



Inputs for the drafting of the National Action Plan on AMR (2022-27)

Anchored by

Centre for Cellular & Molecular Platforms (C-CAMP)

Bengaluru

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Disclaimer:

The document reflects the opinions, perspectives, and conclusions of invited stakeholders and partners from the Indian AMR ecosystem, associated with the India AMR Innovation Hub (IAIH), to the Indian National Action Plan (NAP) 2017-22 for antimicrobial resistance (AMR). The document, however, does not claim to be an exhaustive representation of the topics mentioned in the document. The views will likely evolve further as the discussion and participation continue to expand on this very important public health challenge.

The opinions, perspectives, and conclusions provided in the document are drawn from inputs received from the domain experts who participated in this initiative. However, it does not explicitly imply the opinion of all partners and stakeholders mentioned in the document. The document is not prescriptive; however, it is hoped that it will serve as a good reference for agencies and individuals engaged in the drafting of the NAP for the next five-year period, 2022-27.

Inputs for the drafting of the National Action Plan 2022-27

conceptualized, and compiled by

The India AMR Innovation Hub (IAIH)

- **Intent of the Report**

To consolidate inputs on the National Action Plan (2017-22) from IAIH partners and other stakeholders with the view to contributing to the drafting of the country's next 5 Year NAP on AMR (2022-27).

- **Scope of the Report**

The document brings together key insights, perspectives, and opinions of stakeholders working on different aspects of AMR in the country. Their inputs, in the document, are a distillation of their learnings and experience from their respective domains and are not reviews or critiques of the first NAP on AMR 2017-22. The review of the present NAP (2017-22) has been undertaken by authorized agencies and has not been duplicated here. This document is intended to complement the initiative by communicating with a wider stakeholder and partner network.

- **Brief Background**

In 2017, India released its very own National Action Plan against Antimicrobial Resistance (AMR) for a period of 5 years (2017-22). The NAP is an exhaustive document that covers six strategic priorities. The document also covers key focus areas within each of these priorities along with strategic interventions and activities which could enable the intent to be put to action, to create the perceived impact. The NAP also suggests stakeholders, partners, and networks in the public sector that are present in the specific areas, and those who need to collaborate and converge to create a comprehensive plan for action.

As the first five-year period of the NAP comes to an end, it is important to assess the progress made in the strategic prioritized areas, as had been envisioned in the document. As the challenges posed by AMR continue to grow unabated globally, but more so in India and other emerging economies, it is imperative to take stock of the aspects which did not progress as planned, the reasons behind it, and the action that will enable its course-correction. Equally important is to take a birds-eye view of the other confounders and operational bottlenecks that need to be highlighted

and addressed to pre-empt possible obstacles and to design an appropriate contingency plan for the same.

It is crucial to ensure that the next five-year period of the NAP further accelerates the collective momentum that we have gathered in our fight against AMR and further delivers specific interventions, policies, and frameworks to curb its further escalation. The NAP for 2022-27, or NAP 2.0, should incorporate and leverage the collective experience and wisdom of the AMR stakeholders and agencies working in India. This document aims to be a convergence of inputs towards the NAP 2.0 from across different domains.

The report is a collation of these inputs and contains collective insights of AMR stakeholders and partners associated with the IAIH. The report is not an exhaustive document but attempts to cover largely most of the strategic and operational aspects of the NAP.

- **Methodology**

The framework of the survey was co-developed by the C-CAMP IAIH Team in consultation with the IAIH members. The members subsequently shared their domain-specific inputs which have been compiled and collated. The detailed report brings forward the key highlights and elaborates on this further for clarity.

- **About IAIH**

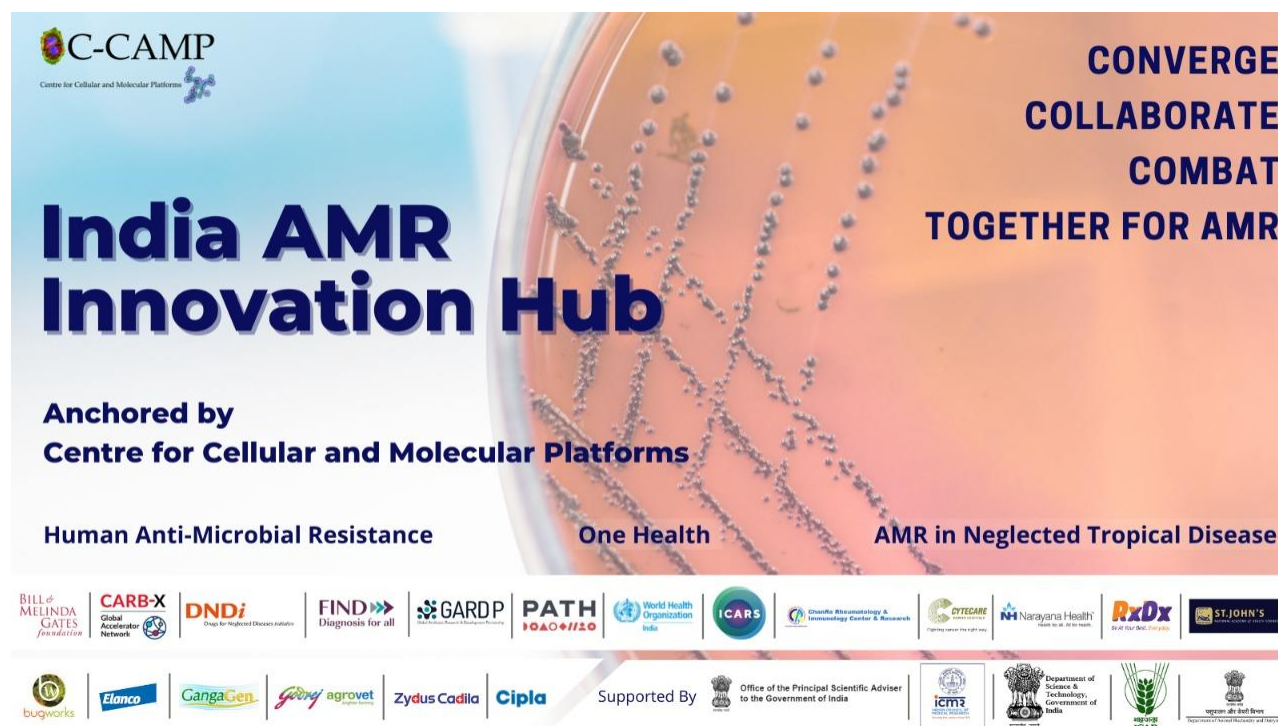
Antimicrobial resistance (AMR) has been identified by WHO as one of the top ten global healthcare threats with projected mortality of 10 million deaths per year by 2050, of which 2 million deaths will be in India alone. At current rates, AMR is estimated to cause 100 trillion USD in global economic losses and 444 million deaths by 2050.

According to a recent report in The Lancet, drug-resistant infections killed 1.27 million people in 2019, more than many widely recognized causes of death, such as malaria and HIV/AIDs. A majority of these deaths were reported from sub-Saharan Africa and South Asia.

India is committed to addressing the grave Public Health Challenge posed by AMR and believes that this needs a multi-stakeholder and multipronged approach.

The Centre for Cellular and Molecular Platforms, C-CAMP, under the aegis of the Office of the Principal Scientific Adviser to the Government of India, has established the India AMR Innovation Hub – IAIH, a convergent platform of national and international stakeholders with a vision of bringing down the AMR burden in India by contributing to national efforts to tackle this global health challenge. These include government agencies, academia, industry, hospitals, start-ups, philanthropies, and non-profits, who bring diverse and deep expertise in various domains of AMR;

this brings a unique vantage to the IAIH to advance its efforts. The IAIH was officially launched in November 2021.




C-CAMP
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India AMR Innovation Hub

**CONVERGE
COLLABORATE
COMBAT
TOGETHER FOR AMR**

**Anchored by
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Human Anti-Microbial Resistance One Health AMR in Neglected Tropical Disease



IAIH priority areas are Human AMR, Human-Animal-Agriculture ecosystem interface (One Health Approach), AMR in the Environment, AMR Stewardship, and Surveillance & Public Health Preparedness. The IAIH offers a common platform to the stakeholders and partners from these fields to come together and comprehensively address the challenges of AMR, not in silos but with one another. The IAIH has already convened two meetings with its multi-sectoral members that have led to an agreement on the hub's priority focus areas, objectives and governance mechanisms, to begin with. It also concretized the commitment that the partners brought forth toward the successful execution of IAIH's mandate.

The Indian government agencies included those working on human health, animal health, the environment, and pharma. The non-government agencies included international agencies, international non-profits, philanthropies, industry, and hospitals.

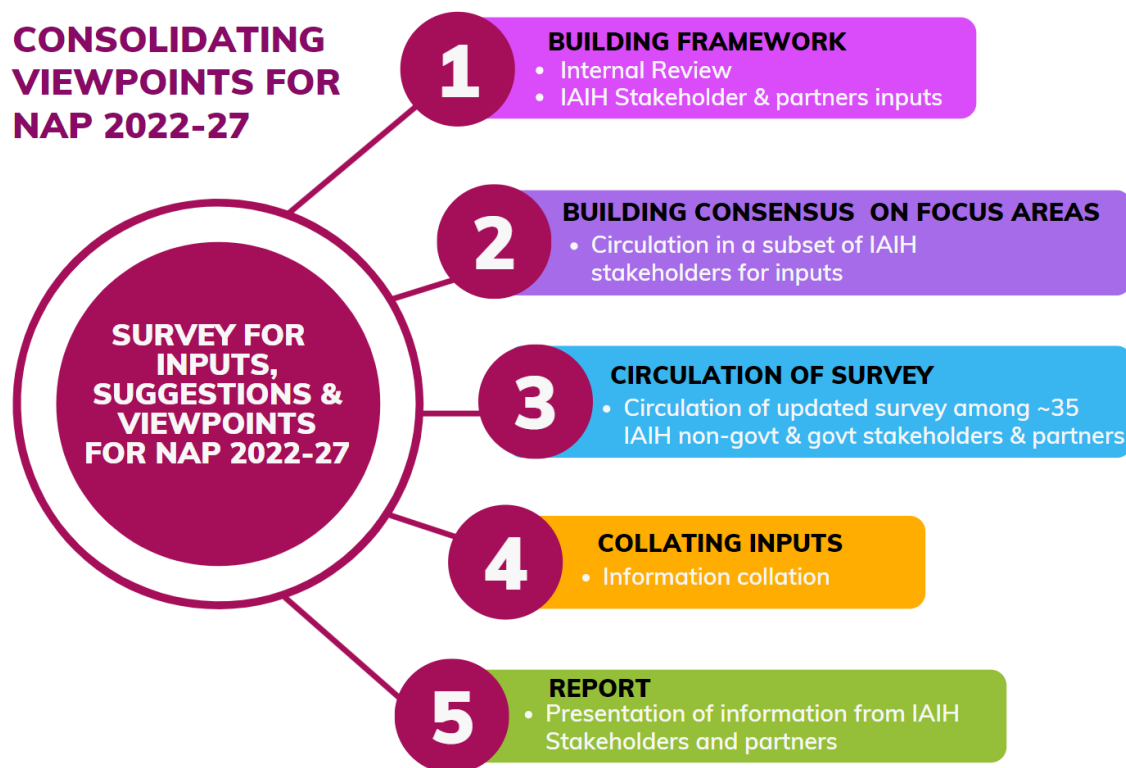


As its first activity, the IAIH had undertaken to bring stakeholders from different sectors onto a common platform to share their views, perspectives, and suggestions for contributing to the draft of the second National Action Plan (2022-27) while incorporating the experiences and lessons learned from the previous NAP.

