



Antimicrobial Resistance (AMR)

Progress in Addressing AMR

“Cambodia, Lao P.D.R and Myanmar”



Antimicrobial Resistance Surveillance Systems

“Progress in Addressing Antimicrobial Resistance”

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ABBREVIATIONS

AMR	= Antimicrobial Resistance
AMS	= AMR Stewardship
AMSP	= AMR Stewardship Program
AMU	= Antimicrobial Use
API	= Active Pharmaceutical Ingredient
DRA	= Drug Regulatory Authority
ESBL	= Extended-Spectrum Beta Lactamases
FAO	= The Food and Agriculture Organization of the United Nations
GAP	= Global Action Plan
GAP-AMR	= Global Action Plan on Antimicrobial Resistance
GLASS	= Global Antimicrobial Surveillance System
IPC	= Infection Prevention and Control
M&E	= Monitoring and Evaluation
NAP	= National Action Plan
NAP-AMR	= National Action Plan on Antimicrobial Resistance
NGO	= Non-Governmental Organization
NRA	= National Regulatory Authority
OIE	= The World Organization for Animal Health
TrACSS	= Tripartite AMR Country Self-Assessment Survey
SEAR	= The South-East Asian Region
UNEP	= United Nations Environment Program
WASH	= Water, Sanitation and Hygiene
WHO	= The World Health Organization

Antimicrobial Resistance Surveillance Systems “Progress in Addressing Antimicrobial Resistance”

A. BACKGROUND

Antimicrobial resistance (AMR) is a grave threat to human health and economic development [1]. Estimated around 10 million deaths may be attributed to AMR by 2050 at the global level and nine million in developing countries, with 4.7 million in Asia, 4.2 million in Africa and 392,000 in Latin America [2]. The overuse and misuse of antimicrobials in humans, animals and plants have accelerated the natural evolutionary processes by which microbes become resistant to antimicrobial treatments. Today, some infections have even been rendered untreatable by existing antimicrobials. Projections suggest that AMR is likely to exacerbate global economic inequality, with the economic costs disproportionately affecting poorer countries. On the animal side, the World Bank has projected significant decreases in international trade due to AMR as a result of decreases in the trade of livestock and livestock products; while on the human side, AMR could derail the Sustainable Development Goals, driving an estimated 24 million people into extreme poverty [3] and potentially resulting in tens of millions of deaths [1].

Antimicrobial effectiveness is a global public good and must be protected by public authorities. Yet, two of the biggest risks to containing AMR are: 1) AMR policies that may not be feasible over decades, and 2) historic divisions between human health and other sectors will hinder efforts to contain resistance [3]. Long-term commitments are needed in monitoring, surveillance, stewardship, and training to bring the substantial change in patterns of antimicrobial use [4] and in how waste and effluents are managed. A One Health approach – incorporating humans, animals, plants and the broader environment – is needed to ensure adequate action [5]. Given the need to coordinate action among these sectors, government engagement is imperative. The necessary changes to global antimicrobial use can be achieved using individually targeted behavior change strategies.

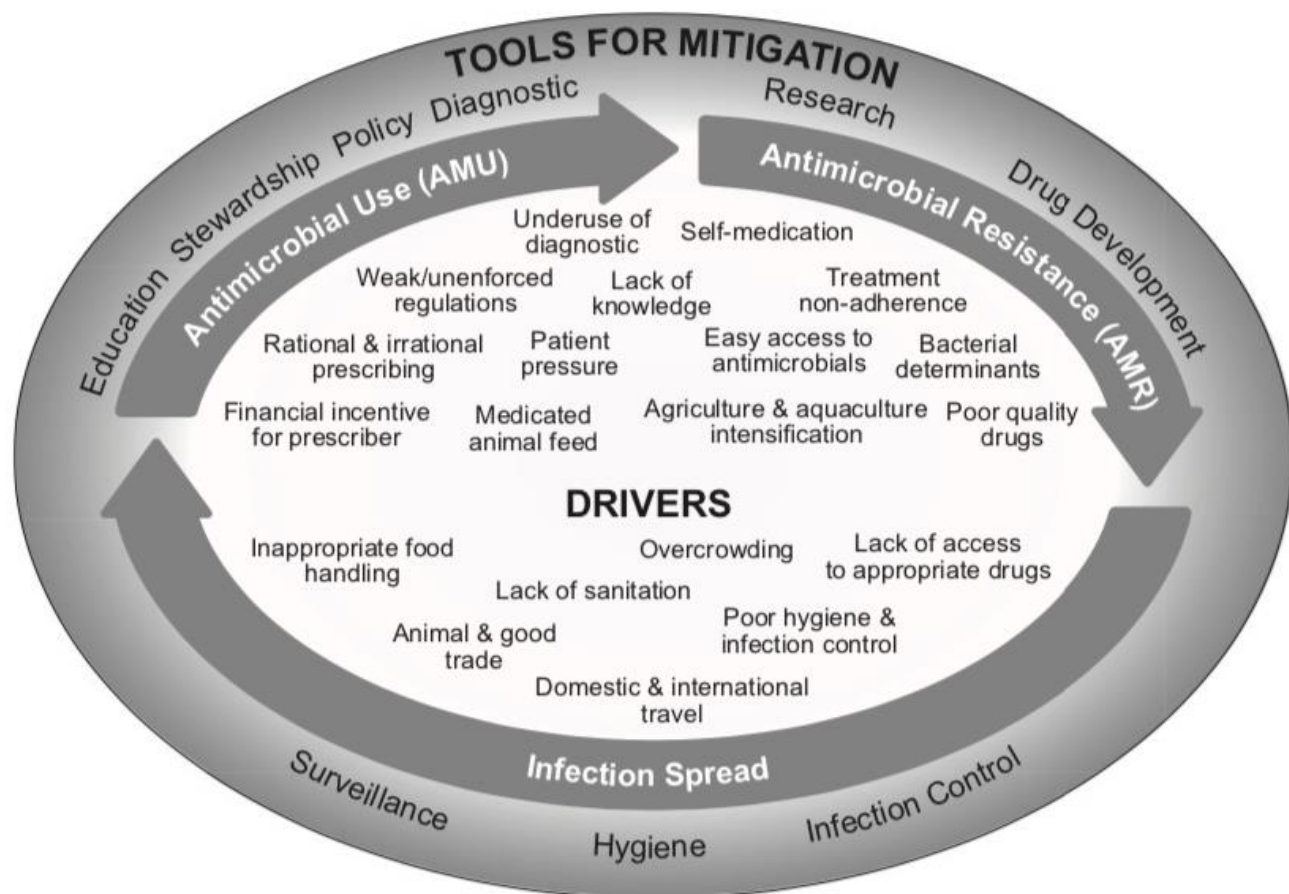
Countries are at different stages in responding to the growing threat posed by AMR. The Global Action Plan on Antimicrobial Resistance (GAP-AMR) was adopted in 2015 by all countries through decisions in the World Health Assembly, The Food and Agriculture Organization of The United Nations (FAO) Governing Conference Governing Conference and The World Organization for Animal Health (OIE) [6–8]. All countries approved the GAP-AMR and agreed to develop and implement National Action Plans on AMR (NAP-AMR) by 2017. The importance of AMR was reaffirmed in 2016 at the United Nations (UN) General Assembly, where Heads of State committed their countries to work together to address AMR and implement the GAP-AMR. The UN General Assembly also called upon WHO, FAO, OIE, regional and multilateral development banks, UN agencies, and civil society to support the development and implementation of national action plans and AMR activities at the national, regional, and global levels [9]. This has been done through the development of One Health tools and training materials [10].

