sector has a mechanism for AMU data repository (ICT system). However, contributions from stakeholders are suboptimal. There is limited involvement of plant and agriculture sectors in collating AMU data. The animal sector has a mechanism for AMU data repository (ICT system). However, the contributions from stakeholders are suboptimal. There is limited involvement of the plant and agriculture sectors in collating AMU data. The Thailand-SAC was endorsed by NPC-AMR, to use as a tool to monitor AMC in Thailand in accordance with the NSP-AMR.	To establish a platform and/or mechanism for sharing of AMR and AMU monitoring data from all the relevant sectors. Review AMU in the plant and agriculture sectors in the context of the AMR containment policy.

Focus and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
8.4 A platform to share AMR surveillance data from relevant sectors	NA	2	4	The One Health approach is applied to all levels of AMR governance structure such as a national AMR strategic committee and working groups with multisectoral planning and implementation. A framework on AMR surveillance under the One Health approach has been developing to monitor AMR and antimicrobial residues throughout the human, food chain, and environmental sectors. Data platform for multisectoral AMR surveillance including human, food animal aquaculture and environmental water has been developing based on WHONET. The plant sector has reported no risk of AMR contamination.	Same as 8.3
8.5 WAAW is nationally coordinated and celebrated with involvement of and contributions from all relevant sectors	NA	5	5	WAAW is nationally coordinated and celebrated with the involvement of the human health, animal health, environment, agriculture and plant sectors, and NGOs. Activities are conducted throughout the year to promote rational use in the community.	To promote generation of awareness of antimicrobials, sustain collaboration between the human and animal health sectors and include other sectors to sustain activities outside of AAW.
8.6 A mechanism for co-sharing of resources for AMR initiatives	NA	3	5	The One Health approach is applied to all levels of AMR governance structure such as the national AMR strategic committee and working groups with multisectoral planning and implementation.	

Fig. A10. Progress analysis of AMR prevention and containment in Thailand, 2016–2021



The figure shows average phase-grading for the indicators in different focus areas.

Achievements and lessons learnt

- Overall, Thailand reported 90% of all indicators with implementation phase of 3 and above, indicating significant progress in the implementation of NAP-AMR, compared to progress analyses in 2018 (80.60%) and 2016 (19.30%), and the highest among Member States in the South-East Asia Region. Two thirds (67.7%) of 31 indicators were in the stage of full operational implementation (phase 4) or even sustainable implementation (phase 5).
- Thailand has a comprehensive NSP on AMR: Progress and Challenges (2017–2022), implemented under the One Health approach, with effective multisectoral national coordination and established monitoring system to track the implementation. The earlier successful ASU programme in improving rational use and reducing the unnecessary use of antibiotics has been incorporated into the existing NSP and implemented nationwide.
- AMU in human as well as in the veterinary sectors are systematically monitored. There was a functioning national network for AMR both for human and veterinary sectors. The One Health Report on AMC and AMR is published annually, the last report was in 2019. Thus, Thailand did not only monitor the activities related to AMR but also the possible impact on AMC.
- AMR has been incorporated in the pre-service training and continuing professional development of health workers as well as in the training for veterinary professionals.
- Reclassification of antibiotics with AWaRe has been adopted and implemented to ensure access to the needed antibiotics and to prevent their overuse by professionals.

Timor-Leste

Focus area and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
1. National AMR plan and governance					
1.1 NAP in line with GAP-AMR, governance issue	2	2	3	The NAP-AMR, which is line with GAP-AMR, includes an operational plan with defined activities and their respective budgets. A national multisectoral AMR committee has been established and is functional. Major progress has been made in implementing NAP-AMR in the country. Updating the NAP is ongoing, with increased attention and participation of government ministries and agencies. The funding support from the Flemming Fund country grant is of great help. However, the government has yet to invest more for AMR containment, especially after the country grant has accomplished.	To continue the implementation of the NAP-AMR with the One Health strategy and secure government budget.
A.2 Raising awareness					
2.1 Awareness campaigns for the public	2	4	4	Nationwide, government-led awareness campaign are held. These target the public and professionals. Survey conducted to assess the awareness of AMR among the public and IEC material has been developed for the rational use of antimicrobials.	To develop methodology to evaluate the impact of the campaigns conducted among the public to raise awareness of AMR.
2.2 Education and training strategies for profesionals in human health	1	3	3	Guidelines have been developed and implemented for AMR-specific education/training for professionals, including rational use of antimicrobials.	To continue introducing the issues of AMR, including the rational use of antimicrobials in the pre-service training, induction training and continuing professional development (CPD) of health professionals.

