Republic of Mauritius

National Action Plan on

Antimicrobial Resistance

2017-2021

Ministry of Health and Quality of Life

April 2017

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FOREWORD BY MINISTER OF HEALTH AND QUALITY OF LIFE

Antimicrobial resistance has become a serious public health threat for effective treatment of an ever increasing range of infections caused by bacteria, parasites, viruses and fungi. When infections can no longer be treated by first-line antibiotics, other antibiotics must be used, which are both more expensive and more toxic. Treatment and hospitalization is prolonged, and patients undergoing operations and other medical procedures are more vulnerable to infections. All this imposes a huge burden on health care systems and on the economy of countries. This is a major challenge to the health system in Mauritius which provides health care free of user cost to the whole population.

Antimicrobial resistance has been driven by misuse of antimicrobials in people and in animals, which are often used without professional oversight. With fewer new antibiotics being developed to replace older and increasingly ineffective ones, the world is heading towards a scenario in which common infections will not be easily treatable and will once again kill.

With extensive travel and trade links throughout the world, no country is immune from drug resistant strains of microorganisms, which move freely in people, animals, plants and the environment, leading to their rapid spread worldwide. Resistance to common antibiotics is an issue that cuts across human and animal health, and food, environment and agriculture sectors. Single, isolated interventions have limited impact and therefore coordinated action is required to minimize the emergence and spread of antimicrobial resistance.

Antimicrobial resistance is putting the gains of the Millennium Development Goals at risk and is endangering the achievement of the Sustainable Development Goals. In response to this growing threat, the Sixty-eight World Health Assembly in May 2015 adopted the global action plan on antimicrobial resistance which was developed by the tripartite collaboration of the World Health Organization (WHO), Food and Agriculture Organization of the United Nations (FAO) and the World Organization for Animal Health (OIE) integrating the One Health Approach. Member States were urged to develop and have in place by May 2017, National Action Plans on antimicrobial resistance that are aligned with the objectives of the global action plan.

Mauritius is proud to have a National Action Plan on antimicrobial resistance that has been elaborated with inputs from all stakeholders and with technical assistance from the World Health Organization. I would like to thank all those who have made this National Action Plan a reality. I am grateful to the WHO for the assistance it has provided for the development of this plan and to all partner ministries for their valuable inputs.

I am confident that this document will provide the way forward for the effective and sustainable implementation of a national strategy to combat antimicrobial resistance, involving all stakeholders, with the common goal of minimizing the threat of antimicrobial resistance for a better quality of health and life in the years to come.

Dr the Honourable M. A. Husnoo, MBChB, DCh, MRCP
Minister of Health and Quality of Life

STATEMENT OF COMMITMENT: MINISTRY OF AGRO-INDUSTRY AND FOOD SECURITY

The discovery by Sir Alexander Fleming in the late 1920s that the mould *Penicillium Notatum* could produce substances that had an antagonistic action on other microorganisms marked a milestone in human medicine advancement. These substances termed as antibiotics (which means against life) have since been produced on a large scale and used to treat and manage bacterial infections, which prior to the introduction of antibiotics took a big toll on human and animal health.

In the livestock sector antibiotics are used both for the prevention and treatment of bacterial infections. In the 1950s antibiotics such as penicillin and oxytetracycline found their way in livestock feeds as growth promoters. The discovery that antibiotics fed to livestock at sub therapeutic doses produce an improved feed conversion efficiency has prompted the livestock industry worldwide to use antibiotics to boost animal production.

In 1969 the first warning about the emergence of resistance of bacteria to antibiotics in human medicine and which had been largely attributed to the widespread use of antibiotics in animals went unheeded. Economics factors prevailed over scientific reasoning and farmers lobbied for continuing to use antibiotics in animal production. Antibiotics as growth promoters are relatively cheap as compared to other non-antibiotic growth promoters. They improve productivity and animals achieve marketable weight gain in a short period of time and more importantly are within the purchasing power of consumers.

Today we are standing at a cross road. One can no longer ignore the phenomenon of antimicrobial resistance. We are in the midst of it and we have to join forces with our health and environmental partners in an endeavour to turn the tide.

At the Ministry of Agro Industry and Food Security data on the amount of antimicrobials used in the livestock and veterinary fields has started to be compiled as from 2016 in line with the guidelines laid down by the OIE. As a member state of the OIE Mauritius is required to submit this data to OIE on an annual basis.

The Ministry is embarking on the promotion of organic farming.

Under the Reinforcing Veterinary Governance in Africa project, around 125 small holder cattle breeders have been trained in basic veterinary health care since September 2015 and wherein participating breeders have been taught how to prevent management related infectious diseases such as mastitis and neo natal calf infections.

A draft legislation on Animal Health is currently being prepared. This piece of legislation will have on the one hand provisions in regards to the authorisation, importation, distribution and use of veterinary medicinal products in the livestock sector. On the other hand, the legislation will address the issue of residues of antimicrobials and other veterinary medicinal products in food of animal origin both at import and national level. It is to be emphasised that it is crucial for the Ministry to verify that products of animal origin are safe to consumers.

Livestock breeders will have to review the way they conduct their activities. The rate of adoption of good husbandry practices is low and this renders animals reared for food prone to infectious diseases and

chronic dependence on antimicrobials. This issue will be addressed through the Animal Production Bill which will make mandatory for livestock breeders to comply with the guidelines on good animal farming practices.

STATEMENT OF COMMITMENT: THE COMPETENT AUTHORITY- SEAFOOD OF THE MINISTRY OF OCEAN ECONOMY, MARINE RESOURCES, FISHERIES AND SHIPPING

The Competent Authority-Seafood of the Ministry of Ocean Economy, Marine Resources, Fisheries and Shipping is fully conscious that AMR is a major global threat of increasing concern to human and animal health. It also has implications in food safety, food security and the wellbeing of aquaculture farming households in Mauritius.

The Government of Mauritius has a vision to make the Ocean Economy one of the pillars of its economic development- leading to its transformation into a high income economy by 2025. Fisheries, seafood processing and aquaculture have been identified as key investment opportunities under the Ocean Economy. In this context, the Ministry aims to provide an enabling environment for the promotion of sustainable development of the fisheries and aquaculture sector and to ensure economic growth and social development while taking into consideration the strategic objectives and implementation of the strategic interventions laid down in the National Action Plan on the prevention of AMR for sound and healthy aquaculture development.

The Competent Authority is fully committed to prevent AMR and take appropriate measures to ensure that public health is not put at risk and the safety of the citizens of Mauritius is given top priority.

STATEMENT OF COMMITMENT: MINISTRY OF SOCIAL SECURITY, NATIONAL SOLIDARITY AND ENVIRONMENT AND SUSTAINABLE DEVELOPMENT

The Ministry of Social Security, National Solidarity and Environment and Sustainable Development will contribute to the National Action Plan on Antimicrobial Resistance by submitting, until the year 2020, isolated E. coli from rivers to the Ministry of Health and Quality of Life for Antibiotic Susceptibility Testing.

EXECUTIVE SUMMARY

The overarching goal of the Mauritian National Action Plan on Antimicrobial Resistance is to promote and ensure the prudent and judicious use of antimicrobials in the human and agricultural sector with emphasis on the promotion of infection prevention and control in an endeavour to slow down the rate of development and spread of antimicrobial resistant microorganisms and to ensure that antimicrobials remain a viable option in the management of infectious diseases.