• **Report in Detail**

The report is a compilation of the inputs provided by the IAIH stakeholders.

For this, the process followed has been depicted graphically:



The snapshots of the survey filled by the stakeholders are shown below:

Part 2: Strategic Inputs for National Action Plan-AMR

* Please suggest three conducive policy frameworks that can be put in place for effective implementation of the strategic priorities, and for scaling and sustaining the AMR focused efforts.

Suggestion 1:

Suggestion 2:

Suggestion 3:

* Please suggest three ways for funding and sustaining the activities envisioned in NAP.

Suggestion 1:

Suggestion 2:

Suggestion 3:

Part 3: Strategic Priorities of NAP

* Please select the Strategic Priority Area that relates most closely to your area of work and for which you would like to provide your inputs based on your expertise.

- Improve awareness and understanding of AMR through effective communication, education and training
- Strengthen knowledge and evidence through surveillance
- Reduce the incidence of infection through effective infection prevention and control
- Optimize the use of antimicrobial agents in health, animals and food

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Part 1: General Information
Part 2: Strategic Inputs for the National Action Plan
Part 3: Specific inputs on Strategic Priorities of NAP

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

Guide for filling the Survey

1. You can choose to give your inputs on all sections or only those within your area of work. However, **Part 1, Part 2 and Part 3.5 and 3.6 are mandatory.**
2. In Part 2-Strategic Inputs, we are looking at overall inputs and for Part 3-Strategic Priorities, we are seeking sector/intervention specific inputs.
3. Kindly provide references to best practices, models, frameworks, wherever possible.
4. The description of the Strategic Priorities, sub-objectives, and the intervention & activities are mentioned at the beginning of each section and are taken from the NAP (2017-21), however we encourage you to refer the NAP document available [here](#).

- **Key Highlights**

Inputs are divided into two segments:

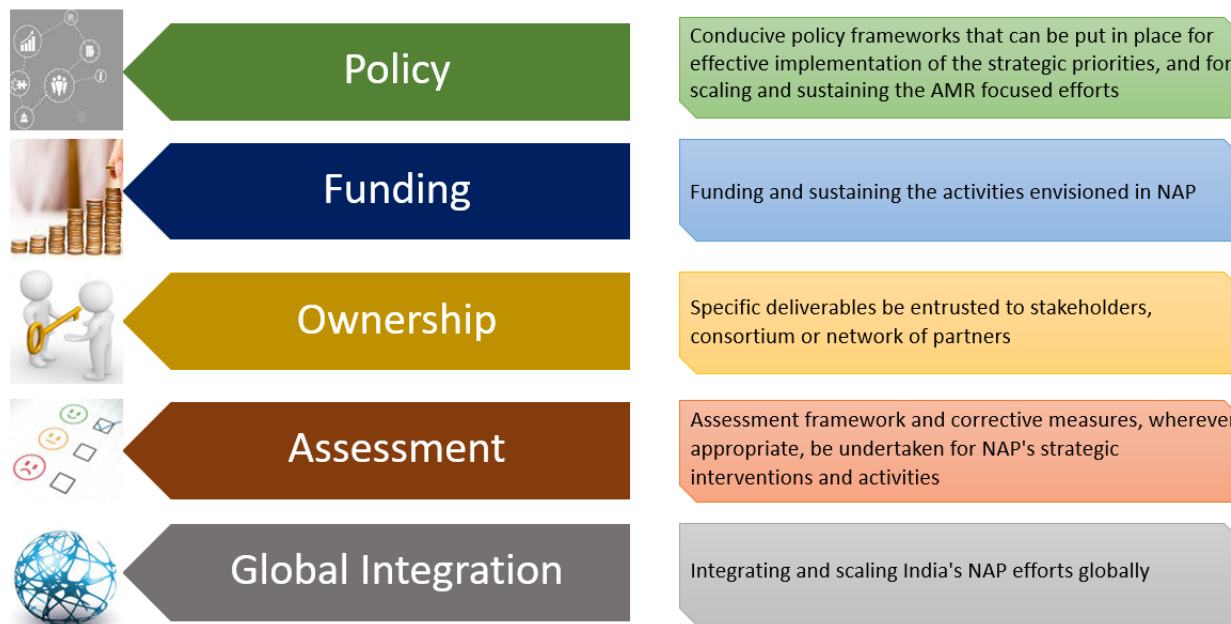
Strategic Inputs

Strategic Priorities

Strategic Inputs:

These include aspects that directly or indirectly influence the outcomes of the National Action Plan. This encompasses issues like stakeholder engagement and accountability, periodic assessment of the strategic priorities and intended outcomes, etc. These aspects are overarching and relevant to all the six strategic priorities of the NAP.

The Domains for the Strategic Inputs included the following:

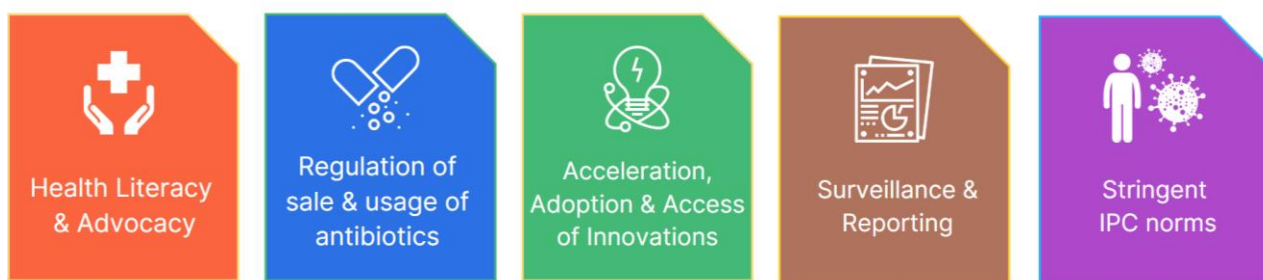


- **Key insights**

Policy Framework

A few areas, identified by the IAIH members, need a larger policy intervention for the success of the NAP for AMR.

It is highlighted that Human health, animal health, agriculture, fisheries, sanitation, and hygiene (a surrogate for the environment) are state subjects under the Indian constitution. Food is on the concurrent list. Therefore, State Action Plans for Containment of AMR are critical for action on the ground.



i) AMR Health Literacy & Advocacy

1. Regional Nodal Points may be constituted that would coordinate with state health departments to implement the NAP. These regional points or centers may be housed at Medical Colleges (Government or Private) or at Centers of Excellence (CoE) to drive a social and media campaign on AMR awareness (IEC) and BCC, over the duration of the AMR plan period.
2. The Office of PSA may setup a societal coalition for Public Health encompassing AMR through focused efforts to promote health literacy, especially through medical colleges and hospitals, etc. addressing the problem of AMR due to over-prescription of antibiotics for treatment of ailments that either do not require the usage of antibiotics or need in lower dosage, is crucial.
 - a. Antibiotic stewardship may be included in the curriculum in medical colleges, post-graduate medical training, nursing colleges, and in the training of Pharmacists to promote judicious use and distribution of antibiotics.
 - b. A new Clinical Infectious Disease module focused on AMR may be offered as a subspecialty for clinicians by NMC. It could also be made part of periodic professional development workshops or refresher courses for clinicians.
 - c. ICMR and other agencies could promote Short Term Research Grants in thematic areas of social aspects of AMR, focused on senior school and college students. This could be aimed at responsible usage of antibiotics.
 - d. State Health Universities may be engaged to formalize this curriculum for its students.

3. To strengthen awareness of AMR, connecting and empowering the society and advocacy groups to be part of the solution of reaching the masses with the requisite messaging. This can go a long way in decreasing the high demand for antibiotics by the patients, especially in conditions that do not require their usage.

ii) Regulation of sale & usage of antibiotics

The regulation on the sale of antibiotics without prescription has been regulated under Schedule X/H1 for many years, however, it has not translated into a lowering in antibiotics consumption. Strict implementation and monitoring guidelines need to be put in place at different levels of healthcare delivery.

In this regard, the following may be considered:

1. Pharmacies and licensed medical stores should dispense antibiotics against valid prescriptions from a registered healthcare provider only.
2. Antibiotics sale at pharmacies and antibiotic usage at healthcare facilities (public or private) should be documented and tracked through authorized agencies.
3. To limit the unnecessary prescription, and hence the usage of antibiotics in medical conditions that do not require them should be addressed by appropriate antimicrobial stewardship programs in hospitals. Clinics, etc. The impact of these programs in lowering consumption, especially for last-resort antibiotics, should be monitored periodically and reported.
4. The drug regulatory agencies should provide a special license for the sale of antibiotics/antimicrobial agents to restricted Pharmacies and licensed medical stores/distributors after validating their knowledge on antimicrobial resistance
5. Alternatively, a nationwide dedicated sales and distribution network may be created exclusively for antibiotics. From manufacturing to distribution should be tracked in real-time monitoring through a dedicated portal.

In the case of antibiotics used in animal husbandry:

1. The prophylactic use of antibiotics in livestock, either directly or through animal feeds, should be gradually phased out. The use of alternatives should be encouraged and incentivized.
2. The labeling of antibiotics in animal food and feed products should be disclosed prominently, wherever applicable.
3. The sale and consumption of antibiotics for livestock, should be regulated, monitored, and followed on through authorized agencies.
4. The unauthorized stocking of antibiotics should be penalized.

iii) Acceleration, Adoption & Access of AMR Innovations

AMR should leverage innovations in diagnostics and therapeutics from India's promising entrepreneurial ecosystem. However, this will be possible only when the introduction and

integration of these innovations is streamlined and fast-tracked to address the urgent needs at the level of the end-user.

The following may be considered:

1. New antibiotics need regulatory facilitation to be introduced in new geographies and for newer indications.
2. The procurement methods for access to affordable new antibiotics need to be streamlined.
3. Research, development, and access to alternatives to antibiotics should be incentivized and fast-tracked.
4. Stewardship through pooling demand and coordinating purchasing of low-volume drugs for resistance pathogen.
5. Research and Development to repurpose older antimicrobial therapeutics, vaccines etc. should be promoted.
6. New funding schemes should be introduced for basic biological research to understand antibiotic resistance in major microbial diseases, and for research on crucial topics like post-COVID-19 antimicrobial resistance risk due to overuse of antibiotics.
7. Permit rapid entry of new antibiotics through an accelerated pathway similar to drugs for cancer and rare disease with limited indications on the label.
8. Newer technologies and diagnostic capabilities should be integrated for informed clinical decision-making on Antibiotics usage for treatments by clinicians.
9. Clinical needs-assessment-centric acceleration plan is needed to accelerate AMR product development.

iv) Surveillance & Reporting

To enable structured surveillance of AMR and associated patterns pan-India, policy intervention mandating local and regional reporting from different centers will be important. For this, the following will be required:

1. Mandatory Country-wide surveillance at all levels of health care.
2. Harness In-house data on Microorganism, Sensitivity Patterns, and AMR.
3. Use of newer technologies to enhance the quality of surveillance data and features.
4. Integration of surveillance data collection in a hub-and-spoke model through public and private sector participation and coordination.
5. Mechanisms to enable the use of surveillance data as information to direct appropriate public health interventions.

v) Stringent Infection prevention & control (IPC) norms

For effectively introducing IPC at all levels of healthcare the following may be considered:

1. Include consideration of vaccine-preventable diseases and scale-up of immunization for support of AMR national plan objectives.