Focus area and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
2.3 AMR awareness generation and education in the animal sector	1	1	2	Awareness-generation activities are conducted mostly under the MoH with the engagement of the animal health sector. However, there are no messages specifically targeted at animal health professionals or farmers. Efforts have begun for training and education to professionals in the animal health sector, especially during the WAAW.	
2.4 AMR awareness generation and education in the environmental sector	NA	1	1	There are no policies or targeted communication strategies on AMR in waste.	It is essential to develop guidelines on the safe disposal of wastewater and expired drugs in the context of generating awareness of AMR in the environmental sector.
3. National AMR surveillance system					
3.1 National human AMR surveillance	1	2	3	Guidelines have been developed but are not fully implemented. Only limited quality data are available and there are problems related to analysis and representativeness.	To strengthen policies and regulations to enforce implementation of the existing guidelines and ensure a robust data analysis system to address the gaps in M&E. To continue AMR surveillance in the national and five referral hospitals.
3.2 Strengthening the national laboratory network for human health	1	1	3	The network is working well.	To continue to strengthen the existing network, improve microbiology capacity of NHL to also cover AMR, establish quality assurance measures, build capacity for data management using WHONET.
3.3 Strengthening of the national laboratory in the animal sector	NA	NA	1	Some work started.	To undertake mapping of the existing microbiology laboratory for the animal sector and its referral system.

Focus area and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
3.4 Early warning systems (EWS)	1	1	1	EWS are not established for AMR bacteria.	To set up EWS for the rapid detection of AMR organisms and a database to provide information on AMR risk on a real-time basis, using advanced IT software.
4. Rational use antimicrobials and surveillance of use/sale (community-based)					
4.1 A national AMR containment policy for control of human use of antimicrobials; antimicrobial stewardship (see also 7.1)	1	2	3	National AMS has been initiated, and has been scaled up to several municipalities.	To expand the ASP to more municipalities and update the AMR guidelines, which include antibiotic guidelines for health facilities.
4.2 NRA/NMRA	1	2	3	There is an NRA/NMRA with a limited capacity. Strategic planning is in place for capacity building and appropriate budgeting; capacity building activities are ongoing.	To promote regulatory cooperation with SEARN on AMR for the import of medical products and regulatory cooperation between laboratories.
4.3 Surveillance of antimicrobial use and sale among humans	1	2	3	A national policy and plan on surveillance of antimicrobials is being formulated. Limited surveillance is conducted in select facilities and national level sales also survey on AMR consumption done. Surveillance on AMU has been initiated in 2020.	To enable the organizational structure and capacity of the NRA to regulate pharmacies to meet the requirements of the NAP. To improve capacity of the NRA for monitoring AMU in humans.
4.4 Regulation of finished antibiotic products and APIs	2	1	1	There is no official regulation of import, export, production, distribution and use of finished antibiotic products and APIs.	It is essential to strengthen the capacity of the NRA for regulating registration, dossier review, and regulating finished antibiotic products and APIs. Develop capacity of NRA and advocacy to implement regulation for antibiotic policy.

Focus area and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
4.5 Regulation of pharmacies regarding OTC sale and inappropriate sale of antibiotics and APIs	1	2	2	There is a national drug policy, which prohibits the sale of antimicrobials without prescription, but implementation is limited. Due to the limited capacity and other barriers, inspection and enforcement is difficult.	Same as 4.4
4.6 A national AMR containment policy and regulatory framework for control and registration of use in animals	1	1	1	There is no national policy or plan to reduce AMU in the animal and fishery sectors.	To develop a national AMR containment policy and regulatory framework for the control and registration of AMU in the animal sector. Follow up and finalize the draft legislation and policy. Also, develop collaborative mechanisms among multisectoral stakeholders for the containment of AMR in the veterinary sector.
4.7 National surveillance of AMR, and use and sale of antimicrobials in the veterinary sector	1	AMU 1 AMR 1	AMR 2 AMU 2	There are no activities on the surveillance of AMU and AMR in the veterinary sector. There is a national veterinary laboratory that can handle bacterial isolation, but not for AST. They have SOPs for some bacteria but not all. Project-based AMU/AMR surveillance is being conducted in a limited manner. There is no policy for AMU/AMR surveillance. The draft animal feed law is yet to be finalized. The NAP outlines surveillance and monitoring activities, however these are yet to be implemented.	To establish AMR surveillance in the animal health sector, supported by a quality assured laboratory network and a robust data analysis mechanism with the cooperation of international experts. Tripartite experts should review the existing laboratory capacity to support surveillance. The National Directorate of Veterinary Services has plans to develop policies and guidelines for AMU, and the collection of sales data.

