

## TABLE OF CONTENTS

### Contents

Ministerial Message .....	i
Executive Summary.....	ii
Chapter 1. Background .....	1
Global challenge and response .....	1
Regional challenges.....	3
Cambodia’s general health and development status and importance of AMR .....	4
Cambodia’s AMR initiatives .....	5
Chapter 2. Goal, purpose and objectives of the multi-sectoral action plan.....	6
Chapter 3. How the plan was developed.....	6
Chapter 4. strategic areas, objectives and key results areas.....	8
Strategic Area 1. Governance and coordination to reduce AMR .....	8
Strategic Area 2. Evidence generation through surveillance and laboratories.....	9
Strategic Area 3. Rational use of antimicrobial medicines .....	9
Strategic Area 4. Containing AMR through good practices .....	10
Strategic Area 5. Increase public awareness .....	11
Strategic Area 6. Building human capacity for AMR.....	11
Strategic Area 7. Research and innovation for AMR .....	12
CHAPTER 5. Implementation .....	13
Chapter 6. Monitoring and evaluation .....	13
References .....	14
Annex A. Key results areas and activities .....	16
Annex B. Draft indicators for monitoring and evaluation .....	36
Annex C. Stakeholders in functions and initiatives related to antimicrobial resistance in Cambodia .....	41

## LIST OF ABBREVIATIONS

AFRIMS	Armed Forces Research Institute for Medical Sciences	IPC	Infection Prevention and Control
AHC	Angkor Hospital for Children	IPC	Institute Pasteur du Cambodge
AMR	Antimicrobial Resistance	ITM	Institute of Tropical Medicine
AMU	Antimicrobial use	JEE	Joint External Evaluation
ATLASS	Assessment Tool for Laboratory and Antimicrobial Resistance Surveillance Systems	KRA	Key Result Area
CAET	Cambodia Applied Epidemiology Training	MAFF	Ministry of Agriculture, Forestry and Fisheries
CamLAPF	Cambodia Laboratory of Agricultural Products and Food	MDR	Multidrug Resistant
CamLIS	Cambodia Laboratory Information System	MIH	Ministry of Industry and Handicraft
CAVET	Cambodia Applied Veterinary Epidemiology Training	MIME	Ministry of Mines and Energy
C-CDC	Cambodia Centers for Disease Control and Prevention	MOE	Ministry of Environment
CDC	Department of Communicable Disease Control (MOH)	MOEYS	Ministry of Education, Youth and Sports
COMRU	Cambodia-Oxford Medical Research Unit	MOH	Ministry of Health
CPA	Complementary Package of Activities	MPA	Minimum Package of Activities
CPG	Clinical Practice Guidelines	MRD	Ministry of Rural Development
DAI	Department of Agro-Industry	MRL	Maximum Residue Limit
DAL	Department of Agricultural Registration	MRSA	Methicillin-Resistant <i>Staphylococcus aureus</i>
DDF	Department of Drugs and Food	NAHPRI	National Animal Health and Production Research Institute
DHS	Department of Health Services	NIPH	National Institute of Public Health
DIC	Department of International Cooperation	NMCHC	National Maternal and Child Health Center
DMDP	Diagnostic Microbiology Development Program	NPH	National Pediatric Hospital
EQA	External Quality Assessment	OIE	World Organization for Animal Health
FAO	Food and Agriculture Organization	PDAFF	Provincial Department of Agriculture Forestry and Fisheries
FiA	Fisheries Administration	PDAFF	Provincial Department of Agriculture Forestry and Fisheries
GAHP	Good Animal Husbandry Practice	RUA	Royal University of Agriculture
GAP	Good Agricultural Practice	SHCH	Sihanouk Hospital Centre of Hope
GAqP	Good Aquaculture Practice	UHS	University of Health Sciences
GDA	General Directorate of Agriculture	URC	University Research Council
GDAHP	General Directorate of Animal Health and Production	USAID	United States Agency for International Development
GDP	Gross Domestic Product	USCDC	US Centers for Disease Control and Prevention
GLASS	Global AMR Surveillance System	VAHWs	Village Animal Health Workers
HRD	Human Resource Development	VHWs	Village Health Workers
IHR	International Health Regulations	WHO	World Health Organization
IMCI	Integrated Management for Childhood Illnesses	XDR-TB	Extensively-drug resistant tuberculosis



## Ministers Message

As Ministries of the Royal Government of Cambodia, we pledge to adopt a collaborative, coherent, comprehensive and integrated approach towards prevention and containment of antimicrobial resistance (AMR) in Cambodia. We reaffirm that sustainable action against AMR shall contribute towards Cambodia's socioeconomic development and the achievement of Cambodia's targets towards the Sustainable Development Goals. We acknowledge that microorganisms resistance against antimicrobials threaten public health and is mainly due to inappropriate use in human health, food and agriculture. We recognize that Cambodia has made gains since the National Policy to Combat Antimicrobial Resistance 2014 and the National Strategy to Combat Antimicrobial Resistance 2015–2017.

We endorse this Multi-Sectoral Action Plan on Antimicrobial Resistance in Cambodia 2019–2023 that is aligned with Cambodia's national development interests and the Global Action Plan on Antimicrobial Resistance. We aim to mobilize human and other resources to develop and implement the strategies and activities of this Multi-Sectoral Action Plan. Recognizing the important contributions of each sector to effective implementation, we will establish a multi-sectoral committee to coordinate and monitor progress of Multi-Sectoral Action Plan.

We hereby urge all stakeholders, including governmental agencies and development partners to support the implementation of the Multi-Sectoral Action Plan on Antimicrobial Resistance in Cambodia 2019–2023. We would like to express our sincere thanks to Tripartite Collaboration of the World Health Organization (WHO), Food and Agriculture Organization of United Nations (FAO) and World Organisation for Animal Health (OIE), bilateral agencies, development banks and international/national Non-Government Organizations for their technical and financial supports in the development of this five-year action plan.

Phnom Penh, 11 December 2019



Minister of Health

Prof. MAM BUNHENG



Minister of Agriculture, Forestry and Fisheries

VENG SAKHON



Minister of Environment

SAY SAMAL

## Executive Summary

The Multi-Sectoral Action Plan on Antimicrobial Resistance in Cambodia 2019–2023 envisions a country with a healthy population and strong governance systems without the threat of AMR that will impede economic growth and cause unnecessary risks to health, security and social protection.

Before drafting the Multi-Sectoral Action Plan (MSAP), the Technical Working Group on Antimicrobial Resistance of the Ministry of Health and the Ministry of Agriculture, Forestry and Fisheries, and Ministry of Environment with support from FAO, OIE and WHO, conducted a situation analysis in October to December 2017 to assess AMR efforts by the agriculture, human health and environment sectors. Published articles, documents, presentations and other reports were reviewed. Key informant interviews and site visits were conducted among government agencies, hospitals, partners and experts. Results of the situation analysis were presented during a consultation of stakeholders on 29–30 November 2017 in Phnom Penh. The participants (government officials, experts and technical officials, and representatives from partner organizations) validated the results, confirmed the gaps and endorsed seven strategic areas where actions should be focused over the next five years.

1. Building human capacity for antimicrobial resistance
2. Containing AMR through good practices
3. Evidence generation through surveillance and laboratories
4. Governance and coordination to reduce antimicrobial resistance
5. Increasing public awareness
6. Rational use of antimicrobial medicines
7. Research and innovation for antimicrobial resistance

Important findings of the situation analysis are reflected in this Action Plan, including policies, achievements, initiatives, recent studies, country activities and stakeholders. Broadly, these include observations in these areas:

- Need for strengthening laboratory capacity, especially in the environment, food and agriculture sectors.
- Need for exchange of experiences and transfer of knowledge on AMR surveillance in human health, agriculture, food and environment.
- Need to enforce regulations and rational use of antibiotics in agriculture and human healthcare.
- Need for research on different aspects of AMR, especially on operations and implementation.
- Need to improve practices contributing to the mitigation of AMR, including infection prevention and control in health facilities, good agricultural practices, good animal husbandry practice, good aquaculture practice, water, sanitation, hygiene, food safety inspection and analysis, and waste management.

- Need for public awareness and advocacy on antibiotic use, AMR and basic practices on agriculture, disease prevention in animals and humans and basic health care.
- Need for capacity building of staff and professionals in several areas of work that influence AMR such as laboratories, surveillance, clinical practice guidelines, infection prevention and control and other areas that require professional skills.
- Need for stronger programme support through governance and coordination between and within Ministries, partnerships and financing.

The Multi-Sectoral Action Plan aims to guide the Royal Government of Cambodia, partners and donors as they identify priority areas for work and collaboration. Target users of the Multi-Sectoral Action Plan include policy and decision-makers and officials of ministries not limited to the Ministry of Health (MOH), the Ministry of Agriculture, Forestry and Fisheries (MAFF) and the Ministry of Environment (MOE), researchers, students, advocates and the media, professional societies and technical experts, community leaders and mobilizers and international partners in designing programmes and activities aimed to combat AMR.



## Chapter 1. Background

### Global challenge and response

Failure to address AMR will have implications for public health, the global economy and agriculture that will threaten current initiatives towards sustainable development. A potential 10 million deaths by 2050 could be due to AMR.<sup>1</sup> Public Health initiatives are threatened by the spread of AMR, especially in countries with few resources to combat resistance.<sup>2</sup> In developing and low-income countries, there are still gaps in surveillance and laboratory capacity and a lack of standards for methodology, data sharing and coordination. AMR is linked to concerns about multidrug resistant tuberculosis (MDR-TB), artemisinin resistance, anti-HIV drug resistance and resistance to antivirals recommended for influenza prevention and treatment. The danger is that antimicrobials responsible for advances in healthcare will no longer be useful for treatment because of AMR.

The 2014 World Bank report on AMR surveillance showed that infections caused by antimicrobial-resistant organisms can cause global economic damage on par with the 2008 financial crisis.<sup>3</sup> If no action is taken, low-income countries could lose over 5 percent of their Gross Domestic Product (GDP) due to healthcare and agriculture costs and losses. Unmitigated AMR could push up to 28 million people into poverty, mostly in developing countries, because of the difficulty in treating infections and losses in agricultural productivity. Healthcare costs could increase by USD 300 billion to more than USD 1 trillion per year.

Absence of actions to combat AMR will have huge repercussions in agriculture in terms of production losses, reduced livelihoods and risks to food security (FAO 2016). A decline in global livestock production is estimated to range from 2.6 percent to 7.5 percent per year. The estimated decrease in global GDP is USD 100 trillion by 2050.

The Tripartite Collaboration between FAO, OIE and WHO advocates the need for a One Health or Health in All Policies Approach and joint efforts in combatting AMR. The 2016 FAO Action Plan identified factors contributing to AMR, among them a lack of regulation, legislation and oversight on the use of antimicrobials in agriculture. Most antibiotics are used in agriculture as growth promoters and for disease prevention in animals. There is irrational use of antibiotics in healthcare practices as well, for example, poor therapy adherence and non-prescribed use. Because of poor regulation and marketing policies in many countries, antibiotics can be purchased over-the-counter or over the Internet. Substandard and falsified antimicrobials further contribute to AMR. Poor practices in husbandry, hygiene and agricultural waste

---

<sup>1</sup> Review on Antimicrobial Resistance (2016). Tackling Drug-Resistant Infections Globally: Final Report and Recommendations. The Review on Antimicrobial Resistance, Chaired by Jim O'Neill. Accessed at <https://amr-review.org/>

<sup>2</sup> World Bank Group (2017). Drug-Resistant Infections: A Threat to our Economic Future. Discussion Draft.

<sup>3</sup> World Bank Group (2016). Drug-Resistant Infections: A Threat to our Economic Future. Discussion Draft.

management further contribute to the spread of resistant bacteria in the food chain and into the environment.