2. In Critical areas like ICU, burns wards look at the microbiome in effluents and see if contamination of local water bodies can be prevented.
3. Implement Antibiotic Stewardship, especially in patients with a prolonged hospital stay.
4. Special tax on companies deemed to be contributing to an increase in AMR.

Aside from the above, a systemic level integration of the State Specific Action Plans would be required. The different Indian states should consolidate their individual AMR-focused initiatives under the specific State Action Plans for AMR at a national level. This should be a multi-sectoral effort to share, collaborate and communicate to enhance collective outcomes.

The problem of AMR cuts across different disease areas and thus should be considered in the context of broader public health efforts, and not siloed as a separate disease vertical. The central and the state governments, along with their different agencies and divisions run various human and animal disease-focused programs that need to come under a common umbrella for an integrative approach to address the issues of AMR.

These can be enabled with the following:

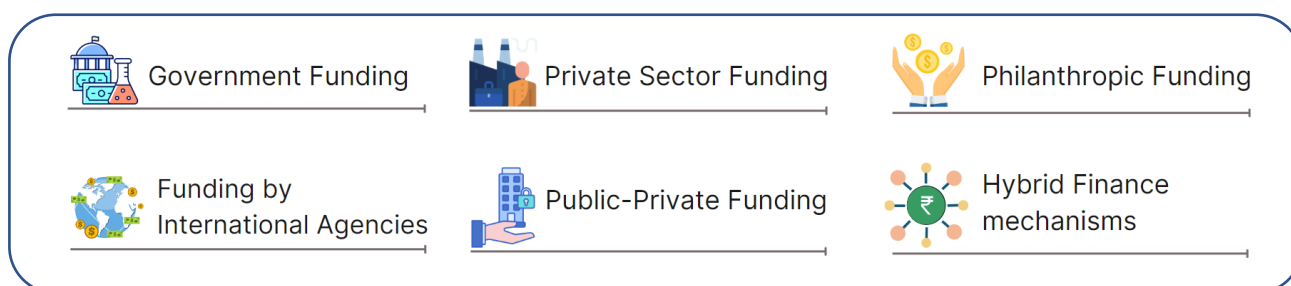
1. A strong leadership role by the Government to implement the One Health approach in tackling AMR on a mission mode across the states of India.
2. An effective and responsive multi-sectoral governance structure to ensure that the goal of preventing the emergence and spread of AMR in the context of One Health is achieved and sustained.
3. Regular interdisciplinary meetings between One Health ministries and joint follow up.
4. Six-monthly reviews of progress on NAP AMR at the national level with sharing of updates on the website.
5. The framework should have a time frame, of 3-5 years for implementation of activities with clearly identified year-wise priorities that are reported and tracked.
6. Budget allocation for joint activities for AMR.
7. The framework should be driven by real-world evidence and should be practically implementable.
8. Framework should work across the care continuum and include awareness, prevention, diagnostics, and treatment.
9. Emphasis should be on implementation of WHO guidelines within the stipulated timeframe and advocacy for a concerted global response to AMR.

Funding

The range of funding requirements in AMR span from R&D to awareness campaigns to assessment to antimicrobials at all levels of healthcare, and that too for a vast variety of priority pathogens and diseases identified by the WHO. The source of funding for such diverse activities also needs to be varied and thought through such that the collective efforts are coordinated, non-repetitive, and offer the best opportunity to utilize the available funds for the desired outcomes.

Multi-sectoral funding, with the potential for innovative financing, is an avenue that may be explored further. Furthermore, a separate funding structure should be formulated to support the timely completion of such projects.

Highlighting a few aspects:



i) Government Funding

Earmarking government funds towards the fulfillment of the NAP objectives would be required. In this context, the following can be considered:

1. An increased government spending on healthcare with opportunities for incentivizing R&D and innovations for AMR.
2. Funding could be considered through National Health Mission (NHM) for AMR in specific domains, like neonatal sepsis, etc. The health indicators and risk reversal trends can be monitored to assess outcomes.
3. Central government grant through DBT, DST, ICMR, and other agencies for Human AMR.
4. Funding for Environmental AMR through Food and Fertilizer dept.
5. An AMR fund can be constituted anchored by the Government of India for prioritizing and fulfilling NAP activities, under the National Health Mission, or other similar initiatives.

ii) Private Sector Funding

Many private sector initiatives currently are a single corporation based, or at best with a limited set of partners. There is scope to augment collective effort in this direction through cross-domain partnerships and alignments.

1. Funding of AMR-focused activities aligned to the NAP should be part of all pharma companies' CSR (to be listed in eligible themes for donation under the Companies Act or another relevant Act).
2. Clear regulation and guidelines from the Government would be beneficial in enabling a framework for aligning mandates between potential partners.
3. Private sector investment can be promoted in supporting the development of diagnostics, therapeutics, vaccines, health system improvement, and research and education about AMR across the public and private sector.
4. Avenues should be explored for leveraging CSR funding to develop a business case for social investment.
5. Pharma companies that have a strong AMR-focused program should be engaged in the design, development, and implementation of private sector-focused initiatives.

iii) Funding through International Agencies & Philanthropic organizations

1. Aligning funding mandates of International funding agencies and philanthropic organizations with the NAP can provide the much-needed impetus.
2. International foundations, non-profits, etc. should be engaged in co-developing and co-funding projects and programs in fulfillment of the NAP objectives.
3. Engaging in global partnerships with international agencies to access funding via international grant-making mechanisms should also be mobilized.

iv) Public-Private Joint Funding & Operations

1. Creating an AMR working group of relevant stakeholders including national and international government funding agencies and private donors in a way that enables the roll-out of RFPs for priority areas in AMR.
2. Increased partnership between academia and industry (pharma, biotech, laboratories) by identifying centers of excellence for AMR for antibiotic clinical trials.
3. Sharing of department budgets and outreach to donors in partnership between ministries and departments of One Health.
4. Having an AMR partners forum (like for vaccines) where international partners and govt. departments can meet and discuss progress six monthly.
5. Joint calls for implementation research and program activities with partners like ICARS.

v) Hybrid Finance mechanisms

Different financing models can be tried to raise capital and accelerate progress towards NAP for AMR:

1. De-risking late-stage failure by linking reward versus success to spur innovation in the biotech ecosystem
2. Taxes
3. Penalties/fines

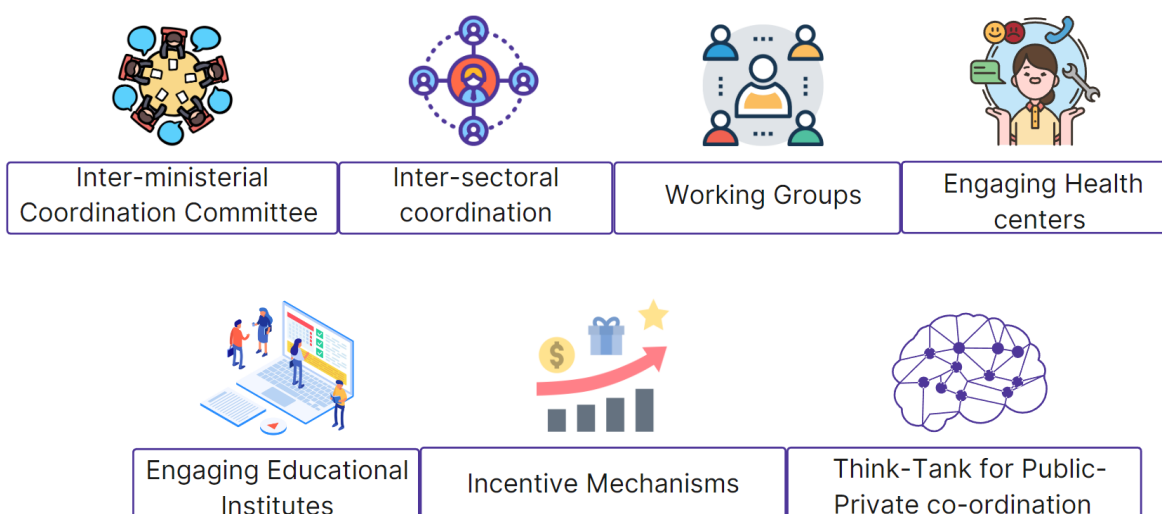
Ownership & Responsibilities

This has emerged from the need to de-centralize the working and outcomes of NAP objectives while leveraging collective expertise, infrastructure, and mandates.

Human health, animal health, agriculture, fisheries, sanitation, and hygiene (a surrogate for the environment) are state subjects, and therefore State Action Plans for Containment of AMR are critical for action on the ground.

A secretariat/AMR cell may be established at the state level, and an over-arching body could oversee the national efforts for AMR containment. A central coordinating body would be absolutely essential.

Stakeholder engagement for effective on-ground coordination is further detailed further:



i) Inter-ministerial Coordination Committee

1. Create an office of AMR at the Central and State government levels accountable for the coordination of activities across sectors.
2. Create public-private sector networks at the state level to oversee deliverables for the state-level action plans.
3. One Health Approach to be kept at the center of all AMR-focused activities.
4. Communication Plan between stakeholders and regular meetings at the highest level

ii) Inter-sectoral coordination

1. Teamwork with other stakeholders and collaboration.

2. Empower the biotech sector with responsible and timely funding coupled with education, networking, greater ownership.
3. Diagnostic companies to develop a suitable point of care diagnostics to indicate early use of appropriate antibiotics.
4. Joint partnership milestones between government. departments tied to funding dispensation within government budgets and partner budgets.
5. Presentation of progress between and individually by departments at AMR Partners Forum.
6. Including researchers, NGOs, and Civil society in the dialogue between national and state-level health, animal husbandry, environment, and food safety departments

iii) Working Groups

1. There has to be an owner of the National Action Plan with funds assigned.
2. All the major stakeholders should be signatories to the National Action Plan and assigned respective responsibilities.
3. Create decentralized (state level) working groups aligned with the NAP-AMR mission with clear timelines and consequences for non-compliance.
4. Formation of sub-working groups for each activity.
5. Continuous tracking implementation of progress by the stakeholders and partners towards the set deliverables.
6. A stringent monitoring and evaluation mechanism to be put in place.
7. Implementing a national program "Mission AMR" with clear accountabilities and responsibilities of key stakeholders other than Government Departments.
8. Identify relevant and specialist organizations in the government, private and non-government sectors and allocate responsibilities in their areas of interest.
9. Empower these partners to lead discussions with local and international partners to drive ownership - all within a common framework.
10. Developing the implementation plan for NAPs strategic interventions, establishing a monitoring framework with the role, responsibilities, and deliverables of partners identified.

iv) Engaging Health centers

1. Hospital accreditation processes need to be strengthened, and supportive funding/rating linked to implementation and reporting of HAI surveillance.
2. Antibiotic stewardship- made compulsory for all Hospitals, clinics, etc. monitored mandatorily by government or third-party ex NABH, JCI.
3. Make AMSP a key priority for hospitals by enforcing it as a quality measure.
4. Establishment of antibiotic stewardship policies in hospitals including mid-size nursing homes.

v) Engaging Educational Institutes

1. Involvement of the National Medical Commission and State Health Universities should be ensured.
2. Premier institutes in health at the regional level, ex. AIIMS, can spearhead activities in their footprint. The mandate for the same can be shared by the government.