The strategic objectives or the 6 "Es" of the Mauritian National Action Plan (NAP) on Antimicrobial Resistance (AMR) are as follows:

1. Engagement and education on AMR amongst all stakeholders.
2. Electronic surveillance of antimicrobial use and resistance in human, animal and environmental health.
3. Effective bio-security and infection prevention and control measures.
4. Evidence-based antimicrobial use in humans and animals.
5. Enforceable regulations to advance AMR prevention and containment.
6. Equitable investment for National Action Plan Implementation.

The multi-sectoral Steering Committee of the Mauritian NAP on AMR has oversight of and is responsible for the development, review, implementation, monitoring and evaluation of the Mauritian NAP on AMR.

The risks identified in Mauritius are:

- Shortage of resources,
- Minimal/shortage of qualified/trained human resources, and,
- Lack of ownership and/or buy-in by stakeholders.

Taking cognizance of resource constraints while acknowledging that the resourcing of the NAP on AMR is the responsibility of the government, the NAP will be funded by:

- The Ministry of Finance and Economic Development to undertake a comprehensive and accurate costing exercise.
- Leveraging existing, cognate budgets within and across Ministries by consultation and collaboration.
- Prioritising the NAP on AMR in the annual budget.
- Sourcing external funds/grants based on a comprehensive business plan.

LIST OF ABBREVIATIONS

AFRC	Albion Fisheries Research Centre
AGISAR	Advisory Group on Integrated Surveillance of Antimicrobial Resistance
AMR	Antimicrobial Resistance
ATCC	American Type Culture Collection
AST	Antibiotic Susceptibility Testing
AU-IBAR	African Union Inter-African Bureau for Animal Resources
CASF	Competent Authority Seafood
DDD	Defined Daily Dose
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FAREI	Food and Agricultural Research and Extension Institute
GAP	Global Action Plan
GLASS	Global Antimicrobial Resistance Surveillance System
HAI	Hospital-Acquired Infections
IOC	Indian Ocean Commission
IPC	Infection Prevention and Control
MIH	Mauritius Institute of Health
MoA	Ministry of Agro-Industry and Food Security
MoE	Ministry of Education and Human Resources, Tertiary Education and Scientific Research
MoH	Ministry of Health and Quality of Life
MoUs	Memorandum of Understandings
N/A	Not Applicable
NAP	National Action Plan
NEL	National Environmental Laboratory
NICD	National Institute of Communicable Diseases
OIE	World Organization for Animal Health
PCU	Population Correction Unit
PG	Post Graduate
SWOT	Strengths Weaknesses Opportunities Threats
ToR	Terms of Reference
UN	United Nations
VRE	Vancomycin-Resistant *Enterococcus*
WAAW	World Antibiotic Awareness Week
WHA	World Health Assembly
WHO	World Health Organization
WMA	Wastewater Management Authority

ACKNOWLEDGEMENTS

The following persons contributed to the successful development of this National Action Plan on Antimicrobial Resistance in Mauritius:

- Dr The Honorable M A Husnoo, Minister of Health and Quality of Life
- Mr G Gunesh, Senior Chief Executive, Ministry of Health and Quality of Life
- Dr M Timol, Acting Director General Health Services, Ministry of Health and Quality of Life
- Dr K. Pauvaday, Former Director General Health Services, Ministry of Health and Quality of Life
- Dr V Gujadhur, Director Health Services, Ministry of Health and Quality of Life
- The National AMR Committee members of the Ministry of Health and Quality of Life
- The National AMR Committee members of the Ministry of Agro-Industry and Food Security
- The National AMR Committee member of the Competent Authority Seafood, Ministry of Ocean Economy, Marine Resources, Fisheries and Shipping
- The National AMR Committee member of the Ministry of Social Security, National Solidarity and Environment and Sustainable Development *(Environment and Sustainable Development Division)*
- Dr L Musango, World Health Organisation Representative, Mauritius
- Mr A Nundoochan, Operations Officer, WHO Country Office
- Professor SY Essack, South African Research Chair in Antibiotic Resistance & One Health, WHO Consultant
- Dr L Gahimbare, AMR Focal Point, WHO AFRO

AMR NATIONAL ACTION PLAN COMMITTEE MEMBERS

Ministry of Health and Quality of Life

- Dr S Aboobakar, Director Health Services, National Focal person
- Dr L.P Veerapa-Mangroo, Community Physician
- Dr (Mrs) A Deelchand, Regional Public Health Superintendent
- Dr A Surnam, Regional Public Health Superintendent
- Dr M.I Issack, Consultant Pathology
- Dr D Nuckchady, Specialist Physician
- Dr A Jorawon, Specialist Physician
- Dr R Kurrimbukus, Specialist Physician
- Mr S Sobarun, Senior Pharmacist

Ministry of Agro-Industry and Food Security

- Dr R Beeharry, Ag Senior Veterinary Officer, Focal person for veterinary and livestock field
- Mr M Gooljar, Senior Technical Officer, Animal Production Division.
- Dr D Meenowa, Assistant Director, Veterinary and Livestock Division

Competent Authority Seafood, Ministry of Ocean Economy, Marine Resources, Fisheries and Shipping

- Dr H. I. Badry, Veterinary Officer

Ministry of Social Security, National Solidarity, and Environment and Sustainable Development *(Environment and Sustainable Development Division)*

- S. Salamut, Scientific Officer, National Environmental Laboratory

NATIONAL ACTION PLAN ON ANTIMICROBIAL RESISTANCE FOR THE REPUBLIC OF MAURITIUS

1. INTRODUCTION

Since their introduction into clinical practice in the 1930s and 1940s, antibiotics have revolutionized healthcare by dramatically decreasing the morbidity and mortality associated with bacterial infections in humans and animals.[1] Antibiotics have saved innumerable lives and made possible major surgery, organ transplantation, treatment of preterm babies, and cancer chemotherapy.[2] However, infectious diseases remain the leading cause of death in several countries, increasingly as a result of antibiotic resistance. Antibiotic resistance is a direct consequence of the selection pressure from both warranted and indiscriminate use of antibiotics in human, animal and environmental health sectors, requiring a One Health approach for its containment. Infections caused by resistant bacteria result in treatment failure in humans and animals, increase the risk of spread to communities and flocks/herds respectively and result in longer duration of illness, higher mortality rates, and increased costs of alternative treatment.[2]

- **The African Context**

Communicable diseases remain the leading cause of death in Africa and are responsible for the majority of years of life lost as well as the majority of deaths of children under 5 years old.[3] The high burden of communicable diseases in Africa intimates extensive antibiotic use and subsequent resistance, but the burden, nature, extent and sequelae of antibiotic resistance is yet to be quantified in most countries.