The World Health Assembly has also called on the WHO, FAO, OIE and other relevant partners to develop a framework for monitoring and evaluation to assist with the achievement of GAP Principle #5. As part of their response, WHO, OIE and FAO created a national self-assessment survey containing questions structured around the objectives of the GAP. The first wave of this survey was sent to WHO's 194 member countries in late 2016. Findings were reported to the World Health Assembly and the OIE World Assembly of Delegates. Non-human health sectors (animal health, plant health, food production, food safety and the environment) were separated in the survey questions, some questions were made more specific, and the bar was raised on some indicators [9]. As such, only a limited number of questions can be compared between 2016-17, 2017-18, 2018-19, and 2019-20 [11–14]. Countries were asked to submit a single official response, validated by all involved sectors, summarizing their national progress. Survey database from those four waves are available at <http://www.who.int/antimicrobial-resistance/global-action-plan/database/en/> . Going forward, the momentum thus achieved will be sustained through stronger multi-sectoral collaboration, including the creation of platforms that can enable joint planning, exchange of surveillance information and sharing of resources [2].

The tripartite (WHO, FAO and OIE) has developed a draft approach for monitoring and evaluation of the GAP-AMR. The purpose of this global monitoring is to review and summarize country progress in implementing key actions to address AMR, for reporting annually at global level. The Regional Office has established baseline data for national AMR control programs to measure progress [15]. It is also intended to encourage national-level review of country progress and help identify priorities for next steps. The country responses will also be used to guide follow-up actions and identify areas where assistance and support is required. This will help to provide a picture of the stage the country has reached in building an effective and sustainable multi-sectoral response to AMR. It may also stimulate discussion at country level on how to increase progress [11–14].

B. METHODOLOGY

In this report, team analyzed and compared countries' responses to the first (2016-17), second (2017-18), third (2018-19), and fourth (2019-20) wave of the tripartite survey and describe the trend and current level of regional and country progress (based on self-assessment) on AMR in Lao PDR, Cambodia, and Myanmar. Team conveyed progress achieved towards the goals of the GAP across regional level among countries. Finally, team explored progress in relation to progress made towards Multi-Sectoral and One-Health approach goals. It is also important to note that although the survey did allow countries to report separately on animal health, plant health, food safety, food production and the environment for some questions, many countries chose just to report on the non-human sectors collectively. For this reason, in some cases comparison is made between the human health sector and the non-human health sectors collectively.



Based on the schematic of the development, spread, drivers and tools for the mitigation of AMR. Drivers and tools for mitigation may influence any or all of AMU, AMR and infection spread. Their location on the schematic does not imply anything about where they play a role [16]. Those schemes accommodate variables in TrACSS data with questions were structured with responses ranging from A (minimal progress) to E (substantial progress). The analysis will explain the progress made by countries with also regards to GAP-AMR objectives: 1) Improve awareness and understanding of antimicrobial resistance through effective communication, education and training; 2) Strengthen the knowledge and evidence base through surveillance and research; 3) Reduce the incidence of infection through effective sanitation, hygiene and infection prevention measures; and 4) Optimize the use of antimicrobial medicines in human and animal health [9,11–14].

C. DATA ANALYSIS

1. Overview of Country Health System

1.1. Lao PDR

In 2011, the Lao People's Democratic Republic's status was upgraded by the World Bank from a low-income country to a lower-middle-income country, with a gross national income of US\$ 1010 per capita. Reported vaccination coverage has continued to improve, and wide ranges of vaccines are available through Government and donor support. HIV, TB and malaria efforts have benefited from considerable investment through the Global Fund to Fight AIDS, Tuberculosis and Malaria (Global Fund) as well as other donors, such as United States government agencies and the Asian Development Bank. The MDG target on access to improved sanitation and drinking water has been achieved as well. Despite strong government commitments to health, as reflected by a number of policy statements, decrees, national strategies and plans, it is evident that there are gaps between policy intentions, effective implementation and good results. Political commitments have not yet been translated into increased health spending and government health expenditure stagnated at 5.9% of the general government budget in 2008–2010. On the other hand, the level of total health expenditure is US\$ 46 per capita in 2010. The incidence of catastrophic health-care expenditure was found to be low and declining and the incidence of health impoverishment declined. However, as a result of insufficient investment in the public health infrastructure and workforce, the health service utilization rate also was low. Health system's performance reflects large urban–rural and rich–poor gaps of service coverage and health status. Malaria is still considered an important contributor to morbidity and mortality, while it should be noted that artemisinin combination therapy was introduced in 2004, following a local increase in resistance to anti-malarial drugs. Recently, AMR has become a significant public health priority with high-level attention evident. In 2015, the AMR Surveillance and Control Committee were established and the following year, the NAP-AMR 2017–2020 was developed. Although the country has capacity to detect some antimicrobial-resistant pathogens in human and animal sectors, there is a need to develop national plans for detection and reporting of priority antimicrobial-resistant pathogens. Moreover, that there is no national plan for antimicrobial stewardship and coordination within and beyond the Ministry of Health remains an issue. The National Reference Laboratory received support from the Global Fund, WHO and the Korean Institute of Tuberculosis to conduct the first national anti-TB drug resistance survey with international standards (2016–2017) [17,18].

1.2. Cambodia

With gross domestic product (GDP) currently growing at more than 7% per annum, Cambodia is about to cross the line between low-income and lower middle-income status. While government funding for health care has increased significantly, it remains at only 1.4% of GDP. Official development assistance is stable at 15–20% of total health expenditure and the out-of-pocket payments provided 61% of the total health expenditure. Donor support is essential, but greater alignment of donor programs to the national priorities is needed. Administration of the public health system in Cambodia is centralized at

the level of the national MOH. On the other hand, morbidity and mortality from malaria remain high compared to other countries in the region. Responding to multidrug resistance along the Cambodia–Thailand border – especially for artemisinin derivatives, *Plasmodium falciparum* – the ARCE (artemisinin resistance containment and elimination) programs established, including intensive screening, vector control tools and village malaria workers. Related with the supply side, public access to pharmaceuticals is widespread, through the large network of private pharmacies, drug stores and informal drug sellers. These various drug sellers (qualified and unqualified) often serve as the first point of contact with the health system, frequently provide general medical advice, and generally sell drugs (including antibiotics) without medical prescription. Shortcomings in rational drug use have led to antibiotic resistance and frequent delays in receiving adequate care. Similar to many other low- and middle-income countries, Cambodia has only relatively recently begun to develop diagnostic microbiological facilities, and, as capacity expands, collaboration has led to sharing of AMR data, revision of clinical practice guidelines, and development of infection control policies. Harmonization between national and global surveillance systems, need to be made to standardize methodology data to embrace a broader One Health approach, including surveillance in plants and the environment. Capture of patient-level data will be critical to understand the impacts of AMR. In Cambodia, the fledgling national AMR surveillance systems for humans and food animals will contribute to the generation of multi-sectoral data as well, allowing a stronger One Health approach in tackling AMR [19,20].