3. Other medical colleges, ex. BMCRI, SJMCH, MSRMC, KIMS, etc. can join on similar lines as the consortium by RGUHS for Dengue Infection.
4. State Health Universities could also participate in conjunction with premier national institutes like IISc / NCBS / JNC SR etc.
5. Academia to develop infrastructure in a few clinical pharmacology departments for therapeutic drug monitoring of anti-infective drugs.

vi) Incentive

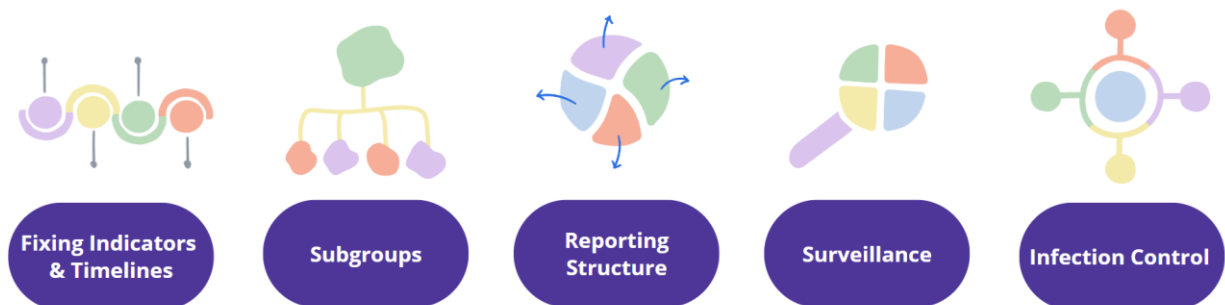
1. Developing an incentive-based tracking system to ensure ownership and accountability.
2. Rewards and recognition for the stakeholders upon completion of deliverables.

vii) Think-Tank for Public-Private co-ordination

1. Apex full-time team associated with Office of PSA to guide activities of IAIH
2. IAIH can hire dynamic individuals for proactive action on a regional basis.

Assessment Framework

Effective high-level taskforces formulated for each strategic priority and working across different levels of implementation of the NAP with appropriate stakeholders may be crucial. However, while drafting strategies, it is critical to understand the reasons for interventions that fail repeatedly in AMR in the past. Having specific reasons will help understand why the new proposals/recommendations/approach may work while past ones have failed, and why the current recommendations would make a difference.



i) Fixing Indicators & Timelines

1. Fixation of Smart Indicators and timelines.
2. Periodic review at the highest level and sharing of information across departments.
3. Annual monitoring by means of questionnaires i) project-specific M&E ii) programmatic M&E aligned to the strategic framework.
4. Templated assessments on a regular basis of the healthcare organizations, medical stores, etc.
5. Developing a comprehensive M&E Framework, that lay down the measures of success, and methods for measuring and validating the success of 6 strategic priorities. The existing Monitoring and Evaluation Framework exclusively focuses on tracking the progress of implementation of the National Action Plan.
6. Conducting quarterly internal reviews between One Health departments within the government.
7. Establishing clear goals over what should be achieved at the end of 5 years.
8. Specific, Measurable, achievable, reproducible/realistic/relevant, and Time-bound goals should be periodically reviewed.
9. Meet every 6 months to review the AMR situation globally and in India with the help of experts and identify issues for correction or modification.
10. Annual conference of NAP with states, and partners (local, international and national, and subnational) sharing learnings and challenges to find a way forward.
11. Policy level M&E around the implementation of national policies under NAP.
12. Collaborating, Learning, and Adapting approach for implementing NAPs strategic interventions.
13. Undertaking a situational analysis of the impact of strategic interventions and activities under the NAP (ideally every year) -understand the progress, and challenges, take corrective measures and update the way forward.
14. Each vertical to have its own M&E mechanism through a centralized third-party mechanism.

15. Empowering an independent think tank group (multi-specialty experts) to evaluate project progress and implement course correction in a timely manner.
16. Medical Colleges to be directed to do so by NMC at a prescribed frequency.

ii) Subgroups

1. Periodic meeting within the subgroup for specific deliverables.
2. Meeting across the stakeholders for an update from working subgroups.
3. Incentive-linked funding with clearly defined milestones and deliverables - robust framework for assessing progress and success

iii) Reporting Structure

1. MoHFW to issue instructions to all health services periodically as per a calendar.
2. Approach all major national healthcare organizations parallelly, the Railways, the Armed Forces, the Paramilitary Forces.
3. Monitor and measure the use of antimicrobials, particularly watch and reserve categories at all levels of care.
4. A quarterly newsletter to highlight the achievement/failure of each department.
5. Building transparency and openness in communication and knowledge exchange across sectors.

iv) Surveillance

1. Make surveillance a priority and use benchmarks for identification of quality of care at the hospital level.
2. Microbiological surveillance, development of antibiograms & execution of appropriate surveillance activities in identified high-risk areas.

v) Infection Control Measures

1. Include infection control as a basic requirement for all secondary and tertiary care centers with methods to measure adherence to IPC.
2. In Critical areas like ICU, burns wards look at the microbiome in effluents and see if contamination of local water bodies can be prevented.
3. Implement Antibiotic Stewardship, especially in patients with a prolonged hospital stay.

Scaling and Integrating India's efforts



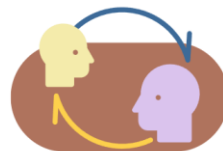
International Collaborations



Data Sharing & Aligning Efforts



Multi-lateral Dialogues



Communication Strategy



Initiatives

i) International Collaborations

1. India needs to establish its strong presence in global organizations/efforts/programs in the field of AMR for example (but not necessarily restricted to) - The Department of Global Coordination and Partnership (GCP) on Antimicrobial Resistance (AMR), Global Antibiotic Research and Development Partnership (GARDP), Global AMR R&D Hub, AMR Industry Alliance, AMR-Global.
2. State, national and international collaborations (e.g. UN, WHO, CDC, JCI) ETC.
3. Involvement and using the platform of the World Organization for Animal Health (WOAH) [formerly OIE], WHO, FAO, and UNEP.
4. Engaging with global forums such as the G20, WHO, and AMR Policy Forums.
5. Engage in global forums on AMR via agencies like WHO, CEPI, BMGF, FIND, PATH, etc.
6. Closer interactions and exchange of knowledge with bodies such as GARDP, DNDi, etc.
7. Partnering with international agencies like ICARs to share learnings, and challenges and brainstorm on practical solutions to tackle One Health at the field level.
8. Open up the forum to global stakeholders.
9. Collaborate with funding bodies such as AMR Action Fund, CARBx, etc to fund clinical trials in India of antibiotics in clinical development. Indian AMR fund could participate.
10. Foreign sister organizations.
11. Establish a group of experts from physicians, microbiologists, and scientists (both from industry and academia) who would collaborate with similar people across the world.

ii) Data Sharing & Aligning Efforts

1. Annual Conference on AMR with international partners to share progress, review and exchange ideas.
2. Timely dissemination at the national and regional levels.
3. Cooperation with the global scientific community in sharing local AMR information and brainstorming on solutions.
4. Partnering with other LMICs and UMIC governments to create shared knowledge and solutions and create regional centers of excellence for AMR solutions.
5. India can steer AMR efforts across the Indian subcontinent to scale up interventional solutions and leverage our huge manufacturing capacity for drugs and vaccines.

6. India needs to play a global leadership role with contextual data and evidence from our country.
7. Align/benchmark with global efforts.
8. Take a leaf out of our coordinated efforts to have delivered 175 crores of vaccine doses - why can't the same be applied in the war against AMR?
9. Translate this presence into bringing global interest into India's AMR NAP and possibly gain global funding opportunities for interventions envisioned in the NAP, eventually scale these integrated tests for efficacy in India to global.
10. Promotion of alternatives to antimicrobials -ethno veterinary medicine, probiotics, etc.

iii) Multi-lateral Dialogues

1. This needs to be a proactive and continuous endeavor from the policy and advocacy champions of AMR as well as the multi-sectoral technology experts.
2. Participate actively in global fora for which funding and central Government endorsement and support would be needed.

iv) Communication Strategy

1. Science communication at the national and international level.
2. High-impact publications from the subgroups.
3. Showcasing the activities on the Departmental website.
4. Look for opportunities to present at international conferences.
5. Advocacy at sub-national and local levels in communities, farms, private sector, and NGOs.

v) Initiatives

1. Implement Antibiotic Stewardship, especially in patients with a prolonged hospital stay.
2. Harness the inhouse AMR surveillance in various hospitals toward a policy.
3. Collaborate with big Pharma companies that have an AMR division and have a global footprint.
4. Involve State Health Universities.
5. Education of the public.
6. To lead in the manufacturing of drugs through in-licensing.
7. Lead regulatory pathways guideline development.
8. Validate and scale-up diagnostics for AMR detection for global availability.

Research & Innovation

Aside from the above, streamlining R&D frameworks and regulatory pathways could also enhance India's efforts and visibility in combating AMR. Some suggestions in this direction:

1. Improve diagnostic infrastructure for universal, accurate, and timely diagnosis of drug-resistant infections.

2. Antibiotic Resistance Breakers: Alternative strategies to potentiate the effects of existing antibiotics i.e. Natural/semi-synthetic molecules in combination with antibiotics to enhance the efficacy of antibiotics either by inhibiting drug efflux or by inhibiting antibiotic degrading enzymes.
3. Predictable Regulatory framework and path for validation of innovative AMR diagnostic including facilities to lead such efforts.
4. Mechanisms to incentivize local antibiotic drug development through innovation in clinical trials streamlined and accelerated regulatory pathways and funding mechanisms (local and international), and mechanisms to introduce already approved antibiotics by Stringent regulatory authorities.
5. Prioritizing the research and development for discovering and developing new antibiotics which are important for public health and specifically active against multidrug and extensively drug-resistant Gram-negative bacteria
6. Presently pharma industries are not actively investing in drug discovery against infectious diseases. Therefore, there is a pressing need of including strategies to encourage industry-academia collaborations in advanced drug discovery research programs.
7. Mechanisms that will enable affordable procurement of novel antibiotics developed in high-income countries as volume requirements will be low.
8. Drug repurposing is one of the strategies to investigate approved drugs for newer targets and is considered fast-track approval from the FDA. Similarly, antimicrobial peptides are emerging as strong candidates for AMRs. They provide a unique opportunity to prepare an extensive library to test against AMR simply by varying 20 naturally occurring amino acids. Integrating the infrastructure and in-silico tools, various drugs can be investigated for repurposing against AMRs through in-silico studies. With strong expertise in designing and synthesizing peptides and small molecules, a library can be generated at national institutes with the requisite facilities.
9. Another aspect to consider is combinatorial drug therapy strategies targeting both microbial cell killing and virulence.

Strategic Priorities:

The six strategic priorities laid out in the NAP 2017-22

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



A. The following suggestions and comments highlight the suggested modification or additions to the strategic priority

Awareness & Education

1. Leverage the State IEC Cells to routinely disseminate the materials to the provider and public.
2. Awareness among the private qualified/licensed health care providers and the unqualified health care providers (like quacks, village doctors).
3. Need to develop a communication strategy, and the target group should include school-going, children.
4. Appropriate communication from the Pharma industry to necessary stakeholders so that it can be mapped to identify the end-user and the district authorities can do the local coordination.
5. The awareness and communication material should be designed with Human Centre Design approach and tested with a pilot group of end-users before taking the selected appropriate messaging to the wider audience.