The WHO's AMR Global Report on Surveillance showed that antibiotic resistance rates in the WHO AFRO region ranged from 0-87% and 0-98% to 3rd generation cephalosporins and fluoroquinolones in *Escherichia coli* respectively, 8-77% and 0-4% to 3rd generation cephalosporins and carbapenems in *Klebsiella pneumoniae* respectively, 0-100% to methicillin in *Staphylococcus aureus,* 1-100% to penicillin in *Streptococcus pneumoniae*, 0-35% to fluoroquinolones in non-typhoidal *Salmonella*, 0-9% to fluoroquinolones in *Shigella spp*., and 0-12% to 3rd generation cephalosporins in *Neisseria gonorrhoea*.[4] A systematic review on antibiotic resistance in clinically relevant bacterial isolates in sub-Saharan Africa over the period 1990-2013 similarly evidenced high levels of resistance to commonly used antibiotics. For example, resistance to chloramphenicol and 3rd generation cephalosporins in *Enterobacteriaceae* from patients with febrile illness showed a median prevalence range of 31-94.2% and 0-46.5% respectively, while *Salmonella enterica Typhi* showed a median resistance prevalence range of 15.4-43.2% against nalidixic acid.[5] The African region clearly carries a substantial antibiotic resistance burden[4, 5]

A desktop analysis, conducted to ascertain the extent to which countries in the WHO African region had implemented the WHO Policy Package to Combat AMR, revealed that just 6.4% (3) of the countries have national AMR plans in place and 14.9% (7) have overarching national infection prevention control (IPC) policies. Some 93.6% (44) of countries have essential medicines lists and 91.5% (43) have national medicines policies and treatment guidelines indicating rational use. None currently have national surveillance systems that routinely generate representative data on antimicrobial use and resistance although several countries have implemented pilot surveillance projects and South Africa has a national

[1] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2937522/pdf/0016-10.pdf
[2] http://www.thelancet.com/pdfs/journals/laninf/PIIS1473-3099(13)70318-9.pdf
[3] http://apps.who.int/iris/bitstream/10665/112738/1/9789240692671_eng.pdf
[4] http://apps.who.int/iris/bitstream/10665/112642/1/9789241564748_eng.pdf
[5] https://academic.oup.com/jac/article-lookup/doi/10.1093/jac/dku176

laboratory-based surveillance programme on selected bacterial and fungal pathogens. None of the countries incentivize research and development into new medicines and tools.[6]

- **The Mauritian Context**

Notwithstanding the fact that the leading cause of death in Mauritius is attributable to non-communicable diseases, country health statistics point to an increase in deaths attributable to infectious diseases, specifically lower respiratory infections, which accounted for 300 deaths out of a total of 5 700 (5.2%) in 2012[7] and Mauritius reported the following rates of resistance in hospital isolates/samples collected during one month in 2012 in the AMR Global Report on Surveillance:

- 43.5% and 57.6% resistance of *E. coli* (n=184) to 3rdgeneration cephalosporins and fluoroquinolones respectively,
- 55.8% and 1.9% resistance of *K. pneumoniae* (n=104) to 3rd generation cephalosporins and carbapenems respectively, and,
- 51.5% resistance to methicillin in *S. aureus* (n=171).

Antimicrobial use and resistance is not quantified in the animal and environmental health sectors in Mauritius.

However, in human health, the situational analysis on AMR in Mauritius reported the following decreases in antibiotic susceptibility in selected bacteria against selected antibiotics over time, as shown in Table 1.

[6]https://academic.oup.com/jpubhealth/article/39/1/8/3065721/Antimicrobial-resistance-in-the-WHO-African-region

[7]http://www.who.int/gho/countries/mus.pdf?ua=1

Table 1: Decrease in susceptibility of selected bacteria against selected antibiotics over time

Organisms and source	Antibiotic	Susceptibility rate			
In-patients *E.coli*	Cefotaxime	83% In March 2005(n=84)	54% in July 2014 (n=183)		
In-patients *Klebsiella*	Cefotaxime	56% in March 2005(n=98)	42% in July 2014(n=118)		
In-patients *Klebsiella*	Meropenem/Imipenem	100% in March 2005(n=98)	91% in July 2014(n=118)		
In-patients *Pseudomonas aeruginosa*	Meropenem/Imipenem	90% in March 2005(n=86)	73% in July 2014(n=93)		
In-patients *Acinetobacter*	Meropenem/Imipenem	48% in March 2005(n=76)	26-28% in July 2014(n=78)		
In-patients *S.aureus*	Methicillin (Oxacillin)	85% in March 2005(n=85)	61% in July 2014(n=140)		
All patients urine *Enterobacteriaceae*	Ciprofloxacin	99% in Jan 1998 (n=200)	39% in July 2014(n=296)		
Pneumococcus	Erythromycin (Macrolides)	Non-invasive 100% in 1999-2001(n=43)	Non-invasive 46% in 2014 (n=56)	Non-invasive 53% in 2015 (n=40)	Non-invasive 60% in 2016 (n=10)
		Invasive 100% in 1999-2002(n=24)	Invasive 78% in 2014 (n=27)	Invasive 61% in 2015 (n=18)	Invasive 67% in 2015 (n=18)
Neisseria gonorrhoeae from urethral and vaginal swabs	Ciprofloxacin	82% in 2006-2007(n=17)	7% in 2013 (n=14)	6% in 2015 (n=30)	3% in 2016 (n=57)
Campylobacter from stools	Ciprofloxacin	97% in 1999 (n=78)	25% in 2013 (n=75)	36% in 2015 (n=99)	23% in 2016 (n=53)

n=number of isolates

The following resistance is negligible in Mauritius:

- Vancomycin-resistant Enterococcus (VRE)
- Ciprofloxacin-resistant non-typhoidal Salmonella

- **Mauritius' commitment to AMR**

Mauritius is signatory to the United Nation (UN) Political Declaration on AMR and the World Health Assembly Resolution (WHA 68.7) that requires Member States to have in place national action plans (NAPs) on AMR by the 70th World Health Assembly (WHA) in May 2017. Mauritius is thus amongst the UN member states which have endorsed the Global Action Plan (GAP) that was developed by the tripartite collaboration of the World Health Organization (WHO), Food and Agriculture Organization of the United Nations (FAO) and the World Organization for Animal Health (OIE). The GAP emphasizes the One Health Approach, provides a "blueprint" for countries to develop and implement national action plans (NAPs) and sets out five strategic objectives:
(1) to improve awareness and understanding of AMR;
(2) to strengthen knowledge through surveillance and research;
(3) to reduce the incidence of infection through infection prevention and control;
(4) to optimize the use of antimicrobial agents; and
(5) to ensure sustainable investment in countering AMR.[8]

The Mauritian NAP on AMR has been developed in compliance with the UN and WHA resolutions.

2. SITUATIONAL AND SWOT ANALYSIS

The Ministry of Health and Quality of Life, the Ministry of Agro-Industry and Food Security, the Ministry of Ocean Economy, Marine Resources, Fisheries and Shipping and the Ministry of Social Security, National Solidarity, and Environment and Sustainable Development conducted a situational analysis of AMR in the human, terrestrial and aquatic animal, and environmental sectors.

Strengths, weaknesses, opportunities and threats (SWOT) gleaned from the situational analysis informed the Mauritian NAP on AMR and are shown in Tables 2, 3 and 4 for each of the human, animal and environmental health sectors stratified by GAP strategic objectives.