1.3. Myanmar

There was no substantial growth in the country's per-capita gross domestic product (GDP) between 2000 and 2012. There are positive indications in Myanmar that the new government is working towards achieving macroeconomic stability. Total health expenditure in Myanmar, 2.0–2.4% of its GDP between 2001 and 2011, is the lowest among countries in the World Health Organization (WHO) South-East Asia and Western Pacific Regions. General government health expenditure (GGHE) as a percentage of general government expenditure (GGE) is low, at 1% between 2003 and 2011. GGHE as percentage of GDP amounted to 0.2–0.3% over the same period. GGHE as a percentage of GDP and of GGE in 2012–2013, increased significantly to 0.76% and 3.14%, respectively; however, this level of health investment is still low compared to demand for health care. Detrimental effects on equity subsequently followed with meagre government budget (average 549.08 kyat per capita in 2011–2012), a majority of which was allocated to extending hospital-based secondary and tertiary care services at the expense of PHC. Therefore, the government started to take the initiative to introduce formal social protection in the country. The health system comprises a pluralistic mix of public and private both in financing and provision. The challenges of Myanmar are to overcome the limitations of the past (e.g. low investment in rural health services), inadequate funding for expansion of universal health coverage, and ensure possible use for health of the funds generated from revenue on extracting natural resources. As part of health outcome; life expectancy at birth increased for both males and females between 1980 and 2011; along with an increase in the child immunization coverage; and declines in infant and under-5 mortality rates, and maternal mortality ratio. However, despite reductions in recent years, malaria remains a leading cause of mortality and morbidity. Malaria is re-emerging due to climatic and ecological changes, migration and natural-extraction industries, artemisinin resistance, and changes in behavior of vectors. On the other hand; Myanmar is among the 22 TB high-burden countries, 27th in the list of multi-drug resistant TB high-burden countries and 41st in TB– HIV high-burden countries in the world. The Three

Millennium Development Goals (3MDG) Fund started in 2013 to fill the gaps in the Global Fund to Fight AIDS, Tuberculosis and Malaria support. AMU and AMR are increasing in Southeast Asia, driven by rapid intensification of food-production systems, loosely regulated access to antimicrobials, poor awareness with respect to antimicrobials (from the public, health professionals and farmers), widespread irrational prescribing and self-medication, and an abundance of low-quality or counterfeit drugs. An additional investigation showed that the concurrent use of two point-of-care rapid tests (urine dipstick and microscopy) improved antimicrobial prescribing in adults with urinary tract infections at the Thailand–Myanmar border [16,21].

2. Country Progress on National Action Plan

2.1. Trend of NAP-AMR Development

Table 1. Progress on Development of AMR National Action Plan (2016-17, 2017-18, 2018-19, 2019-20)

Country	2016-17	2017-18	2018-19	2019-20
Lao PDR	B	C	B	D
Cambodia	D	E	C	D
Myanmar	C	D	D	D

A = No national AMR action plan.

B = National AMR action plan under development.

C = National AMR action plan developed.

D = National AMR action plan approved by government that reflects Global Action Plan objectives, with an operational plan and monitoring arrangements.

E = National AMR action plan has funding sources identified, is being implemented and has relevant sectors involved with a defined monitoring and evaluation process in place.

Progress with development of NAP-AMR has been made in most countries. NAP-AMR is not only approved by the government, but also has an AMR operational and monitoring plan. However, to support the sustainability of further NAP-AMR implementation; NAP-AMR needs to have funding source identified followed by active involvement of relevant sectors both in implementation and defined monitoring and evaluation processes.

2.2. Interlink with Other Relevant NAP

Table 2. Progress on NAP-AMR Linked to Existing Action Plans, Strategies, Targets (2017-18, 2018-19, 2019-20)

Country	HIV			Tuberculosis			Malaria			Neglected Tropical Diseases			Sexually Transmitted Diseases (STIs)		
	2017-18	2018-19	2019-20	2017-18	2018-19	2019-20	2017-18	2018-19	2019-20	2017-18	2018-19	2019-20	2017-18	2018-19	2019-20
Lao PDR	N/A	No	No	N/A	No	No	N/A	No	No	N/A	No	No	N/A	N/A	No
Cambodia	N/A	Yes	Yes	N/A	Yes	Yes	N/A	Yes	Yes	N/A	Yes	Yes	N/A	N/A	Yes
Myanmar	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	N/A	N/A	Yes

The progress of NAP-AMR that links to any other existing action plans, strategies or targets related to HIV, tuberculosis, malaria, neglected tropical diseases, or sexually transmitted diseases has been made and improved; except in Lao PDR. The NAP-AMR is more likely to have link to existing action plans, strategies or targets related to HIV, tuberculosis, malaria, and sexually transmitted diseases; compared to neglected tropical diseases. Although there are a number of NAP-AMRs that have not yet been linked, all of the NAP-AMRs have been identified in the last year, thus indicating that progress has been made in planning between relevant sectors.

2.3. Legislation on Antimicrobial Use

Table 3. Progress on Country Policies for Antimicrobial Use (2017-18, 2018-19, 2019-20)

Country	Human Use			Animal Use		Growth Promotion			Plant Production
	2017-18	2018-19	2019-20	2018-19	2019-20	2017-18	2018-19	2019-20	2019-20
Lao PDR	No	Yes	Yes	No	No	No	No	No	No
Cambodia	No	No	Yes	No	Yes	No	No	Yes	Yes
Myanmar	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes

Antimicrobial use policy and legal status for human use are more likely to have progress compared to non-human sectors. All of participating countries have country laws or regulations on prescription and sale of antimicrobials for human use In 2018-19, but only a few of them have laws or regulations on prescription and sale of antimicrobials for animal use and laws or regulations that prohibit the use of antibiotics for growth promotion in the absence of risk analysis. However, progress on antimicrobial use policy and legal status for non-human use (i.e. animal use and growth promotion) has been made when compared to the progress of previous years.

3. Multi-Sectoral and One-Health Approach

3.1. Collaboration/ Coordination

Table 4. Progress on Multi-sectoral and One Health Collaboration/ Coordination (2016-17, 2017-18, 2018-19, 2019-20)

Country	2016-17	2017-18	2018-19	2019-20
Lao PDR	B	B	B	B
Cambodia	C	C	C	C
Myanmar	A	B	D	D

A = No formal multi-sectoral governance or coordination mechanism on AMR exists.

B = Multi-sectoral working group(s) or coordination committee on AMR established with Government leadership.

C = Multi-sectoral 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.

D = Joint working on issues including agreement on common objectives.

E = Integrated approaches used to implement the national AMR action plan with relevant data and lessons learned from all sectors used to adapt implementation of the action plan.

Progress in multi-sectoral and One Health collaboration / coordination to addressing AMR has been made. All countries have AMR multi-sectoral working groups or coordination committees established with Government leadership. Some of them even functioning and defined clear activities and funding. Progress levels that have been made at this time indicate that all countries have the potential to further improve to the next progress level which used integrated approaches to implementing the NAP-AMR with relevant data and lessons learned from all sectors (i.e. human health, animal health (terrestrial and aquatic), plant health, food production, food safety, and environment including WASH).

3.2. Multi-Sectoral Involvement

Table 5. Progress to Involved Sectors in Developing and Implementing NAP-AMR (2016-17, 2017-18, 2018-19, 2019-20)

Country	Human Health			Animal Health			Plant Health			Food Production			Food Safety			Environment		
	2017-18	2018-19	2019-20	2017-18	2018-19	2019-20	2017-18	2018-19	2019-20	2017-18	2018-19	2019-20	2017-18	2018-19	2019-20	2017-18	2018-19	2019-20
Lao PDR	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	No	Yes	Yes	Yes	Yes	Yes	No	No	N/A
Cambodia	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes
Myanmar	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

In order to support multi-sectoral and One Health collaboration / coordination, many multi-sectoral are actively involved in developing and implementing the NAP-AMR. All sectors are actively involved; both human health and non-human sectors (i.e. animal health, plant health, food production, food safety, and the environment sector). Countries with large working groups (defined as including at least 4 sectors) appear to have made more progress towards several GAP-AMR objectives than those countries with smaller multi-sectoral working groups (defined as including 3 or fewer sectors).