Having understood the urgency to act and the importance of multi-sectoral cooperation, FAO, OIE and WHO formed a Tripartite Collaboration and endorsed a One Health Approach to combat AMR. Strategic areas are outlined in the Global Action Plan on Antimicrobial Resistance 2015 (WHO 2015). They are:

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

The Sixty-Eighth World Health Assembly in May 2015 declared Resolution WHA 68.7 on the Global Action Plan on Antimicrobial Resistance. The AMR resolution recalled previous resolutions on rational use of drugs, emerging and other communicable diseases, global health security, and containment of AMR. Because actions go beyond health at the global, regional and national levels, a One Health Approach has been endorsed to involve actors in human and veterinary medicine, agriculture, food, financing, environment and consumers. Member States are urged to develop national plans and mobilize human and financial resources to combat AMR.

Following the Tripartite Action Plan, FAO developed an action plan for Antimicrobial Resistance 2016–2020 to support the food and agriculture sectors in implementing the Global Action Plan on Antimicrobial Resistance. There are four focus areas: i) improve awareness on antimicrobial resistance and related threats; ii) develop capacity for surveillance and monitoring antimicrobial resistance and antimicrobial use in food and agriculture; iii) strengthen governance related to antimicrobial use and antimicrobial resistance in food and agriculture; and iv) promote good practices in food and agriculture systems and the prudent use of antimicrobials. In 2016, the OIE Strategy on Antimicrobial Resistance and Prudent Use was published to outline strategies in the animal health sector (OIE 2016).

Surveillance is a key area to be enhanced as part of the global action on AMR. WHO developed the Global Antimicrobial Resistance Surveillance System (GLASS) to enhance the capacities of countries to contribute to global monitoring.<sup>4</sup> GLASS aims to enable standardized, comparable and validated data on AMR to be collected, analyzed and shared with countries to better inform decision-making, drive local, national and regional action and provide an evidence base for action and advocacy. The system combines patient, laboratory and epidemiological surveillance

---

<sup>4</sup> <http://www.who.int/glass/en/>



data. GLASS harmonizes surveillance methods in terms of routine surveillance and case-finding, routine clinical sample collection, pathogen-antibacterial combinations and priority specimen types. The GLASS manual contains a list of index pathogens and antibacterial agents used for standards monitoring and comparability. The index bacteria include: *Escherichia coli*, *Klebsiella pneumoniae*, *Acinetobacter baumannii*, *Staphylococcus aureus*, *Streptococcus pneumoniae*, *Salmonella* spp, *Shigella* spp and *Neisseria gonorrhoeae*.

FAO published an Assessment Tool for Laboratory and Antimicrobial Resistance (ATLASS) to support countries in their efforts to identify needs and develop plans to strengthen agricultural surveillance. The tool helps guide the assessment, quantities and types of antimicrobials being used, determine the burden of AMR, identify emergence of new strains, guide treatment strategies and evaluate the efficacy of intervention strategies. OIE has developed a global database on antimicrobial agents intended for use in animals and has collected information related to antimicrobial use in the animal health sector from its member countries annually since 2015.<sup>5</sup>

### Regional challenges

Challenges include lack of national AMR surveillance, limited general public awareness, lack of national policies on antibiotic use in human health, agriculture and the food industry, the unregulated distribution and sale of antimicrobials and the lack of comprehensive infection prevention control (IPC) programmes.

In 2014, Member States in the Western Pacific Region endorsed the Action Agenda for Antimicrobial Resistance during the Sixty-fifth Session of the WHO Regional Committee. Three priority actions were agreed:

1. Improve surveillance of AMR and monitoring of antimicrobial use.
2. Strengthen development and implementation of comprehensive national plans to contain AMR and raise awareness in multiple sectors.
3. Strengthen health system capacity to contain AMR (WHO, 2015).

Similarly, the ASEAN community recognizes the AMR problem and the need for integrated and multi-sectoral efforts on AMR in its Member Nations<sup>6</sup> and endorsed the ASEAN Leaders' Declaration on Antimicrobial Resistance (AMR): Combating AMR through One Health Approach. AMR is the tenth of the 20 priorities in the ASEAN Post 2015 Health Development Agenda. ASEAN Member Nations are urged to strengthen several areas as part of national strategies to combat AMR: agricultural value chains, antimicrobial stewardship, awareness and advocacy, environmental management, infection prevention and control, laboratory capacity and AMR surveillance and research in health, environment and agriculture, multi-sectoral participation, pharmaceutical and food supply chain management, quality antimicrobials, regulatory systems

---

<sup>5</sup> See <http://www.oie.int/en/our-scientific-expertise/veterinary-products/antimicrobials/>

<sup>6</sup> <http://asean.org/asean-leaders-declaration-on-antimicrobial-resistance-amr-combating-amr-through-one-health-approach/> .

and training of professionals and students. The ASEAN study on the Rational Use of Medicines in the ASEAN Region recognizes the AMR challenge in Southeast Asia and recommends the development of national multi-sectoral strategies on AMR.<sup>7</sup> These efforts are within the scope of national structures for prescribing and dispensing medicines. The ASEAN Post-2015 socioeconomic goals include efforts on AMR, food safety, laboratory strengthening and pharmaceutical development.

### Cambodia's general health and development status and importance of AMR

Cambodia has generally improved its health status. The government increased its General Government Health Expenditure per capita from USD 4.00 in 2000, to USD 7.00 in 2005, USD 11.00 in 2009 and to USD 14.52 in 2015<sup>8</sup>. Due to its epidemiological status, Cambodia is facing the double burden of communicable diseases and NCDs. However, Cambodia still has low aggregate health indicators compared to neighboring countries despite its increased per capita spending. The quality of healthcare system in Cambodia still have some rooms for improvement to meet the demand side. The universal access to the healthcare for the poor people has not been met.

A recent analysis recognized the problems of AMR in Cambodia.<sup>9</sup> Among the early causes of concern was the discovery of multidrug resistant malaria along the Cambodia-Thailand border, especially for artemisinin derivatives, *Plasmodium falciparum*, and artemisinin resistance containment and elimination (ARCE) as previously mentioned. Artemisinin resistance is a global threat because there is no alternative at the moment. An increase in multidrug-resistant TB was also observed from 3.1 percent in 2001 to 10.3 percent in 2007 and to 11 percent to 2011.

During the first National AMR Workshop in 2011 (Vlieghe et al. 2012), multidrug-resistant bacteria (e.g. MRSA, ESBL-producing *E coli*, MDR *Salmonella enterica* serovar Typhi) had already been identified. However, there are still data gaps because of the scarcity of microbiology laboratories in Cambodia.

Cambodia and the WHO Country Cooperation Strategy 2016–2020 acknowledge major factors that contribute to AMR in Cambodia including: i) weak surveillance and laboratory capacity; ii) irrational use of antimicrobial agents during treatment of human infections; iii) overuse and misuse of antibiotics in animals raised for food; and iv) limited infection prevention and control measures in health facilities. Consumers can access antibiotics even without valid prescriptions despite existing laws and professional codes.

The same strategy also identifies the main barriers to combat AMR. For example, there is limited awareness of AMR among most stakeholders. Surveillance data to support evidence-based decisions is limited, especially in hospitals. The Clinical Practices Guidelines were not

---

<sup>7</sup> <http://asean.org/storage/2017/04/4.-March-2017-Rational-Use-of-Medicines-in-the-ASEAN-Region.pdf> .

<sup>8</sup> World Bank (2018). <https://data.worldbank.org/indicator/SH.XPD.GHED.PC.CD?locations=NG-GH-KE-ZA-1W-KH>

<sup>9</sup> WHO (2014). Cambodia Health Systems in Transition. World Health Organization and Asia Pacific Observatory.

developed based on evidence, but based on expert opinion, especially the use of the antibiotics. Coordination among different sectors is challenging, especially human health, agriculture and environment, and information remains limited because of the lack of national multi-sectoral policies and strategies.

### Cambodia's AMR initiatives

Cambodia's recent achievements on antimicrobial resistance were anchored in the AMR Country Situation Analysis Report 2013, the National Policy to Combat Antimicrobial Resistance in Cambodia (2014) and the National Strategy to Combat Antimicrobial Resistance 2015–2017. The National Policy and Strategy uses a seven-point strategic framework with strategic objectives that reflected the country's needs in 2015 to 2017. The policies were developed by departments of the Ministry of Health, public and private hospitals, laboratories and professional societies with important functions related to AMR.

The seven strategic areas are as following:

1. Develop a comprehensive national plan
2. Strengthen laboratory capacity for AMR
3. Strengthen AMR surveillance
4. Ensure uninterrupted access to antimicrobial medicines of assured quality
5. Regulate and promote rational use of medicines
6. Enhance infection prevention and control
7. Foster innovations and research and development for new tools

In 2016–2017, MAFF with support from FAO organized four consultations to strengthen food and agriculture sector engagement with AMR efforts. MAFF and FAO developed a draft One Health Roadmap and Action Plan with greater focus on the food and agriculture sector. The One Health Roadmap synthesized recommendations from the consultations into seven action areas: i) coordination mechanism, ii) information sharing, iii) legislation, iv) surveillance, v) research and laboratory practice, vi) rational use and vii) advocacy and awareness. In 2017, the activities proposed under the One Health Roadmap mandated that several agencies be incorporated into this Multi-Sectoral Action Plan, specifically the General Directorate for Animal Health and Production, Fisheries Administration, Department of Agro-Industry, Royal University of Agriculture and the General Directorate of Agriculture of MAFF. The work was coordinated by the MAFF AMR Technical Working Group that was officially formed in October 2017 with technical support provided by FAO and OIE.

The core mandates of MOH and MAFF allowed them to lead efforts in several areas that contribute to combatting AMR. In the health sector, notable achievements include development of policies, guidelines and tools such as the AMR surveillance protocol and pilot sites with links to the Global AMR Surveillance System, Clinical Practice Guidelines, Essential Medicines List, Minimum Package of Activities, Complementary Package of Activities and national policy and guidelines on infection prevention and control and hospital IPC committees,

capacity building of diagnostic microbiology, implementation of a laboratory external quality assessment system, various research studies, and Antimicrobial Awareness Week celebrations, among other health programmes and initiatives.

In the agriculture sector, ongoing actions include new agriculture laboratories in different parts of the country, although with limited capacity to detect AMR, Identification of antibiotics used in agriculture, farm registration and certification, dissemination of good agriculture, aquaculture and good husbandry practices, non-antibiotic residue products certification and Antimicrobial Awareness Week celebrations among other existing agriculture programmes and initiatives.

Policies, protocols and detailed descriptions of Cambodia's current status, recent initiatives and key action areas are described in the Situation Analysis on Antimicrobial Resistance in Cambodia 2018 that accompanies this Multi-Sectoral Action Plan.

## Chapter 2. Goal, purpose and objectives of the Multi-Sectoral Action Plan

The Multi-Sectoral Action Plan visualizes a country with a healthy population and strong governance systems to control the threat of AMR that would impede economic growth and cause unnecessary risks to health, security and social protection.

The plan sets these objectives:

1. Establish a unifying framework and governance mechanisms that enable ministries and other stakeholders to collaborate.
2. Outline gaps and challenges in areas that directly influence AMR.
3. Set strategic areas, objectives and activities to guide annual planning, communication and resource mobilization for stakeholders to ensure coordinated effort.

The Multi-Sectoral Action Plan will guide the Royal Government of Cambodia, partners and donors as they identify priority areas for work and collaboration. Target users of the Plan include policy and decision-makers, officials of MOH, MAFF, MOE and other ministries, researchers, educators and students, advocates and the media, professional societies and technical experts, community leaders and mobilizers, and international partners.

The strategies, activities and tasks identified in this Plan cannot be done by one agency alone. Stakeholders are encouraged to identify that part of the work they can do best based on their organization's mandate.

## Chapter 3. How the plan was developed?

The MOH AMR Technical Working Group, with support from FAO and WHO, conducted a situation analysis in October to December 2017 to assess progress on AMR from the

agriculture, human health and environment sectors. Results of the situation analysis were presented during a consultation among stakeholders on 29-30 November 2017 in Phnom Penh. Key areas discussed included these areas of work:

- AMR surveillance in humans and agriculture.
- Governance, coordination, partnerships and financing.
- Laboratory development and capacity.
- Practices contributing to the mitigation of AMR, including infection prevention and control in health facilities, good practices (GAP, GAHP, GAqP), water, sanitation, hygiene, food safety inspection and analysis and waste management.
- Public awareness, advocacy and education.
- Regulation and rational use of antibiotics in agriculture and human healthcare.
- Research on different aspects of AMR.
- Staff training and capacity building.