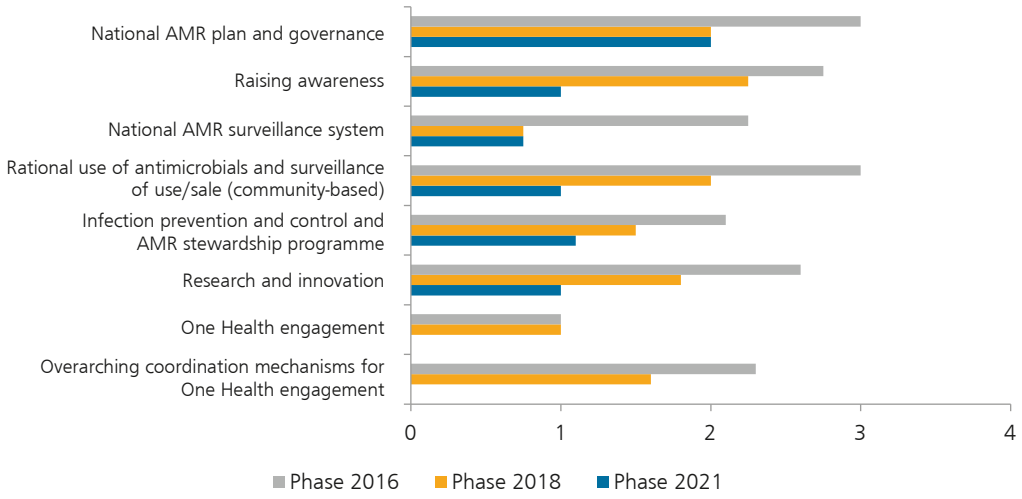
Focus area and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
5. Infection prevention and control					
5.1 AMS in health-care settings (see 4.1 for information)	1	1	3	National AMS has been initiated, and has been scaled up to several municipalities the updated NAP-AMR will include AMS activities.	To expand AMS to more municipalities and strengthen the capacity of laboratories for the surveillance of AMR/ AMU in the human health sector.
5.2 IPC programme in health-care settings	1	1	3	IPC has become prominent issue in health-care settings during the COVID-19 pandemic. IPC guidelines have been developed, trainings conducted and inspection organized in 2020 and 2021.	To establish an IPC committee and strengthen IPC training in health-care facilities.
5.3 National HAI and related AMR surveillance	1	1	1	No policies limited to national plan and guidelines to mandate hospitals for HAI surveillance.	To develop policy/ guidelines and build capacity for HAI surveillance and expand across country in a stepwise manner.
5.4 Sanitation and hygiene	2	3	3	The policy on improving sanitation and hygiene has been implemented on a limited scale. Data on safe water supply and sanitation services exist, but access is low. Improvements have been made, but more is needed.	To focus on expanding the implementation of the WASH programme. To expand the implementation of sanitation and hygiene programme in the communities.
5.5 Vaccination	NA	4	4	PCV was introduced in the routine immunization programme since 2017. There are no plans for including the HiB and typhoid vaccines in the EPI schedule. Immunization has been strong with high coverages in TLS, and it has been strengthened throughout years. However, there are some interruptions during the COVID-19 pandemic.	To maintain high coverage of immunization. To consider developing plans for the sustainability of immunization services beyond GAVI, the vaccine alliance. Support and continue the use of PCV.

Focus area and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
5.6 Biosecurity (IPC) in the animal sector	1	1	2	Biosecurity manuals for poultry farms are in place. Training on biosecurity has been conducted for professionals and farmers.	To continue training on biosafety and biosecurity. To implement biosecurity in the animal sector, including backyard farms and commercial establishments.
6. Research and innovation					
6.1 R&D and innovation on AMR prevention and containment and research funding	1	1	2	Very limited research on AMR funded by the government. Some works have been funded by external donor such as the Fleming Fund or WHO.	To ensure the availability of government funds to conduct targeted research focused on AMR.
7. One Health engagement					
7.1 A national AMR containment policy and regulatory framework to control the release of AR and AMR into the environment and management therein	NA	1	1	There is no national policy on reducing antimicrobial contamination of the environment.	To develop AMR containment policy and regulatory framework to control antimicrobial contamination of the environment and engage the ministries of commerce, industry and environment to initiate AMR surveillance of wastewater and solid waste from all relevant sectors. Conduct research to assess baseline data on AR and AMR from different sources.
7.2 National surveillance of AR and AMR in wastewater from manufacture and use in the human, animal and fishery sectors and disposal by institutions and homes	NA	1	1	Weak national policy and guidelines for the surveillance of AR/AMR in waste and the environment. Though the environmental sector is included in the national AMR committee and is part of the NAP, no surveillance of AMR contamination of the environment is conducted.	Same as 7.1