4. Improve Awareness and Understanding

4.1. Progress on Effective Communication

Table 6. Progress on Awareness and Understanding of AMR Risks and Response (2016-17, 2017-18, 2018-19, 2019-20)

Country	Human Health				Animal Health and Food Production	Animal Health	Plant Health	Food Production	Food Safety	Environment
	2016-17	2017-18	2018-19	2019-20	2016-17	2017-18	2017-18	2017-18	2017-18	2017-18
Lao PDR	A	B	C	C	A	A	A	A	A	A
Cambodia	D	C	C	C	B	C	C	A	A	A
Myanmar	A	C	D	D	B	C	B	B	A	A

2016-17, 2017-18

(Human Sector)

A = No significant awareness-raising activities on antibiotic resistance.

B = Some activities in parts of the country to raise awareness about risks of antibiotic resistance and actions that can be taken to address it.

C = Limited or small-scale antibiotic resistance awareness campaign targeting some, but not all, relevant stakeholders (e.g. general public, doctors, pharmacists, nurses, medicine sellers).

D = Nationwide, government-supported antibiotic awareness campaign targeting all or the majority of stakeholders.

E = Focused, national scale government-supported activities implemented to change behavior regarding antibiotic resistance in target groups in human health, both public and private sectors, with monitoring undertaken of their awareness and behavior change over last 5 years.

(Non-Human Sectors, 2016-17)

A = No significant awareness-raising activities on risks of antibiotic resistance for animal health and risks of transmission of resistant pathogens through the food chain

B = Some activities in parts of the country to raise awareness about antimicrobial resistance and actions to address it.

C = Nationwide, antimicrobial awareness campaign targeting food producers and farmers, with government involvement.

D = Nationwide, government-supported antimicrobial awareness campaign targeting specific groups (e.g. veterinarians, veterinary para-professionals, farmers, pharmaceutical agents,).

E = Focused, national scale activities to change behavior in target groups in animal health, animal husbandry and in the food chain, in both public and private sectors. Monitoring of awareness and behavior change in last 5 years.

(Non-Human Sectors, 2017-18)

A = No significant awareness-raising activities on relevant aspects of risks of antimicrobial resistance.

B = Some activities in parts of the country to raise awareness about risks of antimicrobial resistance and actions that can be taken to address it.

C = Limited or small-scale antimicrobial resistance awareness campaign targeting some but not all relevant stakeholders within sector.

D = Nationwide, government-supported antimicrobial resistance awareness campaign targeting all or the majority of relevant stakeholders within sector.

E = Focused, national scale government supported activities implemented to change behavior of relevant stakeholders within sector, with monitoring undertaken of their awareness and behavior change over last 2-5 years.

2018-19, 2019-20

A = No significant awareness-raising activities on relevant aspects of risks of antimicrobial resistance.

B = Some activities in parts of the country to raise awareness about risks of antimicrobial resistance and actions that can be taken to address it.

C = Limited or small-scale antimicrobial resistance awareness campaign targeting some but not all relevant stakeholders.

D = Nationwide, government-supported antimicrobial resistance awareness campaign targeting all or the majority of relevant stakeholders, based on stakeholder analysis, utilizing targeted messaging accordingly within sectors.

E = Targeted, nationwide government-supported activities implemented to change behavior of key stakeholders within sectors, with monitoring undertaken over the last 2-5 years.

The human health sector is more likely to have progress on raising awareness and understanding of AMR risks and responses compared to non-human sectors. All countries have had limited or small-scale antimicrobial resistance awareness campaigns (especially in human health sector) that targeting some but not all relevant stakeholders. Some campaign activities in parts of the country are also carried out on animal health and plant health sectors. However, most countries still didn't have significant progress for awareness-raising activities on relevant aspects of risks of antibiotic resistance in food production, food safety, and environmental sectors. Therefore, strengthening the progress on awareness and understanding of AMR risks and responses should be focused on human health, animal health, and plant health sectors to encourage the country to launched nationwide activities, government supported campaigns on AMR awareness and implemented strategies to change behavior regarding AMR in target groups in those three main sectors proposed.

Table 7. Progress on The Extent of Involvement of Related Sector (2018-19, 2019-20)

Country	Human Health		Animal Health		Plant Health		Food Production		Food Safety		Environment	
	2018-19	2019-20	2018-19	2019-20	2018-19	2019-20	2018-19	2019-20	2018-19	2019-20	2018-19	2019-20
Lao PDR	C	C	C	C	A	A	B	B	B	B	B	B
Cambodia	C	C	B	C	A	A	A	B	A	C	A	B
Myanmar	C	C	C	C	B	B	B	B	B	B	B	B

A = This sector not involved

B = Some activities done in this sector

C = This sector is a main focus for activities

The commitment of each country contributed to significant progress on awareness and understanding of AMR both in human and non-human sectors. Human health and animal health are more likely to be the main sectors for related activities compared to other sectors. However, some related activities have been conducted in food production, food safety, and environment sectors; but the involvement of the plant health sector still needs to be further strengthened going forward.

4.2. Training and Professional Education

Table 8. Progress of AMR Training and Professional Education (2016-17, 2017-18, 2018-19, 2019-20)

Country	Human Health				Veterinary Sector				Farming sector (animal and plant), food production, food safety and the environment		
	2016-17	2017-18	2018-19	2019-20	2016-17	2017-18	2018-19	2019-20	2017-18	2018-19	2019-20
Lao PDR	B	B	C	C	B	B	C	C	N/A	A	A
Cambodia	A	A	B	B	N/A	A	C	D	A	B	C
Myanmar	B	C	C	C	A	B	C	C	B	B	B

Human Health

- A = No training for human health workers on AMR.
- B = Ad hoc AMR training courses in some human health related disciplines.
- C = AMR is covered in 1) some pre-service training and in 2) some in-service training or other continuing professional development (CPD) for human health workers.
- D = AMR is covered in pre-service training for all relevant cadres. In-service training or other CPD covering AMR is available for all types of human health workers nationwide.
- E = AMR is systematically and formally incorporated in pre-service training curricula for all relevant human health cadres. In-service training or other CPD on AMR is taken up by relevant groups for human health nationwide, in public and private sectors.

Veterinary Sector

(2016-17)

- A = No training of veterinary workforce on AMR.
- B = Ad hoc training courses on AMR available.
- C = Regular participation in training opportunities on AMR.
- D = Training opportunities are available nationwide for public and private sector veterinarians, veterinary para- professionals and animal health workforce on mechanisms leading to AMR, regulations and best practices for antimicrobial use.
- E = AMR incorporated in core veterinary education and CPD for veterinarians, veterinary para-professionals and others involved in animal health and agriculture.

(2017-18, 2018-19)

- A = No training of veterinary related professionals (veterinarians and veterinary paraprofessionals) related to AMR.
- B = Ad hoc AMR training courses available for veterinary related professionals.
- C = AMR and appropriate use is covered in core curricula for graduating veterinarians and for veterinary paraprofessionals when relevant.

- D = Continuing professional training on antimicrobial resistance and antimicrobial use is available nationwide for veterinary related professionals.

- E = AMR is systematically and formally incorporated in curricula for graduating veterinarians and veterinary paraprofessionals when relevant and continuing professional training is a formal requirement.

(2019-20)

- A = No training of veterinary related professionals (veterinarians and veterinary paraprofessionals) related to AMR.
- B = Ad hoc AMR training courses available for veterinary related professionals.
- C = AMR and prudent use of antimicrobial agents are covered in core curricula for graduating veterinarians and for veterinary paraprofessionals in some educational institutions.
- D = Continuing professional training on antimicrobial resistance and antimicrobial use is available nationwide for veterinary related professionals.
- E = AMR is systematically and formally incorporated in curricula for graduating veterinarians and veterinary paraprofessionals and continuing professional training is a formal requirement.

