

GOVERNMENT OF INDIA

**NATIONAL ACTION PLAN ON ANTIMICROBIAL RESISTANCE
(NAP-AMR)**

(2025-2029)



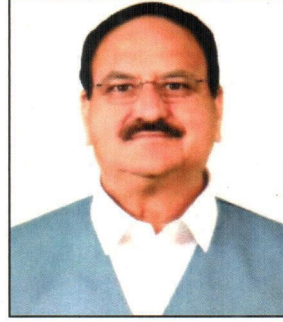
National Action Plan on
Antimicrobial Resistance (NAP-AMR)
(2025-2029)
One Health Approach



Version 2.0
November 2025



जगत प्रकाश नड्डा
JAGAT PRAKASH NADDA



MESSAGE

मंत्री
स्वास्थ्य एवं परिवार कल्याण
व रसायन एवं उर्वरक
भारत सरकार
Minister
Health & Family Welfare
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Government of India

Antimicrobial Resistance (AMR) is recognized as an emerging public-health threat globally with serious health and economic implications. If the current trends continue, AMR may lead to difficulty in treating common infections, uncertainty in success of high-end procedures, longer hospital stays and more expensive treatments.

AMR poses growing threat not just to humans but also to plant and animal health due to interconnected ecosystems and therefore needs to be addressed through a 'One Health' approach involving coordination and collaboration among multiple stakeholders. The National Action Plan on Antimicrobial Resistance was developed in alignment with WHO's Global action plan on AMR and launched in the year 2017. To continue the fight against AMR through one Health approach, a more practical NAP AMR 2.0 (2025-2029) has been prepared. The 'One Health' approach in this action plan has sectoral action as the foundation of intersectoral collaboration and coordination among human, animal, agriculture, environmental and other relevant sectors over the next 5 years. Ministry of Health and Family Welfare (MoHFW) through its various departments and organizations has committed action across all the strategic objectives of this action plan.

Similarly, the Department of Pharmaceuticals is committed to involve industry to generate awareness about antimicrobial resistance. Research activities focussed on drug discovery and priority areas for antimicrobial resistance will be supported through the Department's policies and schemes. The National Institutes of Pharmaceutical Education and Research will leverage both long-and short-term courses to strengthen teaching and awareness regarding antimicrobial resistance. These institutes will also be encouraged to pursue research in this critical area.

I appreciate the participation and commitment of other Departments and Ministries in the NAP AMR 2.0. I am confident that the implementation of this action plan through the well defined framework for interdepartmental and intersectoral collaborations will ensure reversing the progression of AMR.

(Jagat Prakash Nadra)

शिवराज सिंह चौहान
SHIVRAJ SINGH CHOUHAN



कृषि एवं किसान कल्याण और
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D.O. No. 337 /AM



Message

Antimicrobial resistance (AMR) occurs when anti-microbials stop working against microbes such as bacteria, virus, fungi and parasites. AMR causes increase in the morbidity and mortality as infections become difficult to treat, making it's containment a priority across sectors. AMR containment requires not just sectoral action but also coordination and collaboration with other sectors. Ministry of Agriculture and Farmers Welfare is committed to action and coordination and has committed the same in the National Action Plan on Antimicrobial Resistance 2.0 (NAP-AMR 2.0).

Indian Council of Agricultural Research has committed action under all the strategic objectives in NAP-AMR 2.0. This includes knowledge generation through KAP studies, developing repository of IEC materials for awareness generation on AMR among stakeholders, development of teaching modules. Based on training needs, relevant resources will be developed for capacity building among professionals and para-professionals. Training will also be provided to KVK and village level staff about biosafety and biosecurity practices and farmers will be made aware about on-farm sanitation and good hygiene practices. Strengthening of laboratories will improve capacity for AMR detection and surveillance at the state and national level. Research priorities will be identified and research activities will be funded and encouraged for evidence-based policy making.

With respect to animal health, appropriate use of antimicrobials in animals will be encouraged. Guidance documents and training workshops will be organized to develop capacity for measuring consumption and use of antimicrobials. Effective management of wastewater will be established in agricultural farms.

I sincerely hope that our proposed commitments in the NAP-AMR 2.0 brings us closer to our goals and contribute to reduction of the emergence and impact of AMR.


(Shivraj Singh Chouhan)

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भारत सरकार
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DO. No.....MIN PR&FAHD/20.....



Message

Antimicrobial resistance (AMR) is among the most pressing public health challenges of our time, affecting both humans and animals. The rise of resistant pathogens is making it increasingly difficult to treat infections, posing serious risks to health systems and economies alike. This underscores the need for a 'One Health' approach in framing and implementing the National Action Plan on Antimicrobial Resistance. The National Action Plan on AMR 2.0 (2025–2029) represents a unified and coordinated effort across the human, animal, agriculture, and environmental sectors to drive effective interventions for AMR containment.

The Ministry of Fisheries, Animal Husbandry and Dairying is fully committed to addressing AMR in the animal health sector. The Department is working to raise awareness among stakeholders, and to promote biosecurity practices in farms and related facilities. Efforts are also being made to encourage the adoption of validated ethnoveterinary practices that can reduce reliance on antimicrobials and promote sustainable animal health management. Laboratory facilities are being strengthened to enhance the detection and monitoring of AMR across various production systems. Infection prevention and control practices, including the use of vaccination, are being reinforced, and relevant guidelines are being updated in alignment with emerging challenges and field-level observations. In the fisheries sector also, the Department remains committed to supporting AMR containment. This includes reducing the incidence of infections through effective preventive measures and better management of aquatic environments.

Through these targeted and coordinated efforts, the Department aims not only to mitigate the immediate threats posed by AMR but also to lay a resilient foundation for the long-term health and sustainability of the livestock, fisheries, and aquaculture sectors. The successful implementation of the Action Plan will rely on timely execution, strong inter-sectoral collaboration, and sustained commitment from all relevant departments and partners. With our collective resolve and coordinated action, I am confident that we can overcome the growing challenge of antimicrobial resistance and protect the health of our people, animals, and shared environment.

(Rajiv Ranjan Singh)



D.O. No.P-11020/53/2025-PPC



MESSAGE

Antimicrobial resistance (AMR) is a global public health threat that requires urgent attention. In India, with variable health care practices across the country and over the counter availability of antibiotics, strengthening awareness about AMR is an important strategy. Effective containment of AMR requires not only efforts within the health sector but also strong coordination and collaboration across multiple sectors. The Ministry of Information & Broadcasting is committed to supporting and promoting initiatives under the National Action Plan on Antimicrobial Resistance 2.0 (NAP-AMR 2.0).

In collaboration with other stakeholder departments, Ministry of Information & Broadcasting will support the development of IEC material and conduct dissemination campaigns for awareness generation on AMR. To drive behavioural change, especially in antimicrobial prescription practices and infection prevention and control measures, Behaviour Change Communication (BCC) strategies will be formulated for different stakeholder groups. Additionally, mechanisms will be established to manage a central repository of AMR-related IEC materials, ensuring easy access through a unified platform.

The implementation of National Action Plan on Antimicrobial Resistance 2.0 (2025-2029) mandates that we work together and take steps to reduce the emergence, spread and impact of antimicrobial resistance across sectors.

I sincerely hope that our proposed commitments under NAP-AMR 2.0 will bring us closer to achieving our goals and play a meaningful role in reducing the emergence and impact of antimicrobial resistance.

(Ashwini Vaishnaw)

डॉ० जितेन्द्र सिंह

राज्य मंत्री (स्वतंत्र प्रभार),
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Minister of State in the Ministry of Personnel,

Public Grievances and Pensions;

Minister of State in the Department of Atomic Energy; and

Minister of State in the Department of Space

Government of India

MESSAGE

Anti Microbial Resistance (AMR) has emerged as one of the most pressing global public health concerns of the 21st century as it critically undermines the efficacy of essential pharmaceuticals in treating microbial infections. Consequently, addressing AMR has become a global health imperative and calls for concerted efforts by the policy makers, healthcare practitioners and researchers.

The Ministry of Science & Technology is committed to advancing impactful research and development of solutions for AMR through the various activities of the Department of Biotechnology (DBT), Department of Science & Technology (DST) and Council of Scientific and Industrial Research (CSIR).

As part of the National Action Plan on Antimicrobial Resistance 2.0 (2025-2029), the three Departments would work in concert with other relevant Ministries to effectively address AMR through a One Health framework. With a shared focus, the three departments will pursue the development of point-of-care diagnostics and innovative therapeutics centered on host-derived targets and new antibiotic formulations.

In addition to the above stated goals, DBT will undertake operational research projects to assess impact of antimicrobials on human and animal microbiome to understand the consequences of antimicrobial use. Pilot studies will be supported for genomic surveillance of critical and high priority bacterial pathogens. To strengthen India's collaboration on AMR at global level, bilateral and multilateral partnerships will be proposed and advocacy on AMR will be exercised through exchange of ideas and information on the global AMR platforms.

DST will support Centres of Excellence for identification of AMR drivers, especially the resistome signatures.

CSIR will take steps to establish and strengthen the MTCC-AMR testing laboratory to ensure quality standards for detecting AMR pathogens and genomic surveillance. Efforts will be made for estimation of morbidity, mortality, and economic impact of AMR as well as to understand the transmission pathways of AMR.

I appreciate the efforts of all the resource persons involved in shaping and bringing out this policy document.

(Dr. Jitendra Singh)

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PRATAPRAO JADHAV



देश का प्रकृति परीक्षण अभियान
।। संकल्प स्वास्थ्य का, आधार आयुर्वेद का ।।



स्वयं और समाज के लिए योग
Yoga for self and society



संदेश

देश में रोगाणुरोधी प्रतिरोध (एएमआर) एक गंभीर और बढ़ती सार्वजनिक स्वास्थ्य चिंता है जिसका मानव, पशु और पर्यावरणीय स्वास्थ्य पर प्रतिकूल प्रभाव पड़ता है। इस जटिल चुनौती से प्रभावी ढंग से निबटने के लिए 'एक स्वास्थ्य' दृष्टिकोण के सिद्धांतों के अनुरूप एक अच्छी तरह से समन्वित, बहु-सामाग्री क्षेत्रीय प्रतिक्रिया की आवश्यकता है।

इस प्रयास के हिस्से के रूप में आयुष मंत्रालय मानक उपचार दिशानिर्देशों के विकास और प्रसार के जरिए रोगाणुरोधी क्षमता वाली पारंपरिक दवाओं के युक्तिसंगत उपयोग को बढ़ावा देने के लिए प्रतिबद्ध है। मंत्रालय संक्रमण की रोकथाम और प्रबंधन के लिए आयुष हस्तक्षेपों पर कारगर, साक्ष्य-आधारित शोध का भी समर्थन करता है जिसमें एएमआर को संबोधित करने में उनकी संभावित भूमिका पर जोर दिया जाता है। इसके अलावा, आयुष चिकित्सकों और हितधारकों के बीच जागरूकता पैदा करना और क्षमता निर्माण इस वक्त प्रमुख फोकस क्षेत्र बने हुए हैं। आयुष मंत्रालय का उद्देश्य संक्रमण की रोकथाम, स्वास्थ्य संवर्धन और रोगाणुरोधी प्रबंधन के लिए आयुष प्रणालियों के व्यापक राष्ट्रीय रणनीतियों में एकीकरण की सुविधा प्रदान करना है। एएमआर से निपटने में क्षमता निर्माण, निगरानी, डेटा साझाकरण में सुधार और मजबूत अंतर-क्षेत्रीय समन्वय सुनिश्चित करने के लिए अन्य मंत्रालयों और विभागों के साथ घनिष्ठ सहयोग भी किया जा रहा है।

एएमआर 2.0 (2025-2029) पर राष्ट्रीय कार्य योजना की रणनीतिक प्राथमिकताओं के अनुरूप, आयुष मंत्रालय प्रस्तावित कार्यों को लागू करने के लिए पूर्णरूपेण प्रतिबद्ध है। इस व्यापक और सहयोगात्मक प्रयास से एएमआर के लिए एक मजबूत राष्ट्रीय प्रतिक्रिया, बढ़ा हुआ सार्वजनिक स्वास्थ्य लचीलापन और रोगाणुरोधी दवाओं का अधिक टिकाऊ उपयोग सुनिश्चित हो सके। आयुष मंत्रालय एनएपी-एएमआर 2.0 ढांचे के तहत इन लक्ष्यों को प्राप्त करने में सभी हितधारकों के साथ सक्रिय व सकारात्मक जुड़ाव की आशा करता है।

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May 8, 2025

Message

Antimicrobial resistance (AMR) is a silent pandemic which threatens to be the leading cause of death globally by 2050.

India has a dual challenge in this regard. We need to increase the rational and scientific use of antibiotics for addressing the unmet needs of infections, on the one hand, and to prevent the worsening scenario of AMR that demands reducing and rationalizing antimicrobial usage. The world also looks upon India to offer diagnostics, vaccines, therapeutics and other medical countermeasures to avert and control AMR. Under India's G20 presidency in 2023, AMR was highlighted for in the Leaders' Declaration.

The Second National Action Plan for AMR (NAP AMR 2.0) covering the next five-year phase is a salutary effort to mount a decisive response covering all the concerned sectors using the One Health paradigm.

Each sector is to play a pivotal role in reducing the emergence and spread of antimicrobial resistance. In NAP AMR 2.0, using a well-defined framework for multisectoral collaborations specific action plans by various ministries, departments, organizations with timelines and sectoral key performance indicators (KPIs) have been incorporated. This will ensure committed implementation and monitoring thereof.

The overall focus is to raise awareness, strengthen laboratory capacity, enhance infection prevention measures, promote responsible prescribing practices, and develop medical counter-measures (such as diagnostics, preventive tools and novel therapies). Antibiotic overuse in domestic animals must be curbed. Spillage of antibiotics into environment from all sources must be avoided.

There is a special responsibility of the health profession, public and private. We should follow treatment protocols on antibiotic usage. We should be extra careful before prescribing the 'watch' and the 'reserve' antibiotics. We should aim to establish antimicrobial stewardship (AMS) programs in all hospitals by 2030.

I am confident that with committed action by all stakeholders, NAP AMR 2.0 will have a significant impact on AMR containment in India.

Let us all unite against AMR.

(Vinod Paul)

अजय के. सूद

भारत सरकार के प्रमुख वैज्ञानिक सलाहकार

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MESSAGE

Dear Stakeholders,

As resistant strains continue to emerge, discovering new treatments and antimicrobials remains a crucial part of the solution, but alone, they are insufficient to combat Antimicrobial Resistance (AMR) in the long term. The current situation demands that we put our best foot forward. Deep technological innovations and rigorous research standards are necessary to contain the threat of AMR.

Antimicrobial resistance (AMR) containment requires a "One Health" approach focused on effective collaboration, coordination, cooperation, or integration as relevant. This is envisioned to be implemented through the National One Health Mission (NOHM) by integrating diverse inputs across the biosphere into a federated data system.

The Prime Minister's Science, Technology and Innovation Advisory Council (PM-STIAC), the highest government body overseeing scientific research in all sectors, has identified One Health AMR containment as a priority. The India AMR Innovation Hub (IAIH), under my chairmanship, is anchored at the Centre for Cellular and Molecular Platforms (C-CAMP) and is a unique convening of Indian and Global Stakeholders to augment and align efforts for AMR interventions through innovations. IAIH is an innovation platform for AMR bringing research institutions, industry, and start-ups in the country for novel therapies and cost-effective diagnostics to address the burgeoning challenge of AMR.

As the Innovation Arm under NAP AMR 2.0, C-CAMP anchored IAIH through guidance of the office of the PSA, and the NITI Aayog, is committed to harmonizing AMR innovations in the country through periodic meetings of all stakeholders, for coordinated efforts without duplication.

I am grateful to the contributors of this technical document and want to express my belief in its worth to fulfil the critical task of containing antimicrobial resistance in India, and in the process, establishing a roadmap for innovation-centric interventions for other low and middle income countries (LMICs). Coordinated and concerted efforts are required to ensure effective implementation of the commitments stated in the action plan. I hope our determination remains high throughout the journey and we achieve the desired outcomes.

Thank you.

(Ajay K. Sood)

Dated: 8th May, 2025



पुण्य सलिला श्रीवास्तव, भा.प्र.से.
सचिव

PUNYA SALILA SRIVASTAVA, IAS
Secretary



सत्यमेव जयते



भारत सरकार
स्वास्थ्य एवं परिवार कल्याण विभाग
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Government of India
Department of Health and Family Welfare
Ministry of Health and Family Welfare



Message

Antimicrobial Resistance (AMR) is growing into a global public health crisis with the potential to lead to devastating outbreaks at both community and international levels. The spread of resistant microbes threatens to undermine decades of medical advances, making common infections harder to treat and increasing the risk of severe illness and death.

Addressing AMR requires a coordinated effort that goes beyond healthcare and involves sectors such as agriculture, the environment, and food production, all of which are closely intertwined with the use and management of antimicrobials. By bringing these sectors together, a more holistic, unified approach to preventing AMR has been envisioned through the National Action Plan on Antimicrobial Resistance (NAP AMR 2.0) which also includes a well-defined framework for coordination and collaboration across sectors.

Equal emphasis is on prevention and containment strategies and innovations to ensure a more sustainable and effective response to AMR. Among the preventive strategies, focus is on strengthening awareness and education among healthcare providers & general community and to develop the National Infection Prevention and Control programme with linkages to all relevant existing health programmes so as to reduce transmission of infections in healthcare facilities and the overuse of antimicrobials. Another focus area is to replace syndromic management of infectious diseases with laboratory evidence-based treatment to prevent misuse of antimicrobials. By focusing on responsible use, infection control, and education, the aim is to reduce the burden on healthcare systems and safeguard the effectiveness of lifesaving drugs for future generations.

All stakeholder Ministries are requested to engage with relevant partners including the private sector, national professional regulatory bodies, professional associations, institutes, etc to develop implementation roadmaps for the action plan committed in NAP AMR 2.0.

By working together through these collaborative initiatives, we will be better positioned to control antimicrobial resistance and protect public health. The fight against AMR is not just a medical challenge; it is a shared responsibility that requires commitment and action across all levels of society.

Dated 6th June, 2025

Punya Salila
(Punya Salila Srivastava)

टीबी हारेगा देश जीतेगा / TB Harega Desh Jeetega



तन्मय कुमार
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सत्यमेव जयते



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SECRETARY
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MINISTRY OF ENVIRONMENT, FOREST
AND CLIMATE CHANGE



MESSAGE

National Action Plan on Anti-microbial resistance was first launched by the Ministry of Health and Family Welfare (MoHFW) in 2017 and it focused on strengthening surveillance, coordination among different sectors at the State and National level to raise awareness and identification of priority areas for research on diagnostics and therapeutics.

Emergence of Antimicrobial Resistance in the environment can be attributed to improper and excessive use of anti-microbial and unscientific management of bio-medical waste from health care facilities.

In line with the objectives of NAP-AMR, Ministry of Environment, Forest and Climate Change has taken up several initiatives such as regulation and monitoring of various industrial activities through Environmental Clearance and Consent mechanism that prescribes effluent discharge norms for industries for effective implementation and monitoring environment management plan to manage wastes and effluents arising out of these activities. Bio-medical Waste Management Rules, 2016 notified by the Ministry provides a legal enforcement framework for environmentally sound management of wastes and effluents arising out healthcare facilities, hospitals, industries and bio-medical waste treatment facilities.

I compliment the Ministry of Health and Family Welfare and NITI Aayog for finalising and releasing the National Action Plan on Antimicrobial Resistance 2.0 (NAP AMR 2.0) to be implemented through collaboration and coordination of various Ministries, Departments and agencies of Govt. of India under 'One Health Approach'.

(Tanmay Kumar)

Place: New Delhi
Dated: July 17, 2025

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ABBREVIATIONS

| | |
|----------------|--|
| AIIMS | All India Institute of Medical Sciences |
| AMC | Antimicrobial consumption |
| AMR | Antimicrobial resistance |
| AMS | Antimicrobial stewardship |
| AMU | Antimicrobial use |
| ASCAD | Assistance to State/UTs for Control of Animal Disease |
| AST | Antimicrobial susceptibility testing |
| AYUSH | Ayurveda, Yoga and Naturopathy, Unani, Siddha and Homeopathy |
| BIRAC | Biotechnology Industry Research Assistance Council |
| CAA | Coastal Aquaculture Authority |
| CARB-X | Combating antibiotic Resistant Bacteria |
| C-CAMP | Centre for Cellular and Molecular Platforms |
| CDSCO | Central Drugs Standard Control Organisation |
| CEA | Clinical Establishment Act |
| CHEB | Central Health Education Bureau |
| CPCB | Central Pollution Control Board |
| CSIR | Council for Scientific and Industrial Research |
| DAHD | Department of Animal Husbandry and Dairying |
| DCGI | Drug Controller General of India |
| DHR | Department of Health Research |
| DoF | Department of Fisheries |
| DoP | Department of Pharmaceuticals |
| DBT | Department of Biotechnology |
| DST | Department of Science and Technology |
| FAO | Food and Agriculture Organization of the United Nations |
| FBO | Food Business Operators |
| FSSAI | Food Safety and Standards Authority of India |
| GAP AMR | Global Action Plan on AMR |
| GLASS | Global AMR Surveillance System |
| GMP | Good Manufacturing Practices |
| HAI s | Healthcare Associated Infections |

| | |
|----------------|---|
| HCF | Health Care Facilities |
| HMIS | Hospital Management Information System |
| ICAR | Indian Council of Agricultural Research |
| ICMR | Indian Council of Medical Research |
| IEC | Information, Education and Communication |
| INFAAR | Indian Network for Fishery and Animal Antimicrobial Resistance |
| INFAH | Indian Federation of Animal Health Companies |
| IPC | Infection prevention and control |
| IPHLs | Integrated Public Health Laboratories |
| KAP | Knowledge Attitude and Practices |
| KVK | Krishi Vigyan Kendra |
| LIMS | Laboratory Information Management System |
| LMICs | Low-middle Income Countries |
| MDR | Multidrug resistant |
| MoAFW | Ministry of Agriculture and Farmers Welfare |
| MoE | Ministry of Education |
| MoEFCC | Ministry of Environment, Forest and Climate Change |
| MoFPI | Ministry of Food Processing Industries |
| MoHFW | Ministry of Health and Family Welfare |
| MoIB | Ministry of Information and Broadcasting |
| MoU | Memorandum of Understanding |
| MRSA | Methicillin Resistant <i>Staphylococcus aureus</i> |
| NABH | National Accreditation Board for Hospitals and Healthcare Providers |
| NABL | National Accreditation Board for Testing and Calibration Laboratories |
| NACO | National AIDS Control Organisation |
| NAP AMR | National action plan on AMR |
| NBC | Nucleus Breeding Centres |
| NCDC | National Centre for Disease Control |
| NDLM | National Digital Livestock Mission |
| NFDB | National Fisheries Development Board |
| NGO | Non-Government Organization |
| NHSRC | National Health Systems Resource Centre |
| NIHFW | National Institute of Health & Family Welfare |
| NIPER | National Institution of Pharmaceutical Education and Research |

| | |
|-------------|---|
| NITI | National Institute for Transforming India |
| NMC | National Medical Commission |
| NQAS | National Quality Assurance Standards |
| POC | Point of Care |
| SOPs | Standard Operating Procedures |
| SPCB | State Pollution Control Board |
| WASH | Water, Sanitation and Hygiene |
| WHO | World Health Organization |
| WOAH | World Organization for Animal Health |

EXECUTIVE SUMMARY

Antimicrobial resistance (AMR) has been globally recognised as an emerging threat to public health which is linked with high disease and economic burden on people and nations. It is also linked with food, nutrition, livelihood and Sustainable Development Goals. AMR naturally develops over time, usually through genetic changes, however the misuse and overuse of antimicrobials across sectors is accelerating this process. Lack of appropriate infection prevention and control practices is further contributing to spread of infections including multidrug resistant organisms. Furthermore, antimicrobial residues in pharmaceutical and hospital effluents are also considered as potential contributors to the worsening AMR crisis. AMR has been identified as one of the top ten global public health threats by WHO. The World Health Assembly in May 2015, endorsed a resolution, urging member countries to align their national action plans with the global standard by May 2017, and WHO subsequently published the Global Action Plan on Antimicrobial Resistance to guide Member States in developing their plans.

To tackle the problem of AMR in India, a National Task Force on AMR Containment was constituted in 2010 and National policy on AMR containment was developed in 2011. The National Programme on AMR Containment was launched by the Ministry of Health and Family Welfare (MoHFW) during the twelfth Five Year Plan in 2013 to strengthen laboratory capacity at state govt. medical colleges across the country. The NAP-AMR, aligned with the Global Action Plan on AMR, officially released by Hon'ble HFM in 2017, was based on an integrated 'One Health' approach. It emphasises coordination among different sectors at the state, national and international level. The achievements of NAP AMR implementation include development and dissemination of media material for raising awareness on judicious use of antimicrobials and infection prevention in the community and animal husbandry practices among animal handlers; strengthening national and state level AMR and AMC surveillance; strengthening infection prevention practices and antimicrobial stewardship practices in healthcare facilities, strengthening implementation of regulations for antimicrobial use; identifying priority areas for research on diagnostics and therapeutics; several international collaborations and launch of state action plans on containment of AMR in 7 states.

The NAP AMR was to be implemented over 5 years (2017-2021), however due to COVID pandemic its implementation was impacted. Some key challenges in implementing the NAP AMR included limited ownership by non-human health sectors, all inter-sectoral activities were to be coordinated/conducted by a National Authority for Containment of AMR (NACA) which was not

constituted and in the absence of NACA there was no mechanism for Intra- and inter-sectoral coordination and for monitoring the implementation of NAP AMR.

In 2022, the development of NAP-AMR 2.0 (2025-2029) was initiated and the implementation status of NAP AMR was reviewed through a series of National Consultations held for the human health sector, research sector, professional associations and civil society organizations, environment and animal husbandry sectors. A high-level meeting at NITI Aayog was held which included stakeholders from various departments and ministries in May 2023 following which series of meetings were conducted at NITI Aayog with multiple stakeholders from the 20 concerned/aligned ministries and departments under the chairmanship of Hon'ble Member (Health), NITI Aayog. In view of the challenges and gaps experienced during the implementation of NAP AMR (2017-21), the NAP-AMR 2.0 includes specific action plans of each key stakeholder ministry/department with timelines and budget.

The NAP-AMR 2.0 is based on 'Whole of government' approach with sustained funding within each sector/department and effective sectoral action as the foundation of intersectoral coordination. The National Strategy for AMR Containment defines the goal of AMR Containment in India. It also describes the six strategic objectives with sub-objectives and key activities to be undertaken with a 'One Health' approach. The first strategic objective focusses on improving awareness and understanding of AMR through effective communication, education and training. The second strategic objective plans to strengthen laboratory capacity for AMR detection, surveillance and targeted surveillance of antibiotic residues. The third strategic objective aims to reduce the incidence of infection through effective infection prevention and control. Fourth strategic objective is to optimize the use of antimicrobial agents in humans, animals and food through uninterrupted access and judicious use of antimicrobials. The fifth strategic objective promotes research and innovations by identifying priorities for basic and operational research relevant to AMR. The sixth strategic objective focusses on strengthening governance, intra and inter sectoral coordination and collaborations on AMR. NAP AMR 2.0 also includes well defined mechanisms for monitoring the implementation of NAP AMR 2.0 within and across the various ministries and an evaluation framework with defined outcomes and key performance indicators. Action plan owned by each stakeholder is annexed in second half of this document.

Towards implementation of the NAP-AMR 2.0, after its launch each stakeholder ministry is expected to develop their implementation roadmap ensuring engagement of private sector, technical institutions, professional groups, industry, cooperatives, NGOs, international partners and other relevant organisations.

INTRODUCTION

Antimicrobial Resistance (AMR) refers to the condition when the routinely used medicines like antibiotics, antivirals, antiparasitic drugs, or antifungals become ineffective for treating the respective organisms. Antibiotic resistance (ABR) is most important among AMR as many pathogenic bacterial species have developed resistance leading to serious infections. With antibiotics becoming increasingly ineffective against disease-causing bacteria, AMR is being recognised as an emerging public-health threat globally with serious health and economic implications. AMR can lead to greater spread of infectious diseases, difficulty in treating common infections, uncertainty in success of high-end procedures, longer hospital stays and more expensive treatments. AMR poses growing threat not just to humans but also to plant and animal health. AMR recognises that health of humans, animals and ecosystems are interconnected and therefore needs to be addressed through ‘One Health’ approach involving coordination and collaboration among multiple stakeholders.

Antimicrobial resistance occurs naturally over time, usually through genetic changes. However, the misuse and overuse of antimicrobials is accelerating this process. In many places, antibiotics are overused and misused in people and animals, and often given without professional oversight. The overuse and misuse of antimicrobials like in treatment of viral infections in humans, routine use to prevent disease in healthy animals and crops in the absence of good animal husbandry/agricultural practices are contributing to the development and spread of antimicrobial resistance both in animals and humans. The transition to high-protein diets in low- and middle-income countries (LMICs) has been facilitated by the global expansion of intensive animal production systems in which anti-microbials are used routinely to maintain health and productivity. Globally, 73% of all antimicrobials sold on Earth are used in animals raised for food. A growing body of evidence has linked this practice with the rise of antimicrobial-resistant infections, not just in animals but also in humans.¹ In addition, inadequate access to water, sanitation and hygiene, poor infection prevention measures, lack of access to affordable and quality assured drugs, vaccines and diagnostics, all contribute to the spread of drug-resistant pathogens. Poor Infection Prevention and Control (IPC) practices also contribute to the spread of AMR in healthcare facilities. Antimicrobial residues in pharmaceutical, hospital and farm waste are also considered to contribute to AMR.

¹ Van Boeckel et al. *Global trends in antimicrobial resistance in animals in low- and middle-income countries*. 2019. *Science*, 365(6459). <https://doi.org/10.1126/science.aaw1944>

Antimicrobial resistance (AMR) has been prioritized by the World Health Organization (WHO) as one of the top 10 global public health threats facing humanity.² The Global Burden Disease study on antimicrobial resistance conducted in 2021 reported that 4.71 million deaths were associated with bacterial AMR including 1.14 million deaths attributable to bacterial AMR.³

Globally five regions had an increase of more than 10000 deaths attributable to AMR: western sub-Saharan Africa, Tropical Latin America, high income north America, south east Asia and south Asia. AMR mortality in age groups from 25 years and older had an increase from 1990 to 2021, with adults 70 years and older experiencing a more than 80% increase in both attributable and associated mortality. There was a global increase in attributable AMR deaths for 12 pathogens from 1990 to 2021.³ The largest increase in attributable burden globally was methicillin resistant *Staphylococcus aureus* among Gram-positive pathogens and among Gram-negative pathogens, annual mortality attributable to carbapenem resistance rose by 89200 deaths from 1990 to 2021.³ Without intervention it is estimated that global deaths attributable to AMR could reach 10 million annually by 2050. AMR could potentially cause global economic losses of up to \$100 trillion by 2050, due to increased healthcare costs, loss of productivity, and impact on agriculture.⁴

AMR has been the key agenda in numerous World Health Assemblies (WHA) and Regional Committee resolutions. In May 2015, the sixty-eighth World Health Assembly endorsed a resolution making it mandatory for member countries to align national action plans with the global standard by May 2017, and WHO subsequently published the Global Action Plan on Antimicrobial Resistance (GAP-AMR) to guide Member States in developing their plans. The GAP-AMR has five strategic objectives: (1) to improve awareness and understanding of antimicrobial resistance; (2) to strengthen knowledge through surveillance and research; (3) to reduce the incidence of infections; (4) to optimise the use of antimicrobial agents; (5) to ensure sustainable investment in countering antimicrobial resistance. The Global action plan underscores the need for an effective ‘One Health’ approach involving coordination among various sectors at the national and international level. Since the release of the GAP-AMR in 2015, 170 countries have developed NAP on AMR, however, the implementation of the action plans has been challenging. The recent Tracking Antimicrobial Resistance (AMR) Country Self-Assessment Survey (TrACSS) report shows that only 28% countries (47 out of 166) are implementing and monitoring their NAPs. The first high-level meeting on AMR

² World Health Organization. 10 global health issues to track in 2021. 2020. Available from: <https://www.who.int/news-room/spotlight/10-global-health-issues-to-track-in-2021>.

³ GBD 2021 Antimicrobial Resistance Collaborators. Global burden of bacterial antimicrobial resistance 1990–2021: a systematic analysis with forecasts to 2050. *Lancet* 2024. [https://doi.org/10.1016/S0140-6736\(24\)01867-1](https://doi.org/10.1016/S0140-6736(24)01867-1)

⁴ O’Neill J. Tackling drug resistant infections globally: Final report and recommendations. The review of antimicrobial resistance. 2016. http://amrreview.org/sites/default/files/160525_Final%20paper_with%20cover.pdf

was also held at United Nations General Assembly (UNGA) in September, 2016 to garner strong political commitments.

In support of the multisectoral objectives of WHO's GAP-AMR focusing on 'One Health' approach, WHO has developed a core package of 13 interventions to help countries implement NAP on AMR in the people – centred approach, at four levels of implementation namely, community, primary care, secondary and tertiary care, national and/or sub-national level. Such an approach “requires that people have the education and support they need to make decisions and participate in their own care”. The document titled “People Centred approach on AMR” aims to shift the narrative of AMR away from a solely biological phenomenon (drug resistance) towards a people-centred narrative and to equip policy-makers in the human health sector at the country level with a people centred core package of AMR interventions to guide the design and prioritization of interventions taking into account the challenges faced along the AMR people journey. The political declaration⁵ of the second high-level meeting on AMR held during the UN General Assembly (UNGA) 2024 meeting outlines decisive action without which AMR will cause even more global suffering, particularly in low- and middle-income countries.

Acknowledging the problem of AMR, the Government of India has taken series of initiatives which include constitution of a National Task Force on AMR Containment in 2010 leading to development of the National policy on AMR containment⁶ in early 2011. The Ministry of Health and Family Welfare Government (MoHFW) launched the National Programme on AMR Containment during the twelfth Five Year Plan in 2013. The aim of the programme was to strengthen laboratory capacity at state govt. medical colleges across the country in phased manner to generate geographically represented AMR surveillance data. The programme objectives over the years have been expanded to include AMR containment activities in the human health sector in alignment with the NAP AMR.

The MoHFW in September 2016 notified governance mechanisms (reconstituted in September 2021) which supported the development and implementation of the National action plan on AMR (NAP-AMR). The NAP-AMR⁷ was developed involving stakeholders from various ministries/sectors and was officially released by Hon'ble HFM on 19th April 2017. The Delhi Declaration on AMR- an inter-ministerial consensus, was signed at the launch of NAP-AMR, by the ministers of 4 ministries pledging their whole-hearted support in AMR containment. NAP-AMR

5 <https://www.un.org/pga/wp-content/uploads/sites/108/2024/09/FINAL-Text-AMR-to-PGA.pdf>

6 <https://ncdc.mohfw.gov.in/wp-content/uploads/2024/07/National-Policy-for-AMR-Containment-in-India.pdf>

7 <https://ncdc.gov.in/WriteReadData/linkimages/AMR/File645.pdf>.

focused on an integrated ‘One Health’ approach and involved coordination among various sectors for action under 6 strategic priorities:

1. Improve awareness and understanding of AMR through effective communication, education and training
2. Strengthen knowledge and evidence through surveillance
3. Reduce the incidence of infection through effective infection prevention and control
4. Optimize the use of antimicrobial agents in health, animals and food
5. Promote investments for AMR activities, research and innovations
6. Strengthen India’s leadership on AMR through International, National and sub-national collaborations

The NAP-AMR duration was from 2017- 2021, however the COVID 19 pandemic stalled progress on its implementation during 2020-22. Some of the key challenges in implementation of NAP-AMR were limited ownership by non-human health sectors, many intersectoral activities were to be implemented through an independent National Authority for Containment of AMR (NACA) which was not constituted, most of the IPC activities in human health sector were the responsibility of the National coordinating unit (NCU) for IPC which was not constituted, dedicated unit and manpower for coordination and monitoring the multisectoral implementation of NAP AMR was not available.

In the year 2022 several National consultations were held to review status of implementation of NAP-AMR and the process for development of NAP-AMR 2.0 was initiated. The NAP-AMR for the period of 2025-2029 has been developed keeping in view the key challenges in implementation of NAP-AMR 1.0. The updated NAP-AMR has sustainable sectoral ownership with inclusion of budgeted action plans from key ministries/departments/organizations.