Focus area and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
8. Coordination mechanisms for One Health engagement					
8.1 AMR coordination mechanism	NA	1	3	The NAP-AMR mandates a multisectoral coordination committee at the national level and a task force to conduct AMR activities. The process of setting up the committee and task force is under way.	To expedite the setting up of the coordination committee and task force for building an overarching AMR coordination mechanism among all relevant sectors. Ensure the inclusion and engagement of all relevant sectors, particularly environment and plant sectors.
8.2 Inclusion and engagement of all relevant sectors in the NAP-AMR	NA	3	3	The NAP-AMR includes and engages various sectors, including human health, agriculture, veterinary, food safety and trade, NGOs, WASH and the private sector.	Same as 8.1
8.3 A platform and/or mechanism for sharing AMU monitoring data from all relevant sectors	NA	1	2	No mechanism has been developed for sharing of data from all the relevant sectors. Limited data on AMU are available from the human health sector, but none from the animal sector.	To develop an integrated mechanism for sharing of AMR and AMU monitoring data from all relevant sectors, particularly the human and veterinary sectors. Consider a sentinel survey across different sectors, integrated environment with agriculture.
8.4 A platform and/or mechanism for sharing AMR surveillance data from all relevant sectors	NA	1	1	The AST in human health supports the diagnostics and treatment methodology. No organized AMR surveillance is conducted in the human health and animal sectors. There is no mechanism for sharing data among the relevant sectors.	To enhance the involvement of and contributions from all relevant sectors for the generation of awareness of AMR.

Focus area and indicators	Phase 2016	Phase 2018	Phase 2021	Justifications/comments	Recommendations
8.5 WAAW is nationally coordinated and celebrated with involvement of and contributions from all relevant sectors	NA	3	3	WAAW is nationally coordinated and celebrated with the involvement of the human and animal health sectors and targets the public at large along with professionals in the human health sector. WAAW has been organized and celebrated every year, with contribution and participation of all sectors and partners.	To build synergies among all relevant sectors to organize a nationally coordinated WAAW.
8.6 A mechanism for co-sharing of resources for AMR initiatives	NA	1	1	Funds are available for AMR activities, but there is no mechanism for co-sharing of resources.	Co-sharing of resources for AMR initiatives.

Fig. A11. Progress analysis of AMR prevention and containment in Timor-Leste, 2016–2021



The figure shows average phase-grading for the indicators in different focus areas.

Achievements and lessons learnt

- Overall, Timor-Leste reported 48.3% of indicators with implementation phase of 3 and above, indicating significant progress compared to the progress analyses in 2018 (19.30%) and 2016 (0%).
- NAP-AMR has been revised with the One Health approach and implemented with available budget from different resources; a memorandum of understanding has been signed with the Menzies School of Health Research with funding from the Fleming Fund for implementation of the NAP-AMR.

- Every year, educational programmes and training sessions and workshops have been organized by different health-care facilities to professionals on AMR and rational use of antibiotics, including for doctors, pharmacists and nurses.
- Surveillance of AMU has been initiated.
- National antimicrobial stewardship has commenced. It now covers several municipalities.
- IPC has become a major issue in health-care settings during the COVID-19 pandemic. IPC guidelines have been developed, trainings conducted, inspections organized, in 2020 and 2021.

The release of this third comprehensive progress analysis of the implementation of national action plans to address antimicrobial resistance (AMR) in the WHO South-East Asia Region coincides with the Seventy-fifth Session of the WHO Regional Committee for South-East Asia in Bhutan in September 2022. This analysis is based on Member States' participation in the annual tripartite AMR self-assessment surveys conducted globally. Despite the COVID-19 pandemic, the third progress analysis clearly demonstrates significant progress with all countries of the Region having developed national action plans aligned with the Global Action Plan to address AMR.

The analysis reiterates the challenges ahead and underscores the importance of effective coordination, communication and collaboration between the health, veterinary, agriculture and environment sectors to bring about tangible containment of AMR. The analysis reveals that AMR awareness and surveillance, and more efficient and responsive health systems, including functioning laboratory networks for the health, veterinary and environment sectors, will be crucial in promoting rational use of antimicrobials.

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South-East Asian Region

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