Farming Sector

- A = No training provision on AMR for key stakeholders, e.g. farmers and farm workers, extension workers, food and feed processors and retailers, environmental specialists.
- B = Tailored ad hoc AMR training courses available for at least two groups of key stakeholders.
- C = Tailored ad hoc AMR training courses are available for all or the majority of key stakeholders.
- D = Tailored AMR training courses are routinely available nationwide for all key stakeholders and completion of training is a formal requirement for at least two groups of key stakeholders.
- E = Tailored AMR training courses are routinely available nationwide and completion of training is a formal requirement for all key stakeholders.

Progress of training and professional education on AMR in all sectors (human health, veterinary, and farming sectors) has been made. Training and professional education on AMR in human health and veterinary sectors are more likely to have progress compared to farming sectors (i.e. animal and plant, food production, food safety and environment sector). All countries have AMR ad hoc training courses in some human health related disciplines; even most countries have covered some pre-service and in-service training or other continuing professional development (CPD) for human health workers. On the other hand, AMR and prudent use of antimicrobial agents are covered in core curricula for graduating veterinarians and for veterinary paraprofessionals in some educational institutions of all participating countries. Regarding progress in farming sectors, AMR tailored ad hoc training courses were available in most countries for at least two groups of key stakeholders.

4.3. Progress with Services Strengthening

Table 9. Progress with Strengthening Veterinary Services (2016-17, 2017-18, 2018-19, 2019-20)

Country	2016-17	2017-18	2018-19	2019-20
Lao PDR	B	B	B	C
Cambodia	N/A	B	B	B
Myanmar	D	D	D	D

A = No systematic approach at national level to strengthening Veterinary Services.

B = Veterinary services assessed and plans developed to improve capacity, through a structured approach such as OIE Performance of Veterinary Services (PVS) Evaluation and PVS Gap Analysis missions.

C = Implementation of plan to strengthen capacity gaps in Veterinary Services underway.

D = Monitoring of Veterinary Services performance carried out regularly, e.g. through PVS Evaluation Follow Up missions.

E = Documented evidence of strong capacity in compliance with OIE standards on the quality of Veterinary Services¹.

Progress with strengthening veterinary services has been made. Veterinary services in all countries assessed and plans developed to improve capacity through OIE Performance of Veterinary Services (PVS) Evaluation and PVS Gap Analysis missions. Most of these countries have even implemented plans to strengthen capacity gaps in Veterinary Services. This progress indicates that these countries can be further improved to have a monitoring of Veterinary Services performance that carried out regularly.

5. Strengthen Knowledge and Evidence Based

5.1. National Monitoring System

Table 10. Progress on National Monitoring for Antimicrobial Use (2016-17, 2017-18, 2018-19, 2019-20)

Country	Human Health				Animal and Crop Production	Animal Health			Plant Production		
	2016-17	2017-18	2018-19	2019-20		2016-17	2017-18	2018-19	2019-20	2017-18	2018-19
Lao PDR	A	A	A	B	A	A	A	A	N/A	A	A
Cambodia	A	A	A	A	N/A	A	B	C	A	A	B
Myanmar	A	A	A	A	A	B	C	C	B	C	A

¹ http://www.oie.int/index.php?id=169&L=0&htmfile=chapitre_vet_serv.htm

Human Health

- A = No national plan or system for monitoring use of antimicrobials.
- B = System designed for surveillance of antimicrobial use, that includes monitoring national level sales or consumption of antibiotics in health services.
- C = Total sales of antimicrobials are monitored at national level and/or some monitoring of antibiotic use at sub-national level.
- D = Prescribing practices and appropriate antibiotic use are monitored in a national sample of healthcare settings.
- E = On a regular basis (every year/two years) data is collected and reported on:
 - a) Antimicrobial sales or consumption at national level for human use; and
 - b) Antibiotic prescribing and appropriate/rational use, in a representative sample of health facilities, public and private

Animal Health and Crop Production

- A = No national plan or system for monitoring use of antimicrobials in animal or crop production.
- B = Plan agreed for monitoring quantities of antimicrobials used in animals, based on OIE standards.
- C = Implementation of plans to monitor sales, consumption and type of use (therapeutic or growth promotion).
- D = Data collected and reported on national sales or consumption of antimicrobials for animal production.
- E = On a regular basis, data is collected and reported

Animal Health

- A = No national plan or system for monitoring sales/ use of antimicrobials in animals.
- B = Plan agreed for monitoring quantities of antimicrobials sold for/ used in animals, based on OIE standards⁵.

- C = Data collected and reported on total quantity of antimicrobials sold for/used in animals and their intended type of use (therapeutic or growth promotion).
- D = On a regular basis, data is collected and reported to the OIE on the total quantity of antimicrobials sold for/used in animals nationally, by antimicrobial class, by species (aquatic or terrestrial), method of administration, & by type of use (therapeutic/ growth promotion).
- E = Data on antimicrobials used under veterinary supervision in animals are available at farm level, for individual animal species.

Plant Production

- A = No national plan or system for monitoring use of pesticides used for the purpose of controlling bacteria or fungal diseases.
- B = Plan agreed for monitoring quantities of pesticides used for the purpose of controlling bacteria or fungal diseases.

(C to E on 2017-18)

- C = Data collected and reported on quantity of AM used in some subsectors of plant production.
- D = Data collected and reported on total quantity of AM used nationally in plant production.
- E = On a regular basis, data is collected and reported on total quantity of AM use in crop production, by AM class.

(C to D on 2018-19, 2019-20)

- C = Data collected and reported on total quantity of pesticides including antimicrobial pesticides such as bactericides and fungicides sold/ used nationally for the purpose of controlling bacteria or fungal diseases.
- D = On a regular basis, data is collected and reported on quantity of pesticides including antimicrobial pesticides such as bactericides and fungicides sold/used in plant production for the purpose of controlling bacteria or fungal diseases, disaggregated by class of active ingredient and plant type/species.

National monitoring system for consumption and rational use of antimicrobials in animal health is more likely to have progress compared to human health, crop, and plant production sectors. Most countries didn't have a national plan or system, both for monitoring the use of antimicrobials in human health and for monitoring the use of pesticides used for the purpose of controlling bacteria or fungal diseases. However; most countries' plans not only have agreed to monitor quantities of antimicrobials sold for / used in animals (based on OIE standards), but also carried out data collection and reported on the total quantity of antimicrobials sold for/ used in animals and their intended types of use (therapeutic or growth promotion).

5.2. National Surveillance System

Table 11. Progress on National Surveillance System for AMR (2016-17, 2017-18, 2018-19, 2019-20)

Country	Human				Animal and Food		Animal				Food			Plant	Environ-ment
	2016-17	2017-18	2018-19	2019-20	2016-17	2017-18	2018-19	2019-20	2017-18	2018-19	2019-20	2017-18	2017-18		
Lao PDR	B	C	B	D	A	N/A	E	B	N/A	A	A	N/A	N/A		
Cambodia	B	C	C	C	N/A	C	D	D	A	D	D	A	A		
Myanmar	B	C	D	D	B	C	C	C	A	B	B	A	A		

Human Sector

(2016-17, 2017-18)

- A = No capacity for generating data (antibiotic susceptibility testing and accompanying clinical and epidemiological data) and reporting on antibiotic resistance.
- B = AMR data is collated locally for common bacteria, but data collection may not use a standardized approach and lacks national coordination and/or quality management.
- C = National AMR surveillance activities are in place for common bacterial pathogens that link patient information with susceptibility testing, with a national reference laboratory that participates in external quality assurance.
- D = There is a functioning national AMR surveillance system covering antibiotics in hospitals and outpatient clinics, with external quality assurance, and a national coordinating center producing reports on resistance levels.
- E = The national AMR surveillance system integrates surveillance of AMR across sectors, and generates regular reports. The national surveillance system contributes data on AMR to the Global AMR Surveillance System (GLASS).