The AMR Technical Working Groups from MOH and MAFF led the review of the situation analysis and the drafting of the Multi-Sectoral Action Plan. Teams from MOH, MAFF and MOE reviewed the initial draft. On 12-13 February 2018 a national consultation on the Multi-Sectoral Action Plan was held in Kampong Cham involving 60 participants, mostly officials and technical experts who reviewed the draft Plan.

FAO, WHO and OIE supported the drafting, coordination and finalization of the Plan.

## Chapter 4. strategic areas, objectives and key results areas

### **Strategic areas include:**

1. Building human capacity for antimicrobial resistance
2. Containing AMR through good practices
3. Evidence generation through surveillance and laboratories
4. Governance and coordination to reduce antimicrobial resistance
5. Increasing public awareness
6. Rational use of antimicrobial medicines
7. Research and innovation for antimicrobial resistance

### Strategic Area 1. Governance and coordination to reduce AMR

#### **Strategic Objective 1. To ensure sustainable governance through effective coordination and partnerships.**

The National AMR Policy (2014) and Strategy (2015–2017) have initiated many developments in AMR coordination, communication and information sharing among human health and agriculture sectors. Almost all the activities were accomplished by government agencies as the lead with strong support from development partners and hospitals. Most partnerships are at the national level and in major cities. A major challenge for stakeholders is how to identify potential sources of funding to ensure adequate staffing, equipment and supplies, skills-building and capacity development.

Activities in the final Plan should be included in ministerial and departmental annual plans to secure funds. Several stakeholders and consultations have discussed the need for a committee above MOH and MAFF with political power to coordinate, while the existing technical working groups focus on technical work.

#### Current stakeholders:

- Human health: Multi-Sectoral AMR Technical Working Group
- Agriculture: MAFF AMR Technical Working Group

#### Key Results Areas (KRA):

- KRA 1.1 Strengthen technical and political coordination at local, national and international levels
- KRA 1.2 Strengthen policy and legislative frameworks to support AMR initiatives
- KRA 1.3 Resource mobilization to support MSAP implementation
- KRA 1.4 M&E plan, indicators and regular evaluation

The details of the key results areas 1-7 are in Annex A.

## Strategic Area 2. Evidence generation through surveillance and laboratories

### **Strategic Objective 2. To strengthen evidence generation through functional human, agriculture and environment laboratories and effective surveillance mechanisms.**

An AMR surveillance system for people was initiated in 2017 with 8 reporting sentinel sites across the country starting in January 2018. An AMR surveillance framework for animals was developed in 2017, initially focusing on foodborne and commensal bacteria isolates from food animals (pigs, poultry and cattle). Sampling started in 2017. There are large data gaps in agriculture and environment. Index organisms need to be added to conform with GLASS guidelines. Expanded surveillance and monitoring systems for aquatic and terrestrial animals, water, food and environment should be started, and the other sectors can learn from human surveillance experiences. Mechanisms for information sharing should be developed.

Well-functioning laboratories can enhance prescribing practices and AMR surveillance. Laboratory development has received huge support from development partners. There have been additional human and agriculture labs with better equipment and staff capacity, antibiotic susceptibility tests (AST) and microbiology facilities. Labs for human health already have a laboratory information system and many are part of an external quality assurance programme. Limited resources contribute to the challenge of strengthening laboratories, lack of sample referral systems, training staff, ensuring quality and providing equipment. Existing labs for human health with microbiology capacity need further strengthening and mechanisms to ensure sustainability. Links between human and agriculture labs are limited.

#### Current stakeholders:

- Human health: Cambodia CDC, US CDC, NIPH, DMDP, hospitals, ITM, WHO, AHC/University of Oxford (COMRU)
- Agriculture & Environment: GDAH, FiA, GDA, DAI, CamLAPF, RUA, MOE-Epidemiology-Lab, FAO, OIE

#### Key Results Areas:

- KRA 2.1 scaling-up existing surveillance and laboratory activities and systems to support AMR action plan
- KRA 2.2 Strengthening human capacity for laboratory, information sharing, surveillance and outbreak response
- KRA 2.3 Strengthen equipment and supply systems in laboratories for microbiology and surveillance

## Strategic Area 3. Rational use of antimicrobial medicines

### **Strategic Objective 3. To develop and enforce regulations and strategies to ensure access to and rational use of antibiotics in human health, animal health and agriculture.**

Cambodia's health sector has been publishing Clinical Practice Guidelines, an Essential Medicines List, and a Minimum Package of Activities (MPA) for Health Centres, and Complementary Packages of Activities (CPA) for Hospitals. Some hospitals have established a Medicine and Therapeutics Committee (MTC).

Antibiotics are widely used in fisheries, poultry and pig farms. Farm registration and certification should be strengthened. Regulation of antibiotic use in agriculture should be continued, with dissemination of good agriculture, aquaculture and animal husbandry practices (GAP, GAqP, GAHP) and encouragement of innovative evidence-based practices with a reduction of antimicrobials used for disease prevention and as growth promoters. Knowledge of doctors, nurses, veterinary practitioners is important for effective implementation of appropriate use of antibiotics in humans and agriculture. Data on the use of antimicrobial agents in human and animal health and agriculture should be continuously collected so trends can be monitored and the impact of action plans can be assessed.

Current Stakeholders:

- Human health: DDF, DHS, UHS, hospitals, professional societies, WHO and other partners.
- Agriculture: GDAHP, GDA, Department of Agricultural Legislation (DAL), FiA, DAI, FAO, OIE, professional societies

Key Results Areas:

- KRA 3.1 Guidance for and implementation of rational use of antimicrobials
- KRA 3.2 Regulation at different levels to support rational use of antimicrobials
- KRA 3.3 Strengthen the supply chain management for antimicrobials to ensure equitable and universal access for all citizens

#### Strategic Area 4. Containing AMR through good practices

**Strategic Objective 4. To reduce the incidence of infection through effective sanitation, hygiene, food safety, waste management and infection prevention measures.**

Practices contributing to the mitigation of AMR include infection prevention and control in health facilities, good practices (GAP, GAHP, GAqP), clean water, sanitation, hygiene, food safety and waste management. IPC guidelines in hospitals have been disseminated and integrated in other programmes in rural health facilities. Other basic health advice and guidelines should be integrated into existing health programmes in maternal and child health, IMCI and disease programmes. Implementation should be strengthened and monitored. Local guidelines in agriculture should be developed and disseminated based on recent international knowledge. Farmers should follow good practices in agriculture including GAP, GAHP and GAqP.

Current Stakeholders:



- Human health: DHS, DPM, hospitals, GDAHP, provincial and municipal health offices, URC, WHO and other partners.
- Agriculture & Environment: FiA, GDA, Provincial Department of Agriculture, Forestry and Fisheries, PDAHP, DAI, MOE-GDEP, MRD, FAO, OIE

Key Results Areas:

- KRA 4.1 Guidance for and implementation of good practices
- KRA 4.2 Ensure available technologies and supplies to implement protocols and guidelines
- KRA 4.3 Monitoring water, food safety and waste management

### Strategic Area 5. Increase public awareness

#### **Strategic Objective 5. Strengthen communication for public education and awareness.**

Cambodia participated in World Antimicrobial Awareness Week in 2015, 2016 and 2017. Most activities included awareness forums for health and agriculture professionals and students. IEC materials were distributed. In 2017, a MOH-MAFF-WHO-FAO AMR team developed and pilot-tested communication messages for advocacy at the community level. These messages are designed for midwives, nurses, agriculture officers, village health support group, village animal health workers, to use in educating their clients and constituents. Advocacy and education in communities should be continued. In addition, communication and dialogue at the level of decision-makers, managers and political leaders should be strengthened to ensure political and financial support for AMR initiatives.

Current Stakeholders:

- Human health: Multi-sectoral AMR Technical Working Group, MRD, provincial and municipal health departments, professional societies, WHO and other partners.
- Agriculture & Environment: MAFF AMR Technical Working Group, MOE, MRD, PDAFF, FAO, OIE

Key Results Areas:

- KRA 5.1 Increase public awareness through mass media and social media
- KRA 5.2 Integrate AMR communications in programmes and activities

### Strategic Area 6. Building human capacity for AMR

#### **Strategic Objective 6. Strengthen capacity of professionals and staff for AMR advocacy and support all areas of work.**

Health professionals must know the importance of and increase the use of diagnostic laboratories. There are plans to review pre-service curricula in medicine, nursing, pharmacy, veterinary medicine and animal, fisheries and crops sciences and ensure integration of

microbiology, AMR and infection control. There is a call for more local experts in healthcare and agriculture.

The government and development partners should explore, encourage and enhance mechanisms to train more officials and young staff locally and in advanced studies abroad. Participation in regional and international conferences can facilitate knowledge sharing and provide venues for Cambodia to share its best practices and experiences. There is a need for stronger regulation of medicines, agriculture products and feeds that will cover manufacturing, import, export, licensing, distribution and access.

Current Stakeholders:

- Human health: MOH, UHS, professional societies, WHO and other partners.
- Agriculture & Environment: MAFF, RUA, MOE, professional societies, FAO, OIE

Key Results Areas:

- KRA 6.1 Integrate AMR, microbiology, rational medicine use and related areas into pre-service training curriculum and resources
- KRA 6.2 Develop training resources and build capacity on AMR, microbiology, rational medicine use and related areas in in-service training and capacity building
- KRA 6.3 Collaboration with professional societies to integrate AMR and related issues for capacity building, advocacy, research and education

## Strategic Area 7. Research and innovation for AMR

### **Strategic Objective 7. Build research and innovation to support policy, good practices, implementation, monitoring and evaluation of AMR activities.**

In recent years, research findings have been published on detection of AMR and genetic characterization of resistant bacteria. Some studies on practices and knowledge of health providers, farmers and the general public on antibiotic use have also been done. The AMR situation analysis includes summaries of research areas, gaps and questions raised in consultations on AMR research. While much has been done, there is a huge gap in our knowledge on implementation, operations, and best practices. Lessons learnt from other programmes (e.g. TB, HIV/AIDS, malaria, and MDR salmonella in poultry meat) can provide good examples for AMR.

Current Stakeholders:

- Human health: MOH, UHS, AHC, NPH, SHCH, IPC, University of Oxford Group (COMRU), LSHTM, AFRIMS, NAHPRI, ITM, Malaria Consortium, WHO, US CDC and other partners.
- Agriculture & Environment: MAFF, MOE, FAO, OIE

Key Results Areas:

- KRA 7.1 Identifying AMR research gaps and priorities in different areas from natural sciences, applied sciences, social sciences, economics and management
- KRA 7.2 Training and capacity building of national staff for AMR and related research
- KRA 7.3 Implementation and dissemination of AMR research

## CHAPTER 5. Implementation

Work begins when the priorities and action points are integrated into annual plans and budgets. This is what managers, advocates, officials and partners monitor. Annual budgets mobilize funds at the national and provincial levels. Partnership projects between government and development partners should ensure that action points are adequately resourced. The availability and capacity of the workforce is an area that will need innovative mechanisms in staff recruitment and hiring. Coordination between government and partners on technical and operational matters should be done regularly. Joint annual implementation reviews will be useful. In all these activities, strong project management and operations capacity in government offices and partners is important.

## Chapter 6. Monitoring and evaluation

Monitoring and evaluation will be done under the guidance of the AMR Technical Working Group. Baseline values of the proposed indicators should be collected in 2020.

**Table 1. General indicators for M&E**

Indicator	Baseline (2020 )	Annual Target
1. Reduction of morbidity caused by AMR	To be determined	10-20 percent reduction
2. Reduction of irrational antimicrobial use in humans	To be determined	10-20 percent reduction
3. Reduction of antimicrobial consumption in animals	To be determined	10- 20 percent reduction
4. Reduction in hospital-acquired infections	To be determined	10-20 percent reduction
5. Increased public knowledge on AMR and appropriate use of antimicrobials	To be determined	10-30 percent increased public knowledge

There will be two types of M&E: i) routine data collection done annually and ii) special surveys and evaluation activities, mid-term (2021) and end-of-term (2023). Routine data collection and reporting will use indicators and reporting mechanisms built into relevant programmes and departments (e.g. AMR surveillance, laboratories, IPC, AMS) as guided by their specific protocols. Mid-term and final evaluation will make use of additional indicators and shall review

the initiatives based on the strategic objectives and key results areas. It is important that M&E indicators monitor inputs, processes, outputs and outcomes.