[8] http://www.wpro.who.int/entity/drug_resistance/resources/global_action_plan_eng.pdf

Table 2: SWOT Analysis of AMR in Human Health

Strategic Objective	SWOT	
Awareness and Education	**Strengths** • Relatively good awareness amongst medical doctors/ prescribers (n=50) on the treatment of some upper respiratory tract infections and urinary tract infections.	**Weaknesses** • Moderate levels of confidence on antibiotic indication, drug choice, dosage, duration and side effects (n=50). • Lack of awareness on dangers of AMR among the general population. **Threats** • Pressure on doctors by patients to prescribe antibiotics for (viral) infections.
Surveillance and Research	**Strengths** • Comprehensive surveillance of *Salmonella spp, Shigella spp, Campylobacter spp, Gonococci, Pneumococci* and *Haemophilus influenzae*. • Surveillance of *E. coli, P. aeruginosa and S. aure*us is conducted every 2-3 years for a duration of one month. • Some human resource capacity (qualified technical staff). • Laboratories implement internal quality control using ATCC strains and have scored 100% on external quality assurance conducted by WHO/NICD. • Laboratory is equipped with an automated identification and antibiotic susceptibility testing (AST) system–Walkaway • Antibiotic resistance rates areavailable for several drug-bug combinations mostly from in-patients. • The Government Analyst division in the MoH has the equipment, technical know-how and manpower for examination of food samples for antibiotic residues against Codex Alimentarius standards.	**Weaknesses** • Manual recording of surveillance results with associated data extraction and analysis challenges. • No electronic surveillance system • The Bacteriology Laboratory is not accredited • Lack of standards in existing food legislation on antibiotic residues
	Opportunities Central Health Laboratory and/or Victoria Hospital Laboratory may be designated as the National Reference Laboratory for AMR	**Threats** • There are no specialist medical microbiologists nor clinical scientists in bacteriology.

Table 2: SWOT Analysis of AMR in Human Health (*continued*)

<table>
<tr><th>Strategic Objective</th><th colspan="2">SWOT</th></tr>
<tr><td rowspan="2">Infection Prevention and Control (IPC), Hygiene and Sanitation</td><td>Strengths
IPC guidelines and standards exist in hospitals.</td><td rowspan="2">Weaknesses
Lack of dedicated IPC nursing personnel.
Minimal/lack of assessment and feedback on compliance with IPC practices.
Insufficient equipment.
No surveillance of hospital-acquired infections (HAIs).
Poor compliance with existing guidelines.</td></tr>
<tr><td>Threats
Minimal training of healthcare workers in IPC.
Poor understanding of infection control among health personnel.</td></tr>
<tr><td rowspan="2">Optimal Use of Antimicrobial Medicines</td><td rowspan="2">Strengths
Public sector medicines distribution data is available electronically in line list form.
Import of therapeutic substances, including antibiotics is well-regulated by way of permits and is subject to international quality standards.</td><td>Weaknesses
Lack of data on antimicrobial use in the private sector.
Antimicrobial use data in the public sector is not analysed/interpreted.
Overuse and inappropriate use reported in two single site postgraduate (PG) studies.</td></tr>
<tr><td>Threats
Antibiotics are sold over the counter.</td></tr>
<tr><td>Investment, Research and Development</td><td colspan="2">Weaknesses
Minimal research on AMR in human health.</td></tr>
</table>

Table 3: SWOT Analysis of AMR in Terrestrial and Aquatic Animal Health

Strategic Objective	SWOT	
Awareness and Education	**Opportunities** • Competent Authority Seafood is aware of AMR as a threat to food safety.	**Weaknesses** • Minimal/lack of knowledge on the level of awareness amongst stakeholders, including stakeholders in aquaculture.
Surveillance and Research	**Strengths** • Antibiotic residue monitoring is conducted in fish for export to the EU.	**Weaknesses** • There is no electronic laboratory information system. • Laboratories are not accredited. • Lack of capacity to conduct AST and diagnostic tests for infectious aquatic animal diseases.
	Opportunities • National Aquatic Animal Health Strategy is in preparation.	**Threats** • No veterinarians and veterinary pathologists with PG qualifications in aquatic animal health and diseases.
Infection Prevention and Control, Hygiene and Sanitation	**Strengths** • Basic Animal Health Training Course for dairy cattle has been implemented on a pilot basis • Marine aquaculture business operators and ornamental fish exporters implement standard operating procedures that include biosecurity, antimicrobial use and quarantine	**Weaknesses** • Minimal/lack of basic biosecurity measures at farm level. • Antimicrobials are procured through pharmaceutical companies.
	Opportunities • Awareness of alternate methods of disease control such as vaccination, use of pro-biotics, and reducing infection, by example mastitis control programme and ensuring lack of bacterial contamination in feed.	**Threats** • Sub-optimal biosecurity levels at ports of entry.

Table 3: SWOT Analysis of AMR in Terrestrial and Aquatic Animal Health (*continued*)

<table>
<tr><th>Strategic Objective</th><th colspan="2">SWOT</th></tr>
<tr><td rowspan="2">Optimal Use of Antimicrobial Medicines</td><td>Strengths
CASF Protocol is in use in aquaculture.
Import of therapeutic substances including antimicrobials requires a permit and mandatory approval from the Ministry of Health and Quality of Life (MoH).</td><td rowspan="2">Weaknesses
There are no guidelines for use of antimicrobials in livestock.
Pharmacy Act has no rules and regulations concerning the sales of antimicrobials for terrestrial and aquatic animals.</td></tr>
<tr><td>Threats
Antimicrobials are used prophylactically in the ornamental fish industry.
Antimicrobials are freely available for aquaculture, including over the internet.</td></tr>
<tr><td>Investment, Research and Development</td><td colspan="2">Threats
Minimal/lack of AMR-related research conducted in animal health.</td></tr>
</table>

Table 4: SWOT Analysis of AMR in Environmental Health

<table>
<tr><th>Strategic Objective</th><th colspan="2">SWOT</th></tr>
<tr><td rowspan="2">Surveillance and Research</td><td>Strengths
National Environmental Laboratory (NEL) exists and is accredited to MS ISO 17025:2005
NEL monitors the river water quality annually in terms of bacteriological analysis for E.coli</td><td>Weaknesses
AST and antibiotic residue testing is not conducted due to lack of expertise and necessary equipment.</td></tr>
<tr><td colspan="2">Opportunities
Collaboration with other governmental laboratories to carry out AST and antibiotic residue testing.</td></tr>
<tr><td>Investment, Research and Development</td><td colspan="2">Threats
Minimal/lack of AMR-related research conducted in animal health.</td></tr>
</table>

3. GOAL OF THE NAP OF THE REPUBLIC OF MAURITIUS

Taking cognizance of the:

- Relatively low burden of communicable diseases in human health,
- Excellent progress in sanitation and potable drinking water,
- High childhood vaccination coverage, and,
- The forthcoming National Biosecurity Plan,

