Republic of Sudan

Federal Ministry of Health & Ministry of Animal Resources

National Action plan on Antimicrobial Resistance

2018-2020

This Report has been developed by the Federal Ministry of Health

Acknowledgement

The Federal Ministry of Health & the Federal Ministry of Animal Resources are grateful to all those who participated in the development of the Sudan National Action Plan on AMR Containment. Our thanks extend to the Ministry of Environment and Ministry of Educations and all stakeholders.

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National action plan On Antimicrobial Resistance (One Health Approach)

The spread of infections that are resistant to antimicrobial medicines has emerged as a global threat to public health. This has been proved to be promoted by human actions such as inappropriate prescribing and imprudent use of antimicrobials, poor hospital hygiene, inappropriate use of antimicrobials in the livestock, in responsible manufacturing of antibiotics including uncontrolled release of active antibiotics into the environment.

For containing antimicrobial resistance, there is great need to promote and protect human health within the frame work of one health approach through coherent, comprehensive and integrated multi-sectoral cooperation and actions, as human, animal and environmental health are interconnected. This document summarizes the current situation regarding AMR and it is containment in Sudan along with strategic and operational plan to guide the country in overcoming this public health challenges

The goals and objectives of the Sudan National Action Plan on AMR can only be achieved through implementing strategic interventions and activities with all concerned ministries and departments joining hands with other stakeholders to collaboratively tackle these challenges.

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Abbreviation & Acronyms

AMC	Anti-microbial Consumption
AMR	Anti-Microbial Resistance
DGOP	Directorate General of pharmacy
FAO	Food And Agriculture Organization
FMOH	Federal Ministry of Health
GAP AMR	Global Action Plan on Anti- Microbial Resistance
GLASS	Global Surveillance of Anti - Microbial Resistance System
IHR	International Health Regulation
MOAR	Ministry of Animal Resources
MOE NR	Ministry of Environment & Natural Resources
MOH	Ministry of Health
OIE	International Organization for Animal Health
SNAP-AMR	Sudan National Action Plan on Anti microbial Resistance
WHA	World Health Assembly
WHO	World Health Organization
WHO EMRO	World Health Organization office for Eastern Mediterranean Region

Foreword

For the past few decades, antimicrobial resistance (AMR) has been a growing threat to effective treatment of an ever-increasing range of infections caused by bacteria, parasites, viruses and fungi. AMR results in reduced efficacy of antibacterial, anti-parasitic, antiviral and antifungal drugs, making the treatment of patients difficult, costly or even impossible.

Adoption and implementation of the Sudan National Action Plan (SNAP) on AMR is priority for the Ministry of Health (MOH) to sustained access to save antimicrobial to coming generation.

This document provides a set of statements and recommendations to rationalize the use of antimicrobials with particular emphasis in the prevention of infections and monitoring and surveillance of emerging resistance in both Human and Animal Health. Furthermore, it encourages scientific research in identified areas. The document also reflects the strong commitment of the Federal Ministry of Health (FMOH) for ensuring safe treatment and equitable access to high quality antimicrobials for all Sudanese citizens.

I am sure that the implementation of this plan at national and state levels will improve antimicrobial use and hence protect citizens against AMR threats. Therefore, I ask the stakeholders to take the necessary steps to assure the realization of these plan statements.

Finally, I do appreciate the hard work and dedication of the assigned committees from MoH, MoAR, MoE and other stakeholders together with WHO EMRO and WHO-Sudan office for supporting the development of this comprehensive plan.

Bahar Idris Abo Gardah
Minister
Federal Ministry of Health

Foreword

Antimicrobial resistance has been detected in all parts of the world; it is one of the greatest challenges to global public health today. It is being propagated by misuse of antimicrobial medicines, inadequate programs for infection prevention and control (IPC), poor-quality medicines, weak laboratory capacity, inadequate surveillance and insufficient regulation of the use of antimicrobial medicines. There is increasing collaboration among the relevant sectors, in particular, human health (WHO), animal health (OIE) and agriculture (FAO) in a tripartite collaboration according to the political declaration of the high-level meeting of the General Assembly on antimicrobial resistance towards One Health Approach.

Ministry of Animal Resources with other relevant ministries committed to Adopt and implement the Sudan National Action Plan (SNAP) on AMR to ensure continuity of successful treatment and prevention of infectious diseases with effective and safe medicines that are quality-assured, used in a responsible way, and accessible to all who need them.

I am sure this plan can be implemented at national level based on the good collaboration between the different stakeholders and our sustainable political and financial support.

Boshra Guma Aror
Ministry of Animal Resources
Minister

Executive summary (Mile stones)

Regional level:

In May 2015, the sixty-eighth World Health Assembly (WHA) endorsed the Global Action Plan on Antimicrobial Resistance (GAP-AMR) – including antibiotic resistance, the most urgent drug resistance trend.

The WHA resolution urged Member States to align their National Action Plan on AMR with GAP-AMR by May 2017. Commitment by global leaders to combat AMR was further strengthened at the High Level Meeting on AMR at the United Nations General Assembly on 21 September 2016.

Country level:

In March 2016, Sudan participated in the First Inter-country meeting of the national focal points for Antimicrobial Resistance in the East Mediterranean Region of WHO. The objective of this meeting was to build capacities of the focal points to develop National plans on AMR.

In May 2016, Sudan requested a mission from WHO-EMRO Country Capacity Review Mission for Early Implementation of AMR Surveillance in Sudan and conducted a workshop on the same issue with all stakeholders on AMR in FMoH.

In January 2017, FAO and OIE with Ministry of Animal Resources organized a workshop on engaging the food and agriculture sectors in Sub-Sahara Africa and South and South-east Asia in the Global efforts to combat Antimicrobial resistance using a One Health approach.

In March 2017, the WHO Essential Medicines and Health Technologies organized training workshop on WHO program on surveillance of antimicrobial consumption (AMC) With Directorate General of Pharmacy DGoP – FMoH.

In July 2017, WHO-EMRO conducted a workshop on the National Consultation for Development of National Action Plan on antimicrobial resistance for Sudan Khartoum

This constituted the first step of the actual development of the Sudan National action plan on combating AMR, it pulled together all the previous efforts in this matter and drafted a document.

The workshop took place during 24 to 27 July 2017 with wide participation from different states and different disciplines. The attendants were over 60 including human health, Livestock, Academia, and Research Centers. Unfortunately there was no representation of the Agriculture sector or the Private sector.