Suggested indicators are in Annex B. Many of the indicators proposed will require special surveys and studies (e.g. reduction of antimicrobial consumption in animals).

## References

- ASEAN (Association of Southeast Asian Nations). 2015. *ASEAN Post2015 Health Development Agenda*. Jakarta: Association of Southeast Asian Nations. Accessed at <http://asean.org/wp-content/uploads/2017/02/APHDA-In-a-Nutshell.pdf>
- ASEAN. 2017. ASEAN Leader's Declaration on Antimicrobial Resistance: Combating AMR through One Health Approach. November 2017. Jakarta: Association of Southeast Asian Nations.
- ASEAN. 2017. *Rational Use of Medicines in the ASEAN Region*. Jakarta: Association of Southeast Asian Nations.
- FAO (Food and Agriculture Organization of the United Nations). 2016. *The FAO Action Plan on Antimicrobial Resistance 2016-2020. Supporting the food and agriculture sectors in implementing the Global Action Plan on Antimicrobial Resistance to minimize the impact of antimicrobial resistance*. Rome: Food and Agriculture Organization of the United Nations. Accessed at <http://www.fao.org/3/a-i5996e.pdf>
- FAO. 2017. *FAO Initiatives on Prevention and Control of Antimicrobial Resistance (AMR)*. Rome: Food and Agriculture Organization of the United Nations.
- MOH (Ministry of Health, Cambodia). 2014. *National Policy for Combating Antimicrobial Resistance*. Phnom Penh: Ministry of Health. Kingdom of Cambodia.
- MOH. 2015. *National Strategy to Combat Antimicrobial Resistance 2015-2017*. Phnom Penh: Ministry of Health. Kingdom of Cambodia.
- MOH. 2018. *Antimicrobial Resistance (AMR) Situation Analysis: Cambodia*. Ministry of Agriculture, Forestry and Fisheries; Ministry of Health and Ministry of Environment. Phnom Penh: Ministry of Health. Kingdom of Cambodia.
- OIE (World Organisation for Animal Health). 2016. *The OIE Strategy on Antimicrobial Resistance and the Prudent Use of Antimicrobials*. November. Paris: World Organisation for Animal Health. Accessed at [http://www.oie.int/fileadmin/Home/eng/Media\\_Center/docs/pdf/PortailAMR/EN\\_OIE-AMRstrategy.pdf](http://www.oie.int/fileadmin/Home/eng/Media_Center/docs/pdf/PortailAMR/EN_OIE-AMRstrategy.pdf)
- Vlieghe, E., Sary, S., Lim, K., Sivuthy, C., Phe, T., Parry, C., De Smet, B., Monidarin, C., Baron, E., Moore, C.E., Mfuko, W., Asgari, N., Chhorvoin, O., Steenkeste, N., Leyer, C., van Griensven, J., Thai, S., Jacobs, J. (2012). First National Workshop on Antibiotic Resistance in Cambodia: Phnom Penh, Cambodia, 16-18 November 2011. *Journal of Global Antimicrobial Resistance*.
- WHO (World Health Organization). 2015. *Global Action Plan on Antimicrobial Resistance 2015*. Rome: Food and Agriculture Organization, Paris: World Organisation for Animal Health and Geneva: World Health Organization. Accessed at

[http://www.wpro.who.int/entity/drug\\_resistance/resources/global\\_action\\_plan\\_en\\_g.pdf](http://www.wpro.who.int/entity/drug_resistance/resources/global_action_plan_en_g.pdf)

WHO. 2014. *Cambodia Health Systems in Transition*. Geneva: World Health Organization and Asia Pacific Observatory.

WHO. 2015. *Country Cooperation Strategy Cambodia*. Phnom Penh: World Health Organization Cambodia.

WHO. 2015. *Global Action Plan on Antimicrobial Resistance*. Geneva: World Health Organization.

WHO. 2017. *Global Antimicrobial Resistance Surveillance System (GLASS) Guidelines*. Geneva: World Health Organization.

## Annex A. Key results areas and activities

### Strategic Area 1. Governance and coordination to reduce AMR

#### Strategic Objective 1. Ensure sustainable governance through effective coordination and partnerships.

##### Key results areas:

- KRA 1.1 Strengthen technical and political coordination at local, national and international levels
- KRA 1.2 Strengthen policy and legislative frameworks to support AMR initiatives
- KRA 1.3 Resource mobilization to support MSAP implementation
- KRA 1.4 M&E plan, indicators and regular evaluation

KRAs	Activities	Stakeholders	Lead Institution
KRA 1.1 Strengthen technical and political coordination at local, national and international levels	2019–2020  Human health, agriculture and environment  a. Finalize and endorse the Multi-Sectoral Action Plan on AMR 2019–2023 b. Disseminate and launch Multi-Sectoral Action Plan on AMR 2019–2023 with Joint Proclamations c. Establish policy and mechanism for high-level inter-ministerial coordination d. Establish a high-level One Health coordination body with rotating chair person e. Revise and update the TORs of the technical working groups (MOH, MAFF and MOE) including, but not limited to: <ul style="list-style-type: none"> <li>• e.1 Conduct regular technical working group meetings for coordination and information sharing</li> <li>• e.2 Ensure alignment of Multi-Sectoral Action Plan on AMR with plans, activities and strategies of specific departments, offices and programmes of MOH, MAFF and MOE</li> <li>• e.3 Information sharing with AMR programmes in health (e.g. tuberculosis, malaria, HIV/ AIDS, STIs, rational medicines use, medicines regulation, IPC, disease prevention, health promotion,</li> </ul>	Human health: Multi-Sectoral AMR Technical Working Group, WHO  Agriculture: MAFF AMR Technical Working Group, FAO, OIE  Environment: MOE & Partners	Each ministry will rotate on annual basis to chair the Working Group

KRAs	Activities	Stakeholders	Lead Institution
	<p>food safety)</p> <ul style="list-style-type: none"> <li>• e.4 Information sharing with AMR programmes in agriculture (e.g. crops, animal production, fisheries, good practices, food safety inspection and analysis)</li> <li>• e.5 Information sharing with AMR programmes in environment (e.g. water, environmental health, waste management, biosafety)</li> </ul> <p>f. Strengthen partnerships for technical support and implementation including partnerships with professional associations and the commercial sector (e.g. pharmaceutical companies and other public-private partnerships)</p>		
KRA 1.2 Strengthen policy and legislative frameworks to support AMR initiatives	<p>2021–2023</p> <p>Human health, agriculture, environment</p> <p>a. Review and strengthen regulatory and legislative frameworks in different aspects of antimicrobial use, surveillance and monitoring, including AMR response, substandard and falsified medicines, waste management, registration of facilities, registration of animal clinics and farms, licensing, use of antimicrobials for animal disease prevention, use of antimicrobials in growth promoters and commercial feeds and maximum residue limits</p> <p>b. Develop supporting policies</p> <p>c. Implementation of farm, slaughter facility and food processing registration and certification to facilitate information sharing, policy implementation, training and advocacy</p>	<p>Human health: Multi-Sectoral AMR Technical Working Group, WHO</p> <p>Agriculture &amp; Environment: MAFF AMR Technical Working Group, FAO, OIE</p> <p>Environment:</p>	
KRA 1.3 Resource mobilization to support MSAP implementation	<p>2019–2023</p> <p>Human health, agriculture, environment</p> <p>a. Align the MSAP with annual operational plans, strategies and activities of ministries and partners</p> <p>b. Conduct assessment and costing to provide support for planning and budgeting</p> <p>c. Identify sustainable funding mechanisms for MSAP implementation including financing for laboratory management, services and capacity building</p>	<p>Human health: Multi-Sectoral AMR Technical Working Group, WHO</p> <p>Agriculture &amp; Environment: MAFF AMR Technical Working Group, FAO, OIE</p>	

KRAs	Activities	Stakeholders	Lead Institution
	<p>d. Conduct activities and initiatives (e.g. working group meetings) to synthesize and translate evidence into communication messages for policy support</p> <p>e. Strengthen capacity of technical working group members and stakeholders for communications at different levels through communications training, stakeholder mapping and regular coordination</p> <p>f. Conduct dialogues with stakeholders in health, agriculture and environment sectors at all levels</p> <p>g. Regularly review funding resources</p> <p>h. Conduct dialogues with international partners and NGOs on activities and initiatives to support AMR</p> <p>i. Improving availability of staffing through government mechanisms and other partnerships</p>		
KRA 1.4 M&E plan, indicators and regular evaluation	<p>Human health, agriculture and environment</p> <p>a. Baseline review of status and indicators</p> <p>b. Finalize and implement M&amp;E framework and plan with this MSAP</p> <p>c. Conduct mid-term evaluation in 2020</p> <p>d. Conduct full review in 2023</p>	<p>Human health: Multi-Sectoral AMR Technical Working Group, WHO</p> <p>Agriculture &amp; Environment: MAFF AMR Technical Working Group, FAO, OIE</p>	



## Strategic Area 2. Evidence generation through surveillance and laboratories

### Strategic Objective 2. Strengthen evidence generation through functional human, agriculture and environment laboratories and effective surveillance mechanisms

KRAs	Activities	Stakeholders	Lead Institution
<p>KRA 2.1 Establish/strengthen surveillance and laboratory activities and systems to support AMR</p>	<p>2019–2020</p> <p>Human health</p> <ul style="list-style-type: none"> <li>a. Develop and implement guidelines and protocols for surveillance and response for hospital-acquired infections and antibiotic use</li> <li>b. Implementation of regular point-prevalence surveys for hospital-acquired infections, prospective incidence-based surveillance and other essential studies</li> <li>c. Develop and implement guidelines and protocols for AMR outbreak response</li> <li>d. Increase use of clinical microbiology laboratories through training and education</li> </ul> <p>Agriculture &amp; Environment</p> <ul style="list-style-type: none"> <li>a. Strengthen laboratory capacity through involvement in the Assessment Tool for Laboratory and Antimicrobial Resistance (ATLASS) and training on priority protocols (e.g. the FAO and OIE AMR surveillance and laboratory methodology guidelines and WHO ESBL protocol)</li> <li>b. Participate in proficiency tests conducted by external institutions to provide external quality assurance for laboratories involved in AMR surveillance</li> <li>c. Build capacity for drug residue monitoring in food, agriculture and environment laboratories</li> <li>d. Continue and increase identification of antimicrobial resistance in food, agricultural products and the environment</li> <li>e. Implement drug residue monitoring in food, agriculture and environment systems</li> <li>f. Establish AMR surveillance and response systems in agriculture and environment labs</li> </ul>	<p>Human health: C-CDC, US CDC, NIPH, DMDP, Hospitals, ITM, WHO, AHC/University of Oxford (COMRU)</p> <p>Agriculture: GDAHP, FiA, GDA, DAI, FAO, OIE, PNCA, KNCA</p> <p>Environment: MoE, CamLAPF, MOE-Epidemiology-Lab and partners</p>	