6. Assess understanding (through behavioral studies), knowledge (by mapping knowledge, attitude, practices & behavior) and awareness of antimicrobial resistance and antimicrobial use (AMU) amongst key stakeholders/target groups like the population, professionals in health (including AYUSH), veterinary, pharmaceutical and environment, farmers and food processing sector.
7. Document the existing communication and information resources and products on AMR in various sectors/stakeholder groups, consolidate the AMR database on communication and build communication strategy with stakeholders (public and private) based on their expertise.
8. Develop a cross-cutting and sustained communication programme on antimicrobial resistance and use, at national, state, district, and sub-district levels with a focus on raising awareness and change in behaviour to promote rational use of antibiotics highlighting infection prevention through hand hygiene, clean water, sanitation, biosafety in animal farms, etc. The communication should target the general population, farmers & dairy/poultry/meat/fish suppliers, and others through A partnership & collaborative approach including NGOs and the private sector. Features of a successful AMR communication programme may be adapted & adopted from other countries. Health Cess can be considered to fund public health campaigns on AMR.
9. Poultry and those involved in apiary/bee rearing to be included in the target groups.

Education & Training

1. Develop module on AMR and appropriate use of antimicrobials for school children at Xth Standard level and at PUC level.
2. Improve inter-departmental as well as intersectoral communication by developing a strategy towards enabling the institutions to ensure communication and data sharing among their microbiologists and clinicians (antibiotic policy, etc.). AMR training and orientation programmes should be designed to train representatives from all sectors and stakeholders.
3. More clarity is needed how, the data sharing among institutions will drive the education and training.
4. Focus on primary care physicians for rational use of antibiotics.
5. Decentralized approach with action at regional / state levels should be explored. Local Medical Colleges may be tasked to undertake action in their footprint.
6. Involve the public in the dissemination of messaging around prudent use of antibiotics, role of diagnostics, vaccination, and combating AMR – especially, engage through social media e.g. MoHFW has created ‘How to be a COVID-19 Youth Champion -A guide to being an enthusiastic advocate against stigma and discrimination.
7. Increase the pool of infectious disease specialists.
8. The local Medical College ecosystem must be mandated, motivated, guided, funded and incentivized to participate in local Public Health initiatives such as AMR amongst others, through active engagement of DTE of Med Education with the National Health Mission at state levels. This must be facilitated and prioritized.

9. A National Technical Working Group may be established to look at the AMR data from different institutions to recommend training and education requirements depending on the group for whom it is intended.
10. Strengthen and consolidate knowledge and capacity in AMR and related topics as core components of professional education and in-service and pre-service trainings through revised curricula of professionals in human health, in animal health in food industry, agriculture, and the environment. Bring together the segmented knowledge in different subjects (microbiology, pharmacology, training, PSM, etc.).
11. Develop module on AMR and appropriate use of antimicrobials for school children and introduce the concept as part of school curriculum.
12. Strengthen capability and skills of key stakeholders by first conducting Training Needs Analysis (TNA) across all sectors- Human health, Animal health, Food industry, Agriculture, and Environment, followed by developing training resources on antibiotic resistance and enablement of capacity development among professionals by phased implementation.
13. Improve inter-departmental as well as intersectoral communication by developing a strategy towards enabling the institutions to ensure communication and data sharing among their microbiologists and clinicians (antibiotic policy, etc.). AMR training and orientation programmes should be designed to train representatives from all sectors and stakeholders.
14. Establish an IVR based method to notify any particular type of infection in the veterinary and fisheries community.

B. Implementation and assessment mechanisms to enable actionability of the strategic interventions & activities highlighted in the given strategic priority

1. Foremost, a detailed action plan with requisite timelines needs to be created.
2. Staff training on infection control practices. At induction for new appointees and at least once in a year.
3. Conduct training by qualified personnel, preferably Infection Control Officer (ICO) and Infection Control Nurse (ICN). Conduct pre-and post-training evaluations to know the effectiveness of the training. This should include Clinical, Non-Clinical, and Support Service areas of the Hospital.
4. Strengthen laboratories by carrying out systematic assessments across all the sectors and identifying the gap areas.
5. Set up a committee for laboratories to supervise the activities periodically and inform the stakeholders about any shortcomings.
6. Hospitals could possibly implement a data sharing schedule on biannual/annual basis.
7. Regular interactions with professional medical societies.

C. Framework to enable effective intersectoral coordination.

1. A Multi-Disciplinary Hospital Infection Control Committee & Infection Control Team could be established for planning, implementing and evaluating Infection Prevention and Control programme at SJMCH.
2. Implement Antibiotic Stewardship, especially in patients with prolonged hospital stay
3. Monitoring of staff health among food handlers, other staff in the case of outbreaks like MRSA / AMR outbreak and outbreaks of notifiable diseases in the staff and student hostels.
4. Planning the activities in a coordinated manner so as to exercise maximum input from relevant stakeholders.
5. Execution of activities in a definite timeframe will allow more efficient functioning.
6. Evaluation of the activities bi-monthly to identify gaps and focus on outcomes.
7. Involve State Health Universities
8. Introduce a New Clinical Infectious Disease as a Subspecialty for clinicians by NMC to improve policies

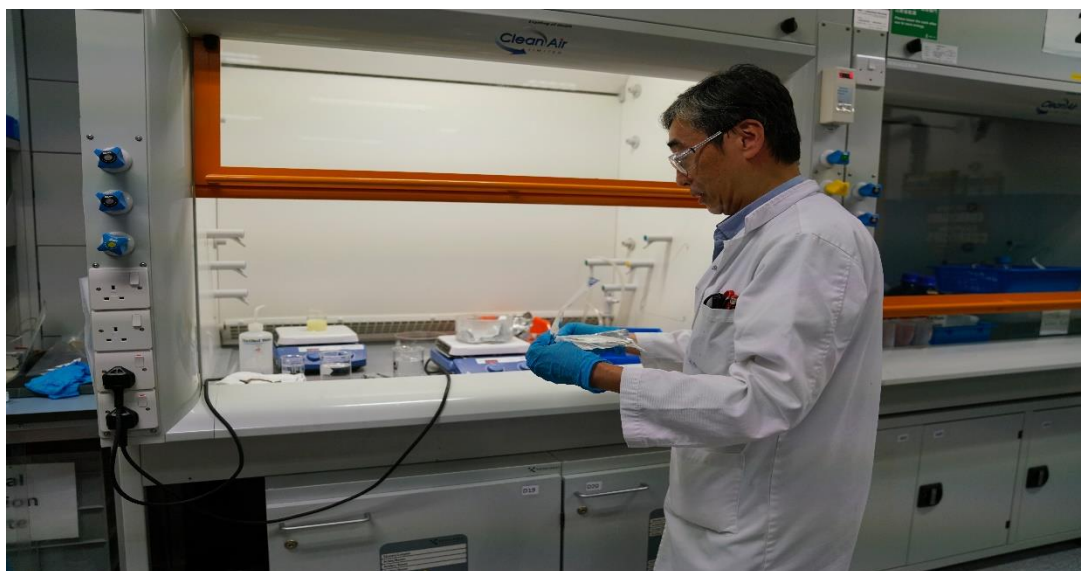
D. Capacities and capabilities required for effective roll-out, and specific ways of building the same

1. Web-based surveillance of microbials and development of antibiograms & execution of appropriate surveillance activities in identified high-risk areas.
2. Developing sound housekeeping and sanitation practices, monitoring effective execution of the same.
3. Digital interventions like:
 - a. Training of HR personnel on laboratory testing and data management at state and center levels.
 - b. Creating an effective online program implementation tool where data is shared real-time with the different stakeholders.
4. Use of WHO-NET or other global software to capture GLASS Pathogens.
5. Lab automation with integrated LMIS to capture the desired laboratory testing information and project the outcome to the State nodal officers.
6. More infectious disease (ID) specialists. A policy to make sure every hospital with > 100 or 200 beds has an ID specialist for a referral.
7. Antibiotic stewardship programs could be made mandatory for physicians (including post graduate students) through digital modules and pharmaceutical industry could be partnered with for dissemination with CME points.

E. Top 5 global initiatives in awareness & communication, education & training, and suggest mechanisms how India can intersect with them to scale globally.

1. Twinning Programme for Faculty to Other developed countries to adopt best practices in reputed hospitals.
2. Hospital authorities to specify funds and allocate funds in the annual budget and should be supported by Government.
3. Develop written policies and procedures for Standards of Infection Prevention & Control Practices, Cleanliness, Sanitation, and Asepsis.
4. Develop a mechanism to supervise Infection Control measures in all phases of Hospital activities and to promote Infection Control Practices at all levels.
5. Develop sound housekeeping and sanitation practices, monitoring effective execution of the same. They need to be educated.
6. Orientation to the government official on WHO's Global guidelines on AMR, World Organization for Animal Health (WOAH) [formerly OIE] guidelines (2022-2027) and environmental AMR framework.
7. Conducting national level training program of India NAP-AMR committee, World Organization for Animal Health (WOAH) [formerly OIE].
8. Developing a roadmap to merge the global initiatives into the national action plan in India.
9. Develop education and training resources in collaboration with global health organizations and partner with these for wider dissemination e.g. WHO Training and Education Technical Series on Safer Primary Care.
10. Make use of the communication framework developed by global organizations for COVID-19 and extend the messaging to areas strategically important under the India NAP-AMR using IEC materials.
11. Sharing of data with select countries under an MoU for expert inputs.
12. Collaboration between professional medical societies in India and UK/Australia.
13. Should start with relentless, sustained education and training starting from medical school, nursing school, Pharmacy, vet sciences etc. Bring in regulation to dispense Antibiotics only on valid prescription. Monitor antibiotic prescription in the Hospitals, clinics, by non-allopathic practitioners (strictly) using technology. Antibiotic stewardship should be mandatory in all healthcare set-ups.

II. Strengthen knowledge and evidence through surveillance



A. The following suggestions and comments highlight the suggested modification or additions to the strategic priority

Laboratory Capacity

1. Enhance microbiology laboratory infrastructure by introducing molecular biology platform and carrying out DST.
2. Switch all serological-based surveillance to Molecular/WGS-based surveillance. Pilot model molecular surveillance and share the details to replicate the models across all the laboratories.
3. Establish regional reference laboratories at National/ State Organizations to continuously monitor the progress of the work.
4. Integrate the activities to that of PM ABHIM/ IPHL.
5. Establish genomic sequencing of resistant organisms similar to INSACOG.
6. Improve access to micro diagnostics in secondary healthcare facilities.
7. Expansion of ICMR surveillance networks to include at least 75% of tertiary care facilities in India.
8. Strengthen microbiology laboratory capacity, based on system/lab assessments, for AMR surveillance in human, animal, food and environment sectors for antimicrobial susceptibility testing (AST) in medical labs, ensuring SOPs, quality assurance and community data.
9. Strengthen microbiology laboratories (including private sector) for antimicrobial resistance and antimicrobial residues in the environment, including waste from farms, factories and healthcare settings.

10. Strengthen capacity for laboratory-based surveillance of AMR with species-level identification of bacteria in humans during health and disease, AMR in animals, food, and environment. These labs under the national network, including the private sector, may be engaged.
11. Organize joint training workshops for bacterial identification, antimicrobial susceptibility testing (AST), and data harmonization in medical labs, animal and food labs, and environmental labs.
12. Identify, strengthen and designate national reference laboratories for AMR surveillance (confirmation and detailed characterization of target pathogens and external quality assessment scheme) in humans (also in animals, food and environment sectors) as a pre-requisite for enrolment in GLASS.