The workshop identified ten strategic priorities areas in human and animal sectors aligned with the global action plan based on the national situation analysis, needs and priorities which included:

1. Build up awareness and understanding of Antimicrobial Resistance through effective and comprehensive behavior change communication, education and training among all relevant health and non-health sectors at all levels.
2. Human Sector Set up integrated National Surveillance System of AMR in Sudan
3. Animal Sector Establishment and Implementation of active, affordable and integrated AMR surveillance plan for animal, agriculture and environment sectors under the concept of one health approach
4. Prevent and control of health care associated infections through a comprehensive IPC program at national, State and Health care facility levels
5. Strengthening disease prevention and bio-security in animals, food and agriculture
6. Implement, strengthen and promote diseases prevention practices in community including access to safe water, sanitation and hygiene
7. Access to high-quality regulated antimicrobials
8. Antimicrobial stewardship
9. Promote investment in AMR research activities

Situation analysis

AMR in Sudan Human sector

Antibiotics are valuable therapeutic agents that brought many infectious diseases under control. Today, they are indispensable in all health systems. Achievements in modern medicine, such as

major surgery, organ transplantation, and cancer chemotherapy would not be possible without access to effective treatment for bacterial infections.

Unfortunately, the imprudent use of these medicines is bringing their miraculous effect to an end. The rapid development of resistance is threatening heath security globally and Sudan is no exception. Antimicrobial resistance (AMR) is increasingly recognized as a key public health concern for both developed and developing countries due to its potentially alarming socioeconomic impact on health.

Numerous studies conducted in Sudan have revealed high rates of development of resistant strains in a number of pathogens showing the seriousness of the issue.

- 90% to 100% of *Enterobacteriaceae* isolates in Ibn Sina Hospital during 2008 - 2010 were resistant to 3rd generation cephalosporins
- 78% and 80% of *E. coli* and *K pneumoniae* respectively were ESBL producers. 51% of Staph aureus were MRSA
- Vancomycin-resistant *enterococcus* ranged from 21% in Soba Hospital to 33% at the National Health Laboratory
- 3%-5% of *Pseudomonas spp* and non-fermenters were resistant to carbapems

Surveillance of AMR is now one of the components of International Health Regulation (IHR). In 2012, the World Health Assembly[i] urged Member States to take the necessary steps to prepare and carry out appropriate national implementation plans in order to ensure the required strengthening, development and maintenance of the core public health capacities as provided for in the International Health Regulations (2005).

An analysis of AMR situation in Sudan has presented a picture that clearly calls for urgent efforts to address the current situation as described below.

Awareness

In regard to awareness and understanding of AMR, numerous efforts have been done by different institutes. However, there is profound lack of harmony and collaboration to promote one message that promotes the rational use of antibiotics. Raising awareness about AMR was mainly

confined to the public and health professionals; nonetheless, it should extend to decision and policy makers and the different levels of the government.

AMR was not found to be a core component of professional education. However, some medical schools had individual efforts in teaching the rational use of medicine and essential medicine concept with very little emphasis in AMR. On the other hand, there are ongoing efforts to revise elementary and secondary school curricula to adapt them according to the changing needs of the society. The importance of AMR has been well acknowledged by the Ministry of General Education, however, technical expertise and training of teachers and preparation of topic guides may be needed to ensure proper inclusion of AMR in the current curricula.

With regard to multi-sectoral (one- health) coalitions to address antimicrobial resistance, the existence of an AMR committee is an asset. However, it needs expansion to include more actors especially from the non-health sector in order to address the issue efficiently. The committee also needs more power if it's to oversee the implementation of future strategies in this matter.

Surveillance

Lack of evidence is a big hindrance in effective planning and has a major effect in making important decision on antimicrobials. The poor laboratory network system and the absence of a functioning surveillance system, with regard to the extent of use and consumption of antibiotics together with the detection and reporting of priority AMR pathogens, are major challenges. However, some promising initiatives are finding their way; such as the joining of Sudan to the WHO Global Antimicrobial Resistance Surveillance System (GLASS) project and setting systems to oversee and monitor antibiotic use and consumption at different levels.

Hygiene & Infection control

There is no clear relationship or collaboration between partners who play an important role in reducing the incidence of infection through effective sanitation, hygiene and infection prevention measures. These include, among others, the Ministry of Environment, Natural Resource and Physical Development (MOEN), the Environmental & Food Control Department (EFCD).

At the healthcare facilities level, non-adherence to existing guidelines and infection control measures due to lack of training; monitoring and supervision mechanisms are major concerns. It is also important to mention the absence of an effective infection control programme in healthcare settings and lack of reliable data on antimicrobial susceptibility which are important factors in the dissemination of multi-resistant organisms.

Use

Optimizing the use of antimicrobial medicines in human and animal health need special attention. There is lack of supervisory or monitoring systems to ensure rational prescribing, and appropriate dispensing of antimicrobials for humans and animals in both public and private sectors. The system is weakened due to low capacity in regard to monitoring.

Similarly, poor access and availability of essential antibiotics may indeed be leading to inappropriate prescription and overuse of certain types that may contribute to development of multi-drug resistance.

A number of policies and guidelines pertaining to medicine use and antibiotics have been developed. Nevertheless, it is important to consider that the development of policies and guidelines alone is not enough. This should be coupled with wide dissemination, followed by regular supervision and monitoring to ensure their use in order to achieve the desired outcomes.

Lastly, there is a need to develop the economic case for sustainable investment that takes into account the needs of Sudan. Research initiatives to analyze the costs and benefits regarding the impact of interventions to combat AMR in the country, financial plans and collaborative partnerships with research institutions and private sectors to mobilize resources for combating AMR are important.

Overall, capacities with regard to combating antimicrobial resistance are available in Sudan. It has been found that most of the necessary infrastructure in the form of institutions, committees are in place, though scattered and operating independent from each other.

There is realization for the need to harmonize and coordinate all activities related to AMR through a structured organ that is properly resourced and given the authority for making decisions and taking appropriate actions as needed. This is seen to be the key for joining forces on the development of the global action plan to combat the problem of AMR. The presence of a body to address the issue of AMR with the aim of developing policies and guidelines and bringing different institutions under a single umbrella would contribute to the desired outcome of combating AMR in the country. A more integrative approach will certainly maximize efficient use of the available limited resources.

In summary, the Guiding Principles in combating AMR includes the engagement of society and one-health. This calls for involvement of human health, animal health, agriculture, food security, environment and economic development. According to the current situation involvement of human health stakeholders alone is a challenge. In order to successfully achieve better outcomes, governance, integration, coordination, and collaboration are pertinent.

AMR in Sudan Animal Sector

Antimicrobials, the most important, if not indispensable so far, microbes combating tool for both human and animal infections, may lose much of their effectiveness due to the capability of pathogenic or non-pathogenic microorganism to develop AMR. Studies on AMR in food and agriculture sector in Sudan are scarce, fragmentary, and riddled with gaps. The analysis of AMR situation in agriculture and animal health in Sudan has presented a picture that clearly identified the strengths and the gaps and calls for urgent efforts to address the current situation of AMR as highlighted below.

Awareness

The Ministry of Livestock mounted three extension campaigns, on the average, annually; none of them had specifically addressed AMR. However, 30% of its weekly-20 minutes edition of the national broadcasting service was used for stressing strict compliance with AMs withdrawal periods, rational AMU, and AM residues in food. Moreover, an FM radio station at a frequency of 98.6 MHz is expected to broadcast an extension service program pertaining to the well being of livestock in 2017. AMR was not found to be a core component of professional education however two universities introduced AMR for undergraduate studies.