KRAs	Activities	Stakeholders	Lead Institution
	<p>Joint efforts</p> <p>a. Harmonize surveillance and monitoring, reporting and information sharing between human health, agriculture and environment laboratories at national level. Establish a centralized laboratory database for AMR surveillance data</p> <p>b. Support coordination of laboratory and surveillance activities and procedures through national and regional networks</p> <p>c. Conduct joint AMR surveillance between MOH, MAFF, MOE and other partners to strengthen understanding of cross-transmission</p> <p>2021–2023</p> <p>Human health, agriculture and environment</p> <p>a. Evaluate, review and update protocols and guidelines related to AMR surveillance</p> <p>b. Strengthen mechanisms for information sharing for labs and surveillance of AMR</p>		
<p>KRA 2.2 Strengthening Human capacity for laboratory, information sharing, surveillance and outbreak response</p>	<p>2019–2020</p> <p>Human health</p> <p>a. Build skills in microbiology and clinical infection, surveillance, epidemiology and other essential skills in hospitals, health facilities and laboratories</p> <p>b. Conduct planning and costing of workforce skills-mix to identify capacity needs</p> <p>Agriculture &amp; Environment</p> <p>a. Build skills for epidemiology, surveillance, microbiology and other essential skills for animal health professionals and in Cambodia Applied Veterinary Epidemiology Training (CAVET) and other training programmes</p> <p>b. Conduct planning and costing of workforce skills-mix to identify capacity</p>	<p>Human health: C-CDC, US CDC, NIPH, DMDP, hospitals, ITM, WHO, AHC/University of Oxford (COMRU)</p> <p>Agriculture: GDAH, FIA, GDA, DAI, FAO, OIE</p> <p>Environment: , MoE, CamLAPF</p>	

KRAs	Activities	Stakeholders	Lead Institution
	<p>needs</p> <p>Joint efforts</p> <p>a. Joint training in human health, agriculture and environment sectors c. Conduct joint human workforce capacity assessment</p> <p>2021–2023</p> <p>Human health, agriculture and environment</p> <p>a. Evaluate and strengthen mechanisms for staff recruitment and training for laboratories and surveillance b. Continue skills training for epidemiology, surveillance, microbiology and other skills through CAVET-MAFF/FETP-MOH and other training programmes</p>	<p>BMOE-EP Lab and partner</p>	
<p>KRA 2.3 Strengthen equipment and supply systems in laboratories for microbiology and surveillance</p>	<p>2019–2020</p> <p>Human health, agriculture and environment</p> <p>a. Assessment, planning and costing of laboratory resource needs b. Strengthening capacity of existing labs through provision of equipment and supplies     b.1. Establish a laboratory for food safety (e.g. Food Safety Centre of Excellence) c. Laboratory quality enhancement in target hospitals     c.1. Enhance laboratory quality control and assurance in target microbiology laboratories</p>	<p>Human health: C-CDC, US CDC, NIPH, DMDP, hospitals, ITM, WHO, AHC/University of Oxford (COMRU)</p> <p>Agriculture: GDAHP, FiA, GDA, DAI, PNCA, KNCA, FAO, OIE</p> <p>Environment: MoE, CamLAPF, MOE-EP Lab and partner</p>	

### Strategic Area 3. Rational use of antimicrobial medicines

#### Strategic Objective 3. Develop and enforce regulations and strategies to ensure access to and rational use of antibiotics in human health, animal health and agriculture.

KRAs	Activities	Stakeholders	Lead Institution
<p>KRA 3.1 Guidance for and implementation of rational use of antimicrobial medicines</p>	<p>2019–2023</p> <p>Human health</p> <p>a. Develop and implement an antimicrobial stewardship programme in target health facilities with supporting local policies, staffing, dedicated teams and budgets</p> <p>a.1. Implement monitoring and surveillance of antimicrobial use (e.g. antimicrobial consumption monitoring and point-prevalence surveys)</p> <p>a.2. Implement initiatives to promote rational antibiotic use (e.g. prospective audit and feedback)</p> <p>b. Incorporate AMR in the upcoming revision of Clinical Practice Guidelines, Essential Medicines List and other guidelines for antibiotic use</p> <p>c. Develop and implement policy to restrict the sale of antibiotics without prescriptions</p> <p>d. Strengthen roles and responsibilities of infection prevention and control and Medicine and Therapeutics Committees in hospitals</p> <p>Agriculture and environment</p> <p>a. Integrate AMU/AMR in guidelines for GAP, GAHP and GAqP</p> <p>b. Training and implementation of guidelines</p> <p>c. Registration of model farms</p> <p>d. Promote use of alternative evidence-based modalities in good practices (traditional approaches, probiotics, etc.)</p> <p>e. Promote record keeping of antimicrobial use and withdrawal time on farms and by animal health service providers and of antimicrobial sales</p> <p>2021–2023</p> <p>Human health</p>	<p>Human health: DDF, DHS, UHS, hospitals, professional societies and development partners</p> <p>Agriculture GDAH, GDA, FiA, DIA, FAO, OIE</p> <p>Environment:</p>	

KRAs	Activities	Stakeholders	Lead Institution
	<ul style="list-style-type: none"> <li>a. Provide continuous training and dissemination of guidelines in health facilities and to health care providers</li> <li>b. Develop model hospitals and health facilities on AMS, IPC and other initiatives on rational use of antimicrobials</li> <li>c. Monitor and evaluate the uptake, use and implementation of guidelines</li> </ul>		
KRA 3.2 Regulation at different levels to support rational use	<p>2019–2023</p> <p>Agriculture and environment</p> <ul style="list-style-type: none"> <li>a. Assess, revise and develop regulatory frameworks for human health, agriculture and environment sectors</li> <li>b. Regulate the use of antibiotics for prevention and growth promotion and commercial feeds for animals</li> <li>c. Public dissemination and implementation of policies</li> <li>d. Develop and disseminate guidelines for minimum residue limits aligned with international standards</li> <li>e. Strengthen regulatory systems through increased workforce and funding in human health and agriculture</li> </ul> <p>2020–2023</p> <ul style="list-style-type: none"> <li>a. Strengthen national regulatory authorities for medicine quality assurance and establish mechanisms for systematic monitoring and evaluation of regulatory processes</li> <li>b. Enhance monitoring of regulation of antibiotics used in animals and agriculture</li> <li>c. Strengthen the services of veterinary drugs and veterinary hospital, veterinary clinic through registration and licensing the veterinary professional.</li> </ul>	<p>Human health: DDF, DHS, UHS, hospitals, professional societies and development partners</p> <p>Agriculture &amp; Environment: GDAHP, GDA, FiA, professional societies FAO, OIE</p>	
KRA 3.3 Establish supply chain management for antimicrobials to ensure equitable and universal access for all citizens	<p>2019–2023</p> <p>Human health</p> <ul style="list-style-type: none"> <li>a. Ensure availability of quality essential medicines and medical products</li> </ul>	Human health: DDF, DHS, UHS, hospitals, professional societies and development partners	

KRAs	Activities	Stakeholders	Lead Institution
	<p>b. Strengthen institutional procurement and supply chain systems for quality antibiotics</p> <p>c. Enforce regulations on prescription-only dispensing of antimicrobials</p> <p>d. Develop messages on and communicate quality of medicines to health professionals and the general public</p> <p>e. Strengthen the services of pharmacies and health facilities through registration and licensing</p> <p>Agriculture and environment</p> <p>a. Communicate messages about quality, including falsified and counterfeit medicines, expired medicine and medicines storage, to veterinary professionals and farm workers</p>	<p>Agriculture &amp; Environment: GDAHP, GDA, FiA, FAO, professional societies</p>	

#### Strategic Area 4. Containing AMR through good practices

#### Strategic Objective 4. Reduce the incidence of infection through effective sanitation, hygiene, food safety, waste management and infection prevention measures

KRAs	Activities	Stakeholders	Lead Institution
<p>KRA 4.1 Guidance for and implementation of good practices</p>	<p>2019–2020</p> <p>Human health</p> <p>a. Assessment of implementation of infection prevention and control efforts in target and pilot public hospitals</p> <p>b. Strengthen IPC implementation in hospitals through training on infection prevention and control tools and guidelines, quality improvement plans and development of other guidelines and protocols</p> <p>c. Assessment and strengthening of medicine and therapeutics committee efforts in public hospitals</p> <p>d. Strengthen roles and responsibilities of infection prevention and control committees</p>	<p>DHS, DPM, CCDC, Hospitals, Provincial/ Municipal Health Offices and development partners</p> <p>Agriculture: FiA, MRD, Provincial Agriculture Offices, DAI, FAO, OIE</p> <p>Environment: MOE-GDEP</p> <p>FAO, OIE</p>	

KRAs	Activities	Stakeholders	Lead Institution
	<p>e. Integrate AMR knowledge and skills in existing programmes in WASH, IMCI, Minimum Package of Activities and other community programmes</p> <p>f. Dissemination, training and monitoring implementation of infection prevention and control and WASH in hospitals and health facilities</p> <p>Agriculture and environment</p> <p>a. Integrate existing internationally recognized good practices into local contexts</p> <p>b. Adopt ASEAN and international good agriculture practice guidelines to improve terrestrial and aquatic animal health and welfare and ensure quality and safety of agricultural products</p> <p>c. Conduct a baseline review of good practices including gap analysis and stakeholder mapping and provide recommendations for producers of animal and other agricultural and food products</p> <p>d. Conduct baseline assessment of the status of water, food safety inspection and analysis and waste management integrating AMR concerns (e.g. in animal husbandry)</p> <p>e. Assess the implementation of GAP, GAqP, GAHP, GMP, GHP and biosecurity on farms, collect evidence on the AMR impact, and recommend sustainable use of antimicrobials in agriculture and food production</p> <p>f. Disseminate, train and monitor implementation of infection prevention and control, safe water, sanitation and hygiene in commercial and backyard farms, food production, processing and manufacturing in animal clinics, veterinary practices, slaughter facilities and live animal markets</p> <p>g. Introduce record keeping on farms using antimicrobials and withdrawal times</p> <p>h. Promote animal health and welfare</p> <p>i. Conduct training-of-trainers on good practices in GAP, GAqP, GAHP, GMP, GHP and biosecurity on farms</p> <p>j. Promote innovation and dissemination of good practices and alternatives in agriculture</p> <p>Joint activities</p> <p>a. Baseline assessments in health facilities and farms and waste treatment and management</p>		

KRAs	Activities	Stakeholders	Lead Institution
	<p>b. Establish model villages and communities with a One Health Approach to combating AMR</p> <p>2021–2023</p> <p>Human health, agriculture and environment</p> <p>a. Monitor infection prevention and control, MTC and quality improvement implementation in hospitals and health facilities</p> <p>b. Monitor implementation of infection prevention and control, immunization programmes, WASH and waste management on farms, food production, processing, and manufacturing, in animal clinics, veterinary practices, slaughter facilities, and live animal markets</p> <p>c. Strengthen sanitary and environmental regulations on farm practices for terrestrial and aquatic animals</p> <p>d. Develop additional best practice guidance in areas such as vaccinations, safe disposal of unused and expired antibiotics and animal feeds and alternatives to antimicrobial growth promoters and biological waste management.</p>		
<p>KRA 4.2 Ensure available technologies and supplies to implement protocols and guidelines</p>	<p>2019–2020</p> <p>Human health, agriculture and environment</p> <p>a. Ensure availability of infection prevention and control infrastructure and hygiene products and supplies (e.g. gloves, syringes, alcohol, running water) in hospitals and health facilities)</p> <p>b. Monitor and report on infection prevention and control and other activities</p> <p>c. Improve provision of infection prevention and control infrastructure and hygiene supplies and equipment in veterinary clinics, veterinary practices, slaughter facilities and live animal markets</p> <p>d. Improve hygiene supply and equipment in production, processing and marketing agricultural products</p> <p>2021–2023</p>	<p>Human health: DHS, DPM, hospitals, Provincial and Municipal Health Offices</p> <p>Agriculture: GDAHP</p> <p>Environment: MOE</p>	



KRAs	Activities	Stakeholders	Lead Institution
	<p>Human health, agriculture and environment</p> <p>a. Roll out implementation of infection prevention and control in other government hospitals</p> <p>b. Ensure availability of required infrastructure and products to support monitoring water, food safety inspection and analysis, and waste management</p>		
KRA 4.3 Monitoring water, food safety and waste management	<p>2019–2020</p> <p>Human health, agriculture and environment</p> <p>a. Support monitoring and conduct baseline assessment of the status of water, food safety inspection and analysis and waste management integrating AMR concerns</p> <p>b. Hire additional staff to support monitoring water, food safety inspection and analysis and waste management</p> <p>c. Develop and implement capacity building activities for monitoring water, food safety inspection and analysis and waste management</p> <p>d. Monitor MRLs of chemical residues (VPH) in the environment</p> <p>e. Develop and implement partnerships for waste management in the health, agriculture and environment sectors</p>	<p>Human health: DDF, CCDC, Provincial/Municipal Health Departments and development partners</p> <p>Agriculture GDAHP, FiA, DAI, MRD, MOE-GDEP Provincial Agriculture Offices (PDAFF), FAO, OIE</p> <p>Environment: MoE and partners</p>	