(2018-19, 2019-20)

- A = No capacity for generating data (antibiotic susceptibility testing and accompanying clinical and epidemiological data) and reporting on antibiotic resistance.
- B = AMR data is collated locally for common bacteria, but data collection may not use a standardized approach and lacks national coordination and/or quality management.
- C = National AMR surveillance activities for common bacterial infections follow national standards, and a national reference laboratory that participates in external quality assurance.
- D = There is a functioning national AMR surveillance system covering common bacterial infections in hospitalized and community patients, with external quality assurance, and a national coordinating center producing reports on AMR.
- E = The national AMR surveillance system integrates surveillance of AMR across sectors, and generates regular reports covering at least one common indicator.

Non-Human Sector

(2016-17)

- A = No national plan or system for monitoring AMR in animals, food and agricultural production.
- B = AMR data is collected locally but may not use a standardized approach and lacks national coordination and/or quality assurance. Priority pathogens have been identified for surveillance.

C = Studies available on levels of resistance in at least 2 pathogens relevant for animals.

D = National system of surveillance of AMR established for relevant animal pathogens which follows quality assurance processes in line with intergovernmental standards. Laboratories that report for AMR surveillance follow quality assurance processes.

E = Data collected and reported on a regular basis on AMR in relevant pathogens for animals and in food.

(2017-18)

A = No national plan for a system of monitoring of AMR is available.

B = National plan for monitoring AMR but capacity (including laboratory) for surveillance and reporting data on AMR is lacking.

C = Some AMR data is collected locally but may not use a standardized approach and lacks national coordination and/or quality management.

D = Priority pathogenic/ commensal bacterial species have been identified for surveillance. Data systematically collected and reported on levels of resistance in at least 2 of those bacterial species, involving a laboratory that follows quality management processes, e.g. proficiency testing.

E = National system of surveillance of AMR established for priority pathogens and for relevant commensal bacteria which follows quality assurance processes in line with intergovernmental standards. Laboratories that report for AMR surveillance follow quality assurance processes.

(2018-19, 2019-20)

A = No national plan for a system of surveillance of AMR is available.

B = National plan for surveillance of AMR but capacity (including laboratory and for reporting data on AMR) is lacking.

C = Some AMR data is collected locally but may not use a standardized approach and lacks national coordination and/or quality management.

D = Priority pathogenic/ commensal bacterial (in animal) or priority food borne pathogenic/ indicator bacterial species (in food), which have been identified for surveillance. Data systematically collected and reported on levels of resistance in at least 1 of those bacterial species, involving a laboratory that follows quality management processes, e.g. proficiency testing.

E = National system of surveillance of AMR established for priority animal pathogens, zoonotic and commensal bacterial isolates (in animal), priority foodborne pathogens (in food), and/or relevant indicator bacteria which follows quality assurance processes in line with intergovernmental standards. Laboratories that report for AMR surveillance follow quality assurance processes

All countries have a national surveillance system for antimicrobial resistance in most sectors. AMR surveillance systems in human, animal, food sectors are more likely to have progress compared to plant and environment sectors. National AMR surveillance activities for humans in all countries are in place for common bacterial pathogens that link patient information with susceptibility testing, with a national reference laboratory that participates in external quality assurance. Moreover, most countries already have a functioning national AMR surveillance system covering antibiotics in hospitals and outpatient clinics, with external quality assurance and a national coordinating center that produces reports on resistance levels. On the other hand, some AMR data is collected locally in most countries for non-human sectors (animal and food sectors), but may not use a standardized approach and lack of national coordination and / or quality management.

In Cambodia, AMR surveillance is routinely undertaken in animals for animal (terrestrial and/or aquatic) isolates linked to animal disease, commensal isolates, and specific resistance phenotypes such as ESBL producing indicator E.coli obtained from healthy animals in key food producing species. While AMR surveillance is systematically undertaken in food (animal and plant origin) for food borne pathogenic bacteria (animal origin) and indicator bacteria (animal) origin).

5.3. National Laboratory Network

Table 12. Progress on National AMR Laboratory Network in AMR Surveillance System (2018-19, 2019-20)

Country	Laboratory Integration		Standardization and Harmonization of Procedures		Relevance of Diagnostic Techniques		Data Management	
	2018-19	2019-20	2018-19	2019-20	2018-19	2019-20	2018-19	2019-20
Lao PDR	A	B	A	A	A	A	E	B
Cambodia	D	C	C	C	C	C	C	C
Myanmar	B	B	A	B	B	B	B	B

Laboratory Integration

A = Information not available.

B = Laboratories perform antimicrobial susceptibility testing (AST) for own purposes and are not included in the national AMR surveillance system.

C = Some laboratories performing AST are integrated in the national AMR surveillance system.

D = All laboratories performing AST are integrated in the AMR surveillance system but the role should be better formalized and the network better and developed.

E = All laboratories performing AST are integrated in the national AMR surveillance system, have a clear position, and are linked to a national network coordinated by a National Reference Laboratory.

Standardization and Harmonization of Procedures

A = Information not available.

B = No standardized national AST guidelines are in place or less than 30% laboratories follow the same AST guidelines.

C = Between 30% to 79% of laboratories follow the same AST guidelines.

D = Over 80% of laboratories use the same AST guidelines.

E = 100% of laboratories use the same AST guidelines.

Relevance of Diagnostic Techniques

A = Information not available.

B = AST, bacterial isolation and identification protocols are not relevant or specific to the national AMR surveillance objectives.

C = Major modifications in the AST, bacterial isolation and identification protocols used are required to improve their adaptation to national AMR surveillance objectives.

D = Minor modifications in the AST, bacterial isolation and identification protocols used would improve their adaptation to the national AMR surveillance objectives.

E = AST, bacterial isolation and identification protocols are perfectly suited to the national AMR surveillance objectives.

Data Management

A = Information not available.

B = AST data are handled manually, or AST data management is not computerized in all laboratories of the network and/or there are problems in the recording of the samples and their traceability along the analysis chain.

C = Most laboratories of the network use computers to manage part of their data but major improvements in the system are required.

D = Some minor improvements may be made in some laboratories of the network for the computerized management of laboratory data (computerized transmission of data, input procedures, sample storage information, etc.).

E = All laboratories use optimal data management (e.g. samples and test results are identified using a complete computerized management system covering each step in the analysis chain, including the storage of epidemiological information, data validation protocol and the computerized transmission of results, conforming perfectly to the requirements of the national AMR surveillance system).

The National AMR Laboratory network includes not only in animal health and food safety sectors, but also laboratories that process samples from food producing terrestrial and aquatic animals and from food. Countries that also have a national program for AMR surveillance in plant health and / or the environment should include these laboratories too. Related to the effective integration of laboratories in the AMR surveillance, laboratories in all participating countries performed antimicrobial susceptibility testing (AST) for own purposes and are not included in the national AMR surveillance system. However, no standardized national AST guidelines are in place in most countries or less than 30% laboratories follow the same AST guidelines.

Related to the relevance of diagnostic techniques used by laboratories included in AMR surveillance system; AST, bacterial isolation and identification protocols in most countries are not relevant or specific to the national AMR surveillance objectives. On the other hand, AST data management in most countries is also still been handled manually, or AST data management is not computerized in all laboratories of the network and/or there are problems in the recording of the samples and their traceability along the analysis chain.