Surveillance

The laboratory capacities of one central, two sub sectoral (fish and wildlife), two private, and eleven state (regional) laboratories are variable and, in some cases, require immediate support if not rehabilitation. The bacteriology and poultry diseases departments of the CVRL are fit to conduct laboratory investigations relevant to most aspect of AMR. Creation and enforcement of a respective regulation and establishment of a regulatory body are urgently needed. Gaps are defined and their "bridging" solutions are suggested. The national laboratory infrastructure meets partially the needs of the VS, but is not entirely sustainable, as organizational deficiencies with regard to the effective and efficient management of resources and infrastructure. However all buildings are actually below the international standard for BSL 2. All are poorly maintained with very poor hygiene conditions. No AMR surveillance was carried out on national base, however, many scholarly studies have been carried out to fulfill the requirement of academic degrees and much attention has been directed towards certain bacteria. There is no approved systematic technical reporting channel for antimicrobial assays and residues.

AMU

The AMU is not regulated and AMs can be easily obtained over the counter from pharmacies, general stores and market stalls. No maps of antimicrobials sales and distribution pathways are available now, furthermore, no specific guidelines on AMU, its slowing down, control or application of the precautionary principle for AMR in animals are available. Empirical up-to-date information and statistics are difficult to find and, if they happen to be present, they are – to a large extent – inconsistent as well as divergent. Precisely, there is not yet an obvious political support for rational AMU and/or AMR combat. There is no national framework of antimicrobials use and monitoring no designatory data to indicate which department is responsible for supervising AMU. The Ministry of Agriculture and Animal Resources of Khartoum State has no mapping of documented antimicrobial information that describes their sales and distribution points. The regulatory legislation of Khartoum State Ministry of Agriculture and Animal Resources does not contain any item on AMU or AMR as previously mentioned. The department responsible for control and regulation of AMU, AMR and AM residues is not designated.

Hygiene & Infection control

There is no IPC manual to reduce the incidence of infection through effective sanitation, hygiene and infection prevention measures in the animal health sector.

In summary, the emergence of resistant strains, the absence of functioning surveillance systems, the imprudent use of antimicrobials at animal and human level coupled with poor awareness, poor hygiene & infection control practices and weak regulations creates a highly conducive environment for the rapid development of antimicrobial resistance.

Hence, reduction of AMR requires the engagement of the whole society, prevention first; access not excess and sustainable political will and financing.

Strategic Priorities aliened with GAP

SO	Global Action Plan on AMR	Sudan
1	Improve awareness and understanding of antimicrobial resistance through effective communication, education and training	Build up awareness and understanding of Antimicrobial Resistance through effective and comprehensive behavior change communication, education and training among all relevant health and non-health sectors at all levels.
2	Strengthen the knowledge and evidence base through surveillance and research	Set up an integrated National Surveillance System for AMR in Sudan Establishment and implementation of an active and integrated AMR surveillance plan for animal, agriculture and environment sectors under the concept of One health Approach
3	Reduce the incidence of infection through effective sanitation, hygiene and infection prevention measures	Prevent and control of health care associated infections through a comprehensive IPC program at national, State and Health care facility levels Strengthening disease prevention and bio-security in animals, food and agriculture Strengthen and promote diseases prevention practices in the community including proper hygiene, sanitation and access to safe water
4	Optimize the use of antimicrobial medicines in human and animal health	Access to high-quality antimicrobials Well- regulated use of antimicrobials Implementing Antimicrobial stewardship

5	Develop the economic case for sustainable investment that takes account of the needs of all countries, and increase investment in new medicines, diagnostic tools, vaccines and other interventions	Promote investment in AMR research activities

Sudan Response

It has become known that resistance of microbes to antibiotics is a threat to public health at the global and national levels, which necessitated international organizations WHO, FAO, OIE and other partners' call for collaboration to tackle it. The impact of AMR has become clear on the health and safety of humans and animals and the economic implications in the future

Sudan has exerted efforts to deal with this phenomenon early as shown below:

- This problem has been dealt with within the strategic plan of the Federal Ministry of Health and has not been taken as a separate plan, but as a main component of the Federal Ministry of Health plans
- The Directorate General of Pharmacy has developed the National Medicines Policy to rationalize medicines use. It has also developed the National Essential Medicines List and Standard Treatment Guidelines and Antibiotic Prescribing Policy and other policies regarding antimicrobial consumptions.
- The National Drug Policy (NDP) has been developed with the participation of the various parties concerned with the interest of organizing, trading, marketing and determining the priorities of the country. The NDP is an effective framework for the development and rationalization of the use of medicines.
- Medicines legislation, the Medicines and Poison Act, and the provision of Regulations for both human and animal sectors control the quality of medicines and license for pharmaceutical establishment and have sound political commitment

- The General Directorate of Quality in the Federal Ministry of Health has updated, launched and distributed the Infection Control Manual to reduce the spread of infection and protect patients.
- National plan for containment of antimicrobial resistance:

  In line with the International Health Regulations (IHR) and the recommendations of the World Health Ministers and the UN resolutions of Member States and the decisions of the Regional Office for the Eastern Mediterranean to adopt a national plan to combat AMR two focal points have been nominated for human and animal health.
- Sudan participated in the first meeting of focal points of the Eastern Mediterranean countries in the State of Morocco in March 2016. The meeting was aimed at building capacity to develop national plans
- A national mechanism has been established to develop the national action plan by a decree from the FMoH comprising representation from all stakeholders reflecting further political commitments.
- Sudan has joined GLASS and assigned a National Reference lab and sentinel sites

Governance

Recommendations to strengthening NAP ON AMR

1. AMR should be steered in a high-level multi-sectorial POLITICAL platform with decision making authority to oversee the implementation of the National Action Plan on AMR and this could be achieved through the currently existing **National Council for Healthcare Coordination**.