NITI Aayog under the leadership of Hon’ble Member (Health) played an instrumental role in bringing together twenty ministries/departments/organizations to conduct a series of brainstorming sessions, and plan systematic roll-out of a strategy for AMR based on the work already done by the ministries/departments and the available policies of Government of India. Each stakeholder ministry/department prepared and presented their respective action plans developed under concerned strategic objectives of NAP-AMR 2.0 with defined goals and timelines. These individual plans converging under the respective strategic objective would ensure cohesive action for tackling anti-microbial resistance across the human, animal, agriculture and environment sectors.

PROBLEM STATEMENT OF AMR IN INDIA

Antimicrobial resistance (AMR) is recognized as a serious threat to global public health and development. This problem primarily stems from the misuse and overuse of antimicrobials in humans, animals and plants. The proliferation of drug-resistant pathogens jeopardizes the advances made in modern medicine, rendering infections more difficult to treat and heightening the risks associated with critical medical procedures such as transplant surgeries and cancer chemotherapy.

AMR affects countries across all regions and income levels, but its impact is disproportionately severe in low and middle-income countries (LMICs). These nations often face challenges due to factors such as poverty and inequality, which further get exacerbated due to the difficulties of managing AMR infections. The world is also grappling with a crisis in the antibiotics pipeline and access to critical medical resources. AMR could also potentially cause global economic losses of up to \$100 trillion by 2050 due to increased healthcare costs, loss of productivity, and impact on agriculture. Therefore, there is an urgent need for enhanced research and development efforts to address the rising levels of resistance along with measures to ensure affordable and equitable access to both new and existing vaccines, diagnostics and medicines.^{8,9}

A global systematic analysis, Global Burden of Disease (GBD) study, conducted by Antimicrobial Resistance Collaborators in 2021, evaluated 84 bacterial pathogen–drug combinations and estimated that 1.14 million deaths were attributable to bacterial AMR and 4.71 million deaths were associated with bacterial AMR, representing a decline in both estimates from 2019. An increase in deaths from 0.0619 million to 1.03 million associated with carbapenem resistant Gram-negative bacteria has been observed from 1990 to 2021, more than any other antibiotic class.¹⁰ The study also forecasted that by 2050, globally 1.91 million deaths will be attributable to AMR annually and 8.22 million deaths will be annually associated with AMR. The future AMR burden will be highest in South Asia, Southeast Asia, East Asia, and Oceania, and Sub-Saharan Africa, with the forecasted cumulative AMR attributable death burden from 2025 to 2050 at 11.8 million (95% UI 9.43–14.4), 8.96 million (7.45–10.4), and 6.63 million (5.00–8.66), respectively.¹¹

⁸ WHO. Antimicrobial resistance key facts. 2023. <https://www.who.int/news-room/fact-sheets/detail/antimicrobial-resistance>

⁹ Drug-Resistant Infections: A Threat to Our Economic future <https://www.worldbank.org/en/topic/health/publication/drug-resistant-infections-a-threat-to-our-economic-future>

¹⁰ GBD 2021 Antimicrobial Resistance Collaborators. Global burden of bacterial antimicrobial resistance 1990–2021: a systematic analysis with forecasts to 2050. *Lancet* 2024. [https://doi.org/10.1016/S0140-6736\(24\)01867-1](https://doi.org/10.1016/S0140-6736(24)01867-1)

The GBD study also revealed that AMR mortality is decreasing in children younger than 5 years, deaths with sepsis decreased by more than 60% over the past 31 years, from 7.69 million in 1990 to 3.14 million in 2019, and 2.68 million in 2021. However, proportion of deaths with sepsis attributable to AMR increased by 18% in children younger than 5 years from 1990 to 2019.¹¹

Burden in India

A multi-facility retrospective observational study was conducted in 10 hospitals in India to assess the mortality burden associated with multidrug-resistant (MDR) and extensively drug-resistant (XDR) infections between January and December 2015¹¹. A total of 19,811 antimicrobial susceptibility test (AST) results were obtained from 13,086 patients. Of these, 5,103 records met all inclusion criteria for the analysis. The overall mortality rate among these patients was 13.1% (581 deaths). The mortality rate was higher among patients infected with *Acinetobacter baumannii* (29.0%) and *Klebsiella pneumoniae* (18.4%) compared to patients infected with *Escherichia coli* (8.8%) and *Staphylococcus aureus* (11%) infections. Overall, mortality rates among patients with MDR infections were highest among those caused by Gram-negative bacteria, as opposed to those caused by Gram - positive bacteria, particularly in the ICU, where 26.9% of patients with Gram-negative MDR infections died, compared to 16% of patients with Gram – positive infections. MDR infections increased the odds of mortality by 1.57 times, and XDR infections by 2.65 times. Restricting the analysis to non-ICU inpatients only, patients with MDR infections had significantly higher odds of mortality (1.74 OR) as did patients with XDR infections (2.87 OR).¹¹

The above study faced several limitations, including the lack of complete clinical data, which prevented the control for important variables like severity of illness, comorbid conditions, and time to effective therapy. Additionally, the classification of infections as hospital- or community-associated was limited by the available data, which may have affected the findings related to the infection-onset location. Despite being observational, the findings strongly suggest a significant threat to public health posed by these resistant infections. Prospective studies to better quantify the burden of MDR and XDR infections, including morbidity, mortality and hospital costs are required. The definitions of MDR and XDR used in the study were based on interim definitions published in 2012 which need to be updated and validated with respect to the Indian context.

¹¹ Gandra et al. *The Mortality Burden of Multidrug-resistant Pathogens in India: A Retrospective, Observational Study. Clinical Infectious Diseases.* 2019;69(4):563–70. Available from: DOI: 10.1093/cid/ciy955

Trends of antimicrobial resistance in human health

The 2023 annual AMR surveillance reports released by National Centre for Disease Control (NCDC) and Indian Council of Medical Research (ICMR) reveal that *E. coli* was the most commonly isolated pathogen, accounting for 34% of AMR surveillance data, predominantly found in urine samples (51%). *S. aureus* was the most common pathogen in pus aspirates (27%) and *Acinetobacter* species was found to be the commonest pathogen isolated from blood samples (23%). The 5-year trend analysis for Methicillin-resistant *S. aureus* (MRSA) from blood samples showed a significant decrease in resistance rates from 66% in 2019 to 55% in 2023. Conversely, trend analysis of Vancomycin-resistant *Enterococcus* spp. (VRE) isolated from blood showed an increase from 2020 (9%) to 2023 (19%). Methicillin resistance was observed to be 60% among ICU patients compared to 46% among outpatients. MRSA isolates were 100% susceptible to vancomycin and linezolid.¹² Extended-spectrum beta-lactamase (ESBL) producing *E. coli* isolates from blood samples showed a decrease from 86% in 2018 to 82% in 2023.¹³ Among the Enterobacterales, comparing data of 2022 and 2023, *E. coli* isolates showed an increase in resistance from 35% to 40% and *Klebsiella* spp. isolates from 47% to 54% to at least one of the carbapenems.¹² *Acinetobacter* species isolates from blood showed 66% resistance and isolates from sterile body fluids showed 71% resistance to carbapenems.¹³ Third-generation cephalosporin resistance was more than 65% among *E. coli*, *Klebsiella pneumoniae*, and *Acinetobacter baumannii*, except *Pseudomonas aeruginosa* (45%) in isolates from ICU and inpatients. Amikacin and gentamicin susceptibility was high in *P. aeruginosa* (~70 - 75%) isolates. *Salmonella* Typhi showed high susceptibility to ceftriaxone (~97% - 99%), trimethoprim-sulfamethoxazole (95%), and azithromycin (99%) and low susceptibility to fluoroquinolones (~60%). In isolates from stool samples, *Shigella* species was observed to have highest resistance to ampicillin (81.5%) and ciprofloxacin (74.3%), resistance to chloramphenicol was 22%. Among *Vibrio cholerae* isolates, highest resistance was observed to trimethoprim/sulfamethoxazole (89%). Low resistance to colistin (0.3% - 0.4%) and minocycline (27% - 32%) was observed in *Acinetobacter* species and among *Klebsiella* spp. resistance to colistin was observed to be 0.4% in urine isolates and 0.8% in blood isolates.¹²

Human fungal infections are rising rapidly with these eukaryotic pathogens now affecting billions globally and causing over 1.5 million deaths annually. The mortality rates for invasive fungal infections are comparable to those of prevalent bacterial diseases. Around 90% of all deaths from fungal infections are attributed to *Candida* sp., *Aspergillus* sp., or *Cryptococcus* species, which are

¹² Annual Report National Antimicrobial Surveillance Network (NARS-Net) 2023. National Centre for Disease Control (NCDC), Directorate General of Health Services, Ministry of Health and Family Welfare. Government of India. Available from: https://ncdc.mohfw.gov.in/wp-content/uploads/2024/09/Final-Annual-Report-2023-06_08_2024.pdf

listed in the World Health Organization's critical priority list of fungal pathogens.¹³ Among these, *Candida* species is the leading cause of invasive infections, particularly candida bloodstream infections (BSI), which pose a significant threat to ICU patients and have a mortality rate between 46% to 75%, a statistic that has remained unchanged for decades.¹⁴

Non-albicans candida species, such as *C. tropicalis*, *C. glabrata*, and *C. parapsilosis* are recognized as major pathogens causing BSIs across various geographic locations. More recently, MDR *Candida auris*, a yeast resistant to fluconazole and showing varying susceptibility to other azoles, amphotericin B, and echinocandins, has emerged globally as a healthcare-associated pathogen. Alarmingly, within just seven years, this hard-to-treat yeast, which spreads clonally both within and between hospitals, has become widespread in multiple countries, leading to a variety of healthcare-associated invasive infections¹⁵. Since its initial identification nearly 15 years ago, *C. auris* has been reported widely, posing a global public health threat due to its high levels of antifungal drug resistance and associated mortality. A study conducted in India analysed 1,400 cases of candidemia from 27 ICUs across the country to identify risk factors. It was found that 5.3% of cases were due to *C. auris*, with a higher frequency in ICUs in the northern part of the country compared to other regions. The study included both private and public-sector hospitals across the country. The higher rate of *C. auris* candidemia in public-sector hospitals may be linked to overcrowding due to healthcare cost constraints and potentially compromised infection control practices.¹⁶

Antimicrobial consumption and usage

The National Antimicrobial Consumption Network (NAC-NET), initiated in 2017 and currently comprising of 35 tertiary care institutes across India, is being coordinated by the NCDC. A point prevalence survey on antibiotic use was conducted across 20 sites from November 2021 to April 2022, assessing a total of 12,342 antibiotic prescriptions. The overall prevalence of antibiotic use was found to be 71.9%, with a range from 37% to 100%. Among these, 6% of patients were on definitive therapy, while 94% were on empirical therapy. Additionally, 45% of the patients received antibiotics for therapeutic purposes, and 55% for prophylactic reasons. The prescriptions were

¹³ WHO fungal priority pathogens list to guide research, development and public health action. Geneva: World Health Organization; 2022. Licence: CC BY-NC-SA 3.0 IGO.

¹⁴ Chowdhary et al. *Candida auris* Genetics and Emergence. *Annu. Rev. Microbiol.* 2023. 77:583–602. Available from: <https://doi.org/10.1146/annurev-micro-032521-015858>

¹⁵ Chowdhary A, Sharma C, Meis JF (2017) *Candida auris*: A rapidly emerging cause of hospital-acquired multidrug-resistant fungal infections globally. *PLoS Pathog* 13(5): e1006290. <https://doi.org/10.1371/journal.ppat.1006290>

¹⁶ Rudramurthy et al. *Candida auris* candidemia in Indian ICUs: analysis of risk factors. *Journal of Antimicrobial Chemotherapy* 2017; 72: 1794–1801. Available from: [doi:10.1093/jac/dkx034](https://doi.org/10.1093/jac/dkx034)

categorized based on the WHO AWaRe classification¹⁷ of antibiotics, revealing that 57% belonged to the Watch group, 38% to the Access group, and 2% to the Reserve group, with 3% of prescriptions falling into the 'not recommended' category. The survey highlighted significant concern of high usage of Watch group antibiotics, which have a higher resistance potential.¹⁸

Antimicrobial resistance in Animal Health

The Indian Council of Agricultural Research (ICAR), with technical support from the Food and Agriculture Organization (FAO) of the United Nations and United States Agency for International Development (USAID), has established the Indian Network for Fishery and Animal Antimicrobial Resistance (INFAAR) to monitor AMR in the aquaculture and veterinary sectors.

In aquaculture, *S. aureus* isolates were mainly susceptible to chloramphenicol, co-trimoxazole, gentamicin, linezolid, and tetracycline. 91.3% isolates showed resistance to penicillin, followed by erythromycin (36.1%) and cefoxitin (16.4%). Freshwater fish isolates displayed high resistance to ciprofloxacin (54.8%), compared to shrimp (6.3%) and marine fish (18.8%). Among coagulase negative staphylococcus (CONS), resistance to chloramphenicol, ciprofloxacin, gentamicin, linezolid, and tetracycline was below 10%. The highest resistance among CONS isolates was to penicillin (79.7%), followed by cefoxitin (33%), erythromycin (27.4%), and co-trimoxazole (13.8%). Less than 10% *E. coli* isolates showed resistance to amikacin, aztreonam, ceftazidime, ceftriaxone, chloramphenicol, co-trimoxazole, enrofloxacin, and imipenem, with 11.5% showing resistance to tetracycline. Marine fish isolates of *E. coli* showed higher resistance to cefpodoxime (66.9%), cefotaxime (54.1%), amikacin (29.9%), and tetracycline (24.2%) compared to freshwater fish and shrimp isolates. *V. parahaemolyticus* isolates showed less than 10% resistance to chloramphenicol, co-trimoxazole, gentamicin, meropenem, and tetracycline, and higher resistance to ampicillin (56.1%), cefotaxime (39.5%), and ciprofloxacin (29.6%).

Surveillance included major food-producing animals such as cattle, buffalo, goats, sheep, pigs, and poultry. Most *S. aureus* isolates were sensitive to chloramphenicol, tetracycline, gentamicin, and linezolid, though about 72% were resistant to penicillin, 19% to erythromycin, and 17% to enrofloxacin. Of the 2543 bovine milk samples including 1721 cow milk and 855 buffalo milk screened, only 35 *S. aureus* of bovine origin were confirmed as MRSA indicating a low risk of milk-borne MRSA infections from cow milk. Bovine staphylococcus isolates were mostly

¹⁷ <https://www.who.int/news/item/01-10-2019-who-releases-the-2019-aware-classification-antibiotics#>

¹⁸ Report of the First Multicentric Point Prevalence Survey of Antibiotic Use at 20 NAC-NET Sites India 2021-2022. National Centre for Disease Control (NCDC), Directorate General of Health Services, Ministry of Health and Family Welfare. Government of India. Available from: <https://ncdc.mohfw.gov.in/wp-content/uploads/2024/03/FinalNACNETReport.pdf>

resistant to penicillin (69%), followed by erythromycin (23%) and enrofloxacin (18%). Among the porcine isolates, higher resistance than bovine isolates was observed to gentamicin (39%) and enrofloxacin (46%). Linezolid resistance among porcine isolates was comparatively low(5.8%).

Among all the food animals, poultry isolates (722) exhibited higher resistance rates to all tested antibiotics. Resistance rates among avian isolates were much higher to ampicillin (58%), cefotaxime (52%), tetracycline (50%) and nalidixic acid (47%). In addition, poultry isolates were also resistant to amoxycylav (36%), enrofloxacin (43%), amikacin (32%), and imipenem (18%). Chloramphenicol resistance was below 15%.

Porcine *E. coli* isolates were frequently resistant to most antibiotics, especially ampicillin (57%), cefotaxime (53%), tetracycline (48%), amoxycylav and amikacin (45% each), and nalidixic acid (41%). Chloramphenicol resistance was low (8%) and 33% of porcine isolates showed resistance to imipenem.¹⁹

¹⁹ Surveillance data of the Indian Network for Fishery and Animal Antimicrobial Resistance (INFAAR) – An analytical report 2019–2022. Available from: <https://openknowledge.fao.org/server/api/core/bitstreams/f95db088-7f44-48f8-bcd7-78b2691c5379/content>

NATIONAL RESPONSE UNDER NAP-AMR 1.0

The NAP-AMR²⁰ developed in alignment with the Global action plan on AMR was officially released by Hon'ble Union Minister of Health & Family Welfare on 19th April 2017. The stakeholder ministries/departments responsible for implementation of the NAP-AMR included MoHFW (NCDC, ICMR, CDSCO, FSSAI, NIHF, CHEB), states & UTs, 11 other ministries (Fisheries, Animal Husbandry & Dairying (DoF, DAHD), Agriculture & Farmers Welfare (ICAR), Environment, Forest & Climate Change (CPCB), Science & Technology (DBT, CSIR), AYUSH, Chemicals & Fertilizers (DoP), Jal Shakti, Education, Food Processing Industries, Information & Broadcasting.

NAP AMR 1.0 defined the priorities and interventions planned to be implemented over 2017 – 2021 to tackle AMR in India. The first 5 strategic priorities of NAP-AMR are aligned with the Global Action Plan on AMR and the sixth strategic priority highlighted India's role in containment of AMR at the international level with other countries and organizations, national disease control programmes and at the sub-national/state level through development of state action plans for AMR to ensure action at the ground level. The interventions are grouped under 6 strategic priorities namely:



The status of implementation of NAP-AMR is sought annually from various stakeholder ministries and departments and compiled. This is also submitted to the WHO's annual Global Database for Tracking Antimicrobial Resistance (AMR) Country Self-Assessment Survey (TrACSS). Summary of the status of implementation of NAP-AMR (2017-2021) is placed below:

²⁰ <https://ncdc.mohfw.gov.in/wp-content/uploads/2024/03/File645.pdf>

I. Improve awareness and understanding of AMR through effective communication, education and training

In human health sector, NCDC developed and disseminated media material for raising awareness on judicious use of antimicrobials for the community, schools and pharmacists. Media material has also been developed for healthcare providers on importance of infection prevention practices to reduce use of antimicrobials. In addition, messages for healthcare professionals and the community have been developed for print, mass and social media platforms. The media material has been disseminated to the states and can also be accessed on the NCDC website. The National Medical Commission (NMC) has recently launched the AMR curriculum and resources for in-service trainings on AMR and IPC for different health professionals and is in process for developing the same for allied health services. FSSAI has conducted training programmes on AMR and are creating awareness for concerned stakeholders by utilising platforms in collaboration with industry associations.

Dept. of Animal Husbandry used social media handles for improving awareness on AMR among animal husbandry farmers. Block level and district level farmers' awareness and animal health camps were organised through the Assistance to State/UTs for Control of Animal Disease (ASCAD) component of the department. During the World AMR Awareness Week (WAAW) specific awareness programmes have been conducted for farmers involved in Dairy, Poultry, Sheep and Goat.

NIPER (National Institute of Pharmaceutical Education and Research) institutions as a part of outreach efforts have worked to raise awareness on sanitation and hygiene and on AMR at grassroot level including school children. AYUSH ministry departments are organizing camps and conducting patient awareness sessions on regular intervals for improving patients' health and awareness.

II. Strengthen knowledge and evidence through surveillance

In Human health sector at the National level, NCDC and ICMR have been coordinating AMR surveillance lab networks in the country since 2013. The National AMR surveillance network (NARS-Net) established under the NCDC coordinated National Programme on AMR Containment has the objective to strengthen state government medical colleges in a phased manner for AMR surveillance and containment activities. The network sites are provided trainings and data feedbacks on regular basis to generate quality data using the standardized programme SOPs (Standard Operating Procedures) revised every 3 years (latest version is dated March 2023). Currently the network includes 50 state medical colleges in 33 states/UTs and is being expanded in a phased manner. The network is supported by National Reference laboratory (NRL) for AMR in bacterial pathogens established at NCDC and NRL for AMR in fungal pathogens established at Mycology department of

Vallabhbhai Patel Chest Institute, Delhi. Annual AMR surveillance reports are published every year and are available on NCDC website.²¹

State level AMR surveillance networks were initiated with support from WHO in 3 states (Kerala, Maharashtra, Delhi) and since 2022-23 are being supported under the National Programme on AMR Containment. These state surveillance networks generate annual reports and share with respective state health departments. The standardized SOPs for AMR data management being used under the National Programme on AMR Containment are also used by the state AMR surveillance networks allowing collation of state AMR surveillance network data in the National data. Under the National Programme, State AMR Surveillance networks have also been initiated in 6 additional states namely Gujarat, Rajasthan, Telangana, Karnataka, Madhya Pradesh and Assam.

ICMR initiated the Anti-microbial Resistance Research and Surveillance Network (AMRSN) in 2013 to enable compilation of data of AMR from tertiary care hospitals, detailed understanding of underlying mechanisms of resistance and molecular characteristics. The main goals of ICMR AMRSN are to: i. Establish network of hospitals to monitor trends in the antimicrobial susceptibility profile of clinically important bacteria and fungi in human health sector; ii. Include comprehensive molecular studies for identifying the clonality of drug-resistant pathogens and their transmission dynamics to enable better understanding of AMR in the Indian context and develop suitable interventions; iii. Create data management system for data collection and analysis and develop the data analytics tools, to facilitate real-time data analysis of AMRSN network, and reporting modules for various stakeholders through data-analytics dashboards and screens. The 2nd edition of SOPs of the network for bacteriology and mycology for the veterinary sector are available on ICMR website.²²

AMRSN network includes seven nodal centers (NCs) located in four tertiary care medical institutions which focus on seven pathogenic groups and 20 regional labs from tertiary care hospitals which provide data from across the country as Regional Centers (RCs). ICMR network includes Institutions from central, state governments and private hospitals and standalone laboratories. ICMR publishes report on AMR trends and patterns every year. The annual report of AMRSN includes the trends of resistance among key priority pathogens to critically important antimicrobials to guide the prevention and treatment interventions for AMR in the country. The reports are available on ICMR website.²³

Since 2018, the aggregated AMR surveillance data of priority bacterial pathogens from both ICMR and NCDC lab networks has been submitted to Global AMR Surveillance System (GLASS).

²¹ <https://ncdc.mohfw.gov.in/reports/>

²² <https://iamrsn-audit.icmr.org.in/index.php/resources/sops>

²³ <https://iamrsn-audit.icmr.org.in/index.php/resources/amr-icmr-data>

In 2023 and 2024, data submitted to GLASS included the data from ICMR, NCDC and state AMR surveillance networks from three states.

One hundred and eight FSSAI notified labs (government and private labs) are capable of testing antibiotic residues. They regularly direct state authorities to pick up surveillance samples to check for antibiotic residues. Annual pan India AMR-AST surveillance is conducted by FSSAI in dairy, meat, poultry meat, fish products, egg or egg products where AST testing of all imported, enforcement commercial samples are analysed.

The Indian Network for Fisheries and Animals Antimicrobial Resistance (INFAAR) is a national network of 21 veterinary and fisheries laboratories conceptualized to strengthen surveillance of AMR in India which was initiated during 2017 by Indian council of Agricultural Research (ICAR) with technical support from FAO. The objective of INFAAR is to generate nationwide, structured, quality data through surveillance and research on AMR, specific to livestock and fisheries sectors for strengthening knowledge and better understanding of AMR. All member laboratories of this network are following standard protocols for undertaking antimicrobial susceptibility testing and are sharing data on pre-agreed organisms and antimicrobial agents at regular intervals. First National report on AMR surveillance in fisheries and livestock sector has been published by FAO in March 2024.²⁴

Surveillance of antibiotic consumption in human health sector has been initiated at 30 hospitals under the National Programme on AMR Containment coordinated by NCDC and is being gradually expanded in a phased manner. ICAR Network involving more than 20 centers in the country has initiated work on monitoring of drug residues and environmental pollutants. DAHD since 2021 has submitted data on antimicrobial use (AMU) in the ANIMUSE (Animal Antimicrobial use Global database) portal of World Organization for Animal Health (WOAH).

Biorepositories for AMR pathogens have been established by Department of Biotechnology (National Centre for Microbial Resource (NCMR) Pune, by ICMR at National Institute of Research in Bacterial Infections (NIRBI) (previously called NICED) Kolkata, and by CSIR at IMTECH, Chandigarh. DBT has also notified the AMR priority pathogen list to guide research, discovery and development of new antibiotics in India.

III. Reduce the incidence of infection through effective infection prevention and control

In the human health sector, the National Guidelines on Infection Prevention and Control²⁵ were launched by MoHFW in January 2020 and translated to training modules²⁶. National level

²⁴ <https://openknowledge.fao.org/server/api/core/bitstreams/f95db088-7f44-48f8-bcd7-78b2691c5379/content>

²⁵ <https://ncdc.mohfw.gov.in/wp-content/uploads/2024/09/NGIPC.pdf>

²⁶ <https://ncdc.mohfw.gov.in/national-guidelines-for-infection-prevention-and-control-in-healthcare-facilities-mohfw-2020-training-modules/>

Training of trainers has been held for all states and UTs and is now being cascaded within the states and UTs. The surveillance of healthcare associated infections (HAIs) established by All India Institute of Medical Sciences (AIIMS) and ICMR as a part of an international collaboration on AMR and IPC (collaboration with US Centers for Disease Control and Prevention) involves capacity building of hospitals in the country in a phased manner. This network has developed protocols, SOPs, training materials and surveillance reporting systems for Indian context for surveillance of Blood Stream Infections including Central line associated blood stream infections (CLABSI) and Urinary tract infections (UTI) including Catheter associated Urinary Tract infection (CAUTI) from more than 190 ICUs from more than 80 plus health care facilities. More than 2000 healthcare workers have been trained on HAI surveillance. This is planned to be transitioned and expanded to include all medical college hospitals and district hospitals in a phased manner. Report of National HAI surveillance trends are shared with key stakeholders by AIIMS on a quarterly basis.

The Hon'ble Prime Minister of India introduced the Swachh Bharat Abhiyan on 2nd of October, 2014 to promote cleanliness in public space. MoHFW, Government of India, launched a national initiative "KAYAKALP" on 15th May, 2015 to promote cleanliness and enhance the quality of public health facilities under which Swachhta guidelines have been issued for health facilities. The purpose of this initiative is to appreciate and recognise the effort to create a healthy environment including infection control practices in healthcare facilities.

Department of Animal Husbandry & Dairying (DAHD) has issued advisory to the livestock and poultry farms to follow good farm management practices to control infections and stress among the flock. Bio-security guidelines issued by the Central Poultry Development Organizations are being made available to all commercial poultry farms. DAHD has developed the biosecurity manual for poultry farms and also conducts biosecurity audits for poultry farms. On similar lines, for the dairy farms good animal husbandry practice guidelines have also been prepared by DAHD. DAHD is implementing world's largest vaccination programme through the National Animal Disease Control Programme (NADCP) for control of foot and mouth disease and brucellosis. The programme is targeted for vaccination coverage of 300 million cattle and buffalo, 225 million sheep and goat and 10 million pigs including traceability with unique Pashu Aadhar. Under ASCAD scheme, DAHD provides assistance for control of animal diseases by providing financial support for vaccination of animals against economically important diseases of livestock and poultry by way of immunization, strengthening of existing state veterinary biological production units, strengthening of existing state disease diagnostic laboratories, holding workshops/seminars and in service trainings of veterinarians and para-veterinarians. The vaccinations help to prevent many of the bacterial and viral diseases thus reducing the disease burden as well as the use of antimicrobials. In order to deliver quality veterinary health services at the farmers' doorstep, Government of India has been undertaking establishment of

mobile veterinary units (MVUs). MVUs provide diagnosis, treatment, vaccination, minor surgical interventions, audio-visual aids and extension services to farmers / animal owners at their doorstep. Under this initiative, till date 4340 MVUs have been sanctioned to different states/UTs out of which almost 1200 have started providing doorstep service delivery to the farmers.

Standard precautions including sterilization of equipment, cleaning and disinfection, biomedical waste management are implemented at all AYUSH facilities. Infection prevention and control programs, occupational safety and surveillance for healthcare associated infections are being conducted at many AYUSH healthcare facilities across the country. AMR prevention through patients' health, hand hygiene and *Agnihotra Yagya* is also being implemented.

IV. Optimize the use of antimicrobial agents in health, animals and food

In human health sector national treatment guidelines for antimicrobial use have been released from time to time by NCDC and ICMR to guide healthcare facilities to formulate their own facility level antibiotic guidelines and policies relevant for the local context and to train physicians on judicious use of antibiotics. ICMR has also issued guidance on diagnosis and management of carbapenem resistant gram negative bacterial infections.

ICMR has conducted regional trainings for Antimicrobial Stewardship Programme (AMSP) for teams from identified tertiary care hospitals in the country to promote rational use of antibiotics and have supported 20 tertiary care hospitals to set up the structure and framework of antimicrobial stewardship. The progress of the AMSP initiative (Phase I) was monitored by capturing process indicators like establishment of AMSP committees, creation of hospital antibiotic policy, introduction of formulary restriction etc. As a next step, AMSP implementation activities with both process and outcome indicators (Phase II) was undertaken in these hospitals where the impact of AMSP interventions has been studied. Guidance document on AMSP has also been developed by ICMR which can be utilized by health care institutions to strengthen their AMS practices.

As part of the ongoing ICMR-Pfizer collaborative study, 11 hospitals were selected to act as mentors for expanding the existing AMR surveillance and stewardship practices along with IPC in secondary healthcare settings (nursing homes/district hospitals) in different parts of the country. More than 90 hospitals are part of this initiative. These hospitals are a mix of public/private/missionary/army hospitals catering to diverse patient populations (urban/rural/semi-urban). Regular meetings were conducted for assessment of knowledge and understanding, capacity and infrastructure of mentor sites. Training of health personnel from mentor centers (clinicians and microbiologists) was conducted on AMSP and IPC. Multiple assessment tools (hospital assessment, baseline assessment and periodic assessment) were developed for capturing baseline antibiotic consumption data. A total of 94 hospitals including 32 small level (six govt. and 26 private) and 62

mid-level (15 govt. and 47 private) participated in this online assessment. Private hospitals outnumbered the government hospitals in every domain except a few. This initiative has helped in creating awareness and capacity building of smaller healthcare institutions. This project is ongoing and will also help in identifying barriers in the establishment and implementation of IPC and AMSP in the smaller hospitals, districts hospitals and nursing homes.

CDSCO has conducted awareness and enforcement drives for the Schedule H and H-1 of Drug and Cosmetic rules which prohibit sales of antimicrobials without a medical prescription. Gazette notification has been issued on 17th July 2019 which prohibits the manufacture, sale and distribution of the drug colistin and its formulations for food producing animals, poultry, aqua farming and animal feed supplements.

In 2018, FSSAI issued notification by which 19 antibiotics and veterinary drugs have been prohibited from being used at any stage of processing of meat, meat products, poultry and eggs, sea food or any variety of fish and fishery products and tolerance limits for 43 antibiotics and veterinary drugs have been specified for various animal tissue and milk.

DAHD has issued the advisory to ensure judicious use of antibiotics in food producing animals in order to prevent AMR. Banning non-therapeutic use of colistin in animals is a significant step to tackle colistin resistance. Standard treatment guidelines for Lumpy Skin Disease and promotion of Ayurvedic formulations and ethno-veterinary practices are also initiatives towards promoting judicious use of antimicrobials. ICAR has provided technical advice to Department of Animal Husbandry and Dairying for policy advocacy on use of antibiotics in animals.

V. Promote investments for AMR activities, research and innovations

Indian Council of Medical Research (ICMR) has identified priority areas for research: (i) Origin, spread and prevention of AMR; (ii) Development of new antibiotics; (iii) Estimate inherent cost of treating antimicrobial resistance in India; (iv) Validate available diagnostics for their utility in the field for improving diagnosis of bacterial infections along with drug susceptibility. ICMR has established National One Health Centre in Nagpur which includes addressing AMR in alignment with other One Health issues as one of its mandates. ICMR-NICED in collaboration with United Nations Environment Programme (UNEP) conducted the project on “Priorities for the Environmental Dimension of Antimicrobial Resistance (AMR) in India” and published the report.

Department of Biotechnology (DBT) has collaborated with Biotechnology Industry Research Assistance Council (BIRAC) to seek new innovative approaches that have the potential to transform public health action on a national or global scale by identifying and filling gaps in area of development of new antibiotics and alternatives to antibiotics to counter AMR. Under this Call, 378 Letters of Intent were received by the Department and a total of 10 projects have been supported.

DBT has also launched mission programme on antimicrobial resistance in 2018-19 focussing on 4 priority areas: i. Research and innovation for therapeutics; ii. Biorepository; iii. Research and innovation for diagnosis; iv. National priority list for AMR specific pathogens. DBT also launched India's One health initiative on 18th February 2019 under which National Institute of Animal Biotechnology (NIAB) Hyderabad was supported as centre for excellence for One health for 3 years. Department of Biotechnology has worked with WHO, Country Office, New Delhi and developed the Indian Priority Pathogen List to guide research, discovery and development of new antibiotics in India. In collaboration with Nesta, a UK based innovation charity, for creating a pipeline of innovations, the department has supported the Longitude Prize in finding a solution to help tackle the problems in AMR: a diagnostic tool that can rule out antibiotic use or help identify an effective antibiotic to treat patients. The department is also participating in the India AMR Innovation Hub (IAIH) chaired by the Principal Scientific Adviser. The IAIH is conceived and driven by the Centre for Cellular and Molecular Platforms (C-CAMP), Bengaluru, India. IAIH is positioned as a unique convergent think tank on AMR Innovations, with Indian and global stakeholders - government, academia, industry, philanthropic and not-for profit organizations.

Department of Animal Husbandry and Dairying has signed a Memorandum of Understanding (MoU) with the Ministry of AYUSH to introduce the concept of Ayurveda and its allied disciplines into veterinary science by their promotion in research and development, capacity building through training, exploring marketing possibilities for herbal veterinary medicines on a sustainable basis. They have also included Ayurvedic courses in Bachelor of Veterinary Science (BVSc) and animal husbandry curriculum. DAHD is supporting research on AMR/AMU under the research and innovation component of National Livestock Mission. A subcommittee to 'Assess and provide recommendations on submission of veterinary vaccines/biological/drugs for policy input' has been constituted. The committee examines the proposals received from DCGI regarding import and manufacturing of drugs and vaccine including antibiotics.

Department of Pharmaceuticals to promote research and development and innovation on AMR has proposed a new scheme "Promotion of Research and Innovation in Pharma-MedTech Sector (PRIP)". Under the proposed PRIP scheme incentives would be provided to companies/startups/MSMEs (Micro, Small and Medium Enterprises) for carrying out R&D in six priority areas including AMR for in-house research as well as for projects in collaboration with academic institutions. NIPER Raebareli is working on various areas of antibacterial and antimicrobial activity. The spectrum covers synthesis of novel compounds, novel formulations of existing active pharmaceutical ingredients, isolation of novel antibacterial agents and their potential in AMR, and anti-microbial peptides and their role in AMR. NIPER Guwahati is working on the development of non-invasive photothermal therapy for the treatment of bacterial infections and they have developed

light-responsive bio scaffolds/patches for the therapy of bacterial infections in conditions like wound healing and acne vulgaris and this proposed approach can be effective in preventing AMR. NIPER Kolkata is focusing on tackling AMR by developing different peptides and small molecules to attenuate the virulence of the pathogen by inhibiting biofilm formation and microbial growth using different mechanisms. The institute is also working on developing small molecule and peptide-based Antibody Recruiting Molecules (ARMs) to target the cell surface of ESKAPE organisms.

All India Institute of Ayurveda under Ministry of AYUSH has undertaken several research works which are aimed towards addressing the problems of infective origin with Ayurveda drugs, which may help in the customization of optimum antimicrobial usage and addressing the problem of AMR. Various clinical trials are ongoing under Ayurveda and Sidha institutes for establishing efficacy of systemic and topical medications for prevention and treatment of infectious diseases both as adjuvant and alternate.

ICAR has undertaken research work on alternatives to antibiotics for mitigating AMR: Antimicrobial peptides, identification and characterization of bacteriophages identified from diverse sources, essential oils and plant extracts, identification of new bacterial strains from the gut and rumen microbes that can be used as probiotics. They have also developed a rapid colorimetric assay to detect ESBL producers, which is more sensitive and specific than conventional assay with detection time within 4 hours instead of 18-24 hours.