5.4. Evidence Based Decision Making

Table 13. Progress on National AMR Strategy Data Reviews (2018-19, 2019-20)

Country	Human Health		Animal Health		Plant Health	Food Production	Food Safety	Environment
	2018-19	2019-20	2018-19	2019-20	2019-20	2019-20	2019-20	2019-20
Lao PDR	No	Yes	No	Yes	No	No	No	No
Cambodia	No	No	No	Yes	No	Yes	Yes	No
Myanmar	No	Yes	No	Yes	No	Yes	No	No

All countries have multi-sectoral working groups / or coordination committees in charge of national AMR strategy data reviews. Progress on national AMR strategy data reviews also have been made in most sectors. Most countries used relevant antimicrobial consumption / use and / or antimicrobial resistance data to amend national strategy and / or informed decision making, at least annually. National AMR strategy data reviews for evidence based decision making in human health, animal health, and food production sectors are more likely to have progress compared to plant health, food safety, and environment sectors.

6. Reduce Incidence of Infection

6.1. Infection Prevention and Control

Table 14. Progress on Infection Prevention and Control in Human Health Care (2016-17, 2017-18, 2018-19, 2019-20)

Country	2016-17	2017-18	2018-19	2019-20
Lao PDR	A	B	C	C
Cambodia	C	C	C	C
Myanmar	C	C	C	C

A = No national IPC programme or operational plan is available.

B = A national IPC programme or operational plan is available. National IPC and water, sanitation and hygiene (WASH) and environmental health standards exist but are not fully implemented.

C = A national IPC programme and operational plan are available and national guidelines for health care IPC are available and disseminated. Selected health facilities are implementing the guidelines, with monitoring and feedback in place.

D = National IPC programme available according to the WHO IPC core components guidelines and IPC plans and guidelines implemented nationwide. All health care facilities have a functional built environment (including water and sanitation), and necessary materials and equipment to perform IPC, per national standards.

E = IPC programmes are in place and functioning at national and health facility levels according to the WHO IPC core components guidelines. Compliance and effectiveness are regularly evaluated and published. Plans and guidance are updated in response to monitoring.

Progress on IPC for human health care in all countries has been made. A national IPC program or operational plan was available and all countries have at least the existing national IPC and water, sanitation and hygiene (WASH) and environmental health standards. The national IPC program in all countries was available according to the WHO IPC core components guidelines and IPC plans. Selected health facilities are implementing the guidelines, with monitoring and feedback in place.

6.2. Sanitation and Hygiene Management

Table 15. Progress on Good Health, Management and Hygiene Practices (2016-17, 2017-18, 2018-19, 2019-20)

Country	Animal and Food Production	Food Production	Plant Health	Food Safety	Environment	Animal Production			Food Processing	
	2016-17	2017-18	2017-18	2017-18	2017-18	2017-18	2018-19	2019-20	2018-19	2019-20
Lao PDR	B	N/A	N/A	N/A	N/A	B	B	B	B	B
Cambodia	N/A	A	A	A	A	A	B	C	B	B
Myanmar	B	C	C	D	B	C	B	B	B	B

Animal and Food Production (2016-17)

A = No systematic efforts to improve infection prevention in the animal and food production sectors related to reducing use of antimicrobials.

B = Plan agreed to promote farm hygiene, increase vaccination, biosecurity and appropriate handling of sick animals to prevent transmission of resistant bacteria to other animals and humans.

C = Implementation of plan for infection prevention in food producing animals for some species, types of farms or geographical areas based on intergovernmental standards. Practical guidance developed and disseminated.

D = Nationwide implementation of plan for infection prevention in animals in public and private sectors and in collaboration with veterinarians.

E = Monitoring of progress on infection prevention relevant to reducing use of antimicrobials in animals, veterinary practices and food chains, with updating of plans and guidance in response to findings.

Animal, Plant, and Food Production (2017-18, 2018-19, 2019-20)

A = No systematic efforts to improve good production practices.

B = Some activities in place to develop and promote good production practices.

C = National plan agreed to ensure good production practices in line with international standards (e.g. OIE Terrestrial and Aquatic Codes, Codex Alimentarius). Nationally agreed guidance for good production practices developed, adapted for implementation at local farm and food production level.

D = Nationwide implementation of plan to ensure good production practices and national guidance published and disseminated.

E = Nationwide implementation of plan to ensure good production practices and monitoring of impact on level of AMR, on animal health and welfare, and on production, with updating of plans and guidance in response to findings.

(E on 2019-20)

E = Implementation of the nation-wide plan is monitored periodically.

Food Processing (2018-19, 2019-20)

A = No systematic efforts to improve good management and hygiene practices.

B = Some activities in place to develop and promote good management and hygiene practices.

C = National plan agreed to ensure good management and hygiene practices in line with international standards (e.g. Codex Alimentarius). Nationally agreed guidance for good practices developed, and adapted for implementation according to local food processing approaches.

D = Nationwide implementation of plan to ensure good management and hygiene practices and national guidance published and disseminated.

(E on 2019-20)

E = Implementation of the nation-wide plan is monitored periodically.

Progress on good health, management and hygiene practices to reduce the use of antimicrobials and minimize development and transmission of AMR in animal production (terrestrial and aquatic) as well as to reduce the development and transmission of AMR in food processing have been made. All countries have some activities in place to develop and promote good management, good production, and hygiene practices for both animal production and food processing. This progress can be improved further to ensure good management, good production, and hygiene practices in line with international standards (e.g. OIE Terrestrial and Aquatic Codes, Codex Alimentarius).

6.3. Infection Prevention Measures

Table 16. Progress on National Coverage with Critical Measure to Reduce Infection

Country	Estimated Immunization Coverage Rate (%)		Estimated Proportion of Health Care Facilities (%) with:		
	Pneumococcus Vaccine	Haemophilus Influenzae Type B (Hib) Vaccine	Basic Water Supplies	Basic Hand Hygiene Facilities	Functional Sanitation Facilities
Lao PDR	56 **	68 **	N/A	N/A	N/A
Cambodia	N/A	N/A	N/A	N/A	N/A
Myanmar	81 * to 89 **	93 * to 89 **	94 *	33 *	67 *

Country self-reported based on data from * 2017, ** 2018

Globally, vaccination coverage rate in many countries is still low. The average pneumococcus vaccine immunization rate was 87.4% for high-income countries, 65.2% for upper-middle-income countries, 70.8% for lower-middle-income countries and 70.8% for low-income countries [9]. Based on TrACSS 2018-19 and 2019-20; among three countries, the average vaccination rate for Pneumococcus Vaccine is 75.3%, which is in the range of coverage rates in high-income and middle-income countries globally.

Overall, the average Haemophilus influenzae type b (Hib) vaccine immunization rate is higher across country income groups and regions. The average rate was 94.4% for high-income countries, 84.4% for upper-middle-income countries, 83.2% for lower-middle-income countries and 83.2% for low-income countries [9]. Based on TrACSS 2018-19 and 2019-20; among three countries, the average vaccination rate for Haemophilus Influenzae Type B (Hib) Vaccine is 83. 3%, which is equivalent to the coverage rate in middle-income countries globally.

Access to basic water supplies, basic hand hygiene facilities and functional sanitation facilities are also lacking in healthcare centers in many parts of the world [9]. Based on TrACSS 2018-19 and 2019-20; among three countries, the average proportion of health care facilities with basic water supplies represents 94%, basic hand hygiene facilities with 33% and functional sanitation facilities with 67%.