   Human health, food and agriculture sector, animal health and environment are primary internal stakeholders.
2. Establishment of AMR secretariat office to co-ordinate between stakeholders
3. AMR National Focal Point for human health and AMR National Focal Point for animal health act as the secretariat.
4. AMR State/Localities Focal Points: To be nominated

Stakeholders for SNAP implementation

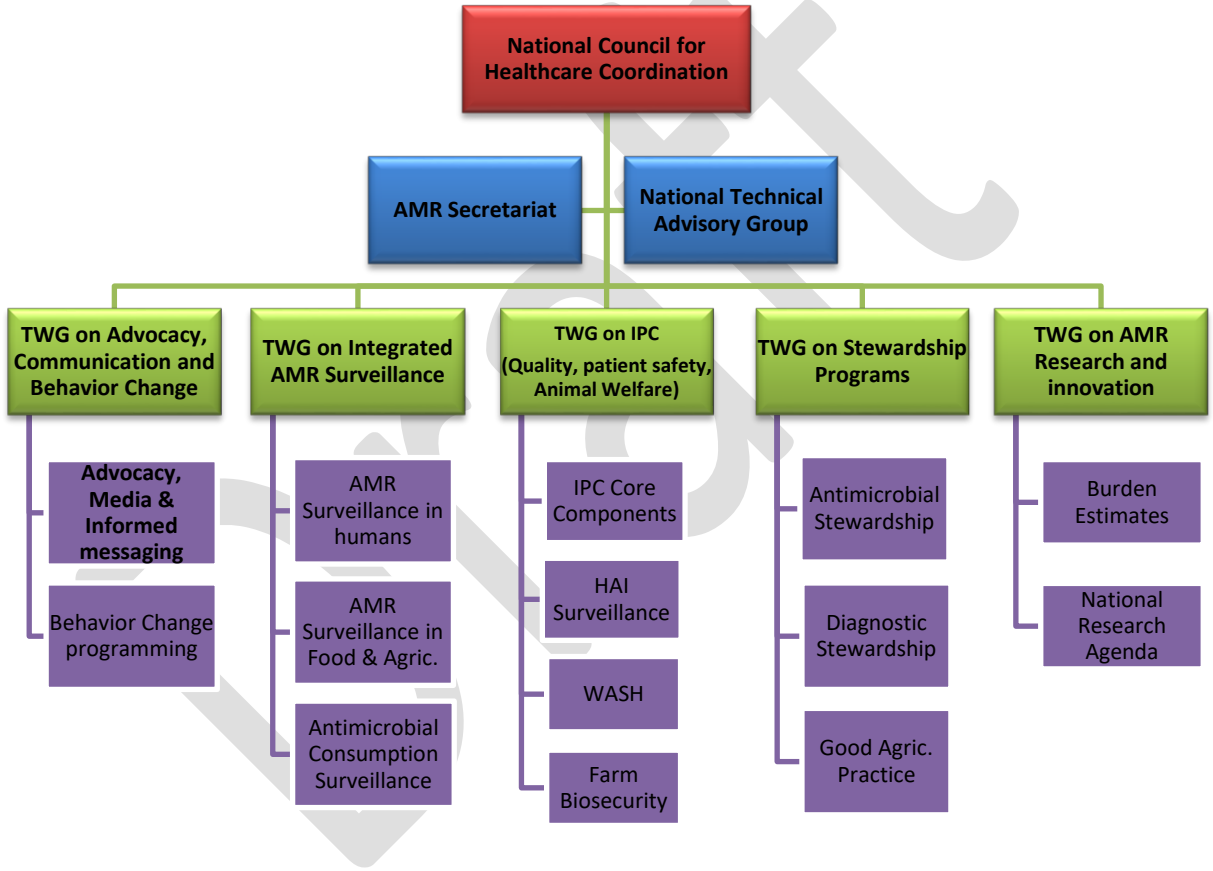
Several stakeholders have different roles, at different levels, in governing the implementation of NAP ON AMR.

Priority intervention

Priority intervention	**Responsible bodies**
Build up awareness and understanding of Antimicrobial Resistance through effective and comprehensive behavior change communication, education and training among all relevant health and non-health sectors at all levels.	FMoH, MoAR, SMoH, DGoP, DGoPHC, MoE
Set up an integrated National Surveillance System of AMR in Sudan	FMoH, NPHL, SMoH,
Establishment and Implementation of an active and integrated AMR surveillance plan for animal, agriculture and environment sectors under the concept of One Health Approach	MoAR, MoA, DGOPHC Animal health & zoonotic disease, Meat hygiene and quarantine
Prevention and control of health care associated infections through a comprehensive IPC program at National, State and Healthcare facility level.	FMoH, MoAR, SMoH, DGoQ Animal Production Fisheries Administration
Strengthening disease prevention and bio-security in animals, food and agriculture	FMoH, MoAR , SMoH, DGoQ Animal Production Fisheries Administration
Strengthen and promote diseases prevention practices in the community including proper hygiene, sanitation and access to safe water.	FMoH, MoAR , SMoH, DGoQ Animal Production Fisheries Administration Ministry of environment
Access to high-quality regulated antimicrobials Well-regulated use of antimicrobials	NMPB-National Medicines and Poison Acts. SMC-License for professional practice, Veterinary council-License for professional practice. NMSF-Supply Chain
Implementing Antimicrobial stewardship	FMoH, MoAR, SMoH, DGoQ Animal Production Fisheries Administration

Promote investment in AMR research activities	Ministry of higher education and scientific research, Ministry of Health, agriculture and animal recourses, Ministry of finance

Governance structure



Vision:

Towards a healthier Sudan free from AMR threat

Mission:

To retain and develop national capacities for the prevention and control of AMR through one health approach

Goal

To protect all population of Sudan against threats of AMR while ensuring, for long as possible, successful treatment and prevention of infectious diseases with effective and safe medicines that are quality assured, used in a responsible way and accessible to all who need them. And monitor antimicrobial resistance and to contribute to regional and global research.

Strategic Objectives

Strategic objective 1: **Improve awareness and understanding of antimicrobial resistance through effective communication, education and training.**
Interventions: 1. To strengthen the advocacy, communication and behavior change on AMR at Federal and State level. 2. To strengthen and consolidate AMR and related topics as core components of education and training.
Strategic objective 2:

Strengthen the knowledge and evidence base through surveillance and research.

Interventions:

1. To establish a National Surveillance System of AMR in Sudan to include the Ministries of Health, Animal Resources, Agriculture, and Environment.
2. Capacity building of The National Reference laboratory for human and animal sectors

Strategic objective 3:

Reduce the incidence of infection through effective sanitation, hygiene and prevention measures.

Interventions:

1. Strengthen and complete the National, State, and healthcare facility infection control programs
2. Establishing a National healthcare associated Infections (HAI) surveillance in integration with the national AMR surveillance system.
3. Strengthen environmental control measures in healthcare settings
4. Promoting good practices at all steps of production and processing of foods from animal and plant sources
5. Strengthen the national capacity to provide safe water, sanitation and hygiene
6. Conduction of awareness campaigns about hygiene and safe water

Strategic objective 4:

Optimize the use of antimicrobial medicines in human and animal health.

Interventions:

1. Strengthen national regulatory authority and regulation for improved quality, safety and efficacy of antimicrobials
2. Ensure the access to antimicrobials at all levels
3. To ensure the prudent use of antimicrobials
4. Monitor antimicrobial consumption and use in health institutes
5. Strengthen national regulatory authority and regulation for improved quality, safety and efficacy of antimicrobials

Strategic objective 5:

Prepare the economic case for sustainable investment, and increase investment in new medicines, diagnostic tools, vaccines and other interventions.
Interventions: 1. To promote research to identify the magnitude and need for combating AMR.