Department of Science and Technology (DST), to address the urgent need for innovative solutions to combat the growing threat of AMR, through "Therapeutic Chemicals" program of Technology Development and Transfer (TDT) Division, launched a call for proposals to create centers in the following identified areas, with reasonable geographical spread in the country: i. Multipronged approaches focused on "Leads to Pre-clinical studies with I.P. potential"; ii. New formulations of existing antibiotics.; iii. Pathogen microbiology including focus on host derived targets and therapies; iv. Diagnostics, devices and the scope of development of POC devices for clinical settings.

ICMR constituted a task force on AMR diagnostics to bridge the translational gap between the indigenous innovations and the requirements of Indian healthcare. This taskforce has initiated a study on rapid methods for antimicrobial susceptibility testing at point-of-care. The study aims to facilitate the availability of indigenously made diagnostics for AMR by translating existing innovations into useful quality-validated tests for early detection of pathogen(s) and susceptibility. This project aligns well with Atmanirbhar Bharat focus of the Govt of India to give push to in-country innovation and development of diagnostics and devices. A 'draft standard validation protocol for AMR diagnostics' is under development with the support of CDSCO and relevant stakeholders to address challenges in establishing the validity of a new indigenous test. The standard protocol

supplements existing documents and guidelines for the validation of In-Vitro Diagnostics (IVD). It will act as a reference document for innovators/developers. It aims to bridge the gap between developer and regulatory mechanism to limit time delays in the market entry of a validated test. Target Product Profiles (TPP) for priority conditions such as sepsis, neonatal sepsis and typhoid fever have been developed which detail the criteria for performance and operational specifications of a ‘fit-for-use’ test as per needs of Indian healthcare. These TPPs will guide developers and innovators who are embarking on the initiative of providing indigenous solutions to the problem of AMR in India and other LMICs. Cost-effectiveness studies have been undertaken for two rapid diagnostics for urinary tract infections.

VI. Strengthen India’s leadership, commitment and collaborations on AMR at International, national and subnational level

India has taken a lead in several International collaborations. International partnerships include ICMR-Global Antibiotic Research and Development Partnership (GARDP) collaboration which led to signing of MoU in 2021. Through this MoU, both the organizations aim to collaborate on research and development opportunities, including clinical trials, epidemiological, observational and interventional studies, to facilitate the development of new treatments and their registration for use in priority populations. One of the projects under this MoU is a feasibility cum observational study entitled “A site feasibility and prospective cohort study of hospitalized adults and children with serious bacterial infection caused by carbapenem-resistant organisms, with focus on Enterobacterales and/or *Pseudomonas aeruginosa*: an Observational Study”. The overall goals of this observational study is to collect prospective, longitudinal cohort and feasibility data to inform study design and comparator selection for future interventional clinical trials. The future trials will assess the efficacy and safety of new antibiotic regimens against serious bacterial infections caused by carbapenem-resistant Enterobacterales and/or *Pseudomonas aeruginosa*.

DBT is a board member of the Global AMR R&D Hub and is working with all partners to leverage their existing capabilities, resources and focus collectively on new R&D intervention to address drug resistant infections. Under an ambitious initiative with NERC (Natural Environment Research Council) through UKRI (UK Research & Innovation), DBT supported five projects focused on “AMR in the Environment from Antimicrobial Manufacturing Waste”. DBT through C-CAMP (Centre for Cellular and Molecular Platforms, Bengaluru) has partnered with CARB-X (Combating Antibiotic Resistant Bacteria), a global non-profit partnership, led by Boston University, to fund the early development of innovative antibiotics, rapid diagnostics, vaccines and other life-saving products to address the rising threat of drug-resistant bacteria. DBT in collaboration with international partners is supporting AMR based R&D activities under Grand Challenge India program in the area of

surveillance and infection prevention & control and removal of antibiotics/antimicrobials from effluents.

The NCDC and US-CDC (Centre for Disease Control & Prevention) India collaboration has focused on strengthening AMR surveillance activities, development of SOPs for AMR surveillance data management, digital trainings using ECHO platform for standardization of bacteriology testing procedures across the National AMR surveillance network. ICMR-AIIMS project for HAI surveillance was also initiated in collaboration with US-CDC India. Under Indo-Netherlands collaboration, a pilot project has been conducted by NCDC on integrated AMR surveillance with 'One Health' approach in Krishna district of Andhra Pradesh. UK's Fleming Fund grant, for which WHO India has been the implementing partner, has supported national training of trainers on IPC and strengthening 3 state AMR surveillance networks in the country. Under India-Denmark partnership, work plan on AMR has been drafted through meetings between stakeholders from both countries.

Intersectoral collaborations include the initiative of the National Digital Livestock Mission (NDLM) under which an integrated system encompassing all the sectors related to livestock in terms of disease tracking, diagnostics, treatment, vaccination, breeding and better market for sale of livestock products thereby digitizing the livestock sector, has been established. Through NDLM the laboratories are being linked digitally, supporting prompt and early diagnosis and reporting leading to timely steps for disease control. One of the components of the NDLM is the e-prescription module which is being considered for monitoring the use of antimicrobials prescribed against various disease conditions and thus have a major effect on the prudent use of antimicrobials, thus combating the issues of AMR. Centre for One Health established at NCDC has also created linkages with AMR programme to identify areas for one health collaboration and coordination. Coordination with several National level programmes has been initiated which includes Leprosy programme, TB programme, Integrated disease surveillance programme.

Health being a state subject, collaboration with states to support development of the state action plans on AMR has been undertaken for effective implementation of NAP-AMR. NCDC in collaboration with agencies like WHO, USAID and other partner agencies has supported states in development of state action plans. A guidance document²⁷ for development of state action plan for containment of AMR (SAP CAR) was shared with the states. Seven states have finalised and launched their state action plan on Containment of AMR: Kerala, Madhya Pradesh, Delhi, Andhra Pradesh, Sikkim, Gujarat and Rajasthan. Several other states are at various stages of developing/finalising their state action plans. Efforts are ongoing to support the remaining states in drafting and finalizing the state action plans.

²⁷ <https://ncdc.mohfw.gov.in/wp-content/uploads/2024/03/SAPCAR.pdf>

DEVELOPMENT OF NAP AMR 2.0 (2025-29)

The process of developing the NAP AMR 2.0 was initiated in June 2022 and a series of national expert consultations were held towards its development. The consultations were held for human health sector, research sector, professional associations and civil society organizations, environment and animal husbandry sectors.

Each consultation was attended by experts who represented several sectors from National and State level and from both public and private institutions. The participants included programme managers (national health programs and state AMR action plans), clinicians, microbiologists, public health professionals, health administrators, researchers, veterinarians, academicians, international development partners and several members of the Civil Society Organizations etc. Brief report of the consultations is available on NCDC website.²⁸ Following were the broad objectives of the consultations:

1. To undertake SWOT (Strength, Weaknesses, Opportunities and Threats) analyses across various sectors in context of the existing NAP-AMR and beyond as well as proposing the structure and contents of the proposed NAP 2.0.
2. To recommend essential elements of AMR research policy and research agenda of the country under NAP 2.0.
3. To identify research priorities in human health, animal health and environment sectors on diagnostics and technologies relevant to AMR, antimicrobial susceptibility testing (AST), estimation of antimicrobial usage/consumption (AMU), interface between human, animal and environment sectors, discovery and development of new antibiotics and their alternatives.
4. To fill up the identified gaps under the broad umbrella of One Health and suggest additional interventions & activities for NAP 2.0.
5. To suggest mechanisms for engaging private sector at national and state levels, coordination across and within sectors for efficient communication, behavioral changes in antimicrobial prescribers and users, effective Infection Prevention and Control (IPC), and appropriate research and surveillance.
6. To identify communication and awareness activities for improving appropriate use of antimicrobials
7. To identify major activities from previous NAP that could not be implemented, reasons thereof and recommend solutions to undertake those activities in NAP 2.0.

²⁸ <https://ncdc.mohfw.gov.in/wp-content/uploads/2024/05/Compiled-report-of-National-Expert-Consultations-for-developing-National-Action-Plan-on-Antimicrobial-Resistance-2.0.pdf>

8. To document challenges, solutions, and plan for the next 5 years for various critical facets of AMR containment.
9. To draft an operational plan with a Monitoring & Evaluation component for efficient implementation of NAP 2.0.

A high-level meeting involving stakeholders from various departments and ministries was held in May 2023 at NITI Aayog under chairmanship of Hon'ble Member Health and Hon'ble member Agriculture to discuss the existing initiatives to address AMR. During this meeting, emphasizing the need to ensure Multisectoral involvement and ownership and to bring in more clarity at the granular level, it was decided to conduct series of meetings at NITI Aayog. The leadership of Hon'ble Member (Health), NITI Aayog has played an instrumental role in bringing together twenty ministries/departments/ organizations to conduct a series of brainstorming sessions, and plan systematic roll-out of a strategy for AMR based on the work already done by the Ministries/Departments and the available Government of India policies. NITI Aayog convened seven rounds of consultations with multiple stakeholders from the 20 concerned/aligned ministries and departments under the chairmanship of Hon'ble Member (Health), NITI Aayog. Each stakeholder ministry/department prepared and presented their respective action plan developed under concerned strategic objective/s of NAP-AMR 2.0 with defined goals and timelines. These individual plans converging under the respective strategic objective ensure cohesive action for tackling anti-microbial resistance across the human, animal and agriculture sectors.

During these meetings the draft of the National Strategy for AMR Containment for NAP AMR 2.0 including six strategic objectives with sub-objectives and activities was developed. A draft template for key stakeholders to develop their action plan was also finalised. Subsequently meetings were held where the stakeholder ministries and departments presented their action plans under each of the strategic objectives including linkages with existing programmes. The recommendations of the experts during these meetings have also been incorporated in the NAP AMR 2.0.

As decided during these meetings, the action plans presented by the key ministries and departments along with activities to be conducted, their timelines, output and output indicators with dedicated budget (existing/planned) are annexed in second half of this document. These action plans will be the basis for regular monitoring of the implementation of NAP AMR 2.0 at sectoral and Inter-sectoral level. Well-defined coordination mechanisms, both intra and Intersectoral, for implementation of the NAP AMR with a 'One Health' approach have been incorporated. Based on these action plans, the key stakeholders have been mentioned for the activities under each Strategic Objective. An evaluation framework has also been included with key performance indicators for the expected outcomes of NAP AMR 2.0.

Towards implementation of the NAP-AMR 2.0, after its launch each stakeholder department is expected to develop their implementation roadmap ensuring engagement of private sector, technical institutions, professional groups, industry, cooperatives, NGOs, International partners and other relevant organisations.

NATIONAL STRATEGY FOR AMR CONTAINMENT FOR NAP AMR 2.0 (2025-29)

The National Strategy for AMR Containment defines the goal of AMR Containment in India and defines the six strategic objectives to achieve that goal. Each strategic objective outlines sub-objectives which further include key activities. This framework developed in consultation with all key stakeholders has guided the development of action plans by each stakeholder ministry and department.

Vision

Create a sustainable ecosystem for humans, animals, plants and environment by preventing emergence and transmission of AMR through effective sectoral and Multisectoral evidence-based ‘One Health’ approach.

Goal

Protect the health of humans, animals, plants and environment through improving awareness and education, strengthening laboratory capacity for AMR detection, prevention of infections, uninterrupted access to and appropriate use of antimicrobials, effective research and innovation and coordination and collaboration.

The above vision and goal shall be achieved through the following guiding principles:

- “Whole of government” approach with sustained funding within each sector/department
- Effective sectoral action to be the foundation of Intersectoral coordination, with identification of activities where cooperation, coordination & collaboration with other sectors is required
- Overarching Multisectoral coordination between various stakeholders
- Framework of six strategic objectives with sub-objectives and activities to guide development of action plan by key stakeholder departments
- After NAP AMR 2.0 is launched, each department will develop an operational plan towards implementation of the action plan ensuring engagement of private sector, technical institutions, professional groups, industry, cooperatives, NGOs, international partners and other relevant organisations
- Leveraging existing national expertise, infrastructure and resources for complementarity to avoid duplication and ensure cost-effectiveness
- Develop a common platform for capturing status of AMR containment activities in real time
- Contribution to global efforts in containing AMR through international collaborations
- Measuring outcome through simple and effective key performance indicators

SIX STRATEGIC OBJECTIVES

1.



Improve awareness and understanding

2.



Strengthen Laboratory Capacity

3.



Reduce Incidence of Infection

4.



Optimize Use of Antimicrobials

5.



Promote Research and Innovations

6.



Strengthen Governance, Coordination and collaborations

Strategic Objective 1

Improve Awareness and Understanding of AMR through effective Communication, Education and Training



1.1. Increase awareness and improve communications regarding AMR, IPC and judicious use of antimicrobials in all sectors

Enhancing awareness and understanding of the factors contributing to AMR is essential to prevent irresponsible use of antimicrobials, whether overuse or misuse, which is the foremost contributor to the emergence of AMR. The importance of communication in enhancing people's awareness and understanding of AMR is also recognised in global action plan on AMR. Gaps in knowledge, attitude and practices need to be identified so as to guide implementation of effective behaviour change campaigns through public communication programmes.

- a. **Assess knowledge, attitude & practices (KAP) among various stakeholders**
 - i. Develop standardized methodology for conducting KAP studies – NCDC (1yr), ICMR (1.5yrs), DAHD (1yr), ICAR (1-2yrs)
 - ii. Conduct KAP studies – NCDC (5yrs), DAHD (1-2yrs), ICAR (2-4yrs)

- b. **Consolidate and develop communication and information resources for improving awareness on AMR, IPC and judicious use of antimicrobials**
 - i. Create a repository of available IEC material- MoIB (1yr) , ICAR (2-3yrs), DAHD (1-5yrs), FSSAI (6mnths)
 - ii. Develop communication material focussed on easy-to-understand messages for each stakeholder group – DAHD (1-5yrs), FSSAI (6mnths), ICAR (1-2yrs), DoF (1-5yrs), NCDC, MoIB

c. Develop, implement & monitor sustained communication programme

- i. Develop a communication plan for national, state, district and sub-district levels – MOIB (1yr), DAHD (1-5yrs), FSSAI (6mnths), ICAR (2-3yrs), NHM (for district level HCF and below), DOF (1-5yrs)
- ii. Implement AMR communication programme targeting general population and other stakeholder groups, through partnership & collaborative approach including NGOs and private sector-MOIB (behaviour change communication strategy through SHGs, PRIs, cooperatives) (1-5yrs), DAHD (1-5yrs), FSSAI (6mnths), ICAR (2-4yrs), DoF (1-5yrs), NHM (through district level HCF & below), DoP (for industry), MoFPI (through industry & associations), MoE (school children, parents, teachers)

1.2. Improve knowledge and capacity of key stakeholders regarding AMR, IPC and judicious use of antimicrobials in all sectors

Inclusion of AMR as a core component of professional education, training, continuing education and development in the health and veterinary sectors and agricultural practice will ensure proper understanding and awareness among professionals. Education on AMR and the use of antimicrobial agents in school curricula would support better understanding and awareness from an early age.

a. Review and revise curricula and modules of professionals/para-professionals in all sectors

- i. Identify professional and para-professional courses which must include AMR and IPC in curricula – NCDC (2yr), DAHD (1yr), DoP (NIPERs), ICAR (1-2yrs)
- ii. Review and revise curricula and teaching modules – NCDC (2yrs), DAHD (2-3yrs), DoP (NIPERs), ICAR (2-3yrs)
- iii. Health professional regulatory bodies to incorporate AMR related education in the respective UG and PG curricula and ensure optimal uptake by students by assessment in the exams – National Medical Commission, National Dental commission, National pharmacy commission, Nursing and midwifery commission, , National Commission for Indian system of medicine etc.
- iv. Include biosafety, biosecurity, hygiene and infection prevention and control (IPC) in curricula for education of animal health and food professionals and workers in Animal

Husbandry & Fisheries departments, slaughterhouses, dairy sector and meat retailers – DAHD (1-2yrs), ICAR (2-3yrs)

b. Mandatory induction and in-service trainings for all professionals/para-professionals in all sectors

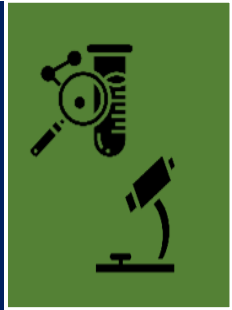
- i. Develop training resources (including online courses) for capacity building among professionals & para-professionals in all sectors – NCDC (2yrs), DAHD (1-2yrs), DoP (NIPERs), FSSAI (6 months), ICAR (1-2yrs), MoE (SEL)
- ii. Include biosafety, biosecurity, hygiene and infection prevention and control (IPC) in curricula for training of animal health and food professionals and workers in animal husbandry & fisheries departments, slaughterhouses, dairy sector and meat retailers – DAHD (2-5yrs), ICAR (1-2yrs)
- iii. Train staff in KVK at village level for biosafety and biosecurity principles and practices; Train farmers in on-farm sanitation and good hygiene practices – DAHD (2-5yrs), ICAR (1-4yrs)
- iv. Implement trainings on AMR, IPC and judicious use of antimicrobials for all key stakeholders – NCDC (5yrs), NHM (district level healthcare facilities and below including health and wellness centres), DAHD (2-5yrs), DoP (NIPERs) (for industry), FSSAI (1yr), ICAR (1-4yrs)
- v. Conduct Continuous Professional Development on AMR, IPC and judicious use of antimicrobials /Integrated Faculty development programmes; dedicated sessions – NCDC (5yrs), DAHD (1-4yrs), FSSAI (1yr), ICAR (1-4yrs)

c. Educate school & college students on AMR & IPC

- i. Review and revise curricula of school and college students – MoE, NCDC (2yrs)

Strategic Objective 2

Strengthen Laboratory Capacity for AMR



2.1. Strengthen microbiology laboratory capacity for AMR detection in human and animal sector

Central to AMR management and control is access to timely and accurate diagnostic services at local level to promote rational use of antimicrobials. This also supports generation of well represented, quality AMR surveillance data to guide policy at local, state and National level. Good laboratory services also provide critical support to infection control programs in healthcare facilities.

a. Establish functional, well utilised, quality assured laboratories at all levels of healthcare for humans and animals/fish to promote evidence-based use of antimicrobials

- i. Strengthen microbiology laboratories (in govt. & private sector) at National, state and district level for AMR detection: NCDC (5 yrs), ICMR (3yrs), NHM (for district & block level HCF through DHLs/IPHLs and BPHLs), NHSRC (National Health Systems Resource Centre), DAHD (1-4yrs), ICAR (1-3yrs), DoF (1-4 yrs)
- ii. Promote laboratory diagnostic testing before prescribing antimicrobials – NCDC (3yrs), DAHD (2-5yrs) , CEA, NABH, NABL
- iii. Develop and implement standardized protocols for pathogen identification and AMR detection: NCDC (1yr), ICMR (1yr), ICAR (1-4yrs), NHM (trainings for district level HCFs & below through NIHFV)
- iv. Establish mechanisms for implementing laboratory quality management systems to ensure quality and reliable test results: NCDC (5yrs), DAHD (1-5yrs), ICAR (1-4yrs), NHM (for district level HCFs & below), CEA

b. Establish AMR surveillance through standardised digital documentation system for hospitals and laboratories at all levels of health care in humans and animals/fish

- i. Establish Hospital Information/Laboratory Information management systems (LIMS) for AMR data management at all levels of health care for humans and animals – NCDC (5yrs), DAHD (1-5yrs), ICAR (1-3yrs), NHM (DHLs/IPHLs and BPHLs)
- ii. Expand National and state AMR Surveillance system- NCDC (5yrs), NMC, CEA

c. Designate reference laboratories for AMR surveillance in human and animal/fisheries sector

- i. Establish/strengthen National and state reference laboratories for AMR to ensure adequate guidance on quality laboratory testing, genomic surveillance of AMR and detection of emerging AMR pathogens - NCDC (5yrs in at least 15 states), ICMR (3yrs), DAHD (2-5yrs), ICAR (1-4yrs), CSIR (3-5yrs)

2.2. Strengthen surveillance for AMR in animal husbandry, fisheries, food and environment

Food chain is an important route for spread of resistant bacteria or genes. Food animal production is potentially a significant contributor to emergence and spread of AMR and surveillance of AMR in food animal sector is critical to the success of AMR containment. Review and analysis of multisectoral AMR surveillance data is essential for development of policy and guidance to contain AMR with a ‘One Health’ approach. The environmental spread of AMR with its potential risk also requires attention in the National action plan. In addition, antibiotic residues in food have been linked with selection for resistance in humans.

a. Strengthen animal husbandry, fisheries, food and environment laboratories for AMR detection at National, state and district level

- i. Establish/strengthen microbiology laboratories at National, state and district level for AMR detection – DAHD (2-4yrs), ICAR (1-4yrs), FSSAI (5yrs)

b. Develop and implement plan for targeted surveillance of AMR in animal husbandry, fisheries, food and environment

- i. Define comprehensive standards for targeted AMR surveillance in animal husbandry, fisheries, food and environment – DAHD (3-5yrs), ICAR (1-2yrs), FSSAI

- ii. Define mechanisms and modalities for data collection – DAHD (2yrs); ICAR (1-2yrs), FSSAI (annually)
- iii. Collate and analyse AMR surveillance data into useful information – DAHD (3-5yrs), ICAR (1-4yrs), FSSAI (continuous)

2.3. Strengthen laboratory capacity for targeted surveillance of antimicrobial residues in animal/fisheries, food and environment sector

Presence of antimicrobial residues in food of animal origin constitutes socioeconomic challenges in international trade in animal and animal products. The major public health significance of antimicrobial residues includes the development of AMR and disruptive effect on the human intestinal microbiome. Surveillance system for monitoring antibiotic residues in the environment, being in a nascent stage globally, first and foremost requires standardisation of the testing methodology for reliable and accurate results and then a well-defined plan for targeted surveillance in critical areas identified based on the local context.

a. Establish functional laboratories for detection of antimicrobial residues in animal/fish, food and environment sector

- i. Establish functional laboratories for testing of antimicrobial residues in animal, food and environment sector – DAHD (3-5yrs), CPCB, ICAR (1-3yrs), DoF (3-5yrs), FSSAI (3yrs)

b. Develop and implement plan for targeted surveillance of antimicrobial residues in animal/fish, food and environment

- i. Define comprehensive standards for targeted surveillance of antimicrobial residues in animal husbandry, fisheries, food and environment- DAHD (2-3yrs), ICAR (1-2yrs), FSSAI, CPCB (through FSSAI labs), DoP (NIPERs) (by DHR under One health scheme)
- ii. Define & establish mechanisms and modalities for testing and data collection – DAHD (2-3yrs), ICAR (1-2yrs), FSSAI, CPCB (through FSSAI labs), DoP (NIPERs) (by DHR under One health scheme)
- iii. Collate and analyse AR surveillance data into useful information – DAHD (3-5yrs), ICAR (1-4yrs), FSSAI, DoP (NIPERs) (by DHR under One health scheme)

Strategic Objective 3

Reduce the Incidence of Infection through Effective Infection Prevention and Control



3.1. Strengthen infection prevention in human health sector

Infection prevention and control (IPC) is key to reducing demand for antimicrobial use and the transmission of antimicrobial resistance. Most of the serious, difficult to treat infections caused by AMR pathogens occur in health care facilities due to overuse of antibiotics. Effective IPC measures by preventing spread of infections lead to decrease in use of antimicrobials further preventing the emergence of AMR.

- a. **Develop, implement and monitor National infection prevention and control program for strengthening infection prevention and control (IPC) at all tiers of healthcare system**
 - i. Develop National IPC programme – NCDC (2yrs)
 - ii. Implement National IPC programme at all tiers of healthcare system in a phased approach- NCDC (5yrs)
 - iii. Define core elements of IPC and establish standardized definitions for these elements at different tiers of health care settings in public and private sector – NCDC (2yrs)
 - iv. Develop and implement standard IPC checklist for various tiers of healthcare facilities: uniform checklist for all programmes – NCDC (2yrs)
 - v. Coordinate with existing accreditation/ quality assessment bodies to ensure IPC assessments and gap analyses at different levels and all categories of health care settings – NCDC (5yrs), NHM (for district level HCFs & below through NQAS and Kayakalp)
 - vi. Strengthen/establish standardized surveillance programs for health care associated infections (HAIs) at all tiers of healthcare facilities using uniform case definitions, methodologies, and reporting mechanisms – NCDC (5yrs), NABH, NHM (for secondary level health care facilities)

- vii. Develop and advocate policies for adequate human resources, dedicated IPC budgets and infrastructure to implement IPC programs in all tiers of healthcare facilities – NCDC (3yrs)
- viii. Develop monitoring and evaluation framework to assess the implementation of national IPC programme – NCDC (3yrs)

b. Update National IPC guidelines/standards on regular basis

- i. Update National IPC guidelines/standards in coordination with other programmes strengthening IPC in the country like Kayakalp etc. – NCDC (2yrs)
- ii. Adapt and disseminate National IPC guidelines for all levels of healthcare – NCDC (3yrs)

c. Develop National IPC curriculum including core competencies for all healthcare professionals and para-professionals

- i. Define core competencies for National IPC curriculum for basic, intermediate and advanced level trainings – NCDC (2yrs)
- ii. Develop National IPC curriculum for basic, intermediate and advanced level trainings – NCDC (2yrs)

d. Strengthen infection prevention in the community through WASH and vaccination

- i. Promote personal hygiene through safely managed water, sanitation, and hygiene (WASH) services – Min of Jal Shakti, NHM (in the community through Ayushman Arogya Mandir)
- ii. Develop and promote social mobilization campaigns for behaviour change towards sanitation and hygiene in different social groups including school /college students – Min of Jal Shakti, NCDC (5yrs), MoE
- iii. Promote and ensure appropriate immunization against Vaccine preventable diseases - Immunisation division, NHM (through immunisation programme)

3.2. Establish IPC programmes in animal/fisheries and food sector

Infection prevention, if well implemented, will reduce or even eliminate the use of antimicrobial agents, which in most cases are used as an alternative for deficient animal husbandry practices. Practical measures of infection prevention, such as vaccination and improvement in husbandry conditions, is key intervention to slow down the emergence and spread of antimicrobial resistance (AMR).

a. Develop, implement and monitor infection prevention and control programme in veterinary settings, animal husbandry, fisheries and food sector

- i. Implement farm infrastructure that promotes infection prevention in animal handling facilities and farms, hatcheries, NBCs, BMCs aquafarms, ornamental fish handling centres/shops, other aquatic animal handling facilities – DAHD (1-5yrs), DoF (1-5yrs), ICAR (1-4yrs)
- ii. Monitoring of sanitation and hygiene on animal facilities and farms, hatcheries, NBCs, BMCs aquafarms, ornamental fish handling centres/shops, other aquatic animal handling facilities - DAHD (1-5yrs), DoF (1-5yrs), ICAR (1-4yrs)
- iii. Increase awareness in community for animal welfare and good production practices (proper hygiene/sanitation/practices for IPC); (extension services)- DAHD (1-5yrs), DoF (1-5yrs)

b. Develop/update National guidelines/standards on Infection Prevention & Control in veterinary settings, animal husbandry, fisheries and food sector on a regular basis; adapt and disseminate IPC guidelines/standards at all levels

- i. Develop/update standards for biosafety, biosecurity, farm infrastructure – DAHD (2-3yrs), ICAR (1-2yrs)
- ii. Adapt National guidelines for all levels of facilities – DAHD (2-5yrs), ICAR (1-3yrs)

c. Ensure immunization of animals

- i. Conduct a baseline assessment for animal vaccine programme and cold chain management and services coverage – DAHD (1yr), ICAR (1-4yrs)
- ii. Develop/review/update regulations for vaccinations for animals with vaccination schedules -DAHD (1-5yrs)
- iii. Review and recommend introduction of new vaccines for animals/birds/fish –DAHD (1-5yrs), ICAR (1-4yrs)

3.3. Reduce environmental contamination with antimicrobial resistance genes, resistant pathogens and antimicrobial residues

A large number of antimicrobials are used in health and animal husbandry sector, leading to the continuous release of residual antimicrobials into the environment. It not only causes ecological harm, but also promotes the occurrence and spread of antimicrobial resistance. Effective management of waste from healthcare facilities, farms, and pharmaceutical industry to reduce environmental impact of impact of AMR is important to mitigate this potential risk factor for emergence of AMR

a. Develop and implement strategic interventions to reduce the environmental impact of AMR through effective waste management

- i. Effective management of biomedical waste including effluents from healthcare facilities – CPCB (on-going),
- ii. Implementation of relevant regulatory provisions of GMP under revised schedule, Developing guidance documents for SDC and GMP inspectors for pharmaceutical waste management – CDSCO (2yrs), DoP and other stakeholders
- iii. Effective management of pharmaceutical industry effluents – CDSCO (2yrs), CPCB (through SPCBs), CSIR (3-5yrs)
- iv. Effective management of farm waste including waste-water from animal/fish and agricultural farms, hatcheries, NBCs, aquafarms, ornamental fish handling centres/shops, other aquatic animal culture/grow out/handling facilities - ICAR (1-4yrs), DAHD (2-5yrs), DoF (2-5yrs)

b. Develop and implement mechanism for safe disposal of expired antimicrobials

- i. Develop and implement mechanism for safe disposal of expired/unused antimicrobials- CDSCO (2yrs), DoP (through inter-ministerial group), CSIR (3-5yrs), CPCB (ongoing), DAHD (2-5yrs), ICAR (1-5yrs)
- ii. Devise methods to promote antibiotic resistant genes (ARGs) free probiotics in animal feed, feed premix; ensure use of registered products only; regulate their import, distribution, online marketing, and appropriate labelling – DAHD (2-4yrs)

Strategic Objective 4

Optimize the Use of Antimicrobial agents in Humans, Animals/Fish and Food



4.1. Uninterrupted access and judicious use of quality antimicrobials in all sectors

To regulate and promote rational use of antimicrobials and ensure proper patient care at all levels, there is need to take necessary steps to stop over-the-counter sale of antibiotics without physician prescription and ensure uninterrupted access to essential medicines of assured quality at hospital and community level.

a. Strengthen and enforce national regulatory authority/ies for access to quality antimicrobials in all sectors

- i. Identify and implement mechanisms to prevent availability of substandard, spurious, falsely labelled and falsified antimicrobials - CDSCO to set up unified portal within 2 years which will have provisions for digitisation of complete supply chain including manufacture, sales, and distribution of antimicrobials, maintenance of database of NSQ (not standard quality)/spurious/adulterated/misbranded products in public domain, database of manufacturers of excipients intermediates, primary packaging materials; Registration of all vendors and stakeholders to track supply chain, and online database of all licenced entities and permitted products
- ii. Establish/strengthen a Quality Management System for supply chain management of antimicrobials- DAHD (2-4yrs), CDSCO (2yrs)

b. Strengthen and enforce national regulatory authority/ies regarding appropriate use of antimicrobials in all sectors

- i. Augmentation of enforcement of Schedule H and H1- CDSCO (Continuous)
- ii. Restrict antibiotics in animal/fish feed, feed premix; ensure use of registered products only; regulate their import, direct distribution, online marketing, and appropriate labelling: DAHD (2-4yrs), DoF (2-4yrs), CDSCO (1yr)

c. Develop and implement evidence-based standard treatment guidelines for humans and animals

- i. Revise National Treatment guidelines for common infectious diseases in humans: ICMR & NCDC (1 yr)
- ii. Develop a mobile application for promoting appropriate use of antimicrobials in treatment of common infectious diseases- ICMR, NCDC (3yrs)
- iii. Develop evidence-based standard treatment guidelines for veterinary settings, food animals, aquatic animals - DADH (1yr), DoF (1-2yrs), ICAR (1-4yrs)

d. Review, strengthen and implement the National essential medicine list regarding access to antimicrobials at different levels of healthcare

- i. Update Essential medicine list in alignment with the WHO AWaRe (Access, Watch, Reserve) classification as relevant to Indian context: CDSCO (continuous)
- ii. Implementation of National essential medicine list regarding access to antimicrobials at different levels of healthcare- NHM (through district level HCFs & below), CEA

e. Develop the National essential medicine list for veterinary medicine, food animals, aquatic animals

- i. Develop and implement the National essential medicine list for terrestrial animals, livestock, poultry and aquaculture at all levels- DAHD (2-5yrs), DoF (2-5yrs)

4.2. Rational use of antimicrobials in human healthcare and community

Antibiotic overuse and misuse are the key factor leading to the emergence of AMR. While national-level antimicrobial consumption data provides an estimate of aggregated data obtained from import, distribution, sales, and reimbursement pathways, antimicrobial use (AMU) data provides more granular information at the patient level, including in hospitals and communities. At the hospital level, limited antimicrobial stewardship (AMS) programs exacerbate the problem of inappropriate use of antibiotics. Antibiotic policies and antimicrobial stewardship programs need to be established in hospitals, stand-alone clinics and the community to optimize antibiotic use and reduce the emergence of resistance by ensuring appropriate prescribing and monitoring of antibiotic use and resistance patterns.

a. Establish National surveillance system for Antimicrobial Consumption in human health sector

- i. Establish mechanisms and modalities for antimicrobial consumption (AMC) surveillance at National, state and district level through the supply chain including manufacture and sale of antimicrobials: CDSCO (2-3yrs), DoP

- ii. Establish mechanisms and modalities for surveillance of antimicrobial consumption at healthcare facility level– NCDC (for HCFs at National & state level) (5yrs), ICMR (for secondary level HCFs) (2yrs)

b. Develop and implement National antimicrobial stewardship guidelines for healthcare facilities, stand-alone clinics and the community

- i. Develop guidance for implementing antimicrobial stewardship in healthcare facilities, stand-alone clinics and the community; NCDC (1yr), ICMR (1yr)
- ii. Implement trainings for implementation of AMS programmes/practices at all levels of healthcare – NCDC (5yrs)
- iii. Implement antimicrobial stewardship programmes in different levels of health care facilities, stand-alone clinics and the community – NCDC (5yrs), ICMR, NHM, Professional associations, NGOs, NABH, NMC
- iv. Establish functional multidisciplinary antimicrobial stewardship committees/teams at various levels of healthcare facilities –NCDC (5yrs), ICMR (3yrs), CEA
- v. Promote digitally mediated data driven AMS practices including facility level surveillance of AMC/AMU and development of antibiograms – NCDC (5yrs)
- vi. Develop guidance document/SOPs and training resources to measure antimicrobial use at healthcare facility level and build capacity - NCDC (5yrs), ICMR (2yrs)
- vii. Establish institution level antibiotic audits and feedback mechanisms to ensure optimal use – NCDC (5yrs) , ICMR (3yrs), NABH
- viii. Engage industry in promoting rational sale/use of antibiotics – DoP in coordination with other relevant stakeholders

4.3. Appropriate use of antimicrobials in veterinary settings, animal husbandry, fisheries, agricultural farms & food processing units

Global antimicrobial consumption in terrestrial and aquatic food animal production is associated with expanded production to meet increasing demand for animal-source nutrition. An appropriate antimicrobial use (AMU) surveillance system provides critical data and evidence to guide antimicrobial stewardship interventions. Antimicrobial stewardship involves maintaining animal health by implementing a range of preventive and management strategies to prevent infections, using an evidence-based approach to use antimicrobials and then using antimicrobials judiciously with continual evaluation of the outcomes of therapy.

a. Establish surveillance system for antimicrobial use (AMU) and antimicrobial consumption (AMC)

- i. Develop guidance document/SOPs and training resources to measure consumption and use of antimicrobials in veterinary settings, animal and agricultural farms, hatcheries, NBCs, BMCs aquafarms, ornamental fish handling centres/shops, other aquatic animal culture/grow out/handling facilities – DAHD (2-3yrs), ICAR (2-3yrs), DoF (2-3 yrs), CDSCO (1yr)
- ii. Establish/Define mechanisms and modalities for surveillance of antimicrobial consumption and use in veterinary settings, fisheries, animal/fish farms and agricultural farms at National, state and district level - ICAR (2-3yrs), DADH (2-3yrs), DoF (2-3yrs)
- iii. Develop software/digital platform for collection of district, state and national level consumption of antibiotics: DAHD (3-5yrs)
- iv. Organize training workshops to develop capacity of health care facilities to measure use of antimicrobials- DAHD (2-5yrs), ICAR (2-4yrs), DoF (2-5yrs)

b. Establish antimicrobial stewardship programmes for rational use of antimicrobials in animals, food and crops

- i. Initiate steps to ensure prescription sale of antibiotics and their use under supervision of a Registered Vet Practitioner (VCI); regulate bulk selling, import and labelling for species-specific use – DAHD (2-5yrs), CDSCO (6mnths), ICAR (1-2yrs)
- ii. Monitoring prescription sales of antibiotics and their use under supervision - CDSCO
- iii. Identification of critically important antibiotics as per the WHO list, Sensitization of Food Business Operators (FBOs) to exercise control of primary production centre – FSSAI (ongoing)

c. Develop and implement plan for phasing out antibiotic use for growth promotion and disease prevention in livestock/fisheries/ agriculture; replace by alternatives/ethno-veterinary medicines