## Strategic Area 5. Increase public awareness

### Strategic Objective 5. Strengthen communication for public education and awareness.

KRAs	Activities	Stakeholders	Lead Institution
KRA 5.1 Increase public awareness through traditional and social media	<p>2019–2020</p> <p>Human health</p> <p>a. Develop existing information, education and communication materials for mass media (e.g. ads for TV, radio and newspapers).</p> <p>b. Develop and disseminate communication messages and material for social media (e.g. Facebook, Instagram)</p> <p>Agriculture and environment</p> <p>a. Develop existing information, education and communication materials for mass media (e.g. ads for TV programmes, radio and newspapers)</p> <p>b. Develop other awareness raising materials based on recent knowledge about AMR and AMU in humans, plant production, fisheries, livestock and food</p> <p>c. Use social media (e.g. Facebook, Instagram)</p> <p>Joint activities</p> <p>a. Develop joint human health, agriculture and environment IEC and training materials</p> <p>b. Develop and disseminate IEC and training tool kits on AMR and AMU in Khmer languages</p> <p>2021–2023</p> <p>Human health, agriculture and environment</p> <p>a. Monitor and evaluate effectiveness of communication activities in different media</p>	<p>Human health: Multi-Sectoral AMR Technical Working Group, MRD, Provincial and Municipal Health Departments, professional societies, WHO</p> <p>Agriculture: MAFF AMR Technical Working Group, MRD, Provincial and District Agriculture Offices (PDAFF), FAO, OIE</p> <p>Environment: MoE and partners</p>	

KRAs	Activities	Stakeholders	Lead Institution
<p>KRA 5.2 Integrate AMR communications in programmes and activities</p>	<p>2019–2020</p> <p>Human health</p> <p>a. Integrate AMR and antibiotic use in advocacy and health promotion activities of existing health programmes (e.g. MCH, IMCI, sanitation and hygiene, TB, malaria, HIV/AIDS)</p> <p>b. Conduct AMR and antibiotic use training for healthcare providers</p> <p>Agriculture and environment</p> <p>a. Integrate AMR and antimicrobial use in advocacy, agriculture and animal health promotion activities of existing programmes (e.g. vaccination programs, genetics, conservation, breeding, animal feed)</p> <p>b. Conduct grassroots awareness activities</p> <p>c. Conduct AMR and antimicrobial use training for general service providers including veterinarians, farmers, village animal health workers</p> <p>Joint activities</p> <p>a. Antimicrobial Awareness Week celebration every year with participation from health, agriculture and environment from both government and private sectors</p> <p>b. Integrate communications strategies into existing community awareness, health promotion programmes and good agriculture advocacy</p> <p>c. Conduct community dialogues to enhance awareness and integrate AMR into community forums</p> <p>2021–2023</p> <p>Human health, agriculture and environment</p> <p>a. Monitor and evaluate communications tools and activities for AMR and antimicrobial use in advocacy and health promotion activities of existing health and agriculture programmes</p> <p>b. Monitor impact of communication and behavior change programmes in pilot and target areas</p>	<p>Human health: Multi-Sectoral AMR Technical Working Group, MRD, Provincial and Municipal Health Departments, professional societies, WHO</p> <p>Agriculture and Environment: MAFF AMR Technical Working Group, MRD, Provincial Agriculture Offices, FAO</p>	

KRAs	Activities	Stakeholders	Lead Institution

**Strategic Area 6. Building capacity for AMR**

**Strategic Objective 6. Strengthen capacity of professionals and staff for AMR advocacy and support all areas of work.**

KRAs	Activities	Stakeholders	Lead Institution

KRAs	Activities	Stakeholders	Lead Institution
<p>KRA 6.1 Integrate AMR, microbiology, rational drug use and other areas into pre-service training curriculum and resources</p>	<p>2019–2020</p> <p>Human health, agriculture and environment</p> <p>a. Curriculum review and integration of AMR and related knowledge in pre-service training for physicians, nurses, pharmacists, laboratory technicians and other degree programmes: Antimicrobial stewardship program Microbiology laboratory practice, networking and information sharing, biosafety and antimicrobial use, microbiology IPC and rational antibiotic use and pharmacovigilance Related courses</p> <p>b. Curriculum review and integration of AMR and related knowledge into pre-service training of animal science, veterinary medicine, fisheries, food, agriculture, environment and other degree programmes: Performance of veterinary service by OIE Animal husbandry and fisheries and agro-industry programmes Related courses</p> <p>c. Enhance links and partnerships with international academics and schools for capacity building, research and other initiatives</p> <p>2021–2023</p> <p>Human health, agriculture and environment</p> <p>a. Development and review of education resources (e.g. update books and references) in clinical pharmacology, pharmacovigilance, veterinary pharmacy and related courses</p> <p>b. Assess, review and translate existing good practices into new programmes for AMR for animal production, veterinary and agriculture practitioners</p>	<p>Human health: HSD, UHS, NIPH, professional societies, development partners</p> <p>Agriculture MAFF, GDAHP, FiA, GDA, RUA, Prekleab National Agricultural School, Kampong Cham National Agricultural School, FAO, OIE Environment: MOE and partners</p>	
<p>KRA 6.2 Develop training resources and build</p>	<p>2019–2020</p>	<p>Human health: MOH,</p>	

KRAs	Activities	Stakeholders	Lead Institution
<p>capacity on AMR, microbiology, rational medicines use and related areas for in-service training and capacity building</p>	<p>Human health, agriculture and environment</p> <p>a. Develop modules and conduct training for health professionals as part of the continuous medical education in these areas:</p> <ul style="list-style-type: none"> <li>• Applied epidemiology training</li> <li>• Laboratory: use of microbiology laboratory, biosafety, biosecurity (epi-lab), storage, packaging and transportation, pathogen management</li> <li>• Antimicrobial stewardship</li> <li>• Rational medicines use</li> <li>• Related areas</li> </ul> <p>b. Develop and review modules and conduct training for agriculture, veterinary and food safety professionals in these areas:</p> <ul style="list-style-type: none"> <li>• Cambodia applied veterinary epidemiology training</li> <li>• AMU and AMR training</li> <li>• Microbiology labs</li> <li>• Good practices</li> <li>• Guidelines for antibiotic use</li> <li>• GAP, GAHP, GAqP, biosafety</li> <li>• Related areas</li> </ul> <p>c. Develop AMR training materials for provincial, district and village officials and staff</p> <p>d. Continue and strengthen partnerships among local institutions and with international institutions on AMR for sharing expertise and lessons learnt between countries</p> <p>e. Strengthen participation in international conferences and sharing AMR information</p> <p>f. Participate in international networks and initiatives (e.g. national biosafety committee network, national medical microbiology laboratory network, CALM List, CamLQMS, check list for accreditation, national quality standards)</p> <p>2021–2023</p> <p>Human health, agriculture and environment</p> <p>a. Conduct joint training for professionals and technicians in human health</p>	<p>UHS, NIPH, professional societies and development partners</p> <p>Agriculture &amp; Environment: MAFF, GDAHP, FiA, GDA, RUA, Prekleab National Agricultural School, Kampong Cham National Agricultural School, MOE, professional societies</p>	

KRAs	Activities	Stakeholders	Lead Institution
	agriculture and environment sectors		
KRA 6.3 Collaboration with professional societies and academics to integrate AMR and related issues for capacity building, advocacy, research and education	2019–2020  Human health, agriculture and environment  a. Integrate action points of the strategy (e.g. biosafety, biosecurity and waste management) into existing programmes of professional societies in human health, agriculture and environment b. Conduct joint activities (e.g. meetings, forums, conferences, research, projects) c. Strengthen public-private partnerships to level-up AMR activities d. Share local and national AMR knowledge and expertise with international colleagues	Human health: MOH, UHS, NIPH, professional societies and development partners  Agriculture & Environment: MAFF, GDAHP, FiA, GDA, RUA, Prekleab National Agricultural School, Kampong Cham National Agricultural School, MOE, professional societies	

## Strategic Area 7. Research and innovation for AMR

### Strategic Objective 7. Build research and innovation capacity to support policy, good practice, implementation, monitoring and evaluation of AMR activities.

KRAs	Activities	Stakeholders	Lead Institution
KRA 7.1 Identifying AMR research gaps and priorities in natural sciences, applied sciences, social sciences, economics and management	<p>2019–2020</p> <p>Human health, agriculture and environment</p> <p>a. Integrate AMR and related issues into this strategy (e.g. surveillance, laboratories, IPC, rational use, sanitation and hygiene, regulation) as an important component of the national health, agriculture and environmental research agendas</p> <p>b. Work towards an overarching research agreement covering all sectors and related ministries to ensure optimal efficiency, transparency and data sharing</p> <p>2020–2023</p> <p>Human health, agriculture and environment</p> <p>a. Conduct a national AMR prevalence study</p> <p>b. Enhance partnerships with institutions to strengthen research on operations and implementation and actively engage the private sector</p>	<p>Human health: MOH, UHS, NIPH, and development partners</p> <p>Agriculture &amp; Environment: MAFF, MOE, RUA, FAO, OIE</p>	
KRA 7.2 Training and capacity building of national staff for AMR and related research	<p>2019–2020</p> <p>Human, agriculture and environment</p> <p>a. Promote and support AMR research as part of existing and new activities in schools and develop specific research tracks for post-graduate degrees</p> <p>b. Raise awareness of local, national, and international training opportunities</p> <p>c. Promote research among sectors</p> <p>2021–2023</p>	<p>Human health: MOH, UHS, NIPH, and development partners</p> <p>Agriculture &amp; Environment: MAFF, MOE, RUA, FAO, OIE</p>	



KRAs	Activities	Stakeholders	Lead Institution
	<ul style="list-style-type: none"> <li>a. Capacity building for qualitative and operational research</li> <li>b. Facilitate the exchange of expertise and lessons learnt from other countries and partners through regular coordination meetings</li> </ul>		
<p>KRA 7.3 Implementation and dissemination of AMR research</p>	<p>2019–2020</p> <p>Human health, agriculture and environment</p> <ul style="list-style-type: none"> <li>a. Conduct research to fill knowledge gaps on AMR issues in all areas and support policy frameworks and development plans, including research on knowledge, attitudes and practices on antibiotics, AMR and AMU among health workers, VHWs, agricultural workers, VAHWs, farmers and community members (public and private)</li> <li>b. Participate in the human global antibiotic appropriateness prevalence study</li> <li>c. Participate in OIE monitoring of the quantities and usage patterns of antimicrobial agents used in aquatic and food producing animals</li> <li>d. Conduct studies to establish correlations between AMR in animals, the environment and humans</li> <li>e. Explore innovative approaches (e.g. IT approaches, mobile apps, bioinformatics, probiotics and other approaches to reduce the need for antimicrobials)</li> <li>f. Regular sharing of research findings through working group meetings and conferences</li> <li>g. Conduct AMR research forums</li> </ul>	<p>Human health: MOH, UHS, NIPH, and development partners</p> <p>Agriculture &amp; Environment: MAFF, MOE, RUA, FAO, OIE</p>	

## Annex B. Draft indicators for monitoring and evaluation

General AMR indicators are presented in the section on monitoring and evaluation. These are input, process and output indicators that can help determine the progress of AMR activities in all sectors. Two types of M&E activities are proposed: i) routine monitoring, for example, in annual reports, and ii) special evaluations and surveys, for example, mid-term and end-of-term reviews, national prevalence surveys and other special studies. A baseline evaluation of indicators is proposed for 2019 to determine the current status.