Operational plan & budget

Strategic Objective: Improve awareness and understanding of antimicrobial resistance through effective communication, education and training.								
Priority1:Increase awareness and improve communications regarding AMR in Sudan at different levels								
Intervention: 1.1. Assess understanding, knowledge and awareness of AMR amongst key stakeholder / target groups								
Intervention: To strengthen the advocacy, communication and behavior change on AMR at federal and state level.								
Activity	**Unit**	**Quantity**	**Date**	**Location**	**Responsibility**	**Cost $**	**Funding**	**Indicator**
To establish a multisectorial AMR communication committee as a central coordinative body and sub-committees at states to lead the communication.	Meeting	1	First year	Federal and State level	AMR Higher committee	1000	Gov	Establishment decree Meeting minutes
To develop standardized IEC material on AMR.	Meetings	4	First year	Federal level	AMR communication committee/relevant bodies	10,000	Donors	Existence of IEC material on AMR
To conduct an orientation workshop for the AMR communication committees at Federal and State level.	Workshop	1	First year	Federal level	AMR communication committee/relevant bodies	10,000	Donors	Workshop conducted
To implement a comprehensive communication program for awareness and behavior change targeting decision-makers, legislative bodies, key stakeholders and community (schools, midwives, grandmothers, key person,	Seminars Broadcasting	4 12	First year Annually	Federal and State level	AMR communication committee and relevant bodies (health promotion	100,000	Donors	Number of activities/ years

and leader, traditional healers, breeders, traders, etc) through partnership and collaborative approach (NGOs, private sector, etc).	Campaigns Etc	1	One/year		depts., extension departments)			
Activity	**Unit**	**Quantity**	**Date**	**Location**	**Responsibility**	**Cost $**	**Funding**	**Indicator**
Intervention: To strengthen and consolidate AMR and related topics as core components of education and training								
To incorporate AMR and related topics as core components of health and veterinary professionals' education and training.	Meetings Workshops	2	First–second year	Federal level	AMR communication committee Responsible bodies (MoHE)	30,000	Donors	Training modules on AMR available
To introduce the concept of AMR and appropriate use of antimicrobials as part of school curriculum	Meetings Workshops	3-4	First–second year	Federal level	Ministry of Education/AMR communication committee	20,000	Donors	AMR in school curricula/ activities
Strategic Objective: Strengthen the knowledge and evidence base through surveillance and research								
Intervention: to establish a National Surveillance System of AMR in Sudan to include the Ministries of Health, Animal Resources, Agriculture, and Environment								
Activity	**Unit**	**Quantity**	**Date**	**Location**	**Responsibility**	**Cost**	**Funding**	**Indicator**
To establish a multisectorial AMR surveillance committee as a central coordinative body and sub-committees	Meeting	1-2	First year	Federal and State level	AMR Higher committee	10,000	Gov	Establishment of decree

at states to lead the surveillance of resistant pathogens.								Meeting minutes & Directives
To strengthen and consolidate the currently available national disease surveillance system to include AMR.	Meeting Purchase Training	1	First year	Federal and State level	Epidemiology Dept. NPHL-AMR surveillance committee	500,000	Gov	Integrated national disease surveillance system
Intervention: Capacity building of The National Reference laboratory for human and animal sectors								
Activity	**Unit**	**Quantity**	**Date**	**Location**	**Responsibility**	**Cost**	**Funding**	**Indicator**
To develop the capacity of the designated National Reference Laboratory for human as stated by the GLASS roadmap (NPL, Soba, Omdurman)	Purchase Training workshops	1	First year	Federal level	FMoH-NPHL	1,500,000	Donors	Number of reports on priority AMR pathogens
To develop the capacity of the designated National Reference Laboratory for AMR in animal and agricultural sector	Purchase Training workshops	2	First year	Federal level	MoAR - CVRL	1,500,000	Donors	Number of reports on priority AMR pathogens
To build the capacity of the 4 identified regional veterinary research labs to detect the priority AMR pathogens	Purchase Training workshops	2	First-Second year	Federal and State level	CVRL	1,500,000	Donors	Number of reports on priority AMR pathogens

To develop and implement a surveillance system to collect, analyze and disseminate information on resistant pathogens in animal sector	Meeting Purchase	1	Continuous	Federal and State level	FMoH-Epidemiology Dept. MoAR	50,000	Donors	Number of reports on priority AMR pathogens

Strategic Objective: Reduce the incidence of infection through effective sanitation, hygiene and prevention measures in humans and animals.								
Intervention: Strengthen and complete national, State and health care facility infection prevention and control programs								
Activity 1: Complete the approved organization structure at all levels (National, state and facility level)								
Activity	**Unit**	**Quantity**	**Date**	**Location**	**Responsibility**	**Cost $**	**Funding**	**Indicator**
To establish a multisectorial AMR IPC committee as a central coordinative body and sub-committees at states to reduce the incidence of infection through effective sanitation, hygiene and prevention measures in humans and animals.	Meeting	1	First year	Federal state and local level	AMR IPC committee	4,000	Gov	Establishment decree
To complete the organization structure of the IPC program at Federal level	Meeting	1	2018	FMOH	FMOH-Quality Directorate	0	Gov	Complete structure of

								IPC program
To complete the organization structure of the IPC program at State level	Structures	18	2018-2019	SMOH (states)	SMOH	0	Gov	Complete structure of IPC program
To complete the organization structure of the IPC program at healthcare institutions (18 central hospitals)	Structures	18	2018-2019	Central Hospital at State	SMOH +Central hospital	0	SMOH	Complete structure of IPC program
Provision of national policies, guidelines, and operational manuals on IPC (translation, printing and dissemination)	Meeting Printing Dissemination	4 2000 52 States	2018	FMoH	FMoH (Quality IPC Directorate) + IPC national committee	50,000	WHO/GF	Documents available
Activity	**Unit**	**Quantity**	**Date**	**Location**	**Responsibility**	**Cost**	**Funding**	**Indicator**
To develop operational manuals for critical areas	Meeting Workshop	2	2019	FMoH	FMoH (Quality IPC Directorate) + IPC national committee	10,000	WHO/GF	2 operational manuals available
Capacity building of healthcare workers at the national, State and facility levels on basic IPC principles and AMR	Workshop	4	2018-2019	FMoH	FMoH (Quality IPC Directorate) + IPC national committee	30,000	WHO/GF	Number of healthcare workers trained
Establish healthcare worker protection and periodic testing for HCW measures	Test	Continuous	2019	Central hospitals	FMoH, SMoH	0	States	Number of healthcare

against infectious diseases (pre-employment vaccination, periodic testing for HCW)	Vaccination							workers tested and vaccinated
Intervention: Establishing a national Healthcare Associated Infections (HAI) surveillance in integration with the national AMR surveillance system.								
Develop a national HAI surveillance team at national level in coordination with the AMR surveillance system	Survey Surveillance	1 Continuous	2018-2019	*FMOH*	Central Hospitals, FMoH, SMoH	0	WHO/GF	Survey Results Monthly reports
Intervention: Strengthening environmental control measures in healthcare settings								
To implement environmental measures at healthcare facilities (water, waste, sanitation, indoor air quality) to meet the national standards	Assessment	1	2018-2019	Central hospitals	Central hospitals + SMOH	0	Donors	Assessment reports available Plan to address measures implemented
Intervention : Infection prevention control in food and agriculture sectors								
Activity	**Unit**	**Quantity**	**Date**	**Location**	**Responsibility**	**Cost**	**Funding**	**Indicator**
Promoting vaccine production, utilization and providing alternatives to the use of antibiotics in agriculture	Policies Purchase Workshops	1 Continuous	2018-2019	Federal and State level	MoAR (ARRC)	200,000	Gov Donors	Policy available Number of vaccines developed
Interventions: Promoting vaccine production and utilization and developing alternatives to the use of antibiotics in agriculture								