- i. Develop and implement plan for phasing out antibiotic use for growth promotion and disease prevention in livestock/fisheries/ agriculture; replace use of medically important antibiotics and those of food safety significance with alternatives, ethnoveterinary medicines- ICAR (1-4yrs), DAHD (3-5yrs)

Strategic Objective 5

Promote Research and Innovations



5.1. Identify priorities for basic and operational research relevant to AMR in all sectors

Research relevant to AMR requires prioritisation of topics to answer the gaps in knowledge so as to guide policy e.g. estimation of the economic burden of AMR. It must also involve the discovery of new affordable, rapid, diagnostic tests and improved treatment regimens, the identification of cost-effective methods for surveillance of AMC and AMU and for infection prevention and control.

a. Define research priorities and develop funded research agenda for AMR innovations in diagnostics (including Point of Care tests), antimicrobials, alternatives to infectious disease management, ethnoveterinary medications, vaccines

- i. Develop and implement sectoral and inter-sectoral research agenda on AMR involving research institutions in the country: ICMR (5yrs), DAHD (1-5yrs), ICAR (1-4yrs), DoF (1-5yrs), CSIR (5yrs)
- ii. Development of methods (sequencing, molecular, microfluidics, immunochromatography, biophysical) for rapid Point of care diagnostics that identify the pathogen and type of resistance ; development of new drugs that overcome drug resistance; development of clinical framework for the use of combinations of antibiotics to prevent resistance development; identification of vaccine candidates; research on phage and microbiome based therapies; research on risk factors that predispose humans to repeat infections (such as recurrent UTIs) – CSIR (3-5yrs)
- iii. Build a mission mode programme (India AMR Innovation Hub) against AMR by identifying, nurturing, building and deploying innovations addressing AMR problem across One Health. As an Innovation engine to support the objectives of the National Action Plan, this effort will deliver innovative solutions in the following domains: Prevention, screening, diagnostics, therapeutics, and AMR surveillance – IAIH (5yrs)

- iv. Innovation in AMR diagnostics to detect and/or test the susceptibility profile of at least one and preferably two of the critical bacterial pathogens as prioritised in the India priority pathogen list and/test their susceptibility profiles; AMR innovations in antimicrobials/products which are active against microbial pathogens in Indian priority pathogen list - DBT (3yrs)
- v. Exploration of potential of AYUSH interventions in the management of infectious diseases in humans and animals to reduce the use of antimicrobials – AYUSH in collaboration with stakeholders in other ministries/departments (3yrs)
- vi. Scheme for promotion of research and innovation in Pharma (PRIP) MedTech Sector through gazette notification DoP – (5yrs)
- vii. Create centres with reasonable geographical spread in the country for diagnostics and devices (including Point of Care (POC) devices), new formulations of existing antibiotics etc. -DST

b. Encourage and fund research for evidence-informed policymaking

- i. Estimate morbidity, mortality and economic impact of AMR: ICMR (3yrs), DAHD (2-5yrs), CSIR, ICAR (2-4yrs)
- ii. Measure quantum and impact of AMR in food chain on human and animal health in Indian context: ICMR (3yrs); CSIR (3-5yrs); ICAR (2-4yrs); IAIH – innovative solutions for measuring quantum and impact of AMR in food chain on human and animal health in Indian context
- iii. Define standards of Antibiotic residues in environment which pose risk for emergence of AMR (for effluents of pharma and healthcare facilities) in Indian context: ICMR (3yrs); IAIH (3-4yrs) - innovative solutions for defining standards of Antibiotic Residues (ARs) in environment which pose risk for emergence of AMR
- iv. Estimation of AMR burden; Understand the prevalence of AMR pathogens and genes; Decipher the mechanisms of spread and transmission dynamics; genomic surveillance; biology of resistance and pathogens; new resistance mechanisms; understanding role of drug tolerance in evolution of drug resistance - CSIR (3-5yrs)

c. Coordinate, fund and pilot operational research projects in human, animal, food and environment sectors with respect to Indian context

- i. Understand transmission pathways of AMR across sectors: ICMR (3yrs), ICAR (1-4yrs), DBT (3yrs), CSIR (3-5yrs); IAIH (3-5yrs) - Innovative solutions for understanding transmission dynamics of AMR across sectors

- ii. Risk assessment of impact of AMR in environment on human and animal and vice-versa – ICAR (1-4yrs); IAIH-innovative solutions to assess risk of AMR in environment on human and animal health
- iii. Develop methods of effluent treatment to minimise risk of antimicrobial residues and AMR pathogens and genes: ICMR (3yrs); ICAR (1-4yrs); CPCB; CSIR (3yrs); IAIH-innovative solutions to manage effluents to minimise risk caused by ARs and AMR pathogens and genes
- iv. Exploring potential of AYUSH drugs in effective treatment of water sources against multi-drug resistant bacteria - AYUSH in collaboration with stakeholders in other ministries/departments (3yrs)
- v. Assess impact of antimicrobials on human and animal microbiome –ICMR (3yrs); CSIR (3yrs); ICAR (1-4yrs); DBT (3yrs)
- vi. Develop methods for measuring antibiotic consumption by collating data of its sales – DoP
- vii. Develop innovative solutions for standardised indigenous testing methods for detection of AMR and Antibiotic Residues (ARs) in environmental pathways- IAIH

d. Create unified fund for research and innovation

- i. Identification of thrust areas for funding research in AMR, including well defined Target Product Profiles and product differentiation – CSIR (3yrs)
- ii. Create an Innovation Fund under the IAIH, an Innovation arm of NAP 2.0, to support indigenous innovative solutions that address the challenge of AMR across the One Health domains. Over 5 years, this aims to support and enable innovative solutions for identified/prioritised top-10 AMR problems in India, across the One Health spectrum. This will be achieved by aligning organisational mandates, and by networking and leveraging resources from different international and domestic agencies – IAIH (5yrs)

Strategic Objective 6

Strengthen Governance, Coordination and Collaborations on AMR



6.1. Strengthen Governance and coordination mechanisms for AMR containment

‘One Health’ approach is a collaborative and multi-disciplinary approach, cutting across boundaries of animal, human, and environmental health to understand the AMR related challenges so as to undertake a risk assessment, and to develop plans for response and control. Strengthening of systems within each sector, namely effective access to diagnostic services to guide appropriate antimicrobial therapy, well implemented & monitored IPC and AMS programmes at all facilities, is essential for effective multidisciplinary coordination and collaboration under the ‘One Health’ approach. E.g. in absence of well represented AMR surveillance data and surveillance of Antimicrobial consumption within each sector, the multisectoral coordination under the ‘One Health’ approach to understand and mitigate the risks will not be possible

a. Establish/strengthen governance mechanism within each sector for coordination of multidisciplinary activities and for monitoring sectoral implementation of NAP AMR

- i. Dedicated AMR coordination unit within each relevant sector/sectors with dedicated funding for activities of the unit. This unit will coordinate with various departments within the sector/sectors for monitoring the status of implementation of action plans committed under NAP AMR 2.0. This unit will also coordinate time bound action on unusual events related to AMR.
 - (i) MoHFW- Establish Unit at NCDC (Chair: the DGHS) to coordinate monitoring of action plan of NCDC, NHM, CDSCO, FSSAI, Medical colleges, ICMR, Media unit MoIB, NHA (National Health Authority), concerned state departments, NMC, CEA, NABH and other accreditation bodies, NHSRC, NIHFW, INIs, etc.
 - (ii) DAHD - Establish unit at DAHD (Chair: Commissioner) to coordinate monitoring of activities of relevant departments under DAHD
 - (iii) DoF - Establish unit at DOF (Chair: Joint Secretary) to coordinate monitoring of activities of relevant departments under DOF

- (iv) MoAFW – Establish unit at ICAR (Chair: Secretary ICAR) to coordinate monitoring of activities of relevant departments under MoAFW
- ii. Each sectoral AMR coordination unit to identify activities on AMR requiring multidisciplinary/multi-departmental coordination on AMR and develop agenda for intra-sectoral coordination – all sectors/stakeholder departments
- iii. Each sectoral AMR coordination unit to identify activities on AMR requiring inter-sectoral coordination on AMR and share with Intersectoral committee/governance system - all sectors/stakeholder departments
- iv. Implementation of activities requiring Intra-sectoral collaboration and coordination
- v. Monitoring of implementation of intra-sectoral activities
- vi. Dashboard/portal on department/ministry website for real time progress updates of implementing AMR containment activities by respective ministries/departments

b. Establish/strengthen governance mechanism for coordination of inter-sectoral activities and for inter-sectoral monitoring of implementation of NAP AMR

- i. Constitution/strengthening of following committees at MoHFW with clear terms of reference:
 - (i) Technical Advisory Group on AMR under DGHS & DG ICMR (meetings to be held at least biannually)
 - (ii) Inter-sectoral Coordination Committee on AMR under Secretary (H) (meetings to be held at least biannually)
- ii. Develop agenda for inter-sectoral coordination with inputs from sectoral AMR coordination units
- iii. Establish an overarching steering group under office of PSA for coordinating action plans of science and research ministries, departments and organisations for coordinated effort without duplication – DBT, DST, CSIR, IAIH, ICAR, ICMR
- iv. High level Intersectoral Coordination & Monitoring Committee under Member (H), NITI Aayog, for bi-annual review of implementation of NAP AMR- all ministries/departments
- v. National dashboard/portal on NITI Aayog portal/website for real time progress updates of AMR containment activities by various ministries, departments and other stakeholders including state governments and partners: NITI Aayog, all relevant

stakeholders (NCDC, ICMR, DAHD, DoF, ICAR, MoEFCC/CPCB, FSSAI, NHM, DoP/NIPERs, Min of AYUSH, DBT, CSIR, MoIB)

- vi. Implementation of activities requiring Inter-sectoral collaboration and coordination
- vii. Monitoring of implementation of inter-sectoral activities

6.2. Strengthen International, national and sub-national collaborations to tackle AMR

AMR is a global public health challenge and International collaborations are essential to share and learn from the best practices in various countries. National level collaborations with various programmes involving disease surveillance like Tuberculosis programme, Leprosy programme etc. are required to consolidate action for AMR containment in the country. Effective implementation of the national action plan requires collaborations with states for development of state action plans in alignment with NAP-AMR and their monitoring and evaluation.

a. Strengthen India's commitment and leadership on AMR

- i. Review India's existing international collaborations on AMR and identify priority areas of action, through bi-annual meetings with key stakeholders from relevant departments/sectors, to strengthen collaborations with other countries - coordinated by DGHS/NCDC for human health sector; DAHD & DoF for Animal husbandry & veterinary sector; IAIH, CSIR (1-2yrs), DBT, ICMR for research.
- ii. Establish a forum on AMR (e.g. annual conference) for the quadripartite (WHO, FAO, WOA, UNEP), other international agencies and funding partners to share information & facilitate coordinated mobilisation of resources for prioritised AMR activities – coordinated by DGHS/NCDC for human health sector; DAHD & DoF for Animal husbandry & veterinary sector; DBT (through Global AMR R & D hub)

b. Strengthen collaborations at National level to tackle AMR

- i. Establish linkages to share best practices and information about drug resistance containment activities in other relevant disease programmes – MoHFW (DGHS/NCDC); MoFAHD (ICAR/DADH)
- ii. Annual conference with Civil society organisations to identify priority areas and review action taken to contain AMR – NCDC for human health sector

c. Establish AMR as a state-level priority by developing and implementing State Action Plans on Containment of AMR (SAP-CAR) aligned to NAP- AMR

- i. Establish state level AMR cell/nodal officer: All states and UTs
- ii. Develop state action plans in alignment with NAP AMR 2.0: All states and UTs
- iii. Develop state/UT specific plans for implementation and monitoring of AMR action plans

STAKEHOLDERS OF NAP AMR 2.0

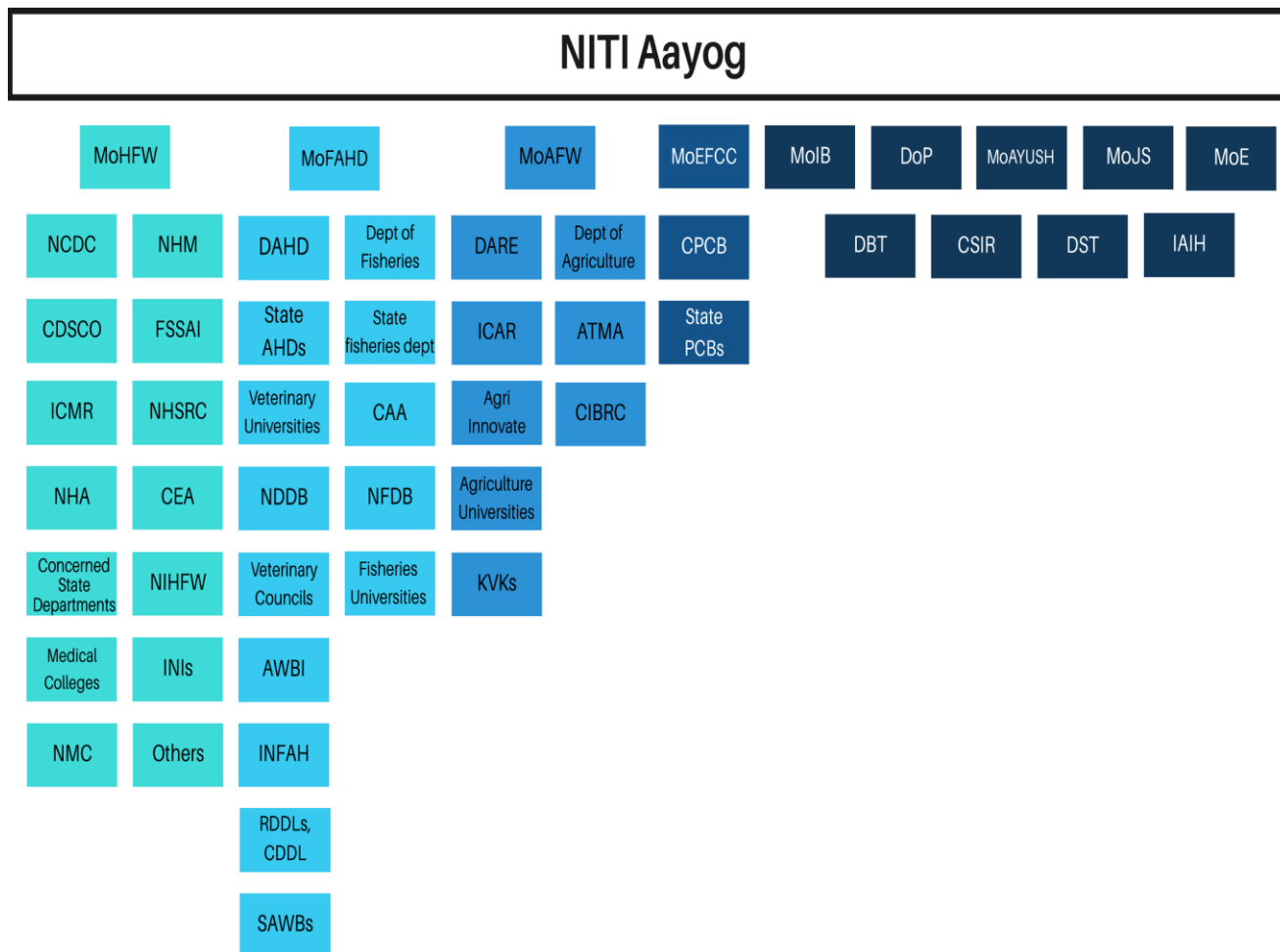
The NAP AMR 2.0 includes specific action plans of all the stakeholder department and ministries (listed below). These action plans outline the activities, timelines, budget, output and output indicators for each of the proposed activities under the 6 strategic objectives. Monitoring the implementation of NAP-AMR 2.0 includes regular monitoring of these specific action plans at sectoral and inter-sectoral levels.

1. Ministry of Health and Family Welfare (MoHFW): Annexure A
 - a. NCDC
 - b. ICMR
 - c. CDSCO
 - d. FSSAI
 - e. NHM
2. Ministry of Fisheries, Animal Husbandry and Dairying (MoFAHD): Annexure B
 - a. DAHD
 - b. Department of Fisheries (DoF)
3. Ministry of Agriculture & Farmers Welfare (MoAFW): Annexure C
 - a. ICAR
4. Ministry of Environment, Forests & Climate Change (MoEFCC): Annexure D
 - a. CPCB
5. Ministry of Science & Technology (MoST): Annexure E
 - a. DBT
 - b. CSIR
 - c. DST
6. Ministry of Chemical & Fertiliser: Annexure F
 - a. Department of Pharmaceuticals (DoP)
7. Other ministries/departments: Annexure G
 - a. Ministry of AYUSH
 - b. India AMR Innovation Hub (IAIH) under Office of Principal Scientific Advisor (PSA)
 - c. Ministry of Jal Shakti (MoJS)
 - d. Ministry of Food Processing Industries (MoFPI)
 - e. Ministry of Information & Broadcasting (MoIB):
 - f. Ministry of Education (MoE)

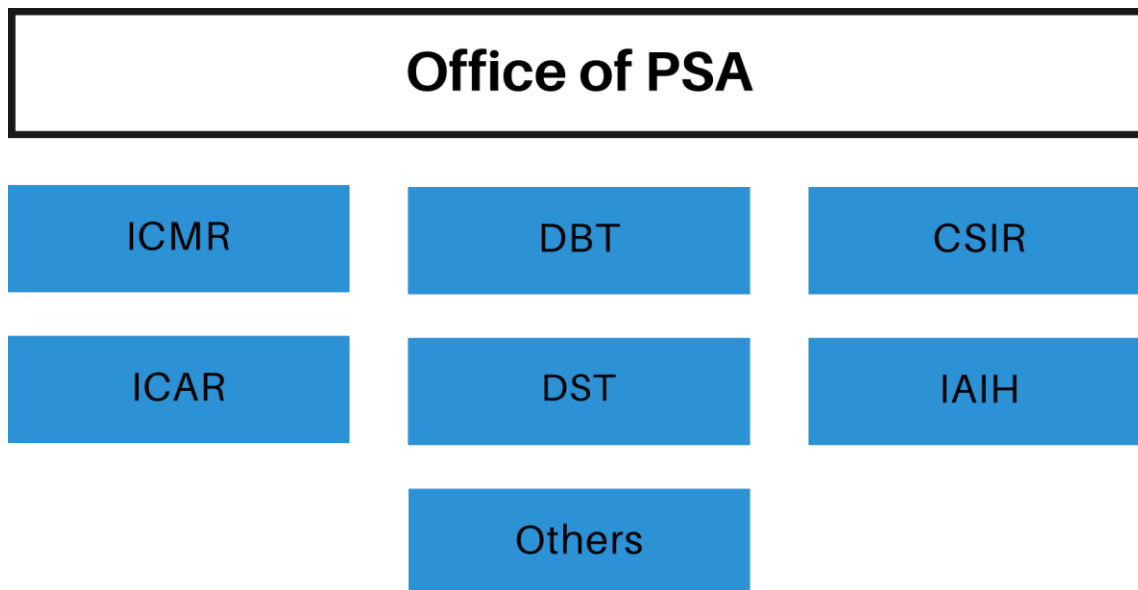
MONITORING MECHANISM

The annexed action plan of each stakeholder is to be monitored by the respective ministry through intra-sectoral meetings through following mechanisms:

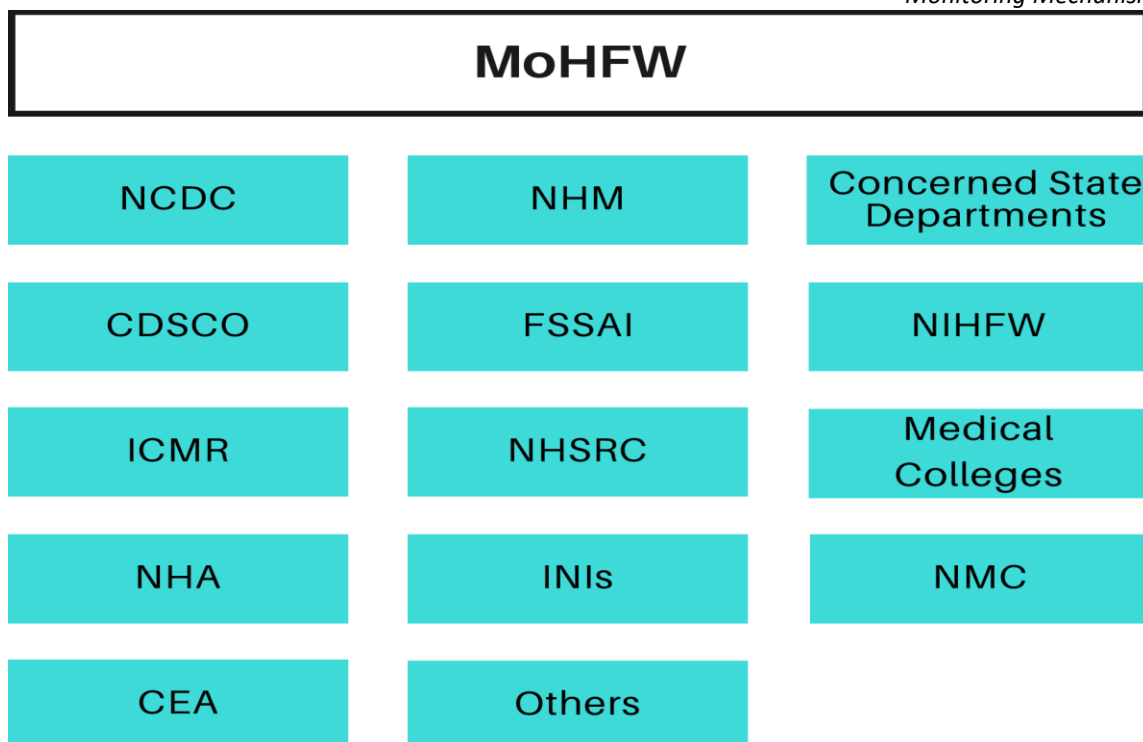
1. High level inter-ministerial technical monitoring of implementation of NAP AMR under NITI Aayog to be done Strategic Objective wise (at least bi-annual meetings)



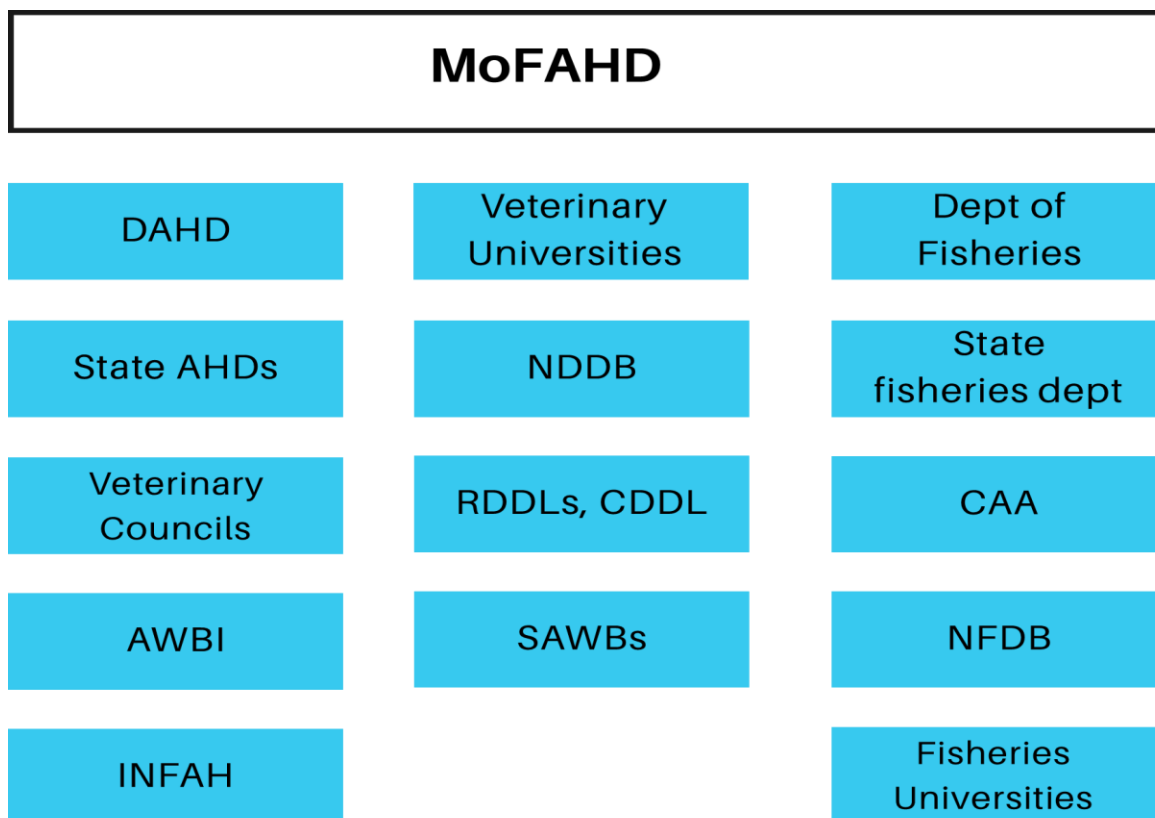
2. Monitoring of the research action plan under Office of PSA at least bi-annually



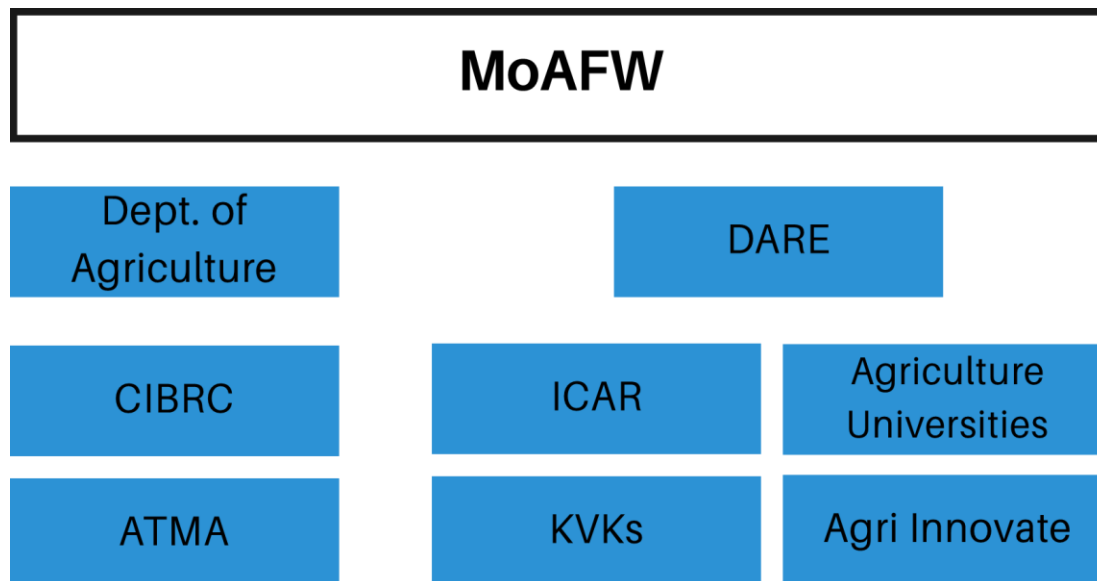
3. MoHFW, the nodal ministry coordinating NAP AMR implementation to have following mechanisms:
- i. Intersectoral Coordination Committee under Secretary (H) to meet at least bi-annually to monitor implementation of NAP AMR
 - ii. Technical Advisory Group (for human health) under chairmanship of DGHS and DG ICMR to meet at least bi-annually
4. Each of the following sector/ministry is to have dedicated unit and governance structure to monitor the implementation of NAP AMR on regular basis (meetings at least bi-annually)
- i. Ministry of Health & Family Welfare (MoHFW) - dedicated unit, meetings co-chaired by DGHS and Additional Secretary (PH)



- ii. Ministry of Fisheries, Animal Husbandry & Dairying (MoFAHD) – dedicated unit, meetings co-chaired by Secretary DADH & DoF



- iii. Ministry of Agriculture & Farmers Welfare (MoAFW) - dedicated unit, meetings co-chaired by Secretary DAFW & Secretary DARE/DG ICAR



- 5. NAP-AMR implementation monitoring dashboard on NITI Aayog website with login to all departments/ ministries, updated in real time
- 6. Dashboard within each ministry/department updated in real time

EVALUATION OF NAP AMR 2.0

The expected outcomes of the National action plan 2.0 and the Key Performance Indicators to measure the progress in achieving those outcomes are described below. These key performance indicators will be evaluated through the established sectoral and inter-sectoral governance mechanisms.

| | OUTCOME | INDICATORS |
|---|--|---|
| ① | Improved awareness among all stakeholders | <ul style="list-style-type: none"> i. Number of awareness campaigns held at National and state level ii. Percentage increase in awareness among key stakeholders/target groups as measured through studies/ surveys |
| ② | Improved education and capacity of key stakeholders | <ul style="list-style-type: none"> i. Number of curricula where AMR related topics have been incorporated ii. Number of manpower trained on AMR/IPC/judicious use of antimicrobials |
| ③ | Quality Assured laboratories at secondary health care level and above strengthened for AMR detection | <ul style="list-style-type: none"> • Number of quality assured laboratories at district and state level strengthened for AMR detection |
| ④ | Representative AMR surveillance data generated | <ul style="list-style-type: none"> • Number of facilities enrolled in state or national level AMR surveillance networks |
| ⑤ | Laboratory capacity for targeted surveillance of Antibiotic Residues (ARs) established/ strengthened | <ul style="list-style-type: none"> • Number of labs strengthened for targeted surveillance of ARs |
| ⑥ | National Infection Prevention and Control/Biosecurity programme developed and implemented across all facilities/units | <ul style="list-style-type: none"> • Number of facilities where IPC/biosecurity programmes are being implemented |
| ⑦ | Surveillance of Antimicrobial consumption (AMC) established | <ul style="list-style-type: none"> • Number of facilities enrolled in AMC surveillance at National and state level |

| OUTCOME | INDICATORS |
|--|--|
| <p>8</p> <p>Improved appropriate use of antimicrobials through Antimicrobial stewardship (AMS) programmes</p> | <ul style="list-style-type: none"> • Number of facilities/institutions with functional AMS programme |
| <p>9</p> <p>Evidence generated through operational research projects to guide policy</p> | <ul style="list-style-type: none"> • Number of operational research projects initiated/completed for generating evidence to inform policy |
| <p>10</p> <p>Innovations for AMR Containment</p> | <ul style="list-style-type: none"> • Number of diagnostic/therapeutic/alternatives/vaccines developed |
| <p>11</p> <p>Intra and intersectoral coordination strengthened</p> | <ul style="list-style-type: none"> i. Number of Intra and intersectoral meetings held; ii. Number of activities requiring intra and intersectoral coordination implemented |
| <p>12</p> <p>National collaboration on AMR strengthened</p> | <ul style="list-style-type: none"> • Number of relevant programmes with which AMR collaboration is established |
| <p>13</p> <p>AMR established as State level priority</p> | <ul style="list-style-type: none"> • Number of state action plans on AMR developed and being implemented with dedicated funding |
| <p>14</p> <p>International collaborations on AMR</p> | <ul style="list-style-type: none"> • Number of interventions/activities undertaken under International collaborations on AMR |

**ACTION PLANS OF KEY STAKEHOLDER
MINISTRIES/DEPARTMENTS/ORGANISATIONS**

ANNEXURE A: MINISTRY OF HEALTH AND FAMILY WELFARE

Name of the Department/organisation: National Centre for Disease Control (NCDC)

Strategic objective 1: Improve awareness and understanding of AMR through effective communication, education and training

Sub-objective 1.1 Increase awareness and improve communications regarding AMR, IPC and judicious use of antimicrobials in human health sector

| | Activity/sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. budget (Existing/planned) (Rs in Crores) | Output | Output Indicator |
|----|---|--|------------|--|---|--|
| a. | Assess knowledge, attitude & practices (KAP) among various stakeholders in human health sector | | | | | |
| | Develop standardized methodology for conducting KAP studies | TISS, NIMHANS IPSS (Indian Institute of population sciences) | 1 year | 0.08 | <ul style="list-style-type: none"> Standardised methodology developed | <ul style="list-style-type: none"> No. of expert group meeting conducted Standardised methodology document available |
| | Conduct KAP studies | PSM/PH dept of all medical /dental/pharmacy/nursing colleges, PHFI, IIPH, NIHFW, social science institutions | Continuous | To be budgeted by respective implementing agencies | <ul style="list-style-type: none"> Findings of KAP studies among various stakeholders available to guide and | <ul style="list-style-type: none"> No. of KAP studies conducted in community and professionals, paraprofessionals |

| | Activity/sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. budget (Existing/planned) (Rs in Crores) | Output | Output Indicator |
|--|-------------------------|--|----------|--|------------------------|--|
| | | | | | evaluate interventions | <ul style="list-style-type: none"> No. of KAP studies results available as reports/ manuscripts |

Sub-objective 1.2. Improve knowledge and capacity of key stakeholders regarding AMR, IPC and judicious use of antimicrobials in human health sector

| | Activity/sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. budget (Existing/planned) (Rs in Crores) | Output | Output indicator |
|-----------|---|--|----------|--|--|---|
| a. | Review and revise curricula and modules of professionals/para-professionals in human health sector | | | | | |
| | Identify professional and para-professional courses which must include AMR and IPC in curricula | NMC, CHEB, Indian Nursing council, Pharmacy council, other relevant professional councils, MoE | 2 years | 0.1 | Courses identified for inclusion of AMR, IPC and judicious use of antimicrobials | No. of courses identified for inclusion of AMR, IPC and judicious use of antimicrobials |
| | Review and revise curricula and teaching modules | NMC, Indian Nursing council, Pharmacy council, other relevant | 2 years | 0.5 | Professional and para-professional courses revised and teaching | <ul style="list-style-type: none"> No. of meetings conducted No. of courses revised |

| | Activity/sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. budget (Existing/planned) (Rs in Crores) | Output | Output indicator |
|-----------|--|---|------------|---|---|--|
| | | professional councils, MoE, CHEB | | | modules developed and available | • No. of teaching modules developed |
| b. | Mandatory induction and in-service trainings for all professionals/ para-professionals in human health sector | | | | | |
| | Develop training resources (including online courses) for capacity building among professionals & para-professionals in human health sectors | Expert groups, Professional associations, partners | 2 years | To be budgeted by respective councils and professional associations | Training resources available on AMR, IPC and judicious use of antimicrobials for human health | <ul style="list-style-type: none"> • No. of training resources developed • No. of online courses available |
| | Implement trainings on AMR, IPC and judicious use of antimicrobials for human health sector | Professional associations, Training institutes (NIHFW, SIHFW) teaching institutions | Continuous | To be budgeted by respective councils and professional associations | Training programmes conducted on AMR, IPC and judicious use of antimicrobials | No. of training programmes conducted annually |
| | Continuous Professional Development / Integrated Faculty development programmes on AMR , | NMC, Indian Nursing council, Pharmacy council, Professional | Continuous | To be budgeted by respective councils and professional associations | Professional development programmes conducted on AMR, IPC and | No. of professional development programmes on AMR, IPC and |

| | Activity/sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. budget (Existing/planned) (Rs in Crores) | Output | Output indicator |
|----|--|--|----------|--|---|---|
| | IPC and judicious use of antimicrobials in human health sector; Dedicated sessions | associations, teaching institutions | | | judicious use of antimicrobials | judicious use of antimicrobials conducted annually |
| c. | Educate school and college students on AMR & IPC | | | | | |
| | Review and revise curricula of schools and colleges | CHEB, MoE | 2 years | 0.2 | Revised curricula available for school and college students on AMR & IPC (including WASH) | • No. of curricula reviewed and revised for school and college students |