Strategic areas and KRAs	Proposed input and process indicators	Proposed output indicators
<p><b>Strategic Area No 1. Governance and coordination to reduce AMR</b></p> <p><b>Strategic Objective 1. Ensure sustainable governance through effective coordination and partnerships</b></p>		
<p><b>Key Results Areas</b></p> <p>KRA 1.1 Strengthen technical and political coordination at local, national and international levels</p> <p>KRA 1.2 Strengthen policy and legislative frameworks to support AMR initiatives</p> <p>KRA 1.3 Resource mobilization to support MSAP implementation</p> <p>KRA 1.4 M&amp;E plans, indicators and regular evaluations</p>	<ul style="list-style-type: none"> <li>• Plan completed, approved, endorsed and disseminated</li> <li>• AMR Technical Working Group membership representation</li> <li>• Policy and legislative framework developed and endorsed by stakeholders and partners</li> <li>• Number of professional societies and hospitals developing programmes on AMR with their own funding</li> <li>• Mid-term reviews conducted</li> <li>• AMR Technical Working Group meetings conducted regularly</li> <li>• Final MSAP review conducted</li> </ul>	
<p><b>Strategic Area 2. Evidence Generation through Surveillance and Laboratories</b></p>		

**Strategic Objective 2. Strengthen evidence generation through functional human, agriculture and environment laboratories and effective surveillance mechanisms**

<p><b>Key Results Areas</b></p> <p>KRA 2.1 Levelling-up existing surveillance and laboratory activities and systems to support AMR</p> <p>KRA 2.2 Strengthening human capacity for laboratories, information sharing, surveillance and outbreak response</p> <p>KRA 2.3 Strengthen equipment and supply systems in laboratories for microbiology and surveillance</p>	<ul style="list-style-type: none"> <li>• Number of new staff trained in CAVET-MAFF and FETP-MOH</li> <li>• Number of new staff trained in microbiology</li> </ul>	<ul style="list-style-type: none"> <li>• Number of human health laboratories reporting to AMR surveillance</li> <li>• Number of human health laboratories achieving level ____ in laboratory quality management</li> <li>• Number of agriculture and environment laboratories with capacity to conduct AST</li> <li>• Baseline AMR data</li> <li>• Frequency of patients sampled per specimen type per population</li> <li>• Frequency of patients with growth of non-susceptible bacteria per specimen type, species and antibiotic</li> <li>• Proportion of sampled patients with positive culture of any susceptible, intermediate or resistant pathogenic bacteria per specimen type</li> <li>• Proportion of samples with growth of non-susceptible bacteria of the species and antibiotic under surveillance per specimen type</li> </ul>
---	---	---

<b>Strategic Area 3. Rational use of antimicrobial medicines</b>		
<b>Strategic Objective 3. Develop and enforce regulation and strategies to ensure access to and rational use of antibiotics in human health, animal health and agriculture</b>		
<b>Key Results Areas</b>		
KRA 3.1 Guidance for and implementation of rational use of antimicrobial medicines		<ul style="list-style-type: none"> <li>• Staff knowledge of guidelines on AMR, AMS, IPC, GAP, GAHP, GAqP</li> <li>• Number of model farms using good practice guidelines</li> <li>• AMS monitoring indicators</li> <li>• Stock-out rates of antibiotics</li> <li>• Rate of antibiotic prescribing</li> <li>• Antibiotic consumption</li> </ul>
KRA 3.2 Regulation at different levels to support rational use		
KRA 3.3 Establish supply chain management for antimicrobials to ensure equitable and universal access for all citizens		

<b>Strategic Area 4. Containing AMR through good practices</b>		
<b>Strategic Objective 4. Reduce the incidence of infection through effective sanitation, hygiene, food safety, waste management and infection prevention measures</b>		
<b>Key Results Areas</b>		
KRA 4.1 Guidance for and implementation of good practices	<ul style="list-style-type: none"> <li>• Number of hospital and health facility staff trained and retrained for IPC</li> <li>• Number of provincial agriculture staff trained on good practices</li> <li>• Number of communities</li> </ul>	<ul style="list-style-type: none"> <li>• Number of staff using guidelines for IPC</li> <li>• Number of model farms using good practice guidelines</li> </ul>
KRA 4.2 Ensure available technologies		

and supplies to implement protocols and guidelines	registered as model villages	
KRA 4.3 Monitoring water, food safety and waste management		

**Strategic Area 5. Increase public awareness**

**Strategic Objective 5. Strengthen communication for public education and awareness**

<b>Key Results Areas</b>	<ul style="list-style-type: none"> <li>• Awareness Week Celebrations</li> <li>• IEC materials distributed</li> <li>• Number of community dialogues</li> <li>• Number of dialogues with partners and stakeholders</li> </ul>	<ul style="list-style-type: none"> <li>• Positive changes in knowledge, attitudes and practices after three years</li> </ul>
KRA 5.1 Increase public awareness through traditional media and social media		
KRA 5.2 Integrate AMR communications in programmes and activities		

**Strategic Area 6. Building capacity for AMR**

**Strategic Objective 6. Strengthen capacity of professionals and staff for AMR advocacy and support all areas of work**

<b>Key Results Areas</b>	<ul style="list-style-type: none"> <li>• Number of curricula with AMR, microbiology and rational use of antibiotics integrated</li> <li>• Number of published technical materials</li> <li>• Number of activities conducted by</li> </ul>	<ul style="list-style-type: none"> <li>• Number of national and local staff with advanced training in AMR specialties (e.g. microbiology, clinical pharmacy, AMR, AMR surveillance and response)</li> </ul>
KRA 6.1 Integrate AMR, microbiology, rational drug use and related areas in pre-service training curriculum and resources		

<p>KRA 6.2 Develop training resources and build capacity on AMR, microbiology, rational drug use and related areas in in-service training and capacity building</p> <p>KRA 6.3 Collaboration with professional societies and academics to integrate AMR and related issues for capacity building, advocacy, research and education</p>	<p>and with professional societies</p> <ul style="list-style-type: none"> <li>• Number of AMR training programmes conducted</li> <li>• Number of professional societies and hospitals developing AMR programmes with their own funding</li> </ul>	
--	---	--

<p><b>Strategic Area 7. Research and innovation for AMR</b></p>		
<p><b>Strategic Objective 7. Build research and innovation to support policy, good practice, implementation, monitoring and evaluation of AMR activities</b></p>		
<p><b>Key Results Areas</b></p> <p>KRA 7.1 Identifying AMR research gaps and priorities on AMR in areas from natural sciences, applied sciences, social sciences, economics and management</p> <p>KRA 7.2 Training and capacity building of national staff for AMR and related research</p> <p>KRA 7.3 Implementation and dissemination of AMR research</p>	<ul style="list-style-type: none"> <li>• Number of research studies conducted on topics related to AMR</li> <li>• Number of local and international research partnerships</li> </ul>	<ul style="list-style-type: none"> <li>• National prevalence rate identified through surveys and surveillance systems</li> <li>• Number of local and international presentations on AMR topics</li> <li>• Number of research studies on AMR topics peer-reviewed and published</li> </ul>

## Annex C. Stakeholders in functions and initiatives related to antimicrobial resistance in Cambodia

### Ministry of Agriculture, Forestry and Fisheries (MAFF)

Institution	Name	Position	Contact
General Directorate of Animal Health and Production (GDAHP), MAFF	H.E. Tan Phannara	Director General	<a href="mailto:tan.phannara@gmail.com">tan.phannara@gmail.com</a>
MAFF	Dr. Sar Chetra	Deputy Secretary General	<a href="mailto:chetrass@gmail.com">chetrass@gmail.com</a>
Department of Agro-Industry (DAI), MAFF	Mr. Kong Pheach	Director	<a href="mailto:peachkong@gmail.com">peachkong@gmail.com</a>
National Animal Health Production Research Institute, GDAHP, MAFF	Dr. Tum Sothyra	Director	<a href="mailto:sothyratum@gmail.com">sothyratum@gmail.com</a>
National Animal Health Production Research Institute, GDAHP, MAFF	Mr. Rortana Chea	Technical officer	<a href="mailto:rortanachea@gmail.com">rortanachea@gmail.com</a>
Department of Public Health and Veterinary Public Health, GDAHP, MAFF	Dr. Tep Bengthay	Deputy Director	<a href="mailto:bengthay@gmail.com">bengthay@gmail.com</a>
Department of Crop Protection, Sanitation and Phyto-Sanitation, General Directorate of Agriculture, MAFF	Dr. Ny Vuthy	Deputy Director	<a href="mailto:n.vuthy@yahoo.com">n.vuthy@yahoo.com</a>
Department of Agriculture Legislation (DAL), MAFF	Dr. Moch Chantha	Deputy Director	<a href="mailto:chanthamoch@gmail.com">chanthamoch@gmail.com</a>
Department of Agro-Industry (DAI), MAFF	Mrs. Chuon Mony	Chief of Laboratory Lab	<a href="mailto:chuonmony@yahoo.com">chuonmony@yahoo.com</a>
Department of Agro-Industry (DAI), MAFF	Mr. Phon Reno	Vice Chief of Laboratory	<a href="mailto:ai_reno@yahoo.com">ai_reno@yahoo.com</a>
Department of Agro-Industry (DAI), MAFF	Ms. Kong Vouchsim	Technical Official	<a href="mailto:kongvouchsim@gmail.com">kongvouchsim@gmail.com</a>
Department of Processing Technology and Quality, FiA, MAFF	Mr. Chab Piseth	Deputy Director	<a href="mailto:pisethchap@gmail.com">pisethchap@gmail.com</a>
Office of Aquaculture, Department of Aquaculture Development, Fisheries Administration (FiA), MAFF	Mr. Neang Savuthdy	Vice Chief of Office	<a href="mailto:vuthdynady@yahoo.com">vuthdynady@yahoo.com</a>
Department of Aquaculture Development, FiA, MAFF	Mrs. Phuong Sengheang	Technical Officer	<a href="mailto:heangfia@gmail.com">heangfia@gmail.com</a>
Department of Planning and Statistics, MAFF	Mrs. So Sreymom	Deputy Director	<a href="mailto:sreymomso88@gmail.com">sreymomso88@gmail.com</a>

### Ministry of Health (MOH)

Institution	Name	Position	Contact
MOH	Prof. Eng Huot	Secretary of State	
Department of Communicable Disease Control (CCDC), MOH	Dr. Ly Sovann	Director	<a href="mailto:sovann_ly@yahoo.com">sovann_ly@yahoo.com</a>

Department of Communicable Disease Control (CCDC), MOH	Dr. Krang Sidonn	Deputy Director	<a href="mailto:sidonnkrang@yahoo.com">sidonnkrang@yahoo.com</a>
Department of Health Services, MOH	Dr. Sok Srun	Director	<a href="mailto:soksrun@online.com.kh">soksrun@online.com.kh</a> <a href="mailto:soksrun@gmail.com">soksrun@gmail.com</a>
Department of Health Services, MOH	Prof. Kim Savuon	Deputy Director	
Department of Health Services – Bureau of Medical Laboratory Services (BMLS), MOH	Dr. Sau Sokunna	Deputy Director	<a href="mailto:sintouch358@gmail.com">sintouch358@gmail.com</a>
Department of Health Services, MOH	Dr. Cheu Sivuthy		
National Institute of Public Health (NIPH), MOH	Prof. Chhea Chhorvann	Director	<a href="mailto:cchhorvann@niph.org.kh">cchhorvann@niph.org.kh</a>
National Institute of Public Health (NIPH), MOH	Mr. Nov Vandarith	Official	<a href="mailto:nvandasrith@niph.org.kh">nvandasrith@niph.org.kh</a>
National Centre for Health Promotion, MOH	Dr. Chhea Chhor Daphea	Director	
Department of Human Resources (DHR), MOH	Dr. Touch Sokneang	Director	<a href="mailto:touchsokneang@yahoo.com">touchsokneang@yahoo.com</a>
International Cooperation Department, MOH	Dr. Sung Vinntak	Director	<a href="mailto:sungvinntak@yahoo.com">sungvinntak@yahoo.com</a>
National Centre for HIV/AIDS, Dermatology and STDs (NCHADS) (STD Program) MOH	Dr. Lon Say Heng	Head of STD Unit	
MOH Department of Drug and Food (DDF)	Prof. Heng Bunkiet	Director	<a href="mailto:hengbunkiet@yahoo.com">hengbunkiet@yahoo.com</a>
Department of Drug and Food (DDF), MOH	Dr. Yang Daravuth	Deputy Director	<a href="mailto:yangdaravuth@gmail.com">yangdaravuth@gmail.com</a>
Department of Preventive Medicine, MOH	Dr. Hak Sithan	Deputy Director	<a href="mailto:sithan_hak@yahoo.com">sithan_hak@yahoo.com</a>
National Centre for Tuberculosis and Leprosy Control (CENAT), MOH	Dr. Huot Chanyuda	Deputy Director	
Centre National pour Malaria (CNM), MOH	Dr. Lek Dysoley	Deputy Director	<a href="mailto:soleycnm@gmail.com">soleycnm@gmail.com</a>