To develop and implement a system for proper disposal of carcasses and animal by-products	Meeting Workshops	Continuous	2018-2019	Federal and State level	MoAR FM of En	50,000	Donors	Disposal system in place
To develop guidelines regulations to maintain animal welfare during transport	Meetings	1	2018-2019	Federal level	MoAR	4,000	Gov	Guidelines available
Interventions: Implement, strengthen and promote infection prevention practices including access to safe water, sanitation and hygiene								
Strengthen the national capacity to ensure proper sanitation and hygiene through regulations of waste disposal systems	Meetings	2-4	2018-2019	Federal level	FMoH, FmoEn, MoAR	6,000	Gov	Regulations available
To ensure the availability of safe water by assessment of its microbial quality from different sources	Surveys Purchase	Regular	2018-2019	Federal and State level	Water resourcs Corp., SSMO, CVRL, NPHL	100,000	Donors	Reports
Conduction of campaigns on WASH at different levels in coordination with relevant ministries	Campaigns	Regular	2018-2019	Federal and State level	FMoH, CPS, UNICEF	100,000	Donors	Number of Campaigns

Strategic Objective: Optimize the use of antimicrobial medicines in human and animal health.								
Intervention: Strengthen national regulatory authority and regulation for improved quality, safety and efficacy of antimicrobials								
Activity	**Unit**	**Quantity**	**Date**	**Location**	**Responsibility**	**Cost $**	**Funding**	**Indicator**

To establish a multisectorial AMR committee on optimization of use as a central coordinative body and sub-committees at states to ensure the prudent use of antimicrobials.	Meetings	1	First year	Federal and State level	AMR higher committee	4,000	Gov	Establishment decree
To review and update policies and regulations on use and access to antimicrobials in humans and animals (NDP, AB Policy etc)	Meetings Workshops	10	2018-2019	Federal level	DGoP, NMPB, NMSF & stake holders MoAR	100,000	Donors	National Documents updated
To enforce regulations on the prescribing and dispensing of antimicrobials in humans and animals	Supervision & assessment Visits	Regular	2018-2019	Federal state and local level	DGoP, SMC, NHIS, SVC & stakeholders MoAR	50,000	Donors	% compliance to laws
To strengthen the post-marketing surveillance system to prevent substandard falsified antimicrobials	Purchase	Continuous	Annual	Federal and state level	NMPB, SVC	300,000	Gov	% of sample tested
Monitor safety of new antimicrobials through pharmacovigilance activities	Survey	Continuous	First year	Federal state and local level	DGoP, SVC	200,000	Donors	Active programme
Intervention: Ensure the access to antimicrobials at all levels								
Activity	**Unit**	**Quantity**	**Date**	**Location**	**Responsibility**	**Cost $**	**Funding**	**Indicator**

To review and update the STGs, EML and the NMSF procurement list to include new antibiotics	Meetings Workshops	Every 2year	First year	Federal level	DGoP, NMPB NMSF, SVC	10,000/ year	Donors	Documents up to date
Activity	**Unit**	**Quantity**	**Date**	**Location**	**Responsibility**	**Cost $**	**Funding**	**Indicator**
To measure the availability & PRICE of antibiotics at health care facilities	Surveys	Every year	First year	Federal state and local level	DGoP & stake holders	10,000/ year	Donors	Availability of report
Intervention: To ensure the prudent use of antimicrobials in human and animals								
Activity	**Unit**	**Quantity**	**Date**	**Location**	**Responsibility**	**Cost $**	**Funding**	**Indicator**
To establish multidisciplinary antimicrobial stewardship programmes at various levels of healthcare facilities	Meetings Training workshops	5 2	2018-2020	Federal state and local level	DoQ DoCM DGoP & stake holders	50,000	Donors	Active program
To establish a multidisciplinary antimicrobial stewardship programmes at animal healthcare facilities	Meetings Training workshops	1 1	2018-2020	Federal state and local level	MoAR, SVC	30,000	Donors	Active program
To develop a policy on restriction and phase-out of the use of antimicrobials as growth promoters and for disease prevention in animals	Meetings Workshops	1 1	First year	Federal state and local level	MoAR, SVC	20,000	Donors	Availability of Guide lines
To develop regulations to restrict and gradually eliminate the use of antibiotics, which are critically important for humans in non-human	Meetings Workshops	1	First year	Federal and State level	MoAR, SVC, FMoH	30,000	Donors	Availability of Guide lines

sectors especially food-producing animals								
Intervention: Monitor antimicrobial consumption and use in health institutes								
To develop a system to monitor the consumption of antimicrobials at public health facilities	Surveillance	Annual	2018-2020	Federal state and local level	DoQ, DoCM, GDoP, MoAR	100,000	Donors	Availability of report

Strategic Objective: Promote investment in AMR research activities								
Intervention: to promote research to identify the magnitude and need for combating AMR								
Activity	**Unit**	**Quantity**	**Date**	**Location**	**Responsibility**	**Cost $**	**Funding**	**Indicator**
To prioritize research gaps and research needs in AMR, AMU and antimicrobial residues	Meeting	Every 2 years	2018	Federal level	AMR Higher committee, Educational institutions, national research Council	5,000	Donors	Research areas identified
To study the economic impact of AMR due to irrational use of Antimicrobials in humans and agriculture	Survey	1	2019	Federal and state level	Relevant Ministries	50,000	Donors	Survey report

Monitoring and evaluation plan

Planning element (activity linked to strategic plan)	Indicator	Value calculation	Frequency	Data source	Methods	Base line
Strategic Objective: Improve awareness and understanding of antimicrobial resistance through effective Communication, education and training.						
To establish a multisectorial AMR communication committee as a central coordinative body and sub-committees at states to lead the communication.	Number of positive decisions taken by the committee	Figure	Annually	FMoH , SMoH FMAR S MAR & relevant bodies	Key informant inter view & Report Review	**0**
To develop a standardized IEC material on AMR.	Existence of IEC material on AMR.	Figure and type	Annually	FMoH , SMoH	Key informant inter view & Report Review	**0**
To conduct an orientation workshop for the AMR communication committees at federal and state levels, breeders, traders, etc) through partnership and collaborative approach (NGOs, private sector, etc). State level.	Number of WORK SHOPs conducted	Figure	Annually	FMAR S MAR	Key informant inter view & Report Review	**0**
To implement comprehensive communication program for awareness and behavior change targeting decision-makers, legislative bodies, key stakeholders and community (schools, midwives, grandmothers, key person, and	% Improvements in perceptions on AMR	%	Annually	Communities	Surveys	0