Surveillance of AMR

1. Linkages with Integrated Health Information Platform (IHIP) / IDSP.
2. Introduce a molecular biology/WGS-based platform to carryout surveillance across all the sectors
3. Establish Data Coordination Centre at the Regional and National levels to collect data and analysis of results.
 - a. Develop a database to monitor AMR cases in hospitals because of hospital-acquired infections
 - b. Work in coordination with private companies in the field of data analytics, ex. TCS Genomic Sciences division, etc.
 - c. Conduct collaborated surveillance of AMR quarterly for the first year and reduce it to half-yearly over the next year.
4. Use the Molecular platform to carry out surveillance.
5. Establish TWG and assign a task for every year.
6. There is a need to have measures and metrics for benchmarking for each of the 4 goals and milestones for achievement of benchmarks developed for application by institutions.
7. Strengthen surveillance for AMR in humans, animals, food and environment by establishing an intersectoral expert group on integrated AMR surveillance, including surveillance standards and coordination mechanisms at various healthcare levels, drug-bug combinations etc. in a phased approach.
8. Organize annual national consultation to strengthen the AMR surveillance programme in humans, animals, food and environment.
9. Standardize data analysis and information management for AMR surveillance by defining mechanisms and modalities for data collection, collation & analysis and information management at central, state and district level (including urban, rural, government, private and unorganized sector) to increase health intelligence for AMR in humans, animal and food (including fisheries), and environment. This information should be made available to all stakeholders, including the private sector, as an online database.
10. Establish a national framework for surveillance of antimicrobial residues/contaminants in food and environment; of antibiotic residues and contaminants in the environment including waste from farms, factories (pharmaceutical industry, making animal feed, processing meat, dairy, fish),

veterinary and human health care settings. Develop standards for antibiotic residues in food from animals such as chicken, eggs, milk, and fish; and in industrial effluents and waste from farms, human healthcare, and veterinary care settings. Collate and analyze antibiotic residue surveillance data from food and environment into useful information to understand linkages with AMR development. The information should be published.

11. Mechanisms required for characterization and access to resistant strains for enabling expedited R&D, and efficient AMR risk mitigation
 - An effective surveillance mechanism needs to be established for identification, isolation, and genomic characterization of resistant pathogens.
 - Genomic characterization is absolutely necessary as a starting point for facilitating R&D efforts.
 - The areas of high-frequency surveillance could be hospital ICUs, wards, veterinary hospitals & poultry farms, etc.
 - Today, the Pharma industry doesn't have easy access to well-characterized AMR strains. Efforts are needed to set up a large repository of AMR strains that is easily accessible to the industry. Further, this repository should be periodically updated with the latest resistant strains.
 - NIH, US provides free screening of NCEs against AMR.
 - Such facility should be developed by the Government. in India.
 - A dedicated central BSL Class III & IV facility (both for in-vitro and in-vivo) needs to be built

To manage AMR in the broader healthcare context will require measures, for tackling AMR, to be implemented in the same spirit as the measures implemented for tackling COVID-19.

- It should involve rigorous population serological surveillance, strict quarantine & isolation, and intensive & palliative care for the patients/carriers harbouring resistant pathogens.
 - Focus should be on early detection, diagnosis, prevention of spread & effective treatment.
 - Quarantine the areas in hospitals that harbor pathogens. Quarantine patients that are diagnosed with an infection by resistant pathogens.
 - Create clear treatment guidance & educate all doctors. Treatment guidelines should be constantly revised in view of the identification of new treatment strategies.
- Creating a measurable, objective, and geo-tagged index to quantify AMR will be important. The efforts of preventing AMR can be effectively initiated only when there is a measurable quantum of AMR which is geo-tagged.
- The competent government body can develop an AMR Index – A number that gives integrated and geographically relevant information about AMR.
 - This Index can have integrated data accounting for the end consumption of antimicrobials, treatment outcomes, sensitivity tests, environmental and epidemiological features, etc.
 - Data collection, processing, and analysis should be Step 1 in the efforts to mitigate AMR.
 - This activity should be a part of the current National Action Plan. The usefulness of such data would be immense, for instance:

- Geographies, where AMR threats are imminent, can be prioritized in terms of identifying the root cause of AMR and its mitigation measures.
- This data would be very useful in increasing the awareness among the Clinicians about the real threat of AMR and the judicious use of antimicrobials at a hyper-local level.
- It could provide an aspirational target and a metric for objective impact assessment of the National Action Plan (NAP) for the prevention of AMR over the next five years and future terms.

B. Implementation and assessment mechanisms to enable actionability of the strategic interventions & activities highlighted in the given strategic priority

1. Foremost, a detailed action plan with requisite timelines needs to be created.
2. Strengthening of digital infrastructure for monitoring and evaluation.
3. Train HR on improving data quality and collection.
4. Defining SMART impact indicators that measure progress at the community level.
5. Referencing SENTRY surveillance in the US.

C. Framework to enable effective intersectoral coordination.

1. Carrying out systematic assessment across all the sectors and identifying the gap areas.
2. Set up a committee to supervise the activities periodically and inform the stakeholders about any shortcomings.
3. Monitoring and evaluation of activities carried out, and identifying best practices and GAP analyses.
4. Take improving measures and actions to reimplement activities.
5. Joint monitor all the activities annually and submit reports to the NAP committee.

D. Incentives for effective intersectoral engagements; also highlighting disincentives, if any.

1. Additional funds for achieving target in order to set up additional infrastructure etc.
2. Recognizing people and institutions working well in the industry and providing certifications, training for them at national or international level.
3. Establish a common database for centers to upload data regularly.

E. Capacities and capabilities required for effective roll-out, and specific ways of building the same

1. Aligning the need for data collection tools for capturing evidence from clinical practices and treatment points of view.
2. System for augmenting antibiotic prescription practices based on AMR data.
3. Application of AI to collect and analyze data for national and global surveillance.
4. Appoint one person at key centers which have been identified for the network similar to a pharmacovigilance program.
5. Improved systems for systematic collection of data and regular publications of compiled data at the national, state, and local levels.
6. Creation of local dashboards that display key metrics measuring relevant outcomes.
7. Sharing of best practices between states and healthcare facilities.

F. Global initiatives in surveillance and evidence-based public health interventions. Mechanisms of how India can intersect with these efforts to scale globally.

1. Focus on innovation along with utilizing existing technologies (molecular/WGS) based surveillances in India.
2. Collaborated surveillance for common priority pathogens in humans, animals, and the environmental sector.
3. Collect data from the field on a periodic basis and monitor the progress of surveillance.
4. Collection and analyses of data from human, animal, and environmental sectors, and dissemination of the results to national and international partners.
5. Building the overall capacity of HR by providing continuous training.
6. There is an urgent need to recognize the AMR situation in South Asia. Action of GoI should be in line with this urgency and recognition of this as a credible threat to the economy as well as health and well-being of all Indians. Innovation is important but will fall well short of impact if not accompanied by coordinated efforts to improve AMSP, IPC, and Environmental contamination.

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



A. The following suggestions and comments highlight the modification or additions to the strategic priority

Human Health: i) Develop and establish a stratified national plan for IPC in health care ii) Strengthen infection prevention outside healthcare settings to limit the development and spread of AMR iii) Align healthcare support industry with infection prevention and control

1. Introduce innovative tools to have appropriate IPC measures across all the sectors.
2. Deploy smart technologies to ensure compliance at all the time and conduct periodic audits or supervisory visits to evaluate the impact.
3. IPC metrics need to include clear targets for the reduction of poor outcomes e.g. healthcare associated infections.
4. Need to include prevention approaches outside of traditional facility-based IPC, this includes prevention of infections through vaccines for key pathogens including typhoid, pneumococcus, and soon RSV, as well as impact of vaccines on reducing antibiotic use.
5. How to raise awareness should be clarified.
6. Education and training should be part of the curriculum.
7. Timely implementation of key learnings and failures from ongoing initiatives to sharpen interventional strategies.
8. Ensure the development and implementation of infection prevention and control policies and strategies across all tiers of the healthcare system.
9. Define terms of reference and scope and establish National Coordinating Unit (NCU) for infection prevention and control at different tiers of health care settings in public and private facilities.
10. Conduct IPC assessments and gap analyses at different levels and all categories of health care settings. Develop capacities for its effective implementation, set M & E framework.
11. Performance monitoring/performance payment within different schemes or quality programmes like Swachh Bharat Abhiyaan, Kayakalp and Swachh Swasth Sarvatra initiatives.

12. Develop a national IPC implementation plan (in a phased approach) based upon risk and need-based matrix with clearly defined interventions. Strengthen infection prevention outside healthcare settings to limit the development and spread of AMR.
13. Behaviour change communication and social mobilization campaign to be developed and implemented.
14. Documentation of knowledge, attitude, and practice (KAP) study on IPC practices and emphasis on hand hygiene through campaigns. Align the healthcare support industry with infection prevention and control.
15. Identify areas of collaboration keeping healthcare needs, patients and healthcare workers' safety, and long-term industry perspectives in alignment.
16. Collaborate with other Government bodies and ministries, regulations, and industry.
17. Establish a board for IPC professionals in public and private healthcare institutions, to review devices or modalities in healthcare, to review infection prevention and control mechanisms and adequacy.
18. Align the health care support industry to manufacture single-use devices (SUDs) in line with the Make in India initiative.

Establish IPC programmes in veterinary settings and animal husbandry

1. Replicate the model to the standard of Human health.
2. Introduce accreditation programs to ensure IPC is under the scope of the certification.
3. Conduct workshops to sensitize the veterinary hospitals/laboratories.
4. This will require designated funding and manpower from MOH-- that needs to be explicit.
5. Include AMR as part of the course curriculum in Medicine/ veterinary/fisheries /aquaculture and school students.
6. Include biosafety, biosecurity, hygiene and infection prevention and control in curricula for education and training of animal health and food professionals and workers.
7. Establish IPC coordinating unit within MoHFW (at centre and state levels), with designated staff and defined terms of reference.
8. Increase awareness in community for good production practices & demonstrate rewards.

Reduce environmental contamination with resistant genes, resistant pathogens and antimicrobial residues

1. Periodic Monitoring of environmental contamination with resistant genes, resistant pathogens and antimicrobial residues.
2. Taking corrective actions to identify the root cause of environmental contamination and restricting further spread.
3. Biannual monitoring of improving actions and ensuring that the implementation is full proof.
4. Strict enforcement of penalties on violators polluting the environment via uncontrolled effluents.

5. Adopt technological solutions to quantify the manufacture, supply and sales of antibiotics across various sectors in real-time to establish evidence on use and misuse.
6. Based on environment risk assessment develop guidelines for locating farms, factories, slaughter houses, wet markets, processing units, feed manufacturers, health care facilities, and veterinary care facilities; ensuring compliance by strengthening existing guidelines and enforcement strategies related to payments, benefits, etc.
7. Develop policy & implementation mechanisms on extended producers' responsibility for expired/unused antibiotics.
8. Define standards and monitor antibiotic residues and bacterial load in effluents.
9. Develop SOPs, best practices and guidelines for disinfection at treatment plant to remove bacteria. Develop necessary legislation and incentives along with risk assessment tools.
10. Include biosecurity in farmer-field school curriculum and sector-specific manuals and guidelines to improve environmental management of AMR.