Strategic objective 2: Strengthen laboratory capacity for AMR

Sub-objective 2.1: Strengthen microbiology laboratory capacity for AMR detection in human health sector

| | Activity/sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. budget (Existing/planned) (Rs in Crores) | Output | Output indicator |
|----|---|--|----------|--|--|--|
| a. | Establish functional, well utilised, quality assured laboratories at all levels of healthcare for humans to promote evidence-based use of antimicrobials | | | | | |
| | Strengthen microbiology laboratories (in govt. & private sector) at National and state level for AMR detection | NABL, NQAS, NHSRC, IDSP, NMC, NHM, Professional Associations | 5 years | Strengthen through existing frameworks | Microbiology labs strengthened at least 200 tertiary care Institutions | • No. of microbiology labs strengthened for AMR detection |
| | Promote laboratory diagnostic testing before prescribing antimicrobials | NABL, NQAS, NHSRC, IDSP, NMC, NHM (IPHS guidelines), Professional Associations | 3 years | - | Suspected infectious disease patients in at least 200 tertiary care hospitals prescribed antimicrobials after submitting samples for microbiological diagnosis | • Number of facilities where patients with infectious diseases are prescribed antimicrobials after submission of appropriate samples |

| | Activity/sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. budget (Existing/planned) (Rs in Crores) | Output | Output indicator |
|-----------|---|---|----------|---|---|---|
| | Develop and implement standardized protocols for pathogen identification, AST | Develop: NABL, National level Institutions, EQAS providers, Implement: NHSRC, IDSP, Professional associations, NHM, medical colleges | 1 year | 0.2 | Standardized protocols for pathogen identification, AST developed and implemented | <ul style="list-style-type: none"> • Updated Standard protocols available and disseminated • No. of trainings conducted on Standardised protocols |
| | Establish mechanisms for implementing laboratory quality management systems to ensure quality and reliable test results e.g. mandatory accreditation of all labs in the country | NABL, NQAS, NMC, IDSP | 5 years | Strengthen through existing frameworks/health programmes (NHM, Medical colleges, NHSRC, NABH) | At least 200 tertiary care hospital labs having Quality Management systems/accreditation in place | No. of tertiary care hospitals having Quality Management systems/accreditation in place |
| b. | Establish AMR surveillance through standardised digital documentation system in hospitals and laboratories at all levels of health care in humans | | | | | |

| | Activity/sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. budget (Existing/planned) (Rs in Crores) | Output | Output indicator |
|-----------|--|--|-----------------|--|---|---|
| | Establish Hospital Information and Laboratory Information management systems (LIMS) uniformly across the country which would support AMR data management at all levels of health care for humans | NIC. IHIP, National Health Intelligence Bureau. E-hospital | 5 years | 20.0 Through existing frameworks (NHM, Medical colleges, NHSRC, NABH) | Uniform National HMIS and LIMS software prototype which can be bridged with other data systems in the country, developed and made available | No. of tertiary care hospitals having HMIS & LMIS |
| | Expand National and state AMR Surveillance System | NABL, Other lab strengthening programmes | 5 years | Through existing health programmes /projects | National AMR Surveillance Network expanded to at least 200 tertiary healthcare facilities and at least 15 states | <ul style="list-style-type: none"> • No. of tertiary health care facilities reporting quality AMR data to National • No. of states having state level AMR surveillance Networks |
| c. | Designate reference laboratories for AMR surveillance in human health sector | | | | | |

| | Activity/sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. budget (Existing/planned) (Rs in Crores) | Output | Output indicator |
|--|---|---|-----------------|---|--|--|
| | Establish/strengthen National and state reference laboratories for AMR to ensure adequate guidance on quality laboratory testing, genomic surveillance of AMR and detection of emerging AMR pathogens | National and state level Institutions | 5 years | National: 25.0 States (in at least 15 states): 20.0 (Various health programmes including National Programme on AMR Containment) | At least 2 National Reference labs (bacterial and fungal) and 15 state reference labs for AMR established/strengthened | <ul style="list-style-type: none"> • No. of NRL established/strengthened for AMR • No. of SRLs established for AMR |

Strategic objective 3: Reduce the incidence of infection through effective infection prevention and control

Sub-objective 3.1 Strengthen infection prevention in human health sector

| | Activity/sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. budget (Existing/planned) (Rs in Crores) | Output | Output indicator |
|-----------|--|---|-----------------|---|---------------|-------------------------|
| a. | Develop, implement & monitor National infection prevention and control program for strengthening Infection Prevention and Control (IPC) at all tiers of healthcare system | | | | | |

| | Activity/sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. budget (Existing/planned) (Rs in Crores) | Output | Output indicator |
|--|---|---|-----------------|--|---|--|
| | Develop National IPC programme | AIIMS, ICMR, NHSRC, (Kayakalp), Professional associations, NABH, NQAS, CTD, NACO, NHM, AIPH | 2 year | 1.0 | Approved National IPC programme in place | <ul style="list-style-type: none"> • Dedicated secretariat for IPC established • No. of consultations held for developing the National IPC programme |
| | Implement National IPC programme at all tiers of healthcare system in a phased approach | NMC, NHM, NHSRC, CTD, NACO, NABH, NABL, AIPH | 5 years | Implement through existing frameworks (NHM, Medical colleges, NABH, National Programme on AMR Containment) | National IPC programme implemented at all levels of healthcare | No. of tertiary health care facilities implementing IPC as per the National programme |
| | Define core elements of IPC and establish standardized definitions for these elements at different tiers of health care settings in public and private facilities | AIIMS, NHSRC (Kayakalp), Professional associations, NABH, NQAS, CTD, NACO, NHM | 2 years | 0.5 | Core elements of IPC for different tiers of health care settings in public and private facilities defined | Standard definitions of core elements of IPC for different tiers of health care settings in public and private facilities available |

| | Activity/sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. budget (Existing/planned) (Rs in Crores) | Output | Output indicator |
|--|--|--|-----------------|---|---|--|
| | Develop and implement standard IPC checklist for various tiers of healthcare facilities- Uniform checklist for all programmes | Develop: NCDC, NQAS, NABL, NHSRC Implement: through programme induction/review meetings | 2 years | 0.2 | Standard IPC checklist (common for all programmes) for each level of healthcare developed and implemented | No. of tertiary health care facilities using the standard checklist for IPC to self-assess and improve the implementation of IPC |
| | Coordinate with existing accreditation/ quality assessment bodies to ensure regular assessment of IPC at different levels and all categories of health care settings | NABL, NABH, NQAS, NHSRC, CTD, NACO, NHM, Patient safety | 5 years | - | IPC assessment conducted at regular intervals for different levels and all categories of health care settings | No. of tertiary health care facilities assessing IPC at regular intervals |
| | Strengthen/establish standardized surveillance programs for health care associated infections (HAIs) at healthcare facilities using uniform case definitions, | AIIMS, ICMR, medical colleges, NMC, NABH, IHIP | 5 years | Implement through existing frameworks (Medical colleges, NABH, National Programme on AMR Containment) | Standardized surveillance programs for health care associated infections established in at | No. of tertiary healthcare facilities with standardized surveillance for health care associated infections |

| | Activity/sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. budget (Existing/planned) (Rs in Crores) | Output | Output indicator |
|-----------|--|---|-----------------|---|---|---|
| | methodologies, and reporting mechanisms | | | | least 200 tertiary care facilities | |
| | Develop and advocate policies for adequate human resources, dedicated IPC budgets, and infrastructure to implement IPC programs in healthcare facilities | NHM, NMC, NABH, NHSRC, Health Insurance schemes | 5 years | - | Policies developed and advocated for IPC | No. of states/UTs who have adopted policies for IPC |
| | Develop monitoring and evaluation framework to assess the implementation of national IPC programme | NHM, NHSRC, NABH, NMC | 3 years | - | Monitoring and Evaluation framework developed & used to assess the implementation of national IPC programme | No. of states using Monitoring and Evaluation framework to assess the implementation of IPC programme |
| b. | Update National IPC guidelines on regular basis | | | | | |

| | Activity/sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. budget (Existing/planned) (Rs in Crores) | Output | Output indicator |
|-----------|---|---|--------------------------------------|---|---|---|
| | Update National IPC guidelines in coordination with other programmes strengthening IPC in the country like Kayakalp etc. | Technical experts | 2 years and then after every 3 years | 0.2 | National IPC Guidelines updated | Updated National IPC Guidelines available |
| | Adapt and disseminate National IPC guidelines for all levels of healthcare | Technical experts from National and state | 3 years | 0.5 | National IPC guidelines for various levels of healthcare adapted and disseminated | IPC guidelines developed for various level of healthcare and disseminated |
| c. | Develop National IPC curriculum including core competencies for all health care professionals and para-professionals | | | | | |
| | Define core competencies for National IPC curriculum for basic, Intermediate and advanced trainings | IPC stakeholders | 2 years | 0.5 | National IPC curriculum with core competencies developed | |
| | Develop National IPC curriculum for basic, Intermediate and advanced trainings | | | | | |

| | Activity/sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. budget (Existing/planned) (Rs in Crores) | Output | Output indicator |
|-----------|---|---|----------|--|----------------------------|-----------------------|
| d. | Strengthen infection prevention in the community through vaccination and WASH | | | | | |
| | Develop and promote behaviour change towards sanitation and hygiene through social mobilization campaigns in different social groups including school children/college students | TISS, Sociology depts. in universities etc. | 5yrs | Respective institutions | Behaviour change campaigns | No. of campaigns held |

Strategic objective 4: Optimize the use of antimicrobial agents in humans, animals/fisheries and food

Sub-objective 4.1: Uninterrupted access and judicious use of high-quality antimicrobials in human health sector

| | Activity/sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. budget (Existing/planned) (Rs in Crores) | Output | Output indicator |
|-----------|---|--|----------|--|--------|------------------|
| c. | Develop and implement evidence based standard treatment guidelines for human health sector | | | | | |

| | Activity/sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. budget (Existing/planned) (Rs in Crores) | Output | Output indicator |
|--|---|--|------------------------------|---|---|--|
| | Constitute expert group and update National Treatment Guidelines for common infectious diseases | Experts from Institutions of National repute in govt. and private sector, ICMR | 1 year, then every 3-5 years | 0.4 | National Treatment Guideline updated at regular intervals and available | <ul style="list-style-type: none"> •Multidisciplinary Expert group constituted •Updated treatment guidelines available |
| | Develop a Mobile application for antimicrobial use in treatment of common infectious diseases | NIC, National & International Partners | 3 years | 1 | Mobile app developed and available for all doctors in the country | |

Sub-objective 4.2: Rational use of antimicrobials in human healthcare and community

| | Activity/sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. budget (Existing/planned) (Rs in Crores) | Output | Output indicator |
|-----------|--|---|-----------------|---|--------------------------------------|--|
| a. | Establish National surveillance system for Antimicrobial Consumption in human health sector and community | | | | | |
| | Establish mechanisms and modalities for AMC | NHM, NABH, NQAS | 5years | 2 | AMC data available and being used to | <ul style="list-style-type: none"> •System for monitoring AMC available |

| | Activity/sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. budget (Existing/planned) (Rs in Crores) | Output | Output indicator |
|-----------|---|--|----------|---|--|---|
| | surveillance at healthcare facility level | | | | guide facility level antimicrobial policy/stewardship | • No. of facilities collecting and collating AMC data |
| | Develop SOPs/guidelines, training modules to build capacity of healthcare facilities to measure AMC | National & International partners | 5years | 2 | Capacity building done at National and state level for facility level AMC surveillance | No. of facilities trained to measure AMC |
| b. | Develop and implement National Antimicrobial stewardship (AMS) guidelines for healthcare facilities, stand-alone clinics and the community | | | | | |
| | Develop guidance for implementing antimicrobial stewardship in healthcare facilities, stand-alone clinics and the community | Experts from Institutions of National repute in govt. and private sector | 1 year | 0.2 | National Guidelines developed for implementing AMSP at various levels | National Guidelines developed for implementing AMSP at various levels |
| | Implement trainings for implementation of AMS | NHSRC, NHM, Professional associations, | 5 years | Within frameworks of various health programmes and by | Trainings on AMS conducted for | No. of trainings held on AMS |

| | Activity/sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. budget (Existing/planned) (Rs in Crores) | Output | Output indicator |
|--|--|---|-----------------|---|--|--|
| | programmes/practices at all levels of health care | NMC, INC, other councils | | professional and paraprofessional councils and associations | all tiers of healthcare | |
| | Implement antimicrobial stewardship programme at tertiary healthcare facilities | NMC, NABH, Professional associations, | 5 years | Strengthen through existing frameworks | AMS programmes implemented in at least 200 tertiary care Institutions | No. of tertiary healthcare facilities where AMS programmes are implemented |
| | Establish functional multidisciplinary antimicrobial stewardship committees/teams at various levels of healthcare facilities | NMC, NABH, NQAS, Kayakalp, other NHM programmes | 5 years | Respective institutions | Functional multidisciplinary antimicrobial stewardship committees/teams functional at least 200 tertiary care Institutions | No. of facilities having multidisciplinary AMS teams |
| | Promote digitally mediated data driven AMS practices including utilisation of facility level | NMC, NABH, NQAS, Kayakalp | 5 years | Respective institutions | Healthcare facilities with digitised HMIS & LIMS using | No. of health care facilities using digital data derived facility level |

| | Activity/sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. budget (Existing/planned) (Rs in Crores) | Output | Output indicator |
|--|--|---|-----------------|---|--|---|
| | antibiograms and AMU data | | | | local antibiograms for evidence based use of antimicrobials | antibiograms to guide clinical decision |
| | Develop guidance document/SOPs and training resources to measure AMU at Healthcare facility level and build capacity | National & International partners | 5 years | 0.5 | Guidance document/SOPs available, training resources developed and trainings implemented | No. of guidance document/SOPs/ training resources developed No of trainings held |
| | Establish institution level antibiotic audits and feedback mechanisms to ensure optimal use | NMC, NABH, NQAS, Kayakalp | 5 years | 2 | Antibiotic audits conducted and feedback provided to clinical departments by the AMS teams in at least 200 | No. of facilities sharing audit and feedback mechanisms to improve AMS implementation |

| | Activity/sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. budget (Existing/planned) (Rs in Crores) | Output | Output indicator |
|--|--------------------------------|---|-----------------|---|----------------------------|-------------------------|
| | | | | | tertiary care Institutions | |

Name of the Department/organisation: Indian Council of Medical Research (ICMR)**Strategic objective 1: Improve awareness and understanding of AMR through effective communication, education and training****Sub-objective 1.1 Increase awareness and improve communications regarding AMR, IPC and judicious use of antimicrobials in all sectors**

| | Activity/sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. budget (Existing/planned) (Rs in Crores) | Output | Output Indicator |
|----|--|--|-----------|--|-----------------------------|---|
| a. | Assess knowledge, attitude & practices (KAP) among various stakeholders | | | | | |
| | Develop standardized methodology for conducting KAP studies | Research institutions/hospitals, ICMR institutes | 18 months | 1 | Finalisation of KAP modules | No. of expert group meetings conducted No of sites selected for testing the KAP module |

Strategic objective 2: Strengthen laboratory capacity for AMR

Sub-objective 2.1: Strengthen microbiology laboratory capacity for AMR detection in human and animal infections

| | Activity/sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. budget (Existing/planned) (Rs in Crores) | Output | Output indicator |
|----|---|--|----------|--|--|---|
| a. | Establish functional, well utilised, quality assured laboratories at all levels of healthcare for humans and animals to promote evidence-based use of antimicrobials | | | | | |
| | Strengthen microbiology laboratories (in govt. & private sector) at National, state and district level for AMR detection | NCDC, NHSRC | 3 years | 25 | At least 200 labs trained on AMST Skilled workforce Data management system for District Hospitals Surveillance data from secondary level hospitals | No. of workshops organised No of hospitals and staff trained |

| | Activity/sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. budget (Existing/planned) (Rs in Crores) | Output | Output indicator |
|----|---|---|-----------------|---|---|---|
| | Develop and implement standardized protocols for pathogen identification, AST | Experts , NCDC | 12 months | 0.02 | Standardized protocol developed Implementation | No. of expert group meetings conducted Standardized protocol available |
| c. | Designate reference laboratories for AMR surveillance in human sector | | | | | |
| | Establish/strengthen National and state reference laboratories for AMR to ensure adequate guidance on quality laboratory testing, genomic surveillance of AMR and detection of emerging AMR pathogens | NCDC, other research institutes | 3 years | 10 | System of genomics surveillance Data on emerging AMR pathogens | No. of national and State reference labs engaged |

Strategic objective 4: Optimize the use of antimicrobial agents in humans, animals and food

Sub-objective 4.1: Uninterrupted access and judicious use of high-quality antimicrobials in all sectors

| | Activity/sub-activities | Other stakeholders proposed to be involved | Timeline | Budget (existing/planned) | Output | Output indicator |
|----|--|---|-----------|---------------------------|---|---|
| c. | Develop and implement evidence based standard treatment guidelines for humans and animals | | | | | |
| | Develop and implement evidence based standard treatment guidelines for humans and animals | NCDC, independent experts, DGHS, societies like IAP, IDS. Critical care society | 12 months | 0.05 | Treatment guideline Mobile application | <ul style="list-style-type: none"> • No of experts engaged • No of times downloaded |

Sub-objective 4.2: Rational use of antimicrobials in human healthcare and community

| | Activity/sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. budget (Existing/planned) (Rs in Crores) | Output | Output indicator |
|----|--|--|----------|--|--------|------------------|
| a. | Establish National surveillance system for Antimicrobial Consumption in human health sector | | | | | |

| | Activity/sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. budget (Existing/planned) (Rs in Crores) | Output | Output indicator |
|----|---|---|-----------------------|---|--|--|
| | Develop guidance document/SOPs and training resources to measure consumption (AMC) of antimicrobials | NCDC, hospitals, NHSRC for district hospitals | 2 years | | SOPs developed, implementation, Skilled manpower | -SOPs available -No of training-workshops organized |
| b. | Develop and implement National Antimicrobial stewardship (AMS) guidelines | | | | | |
| | Develop guidance for implementing antimicrobial stewardship in healthcare facilities, stand-alone clinics and the community | NCDC Independent experts | One year | 0.05 | Guideline for implementing antimicrobial stewardship in healthcare facilities, stand-alone clinics and the community developed | Guidelines available |
| | Establish functional multidisciplinary antimicrobial stewardship committees/teams at | Hospitals (govt and private) Research institutes | 3 years to completion | 15 | -Antimicrobial consumption in hospitals -Mortality related to drug | -No. of hospitals included in the study -No. with antibiotic policy |

| | Activity/sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. budget (Existing/planned) (Rs in Crores) | Output | Output indicator |
|----|--|--|-----------------------|---|--|---|
| | various levels of healthcare facilities | | | | resistant infections -Costs for treatment for drug resistant infections | -No. of patients followed up -No .of Antimicrobial stewardship interventions |
| c. | Implement antimicrobial stewardship programmes in healthcare facilities, stand-alone clinics and the community | | | | | |
| | Establish functional multidisciplinary antimicrobial stewardship committees/teams at various levels of healthcare facilities | Hospitals (govt. and private) Research institutes | 3 years to completion | 15 | -Antimicrobial consumption in hospitals -Mortality related to drug resistant infections -Costs for treatment for DR infections | -No. of hospitals included in the study -No. with antibiotic policy -No. of patients followed up -No .of Antimicrobial stewardship interventions |
| | Facilitate generation and utilisation of facility level | | | | -Improved data collection | Antibiograms templates available |

| | Activity/sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. budget (Existing/planned) (Rs in Crores) | Output | Output indicator |
|--|--|---|-----------------|---|--|--|
| | AMU surveillance data and antibiograms | | | | -Antibiograms templates developed | |
| | Establish institution level antibiotic audits and feedback to ensure optimal use | | | | -Data collection protocols developed -Audits tool developed -Audits process established -Reduction in inappropriate Prescribing | Data collection protocols available Feedback mechanisms available |

Strategic objective 5: Promote Research and innovations

Sub-objective 5.1: Identify priorities for basic and operational research relevant to AMR in all sectors

| | Activity/sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. budget (Existing/planned) (Rs in Crores) | Output | Output indicator |
|-----------|---|--|----------|--|---|---|
| a. | Define research priorities and develop funded research agenda for AMR innovations in diagnostics (including Point of Care tests), antimicrobials, alternatives to infectious disease management, ethnoveterinary medications, vaccines | | | | | |
| | Develop and implement sectoral research agenda on AMR involving research institutions in the country | Research institutions | 5 years | 50 | Publications | No. of expert group meetings conducted |
| | Development of typhoid diagnostic | | 2 years | 6 | Feedback mechanism established | No of participating sites |
| | Advanced centre for phage therapy | | 3years | 10 | | Publications |
| b. | Encourage and fund research for evidence-informed policymaking | | | | | |
| | Estimate morbidity, mortality and economic impact of AMR (Prospective study in tertiary care hospitals Modelling exercise with National Data Modelling Centre IIT-Mumbai) | Hospitals IIT, Mumbai | 3 years | 10 | <ul style="list-style-type: none"> •Epidemiological reports available •Mortality related to drug resistant infections in Indian hospitals | Epidemiological reports published Publications |

| | Activity/sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. budget (Existing/planned) (Rs in Crores) | Output | Output indicator |
|-----------|---|---|-----------------|---|--|--|
| | | | | | <ul style="list-style-type: none"> Impact of AMR and cost-benefit analysis documented | |
| | Quantum and impact of AMR in food chain on human and animal health in Indian context | Research institutions ICAR | 3 years | 10 | | |
| | Defining standards of AR in environment which pose risk of emergence of AMR (for effluents of pharma and healthcare facilities) in Indian context | Research institutions | 3 years | 10 | | |
| c. | Coordinate, fund and pilot operational research projects in humans, animals, food and environment sectors with respect to Indian context | | | | | |
| | Study on impact of flu and pneumococcal vaccines on antimicrobial usage and hospitalisation | Research institutions/hospitals | 4 years | 25 | -Finalisation of study protocol -Participating sites | -No. of expert group meetings conducted -No of sites selected for |

| | Activity/sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. budget (Existing/planned) (Rs in Crores) | Output | Output indicator |
|--|---|---|-----------------|---|---|--|
| | | | | | -Result from the community study in terms of relative risk for hospitalisation and antimicrobial usage | undertaking the study -No of patients enrolled and follow up completed -No. hospitalised in control and test group |
| | Understand transmission pathways of AMR across sectors | Research institutions Hospitals ICAR | 3 years | 15 | -Transmission of key pathogens across sectors -Transmission routes mapped -Implementation of targeted interventions | -Reservoir identified -Research and surveillance data -Publications |
| | Develop methods of effluent treatment to minimise risk of antimicrobial residues, | Research institutions | 3 years | 10 | | |

| | Activity/sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. budget (Existing/planned) (Rs in Crores) | Output | Output indicator |
|--|--|---|-----------------|---|---------------|-------------------------|
| | AMR pathogens and genes | | | | | |
| | Assess impact of antimicrobials on human and animal microbiome | Research institutions Hospitals ICAR | 3 years | 25 | | Publications |

Name of the Department/organisation: Central Drug Standards Control Organisation (CDSCO)

Strategic objective 3: Reduce the incidence of infection through effective infection prevention and control

Sub-objective 3.3: Reduce environmental contamination with resistant genes, resistant pathogens and antimicrobial residues

| | Activity/sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. budget (Existing/planned) (Rs in Crores) | Output | Output indicator |
|----|---|--|----------|--|---|------------------|
| a. | Develop and implement strategic interventions to reduce the environmental impact of AMR | | | | | |
| | <p>Effective management of pharmaceutical industry effluents</p> <p>Additional activities / Sub-activities suggested by CDSCO:</p> <ol style="list-style-type: none"> 1. Implementation of appropriate regulatory provisions under Schedule M, 2. Have regular stake holders interactions for | <p>MoEFCC/CPCB, All state Drugs Control Authorities, Pharma Associations, NGOs</p> | 2 years | - | <ul style="list-style-type: none"> • Proper sensitization of all the stakeholders including the regulatory inspections will ensure better control on antimicrobials in industrial effluents. | |

| | | | | | |
|---|---|---|---|---|---|
| <p>implementation of GMP principles to ensure monitoring of antimicrobial waste in industrial effluents,</p> <p>3. Implementing recommendations/expectations of Pharmaceutical manufacturers regarding waste management to mitigate and prevent potential AMR</p> <p>4. Developing guidance for the state Drugs Controllers and especially, the GMP inspectors for management of waste and waste water from the production of Antimicrobials.</p> <p>5. Augmentation of enforcement activities.</p> | | | | | |
| <p>Effective management of waste-water from animal and agricultural farm</p> | - | - | - | - | - |

| | | | | | | |
|----|--|---|---------|---|--|--|
| b. | Develop and implement mechanism for safe disposal of expired antimicrobials | | | | | |
| | Incorporation in Drugs and Cosmetics Rules - Developing and implementing mechanism for safe disposal of expired antimicrobials | MoEFCC/CPCB, All state Drugs Control Authorities, Pharma Associations, NGOs | 2 years | - | Uniform and Safe disposal of expired antimicrobials will prevent exposure of such antimicrobials to the environment. | |
| | Sensitization of all stake holders | | | | | |

Strategic objective 4: Optimize the use of antimicrobial agents in humans, animals and food

Sub-objective 4.1: Uninterrupted access and judicious use of high-quality antimicrobials in all sectors

| | Activity/sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. budget (Existing/planned) (Rs in Crores) | Output | Output indicator |
|----|---|---|-----------------|---|---|-------------------------|
| a. | Strengthen and enforce national regulatory authority/ies for access to quality antimicrobials in all sectors | | | | | |
| | Identify and implement mechanisms to prevent | All state Drugs Control Authorities, | 6 months | - | <ul style="list-style-type: none"> Digitalization of supply chain of | |

| | Activity/sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. budget (Existing/planned) (Rs in Crores) | Output | Output indicator |
|--|---|---|-----------------|---|---|-------------------------|
| | <p>availability of substandard, spurious, falsely labelled and falsified antimicrobials e.g. digitisation of complete supply chain including manufacture and sale of antimicrobials</p> <p>Additional activities:</p> <ul style="list-style-type: none"> • Government has established unified portal, to get information w.r.t. substandard, spurious, falsely labelled and falsified antimicrobials. The digitalization of complete supply chain including manufacture, sale and distribution of Antimicrobials. • Track & trace has been implemented for 300 brands as per GSR | Pharma Associations, NGOs | | | antimicrobials will result in better control on substandard, spurious, falsely labelled and falsified antimicrobials. | |

| | Activity/sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. budget (Existing/planned) (Rs in Crores) | Output | Output indicator |
|--|--|--|-----------------|---|---|-------------------------|
| | 823(E) dated 17.11.2023. The list may be expanded to cover more brands including all the antimicrobials.) | | | | | |
| | <p>Establish a Quality Management System for supply chain management of antimicrobials</p> <p>Additional activities:</p> <ul style="list-style-type: none"> Develop guidelines for ensuring Quality Management System for supply chain management of antimicrobials implemented by the Central and State drugs Controllers to ensure quality management System for supply chain management of antimicrobials | All state Drugs Control Authorities, Pharma Associations, NGOs | 2 years | - | Form implementation of the quality management system in the Centre and State will ensure manufacture, sale and use of quality antimicrobials. | |

| | Activity/sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. budget (Existing/planned) (Rs in Crores) | Output | Output indicator |
|--|--|--|--------------------|--|--|------------------|
| Strengthen and enforce national regulatory authority/ies regarding appropriate use of antimicrobials in all sectors | | | | | | |
| | Implement Schedule H and H1 Additional activities: 1. Issuing circulars to SLA from time to time to ensure implementation of Schedule H & H1 through enforcement activities. To continue such activity, it will be continuously monitored by CDSCO. 2. Development of guidance for states to ensure implementation of Schedule H & H1 drugs through enforcement activities. | All State Drugs Control Authorities | Continuous process | - | <ul style="list-style-type: none"> ➤ Development of Unified portal may result in rational use of antimicrobials ➤ Implementation of guidance will ensure better enforcement by the state drugs controllers | |
| | Update Essential medicine list in alignment with the WHO's AWaRe classification as relevant to Indian context | ICMR, DHR | Continuous process | | Revision of NLEM | |

| | Activity/sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. budget (Existing/planned) (Rs in Crores) | Output | Output indicator |
|--|--|---|-----------------|---|---|-------------------------|
| | <p>Restrict antibiotics in animal feed, feed premix; ensure use of registered products only; regulate their import, direct distribution, online marketing, and appropriate labelling.</p> <p>1. Implementing and restricting, gradually eliminating the use of antibiotics in animal feed, feed premix, which are critically important for humans especially in food producing animals. (CDSCO under D & C Act, Colistin and its formulations have been prohibited for manufacture, sale and distribution for food producing animals, poultry, aqua, animal feed supplements).</p> <p>2. Ensuring prescription sale of antibiotics and their use under</p> | FSSAI, MoFPI, DoF, DAHD, ICAR | 6 months | - | Uniform implementation of the said guidelines through stake holders awareness and enforcement activities may result in rational use of antimicrobials | |

| | Activity/sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. budget (Existing/planned) (Rs in Crores) | Output | Output indicator |
|--|---|---|-----------------|---|---------------|-------------------------|
| | supervision; regulate bulk selling and labelling for species-specific use. 3. Issuing an advisory to manufacturers to use their digitalized well developed supply chain network, for manufacture and sale of antimicrobials. | | | | | |

Sub-objective 4.3: Appropriate use of antimicrobials in veterinary settings, animal husbandry, fisheries, agricultural farms and food processing units

| | Activity/sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. budget (Existing/planned) (Rs in Crores) | Output | Output indicator |
|--|--|---|-----------------|---|---------------|-------------------------|
| | Establish surveillance system for AMU and AMC | | | | | |

| | Activity/sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. budget (Existing/planned) (Rs in Crores) | Output | Output indicator |
|--|--|---|-----------------|---|---|-------------------------|
| | <p>Develop guidance document/SOPs and training resources to measure consumption and use of antimicrobials in veterinary settings, animal and agricultural farms</p> <p>Additional activities:</p> <ol style="list-style-type: none"> 1. Issuing guidance documents/SOPs for restricting, and gradually eliminating the use of antibiotics in animal feed, feed premix, which are critically important for humans especially in food producing animals. 2. Ensuring prescription sale of antibiotics and their use under supervision; regulate bulk selling and | MoFPI, DoF, DAHD, ICAR | 6 months | - | Uniform implementation of the said guidelines through stake holders awareness and enforcement activities will ensure rational use of antimicrobials | |

| | Activity/sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. budget (Existing/planned) (Rs in Crores) | Output | Output indicator |
|--|---|---|-----------------|---|---|-------------------------|
| | labelling for species-specific use. 3. Issuing an advisory to manufacturers to use their digitalized well developed supply chain network, for manufacture and sale of antimicrobials. | | | | | |
| | Define mechanisms and modalities for AMC/AMU surveillance | - | - | - | - | - |
| | Initiate steps to ensure prescription sale of antibiotics and their use under supervision of a Registered Vet Practitioner (VCI); regulate bulk selling, import and labelling for species-specific use Additional activities: | MoFPI, DoF, DAHD, ICAR | 6 months | - | Uniform implementation of the said guidelines through stake holders awareness and enforcement activities will ensure rational sale and use of antimicrobials. | |

| | Activity/sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. budget (Existing/planned) (Rs in Crores) | Output | Output indicator |
|--|---|---|-----------------|---|---------------|-------------------------|
| | <ol style="list-style-type: none"> 1. Monitoring prescription sale of antibiotics and their use under supervision; regulate bulk selling and labelling for species-specific use. 2. Issuing advisory to manufacturers to use their digitalized well developed supply chain network, for manufacture and sale of antimicrobials. | | | | | |

Name of the Department/organisation: Food Safety and Standards Authority of India (FSSAI)**Strategic objective 1: Improve awareness and understanding of AMR through effective communication, education and training****Sub-objective 1.1 Increase awareness and improve communications regarding AMR, IPC and judicious use of antimicrobials in all sectors**

| | Activity | Other stakeholders proposed to be involved | Time line | Approx. budget (Existing/planned) (Rs in Crores) | Output | Output Indicator |
|-----------|--|---|------------------|---|---|---|
| b. | Consolidate and develop communication and information resources for improving awareness on AMR, IPC and judicious use of antimicrobials | | | | | |
| | <ul style="list-style-type: none"> • Develop commodity specific guidance document for FBOs • Development of online portal for Self-Learning / e- learning modules • Translation of AMR related content to regional languages. • Development of AMR webpage on the FSSAI website. | Food Business Operators from the dairy sector, meat & poultry industry and Beekeeping and associations like CLFMA, AIMLEA, SEAI, CII, FICCI, SEAI and Poultry | 6 months | | Development and repository of awareness material. | Awareness generation and sensitization of stakeholders. |

| | Activity | Other stakeholders proposed to be involved | Time line | Approx. budget (Existing/planned) (Rs in Crores) | Output | Output Indicator |
|-----------|--|--|--|--|--|---|
| | | Federation of India etc. | | | | |
| c. | Develop, implement & monitor sustained communication programme | | | | | |
| | <ul style="list-style-type: none"> The Communication material can be shared to the concerned States/UTs. Permanent Agenda for CAC meetings for discussion with Food Safety Commissioners of all States/ UTs. | Food Business Operators from the dairy sector, meat & poultry industry and Beekeeping. | Development-6 months, Monitoring Quarterly | | Updation and availability of material. | Increased awareness of State FSOs and effective coordination. |

Sub-objective 1.2. Improve knowledge and capacity of key stakeholders regarding AMR, IPC and judicious use of antimicrobials in all sectors

| | Activity | Other stakeholders proposed to be involved | Time line | Approx. budget (Existing/ planned) (Rs in Crores) | Output | Output indicator |
|-----------|---|---|-----------|---|--|--|
| b. | Mandatory induction and in-service trainings for all professionals/para professionals in all sectors | | | | | |
| | <ul style="list-style-type: none"> • AMR to be a mandatory part of all induction and in service trainings for FSSAI & State Govt. officials. • To conduct short courses/trainings/workshops on AMR by collaborating with the pioneer institutions • E-learning modules with system generated e=certification for govt. officials | <ul style="list-style-type: none"> • FSSAI officials, State FSOs, Food Analysts and Lab personnel. | 06 months | | <ul style="list-style-type: none"> • All FSSAI & State FDA officials will have awareness about AMR • Updated knowledge about latest developments | Increased awareness amongst Govt. officials. |

Strategic objective 2: Strengthen laboratory capacity for AMR

Sub-objective 2.2: Strengthen surveillance for AMR in animal husbandry, fisheries, food and environment

| | Activity/sub-activities | Other stakeholders proposed to be involved | Time line | Approx. budget (Existing/ planned) (Rs in Crores) | Output | Output indicator |
|-----------|---|--|-----------|---|--|--|
| a. | Strengthen food and environment laboratories for AMR detection at National, state and district level | | | | | |
| | <ul style="list-style-type: none"> All 37 FSSAI notified State Food Testing laboratories (SFTL) can be facilitated with Sophisticated Equipment. 20 FSSAI notified State food laboratories can be strengthened with infrastructure and equipment for AMR. | All Food testing labs under Central & State Food Authority notified by FSSAI | 5 years | 74 Cr Rs. 2.00Cr. per lab for 37 labs | Labs capability of testing AMR will be increased | Number of labs capable of testing AMR. |
| | | | 5 years | 140 Cr. (Rs 7.00Cr. per lab for 20 labs) | | |
| b. | Develop and implement plan for targeted surveillance of AMR in food and environment | | | | | |
| | <ul style="list-style-type: none"> Annual pan India AMR-AST surveillance – Dairy, Meat, poultry | NRLs and all NFLs of FSSAI | Annually | 0.68 Cr per survey | Indicates presence of resistant food borne pathogens | Compilation of Surveillance |

| | Activity/sub-activities | Other stakeholders proposed to be involved | Time line | Approx. budget (Existing/ planned) (Rs in Crores) | Output | Output indicator |
|--|---|---|------------------|--|---------------|-------------------------|
| | <p>meat, fishery products, egg or egg products.</p> <ul style="list-style-type: none"> • Testing of all imported, enforcement, commercial samples for AST. • Antimicrobial susceptibility testing (AST) data analysis using InFoLnet • Constitution of Inter departmental investigation team to investigate the root cause of AMR in specific food matrix in specific region • Sharing of data with NCDC, DAHD, Department of Fisheries & other stakeholders to take preventive action. | | | | | Data on AMR-AST |