Planning element (activity linked to strategic plan)	Indicator	Value calculation	Frequency	Data source	Methods	Base line
leader, traditional healers, breeders, traders, etc)through partnership and collaborative approach (NGOs, private sector, etc).						
To incorporate AMR and related topics as core components of health and veterinary professionals' education and training.	% of universities adopting the modules on AMR	%	5 years	Higher education	Check list	0
Introduce concept of AMR and appropriate use of antimicrobials as part of school curriculum	% of schools having concept of AMR and appropriate use of antimicrobials as part of their curriculum	%	5 years	General education	Key informant inter view & Report Review	0
Strategic Objective: Strengthen the knowledge and evidence base through surveillance and research						
To establish a multisectorial AMR surveillance committee as a central coordinative body and sub-committees	Number of positive decisions taken by the committee	Figure	Annually	FMoH , SMoH FMAR S MAR & relevant bodies	Key informant inter view & Report Review	0

Planning element (activity linked to strategic plan)	Indicator	Value calculation	Frequency	Data source	Methods	Base line
To strengthen and consolidate the currently available national disease surveillance system to include AMR surveillance.	% of currently available national disease surveillance system sentinel sites Integrated With AMR surveillance	% sentinel sites Integrated With AMR surveillance	Annually	FMoH , SMoH FMAR S MAR & relevant bodies	Key informant inter view & Report Review	3
To develop the capacity of the designated National Reference Laboratory for human as stated by the GLASS roadmap (NPL, Soba, Omdurman)	% of AMR reports on GLASS Priority organism	%	Annually	FMoH , SMoH FMAR S MAR & relevant bodies	Key informant inter view & Report Review	0
To build the capacity of the identified 4 regional veterinary research labs to detect the priority AMR pathogens	% AMR reports on GLASS Priority organism	%	Annually	FMoH , SMoH FMAR S MAR & relevant bodies	Key informant inter view & Report Review	0
Strategic Objective: Reduce the incidence of infection through effective sanitation, hygiene and prevention measures in humans and animals.						
To establish a multisectorial AMR IPC committee as a central coordinative body and sub-	Number of positive decisions taken	Figure	Annually	FMoH , SMoH FMAR S MAR	Key informant inter view	0

Planning element (activity linked to strategic plan)	Indicator	Value calculation	Frequency	Data source	Methods	Base line
committees at states to reduce the incidence of infection through effective sanitation, hygiene and prevention measures in humans and animals.	by the committee			& relevant bodies	& Report Review	
complete organization structure of IPC program at federal level	Presence of Complete structure of IPC program at federal level	figure	Annually	FMoH , SMoH	Key informant inter view & Report Review & check list	0
complete organization structure of IPC program at state level	% of states with Complete structure of IPC program	%	Annually	FMoH , SMoH	Key informant interview & Report Review & check list	0
complete organization structure of IPC program at healthcare institutions (18 central hospitals)	% of central hospitals with Complete structure of IPC program	%	Annually	FMoH , SMoH	Key informant interview & Report Review & check list	0
Provision of governing documents (national policies, guidelines, and operational manuals)	% of health facilities With IPC Manual	%	Annually	FMoH , SMoH	Key informant interview & Report Review & check list	0

Planning element (activity linked to strategic plan)	Indicator	Value calculation	Frequency	Data source	Methods	Base line
Capacity building of healthcare workers at the national, state and facility levels	% of targeted personnel exposed to AMR & IPC training	%	Annually	FMoH , SMoH	Key informant interview & Report Review & check list	0
conduction of pre employment tests for HCW at the 18 central hospitals	% of pre employment tests for HCW conducted for central hospitals	%	Annually	FMoH , SMoH	Key informant interview & Report Review & check list	0
conduction of vaccination program of HCW at the targeted hospital	% of targeted hospital conducting vaccination program of HCW	%	Annually	FMoH , SMoH	Key informant interview & Report Review & check list	0
conduction of periodic testing for HCW at the targeted hospital	% of targeted hospital conducting periodic testing for HCW	%	Annually	FMoH , SMoH	Key informant interview & Report Review & check list	0
Develop a national HAI surveillance team at national level in	% of National and state hospital having HAI surveillance	%	Annually	FMoH , SMoH Health institutions	Key informant interview &	0

Planning element (activity linked to strategic plan)	Indicator	Value calculation	Frequency	Data source	Methods	Base line
coordination with the AMR surveillance system.	integrated with national surveillance system				Report Review & check list	
conduct assessment of environmental measures at the targeted hospitals	% of Health institution adopting standard of environmental measures	%	Annually	FMoH , SMoH Health institutions	Key informant interview & Report Review & check list	0
Promoting vaccine production and utilization and developing alternatives to the use of antibiotics in agriculture	Number of vaccines produced and utilized Number of antibiotics alternatives developed and used in agriculture	Figure	Annually	FMoH , SMoH FMAR S MAR & relevant bodies	Key informant inter view & Report Review	0
Promoting good practices at all steps of production and processing of foods from animal and plant sources	% of factories adopting good practices at all steps of production and	%	Annually	FMoH , SMoH FMAR S MAR & relevant bodies	Key informant inter view & Report Review	0

Planning element (activity linked to strategic plan)	Indicator	Value calculation	Frequency	Data source	Methods	Base line
	processing of foods from animal and plant sources					
Regulations of waste disposal systems(industrial, household, markets, etc) to ensure a safe environment (Environment protection)	% of states implementing Regulations of waste disposal systems	%	Annually	FMoH , SMoH FMAR S MAR & relevant bodies	Key informant inter view & Report Review	0
To assess microbial quality of drinking water from different sources	% of drinking water sources assessed for microbial quality	%	Annually	FMoH , SMoH FMAR S MAR & relevant bodies	Key informant inter view & Report Review	0
Conduction of campaigns on WASH at different levels schools, universities, etc. in coordination with relevant ministries	Number of WASH campaigns conducted at different levels	Figure	Annually	FMoH , SMoH FMAR S MAR & relevant bodies	Key informant inter view & Report Review	0

Strategic Objective: Optimize the use of antimicrobial medicines in human and animal health.						
Planning element (activity linked to strategic plan)	**Indicator**	**Value calculation**	**Frequency**	**Data source**	**Methods**	**Base line**
To establish a multisectorial AMR committee on optimization of use as a central coordinative body and sub-committees at states to ensure the prudent use of antimicrobials.	Number of positive decisions taken by the committee	Figure	Annually	FMoH , SMoH FMAR S MAR & relevant bodies	Key informant inter view & Report Review	0
to review and update policies and regulations on use and access to antimicrobials in humans and animals	Number of policies and regulations updated	Figure	Annually	FMoH , SMoH FMAR S MAR & relevant bodies	Key informant inter view & Report Review	?
To enforce regulations on the prescribing and dispensing of antimicrobials in humans and animals	% adherence and compliance to guidelines	%	Annually	FMoH , SMoH FMAR S MAR & relevant bodies	Survey & Key informant inter view & Report Review	?
To strengthen the post-marketing surveillance system to prevent substandard falsified antimicrobials	Number of sample tested	Number	Annually	NCQL NMPB	Survey & Key informant inter view & Report Review	?
Monitor safety of new antimicrobials through pharmacovigilance activities	Number of ADR reported	Number	Annually	FMoH NMPB	Key informant inter view & Report Review	?