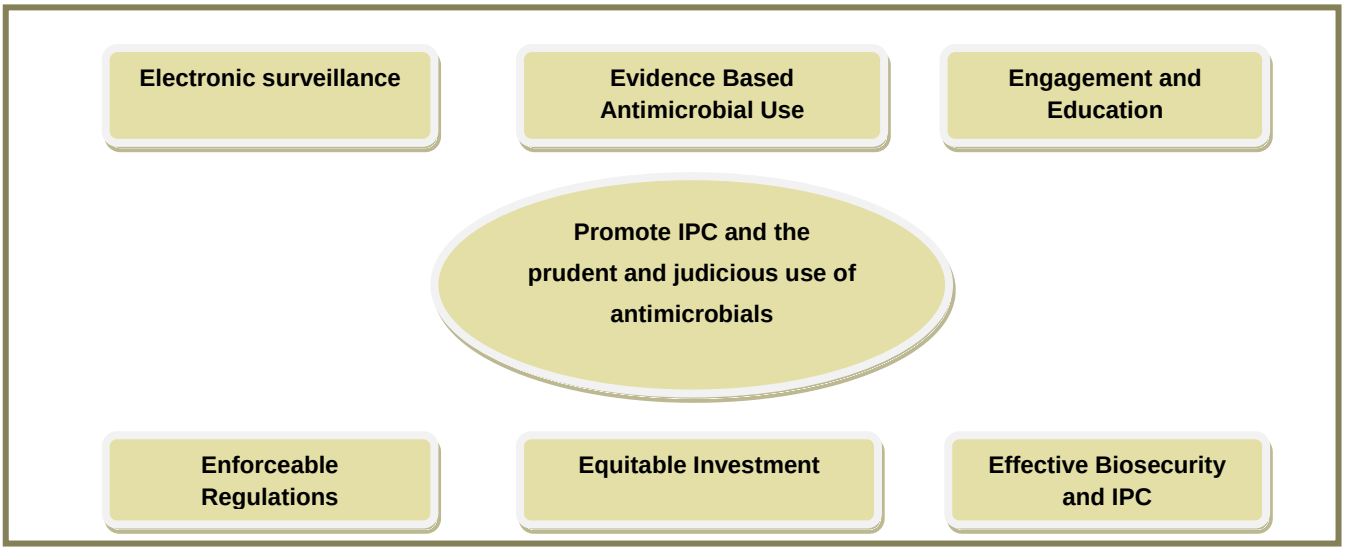
the overarching goal of this National Action Plan on Antimicrobial Resistance is to promote and ensure the prudent and judicious use of antimicrobials in the human and agricultural sectors with emphasis on the promotion of infection prevention and control, in an endeavour to slow down the rate of development and spread of antimicrobial resistant microorganisms, and to ensure that antimicrobials remain a viable option in the management of infectious diseases.

The strategic objectives or the 6 "Es" of the Mauritian NAP on AMR, aligned with the GAP on AMR are as follows:

1. Engagement and education on AMR amongst all stakeholders.
2. Electronic surveillance of antimicrobial use and resistance in human, animal and environmental health sectors.
3. Effective biosecurity and infection prevention and control measures.
4. Evidence-based antimicrobial use in humans and animals.
5. Enforceable regulations to advance AMR prevention and containment.
6. Equitable investment for National Action Plan Implementation.

4. CONCEPTUAL FRAMEWORK

Figure 1: Conceptual Framework of Mauritian NAP on AMR



Enabled by a foundation of enforceable regulations, equitable investment and effective biosecurity and infection prevention and control measures, the Mauritian NAP on AMR aims to promote and ensure the prudent and judicious use of antimicrobials and promote infection prevention and control by evidence-based antimicrobial treatment informed by electronic surveillance of antimicrobial use and resistance in humans, animals and agriculture together with engagement and education on antimicrobial use, resistance and stewardship and prevention of nosocomial infections.

5. GOVERNANCE

The implementation of the Mauritian NAP on AMR will be the responsibility of the multi-sectoral Steering Committee which will be duly mandated, authorized, funded and empowered in decision-making by the relevant Ministries as appropriate.

The Charter of the Steering Committee of the Mauritian NAP on AMR is as follows:

Name of Committee	Steering Committee of the National Action Plan on Antimicrobial Resistance of the Republic of Mauritius
Purpose statement	The Committee has oversight of and is responsible for facilitating the development, review, implementation, monitoring and evaluation of the Mauritian National Action Plan on Antimicrobial Resistance
A: Structure	**Membership and Terms of Office**

Office bearers	• Ministry of Health and Quality of Life
	  ○ Director General Health Services
	  ○ Director Health Services
	  ○ Director Pharmacy Services
	  ○ Director Laboratory Services
	• Ministry of Agro-Industry and Food Security
	  ○ Assistant Director-Livestock and Veterinary Division
	  ○ Senior Veterinary Officer- Focal Person for AMR
	  ○ Senior Technical Officer Animal Production Division
	  ○ Representative of the Veterinary Council
	• Ministry of Ocean Economy, Marine Resources, Fisheries and Shipping
	  ○ Officer in Charge Competent Authority Seafood
	  ○ Veterinary Officer
	  ○ Representatives of the Aquaculture division of the AFRC
	• Ministry of Social Security, National Solidarity and Environment and Sustainable Development
	  ○ Director
	• Ministry ofEnergy and Public Utilities
	  ○ Technical Officer-Focal Person of AMR
	• Private Sector Representatives (Medicine and Pharmacy)

In attendance (non-voting)	Secretariat
Chair	The Chair shall be appointed by the Minister of Health and Quality of Life
Quorum	A majority of members (50 % + 1)

Minimum number of meetings per annum	Four meetings will be held annually in: • January • April • July • October
Terms of Office	The Chair will be in Office for an initial term of 3 years, renewable for a further 3 years.
B: Authority/Mandate	**Terms of Reference**
	1. Address all AMR-related activities in the country 2. Facilitate the development, review, implementation, monitoring and evaluation of the NAP 3. Review the priority list of strategic interventions and undertake implementation planning 4. Undertake risk analysis and implement mitigation strategies 5. Lobby for government and external funds/resources to advance the NAP 6. Oversee reporting against the internal and external monitoring and evaluation plan and institute interventions on results as appropriate
C: Operation	**Standard Operating Procedures**
Agenda approved by	Chairperson
Agenda distributed to	Members
Draft minutes approved by	Chairperson
Minutes distributed to	Members
Other relevant meeting procedures:	1. The agenda shall close 10 days prior to a meeting and the agenda and supporting documents shall be distributed electronically 7 days prior to the meeting 2. Items for the agenda shall be submitted in electronic format and hard copy to the secretariat. Urgent items may be added to the agenda up to 5 days before a meeting 3. Decisions shall be taken by consensus. Should it be necessary to vote, decisions shall be taken on majority with the Chair having the casting vote should the vote be equal 4. Apologies for absence shall be submitted in writing to the Chair 5. Members must attend a minimum of 75% of meetings in a year otherwise their membership may be terminated 6. Substantive members may send a mandated representative if this is approved by the Chair 7. Decisions taken by the Committee shall be noted 8. All meetings shall be recorded and minutes provided to the Committee within 10 working days of the meeting 9. Members will be required to sign a code of conduct and confidentiality agreements and will be asked to declare any conflicts of interest at each meeting

D. Communication and reporting lines	The following structures/organisation/committees will be communicated with on a regular basis
Describe all committees/ structures/ government bodies or departments that the committee will communicate with:	**ANIMAL HEALTH** • Ministry of Agro-Industry and Food Security: Animal Health Laboratory, Pharmacy Board, FAREI, Livestock and Veterinary Division • Ministry of Ocean Economy, Marine Resources, Fisheries and Shipping: CASF **HUMAN HEALTH** • Ministry of Health and Quality of Life: Pharmacy Board, Central Health Laboratory, Regional Public Health Superintendents **ENVIRONMENT** • Ministry of Social Security, National Solidarity and Environment and Sustainable Development: Environmental Laboratory Services • Ministry of Energy and Public Utilities: WMA