Sub-objective 2.3: Strengthen laboratory capacity for targeted surveillance of Antibiotic Residues in animal, food and environment sector

| | Activity/sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. budget (Existing/ planned) (Rs in Crores) | Output | Output indicator |
|----|--|---|--------------------------------|--|---|--|
| a. | Establish functional laboratories for detection of antimicrobial residues in animal, food and environment sector | | | | | |
| | <ul style="list-style-type: none"> • Methods of analysis together with other necessary consumables. • Establishing and Strengthening of FSSAI notified State food laboratories with infrastructure and equipment for the analysis of antimicrobial residues. | <p>All NFLs and Food Testing laboratories under State Food Authority</p> <p>Food Testing Laboratories under State Food Authority.</p> | <p>Annually</p> <p>3 years</p> | <p>3.4 Cr Approx. Rs 10 lakhs per lab per year for 34 labs</p> <p>92 Cr Approx. Rs.4 Cr/ lab for 23 labs</p> | <p>Labs capability of testing samples on antimicrobial residues will be increased</p> | <p>No. of labs capable of testing antimicrobial residues</p> |
| b. | Develop and implement plan for surveillance of antibiotic residues (AR) in animal, food and environment | | | | | |

| | | | | | | |
|--|---|-------------------------------------|---|--|---------------------------|--|
| | <ul style="list-style-type: none"> • General Surveillance on safety parameters including antimicrobial residues in food commodities • Targeted surveillance of antimicrobial residues based on the desktop audit for specific region and specific commodity | NDRI, NRCM, CIFT and NFLs of FSSAI. | One surveillance per year for dairy, meat, poultry, fisheries and egg or egg products | 5 Cr Approx. Rs.5000 per sample (Total 10000 samples) | Protocol for surveillance | Compilation of Surveillance Data on antimicrobial residues |
|--|---|-------------------------------------|---|--|---------------------------|--|

Strategic objective 4: Optimize the use of antimicrobial agents in humans, animals and food

Sub-objective 4.3: Appropriate use of antimicrobials in veterinary settings, animal husbandry, fisheries, agricultural farms and food processing units

| | Activity/sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. budget (Existing/ planned) (Rs in Crores) | Output | Output indicator |
|-----------|--|--|----------|---|--------|------------------|
| b. | Establish antimicrobial stewardship programmes for rational use of antimicrobials | | | | | |
| | <ul style="list-style-type: none"> • Identification of Critically Important Antibiotics as per the WHO list. • Sensitization of FBOs to exercise control of primary production centre. | DAHD, Department of Fisheries and DA & FW. | Ongoing | | | |

Strategic objective 5: Promote Research and innovations**Sub-objective 5.1: Identify priorities for basic and operational research relevant to AMR in all sectors**

| | Activity/sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. Budget (existing/ planned) (Rs in Crores) | Output | Output indicator |
|----|---|--|----------|---|--------|------------------|
| c. | Coordinate, fund and pilot operational research projects in humans, animals, food and environment sectors with respect to Indian context | | | | | |
| | Funding of research projects on AMR for PhD scholars and Post doctorate scholars | PhD and Post doctorate scholars. | 3 years | 5Cr | | |

Strategic objective 6: Strengthen Governance, Coordination and collaborations on AMR**Sub-objective 6.1: Strengthen Governance and Coordination mechanisms for AMR Containment**

| | Activity/sub-activities | Other stakeholders proposed to be involved | Time line | Approx. Budget (existing/ planned) (Rs in Crores) | Output | Output indicator |
|----|--|--|-----------|---|--------------------------------|---|
| a. | Identify activities on AMR requiring multidisciplinary /multi-departmental coordination within each sector and develop agenda for sectoral coordination | | | | | |
| | Awareness and education activities requiring multidisciplinary /multi-departmental coordination | Food Business Operator in the sector of Fisheries, Animal Husbandry, | Ongoing | | Development of data repository | Awareness generation and sensitization of stakeholders. |

| | | | | | | |
|--|--|---|---------------------------|----------|--|--|
| | <ul style="list-style-type: none"> Information, Education and Communication Activities will be carried out in coordination with States/UTs. AMU data is required from DAHD and other stakeholders. | Agricultural Farms and Food Processing Units. | | | | |
| | <p>Lab capacity strengthening and AMR surveillance activities requiring multidisciplinary /multi-departmental coordination</p> <ul style="list-style-type: none"> Conduct surveillance and identify the prevalence of Antimicrobial resistant food borne pathogens in various food commodities. Multi Institutional collaboration for creation of repository on prevalence of antimicrobial resistant food borne pathogens linked to various food matrices | ICAR-NRCM, DBT/CSIR ICMR, DAHD, DoF, CFTRI, CIFT and NDRI | 5 years Biannually | Rs 5 Cr. | <p>Compilation of Surveillance Data on prevalent antimicrobial resistant food borne pathogens in various food commodities</p> <p>Establishment of reference material for drug resistant genes in food borne pathogen. Establishment of a reference lab for AMR</p> | <p>Prevalent antimicrobial resistant food borne pathogens in various food commodities.</p> <p>Protocol for reporting the strain.</p> |

Name of Department/organisation: National Health Mission (NHM)

The following activities will be implemented at secondary healthcare level and below through the existing schemes:

Strategic Objective 1: Improve awareness and understanding

1.1.a. Develop, implement & monitor sustained communication programme

- i. IEC and interactive videos on AMR and IPC, once developed, can be made available on Learning Management Information System (LMIS) of NIHFWS as well as on the social media handles of NHM and NHRCS

1.2.b. Implement trainings on AMR, IPC and judicious use of antimicrobials

- i. Implement trainings (healthcare facility level wise) on AMR, IPC and judicious use of antimicrobials for doctors and other HCWs at secondary health care facilities and below including health and wellness centers (NIHFWS)

Strategic Objective 2: Strengthen Laboratory Capacity

2.1.a. Establish functional, well utilised, quality assured laboratories at all levels of healthcare for humans to promote evidence-based use of antimicrobials

- i. Strengthen microbiology laboratories at district and block level for AMR detection (through District Hospital labs (DHLs)/Integrated Public Health labs (IPHLs) and Block Public Health laboratories (BPHLs))
- ii. Implement standardized protocols for pathogen identification, AST through trainings (NIHFWS)
- iii. Establish laboratory quality management systems at DHLs/IPHLs and BPHLs to ensure quality and reliable test results through NQAS

2.1.b. Establish AMR surveillance through standardised digital documentation system in hospitals and laboratories at all levels of health care in humans

- i. Establish/strengthen Hospital Information/Laboratory Information management systems (LIMS) at District Hospitals and below, DHLs/IPHLs and BPHLs to support AMR data management (By integrating LIMS into the AMR surveillance framework (once developed on IHIP), hospitals and laboratories can systematically collect, analyse, and share antimicrobial resistance data)

Strategic objective 3: Reduce the incidence of infection

3.1.a. Develop, implement & monitor National infection prevention and control program for strengthening Infection Prevention and Control (IPC)

- i. Ensure IPC assessments, gap analyses and strengthen IPC at secondary healthcare facility level and below through NQAS and Kayakalp
- ii. Strengthen/establish standardized surveillance programs for health care associated infections (HAIs) at secondary level healthcare facilities using uniform case definitions, methodologies, and reporting mechanisms (ICMR-AIIMS Trauma Centre-NCDC)

3.1.c. Strengthen infection prevention in the community through vaccination and WASH

- i. Promote personal hygiene through safely managed water, sanitation, and hygiene (WASH) in the community through Ayushman Arogya Mandir
- ii. Promote and ensure appropriate immunization against vaccine preventable diseases - Through the Universal Immunisation Programme and progress tracked through the UWIN portal

ANNEXURE B: MINISTRY OF FISHERIES, ANIMAL HUSBANDRY AND DAIRYING

Name of the Department/organisation: Department of Animal Husbandry & Dairying (DAHD)

Strategic objective 1: Improve awareness and understanding of AMR through effective communication, education and training

Sub-objective 1.1 Increase awareness and improve communications regarding AMR, IPC and judicious use of antimicrobials in all sectors

Other stakeholders: ICAR - Dept of Agriculture and Farmers Welfare; Agriculture, Veterinary, Fisheries Universities; RD, MOEFCC, INFAH, Private Organizations-Poultry Sector, Cooperative societies Professional Organizations, NGOs, FPOs

| | Activity/sub-activities | Time line | Approx. Budget (existing/ planned) (Rs in Crores) | Output | Output Indicator** |
|----|--|-----------|---|---|---|
| a. | Assess knowledge, attitude & practices (KAP) among various stakeholders | | | | |
| | Develop standardized methodology for conducting KAP studies | Y-1 | Existing scheme/ projects | Uniform SOPs for KAP Studies | SOPs of KAPs for AH sector |
| | Conduct KAP studies | Y-1-2 | Existing scheme/ projects | Baseline data generated across stakeholders | National level data base on KAPs; publications; Reports |

| | Activity/sub-activities | Time line | Approx. Budget (existing/ planned) (Rs in Crores) | Output | Output Indicator** |
|----|--|-----------|---|---|--|
| b. | Consolidate and develop communication and information resources for improving awareness on AMR, IPC and judicious use of antimicrobials | | | | |
| | Create a repository of available IEC material | Y 1-5 | Existing scheme/ projects | IEC Material available (digitally and in print format) | Number of IEC materials- Digital Platforms / Dashboard available- Website Hits- Number Tweets- |
| | Develop communication material focussed on easy to understand messages for each stakeholder group | Y 1-5 | Existing scheme/ projects | IEC Material in Local Language available for stakeholders | Number of IEC material in Regional/Vernacular Languages developed-10 languages |
| c. | Develop, implement & monitor sustained communication programme | | | | |
| | Develop a communication plan for national, state, district and sub-district levels | Y-1-5 | Existing scheme/ projects | Communication Plan developed at National, State and District/Sub-District Level | Number of Communication Plans Developed |

| | Activity/sub-activities | Time line | Approx. Budget (existing/ planned) (Rs in Crores) | Output | Output Indicator** |
|--|---|-----------|---|---------------------------------------|--|
| | Implement AMR communication programme targeting general population and other stakeholder groups, through partnership & collaborative approach | Y-1-5 | Existing scheme/ projects | AMR Communication program implemented | Number of AMR Communication Programs implemented- Categories of stakeholders covered at National-State-District/Sub-District Level (Taluk-Block) |

Sub-objective 1.2. Improve knowledge and capacity of key stakeholders regarding AMR, IPC and judicious use of antimicrobials in all sectors

Other stakeholders: ICAR; VCI, State Veterinary Councils, Universities (Agriculture- Veterinary-Fisheries); Para-vet Council of respective States; Agriculture Skill Council of India, FSSAI; NDDB, National Fisheries Development Board (NFDB), MCDs, KVKs, Extension centers; DAHD, ICAR, DoF, State AHDs; Fisheries Dept., Common Service Centres (CSCs), RD Dept.

| | Activity/sub-activities | Time line | Approx. Budget (existing/ planned) (Rs in Crores) | Output | Output indicator |
|----|--|-----------|---|-------------------------------------|--|
| a. | Review and revise curricula and modules of professionals/para-professionals | | | | |
| | Identify professional and para-professional courses | Y-1 | VCI, ICAR Existing scheme/ project | Professional and para- professional | Number of courses identified in the curriculum |

| | Activity/sub-activities | Time line | Approx. Budget (existing/ planned) (Rs in Crores) | Output | Output indicator |
|----|---|-----------|---|---|--|
| | which must include AMR and IPC in curricula | | | courses on AMR and IPC identified | |
| | Review and revise curricula and teaching modules | Y-2-3 | VCI, ICAR, DAHD Existing scheme/ project | Curricula and Teaching modules revised | Number of curricula and teaching modules revised |
| | Include biosafety, biosecurity, hygiene and infection prevention and control in curricula for education of animal health and food professionals and workers in Animal Husbandry Depts, Slaughterhouse, Dairy, Fisheries Sector and meat retailers | Y-1-2 | Existing scheme/ projects | Inclusion of IPC measures in curriculum | Number of Inputs provided in the curriculum |
| b. | Mandatory induction and in-service trainings for all professionals/para-professionals in all sectors | | | | |

| | Activity/sub-activities | Time line | Approx. Budget (existing/ planned) (Rs in Crores) | Output | Output indicator |
|--|---|------------------|--|---|--|
| | Develop a chapter on One-Health with special focus on AMR in Veterinary Curriculum | Y-1 | VCI/ Existing scheme/ project | Chapter on One-Health with special focus on AMR | One Chapter on One Health-AMR developed |
| | Include biosafety, biosecurity, hygiene and infection prevention and control in curricula for training of animal health and food professionals and workers in Animal Husbandry Depts, Slaughterhouse, Dairy Sector and meat retailers | Y-2-5 | Existing scheme/ projects | Inclusion of IPC measures in curriculum | Number of Trainings conducted (on 6 monthly basis) |
| | Train staff in KVK and village level for biosafety and biosecurity principles and practices | Y-2-5 | ICAR/State AHD, LHDCP Existing scheme/ projects of DAHD | KVK and Village level Staff trained | Number of KVK staff trained |
| | Train farmers in on-farm sanitation and good hygiene practices and | Y-2-5 | Existing scheme/ projects | Farmers trained on good AH- Aquaculture Practices | Number of Farmers trained (1 lakh farmers trained) At least two events per year in each Panchayat for awareness on |

| | Activity/sub-activities | Time line | Approx. Budget (existing/ planned) (Rs in Crores) | Output | Output indicator |
|--|---|-----------|---|---|---|
| | Good Animal husbandry Practices | | | | risk of inappropriate use of antimicrobials in animals |
| | Conduct Continuous Professional Development on AMR/ Integrated Faculty development programmes; Dedicated sessions | Y-1-4 | VCI LHDCP Existing Budget through State VC | Professional Development on AMR/ Integrated Faculty development programmes Conducted; Virtual Learnings | Number of PED Courses conducted Pan-India; Number of Virtual Programs conducted |

Strategic objective 2: Strengthen laboratory capacity for AMR

Sub-objective 2.1: Strengthen microbiology laboratory capacity for AMR detection in human and animal infections

Other stakeholders: ICAR; RDDDLs, CDDL; MoFAHD, INFAAR; State AHDs & Fisheries Depts; Veterinary-Fisheries Universities / Colleges; Private Sector

| | Activity/sub-activities | Time line | Approx. Budget (existing/ planned) (Rs in Crores) | Output | Output indicator |
|---|---|-----------|---|---|---|
| a | Establish functional, well utilised, quality assured laboratories at all levels of animal healthcare to promote evidence-based use of antimicrobials | | | | |
| | Strengthen microbiology laboratories (in govt. & private sector) at National, state and district level for AMR detection | Y-1-4 | Existing scheme/ projects | All RDDDLs, CDDL, State DI Labs, Veterinary Polyclinics (AH Dept.), Veterinary College Microbiology Depts. Strengthened | 1-CDDL, 5-Number of RDDDLs, 6 State DI Labs, Micro Labs strengthened, NDDDB Lab, Veterinary College Lab |
| | Promote laboratory diagnostic testing before prescribing antimicrobials | Y-2-5 | Existing Scheme/Projects | Development of roadmap for AST before antimicrobial treatment in select institutions on a pilot basis. | Number of institutions which promoted AST before initiating antimicrobials |
| | Establish mechanisms for implementing laboratory quality management systems to ensure quality and reliable test results e.g. | Y-1-5 | Existing Scheme/Projects | Accredited Labs established | 2-Labs Accredited (ISO- 17025) |

| | Activity/sub-activities | Time line | Approx. Budget (existing/ planned) (Rs in Crores) | Output | Output indicator |
|----|---|------------------|--|---|--|
| | mandatory accreditation of all labs in the country | | | | |
| b. | Establish standardized digital documentation system in hospitals and laboratories at all levels of health care in humans and animals | | | | |
| | Establish Hospital Information/Laboratory Information management systems (LIMS) for AMR data management at all levels of animal health care | Y-1-5 | Existing Scheme/Projects | LIMS Established for AMR DMS | 1 National Network |
| c. | Designate reference laboratories for AMR surveillance in animal sectors | | | | |
| | Establish/strengthen National and state reference laboratories for AMR to ensure adequate guidance on quality laboratory testing, genomic surveillance of AMR and detection of emerging AMR pathogens | Y-2-5 | Existing Scheme/Projects | National Reference Labs Established/ Strengthened on quality laboratory testing, genomic surveillance of AMR and detection of | 4-National/Regional Reference Labs Established |

| | Activity/sub-activities | Time line | Approx. Budget (existing/ planned) (Rs in Crores) | Output | Output indicator |
|--|--------------------------------|------------------|--|------------------------|-------------------------|
| | | | | emerging AMR pathogens | |

Sub-objective 2.2: Strengthen surveillance for AMR in animal husbandry, fisheries, food and environment

Other Stakeholders: FSSAI; MoEFCC; ICAR; CPCB

| | Activity/sub-activities | Time line | Approximate Budget (existing/ planned) (Rs in Crores) | Output | Output indicator |
|----|---|------------------|--|---|---------------------------|
| a. | Strengthen food and environment laboratories for AMR detection at National, state and district level | | | | |
| | Establish/strengthen microbiology laboratories at National, state and district level for AMR detection | Y-2-4 | Existing scheme/ projects | Micro Labs strengthened at National and State Level | 6 Micro Labs strengthened |
| | Develop and implement plan for targeted surveillance of AMR in food and environment | | | | |

| | Activity/sub-activities | Time line | Approximate Budget (existing/ planned) (Rs in Crores) | Output | Output indicator |
|----|--|-----------|---|--|---|
| b. | Define comprehensive standards for targeted AMR surveillance in food and environment | Y-3-5 | Existing scheme/ projects | Standards for targeted AMR Surveillance developed | Number of Standards developed |
| | Define mechanisms and modalities for data collection | Y-2 | Existing scheme/ projects | Mechanism and modalities for data collected worked out | Mechanism and modalities defined |
| | Collate and analyse AMR surveillance data into useful information | Y-3-5 | Existing scheme/ projects | AMR data analysed | Data collated and analysed for both sectors AHD and fisheries |

Sub-objective 2.3: Strengthen laboratory capacity for targeted surveillance of Antibiotic Residues in animal, food and environment sector

Other Stakeholders: ICAR, FSSAI, NDBB

| | Activity/sub-activities | Timeline | Approx. Budget (existing/planned) | Output | Output indicator |
|----|---|----------|--------------------------------------|--------|------------------|
| a. | Establish functional laboratories for detection of antimicrobial residues in animal, food and environment sector | | | | |

| | | | | | |
|----|--|-------|----------------|---|-------------------------------|
| | Establish functional laboratories for detection of antimicrobial residues in animal, food and environment sector | Y-3-5 | ICAR and FSSAI | Functional labs for AR detection established | Number of AR Labs established |
| b. | Develop and implement plan for surveillance of antibiotic residues in animal food and environment | | | | |
| | Define comprehensive standards for targeted surveillance of ARs | Y-2-3 | FSSAI and ICAR | Comprehensive standards for targeted surveillance developed | |
| | Define mechanisms and modalities for testing & data collection | Y-2-3 | FSSAI and ICAR | Mechanism and modalities for data collection developed | |
| | Collate and analyse AR surveillance data into useful information | Y-3-5 | FSSAI and ICAR | AR Surveillance collated and analysed | Report generated |

Strategic objective 3: Reduce the incidence of infection through effective infection prevention and control

Sub-objective 3.2: Establish IPC programmes in animal and food sector

Other Stakeholders: DAHD; State AHDs; Costal Aquaculture Authority; State Fisheries Dept; Animal Welfare Board of India (AWBI), State Animal Welfare Boards (SAWBs), Agriculture Technology Management Agency (ATMA), KVKs, MPEDA; State PCBs, MCDs, CPCB, RSETI; Vaccine Manufactures; CDSCO – DAHD

| | Activity/sub-activities | Timeline | Approximate Budget (existing/ planned) (Rs in Crores) | Output | Output indicator |
|----|--|----------|---|---|--|
| a. | Develop, implement and monitor infection prevention and control programme in veterinary settings, animal husbandry, fisheries and food sector | | | | |
| | Implement farm infrastructure that promote infection prevention in animal handling facilities and farms | Y-1-5 | Budget provisioning made under the existing schemes | Improved Biosecurity and containment measures that promote IPC in Livestock and Aquaculture Farms | % Farms complied to IPC guidelines |
| | Increase awareness in community for Animal Welfare and good production practices (proper hygiene/sanitation /practices of IPC); (Extension services) | Y-1-5 | CEP and LHDCP Existing Budget | Improved awareness amongst community | Number of awareness programs on IPC conducted (on 6 monthly basis) |
| | Monitoring of sanitation and hygiene on animal facilities and farms | Y-1-5 | LHDCP Existing Budget | Better sanitation and hygiene in animal | No. of sites monitored |

| | Activity/sub-activities | Timeline | Approximate Budget (existing/ planned) (Rs in Crores) | Output | Output indicator |
|----|--|----------|---|---|---|
| | | | | and aquaculture facilities | |
| b. | Develop/Update National guidelines/standards on Infection Prevention & Control in animal husbandry including fisheries and food sector on a regular basis; adapt and disseminate IPC guidelines/standards at all levels | | | | |
| | Develop/update standards for biosafety, biosecurity, farm infrastructure | Y 2 -3 | Existing scheme/ projects | Biosafety, Biosecurity, farm infrastructure developed | Protocols Developed for each livestock poultry and fisheries farm |
| | Adapt National guidelines to all levels of facilities | Y-2-5 | Routine Activity | National Guidelines adapted | No. of facilities adapted National Guidelines |
| c. | Ensure immunization of animals | | | | |
| | Conduct a baseline assessment for animal vaccine programme and cold chain management and services coverage | Y-1 | LHDCP in place | LHDCP - Cold chain facility assessed and revised | Already in place-LHDCP |

| | Activity/sub-activities | Timeline | Approximate Budget (existing/ planned) (Rs in Crores) | Output | Output indicator |
|--|---|----------|---|---|---|
| | Develop/review/Update regulations for vaccinations for animals with vaccination schedules | Y-1-5 | LHDCP In place | Regulations for vaccinations reviewed | Vaccination Schedules adapted |
| | Review and recommend introduction of new vaccines for animals / birds/fish | Y-1-5 | Existing Scheme/ mechanism and Private Sector | New Vaccine/ Strain introduction reviewed and recommended | No. of new vaccine/ strains introduced or changed |

Sub-objective 3.3: Reduce environmental contamination with resistant genes, resistant pathogens and antimicrobial residues

Other Stakeholders: DAHD; State AHDs; Fisheries Dept, Costal Aquaculture Authority (CAA); CDSCO; CPCB; Pharma- Manufacturers

| | Activity/sub-activities | Timeline | Approximate Budget (existing/ planned) (Rs in Crores) | Output | Output indicator |
|----|--|----------|---|--|----------------------------|
| a. | Develop and implement strategic interventions to reduce the environmental impact of AMR | | | | |
| | Effective management of waste-water from animal, fisheries and agricultural farm | Y-2-5 | Existing scheme/ projects | Waste management guidelines/ protocols developed | Number of ETPs established |

| | | | | | |
|----|---|-------|---------------------------|--|--|
| | | | | | |
| b. | Develop and implement mechanism for safe disposal of expired antimicrobials | | | | |
| | Develop and implement mechanism for safe disposal of expired antimicrobials at selected sites | Y-2-5 | Existing scheme/ projects | Mechanisms developed by regulatory authorities with inputs from all stakeholders | Guidelines developed and implemented at selected sites |

Strategic objective 4: Optimize the use of antimicrobial agents in humans, animals and food

Sub-objective 4.1: Uninterrupted access and judicious use of high-quality antimicrobials in all sectors

Other Stakeholders: CDSCO; State FDA; DAHD, DoF; FAO. WOH; MoCI, CAA; BIS, FSSAI; State Drug Controllers; INFAH; Private Sector Manufacturers

| | Activity/sub-activities | Timeline | Approximate Budget (existing/ planned) (Rs in Crores) | Output | Output indicator |
|----|--|-----------------|--|---------------|-------------------------|
| a. | Strengthen and enforce national regulatory authority/ies for access to quality antimicrobials in all sector | | | | |

| | Activity/sub-activities | Timeline | Approximate Budget (existing/ planned) (Rs in Crores) | Output | Output indicator |
|-----------|---|-----------------|--|--|--|
| | Establish a Quality Management System for supply chain management of antimicrobials | Y-2-4 | Existing Budget continuing activity under ECAH and NDLM | QMS for supply chain of antimicrobials established | Digital platform established |
| b. | Strengthen and enforce national regulatory authority/ies regarding appropriate use of antimicrobials in all sectors | | | | |
| | Restrict antibiotics in animal feed, feed premix; ensure use of registered products only; regulate their import, direct distribution, online marketing, and appropriate labelling | Y-2-4 | Continuing activity of DAHD | Proposals received and disposed | No. of proposals received and disposed |
| c. | Develop and implement evidence based standard treatment guidelines for humans and animal | | | | |

| | Activity/sub-activities | Timeline | Approximate Budget (existing/ planned) (Rs in Crores) | Output | Output indicator |
|----|--|-----------------|--|---|---|
| | Develop evidence- based “Standard Treatment Guidelines” for veterinary settings, food animals, fisheries | Y-1 | Existing Budget | Standard Treatment Guidelines Developed for terrestrial animals | Treatment guidelines for priority Livestock, Poultry (in 6 month) |
| e. | Develop the National essential medicine list for veterinary medicine, food animals, aquatic animals | | | | |
| | Review, strengthen and implement the National essential medicine list regarding access to antimicrobials at different levels of healthcare | | | National Essential Medicine list developed for Livestock, Poultry | |

Sub-objective 4.3: Appropriate use of antimicrobials in veterinary settings, animal husbandry, fisheries, agricultural farms and food processing units

Other Stakeholders: ICAR; DAHD-State AHDs; NDDB; CDSCO, State Drug Controllers; INFAH, NDLM, CDSCO, KVKs, VCI; FSSAI, BIS, EIC, APEDA; AYUSH, Pharma, DBT; Universities-Agriculture-Ayurveda; Private Sector

| | Activity/sub-activities | Timeline | Approximate Budget (existing/ planned) (Rs in Crores) | Output | Output indicator |
|----|--|-----------------|--|--|---|
| a. | Establish surveillance system for AMU and AMC | | | | |
| | Develop guidance document/SOPs and training resources to measure consumption and use of antimicrobials in veterinary settings, animal and agricultural farms | Y-2-3 | Existing scheme/ projects | Advisory, Guidelines and SOPs on AMU and AMC developed | Advisory, Guidelines and SOPs- documents. No. of settings where protocol is validated |
| | Define mechanisms and modalities for AMC/AMU surveillance | Y-2-3 | Existing scheme/ projects | Advisories, Guidelines and mechanisms developed | No. of settings where the protocol is validated |
| | Develop software/digital platform for collection of district, state and national level consumption of antibiotics | Y-3-5 | Existing scheme/ projects | Software developed | NDLM Dashboard |
| | Organize training workshops to develop capacity of health care facilities to measure | Y-2-5 | Existing scheme/ projects | Training Workshops organized in various animal health settings | Number of Trainings organized (on a six monthly basis) |

| | Activity/sub-activities | Timeline | Approximate Budget (existing/ planned) (Rs in Crores) | Output | Output indicator |
|----|--|----------|---|---|--|
| | consumption and use of antimicrobials | | | | |
| b. | Establish antimicrobial stewardship programmes for rational use of antimicrobials | | | | |
| | Initiate steps to ensure prescription sale of antibiotics and their use under supervision of a Registered Vet Practitioner (VCI); regulate bulk selling, import and labelling for species-specific use | Y-2-5 | Advisories and Notification by DAHD | Steps initiated to regulate prescription sale of antibiotics | Notifications, Advisory, Orders Issued |
| c. | Develop and implement plan for phasing out antibiotic use for growth promotion and disease prevention in livestock/fisheries/ agriculture; replace by alternatives/ethnoveterinary medicines | | | | |
| | Promotion of alternatives/ ethnoveterinary medicines | 3-5yrs | Existing scheme/ projects | Alternatives for Antibiotics that are Medically Important and are of Food Safety Significance | No. of alternative products used and developed |

| | Activity/sub-activities | Timeline | Approximate Budget (existing/ planned) (Rs in Crores) | Output | Output indicator |
|--|---|-----------------|--|----------------------|--|
| | Devise methods to promote ARG free probiotics in animal feed, feed premix; ensure use of registered products only; regulate their import, distribution, online marketing, and appropriate labelling | Y-2-4 | Continuing Activity of DAHD | Guidelines Developed | No. of Proposals received and disposed |

Strategic objective 5: Promote Research and innovations

Sub-objective 5.1: Identify priorities for basic and operational research relevant to AMR in all sectors

Other Stakeholders: DAHD, AYUSH, NDDB; MoEFCC; ICAR, ICMR; CSIR (NEERI), CPCB; DBT, DST, DHR, GBRC; Quadripartite Organisations; CSIR, Research and academics; Veterinary- Fisheries Universities; Social & Behavioural Sciences institutes ; FSSAI; Pharma Industries & Private Research Inst.

| | Activity/sub-activities | Timeline | Budget (existing/ planned) (Rs in Crores) | Output | Output indicator |
|----|--|-----------------|--|---------------|-------------------------|
| a. | Define research priorities and develop funded research agenda for AMR innovations in diagnostics (including Point of Care tests), antimicrobials, alternatives to infectious disease management, ethno veterinary medications, vaccines | | | | |

| | Activity/sub-activities | Timeline | Budget (existing/ planned) (Rs in Crores) | Output | Output indicator |
|----|---|----------|---|---|---|
| | Develop and implement sectoral research agenda on AMR involving research institutions in the country | Y-1-5 | ICAR | Sectoral Research Agenda Developed | No. of Sectoral agendas developed on AMR in research institutions |
| | Develop and implement inter-sectoral research agenda on AMR involving research institutions in the country | Y-1-5 | Existing Schemes of DAHD | Inter-Sectoral Research Agenda Developed | No. of inter-Sectoral agendas developed on AMR in research institutions |
| b. | Encourage and fund research for evidence-informed policymaking | | | | |
| | Estimate morbidity, mortality and economic impact of AMR | Y-2-5 | Existing Scheme and project | Assessment of Economic Impact of AMR on Livestock, Poultry and Fisheries Sector | Economic impact report |
| c. | Coordinate, fund and pilot operational research projects in humans, animals, food and environment sectors with respect to Indian context | | | | |
| d. | Create unified fund for research and innovation | | | | |
| | Fund for research | 5yrs | Existing schemes of DAHD | Funding under LHDCP, NLM explored | Number of projects supported |

Strategic objective 6: Strengthen Governance, Coordination and collaborations on AMR

Sub-objective 6.1: Strengthen Governance and Coordination mechanisms for AMR Containment

Other stakeholders: MoFAHD & State AHDs & Fisheries Dept; ICAR, ICMR, CSIR, NHM; MoEFCC; AYUSH; I&B; Quadripartite Organisations (FAO, WOA, WHO, UNEP), WB, ADB; Universities; NCDC, DBT, DHR; CDSO, FSSAI; INFAH; All stakeholder ministries, departments, FPOs, International Bodies; AMR Focal Point at National and State, Sectoral Coordination Committees at National and State Level

| | Activity/sub-activities | Timeline | Budget (existing/ planned) (Rs in Crores) | Output | Output indicator |
|-------|--|----------|---|---|---|
| 6.1.1 | Identify activities on AMR requiring multidisciplinary /multi-departmental coordination within each sector and develop agenda for sectoral coordination | | | | |
| | Awareness and education activities requiring multidisciplinary /multi-departmental coordination | Y-1-5 | Existing scheme/ projects of DAHD | Increased Awareness & Education amongst all sectors | Number of Depts. Coordinated and Meetings organized |
| | Lab capacity strengthening and AMR surveillance activities requiring multidisciplinary /multi-departmental coordination | Y-1-4 | Existing scheme/ projects of DAHD | Laboratory Capacity strengthening exercises | Number of Sectors coordinated and Lab Strengthening meetings convened |
| | Infection prevention and control related activities requiring | Y-1-4 | Existing scheme/ projects of DAHD | IPC Guidelines, Advisories developed | Number of Meetings /Workshops conducted with all stakeholders |

| | | | | | |
|----------------|---|-------|-----------------------------------|--|--|
| | multidisciplinary /multi-departmental coordination | | | | |
| | Activities to promote judicious use of antimicrobials requiring multidisciplinary /multi-departmental coordination | Y-1-5 | Existing scheme/ projects of DAHD | AMR Stewardship strengthened | Number of AMR stewardship activities conducted |
| 6.1. 2 . | Establish/strengthen governance mechanism within each sector for coordination of multidisciplinary activities and for monitoring sectoral implementation of NAP AMR | | | | |
| | Dedicated officer/AMR coordination unit within each sector with dedicated funding for coordination of activities for AMR requiring multidisciplinary /multi-departmental coordination | Y-1 | Existing scheme/ projects of DAHD | AMR Coordination Unit , AMR Focal Point (AH) | Number of AMR coordination units established amongst all sectors |
| | Constitution of sectoral coordination committee within each sector with clear terms of reference and regular meetings | Y-1-4 | | TORs defined; Meetings organized | Number of States |
| a. | Identify activities on AMR requiring intersectoral coordination and develop agenda for inter-sectoral coordination | | | | |

| | | | | |
|--|-------|-----------------------------------|--|----------------------------------|
| Awareness and education activities requiring inter-sectoral coordination | Y-1 | Existing scheme/ projects of DAHD | Agenda for Inter-sectoral coordination regarding Awareness and IEC developed | Number of Agenda Items finalized |
| Coordination of AMR surveillance across sectors | Y-1-4 | | Coordinated AMR Surveillance across sectors | |
| Infection prevention and control related activities requiring intersectoral coordination | Y-1-4 | Existing scheme/ projects of DAHD | IPC coordination strengthened amongst all Sectors. | |
| Activities to promote judicious use of antimicrobials requiring intersectoral coordination | Y-1-5 | Existing scheme/ projects of DAHD | | |
| Inter-sectoral research agenda on AMR | Y-1-4 | Existing scheme/ projects of DAHD | | |

*There are provisions within the Livestock Health and Disease Control scheme of this Department that offer funding support for various activities such as training, awareness, surveillance, and more. Additionally, steps are being taken to ensure the availability of funds through Animal Health System Support for One Health and Pandemic Fund projects. We will explore the potential for funding under this scheme for the various activities outlined in the revised NAP for AMR.