7. Optimize Use of Antimicrobial Medicine

7.1. Rational Antimicrobial Use and Stewardship Program

Table 17. Progress on Antimicrobial Use and Stewardship (2016-17, 2017-18, 2018-19, 2019-20)

Country	Human Health				Animal and Crop Production		Plant Health	Animal Health			Plant Production
	2016-17	2017-18	2018-19	2019-20	2016-17	2017-18	2017-18	2018-19	2019-20	2019-20	2019-20
Lao PDR	A	C	A	B	A	A	A	A	B	A	A
Cambodia	N/A	A	A	C	N/A	A	A	B	C	C	C
Myanmar	A	B	C	C	A	B	B	B	B	B	B

2016-17

- A = No/weak national policy & regulations for antimicrobial stewardship
- B = National policy and regulations for antimicrobial stewardship developed & approved, that address use, availability and quality of antibiotics in the community and in health care settings.
- C = National antimicrobial stewardship program is being implemented in some healthcare facilities. Planned legal/regulatory changes are being introduced to regulate access to antibiotics for human use.
- D = Antimicrobial stewardship program is implemented in health care facilities nationwide. Legal/regulatory changes approved and publicized to regulate sales and products for human use, but not fully enforced. Antibiotic quality testing program operational.
- E = Antimicrobial stewardship program is implemented in most health care facilities and in community. Regulations are enforced

on access to antibiotics and use in human health. Monitoring and surveillance results are used to inform action and to update treatment guidelines and essential medicines lists.

2017-18, 2018-19, 2019-20

- A = No/weak national policies for appropriate use.
- B = National policies for antimicrobial governance developed for the community and health care settings.
- C = Practices to assure appropriate antimicrobial use being implemented in some healthcare facilities and guidelines for appropriate use of antimicrobials available.
- D = Guidelines and other practices to enable appropriate use are implemented in most health facilities nationwide. Monitoring and surveillance results are used to inform action and to update treatment guidelines and essential medicines lists.
- E = Guidelines on optimizing antibiotic use are implemented for all major syndromes and data on use is systematically fed back to prescribers

Progress on antimicrobial use and stewardship in most sectors has been made. All countries have developed national policies and regulations for anti-microbial stewardship that address use, availability and quality of antibiotics in the community and in health care settings. Those rational antimicrobial use and stewardship programs have even been implemented in some healthcare facilities by most countries. This progress can be further improved and followed by using monitoring and surveillance results to inform action and to update treatment guidelines and essential medicines lists, especially in human health, animal health, and plant production sectors.

7.2. AWaRe Classification and Stewardship Strategies

Table 18. Progress on Adoption of “AWaRe” Classification of Antibiotic

Country	Progress Level
Lao PDR	B
Cambodia	A
Myanmar	B

Country self-reported based on data from TrACSS 2019-20

- A = Country has no knowledge or information about the AWaRe classification of antibiotics.
- B = Country has knowledge about the AWaRe classification of antibiotics and country has intention to adopt it in the next few years.
- C = Country has adopted the AWaRe classification of antibiotics in their National Essential Medicines List.
- D = Country is monitoring its antibiotic consumption based on the AWaRe classification of antibiotics.
- E = Country has incorporated AWaRe classification of antibiotics into its antimicrobial stewardship strategies.

Most countries already have knowledge about the AWaRe classification of antibiotics and country has the intention to adopt it in the next few years. This progress will determine the extent of further progress on how countries will adopted the AWaRe classification of antibiotics in their National Essential Medicines List and how countries will monitor their antibiotic consumption based on the AWaRe classification of antibiotics along with the level of antimicrobial stewardship strategy to be used.

Table 19. Progress on Antimicrobial Stewardship Strategies

Country	National Level	Community Level	Facility Level
Lao PDR	N/A	N/A	N/A
Cambodia	No	No	Yes
Myanmar	No	No	Yes

Country self-reported based on data from TrACSS 2019-20

No country has yet begun adopting the AWaRe classification of antibiotics in their National Essential Medicines List. However, most countries starting plan to incorporate AWaRe classification of antibiotics into its antimicrobial stewardship strategies at the facility level.

8. Transmission and Contamination Prevention

8.1. National Risk Assessment

National assessment of risks for AMR transmission in the environment and pollution control is one integral part that supports the achievement of strategic objectives 4. Progress on risk assessment for AMR transmission in the environment is classified into whether high-risk locations have been identified and whether risk reduction actions underway. Based on the risk for AMR transmissions, most of them indicate that they do not have high-risk locations that have been identified. However, the three highest risks for AMR transmission that have a high-risk location that have been identified, such as: areas of a low community access to safe water and sanitation, human health facilities without access to safe water supply and sanitation, and disposal of unused medicines antimicrobial agents (unused should include left-over product and also product containers, including pesticides). On the other hand, most countries have risk reduction actions underway on all risks for AMR transmission.

8.2. Mitigation Legislation

Legislation and / or regulations to prevent contamination of the environment with antimicrobials are one essential part to achieve the strategic objectives 4. Progress on legislation and / or regulations to mitigate risk are grouped into whether that specifically addresses AMR, whether it has impacts on AMR, and whether it has a functioning system for monitoring compliance and enforcement. Based on the risk for AMR transmissions among three countries, legislation and / or regulations to prevent contamination of the environment with antimicrobials have already addressed specifically for AMR in all risk for AMR transmissions, except wastewater discharges from manufacturing sites for antimicrobial agents (either as Active Pharmaceutical Ingredient (API) or finished products).

Most legislation and / or regulations to prevent contamination of the environment with antimicrobials also have an impact on AMR in all risks for AMR transmission. Those legislation and / or regulations in three countries also have functioning systems for monitoring compliance and enforcement in all risk for AMR transmission, except wastewater discharges from manufacturing sites for antimicrobial agents (either as Active Pharmaceutical Ingredient (API) or finished products).

9. Research and Innovation

The GAP-AMR has identified research and innovation as a key strategic objective so that evidence can be generated to guide current and future containment efforts. Research and innovation has one sub-indicator: research and development (R&D) and innovation, including research funding for AMR prevention and containment. However, as has been demonstrated in many areas of public health, health research is often disconnected with the needs of policymakers and program managers [2,15]. Based on TrACSS data, NAP-AMR not only approved by the government, but also has an AMR operational and monitoring plan. However, to support the sustainability; NAP-AMR needs to have funding source identified followed by active involvement of relevant sectors both in implementation and defined monitoring and evaluation processes.

Countries mentioned that there were no policies fostering a research environment, although had the capacity for research. However, an equal number of countries mentioned that they had policies planned and the existing structural plan to foster research and innovation on AMR. In order to support sustainable operation, government should lead research outputs related to AMR global research agenda [15]. Based on TrACSS data, antimicrobial use policy and legal status for human use are more likely to have progress compared to non-human sectors. However, all three countries have AMR multi-sectoral working groups established with Government leadership. Some of them even functioning and defined clear activities and funding.

As part of the AMR surveillance system, the sustainable operation of the national laboratory network strengthening is through an established laboratory network, EQA measures in place, and demonstrated capacity of reference lab for research [15]. Research is an integral component of laboratory surveillance, there being an established infrastructure, equipment and human resources dedicated to research-related activities [2]. Based on the situational analysis report, the existing policies and structures in most countries have supported activities related to research on the prevention and containment of AMR, while still in the process of strengthening the integration of research to supporting evidence-based policy decisions. To prepare for this, every country needs to have well-established infrastructure, equipment, skilled manpower and funds for R&D both from domestic and international donors.

Most countries are yet to put together a strategic research agenda that is relevant to current policies and programs, and address implementation challenges facing AMR containment efforts. Therefore, it is necessary to prioritize strategic research agendas that can strengthen AMR containment program delivery. At the same time, try to include other priorities that have potential to impact the assessment of AMR containment initiatives with a special focus on the economic burden from evolving AMR. Through the One Health drive agenda with investments and engagement across sectors, one of the strategies related to R&D is generating necessary evidence and enabling frameworks to support interventions as part of the effort to encourage implementation research [2,9].

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