6. STRATEGIC AND OPERATIONAL PLAN

Table 5: Strategic Objective 1: Engagement and Education on AMR amongst all Stakeholders

Strategic Interventions	No.	Activities	Responsibility	Timeframe	Indicator(s) (Description)	Indicator (Measure)	
						Baseline	Target
1.1 Increase national awareness of AMR *Milestones:* • *Awareness and advocacy materials developed.* • *Awareness campaigns held.* • *Multi-media messaging on AMR launched.* • *Media briefings held.*	1.1.1	Adapt WHO WAAW materials to the Mauritian context and develop awareness materials for diverse stakeholders in human, animal and environmental health sectors.	All 5 Ministries	1 year	WAAW and other AMR materials	1	4
	1.1.2	Run awareness campaigns amongst stakeholders bi-annually, including during WAAW.	All 5 Ministries	1 year	Awareness campaigns	1	2
	1.1.3	Advocate for the appropriate use of antimicrobials and the containment of AMR using billboards, print, radio, television and social media.	All 5 Ministries	1 year	Media briefing	0	4
1.2 Ensure the inclusion of AMR and related topics in primary school, secondary school, health and veterinary professional curricula. *Milestone:* • *New/Revised curricula implemented.*	1.2.1	Develop and pilot a One Health AMR-related curriculum content for primary and secondary schools with the Ministry of Education and Human Resources, Tertiary Education and Scientific Research.	MoH, MoA, CASF, MoE	2-3 years	Revised curriculum	0	2
	1.2.2	Integrate antimicrobial resistance and stewardship in health, agriculture, and environmental health curricula by engaging with relevant Universities.	MoH , MoA, MoE and Universities	2-3 years	Revised curriculum	0	4

Table 6: Strategic Objective 2: Electronic surveillance of antimicrobial use and resistance in human, animal and environmental health sectors.

Strategic Interventions	No.	Activities	Responsibility	Timeframe	Indicator(s) (Description)	Indicator (Measure)	
						Baseline	Target
2.1 Set up a National Electronic Surveillance System for antimicrobial use and resistance in humans and (food) animals. *Milestone:* • *Electronic Surveillance system operationalized.*	2.1.1	Install and train key personnel in the use of WHONET and the WHO Antimicrobial Consumption Tool.	MoH, MoA, WHO	2 years	Electronic data	0	1
	2.1.2	Designate a dedicated system administrator to collate and report on resistance data/trends from human, animal and environmental health sectors.	MoH, MoA	1.5 years	Dedicated officer appointed	0	2
	2.1.3	Participate in GLASS.	MoH	1 year	GLASS enrolment completed	0	Enrolled
2.2 Build human resource, infrastructural and technical laboratory capacity to produce high-quality microbiological data for human, animal and environmental sectors. *Milestones:* • *Laboratories accredited.* • *MoUs signed.* • *National Reference Laboratory established.*	2.2.1	Achieve accreditation for laboratories to process human, animal and environmental samples, specifically bacterial identification and AST.	WHO, MoH, MoA	2-3 years	Accredited laboratories	0	4
	2.2.2	Ascertain the surveillance capacity of the Central Health, Animal Health, Food Technology, Government Analyst Division and National Environmental Laboratories.	All Ministries	1 year	Laboratory capacity ascertained	0	4
	2.2.3	Institute MoUs between laboratories to define role and responsibilities of each.	All Ministries	1.5 years	MoUs		
	2.2.4	Recruit and train qualified personnel for AMR.	All Ministries	2 years	Number of trained personnel	Baseline	Baseline x 2
	2.2.5	Designate a National Reference Laboratory for surveillance of antimicrobial use and resistance in human, animal and environmental health sectors with standard operating procedures and external quality assessment.	Cabinet	5 years	National Reference Laboratory	0	1

Table 6: Strategic Objective 2: Electronic surveillance of antimicrobial use and resistance in human, animal and environmental health sectors *(continued)*

Strategic Interventions	No.	Activities	Responsibility	Timeframe	Indicator(s)(Description)	Indicator (Measure)	
						Baseline	Target
2.3 Implement AGISAR, FAO and OIE surveillance protocols incrementally. *Milestone:* • *Farm-to-fork surveillance implemented.*	2.3.1	Set up committee to adapt existing protocols.	MoA, CASF	1 year	Protocols	0	3
	2.3.2	Devise and implement a sampling strategy from farm to fork for selected food animals.	MoA, CASF	2-3 years	Number of samples analysed	Baseline	Baseline x 2
	2.3.3	Train personnel in sampling strategy.	MoA, CASF	2-3 years	Number of trained personnel	Baseline	Baseline x 2
2.4 Electronically quantify and monitor antimicrobial use in humans and (food) animals). *Milestone:* • *Electronic database on antimicrobial use set up.*	2.4.1	Adapt and implement existing antimicrobial consumption methodology to determine antimicrobial use in human and animal health by DDD and PCU respectively.	MoH, MoA	2 years	Databases	1	2
	2.4.2	Produce and implement a standard application form to quantify the importation of antimicrobials for human, animal and environmental health sectors.	MoH, MoA, CASF	1.5 years	Application forms	0	4

Table 7: Strategic Objective 3: Effective biosecurity and infection prevention and control measures

Strategic Interventions	No.	Activities	Responsibility	Timeframe	Indicator(s) (Description)	Indicator (Measure)	
						Baseline	Target
3.1 Establish a national infection prevention and control programme for healthcare facilities and communities. *Milestones:* • *Functional National IPC Committee.* • *IPC Policy and Guidelines optimized.* • *IPC campaigns held* • *IPC personnel designated.*	3.1.1	Review the membership and terms of reference (ToR) of the National IPC Committee.	MoH	1 year	Committee	Exists	Functio-nal
	3.1.2	Review and update the national IPC policy and guidelines for IPC in health care facilities and communities.	MoH	1 year	IPC policy	0	1
	3.1.3	Identify and empower dedicated personnel for the implementation of IPC policy and guidelines in healthcare facilities and communities.	MoH	3 years	Dedicated personnel	Baseline	Baseline x 2
	3.1.4	Run campaigns on hygiene, hand washing and food security.	MoH	1 year	IPC campaigns	1	4
3.2 Institute surveillance of HAIs/ nosocomial infections *Milestone:* • *Surveillance of HAIs instituted.*	3.2.1	Progressively implement surveillance of HAI in all hospitals.	MoH	3 years	HAI incidence data	Baseline	Baseline x 2

Table 7: Strategic Objective 3: Effective biosecurity and infection prevention and control measures *(continued)*

Strategic Interventions	No.	Activities	Responsibility	Timeframe	Indicator(s) (Description)	Indicator (Measure)	
						Baseline	Target
3.3 Introduce infection prevention and control programmes in veterinary settings and in animal husbandry	3.3.1	Develop, implement, monitor and evaluate a National Biosecurity Plan addressing all species of livestock as well as abattoirs, feed manufacturing plants, processing plants, hatcheries, and large-scale establishments.	MoA, CASF	4 years	Plan	0	1
Milestones: • *National Biosecurity Plan approved for implementation.* • *Basic Animal Health Care Training implemented.* • *Animal Vaccination Policy approved for implementation.* • *Animal husbandry practices comply with FAO and OIE guidelines*	3.3.2	Roll out Basic Animal Health Care Training to farmers with emphasis on prevention of diseases.	MoA, FAREI	2 years	Number of farmers trained	125	1000
	3.3.3	Develop, implement, monitor and evaluate vaccination policy in (food) animals.	MoA, CASF	3-4 years	Vaccination Policy	Baseline	All livestock and fish vaccinated
	3.3.4	Optimise, implement, monitor and evaluate good husbandry and agricultural practices as delineated in the standards of the OIE Terrestrial and Aquatic Animal Health Codes and the FAO/WHO Codex Alimentarius.	MoA	4 years	Number of guidelines adopted/ adapted/ developed	0	2