**Output indicators is only indicative as it involves participation of multi-stakeholders

Name of the Department/organisation: Department of Fisheries (DoF)**Strategic Objective 1: Improve awareness and understanding of AMR through effective communication, education and training****Sub-objective 1.1 Increase awareness and improve communications regarding AMR, IPC and judicious use of antimicrobials in Fisheries Sector**

| | Activity/sub- activities | Other stakeholders proposed to be involved | Timeline | Approx. Budget (existing/ planned) (Rs in Crores) | Output | Output Indicator |
|-----------|--|---|----------|---|--|--|
| b. | Consolidate and develop communication and information resources for improving awareness on AMR, IPC and Judicious use of antimicrobials | | | | | |
| | Awareness/ Information Education and communication Awareness Campaigns by engaging Self-Help Groups and Krishi Vigyan Kendras/ village Panchayats / College of Fisheries/ NSPAAD Centre etc. at least 1 session in every KVK in one year. | ICAR Fisheries Institute Fisheries Universities, KVKs, College of Fisheries, Professional Organisations, Fisheries Cooperatives, NGOs, FPOs, Coastal Aquaculture Authority, NFDB, MPEDA, Industry Association | Y-1-5 | Budgetary support from the existing schemes | IEC Material in Local Language available for various stakeholders. Spread IEC campaign by engaging all Self Help Group/KVKs/ College of Fisheries/ NSPAAD | Number of IEC material in Regional/Vernacular Languages developed languages/ No. of awareness programs conducted annually for various categories of stakeholders. |

Strategic Objective 2: Strengthen laboratory capacity for AMR

Sub-objective 2.1: Strengthen microbiology laboratory capacity for AMR detection in fisheries

| | Activity/sub- activities | Other stakeholders proposed to be involved | Timeline | Approx. Budget (existing/ planned) (Rs in Crores) | Output | Output Indicator |
|-----------|--|---|----------|--|--|--|
| a. | Establish functional, well utilised, quality assured laboratories at all levels of healthcare for fish to promote evidence based use of antimicrobials | | | | | |
| | <p>Strengthen microbiology laboratories (in govt. & private sector) at National, State and District level for AMR detection.</p> <p>At least one Lab to be strengthened for AMR surveillance</p> | <p>ICAR Fisheries Institute, Fisheries Universities, College of Fisheries,</p> <p>NFDB and Private Sector</p> | Y-1-4 | Budgetary support from the existing schemes of DoF | <p>Strengthen labs Microbiological labs of Fisheries Universities/ Institutes/ Fisheries College and selected labs in private sector</p> <p>Strengthened Aquatic Animal Health & Quality Testing Laboratory of NFDB, Hyderabad</p> | No. of Microbiological Labs strengthened |

Sub-objective 2.3: Strengthen laboratory capacity for targeted surveillance of Antibiotic Residues in fisheries sector

| | Activity/sub- activities | Other stakeholders proposed to be involved | Timeline | Approx. Budget (existing/ planned) (Rs in Crores) | Output | Output Indicator |
|----|--|--|----------|---|--|---|
| a. | Establish functional laboratories for detection of antimicrobial residues in fisheries sector | | | | | |
| | Establish functional laboratories for detection of antimicrobial residues in fisheries sector | ICAR Fisheries Institute, Fisheries Universities, College of Fisheries, Nitte University (NU), Mangalore National Fisheries Development Board (NFDB) and Private Sector, FSSAI, MPEDA, EIC etc. | Y-3-5 | Funding from the existing schemes of DoF | Functional Labs for antimicrobial residues detection established | Number of antimicrobial residues testing labs established |

Strategic Objective 3: Reduce the incidence of infection through effective infection prevention and control

Sub-objective 3.2: Establish IPC programmes in fisheries sector

| | Activity/sub- activities | Other stakeholders proposed to be involved | Timeline | Approx. Budget (existing/ planned) (Rs in Crores) | Output | Output Indicator |
|-----------|--|---|----------|--|---|---|
| a. | Develop, implement and monitor infection prevention and control programme in fisheries and aquaculture | | | | | |
| | Setting up of farm infrastructure to promote infection prevention in Hatcheries, BMCs, aqua-farms, ornamental fish handling centre/shops, other aquatic animals handling facilities. | Costal Aquaculture Authority, State Fisheries Dept/ State AHDs, | Y-1-5 | Budget availability from the existing schemes of DoF | Improved Biosecurity and containment measures that promote IPC in Livestock and Aquaculture Farms | % Farms complied to IPC to guidelines |
| | Increase awareness in community for Animal Welfare and good production practices (proper hygiene/sanitation /practices of IPC); (Extension services) | State Fisheries Dept, MPEDA, ICAR, COFs, Universities, CAA, AWBI, SAWBs, State AHDs/. ATMA, KVKs, | Y-1-5 | Budget availability from the existing schemes of DoF | Improved awareness amongst community | Number of awareness programs on IPC conducted |
| | Monitoring of sanitation and hygiene on Hatcheries, BMCs, aqua-farms, | State Fisheries Dept/ AHDs, and State PCBs, MCDs | Y-1-5 | Routine Activity | Better sanitation and hygiene in animal | No of farms/facilities monitored |

| | Activity/sub- activities | Other stakeholders proposed to be involved | Timeline | Approx. Budget (existing/ planned) (Rs in Crores) | Output | Output Indicator |
|--|---|--|----------|---|----------------------------|------------------|
| | ornamental fish handling centre/shops, other aquatic animals handling facilities. | | | | and aquaculture facilities | |

Sub-objective 3.3: Reduce environmental contamination with resistant genes, resistant pathogens and antimicrobial residues

| | Activity/sub- activities | Other stakeholders proposed to be involved | Timeline | Approx. Budget (existing/ planned) (Rs in Crores) | Output | Output Indicator |
|-----------|---|---|----------|--|--|---|
| a. | Develop and implement strategic interventions to reduce the environmental impact of AMR | | | | | |
| | Strengthening of Quality standards and its linking under One Health. Effective management of waste- water from Hatcheries, BMCs, aqua-farms, ornamental fish handling centre/shops, other aquatic animals culture /grow-out/handling facilities. | State Fisheries Dept, CAA AHDs, PCBs , FSSAI, MPEDA and EIC | Y-2-5 | Budget availability from the existing schemes of DoF | Waste Management guidelines/protocols developed. Quality standards Strengthen through AMR specific Surveillance | Number of aqua-facilitates/units complied with Effluent treatment plants (ETPs) |

Strategic Objective 4: Optimize the use of antimicrobial agents in fisheries**Sub-objective 4.1: Uninterrupted access and judicious use of high-quality antimicrobials in fisheries**

| | Activity/sub- activities | Other stakeholders proposed to be involved | Timeline | Approx. Budget (existing/ planned) (Rs in Crores) | Output | Output Indicator |
|----|--|--|----------|---|---|--|
| b. | Strengthen and enforce national regulatory authority/ies regarding appropriate use of antimicrobials in all sectors | | | | | |
| | Restrict antibiotics in animal/fish feed, feed premix; ensure use of registered products only; regulate their import, direct distribution, online marketing, and appropriate labelling | CDSCO, CAA, State Fisheries Depts., BIS, FSSAI, DAHD | Y-2-4 | Budget from the existing schemes of DoF | Proposals received and disposed | No. of Proposals received and disposed / No. of antibiotics reviewed and restricted. |
| c. | Develop and implement evidence based standard treatment guidelines for aquatic animals | | | | | |
| | Develop evidence-based “Standard Treatment Guidelines” for aquatic animals | FAO, WOA, ICAR, DAHD | Y-1-2 | FAO | SOPs for appropriate use of antibiotics for treatment and prophylaxis of infection in aquatic animals for use by veterinarians and other Fish Care Professionals. | No. of SOPs developed |

| | Activity/sub- activities | Other stakeholders proposed to be involved | Timeline | Approx. Budget (existing/ planned) (Rs in Crores) | Output | Output Indicator |
|----|--|--|----------|---|--|--------------------------------------|
| e. | Develop the National Essential Medicine List for aquatic animals | | | | | |
| | Develop and implement the National essential medicine list for aquatic animals | CDSCO, DAHD , State AHDs | Y-2-5 | Budget from the existing schemes of DoF | National Essential Medicine list developed for Aquatic Animals. | No. of essential medicine listed-out |

Sub-objective 4.3: Appropriate use of antimicrobials in fisheries.

| | Activity/ sub- activities | Other stakeholders proposed to be involved | Timeline | Approx. Budget (existing/ planned) (Rs in Crores) | Output | Output Indicator |
|----|---|---|----------|--|--|--|
| a. | Establish surveillance system for AMU and AMC | | | | | |
| | Develop guidance document/SOPs and training resources to measure consumption and use of antimicrobials in Hatcheries, BMCs, aqua-farms, ornamental fish handling centre/shops, other aquatic animals culture /grow-out/handling facilities. | ICAR, Sate Fisheries Department/ CAA, DAHD/State AHDs, Private Sector | Y-2-3 | Budget availability from the existing schemes of DoF | Advisory, Guidelines and SOPs on AMU and AMC developed | Advisory, Guidelines and SOPs-documents. No. of settings where protocol is validated |

| | Activity/ sub- activities | Other stakeholders proposed to be involved | Timeline | Approx. Budget (existing/ planned) (Rs in Crores) | Output | Output Indicator |
|--|--|--|-----------------|--|--|---|
| | Define mechanisms and modalities for AMC/AMU surveillance | CDSCO, State Drug Controllers, ICAR, DAHD- State Fisheries Depart/ AHDs. INFAH, Multi-disciplinary District level committee and Task Force committee for regulating usage of Antibiotics in Aquaculture, CAA | Y-2-3 | Budget availability from the existing schemes of DoF | Advisories, Guidelines and mechanisms developed | No. of settings where the protocol is validated |
| | Organize training workshops to develop capacity of health care facilities to measure consumption and use of antimicrobials | ICAR Fisheries Institute, DAHD, State AHDs,/State Fisheries Dept./ KVKs, VCI | Y-2-5 | Budget availability from the existing schemes of DoF | Awareness among fishers/fish farmers for misuse of antibiotic. | Number of Trainings organized |

Strategic Objective 5: Promote Research and innovations**Sub-objective 5.1: Identify priorities for basic and operational research relevant to AMR in Fisheries**

| | Activity/sub- activities | Other stakeholders proposed to be involved | Timeline | Approx. Budget (existing/ planned) | Output | Output Indicator |
|----|--|--|----------|------------------------------------|--|--|
| a. | Define research priorities and develop funded research agenda for AMR innovations in diagnostics (including Point of Care tests), antimicrobials, alternatives to infectious disease management, ethno-veterinary medications, vaccines | | | | | |
| | Develop and implement sectoral research agenda on AMR involving research institutions in the country | ICAR Fisheries Institute, Fisheries Universities, College of Fisheries, DAHD | Y-1-5 | Existing schemes of DoF | Sectoral Research Agenda Developed | Sectoral agendas developed on AMR in research institutions |
| | Develop and implement Inter-sectoral research agenda on AMR involving research institutions in the country | DBT, CSIR, AYUSH, ICMR, ICAR Fisheries Institute, Fisheries Universities, College of Fisheries | Y-1-5 | Existing Schemes of DoF | Inter-Sectoral Research Agenda Developed | Inter-Sectoral agendas developed on AMR in research institutions |

ANNEXURE C: MINISTRY OF AGRICULTURE AND FARMERS WELFARE

Name of the Department/organisation: Indian Council of Agricultural Research (ICAR)

Strategic objective 1: Improve awareness and understanding of AMR through effective communication, education and training

Sub objective 1.1 Increase awareness and improve communications regarding AMR, IPC and judicious use of antimicrobials in all sectors

| | Activity / sub-activity | Other stakeholders proposed to be involved | Timeline | Budget (existing/ planned) (Rs in Crores) | Output | Output Indicator |
|-----------|--|---|----------|---|--|---|
| a. | Assess knowledge, attitude & practices (KAP) among various stakeholders | | | | | |
| | Develop standardized methodology for conducting KAP studies | MoFAHD, Dept. of Agri. And Farmer's Welfare (DA&FW) Concerned line Depts, ICMR, MoEFCC, SAUs/CAUs, ICSSR | Y1-Y2 | 0.02 | Standard methodologies for conducting studies for different stakeholders | Number of validated methodologies for each sector |
| | Conduct KAP studies | MoFAHD, DA&FW Concerned line Departments, SAUs/CAUs, KVKs and SHG | Y1-Y4 | 0.05 | KAP surveys conducted and data analysis | Number of KAP surveys Compiled KAP Report |

| | Activity / sub-activity | Other stakeholders proposed to be involved | Timeline | Budget (existing/ planned) (Rs in Crores) | Output | Output Indicator |
|-----------|---|---|-----------------|--|--|------------------------------|
| b. | Consolidate and develop communication and information resources for improving awareness on AMR, IPC and judicious use of antimicrobials | | | | | |
| | Create a repository of available IEC material | SAU/CAU, MoFAHD, DA&FW, KVKs | Y2-Y3 | 0.02 | Creation of repository with digital and or printed material | Library of IEC material |
| | Develop communication material focussed on easy to understand messages for each stakeholder group | SAU/CAU, MoFAHD, DA&FW, KVKs | Y1-Y2 | 0.08 | Development of printed and digital material on AMR awareness | Printed and digital material |
| | Develop, implement & monitor sustained communication programme | | | | | |
| | Develop a communication plan for national, state, district and sub-district levels | SAUs/CAUs | Y2 – Y3 | 0.05 | Mobile App based communication program | Multilingual mobile Apps |
| | Implement AMR communication programme targeting general population and other stakeholder groups, through partnership & collaborative approach including NGOs and private sector | SAUs/CAUs, KVKs | Y2 – Y4 | 0.02 | Implement AMR awareness program | No. of Awareness programmes |

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Sub-objective 1.2. Improve knowledge and capacity of key stakeholders regarding AMR, IPC and judicious use of antimicrobials in all sectors

| | Activity/indicative sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. Budget (existing/ planned) (Rs in Crores) | Output | Output Indicator |
|-----------|---|--|----------|---|---|---|
| a. | Review and revise curricula and modules of professionals/para-professional courses which must include AMR and IPC | | | | | |
| | Identify professional and para-professional courses which must include AMR and IPC in curricula | MoFAHD, DA&FW, VCI, SAUs/CAUs | Y1-Y2 | 0.02 | Identification of courses on AMR, One health and IPC | Customized courses on AMR, One health and IPC |
| | Review and revised curricula and teaching modules | MoFAHD, DA&FW, VCI, SAUs/CAUs | Y2 to Y3 | 0.01 | Periodical review of curricula and teaching modules | Teaching modules on AMR, One health and IPC |
| | Include biosafety, biosecurity, hygiene and infection prevention and control in curricula for education of animal health, and food professionals and workers in Animal Husbandry Depts, Slaughterhouse, Dairy Sector and meat retailers | MoFAHD, DA&FW, VCI, SAUs/CAUs, | Y2 to Y3 | 0.02 | Revised curricula for education in the targeted sectors | Holistic professional teaching modules |
| | Mandatory induction and in-service trainings for all professionals and para-professionals | | | | | |
| | Conduct Training Needs Analysis (TNA) in all sectors. | MoFAHD, DA&FW, State Animal | Y1-Y2 | 0.1 | TNA on pilot basis | Overview of training needs |

| | | | | | | |
|--|--|--|-------|-----|--|--|
| | | Husbandry Depts, SAUs/CAUs | | | | |
| | Develop training resources (including online courses) for capacity building among professionals & para-professionals in all sectors | MoFAHD, DA&FW, State Animal Husbandry Depts, SAUs/CAUs, KVKs | Y1-Y2 | 0.2 | Training plans/ courses for the capacity building amongst key stakeholders | Customized training manuals/courses |
| | Include biosafety, biosecurity, hygiene and infection prevention and control in curricula for training of animal health, and food professionals and workers in Animal Husbandry Depts, Slaughterhouse, Dairy Sector and meat retailers | MoFAHD, DA&FW, State Animal Husbandry Depts, SAUs/CAUs, KVKs | Y1-Y2 | 0.2 | IPC manuals for personnel involved in animal and fishery sector | Number of sector specific IPC manuals |
| | Train staff in KVK and village level for biosafety and biosecurity principles and practices | MoFAHD, DA&FW, State Animal Husbandry Depts, KVKs, SAUs, CAUs | Y1-Y4 | 0.4 | Trained KVK personnel and SMS/Scientists on Biosafety and Biosecurity principles & practices | Number of subject matter specialists trained |
| | Train farmers in on- farm sanitation and good hygiene practices | MoFAHD, DA&FW, State Animal Husbandry Depts, KVKs, SAUs, CAUs, | Y1-Y4 | 0.2 | Trained farmers on - farm sanitation and good hygiene practices | Number of farmers trained |

| | | | | | | |
|--|---|---|-------|-----|--|---|
| | Implement trainings on AMR, AMU for different key stakeholders | MoFAHD, DA&FW, State Animal Husbandry Depts, KVKs, SAUs, CAUs | Y1-Y4 | 0.4 | Organization of trainings for Key Stakeholders. | Number of trainings |
| | Conduct Continuous Professional Development on AMR/ Integrated Faculty development programmes; Dedicated sessions | MoFAHD, DA&FW, State Animal Husbandry Depts, SAUs, CAUs | Y1-Y4 | 0.4 | Conduction of professional/ faculty development programme on AMR | Number of trainings for faculty development |

Strategic objective 2: Strengthen laboratory capacity for AMR

Sub-objective 2.1. Strengthen microbiology laboratory capacity for AMR detection in human and animal infections

| | Activity/indicative sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. Budget (existing/planned) (Rs in Crores) | Output | Output Indicator |
|-----------|---|---|----------|--|--|-----------------------------------|
| a. | Establish functional, well utilised, quality assured laboratories at all levels of healthcare for humans and animals to promote evidence-based use of antimicrobials | | | | | |
| | Strengthen microbiology laboratories (in govt. & private sector) at National, state and district level for AMR detection | MoFAHD, DA&FW, State Animal Husbandry Depts, SAUs, CAUs | Y1-Y3 | 2.0 | Strengthening of ICAR-INFAAR (Indian Network on Fishery and Animal Antimicrobial Resistance) network” labs | Number of laboratories strengthen |

| | Activity/indicative sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. Budget (existing/planned) (Rs in Crores) | Output | Output Indicator |
|-----------|---|---|-----------------|---|---|--|
| | Develop and implement standardized protocols for pathogen identification, AST | MoFAHD, DA&FW, State Animal Husbandry Depts, SAUs, CAUs | Y1-Y4 | 0.02 | SOPs/ laboratory manuals for pathogen detection and AST | Number of sector specific SOPs /laboratory manuals |
| | Establish mechanisms for implementing laboratory quality management systems to ensure quality and reliable test results e.g. mandatory accreditation of all labs in the country | Authorised agency for quality management assessment | Y1-Y4 | 0.2 | Implement External Quality Assessment Services (EQAS) for under ICAR-INFAAR | Number of quality assessed labs |
| b. | Establish standardised digital documentation system in hospitals and laboratories at all levels of health care in humans and animals | | | | | |
| | Establish Hospital Information/Laboratory Information management systems (LIMS) for AMR data management at all levels of health care for humans and animals | SAUs/CAUs | Y1-Y3 | 0.06 | LIMS in selected laboratories of Indian Network on Fishery and Animal Antimicrobial Resistance (INFAAR) | Number of laboratories with LIMS |
| c. | Designate reference laboratories for AMR surveillance in human and animal sectors | | | | | |
| | Establish/strengthen National and state reference laboratories for AMR to ensure adequate guidance on quality laboratory testing, | MoFAHD, DA&FW, State Animal Husbandry Depts, SAUs, CAUs | Y1-Y4 | 1.00 | National AMR reference labs in animal and fishery (two each) | Number of National AMR reference labs |

| | Activity/indicative sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. Budget (existing/planned) (Rs in Crores) | Output | Output Indicator |
|--|---|---|-----------------|---|---------------|-------------------------|
| | genomic surveillance of AMR and detection of emerging AMR pathogens | | | | | |

Sub-objective 2.2. Strengthen surveillance for AMR in animal husbandry, fisheries, food and environment

| | Activity/ sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. Budget (existing/ planned) (Rs. In Crores) | Output | Output Indicator |
|-----------|---|---|-----------------|---|---|--|
| a. | Strengthen food and environment laboratories for AMR detection at National, state and district level | | | | | |
| | Establish/strengthen microbiology laboratories at National, state and district level for AMR detection | MoFAHD, DA&FW, State Animal Husbandry Depts, SAUs, CAUs | Y1-Y4 | 1.00 | Upgraded laboratories | Number of laboratories upgraded |
| | Develop and implement plan for targeted surveillance of AMR in food and environment | | | | | |
| | Define comprehensive standards for targeted AMR surveillance in food and environment | MoFAHD, DA&FW, SAUs, CAUs | Y1-Y2 | 0.05 | National AMR surveillance standards for animals, food and environment AMR surveillance SOPs | National surveillance plan in animals Defined surveillance SOPs |
| | Define mechanisms and modalities for data collection | MoFAHD, DA&FW, SAUs, CAUs, | Y1-Y2 | 0.05 | Mechanisms for data collection/information management for AMR surveillance | Guidelines for data collection |
| | Collate and analyse AMR surveillance data into useful information | SAUs, CAUs | Y1-Y4 | 0.02 | Analysis of AMR surveillance data | AMR surveillance reports/ research and review papers |

Sub-objective 2.3. Strengthen laboratory capacity for targeted surveillance of Antibiotic Residues in animal, food and environment sector

| | Activity/ sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. Budget (existing/planned) (Rs. In Crores) | Output | Output Indicator |
|-----------|---|--|----------|--|--|---|
| a. | Establish functional laboratories for detection of antimicrobial residues in animal, food and environment sector | | | | | |
| | Establish functional laboratories for detection of antimicrobial residues in animal, food and environment sector | SAUs | Y1-Y3 | 1.1 | Four functional labs for detection of antimicrobial residues | Number of laboratories will be functional |
| b. | Develop and implement plan for surveillance of antibiotic residues (AR) in animal, food and environment | | | | | |
| | Define mechanisms and modalities for data collection | SAUs | Y1-Y2 | 0.06 | Standardized SOPs | Developed & validated SOPs |
| | Collate and analyse AR surveillance data into useful information | SAUs | Y1-Y4 | 0.05 | Status of antibacterial residues in livestock products | Data for antibacterial residues |

Strategic objective 3: Reduce the incidence of infection through effective infection prevention and control

Sub-objective 3.2. Establish IPC programmes in animal and food sector

| | Activity/ sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. Budget (existing/ planned) (Rs. In Crores) | Output | Output Indicator |
|--|-----------------------------|--|----------|--|--------|---------------------|
|--|-----------------------------|--|----------|--|--------|---------------------|

| | | | | | | |
|-----------|--|------------------------------|---------|------|--|---------------------------------------|
| a. | Develop, implement and monitor infection prevention and control programme in veterinary settings, animal husbandry, fisheries and food sector | | | | | |
| | Implement farm infrastructure that promote infection prevention in animal handling facilities and farms | SAUs, CAUs, | Y1-Y4 | 0.2 | SOPs to promote infection prevention at animal and fishery farms | SOPs documents |
| | Undertake regular checks of sanitation and hygiene on animal facilities and farms | SAUs, CAUs | Y1-Y4 | 0.02 | Routine on farm visits/checks to ensure sanitation and hygiene | Number of regular checks |
| b. | Develop/Update National guidelines/standards on Infection Prevention & Control in animal husbandry including fisheries and food sector on a regular basis; adapt and disseminate IPC guidelines/standards at all levels | | | | | |
| | Develop/update standards for biosafety, biosecurity, farm infrastructure | MoFAHD, DA&FW, SAUs, CAUs | Y1-Y2 | 0.5 | Standardized SOP | Number of SOPs developed |
| | Adapt National guidelines to all levels of facilities | MoFAHD, DA&FW, SAUs, CAUs | Y1 – Y3 | 0.2 | Adaptation of SOPs by animal & fish farms of ICAR institutes | Number of adapted animal & fish farms |
| c. | Ensure immunization of animals | | | | | |
| | Conduct a baseline assessment for animal vaccine programme and cold chain management and services coverage | DAHD, State line Departments | Y1 – Y4 | 6.0 | Sero-monitoring of vaccinated animals | Number of samples screened |
| | Review and recommend introduction of new | MoFAHD, SAUs, CAUs | Y1 – Y4 | 0.2 | Recommendation for new vaccines (if necessary) | Number of vaccines recommended |

| | | | | | | |
|--|-----------------------------------|--|--|--|--|--|
| | vaccines for animals / birds/fish | | | | | |
|--|-----------------------------------|--|--|--|--|--|

Sub-objective 3.3. Reduce environmental contamination with resistant genes, resistant pathogens and antimicrobial residues

| | Activity/ sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. Budget (existing/planned) (Rs. In Crores) | Output | Output Indicator |
|-----------|--|--|----------|--|-----------------------------|--|
| a. | Develop and implement strategic interventions to reduce the environmental impact on AMR | | | | | |
| | Effective management of waste-water from animal and agricultural farm | MoFAHD, DA & FW, SAUs, CAUs | Y1-Y4 | 0.2 | Waste water disposal system | No. of ICAR animal agriculture and fish farms effectively managing waste water |

Strategic objective 4: Optimize the use of antimicrobial agents in humans, animals and food

Sub-objective 4.1: Uninterrupted access and judicious use of high-quality antimicrobials in all sectors

| | Activity/ sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. Budget (existing/planned) (Rs. In Crores) | Output | Output Indicator |
|-----------|---|--|----------|--|--|----------------------|
| a. | Develop and implement evidence-based “Standard Treatment Guidelines” for veterinary settings, food animals, fisheries and humans | | | | | |
| | Develop and implement evidence-based “Standard Treatment Guidelines” for veterinary settings, food | MoFAHD, CAUs, SAUs | Y1-Y4 | 0.2 | Treatment guidelines for major diseases affecting animals and fish | Number of guidelines |

| | | | | | |
|-------------------------------|--|--|--|--|--|
| animals, fisheries and humans | | | | | |
|-------------------------------|--|--|--|--|--|

Sub-objective 4.3. Appropriate use of antimicrobials in veterinary settings, animal husbandry, fisheries, agricultural farms and food processing units

| | Activity/ sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. Budget (existing/ planned) (Rs. In Crores) | Output | Output Indicator |
|-----------|--|---|-----------------|---|---------------------------------|--------------------------------|
| a. | Establish surveillance system for AMU and AMC | | | | | |
| | Develop guidance document/SOPs and training resources to measure consumption and use of antimicrobials in veterinary settings, animal and agricultural farms | MoFAHD, DA&FW, SAUs, CAUs, DA & FW | Y2-Y3 | 0.1 | SOPs/ Training manuals on AMU | Number of SOPs |
| | Define & establish mechanisms and modalities for AMC/AMU surveillance | SAUs, CAUs, DA&FW | Y2-Y3 | 0.01 Cr | Mechanisms/modalities developed | Number of modalities developed |
| | Organize training workshops to develop capacity of health care facilities to measure | SAUs, CAUs, DA&FW, DAHD | Y2-Y4 | 0.4 Cr | Trained veterinary officers | Number of trainings workshops |

| | Activity/ sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. Budget (existing/ planned) (Rs. In Crores) | Output | Output Indicator |
|-----------|--|---|-----------------|---|---|-----------------------------|
| | consumption and use of antimicrobials | | | | | |
| b. | Establish antimicrobial stewardship programmes for rational use of antimicrobials | | | | | |
| | Develop evidence-based “Standard Treatment Guidelines” for veterinary settings, food animals, fisheries | SAUs, CAUs, DA&FW, DAHD | Y1-Y2 | 0.2 | Treatment guidelines for major diseases of food animals and fish. | Number of guidelines |
| | Promote strict biosecurity practices at animal and fish farms | SAUs, CAUs, DA&FW | Y1-Y3 | 0.1 | Training of the farmers/ animal handlers on biosecurity practices | No. of Trainings. |
| c. | Develop and implement plan for phasing out antibiotic use for growth promotion and disease prevention in livestock/fisheries/ agriculture; replace by alternatives/ethno-veterinary medicines | | | | | |
| | Develop and implement plan for phasing out antibiotic use for growth promotion and disease prevention in livestock/fisheries/ agriculture; replace by alternatives/ethno-veterinary medicines | SAUs, CAUs, DA&FW, DAHD, Ministry of AYUSH | 2025-2029 | 5 Cr | Developed alternate therapies | Number of therapies |

Strategic objective 5: Promote Research and innovations

Sub-objective 5.1. Identify priorities for basic and operational research relevant to AMR in all sectors

| | Activity/ sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. Budget (existing/planned) (Rs. In Crores) | Output | Output Indicator |
|-----------|---|--|----------|--|--|---|
| a. | Define research priorities and develop funded research agenda for AMR innovations in diagnostics (including Point of Care tests), antimicrobials, alternatives to infectious disease management, ethnoveterinary medications, vaccines | | | | | |
| | Develop and implement sectoral research agenda on AMR involving research institutions in the country | SAUs, CAUs, DA&FW, DAHD | Y1-Y2 | 0.05 | Research priorities | Number of research priorities |
| | Develop and implement Inter-sectoral research agenda on AMR involving research institutions in the country | SAUs, CAUs, DAHD, DA&FW, DBT, DST, ICMR | Y1-Y4 | 0.10 | Intersectoral research agenda | Number of research agenda |
| b. | Encourage and fund research for evidence-informed policymaking | | | | | |
| | Estimate morbidity, mortality and economic impact of AMR | SAUs, CAUs, MoFAHD | Y2-Y4 | 0.5 | Impact of AMR in animals | Estimated economic impact of AMR in animals |
| | Quantum and impact of AMR in food chain on human and animal health in Indian context | SAUs, CAUs, MoFAHD, DA&FW | Y2-Y4 | 0.5 | Quantifying the burden of AMR pathogens/ARGs in animal/fish food | Estimated burden on AMR pathogens or ARGs |
| c. | Coordinate, fund and pilot operational research projects in human, animal, food and environment sectors with respect to Indian context | | | | | |

| | | | | | | |
|--|---|---|-------|------|---|---|
| | Understand transmission pathways of AMR across sectors | SAUs, CAUs, DAHD, DBT, DST, ICMR, DA&FW | Y1-Y4 | 5.0 | Knowledge developed on transmission pathways of AMR through characterization of pathogens | Number of research papers and reports/ No of pathogens characterized |
| | Risk assessment of impact of AMR in environment on human and animal health and vice-versa | SAUs, CAUs, DAHD, DBT, DST, ICMR | Y1-Y4 | 5.0 | Risk factor analysis for AMR in animals | Number of risk factors identified |
| | Develop methods of effluent treatment to minimise risk of antimicrobial residues, AMR pathogens and genes | SAUs, CAUs, DAHD, DBT, DST, ICMR, DA&FW | Y1-Y4 | 0.50 | Upgraded methods of safe disposal of waste from animal, poultry and fish farms | Number of Package of practices (PoP) |
| | Assess impact of antimicrobials on human and animal microbiome | SAUs, CAUs, DAHD, DBT, DST, ICMR | Y1-Y4 | 2.0 | Effect of antimicrobials on animal microbiome | Number of research papers and reports/trial conducted |

Strategic objective 6: Strengthen Governance, Coordination and collaborations on AMR

Sub-objective 6.1. Strengthen Governance and Coordination mechanisms for AMR Containment

| | Activity/ sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. Budget (existing/planned) (Rs. In Crores) | Output | Output Indicator |
|--|-----------------------------|--|----------|--|--------|---------------------|
|--|-----------------------------|--|----------|--|--------|---------------------|

| a. | Identify activities on AMR requiring multidisciplinary /multi-departmental coordination within each sector and develop agenda for sectoral coordination | | | | | |
|----|--|------------------------------|-------|---------|---------------------------------|-------------------------------|
| | Awareness and education activities requiring multidisciplinary /multi-departmental coordination | DAHD, DA&FW, SAUs, CAUs, DoF | Y1-Y4 | 0.02 Cr | Awareness and education | Number of activities |
| | Lab capacity strengthening and AMR surveillance activities requiring multidisciplinary /multi-departmental coordination | DAHD, DA&FW, SAUs, CAUs, DoF | Y1-Y4 | 0.1 Cr | Capacity building | Number of workshops/trainings |
| | Infection prevention and control related activities requiring multidisciplinary /multi-departmental coordination | DAHD, DA&FW, SAUs, CAUs, DoF | Y1-Y4 | 0.1 Cr | Capacity building | Number of workshops/trainings |
| | Activities to promote judicious use of antimicrobials requiring multidisciplinary /multi-departmental coordination | DAHD, DA&FW, SAUs, CAUs, DoF | Y1-Y4 | 0.1Cr | Capacity building | Number of activities |
| | Research activities requiring multidisciplinary /multi-departmental coordination | DAHD, DA&FW, SAUs, CAUs, DoF | Y1-Y4 | 4.0 | Collaborative research programs | Number of research program |

| | | | | | | |
|-----------|---|--|-------|------|---------------------------|---|
| b. | Establish/strengthen governance mechanism within each sector for coordination of multidisciplinary activities and for monitoring sectoral implementation of NAP AMR | | | | | |
| | Dedicated officer/AMR coordination unit within each sector with dedicated funding for coordination of activities for AMR requiring multidisciplinary /multi-departmental coordination | | Y1-Y4 | 0.5 | Dedicated AMR focal point | Coordinating unit on AMR for agriculture, animal and fishery sector |
| | Constitution of sectoral coordination committee within each sector with clear terms of reference and regular meetings | | Y1-Y4 | 0.02 | Coordination committee | Number of meetings by Sectorial Coordination committee |
| c. | Identify activities on AMR requiring inter-sectoral coordination and develop agenda for inter-sectoral coordination | | | | | |
| | Awareness and education activities requiring inter-sectoral coordination | DAHD, ICMR, NCDC, DBT, DST, SAUs, CAUs | Y1-Y4 | 0.05 | Awareness and education | Number of activities |
| | Coordination of AMR surveillance across sectors | DAHD, ICMR, NCDC, DBT, DST, SAUs, CAUs | Y1-Y4 | 0.2 | Capacity building | Number of workshops/ trainings |
| | Infection prevention and control related activities requiring intersectoral coordination | DAHD, ICMR, NCDC, DBT, DST, SAUs, CAUs | Y1-Y4 | 0.2 | Capacity building | Number of workshops/ trainings |
| | Activities to promote judicious use of antimicrobials requiring intersectoral coordination | DAHD, ICMR, NCDC, DBT, DST, SAUs, CAUs | Y1-Y4 | 0.2 | Capacity building | Number of activities |

| | | | | | | |
|-----------|---|--|-------|------|---|--|
| | Inter-sectoral research agenda on AMR | DAHD, ICMR, NCDC, DBT, DST, SAUs, CAUs | Y1-Y4 | 5.0 | Collaborative research programs | Number of research program |
| d. | Establish/strengthen governance mechanism for inter-sectoral coordination of AMR activities and for inter-sectoral monitoring of implementation of NAP AMR | | | | | |
| | Dedicated AMR coordination unit (e.g. at Niti Ayog) with dedicated funding for coordination of activities for AMR requiring inter-sectoral coordination | | Y1-Y4 | 0.5 | Dedicated AMR focal point for inter sectoral coordination | Inter sectoral coordinating unit on AMR for agriculture, animal and fishery sector |
| | Constitution of inter-sectoral coordination committee with clear terms of reference and regular meetings | | Y1-Y4 | 0.05 | Inter sectoral coordination committee | Number of meetings/ activities by coordination committee |

Sub-objective 6.2. Strengthen International, national and sub-national collaborations to tackle AMR

| | Activity/ sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. Budget (existing/planned) (Rs. In Crores) | Output | Output Indicator |
|-----------|---|---|----------|--|---------------|--|
| a. | Strengthen India's commitment and leadership on AMR | | | | | |
| | Review India's existing international collaborations on AMR | NITI Aayog, NCDC, ICMR, DAHD, DoF, ICAR, MoEFCC/CPCB, FSSAI, NHM, | Y1-Y4 | 0.1 | Retrospection | Number of interfaces Review report on status of international |

| | | | | | | |
|-----------|--|--|-------|-----|--|---|
| | | DoP/NIPER, Min of AYUSH, DBT/CSIR, MoIB | | | | collaboration on AMR |
| | Identify priority areas of action to strengthen coordination with other countries | FAO, WHO, WOAHA, other countries | Y1-Y4 | 0.5 | Identified priority areas | Number of priority areas identified |
| b. | Strengthen collaborations at National level to tackle AMR | | | | | |
| | Establish linkages to share best practices and information about drug resistance containment activities in other relevant disease programmes | NCDC, ICMR, DAHD, DoF, ICAR, MoEFCC/ CPCB, FSSAI, NHM, DoP/NIPER, Min of AYUSH, DBT/CSIR, MoIB | Y1-Y4 | 0.2 | Better understanding of different practices of AMR containment | Number of linkages and practices identified for AMR containment |

ANNEXURE D: MINISTRY OF ENVIRONMENT, FORESTS AND CLIMATE CHANGE

Name of the Department/organisation: Central Pollution Control Board (CPCB)

Strategic objective 1: Improve awareness and understanding of AMR through effective communication, education and training

Sub-objective 1.1.C.: Increase awareness and improve communications regarding AMR, IPC and judicious use of antimicrobials

Play a role in monitoring and awareness generation about AMR in the environment

(Action: CPCB/SPCBs)

Strategic objective 2: Strengthen laboratory capacity for AMR

Sub-objective 2.3.b. Develop and implement plan for targeted surveillance of ARs in environment

Monitoring of antibiotic residues in the aquatic environment and capacity building of State Pollution Control Boards (SPCBs).

(Action: CPCB/SPCB)

Strategic objective 3: Reduce the incidence of infection through effective infection prevention and control

Sub-Objective: 3.3.a (i) Develop and implement strategic interventions to reduce the environmental impact of AMR through effective waste management.

Environmentally sound management, treatment and disposal of waste generated from industries engaged in bulk drug formulations of pharmaceuticals in line with hazardous waste in Hazardous and other waste (Management and Transboundary movement) Rules, 2016 and Environment Protection Rules, 1986

(Action: CPCB/SPCB/Healthcare Facilities)

3.3.a (ii) Effective management of biomedical waste including effluents from healthcare facilities

Implementation of Bio Medical Waste (BMW) Rules 2016 for environmentally sound management of Bio-Medical waste and effluents from healthcare facilities

(Action: CPCB/SPCB/Healthcare Facilities)

3.3.a (iii) Effective management of Pharmaceutical Industries effluents

Implementation and monitoring of Environmental Standards of pharmaceutical industry notified vide S.O dated 06.08.2021 by MoEFCC to monitor the compliance

(Action: CPCB/SPCB/Pharmaceutical industries)

3.3.a (iv) Effective management of waste and waste-water from animal/fish and agricultural farm

Implementation of guidelines for poultry farms for environmentally sound management of waste and waste water

(Action: CPCB/SPCB/Poultry farms)

3.3.b. Develop and implement mechanism for safe disposal of expired antimicrobials

Implementation and monitoring of mechanism for treatment, processing and final disposal of expired or discarded medicines including pharmaceutical waste like antibiotics, prescribed in the Bio-medical Waste Management Rules, 2016

(Action: CPCB/SPCB/Healthcare Facilities/Pharmaceutical industries)

Strategic objective 5: Promote Research and innovations

Sub-objective: 5.1.c. Develop methods of effluent treatment to minimise risk of antimicrobial residues and AMR pathogens/genes.