B. Implementation and assessment mechanisms to enable actionability of the strategic interventions & activities highlighted in the given strategic priority

1. Foremost, a detailed action plan with requisite timelines needs to be created.
2. Formation and administrative authority to the Hospital Infection Control Committee (HICC) and Infection Control Team (ICT) to coordinate and evaluate the implement infection control practices.
3. Receive Infection Prevention and Control reports, to analyze them and take appropriate corrective and preventive actions.
4. Monitor the Annual Programme and Action plans to reduce Health Care-Associated Infections.
5. Physicians can undergo periodic assessments through digital CMEs as part of their regular updating.
6. Periodic assessments of laboratories to identify the strengths and weaknesses.
7. Strengthening the laboratories to provide HR training, infrastructure upgradation and minimum desirable equipment to operationalize the laboratory.
8. Training on WHO NET's platform for data collection and analyses.
9. Biannual monitoring of functioning of laboratories and data audits.
10. Introducing national external quality assurance program to the identified laboratories and implementing EQAS over a period of time.
11. Referencing: <https://www.gov.uk/government/news/antimicrobial-resistance-uk-launches-5-year-action-plan-and-20-year-vision> could be helpful.
12. Traceability and digitalization in the vaccination programme.
13. Role of AI and ML for overall monitoring in AMR.
14. Registration of livestock establishments.
15. Harness In-house data on Microorganism, Sensitivity Patterns, AMR, etc.
16. Implement Antibiotic Stewardship, especially in Patients with a prolonged hospital stay.

17. In Critical areas like ICU, Burns wards look at the microbiome in effluents and see if contamination of local water bodies can be prevented.
18. A Multi-Disciplinary Hospital Infection Control Committee & Infection Control Team could be established for planning, implementing and evaluating Infection Prevention and Control programme.
19. Make it a Mandatory subject in Microbiology MD level at the University level.
20. Monitor periodically and review all Infection Control Policies and procedures.
21. Timely interventions.
22. Engage community leaders in finding local implementable solutions.

C. Framework to enable effective intersectoral coordination.

1. Planning and inter-sectoral activities.
2. Execution of planned activities across all the sectors.
3. Monitoring and evaluation of activities carried out and identifying best practices and GAP analyses.
4. Taking corrective actions from weak areas and reimplementing the activity.
5. Joint monitoring of all the activities annually and submitting reports to the NAP committee.
6. National directive directing federal states to take cognizance of the directives. Make its compliance mandatory to avoid HCO from losing their license.
7. One Health approach, Sharing of data across departments and Laboratory networking
8. Involve State Health Universities.
9. Introduce a New Clinical Infectious Disease as a Subspecialty for clinicians by NMC to improve policies.
10. Microbiological surveillance, development of antibiograms & execution of appropriate surveillance activities in identified high risk areas.
11. Openness and transparency in communication across stakeholders.
12. Clarity in roles and responsibilities.
13. Sharing success stories from the ground across the network to spark replication and optimism.

D. Incentives for effective intersectoral engagements; also highlighting disincentives, if any.

1. Based on predefined targets qualitative incentives can be:
 - a. Additional funding for achieving target to set up additional infrastructure etc.
 - b. Recognizing people and institutions, and providing certifications, training them at national or international level.
2. Coordinated intersectoral implementation plan on IPC.
3. Develop SOPs, conduct training workshops and waste disposal and treatment.
4. Quarterly or 6 monthly intersectoral review meeting.
5. Accreditation of regional laboratories by NABL, IVRI, WHO, World Organization for Animal Health (WOAH) [formerly OIE], FAO etc.

6. Publish league tables, good practice recognition, certificates, HCO can have logos which say they comply with AMR guidelines.
7. Uniform biosecurity guidelines for livestock and poultry farms.
8. Sharing of good practices.
9. Awareness creation among public.
10. District level oversight and enforcement powers to stem waste disposal challenges.
11. Design and implement national level policy on best practices in infection control and prevention.

E. Capacities and capabilities required and suggested ways of building the same.

1. Introducing smart innovative solutions, which may prevent HAI and IPC in healthcare set-ups.
2. Training HR on innovative solutions in healthcare set-ups.
3. All healthcare set-ups should have incinerator for waste disposal.
4. Training at all levels.
5. SOP, has to be written down and followed to the tee.
6. Use of technology to capture, analyse.
7. Capacity building in epidemiology for data collection/ analyses.
8. R & D activities on alternatives to antibiotics, ex. Herbal medicines, peptides etc.
9. Research on antimicrobials use in veterinary sector and its impact on human health.
10. Pharmacies Inventory of Sales of Antibiotics in Major Hospital Setting.
11. Cost effective analysis of the Antibiotic steward ship.
12. To analyze trends in infections and take appropriate measures whenever unacceptable trends are noticed.

F. Global initiatives in infection prevention and control. Suggest mechanisms on how India can intersect with these efforts to scale globally.

1. Review the latest IPC initiatives deployed globally.
2. Train the HR on those protocols for IPC initiatives.
3. Identify the gaps in IPC measures and conduct qualitative assessments in healthcare set-ups and deploy corrective actions.
4. Deploying similar IPC practices across all the intersectoral agencies.
5. Continuous monitoring and supervision of IPC measures in the intersectoral agencies to be performed.
6. Antibiotic stewardship, Training and education, Bringing in strict regulation, No dispensing Antibiotics without valid prescription and Monitor sale of antibiotics.
7. Uniform SOP and Contingency Plan for livestock diseases.
8. Interpret, uphold, and implement the Hospital Infection Control policies and procedures in the Medical Colleges.

9. Develop written policies and procedures for Standards of Infection Prevention & Control Practices, Cleanliness, Sanitation, and Asepsis.
10. Develop a mechanism to supervise Infection Control measures in all phases of Hospital activities and to promote Infection Control Practices at all levels.
11. Develop sound housekeeping and sanitation practices, monitoring effective execution of the same. They need to be educated.
12. For innovative funding mechanisms to support antibiotic discovery and development - CARB-X model should be adopted.
13. Grand challenges type funding to support innovative ideas and products from concept to market in staged manner to support development of diagnostics and drugs.
14. Create a national database of funding opportunities that support research on surveillance, infection control, innovative interventions.
15. Being an enabler in sharing real world evidence of AMR trends and effective practices with rest of the world.

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



A. The following suggestions and comments highlight the modification or additions to the strategic priority

- i) Regulated access to high-quality antimicrobials -Ensure uninterrupted access to high-quality antimicrobial medicines ii) Regulated access to high-quality antimicrobials- regulatory framework and intersectoral coordination on use of antimicrobials in animals and food safety
1. Create adequate methods for monitoring and corrective actions for violations at local, state and national levels.
 2. Create an accountable authority that will report on metrics related to sale of antibiotics without prescriptions and non-therapeutic use of human sector antibiotics.
 3. Strengthen national regulatory authorities for improved quality, safety and efficacy of antimicrobials.
 4. Stringent Quality control mechanisms of existing antibiotics as this is also considered as a critical cause for development of AMR.
 5. Regulatory enforcement to prohibit sale of antimicrobials as OTC under Drugs & Cosmetics Act, and Rules:
 - a. Review categorization of high-end antimicrobials as well as new antibiotics in Schedule X/H1 of national regulations.

- b. Establish an online forum on use and access as per level of healthcare.
6. Expedite regulatory processes to ensure uninterrupted supply of quality-assured antimicrobials; regulate the availability of probiotics without resistance determinants.
7. Probiotics without resistance determinants.
8. Strengthen and enforce regulations to minimize substandard, spurious, falsely labeled, and falsified antimicrobials.
9. Establish a quality management system for supply chain management of antimicrobials.

Surveillance of antimicrobial use- national surveillance system- in humans, animals, agriculture & food sectors

1. Establish a framework for triangulating antimicrobial data for estimating the antimicrobial utilization patterns across different sectors and at the population level.
2. The monitoring framework to estimate national consumption of antimicrobials and the feedback mechanism for all stakeholders to ensure adherence to guidelines for optimal use of antimicrobials has not been done in a systematic way. There is a need for better quality data that can be aggregated at the national level as well as broken down at the local level.
3. Using the AWaRe system of classification to report results should be explored
4. Development of guidelines needs to be evidence based.
5. Establish independent veterinary regulatory authority.
6. Restrict and phase-out non-therapeutic use of antimicrobials.
7. Foster development of antimicrobial policies and evidence-based standard treatment guidelines for food animals.
8. Ensure prescription sale of antibiotics and their use under supervision; regulate bulk selling, importation, and labelling for species-specific use.
9. Develop tools & capacities to estimate national consumption of antibiotics measure consumption of antibiotics at healthcare facilities register and collect data from manufacturers, sellers, prescribers and bulk users measure consumption of antibiotics in animal health facilities, food and agriculture
10. Develop monitoring framework to estimate national consumption of antimicrobials.
11. Establish feedback mechanism for all stakeholders to ensure adherence to guidelines for optimal use of antimicrobials.

i) Antimicrobial stewardship in human health ii) Antimicrobial stewardship and policies in animal husbandry and food

1. Algorithms for Syndrome based treatment guidelines based on evidence collated from various medical colleges.
2. District wise antibiograms once every year to start with and then 6-monthly to advise the local practitioners on choice.

3. Integrate various Physician associations to have CME in this area on a constant basis.
4. Generate evidence through implementation and operational research shaping future AMR policy.
5. Introduce Diagnostic stewardship across all the sectors.
6. Introduce Whole Genome Sequencing to carry forward the surveillance.
7. Focus on neonatal sepsis as it impacts the Neonatal mortality rate which is a useful indicator of maternal and newborn neonatal health and care.
8. Create a centralized dashboard to map hot spots to identify the notification of threatful pathogens and usage of large volumes of antibiotics.
9. Usage of high-end antibiotics (oral and injectable) can be supplied via a restricted distribution network. Government can control the access & use of effective medicines through government network (using online portal similar to CoWin). Such medicines should not be available at local pharmacies.
10. M&E framework for AMSPs is rudimentary and it needs to be developed into standardized protocols for regular reporting of data from every healthcare facility.
11. Legislation for heavy penalties on environmental pollution with antibiotics.
12. Establish antimicrobial stewardship programmes in healthcare facilities; Implementation of Antimicrobial stewardship (AMS) programmes in selected health facilities in a phased manner with adequate capacity building for scale-up Regular review of AMS programmes to be done with appropriate M&E frameworks.
13. Improve appropriate use of antimicrobials in the community; Increase awareness of appropriate antimicrobial use among provider, dispenser, and consumer populations through campaigns Monitor antimicrobial use in community settings by engaging standalone clinics and pharmacies.
14. Strengthen the legislation regarding various facets of antimicrobials and its implementation to optimize use of antibiotics.
15. Improve knowledge and skills of prescribers, dispensers and medical trainees through periodic pre-service & in-service training. Also, Promote measures for overall health improvement and service delivery (Maternal/child health and Immunization division, prevention of STDs, early diagnosis of endemic diseases etc.). Antimicrobial stewardship and policies in animal husbandry and food.
16. Establish antimicrobial stewardship programmes for rational use of antimicrobials in animal facilities, agriculture, and food processing units.
17. A detailed action plan for phasing out or immediately banning antibiotics in feed needs to be presented to the government for this issue to be solved.
18. Establish and implement national policies on use of antimicrobial agents in animals and agriculture

B. Implementation and assessment mechanisms to enable actionability of the strategic interventions & activities highlighted in the given strategic priority

1. Introducing scoring matrix to evaluate the lab performance across all sectors.
2. Training and re-training of key officials across all sectors.
3. Establishment of technical working group with representations from all sectors.

4. Developing TOR for TWG.
5. Conduct periodic review meeting of TWG to assess the progress.
6. WHO framework for funding and assessment of NAPs.
7. Liaise with other governments, such as South Africa through NGOs like ICARS, GARDP etc.
8. Examine success stories in south east Asia who have recently been able to tackle AMR.

C. How can support, contributions, adherence, and engagement of stakeholders be incentivized for sustaining efforts in the long-term?