Planning element (activity linked to strategic plan)	Indicator	Value calculation	Frequency	Data source	Methods	Base line
To review and update the STGs, EML and the NMSF procurement list	Number of documents updated of formulated	Number	Annually	FMoH , SMoH FMAR S MAR & relevant bodies	Key informant inter view & Report Review	?
To measure the availability & PRICE of antibiotics at health care facilities	% availability & Affordability of essential AB	%	Annually	Health institutions	Survey Key informant inter view & Report Review	?
title: Establish multidisciplinary antimicrobial stewardship programmes at various levels of healthcare facilities	# of health facilities with Stewardship program	Number	Annually	Health institutions	Key informant inter view & Report Review	?
title: Establish multidisciplinary antimicrobial stewardship programmes at animal healthcare facilities	# of animal healthcare facilities with Stewardship program	Number	Annually	animal healthcare facilities	Key informant inter view & Report Review	?

Planning element (activity linked to strategic plan)	Indicator	Value calculation	Frequency	Data source	Methods	Base line
To review and update the STGs, EML and the NMSF procurement list	Number of documents updated of formulated	Number	Annually	FMoH , SMoH FMAR S MAR & relevant bodies	Key informant inter view & Report Review	?
AC title: Restrict and phase-out the use of antimicrobials as growth promoters and for disease prevention in animals	% of Food production farmers using antimicrobials as growth promoters and for disease prevention in animals	Number	Annually	Food production farmers	MAR & relevant Key informant inter view & Report Review	
AC title: Restrict and gradually eliminate the use of restricted antibiotics, which are critically important for humans in non-human sectors especially food-producing animals	Number of antibiotics critically important for humans, which are Restrict and eliminate from use in non-human sectors	Number	Annually	Food and animal production farmers	MAR & relevant Key informant inter view & Report Review	

Planning element (activity linked to strategic plan)	Indicator	Value calculation	Frequency	Data source	Methods	Base line
To review and update the STGs, EML and the NMSF procurement list	Number of documents updated of formulated	Number	Annually	FMoH , SMoH FMAR S MAR & relevant bodies	Key informant inter view & Report Review	?
To develop a system to monitor the consumption of antimicrobials at public health facilities	% of public health facilities reporting to the system	%	Annually	FMoH , SMoH FMAR S MAR & relevant bodies	WHO methodology	?

Strategic Objective :Promote investment in AMR research activities						
Planning element (activity linked to strategic plan)	**Indicator**	**Value calculation**	**Frequency**	**Data source**	**Methods**	**Base line**
To establish a multisectorial AMR committee on AMR research activities as central coordinative body and sub-committees at states to ensure streamline research efforts	Number of positive decisions taken by the committee	Figure	Annually	FMoH , SMoH FMAR S MAR & relevant bodies	Key informant inter view & Report Review	0

Consultations to prioritize research gaps and research needs in AMR, AMU and antimicrobial residues.	Number of consultations completed	Number	Annual	Ministry of Livestock and Ministry of Health Information Centers	Interview with AMR Focal Points	Consultations to prioritize research gaps and research needs in AMR, AMU and antimicrobial residues.

References

1. World Health Organization: Regional Office of Eastern Mediterranean: http://www.emro.who.int
2. World Health Organization: National Action Plans : http://www.who.int/drugresistance/action-plans/en/
3. Publications on antimicrobial resistance : http://www.who.int/drugresistance/documents/en/
4. The Bulletin series: antimicrobial resistance: http://www.who.int/bulletin/antimicrobial_resistance/en/
5. Antibiotic resistance—the need for global solutions: http://www.reactgroup.org/uploads/news/The-Lancet-Infectious-Diseases-Commission-on-Antibiotic-Resistance-Nov2013.pdf
6. RAPID DIAGNOSTICS: STOPPING UNNECESSARY USE OF ANTIBIOTICS THE REVIEW ON ANTIMICROBIAL RESISTANCE: http://amr-review.org/sites/default/files/Paper-Rapid-Diagnostics-Stopping-Unnecessary-Prescription-Low-Res.pdf
7. Response to the Antimicrobial Resistance Threat: http://www.bag.admin.ch/themen/internationales/11287/15615/index.html?lang=de
8. Antimicrobial Resistance Empirical and Statistical Evidence-Base: A report from the Department of Health Antimicrobial Resistance Strategy Analytical Working Group: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/385977/AMR_EBO.pdf
9. TARGET Antibiotics Toolkit: http://www.rcgp.org.uk/targetantibiotics/
   UK One Health Report Joint report on human and animal antibiotic use, sales and resistance, 2013: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/447319/One_Health_Report_July2015.pdf
10. Potential burden of antibiotic resistance on surgery and cancer chemotherapy antibiotic prophylaxis in the USA: a literature review and modelling study: http://www.ncbi.nlm.nih.gov/pubmed/26482597
11. Alternatives to antibiotics—a pipeline portfolio review: http://www.sciencedirect.com/science/article/pii/S1473309915004661
    Antimicrobial Resistance (AMR) Systems Map: Overview of the factors influencing the development of AMR and the interactions between them: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/387746/Microbial_Maps.pdf
12. WHO Manuals

    - Global Antimicrobial Resistance Surveillance System - Manual for Early Implementation

- Global Action Plan On Antimicrobial Resistance
- The evolving threat of antimicrobial resistance Options for action

Report

- ANTIMICROBIAL RESISTANCE Global Report on surveillance
- Worldwide country situation analysis:response to antimicrobial resistance
- Worldwide country situation analysis: response to antimicrobial resistance - Summary - April 2015

Resolution

- Global action plan on antimicrobial resistance - WHA68.7 - EN - FR
- ANTIMICROBIAL RESISTANCE AND RATIONAL USE OF ANTIMICROBIAL AGENTS
- Global action plan on antimicrobial resistance - Draft resolution with amendments resulting from informal consultations
- Annual report of the Regional Director for 2012 and progress reports (EM/RC60/R.1)

Stakeholder Analysis

- Stakeholder Analysis Matrix
- Stakeholder Analysis - Winning a Partnership
- Stakeholder Analysis Plotter

Tools

- SAMPLE TEMPLATE - National action plan - on antimicrobial resistance
- National Action Plan development support tools - Sample Checklist