To reduce antibiotic residues from effluent sources, industries are adopting 3Rs concept i.e. reduce, recycle and reuse of treated effluent to maximum extent to minimise risk of Pharmaceutical Compounds' residues in to the environment.

(Action: CPCB/SPCB/Pharmaceutical companies)

ANNEXURE E: MINISTRY OF SCIENCE AND TECHNOLOGY

Name of the Department/organisation: Department of Biotechnology (DBT)

Strategic objective 5: Promote Research and innovations

Sub-objective 5.1: Identify priorities for basic and operational research relevant to AMR in all sectors

| Activity/ sub-activities | Other Stakeholders Proposed to be Involved | Timeline | Approx. Budget (existing/planned) (Rs. In Crores) | Output | Output indicator |
|---|---|----------|---|--|---|
| Funding innovation in: | | | | | |
| AMR diagnostics to detect at least one and preferably two of the critical bacterial pathogens as prioritized in the Indian Priority Pathogen List and/or test their susceptibility profiles | iBRIC (institutes of Biotechnology research and innovation council) | 3 years | 20.0 | <ul style="list-style-type: none"> Rapid detection test for ESKAPE pathogens Direct detection of the target pathogen(s) from primary samples (culture independent) | Acceleration of product development (TRL 4: Proof of concept established, and TRL 6-7: early to late-stage validation). |
| Antimicrobials/ products which are active against microbial pathogens in Indian priority Pathogen list | BIRAC | | | <ul style="list-style-type: none"> Advancement of novel therapeutics (novel platforms, new | Acceleration of product development (TRL 4: Proof of concept established, and TRL 8: Pre |

| | | | | | |
|--|---|---------|------|---|---|
| (mainly, E. coli, Klebsiella pneumoniae, Acinetobacter baumannii, Pseudomonas aeruginosa, Staphylococcus aureus, carbapenem resistant Enterobacteriaceae (CRE). | | | | chemical entities/combination molecules, antimicrobial peptides, bacteriophage therapies | commercialization) |
| b. Funding R and D projects which address questions related to mechanisms of emergence of drug resistance, development of new diagnostics, and treatment regimens for addressing AMR including sepsis related mortality in new states through competitive extra mural grants | iBRIC Other R & D institutes | 3 years | 20.0 | Creation of new knowledge | Publications, creation of consortia, patents |
| c. Operational Research projects - Assess impact of antimicrobials on human and animal microbiome | iBRIC, THSTI, BRIC-NCCS, IISCRs, CSIR labs, AIIMS | 3 years | 0.5 | <ul style="list-style-type: none"> Effect of first line antibiotics used in critical disease conditions Effect on emergence of antimicrobial tolerance and microbial persistence through multi-omic systemlevel | i. Evidence for effect of antibiotics on microbiome to guide policy development for antimicrobial therapy ii. Peer reviewed publications |

| | | | | | |
|---|--------------|---------|-----|---|--|
| | | | | analysis in clinical studies. | |
| d. Coordinate, fund and pilot operational research projects in humans, animals, food and environment sectors with respect to Indian context (transmission pathways) | iBRIC, THSTI | 2 years | 0.5 | <ul style="list-style-type: none"> Genomic surveillance of critical and high priority bacterial pathogens with One Health approach as a pilot study Develop rapid AMR detection assays for environmental and clinical utility | <ul style="list-style-type: none"> Patents, Publications, Technology Development Establishment of using rapid sequencing technologies for AMR screening and surveillance at pilot scale. |

Strategic objective 6: Strengthen Governance, Coordination and collaborations on AMR

Sub-objective 6.2: Strengthen International, national and sub-national collaborations to tackle AMR

| Activity/sub-Activities | Other stakeholders proposed to beInvolved | Timeline | Approx. Budget (existing/ planned) (Rs. In Crores) | Output | Output indicator |
|-------------------------|---|----------|--|--------|------------------|
|-------------------------|---|----------|--|--------|------------------|

| | | | | | |
|--|---|---|-------------------------------|--|---|
| a. Strengthen India's commitment and leadership on AMR | Bilateral (i.e. USA, United Kingdom, and Australia) and Multilateral partnerships in mutually agreed areas on AMR, BMGF, IAVI | As per mutually agreed dates with the counterpart | Within existing budget of DBT | Creation of new knowledge and contribute to Strengthen antimicrobial stewardship globally. | Publications, Patents, Creation of consortia, Connecting to global advocacy groups & Capacity building. |
| b. Establish a forum on AMR for donors and partners to share information & facilitate coordinated mobilization of resources for prioritized AMR activities | Advocacy through Global AMR R&D Hub | As per mutually agreed dates with the counterpart | - | Advocacy on AMR through exchange of ideas on Global AMR R&D forum by representing India | Participation in meetings |

Name of the Department/organisation: Council for Science Industrial Research (CSIR)**Strategic objective 2: Strengthen laboratory capacity for AMR****Sub-objective 2.1: Strengthen microbiology laboratory capacity for AMR detection in human and animal infections**

| | Activity/ sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. Budget (existing/planned) (Rs. In Crores) | Output | Output indicator |
|-----------|---|--|-----------|---|--------------------------------------|---|
| c. | Designate reference laboratories for AMR surveillance in human and animal sectors | | | | | |
| | Establish/strengthen National and state reference laboratories for AMR to ensure adequate guidance on quality laboratory testing, genomic surveillance of AMR and detection of emerging AMR pathogens | | 3 -5 Year | 25 - 30 Cr | MTCC-AMR Testing Laboratory / Center | MTCC-AMR Testing Laboratory and a national repository |

Strategic objective 3: Reduce the incidence of infection through effective infection prevention and control**Sub-objective 3.3: Reduce environmental contamination with resistant genes, resistant pathogens and antimicrobial residues**

| | Activity/ sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. Budget (existing/ planned) | Output | Output indicator |
|----|--|--|------------|------------------------------------|---|--|
| a. | Develop and implement strategic interventions to reduce the environmental impact of AMR | | | | | |
| | Effective management of Pharmaceutical industry effluents | CSIR, Pharmaceutical industry, Pollution Control Board | 3-5 years | 1-2 crores | Development of rapid, easy-to-use methods that can detect specific antibiotic residues in effluents | Validated methods that are fit for purpose and tested in a relevant environment |
| b. | Develop and implement mechanism for safe disposal of expired antimicrobials | | | | | |
| | Develop and implement mechanism for safe disposal of expired antimicrobials | Local and state approval for samples Pollution board and antibiotic manufacturing industries | 3 – 5 year | 10 – 20 Cr | Bioremediation of expired antibiotics in controlled environment | Local and state approval for samples Pollution board and antibiotic manufacturing industries |

Strategic objective 5: Promote Research and innovations

Sub-objective 5.1: Identify priorities for basic and operational research relevant to AMR in all sectors

| | Activity/ sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. Budget (existing/planned) (Rs. In Crores) | Output | Output indicator |
|----|---|--|----------|---|---|--|
| a. | Define research priorities and develop funded research agenda for AMR innovations in diagnostics (including Point of Care tests), antimicrobials, alternatives to infectious disease management, ethnoveterinary medications, vaccines | | | | | |
| | | State/ local authorities for enabling access to samples from hospitals, clinics, livestock, veterinary, environment Industry partners for drug and diagnostic development DCGI | 5 years | 50-100 crores | Development of methods (sequencing, molecular, microfluidics, immunochromatography, biophysical) for rapid point-of-care diagnostics that identify the pathogen and type of resistance Development of new drugs that | State/ local authorities for enabling access to samples from hospitals, clinics, livestock, veterinary, environment Industry partners for drug and diagnostic development DCGI |

| | Activity/ sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. Budget (existing/planned) (Rs. In Crores) | Output | Output indicator |
|--|---|---|-----------------|--|---|-------------------------|
| | | | | | <p>overcome drug resistance</p> <p>Development of a clinical framework for the use of combinations of antibiotics to prevent resistance development</p> <p>Identification of vaccine candidates</p> <p>Research on phage and microbiome based therapies</p> <p>Research on risk factors that predispose humans to repeated infections (such as recurrent UTI)</p> | |
| | Develop and implement sectoral research agenda on AMR involving | FAO | | | | |

| | Activity/ sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. Budget (existing/planned) (Rs. In Crores) | Output | Output indicator |
|-----------|--|---|-----------------|--|---|--|
| | research institutions in the country | Animal husbandry & Environment, forests / wildlife | | | | |
| | Develop and implement Inter-sectoral research agenda on AMR involving research institutions in the country | ICMR, ICAR, FAO, Animal husbandry & Environment, forests / wildlife | | | | |
| b. | Encourage and fund research for evidence-informed policymaking | | | | | |
| | Estimate morbidity, mortality and economic impact of AMR | | | | | Estimate morbidity, mortality and economic impact of AMR |
| | Quantum and impact of AMR in food chain on human and animal health in Indian context | ICMR, ICAR, FAO, state / local authority for approvals for sample/ data | 3-5 years | 50-100 crores | Estimation of AMR burden Identify and quantify antibiotic residues | Quantum and impact of AMR in food chain on human and animal health in Indian context |

| | Activity/ sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. Budget (existing/planned) (Rs. In Crores) | Output | Output indicator |
|----|---|---|-----------------|--|---|-------------------------|
| | | | | | Epidemiology & surveillance of AMR Understand the prevalence of AMR pathogens and genes Decipher the mechanisms of spread and transmission dynamics Genomic surveillance Biology of resistance and pathogens New resistance mechanisms | |
| c. | Coordinate, fund and pilot operational research projects in humans, animals, food and environment sectors with respect to Indian context | | | | | |

| | Activity/ sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. Budget (existing/planned) (Rs. In Crores) | Output | Output indicator |
|--|--|---|-----------------|--|---|--|
| | Understand transmission pathways of AMR across sectors | ICMR, ICAR, FAO, state / local authority for approvals for sample/ data | 3-5 years | 20-30 crores | <p>Selection of specific niches such as poultry farms, dairy farms or other sites of close interaction between animals and human to undertake activities listed below:</p> <p>Estimation of AMR burden</p> <p>Epidemiology & surveillance of AMR</p> <p>Understand the prevalence of AMR pathogens and genes</p> <p>Decipher the mechanisms of spread and</p> | Understand transmission pathways of AMR across sectors |

| | Activity/ sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. Budget (existing/planned) (Rs. In Crores) | Output | Output indicator |
|--|---|---|-----------------|--|---|--|
| | | | | | <p>transmission dynamics</p> <p>Genomic surveillance</p> <p>Biology of resistance and pathogens</p> <p>New resistance mechanisms / pathways</p> <p>Establishing role of bacterial communities in horizontal transfer of AMR</p> <p>Understanding role of drug tolerance in evolution of drug resistance</p> | |
| | Develop methods of effluent treatment to minimise risk of | Industry, pollution control board | 3 years | 3 crores | Validated methods for detection of | Demonstration of method at a pilot scale |

| | Activity/ sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. Budget (existing/planned) (Rs. In Crores) | Output | Output indicator |
|--|--|---|-----------------|--|---|--|
| | antimicrobial residues, AMR pathogens and genes | | | | antimicrobial residues Understanding the levels of residue that minimize the risk of AMR in the environment Development of rapid methods for detection of AMR genes / pathogens High throughput screening assays | |
| | Assess impact of antimicrobials on human and animal microbiome | CSIR, ICAR, veterinary institutes | 3 years | 5 crores | Infrastructure development for large scale microbiome sequencing studies in animals and humans Elucidate genome transcriptome, | AMR rich knowledge on human and animal microbiome Human resources with expertise in big data analysis |

| | Activity/ sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. Budget (existing/planned) (Rs. In Crores) | Output | Output indicator |
|----|--|---|-----------------|--|---|--|
| | | | | | metagenome, proteomic responses to antimicrobial agents in microbiomes Establishment of Center for Microbiome studies Observational, longitudinal studies in humans analysing the impact of antimicrobial usage on the human microbiome | Catalogue of microbial impact /responsiveness against different type of antibiotics / antimicrobial agents State of art of infrastructure - Center for microbiome studies for basic and applied sciences Recommendations on antibiotic usage vis-s-vis microbiome preservation |
| d. | Create unified fund for research and innovation | | | | | |

| | Activity/ sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. Budget (existing/planned) (Rs. In Crores) | Output | Output indicator |
|--|--|---|-----------------|--|--|--|
| | Create unified fund for research and innovation | Industry, Foundations, BIRAC, NBM, NMITLI, RSC | 3 years | 200 Cr | Identification of thrust areas for funding research in AMR, including well defined Target Product Profiles and product differentiation Collaborations with global agencies such as CARB-X | Fund created and ready to deploy R&D project /proposals for innovative AMR solutions |

Strategic objective 6: Strengthen Governance, Coordination and collaborations on AMR

Sub-objective 6.1: Strengthen Governance and Coordination mechanisms for AMR Containment

| | Activity/ sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. Budget (existing/planned) (Rs in Crores) | Output | Output indicator |
|--|---------------------------------|---|-----------------|---|---------------|-------------------------|
|--|---------------------------------|---|-----------------|---|---------------|-------------------------|

| Identify activities on AMR requiring multidisciplinary /multi-departmental coordination within each sector and develop agenda for sectoral coordination | | | | | | |
|--|---|---|-------------|---------|--|--|
| | Lab capacity strengthening and AMR surveillance activities requiring multidisciplinary /multi-departmental coordination | ICMR, ICAR, PCB,FAO, Animal, environmental sectors | 3 – 5 Year | 30 – 50 | <ul style="list-style-type: none"> Establishment of Centre of Excellence for AMR to undertake research and development in the field Establishment of CSIR AMR One health surveillance system | Dedicated centre for AMR Excellence for research and solutions |
| b | Identify activities on AMR requiring intersectoral coordination and develop agenda for inter-sectoral coordination | | | | | |
| | Coordination of AMR surveillance across sectors | Local and state approvals, line ministries for sample access points | 3 to 5 year | 30- 50 | Establishment of AMR One health surveillance system | Surveillance data across sectors |

6.2. Strengthen International, National and sub-national collaborations to tackle AMR

| Activity/ sub-activities | Other stakeholders | Timeline | Approx. Budget (existing/planned) | Output | Output indicator |
|--------------------------|--------------------|----------|-----------------------------------|--------|------------------|
|--------------------------|--------------------|----------|-----------------------------------|--------|------------------|

| | | proposed to be involved | | (Rs in Crores) | | |
|---|---|--|---------|----------------|---|------------------------------|
| a | Strengthen India's commitment and leadership on AMR | | | | | |
| | Review India's existing international collaborations on AMR | CSIR, ICMR, MoH, DBT, CSIR, DST, state governments | 1 year | - | Collaborations identified for strengthening or renewing | International collaborations |
| | Identify priority areas of action to strengthen coordination with other countries | ICMR, MoH | 2 years | - | Priority areas identified to reduce the spread of AMR between countries | Report/White paper |

Name of the Department/organisation: Department of Science and Technology (DST)

Strategic objective 5: Research and Innovation

- Through "Therapeutic Chemicals" program of the Technology Development and Transfer (TDT) Division, DST has launched a call for proposals to create Centers in the following identified areas, with reasonable geographical spread in the country.
 - Multipronged approaches focused on "Leads to Pre-clinical studies with I.P. potential".
 - New formulations of existing antibiotics.
 - Pathogen microbiology including a focus on host-derived targets and therapies.
 - Diagnostics, devices and the scope of development of POC devices for clinical settings.

ANNEXURE F: MINISTRY OF CHEMICAL AND FERTILIZER

Name of the Department/organisation: Department of Pharmaceuticals (DoP)

Strategic objective 1: Improve awareness and understanding of AMR through effective communication, education and training

- 1.1.c. Engage industry in promoting education, awareness about AMR
- 1.2.a. All NIPERs to implement teaching modules related to AMR within the course curriculum of students
- 1.2.b. NIPERs to organise short term courses and workshops for AMR.

Strategic objective 2: Strengthen laboratory capacity for AMR

- 2.3.b. All the NIPERs labs to be upgraded to research labs by Department of Health Research (DHR) under One Health scheme to strengthen the AMR/research activities

Strategic objective 3: Strengthen Infection Prevention and Control

- 3.3.a. Engage industry in promoting adherence to environmental and other norms in manufacturing antimicrobials
- 3.3.b. Create an inter-ministerial group for developing pathways for safe and effective disposal of expired antimicrobials (pertaining to both human and animal sectors) encompassing the entire supply chain (manufacturer, stockists, retailers, health care professionals facilities, etc.) and local administration in a given geography

Strategic objective 4: Optimize the use of antimicrobial agents in humans, animals and food

- 4.2.a. Department of Pharmaceuticals to support in getting Antimicrobial consumption data in the country through the sales data collated by Pharmarack
- 4.2.b. Engage industry in promoting rational sale/use of antibiotics

Strategic objective 5: Promote Research and innovations

- 5.1.a. New Scheme introduced by DoP (duration 5 yrs) for Promotion of Research and Innovation in Pharma MedTech Sector through Gazette notification on 17th August 2023
- **Component A (outlay Rs 700 Cr):** 7 Centre of excellence to be set up at NIPERs CoE for Anti-viral & Anti-Bacterial Drug Discovery & Development
 - **Component B (Outlay Rs 4250 Cr):** Providing financial support to the companies for research in six priority areas which includes AMR
 - Engage industry in promoting R & D
 - NIPERs to conduct research in AMR
- 5.1.c. Develop antibiotic consumption data by collating inputs on its sales (from DoP), production/imports (from CDSCO) and use/consumption in public/private sectors [from ICMR/NCDC/DGHS (for human health), ICAR (for animal health)] in research mode

ANNEXURE G: OTHER MINISTRIES/DEPARTMENTS

Ministry of AYUSH

Strategic objective 5: Promote Research and innovations

Sub-objective 5.1: Identify priorities for basic and operational research relevant to AMR in all sectors

| | Activity/sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. Budget (existing/planned) (Rs in Crores) | Output | Output indicator |
|--|---|--|----------|--|---------------------------------|------------------|
| | <p>Define research priorities and develop funded research agenda for AMR innovations in diagnostics (including Point of Care tests), antimicrobials, alternatives to infectious disease management, ethno-veterinary medications, vaccines</p> <p>Preclinical experimental studies to identify potential Ayush drugs as stand - alone against prevalent bacterial strains in humans and animals</p> <p>i. Evaluation of antimicrobial, anti-oxidant</p> | | 2 Years | Within existing budget of the | Antimicrobial, anti-oxidant and | |

| | Activity/sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. Budget (existing/planned) (Rs in Crores) | Output | Output indicator |
|--|--|--|-------------------------------|---|---|--|
| | <p>and immuno-modulatory properties of selected Ayush formulations</p> <p>Mechanistic and Preclinical experimental studies to explore the efficacy of potential Ayush drugs against Anti-microbial resistant strains prevalent in humans and animals</p> <p>ii. Combination approach of Ayurvedic and conventional antibacterial drugs to overcome Antimicrobial resistance in methicillin-resistant Staphylococcus aureus</p> <p>iii. Screening of Ayurvedic formulations for Antimicrobial activity against isolated MDR and growth promotion activity of gut microbiota</p> | | <p>2 Years</p> <p>2 Years</p> | <p>Ministry of Ayush</p> <p>Within existing budget of the Ministry of Ayush</p> | <p>immuno-modulatory properties of Ayush drugs</p> <p>Pre-clinical leads on efficacy of methicillin-resistant Staphylococcus aureus</p> <p>Dual potential of Ayurvedic formulations</p> | <p>In-Vitro studies on different bacterial strains</p> <p>In-Vitro and In-Silico activities</p> <p>In-vitro evaluation Gut micro-biota study</p> |

| | Activity/sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. Budget (existing/planned) (Rs in Crores) | Output | Output indicator |
|--|--|--|----------|--|--|--|
| | <p>iv. Efficacy of Ayurvedic drugs- Bilvadigulika, Rajat Bhasma, Shankha Bhasma and Sanjivani vati in anti-microbial resistance</p> <p>Clinical exploration of potential leads from Pre-Clinical studies in developing approaches for various common human and veterinary diseases caused by the anti-microbial resistant strains</p> <p>(i) Ayurvedic formulations for clinical and sub-clinical mastitis in cattle</p> | | 3 Years | | Alternative stand alone and adjuvant therapeutic approach in drug-resistant gut microbes to establish potent treatment modality to combat against anti-microbial resistance. | Effect on drug-resistant gut microbes Mechanistic study |
| | | | 3 years | Within existing budget of the Ministry of Ayush | Reduced dependence on Antibiotics for mastitis in cattles | Efficacy of Ayurveda interventions in early recovery |

| | Activity/sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. Budget (existing/planned) (Rs in Crores) | Output | Output indicator |
|--|---|--|-----------|--|--|---|
| | (ii) Ayurvedic formulations on Mixed infection in Poultry | | 2 years | Within existing budget of the Ministry of Ayush | Green and safe poultry production | Gut health, immunity and meat quality in broiler chicken and broiler under <i>Eimeria</i> mixed infection |
| | (iii) Coccidia Eimeria tenella infection in domestic chicken (<i>Gallus gallus domesticus</i>) | | 1.5 years | Within existing budget of the Ministry of Ayush | Anti-coccidial potential of <i>Kutaja</i> (<i>Holarthena antidysenterica</i>) bark extract | Early recovery with adjuvant or stand alone Ayurveda intervention |
| | (iv) Calf diarrhea | | 2.5 years | Within existing budget of the Ministry of Ayush | Control and management of calf diarrhoea with novel antidiarrhoeal polyherbal formulation (APHF) | Early recovery of calf diarrhoea |
| | Exploring potential of Ayush drugs in effective treatment of | | 2.5 Years | Within existing budget of the Ministry of Ayush | Potential of Ayush drugs as solution to | |

| | Activity/sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. Budget (existing/planned) (Rs in Crores) | Output | Output indicator |
|--|--|---|-------------------------------|---|---------------------------------------|--|
| | <p>water sources against multi-drug resistant bacteria</p> <p>Identification of potent anti-microbial compounds from medicinal plants against multi-drug resistant bacteria isolated from different water sources in Jhansi district.</p> <p>Exploration of Unani formulations against drug-sensitive and MDR-TB as an adjunct to ATT treatment.</p> <p>Combating antimicrobial resistance through <i>Afavia</i> (spices used in Unani medicine) in medically important ESKAPE pathogens - mechanistic exploration.</p> | | <p>3 Years</p> <p>3 Years</p> | <p>Within the plan budget of CCRUM, Ministry of Ayush</p> <p>Within the plan budget of CCRUM, Ministry of Ayush</p> | <p>MDR contaminated water sources</p> | <p>Isolation and identification of MDR bacteria from different water sources in Jhansi</p> |

| | Activity/sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. Budget (existing/planned) (Rs in Crores) | Output | Output indicator |
|--|--|---|-----------------|---|---|---|
| | Combating antimicrobial resistance through identified Unani formulations in medically important ESKAPE pathogens – mechanistic exploration | | 3 Years | Within the plan budget of CCRUM, Ministry of Ayush | Antimicrobial, anti-oxidant and immuno-modulatory properties of Ayush drugs | In-Vitro studies on different bacterial strains |

India AMR Innovation Hub

Strategic objective 5: Promote Research and innovations

Sub-objective 5.1: Identify priorities for basic and operational research relevant to AMR in all sectors

| | Activity/indicative sub-activities | Other stakeholders proposed to be involved | Time line | Approx. Budget (existing/planned) (Rs. In Crores) | Output | Output indicator |
|----|--|---|------------|---|---|--|
| a. | Define research priorities and develop funded research agenda for AMR innovations in diagnostics (including Point of Care tests), antimicrobials, alternatives to infectious disease management, ethno-veterinary medications, vaccines | | | | | |
| | <p>Establish a dedicated Innovation Arm for NAP 2.0</p> <p>Develop and implement sectoral innovation platform on AMR involving research institutions, industry and start-ups in the country</p> | <p>Public Sector (DBT/DST/ICMR/ICAR/etc.) & Private Sector (Tata Group, Private hospital affiliated/etc.)</p> <p>Research Institutes, Start-ups, Non-Govt agencies, Foundations</p> | 3-6 months | | <p>Build a national-level innovation platform</p> <p><u>Vision:</u></p> <p>Enabling targeted innovative solutions for India's top-10 AMR challenges, across the Human, Agri/Animal, and Environment (One Health) for India and</p> | <p>Prioritized Problem statements for seeking innovations</p> <p>Opportunities in engaging the research institutes to further the national AMR mandate</p> |

| | Activity/indicative sub-activities | Other stakeholders proposed to be involved | Time line | Approx. Budget (existing/planned) (Rs. In Crores) | Output | Output indicator |
|--|---|---|------------------|--|---|---|
| | | | | | <p>beyond, during the period of NAP 2.0.</p> <p>Understanding the innovation-focus output in AMR emerging from research institutions/start-ups.</p> <p>Understanding the existing infrastructure and expertise that can be leveraged in partnership with the academic institutions.</p> | |
| | <u>Proposed Roadmap and Process:</u> | | 3-6 months | | <p><u>Mission:</u></p> <p>The Mission of the IAIH-India AMR</p> | Launch of India AMR Grand Challenges specific calls |

| | Activity/indicative sub-activities | Other stakeholders proposed to be involved | Time line | Approx. Budget (existing/planned) (Rs. In Crores) | Output | Output indicator |
|--|--|---|------------------|--|---|-------------------------|
| | <p>India AMR Grand Challenges programme will aim to identify and support promising mid- and near-ready solutions for top AMR challenges in India and fast-track their development, validation, and readiness level to enable their implementation and deployment through the convergent IAIH networks</p> <p>Step-1. Identification of Top-10 AMR challenges, which are prevalent in India.</p> <p>Step-2. Prioritizing these challenges and seeking innovative solutions through the ‘India AMR Grand Challenge Programme’.</p> | | | | Grand Challenges is to collectively bring the required innovations to address the challenge of AMR by leveraging the collective expertise, resources, and networks of India’s vibrant Innovation Ecosystem. | |

| | Activity/indicative sub-activities | Other stakeholders proposed to be involved | Time line | Approx. Budget (existing/planned) (Rs. In Crores) | Output | Output indicator |
|--|---|---|------------------|--|---------------|-------------------------|
| | <p>Step-3. Raising investments and funds to support AMR-focused innovations.</p> <p>Step-4. Hand-holding innovations across different stages of readiness levels.</p> <p>Step-5. Enable deployment and integration of the most promising AMR innovations.</p> <p>Working with Identifying areas of expertise, infrastructure, accreditations, implementation networks etc. that can be leveraged to address the AMR challenge</p> | | | | | |

| | Activity/ sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. Budget (existing/planned) (Rs in Crores) | Output | Output indicator |
|-----------|---|---|-----------------|---|--|--|
| b. | Encourage and fund research for evidence-informed policymaking | | | | | |
| | Raise funds for innovative solutions against AMR | National and international partners to raise funds for innovative solutions addressing India's AMR Challenges across One Health | 3-5 yrs | | At least 3-5 Funding Programmes for India AMR Grand Challenges | Funding for translational and innovative solutions to academic researchers, start-ups and industry |
| | Innovative solutions for measuring quantum and impact of AMR in food chain on human and animal health in Indian context | Indian Federation of Animal Health (INFAH) Companies, World Organization for Animal Health (WOAH), etc. | | | Understanding the challenges in farm animal health and management, with focus on AMR | Prioritizing problem areas that can be addressed by innovations for infection prevention & control, diagnosis & detection, therapeutics, and surveillance. |

| | Activity/ sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. Budget (existing/planned) (Rs in Crores) | Output | Output indicator |
|--|---|---|-----------------|---|--|---|
| | Innovative solutions for defining standards of AMR in environment which pose risk of emergence of AMR (for effluents of pharma and healthcare facilities) in Indian context | Indian Pharma Association, Medical Association of India, Association of Healthcare Providers (India), Association of Private Hospitals, non profits like Centre for Science & Environment (CSE), etc. SBIF, CARB-X | 3-4 years | 15 Cr | Understanding the crucial areas in the environment that lead to AMR affecting Human and Animal health Understanding the standards available/developed/developing for detecting antimicrobial traces in the environment, resistant pathogens, etc. in environmental samples. | India AMR Grand Challenge focused on AMR in Human Health with focus on specific problem areas across 2-3 calls. |

| | Activity/ sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. Budget (existing/planned) (Rs in Crores) | Output | Output indicator |
|-----------|--|---|-----------------|---|--|--|
| c. | Coordinate, fund and pilot operational research projects in humans, animals, fisheries, food and environment sectors with respect to Indian context | | | | | |
| | Innovative solutions for understanding transmission pathways of AMR across sectors | | | | Stakeholder consultation & prioritizing problem areas for innovation-centric interventions | Piloting innovations in specific domains for assessment of technical efficiency and primary assessment of potential transmission pathways of AMR |
| | Innovative solutions to assess risk of AMR in environment on human and animal health | State Health Departments, Indian Pharma Association, Medical Association of India, Association of Healthcare Providers (India), Association of Private Hospitals, non-profits like Centre for Science & | | | -NA- | |

| | Activity/ sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. Budget (existing/planned) (Rs in Crores) | Output | Output indicator |
|--|---|--|-----------------|---|--|---|
| | | Environment (CSE), etc., Indian Federation of Animal Health (INFAH) Companies, World Organization for Animal Health (WOAH), etc, | | | | |
| | Innovative solutions to manage effluents (from healthcare facilities and pharma industry) to minimise risk of antimicrobial residues, AMR pathogens and genes | GAMRIF | 3-4 years | 50 Cr | Stakeholder consultation & prioritizing problem areas for innovation-centric interventions | India AMR Grand Challenge focused on AMR in the Environment on specific problem areas across 2-3 calls. |
| | Develop innovative solutions for standardised indigenous testing methods for detection of AMR and ARs in the environmental pathways | Non-govt. partners in animal health, fisheries and environment | 3-4 years | | Stakeholder consultation & prioritizing problem areas for innovation- | India AMR Grand Challenge focused on One Health with focus on specific |

| | Activity/ sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. Budget (existing/planned) (Rs in Crores) | Output | Output indicator |
|-----------|--|---|-----------------|---|---|--|
| | | SBIF, State-level/City-level AMR focused projects | | | centric interventions | problem areas across 2-3 calls. |
| d. | Create unified fund for research and innovation | | | | | |
| | Create an Innovation Fund under the IAIH, an Innovation arm of NAP 2.0, to support indigenous innovative solutions that address the challenge of AMR across the One Health domains. Over 5 years, this aims to support and enable innovative solutions for identified/prioritised top-10 AMR problems in India, across the One Health spectrum. This will be achieved by aligning organisational mandates, and | GAMRIF, SBIF, CARB-X | 5 years | 60 Cr | Discussion and mandate alignment with leading global and non-government national funding partners | Rs. 60-75 Cr Fund for supporting AMR Innovations across the One Health spectrum. |

| | Activity/ sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. Budget (existing/planned) (Rs in Crores) | Output | Output indicator |
|--|---|--|----------|--|--------|------------------|
| | by networking and leveraging resources from different international and domestic agencies | | | | | |

Strategic objective 6: Strengthen Governance, Coordination and collaborations on AMR

Sub-objective 6.1: Strengthen Governance and Coordination mechanisms for AMR Containment

| | Activity/sub-activities | Other stakeholders proposed to be involved | Time line | Approx. Budget (existing/planned) (Rs. In Crores) | Output | Output indicator |
|-----------|--|---|------------------|---|--|---|
| a. | Identify activities on AMR requiring multidisciplinary/multi-departmental coordination within the sector and develop agenda for sectoral coordination | | | | | |
| | The National Institute of One Health (NIOH) under the National One Health Mission (NOHM) will be taking up the R&D issues related to AMR. | Departments having functional units at NIOH (ICMR, NCDC, ICAR, DAHD, MOEFCC, DBT, DoP/NIPER, CSIR and DST | 6 months- 5years | | <ul style="list-style-type: none"> R&D priorities for AMR identified projects focused on AMR funded by NIOH | Number of projects funded for R&D on AMR issues by NIOH |

| b. Identify activities on AMR requiring inter-sectoral coordination and develop agenda for inter-sectoral coordination | | | | | | |
|---|---|---|--|---|--|--|
| | Coordination of AMR surveillance across sectors | <p>The integrated surveillance approach under the One Health Mission can be leveraged for surveillance of AMR. The specific activities are-</p> <ul style="list-style-type: none"> • Develop frameworks for conducting integrated surveillance across human, animal and environmental sectors • Optimizing the Assays for environmental surveillance • Setting up the surveillance sites across geographies (pilots) | <p>Stakeholders of NOHM</p> <p>(PSA office, MoHFW, DHR, NCDC, DAHD, ICAR, MoEF&CC, DBT, CSIR, DST, Dept. of Pharmaceuticals (DoP), NDMA, AYUSH and DRDO)</p> | <ul style="list-style-type: none"> • Development of Frameworks- Six months • Optimizing assays 6-12 months • Setting surveillance pilots (6-12 months) | | |

Sub-objective 6.2: Strengthen International, national and sub-national collaborations to tackle AMR

| | Activity/indicative sub-activities | Other stakeholders proposed to be involved | Timeline | Approx. Budget (existing/planned) | Output | Output indicator |
|-----------|---|--|-----------------|--|---|---|
| a. | Strengthen India's commitment and leadership on AMR | | | | | |
| | Identify priority areas of action to strengthen coordination with other countries | An International network of One Health Institutes is proposed under NOHM. This network will be closely plugged into respective national priorities and also be aligned with the Global Agenda on One Health. | 6-8 months | Existing | A network of OH (One Health) institutes which works collaboratively on common areas of interest | <ul style="list-style-type: none"> • Bilateral/Multilateral discussions on OH issues • Collaborative R&D projects |

Ministry of Jal Shakti

- Promoting Water Sanitation and hygiene in the community, leverage swachhagrahis under Swachh Bharat Mission for IPC activities
- Spread awareness on AMR and for adopting behaviors of safe sanitation as per guidelines of Swachh Bharat Mission Grameen Phase 2.0.
- States to ensure orientation of frontline workers on use of protective gears while delivery of sanitation and hygiene services
- Water surveillance to control bacterial contamination by coliforms and maintain chlorine levels in water

Ministry of Food Processing Industries

- Improve awareness and understanding on AMR: to be done through industries and associations

Ministry of Information & Broadcasting

- Develop adaptive IEC material and its dissemination for improving AMR related issues in collaboration with other stakeholders
- Design a campaign programme for awareness on AMR
- AMR Behavior change communication strategy to be developed covering period upto 2027 as phase 1 [self-help groups, cooperatives, Panchayati Raj Institutions (PRIs)], phase 2 (2027-29) to be developed based on leanings and experience during phase 1
- Media unit (I & B cell) , MoHFW to be the repository nodal points for IEC/BCC strategy

- NCDC and I & B cell to work together for developing the scientific content, BCC material be developed in all Indian languages. IEC material to be developed as easily understandable messages
- Develop AMR citizen charter on what an individual citizen can do to counter AMR

Ministry of Education

- Dept. of School Education & Learning:
 - Designing a learning module for teachers with respect to AMR, upload it on NISHTHA portal and sharing materials with NCERT (National Council of Educational Research and Training)
 - Embed syllabus on AMR in the curriculum in a graded manner
 - Create awareness regarding AMR among schoolchildren, their parents and teachers during regular events such as health check-ups etc.

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World Health Organisation

81. Dr. Roderico H. Ofrin, WHO Representative to India, World Health Organization (WHO) Country Office for India
82. Dr. Anuj Sharma, NPO (AMR and Labs), World Health Organization (WHO) Country Office for India

B. List of participants of series of National Consultations held towards development of NAP AMR 2.0 may be seen in the compiled report of consultations: link of the compiled report is placed below

<https://ncdc.mohfw.gov.in/wp-content/uploads/2024/05/Compiled-report-of-National-Expert-Consultations-for-developing-National-Action-Plan-on-Antimicrobial-Resistance-2.0.pdf>

**Ministry of Health & Family Welfare
Government of India**