### Ministry of Environment (MOE)

Institution	Name	Position	Contact
National Council for Sustainable Development (NCSD), MOE	H.E. E Vuthy	Deputy Secretary General	<a href="mailto:evuthy@gmail.com">evuthy@gmail.com</a>
General Directorate of Environmental Protection (GDEP), MOE	H.E. Heng Nareth	Director General	<a href="mailto:heng.nareth@online.com.kh">heng.nareth@online.com.kh</a>
General Directorate of Environmental knowledge and Information(GDEKI), MOE	Dr Meas Chanthyda	Deputy Director General	<a href="mailto:Measchanthyda39@gmail.com">Measchanthyda39@gmail.com</a>
Department of Hazardous Waste Management, GDEP, MOE	Mr. Chuop Sivutha	Deputy Director	<a href="mailto:Sivuthachuop097@gmail.com">Sivuthachuop097@gmail.com</a>
Laboratory Department, GDEP	Mr. Aing Haypheng	Laboratory Officer	<a href="mailto:hayphengaing@gmail.com">hayphengaing@gmail.com</a>
GDEP	Mr. Chea Leng	Deputy Director	<a href="mailto:lengmoe@gmail.com">lengmoe@gmail.com</a>
GDEP	Mr. Bol Nget	Deputy Director	<a href="mailto:ngetbol@gmail.com">ngetbol@gmail.com</a>



Institution	Name	Position	Contact
GDEP	Mr. Huot Syradoth	Vice-chief Bureau	<a href="mailto:syradoth_huot4@yahoo.com">syradoth_huot4@yahoo.com</a>
GDEP	Mr. Say Vorng	Vice-chief Bureau	<a href="mailto:sayvorng@ymail.com">sayvorng@ymail.com</a>
MOE	Mr. Pen Viseth	Vice Chief Bureau	+ 885 85 777 275
MOE	Mr. Suon Sokun	Vice Chief Bureau	+ 885 93 852 003

#### Other Ministries

Institution	Name	Position	Contact
Ministry of Rural Development	Mr. Thay Chanto		<a href="mailto:thaychanto@gmail.com">thaychanto@gmail.com</a>

#### Hospitals

Institution	Name	Position	Contact
Calmette Hospital	Dr. Huot Sotheara	Medical Director	<a href="mailto:hsotheara@yahoo.com">hsotheara@yahoo.com</a>
Calmette Hospital	Dr. Sotharith Bory	Infectious Disease	<a href="mailto:sotharith_bory@yahoo.com">sotharith_bory@yahoo.com</a> ; 012632868
Calmette Hospital	Ph. Ho Seanghuoy	Chief of Infectious Unit	
National Maternal and Child Health Center	Dr. Tung Rathavy	Director	No 31A, Rue de France (St. 47), 12202, Phnom Penh
National Pediatric Hospital	Dr. Nhep Angkeabos	Director	100 Russian Federation Boulevard, Phnom Penh; +855 23 884 137
Sihanouk Hospital Centre of Hope	Dr. Phe Thong	Director	<a href="mailto:thongphe@sihosp.org">thongphe@sihosp.org</a>
Angkor Hospital for Children	Dr. Ngoun Chanpheaktra	Medical Executive Director	<a href="mailto:pheaktra@angkorhospital.org">pheaktra@angkorhospital.org</a> ; Tep Vong (Achamean) Road & Oum Chhay Street, Svay Dangkum, Siem Reap
Angkor Hospital for Children	Dr. Miliya Thyl	Clinical Microbiologist	<a href="mailto:miliya_thyl@angkorhospital.org">miliya_thyl@angkorhospital.org</a> 089 287 059

#### Schools

Institution	Name	Position	Contact
University of Health Sciences	Dr. Saphonn Vonthanak	Rector	#73, Preah Monivong Blvd, Sangkat Sras Chak, Khan Daun

			Penh, Phnom Penh; Tel +855 (0) 23 430 559
University of Health Sciences, Faculty of Pharmacy	Prof. Chou Monidiarin	Vice Dean	<a href="mailto:cmonnidarin@uhs.edu.kh">cmonnidarin@uhs.edu.kh</a> , 016 306 668
Royal University of Agriculture - Faculty of Veterinary Medicine	Prof. Kang Kroesna	Dean	<a href="mailto:kkroesna@rua.edu.kh">kkroesna@rua.edu.kh</a>
Royal University of Agriculture - Faculty of Veterinary Medicine	Dr. Ven Vutey	Vice Dean	<a href="mailto:vennvutey@rua.edu.kh">vennvutey@rua.edu.kh</a>
Royal University of Agriculture - Faculty of Animal Science	Dr. Te Kuyhor	Dean	<a href="mailto:tkuyhor@yahoo.com">tkuyhor@yahoo.com</a>

### Laboratories

Institution	Name	Position	Contact
Institute Pasteur du Cambodge	Dr. Didier Fontenille	Director	5 Monivong Boulevard, PO Box 983, Phnom Penh; <a href="mailto:accueil@pasteur-kh.org">accueil@pasteur-kh.org</a>
Institute Pasteur du Cambodge	Agathe de Lauzanne		<a href="mailto:adelauzanne@pasteur-kh.org">adelauzanne@pasteur-kh.org</a>
Diagnostic Microbiology Development Program (DMDP)	Joanne Letchford	Country Director	<a href="mailto:joanne.letchford@dmdp.org">joanne.letchford@dmdp.org</a>
Diagnostic Microbiology Development Program (DMDP)	Joe Hessell	Clinical Pharmacist	
Diagnostic Microbiology Development Program (DMDP)	Oeng Sopheap		<a href="mailto:oeng.sopheap@dmdp.org">oeng.sopheap@dmdp.org</a>
US Communicable Disease Control – Cambodia	Robert Newman	Country Director	National Institute of Public Health, #80, 289 Samdach Penn Nouth St. (289), Phnom Penh, Cambodia
US Communicable Disease Control – Cambodia	Dr. Michael Kinzer	DGHP Program Director	<a href="mailto:mnk6@cdc.gov">mnk6@cdc.gov</a>
US Communicable Disease Control – Cambodia	Dr. Bun Sreng		<a href="mailto:iyy0@cdc.gov">iyy0@cdc.gov</a>
US Communicable Disease Control – Cambodia	Dr. Sar Boran		<a href="mailto:iez8@cdc.gov">iez8@cdc.gov</a>
Cambodia-Oxford Medical Research Unit	Prof. Paul Turner	Director & Clinical Microbiologist	<a href="mailto:pault@tropmedres.ac">pault@tropmedres.ac</a>
Armed Force Research Institutes of Medical Sciences (AFRIMS)	Mr. Lon Chanthap	Chief Field Operations	<a href="mailto:chanthapl.ca@afirms.org">chanthapl.ca@afirms.org</a> 012 976 799

### Partners

Institution	Name	Position	Contact
FAO Regional Office for Asia and the Pacific	Dr. Katinka De Balogh	Senior Animal Health and Production Officer	<a href="mailto:Katinka.DeBalogh@fao.org">Katinka.DeBalogh@fao.org</a>
FAO Cambodia	Dr. Kristina Osbjør	ECTAD Team Leader	<a href="mailto:kristina.osbjer@fao.org">kristina.osbjer@fao.org</a>
FAO Cambodia	Dr. Sokerya Seng	National coordinator on AMR	<a href="mailto:sokerya.seng@fao.org">sokerya.seng@fao.org</a>
WHO Cambodia	Dr. Kumanan Rasanathan	Health Systems Team Lead	<a href="mailto:rasanathank@who.int">rasanathank@who.int</a>
WHO Cambodia	Lkhagvadorj Vanchinsuren	Technical Officer for Medicines	<a href="mailto:lkhagvadorjv@who.int">lkhagvadorjv@who.int</a>
WHO Cambodia	Dr. Lester S A Geroy	AMR Consultant	<a href="mailto:lester.geroy@upou.edu.ph">lester.geroy@upou.edu.ph</a> , <a href="mailto:lelim22@yahoo.com">lelim22@yahoo.com</a>
WHO Western Pacific Region	Dr. Ketevan Kandelaki	Technical Officer	<a href="mailto:kandelakik@who.int">kandelakik@who.int</a>
WHO Western Pacific Region	Dr. Escalante Socorro	Team Coordinator	<a href="mailto:escalantes@who.int">escalantes@who.int</a>
WHO Secretariat (Bangkok)	Dr. David Sutherland		<a href="mailto:sutherlandda@who.int">sutherlandda@who.int</a>
World Organisation for Animal Health	Dr. Hirofumi Kugita		<a href="mailto:h.kugita@oie.int">h.kugita@oie.int</a>
European Union	H.E. George Edgar	Ambassador	220 611; No. 100 A, Preah Norodom Boulevard, Khan Daun Penh, 12207 Phnom Penh + 855 23 216 996
USAID	Ms. Polly Dunford	Mission Director	
USAID	Sotheara Nop	Development Assistance Specialist for Infectious Diseases	<a href="mailto:snop@usaid.gov">snop@usaid.gov</a>
World Bank	Ellen Goldstein	Country Director for Myanmar, Cambodia and Lao PDR	Exchange Square Building, No. 19-20, Street 106, Sangkat Wat Phnom, Khan Daun Penh, Phnom Penh
ADB Cambodia	Mr. Samiuela T. Tukuafu	Country Director	No. 29 Suramarit Blvd. (268/19) Sangkat Chaktomuk, Khan Daun Penh, Phnom Penh, Cambodia; + 855 23 215805, 215806, 216417
Australia Department of Foreign Affairs and Trade	Ms. Angela Corcoran	Ambassador to Cambodia	16B National Assembly St, Sangkat Tonle Bassac, Khan Chamkamon, Phnom Penh; +855 23 213 470
Korean International Cooperation Agency	Yun Gil Jeong	Representative	<a href="mailto:cambodia@koica.go.kr">cambodia@koica.go.kr</a> ; Phnom Penh Tower, 12th Floor, #445, Monivong Blvd, Corner Street 232, Sangkat Boeung Prolet, Khan 7

Institution	Name	Position	Contact
			Makara, Phnom Penh, Cambodia
Japan International Cooperation Agency (JICA)	Yuichi Sogano	Chief Representative	6th,7th,8th Floors, Building #61-64, Preah Norodom Blvd, Phnom Penh, Cambodia
GIZ	Thomas Waldruff	Country Director	GIZ-kambodscha@giz.de; #17, Street 306; Phnom Penh; +855(23)86011
Global Fund			
Malaria Consortium	Yves Bourny	Director	<a href="mailto:y.bourny@malariaconsortium.org">y.bourny@malariaconsortium.org</a>
Malaria Consortium	Dyna Doum		<a href="mailto:d.doum@malariaconsortium.org">d.doum@malariaconsortium.org</a>
Malaria Consortium	Prudence Hamade		<a href="mailto:p.hamade@malariaconsortium.org">p.hamade@malariaconsortium.org</a>
Malaria Consortium	Sergio Lopes		<a href="mailto:s.lopes@malariaconsortium.org">s.lopes@malariaconsortium.org</a>
University Research Council (URC)	Dr. Som Hun		<a href="mailto:shun@URC-CHS.COM">shun@URC-CHS.COM</a>
Phnom Penh Post	Yesenia Amaro	Journalist	<a href="mailto:m.yesenia.amaro@gmail.com">m.yesenia.amaro@gmail.com</a>