Table 8: Strategic Objective 4: Evidence-based antimicrobial use in humans and animals

Strategic Interventions	No.	Activities	Responsibility	Timeframe	Indicator(s) (Description)	Indicator (Measure)	
						Baseline	Target
4.1 Ensure availability of high-quality antimicrobial medicines *Milestone:* • *Regulations strengthened/ optimized.*	4.1.1	Review and enhance the regulations for the registration and procurement of antimicrobials for use in humans and animals.	Pharmacy Board	4-5 years	Regulations amended	0	1
4.2 Institute antimicrobial stewardship in humans, animals and agriculture. *Milestone:* • *Antimicrobial stewardship Committees established.*	4.2.1	Set up stewardship committees with membership and ToR in healthcare facilities and sector-wise in animals.	MoH, MoA, CASF	1.5 years	Stewardship Committees	0	4
	4.2.2	Incrementally introduce antimicrobial stewardship interventions in healthcare facilities and in animal sectors according to international guidelines.	MoH, MoA, CASF	2-3 years	Stewardship interventions	0	3

Table 9: Strategic Objective 5: Equitable investment for implementation of the National Action Plan

Strategic Interventions	No.	Activities	Responsibility	Timeframe	Indicator(s) (Description)	Indicator (Measure)	
						Baseline	Target
5.1 Identify key research areas in AMR *Milestone:* • *Research Priority Setting Exercise completed.*	5.1.1	Undertake a research priority setting exercise with Ministries, academic institutions etc.	MoH, MIH, MoA-FAREI, Albion Fisheries Research Centre	1.5 years	Research Priority List	0	1
	5.1.2	Source funding and conduct research in priority areas identified above.	All	2-3 years	Research projects publications	Baseline	Baseline x 2
5.2 Obtain commitment of funds from relevant Ministries for NAP implementation *Milestones:* • *Government funding secured.* • *AMR is prominent in relevant national policies, strategies and plans.*	5.2.1	Include relevant AMR activities in annual budgets amongst and between relevant Ministries and the Ministry of Finance.	All	Annually	Dedicated budget for NAP on AMR	0	To be determined
	5.2.2	Ensure that AMR features in the Health Sector Strategy, the National Biosecurity Plan, National Aquatic Animal Health Strategy and Non-sugar sector Strategic Plan.	MoH, MoA, CASF	5 years	AMR features in plans	1	4
5.3 Identify and approach potential national and international funders to facilitate NAP implementation *Milestones:* • *External funding secured.*	5.3.1	Prepare a business plan for the implementation of the NAP with the Ministry of Finance.	MoH, MoA, CASF	1 year	Business plan	0	1
	5.3.2	Approach the WHO, FAO, OIE, AU-IBAR, IOC, Fleming Fund etc. for partial funding.	MoH, MoA, CASF	Annually and in response to funding calls	Grant or funds received	1	2

Table 10: Strategic Objective 6: Enforceable regulation to advance AMR prevention and containment

Strategic Interventions	No.	Activities	Responsibility	Timeframe	Indicator(s) (Description)	Indicator (Measure)	
						Baseline	Target
6.1 Review, and/or introduce legislation for the optimal procurement, distribution, prescription, dispensing, administration and use of antimicrobial medicines *Milestones:* • *Acts and regulations amended.* • *Antimicrobial list published.* • *Human resource capacity increased.*	6.1.1	Review and amend the relevant Acts.	MoH, MoA, CASF and State Law Office	3-5 years	Amended acts	5	5
	6.1.2	Translate existing guidelines into regulations as appropriate.	MoH, MoA, CASF and State Law Office	3-5 years	Guidelines and regulations.	1	4
	6.1.3	Increase the number and empower public health and veterinary officers and technical officers of the CASF to enforce regulations.	MoH, MoA, CASF	2-3 years	No. of public health, veterinary and technical officers	Baseline	Baseline x2
	6.1.4	Review the list of antimicrobials approved for therapeutic use in food animals and regulate them accordingly.	MoA, CASF	2-3 years	Antimicrobial Medicines List	1	1
	6.1.5	Increase the human resource capacity of the relevant Boards to enforce existing regulations.	Pharmacy Board, Animal Welfare Board, CASF	2-3 years	No. of inspectors	Baseline	Baseline x 2

7. RISK ANALYSIS

Three risks were common to most strategic interventions and their associated activities. Risk identification and mitigation is delineated in Table 11:

Table 11: Risk Identification and Mitigation

Risk Identification	Risk Mitigation
Lack of/inadequate resources	• Leverage existing, cognate budgets within and across Ministries for NAP activities. • Prioritise the NAP AMR in annual budgets. • Source external funds/grants e.g. Fleming Fund.
Minimal/lack of qualified/trained human resources	• Create and/or fill posts in all sectors. • Identify training needs by workplace skills analysis. • Collaborate with educational institutions to develop and train personnel as required.
Lack of ownership and/or buy-in by stakeholders	• Implement comprehensive consultation, collaboration, sensitization and advocacy for the NAP. • Obtain Cabinet endorsement. • Ensure that AMR features in national strategies and plans.

8. PRIORITIZATION AND ANNUAL IMPLEMENTATION PLANS

The strategic interventions and associated milestones and activities are prioritized using a matrix premised on importance, financial feasibility and political commitment. Strategic interventions and activities are stratified into short term (within 1 year), medium term (2-3 years) and long term (4-5 years) as shown in Table 12.

An annual implementation plan will be elaborated in January of each year, well in advance of the pre-budget consultations.

Table 12: Prioritization of Strategic Interventions

Short Term (1-1.5 years)	Medium Term (2-3 years)	Long Term (4-5 years)
1. Adapt WHO WAAW materials in the Mauritian context and develop awareness materials for diverse stakeholders in human, animal and environmental health sectors (1.1.1); 2. Run awareness campaigns amongst stakeholders bi-annually, including during WAAW (1.1.2); 3. Advocate for the appropriate use of antimicrobials and the containment AMR using billboards, print, radio, television and social media (1.1.3); 4. Designate a system administrator to collate and report on resistance data/trends from human, animal and environmental health (2.1.2). 5. Participate in GLASS (2.1.3); 6. Ascertain the surveillance capacity of the Central Health, Animal Health, Food Technology, Government Analyst Division and National Environmental Laboratories (2.2.2); 7. Institute MoUs between laboratories to define role and responsibilities of each (2.2.3); 8. Set up a committee to adapt existing AGISAR, FAO and OIE surveillance protocols (2.3.1); 9. Produce and implement a standard application form to quantify the importation of antimicrobials for human,	1. Develop and pilot a One Health AMR-related curriculum content for primary and secondary schools with the Ministry of Education (1.2.1); 2. Integrate antimicrobial resistance and stewardship in health, agriculture, and environmental health curricula by engaging with relevant Universities (1.2.2); 3. Install and train key personnel in the use of WHONET and the WHO Antimicrobial Consumption Tool (2.1.1); 4. Achieve accreditation for laboratories to process human, animal and environmental samples, specifically bacterial identification and AST (2.2.1); 5. Recruit and train qualified personnel for AMR (2.2.4); 6. Devise and implement a sampling strategy from farm to fork for selected food animals (2.3.2). 7. Train personnel in sampling strategy; (2.3.3) 8. Adapt and implement existing antimicrobial consumption methodology to determine antimicrobial use in human and animal health by DDD and PCU respectively; (2.4.1) 9. Identify and empower dedicated personnel for the implementation of IPC policy and guidelines in healthcare facilities and communities (3.1.3); 10. Progressively implement surveillance of HAI in all hospitals (3.2.1);	1. Designate a National Reference Laboratory for the surveillance of antimicrobial use and resistance in human, animal and environmental health with appropriate SoPs and external quality assessment (2.2.5); 2. Develop, implement, monitor and evaluate a National Bio-security Plan addressing all species of livestock as well as abattoirs, feed manufacturing plants, processing plants, hatcheries, and large-scale establishments (3.3.1); 3. Develop, implement, monitor and evaluate vaccination policy in (food) animals (3.3.3); 4. Optimise, implement, monitor and evaluate good husbandry and agricultural practices as delineated in the standards of the OIE Terrestrial and Aquatic Animal Health Codes and the FAO/WHO Codex Alimentarius (3.3.4); 5. Review and enhance the regulations for the registration and procurement of antimicrobial use for humans and animals (4.1.1); 6. Ensure that AMR features in the Health Sector Strategy, the National Bio-security Plan, National Aquatic Animal Health Strategy and Non-sugar sector Strategic Plan (5.2.2); 7. Review and amend the relevant Acts (6.1.1); 8. Translate existing guidelines into regulations as appropriate (6.1.2);

animal and environmental health sectors (2.4.2). 10. Review the membership and terms of reference (ToR) of the National IPC Committee (3.1.1); 11. Review and update the national IPC policy and guidelines for IPC in health care facilities and communities (3.1.2); 12. Run campaigns on hygiene, hand washing, food security (3.1.4); 13. Set up stewardship committees with membership and ToR in healthcare facilities and sector-wise in animals (4.2.1); 14. Undertake a research priority setting exercise with Ministries, academic institutions etc. (5.1.1); 15. Include relevant AMR activities in annual budgets amongst and between relevant Ministries and the Ministry of Finance (5.2.1); 16. Prepare a business plan for the implementation of the NAP with the Ministry of Finance (5.3.1); 17. Approach the WHO, FAO, OIE, AU-IBAR, IOC, Fleming Fund and other International organisations for partial funding (5.3.2).	11. Roll out Basic Animal Health Care Training to farmers with emphasis on prevention of diseases (3.3.2); 12. Incrementally introduce antimicrobial stewardship interventions in healthcare facilities and animal sectors according to international guidelines (4.2.2); 13. Source funding to conduct research on identified priorities (5.1.2); 14. Increase the number and empower public health and veterinary officers and technical officers of the CASF to enforce regulations (6.1.3); 15. Review a list of antimicrobials approved for therapeutic use in food animals and regulate them accordingly (6.1.4). 16. Increase the human resource capacity of the relevant Boards to enforce existing regulations (6.1.5).	

9. RESOURCING THE PLAN

Taking cognizance of resource constraints while acknowledging that resourcing of the NAP on AMR is the responsibility of the government, the NAP will be funded by:

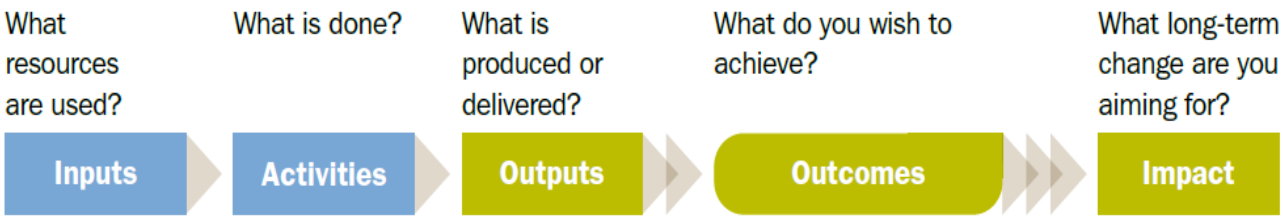
- The Ministry of Finance and Economic Development.
- Leveraging existing, cognate budgets within and across Ministries by consultation and collaboration, e.g. budgets allocated for vaccination, IPC, medicines procurement etc.
- Prioritizing the NAP on AMR in annual budgets.
- Sourcing/Lobbying for external funds/grants e.g. WHO, FAO, OIE, AU-IBAR, IOC, Fleming Fund on the basis of a comprehensive business plan.

10. MONITORING AND EVALUATION

A "Results Management Framework" is proposed for the monitoring and evaluation of the Mauritian NAP on AMR.

A "result" may be defined as an output, outcome or impact emanating from inputs and activities as shown in the Figure below[9]:

Figure 2: Results Management Framework



Outputs are usually short-term quantitative results such as products or services of completed activities. They are measured on a regular basis by keeping account of what has been produced within a specific timeframe and budget. Outcomes are the intended, intermediate effects on the target groups[10].
The intended outcome (purpose) of the Mauritian NAP on AMR is to promote and ensure the prudent and judicious use of antimicrobials in the human and agricultural sector with emphasis on the promotion of infection prevention and control by implementing the 6 strategic objectives delineated above. Internal monitoring and evaluation will be against the identified indicators within the anticipated timeframes while external monitoring and evaluations will be outcome and output based against a distinct set of indicators as shown in Table 13.

[9-10] https://www.norad.no/globalassets/import-2162015-80434-am/www.norad.no-ny/filarkiv/vedlegg-til-publikasjoner/results-management-in-norwegian-development-cooperation.pdf

Table 13: External Monitoring and Evaluation

Inputs	Activities	Outputs	Outcome (against baseline)
• Funding from Ministries and external sources. • Awareness materials. • Curricula. • Laboratory infrastructure and equipment. • Information technology infrastructure. • Human resources.	As elaborated in the Strategic and Operational Plan above	• Awareness campaigns. • Electronic surveillance system of antimicrobial use and resistance in humans and animals. • Electronic database of antimicrobial use in humans (DDD) and animals (PCU). • Annual reports on surveillance of antimicrobial resistance in humans and animals. • Increased vaccination coverage in humans and animals. • Proportion of healthcare facilities and farms implementing IPC and biosecurity policies respectively. • Proportion of healthcare facilities and animal sectors implementing antimicrobial stewardship programmes. • Standard treatment guidelines/hospital formularies and essential medicines list for infections informed by AMR surveillance. • National AMR research agenda developed. • Funding for NAP implementation secured. • Funding for AMR research priorities secured.	Year-on-year decrease in: • Antimicrobial use in humans and animals. • Hospital acquired infections. • Infection rates and outbreaks in humans and animals. • Resistance in selected drug-bug combinations in human and animal health.