1. Developing a digital tool to capture the sale of priority antibiotics by the pharmaceutical companies to the chemists.
2. Integrate chemists, software to national dashboard to project sale of priority antibiotics.
3. Conduct audit of sale of priority antibiotics by the end users.
4. Reach the last mile by contacting the end user.
5. Submitting the audit files of field visit to the necessary stakeholders.
6. Create a central agency/authority dedicated to AMR nationally which will champion the cause and coordinated efforts for intersectoral coordination.
7. Intersectoral coordination and frequent monitoring of results with sharing across sectors is a key factor for AMR control.
8. A central AMR authority will also enable better engagement internationally for India to be a key player in AMR solutions.
9. Pilot projects with innovative ways of bringing in change.
10. Involve researchers, NGOs, civil society organizations and international partners to undertake pilot project, experiment new ideas and absorb best practices.
11. All of the above examples need to become embedded as the default behavior across the antibiotic ecosystem.
1. Sustained education of public, HCPS, hospital administrators, pharmacists, medical students etc to ensure suggestion.
2. Rewards for facilities that show high levels of adherence to key metrics that measure good IPC and AMSP.
3. Establish funding within government departments for AMR mitigation and share it with international partners to leverage for more.
4. Sharing of data and future plans for AMR every 6 months between departments of government, states and international partners.

D. What are the necessary capacities needed to fill the current gaps, and to scale and sustain efforts?

1. Integration of sale of antibiotics from pharmaceutical companies to chemists to patients.
2. Linking the diagnostic results for the type of infection for which the antibiotic was prescribed.

3. Trained personnel across the health sector that can monitor and enforce IPC and AMSP.
4. Increased innovation infrastructure for development of local AMR solutions- therapeutics and diagnostics.
5. Linkages of local efforts to national and international scientific community through congresses etc.
6. Budget and Human resources at field and policy level.
7. Platforms to engage One Health sectors and partners to keep all stakeholder motivated.
8. Work together with industry- pharma sector, manufacturers, veterinary food manufacturers feed and regulatory agencies.

E. Which mechanisms would enable intersection and integration with the larger global efforts against AMR to amplify collective efforts?

1. Joint international workshops and training are essential for disseminating the Indian NAP-AMR activities to the global communities.
2. Publication of data on intersectoral coordination to work together on AMR.
3. Creation of a regional AMR center of excellence for south Asia as a response to the gram report.
4. Linking national AMR data to regional and global data.
5. Participation of innovators in the global AMR academic and pharma colloquia.
6. Joint calls for action and research in partnership.
7. Non-monetary reward and recognition at field and sub national level as well sharing of data.

V. Promote investments for AMR activities, research and innovations



A. The following suggestions and comments highlight the modification or additions to the strategic priority

i) Prepare the economic case for sustainable investments for AMR interventions ii) Identify priorities for basic and operational research to optimize use of antimicrobials and improve infection prevention and control in human and animal health

1. Developing digital tools for OR to deploy in high burden public healthcare facilities.
2. Identify the operational challenges and improvise the protocols for the OR.
3. Submit the OR findings to the stakeholders and replicate the models in other geographies across all sectors.
4. Strengthen the marketplace for diagnostics and other solutions to combat AMR by bringing investment, de-risking the manufacturers in the stages of product development, fast-tracking regulatory approvals, building an efficient system of procurement.
5. The economic case is important, the goals needs to be more specific.
6. Vaccines need to be included.
7. Clearly defined regulatory pathways published for accelerated, breakthrough and expedited approval of novel drugs and vaccines.
8. Pooled purchase model by Government of India to support speedy approval and rewards for novel antibiotics.
9. Resource mobilization plan to be endorsed and implemented with clear role of the stakeholders.

10. Identify priorities for basic and operational research to optimize use of antimicrobials and improve infection prevention and control in human and animal health National research priorities for AMR to be defined and published National strategy plan to be developed to foster research and innovations to tackle AMR. Development of new antibiotics, alternative tools and diagnostics to be supported.
11. All agencies to annually publish their operational research agenda on AMR.
12. Fund and coordinate basic research projects in humans, animals, food and environment sectors to build evidence on AMR.

B. Implementation and assessment mechanisms to enable actionability of the strategic interventions & activities highlighted in the given strategic priority

1. Partnership and accountability models created for community, centre-state and international level partnership.
2. Updates on the AMR NAP website to know the progress.
3. Dedicated funding for R & D.
4. Involvement of the pharmaceutical companies.
5. Introducing scoring matrix to evaluate the lab performance across all sectors. Training and re-training of key officials across all sectors.
6. Establishment of technical working group with representations from all sectors.
7. Developing TOR for TWG.
8. Conduct periodic review meeting of TWG to assess the progress.
9. Bi-ennial assessment by MOH and ICMR.
10. Regulatory guidance and pathways for approval.
11. Faster review cycle for approval of new drugs and vaccines.
12. Advise to implement guidelines of the following:
 - a. WHO implementation handbook for national action plans on antimicrobial resistance: guidance for the human health sector. 2022.
 - b. WHO Situation Analysis of National Action Plans for AMR Containment. 2018.
 - c. US CDC National Action Plan for Combating Antibiotic-Resistant Bacteria –Progress Report.

C. Framework to enable effective intersectoral coordination by integrating the individual research priorities.

1. 6 monthly updates of inter departmental progress and annual report on NAP progress.
2. Sharing budget line item and utilization status.
3. The research priorities by nature should be interdisciplinary and translational so that intersectoral coordination is enabled from the beginning.

4. There also needs to be merging point –an apex body that looks after the different sectors in a One Health Approach including Monitoring, Evaluation, and Learning, and even management and sharing of research output among the multisectoral stakeholders.
5. Execution of planned activities across all the sectors.
6. Monitoring and evaluation of activities carried out, and identifying best practices and GAP analyses.
7. Taking corrective actions from weak areas and reimplementing the activity.
8. Joint monitoring of all the activities annually and submitting reports to the NAP committee.
9. Think-tanks like IAIH can play a role.
10. One Health Approach and Sharing of information among stakeholders.
11. State and district level teams to coordinate and integrate with NAP.
12. Continuous training and feedback mechanisms to track progress.
13. An openness and commitment among stakeholders to see how each of them contribute to tackling this global issue.

D. Incentives for effective intersectoral engagements; also highlighting disincentives, if any.

1. Investments promoting intersectoral engagements is usually a good incentive. Apart from this, incentives in the form of token of appreciation like selecting program with the most intersectoral engagements e.g. once every six months could encourage more to step up.
2. The incentive could also be in the form of designing a mechanism of faster adoption of solutions that cut across wide priorities in AMR.
3. There may also be a performance-based scoring system for programs with a high weightage for intersectoral engagements.
4. Disincentive thereby could be reflection of a low performance for program not diverging to the intersectoral priorities.
5. Additional funding for achieving target to set up additional infrastructure etc.
6. Recognizing people and institutions, and providing certifications, training them at national or international level.
7. Research on alternatives of antimicrobials.
8. Promotion of ethno-veterinary practices.
9. Public private partnerships to support AMR research.
10. Creating awareness among the investor community on the long gestation times and risk in drug and vaccine discovery.
11. Reward and recognition of states, cities and communities where action is taking place.
12. Partnership forums to laud government departments, private sector partners, community level organizations and international partners involved in changing status quo.

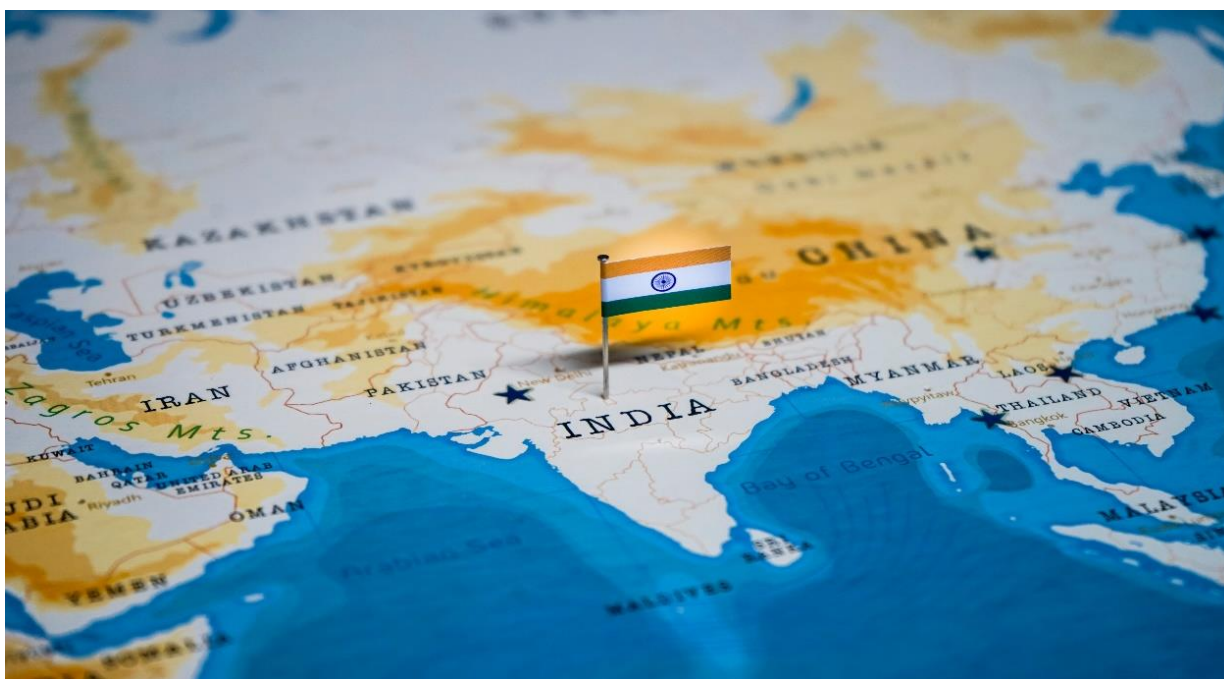
E. Capacities and capabilities required and suggest specific ways of building the same.

1. Complimenting the government activities and integrating to PM-ABHIM/ IPHL.
2. Innovative financial mechanisms like social impact bond.
3. Funding and creating regional hubs and scaling to other geographies.
4. Investment linked to innovation and progress made.
5. Creating a pooled funding mechanism like CARB-x or GARDP.
6. Expanding on current government funding schemes to spur innovations across the AMR sector.
7. Sharing of within govt and partner fund leveraged.
8. Transparency of achievements for progress in NAP activities.
9. Forum for all stakeholders- private, public and others to share viewpoint.

F. Top five global initiatives for raising investments for healthcare outcomes, and suggested mechanisms how India can intersect with these efforts to scale globally.

1. Advocacy with other public health and veterinary health programs for AMR partnerships.
2. Interaction with vaccines, TB and epidemic preparedness areas to partner for AMR.
3. Global fund, include diagnostics and vaccines.
4. Gavi for vaccines intersecting with AMR.
5. Combating Antibiotic-Resistant Bacteria Biopharmaceutical Accelerator (CARB-X) is a global non-profit partnership dedicated to accelerating antibacterial research to tackle the global rising threat of drug-resistant bacteria. Total corpus was US\$480 million for 2016-22.
6. The Global AMR Innovation Fund (GAMRIF) is a UK aid fund that supports research and development around the world to reduce the threat of antimicrobial resistance in low- and middle-income countries by supporting early-stage innovative research in underfunded areas of antimicrobial resistance (AMR) research and development.
7. The AMR Action Fund aims to bring 2-4 new antibiotics to patients by 2030 by investing more than US\$1 billion in smaller biotech companies and provide industry expertise to support the clinical development of novel antibiotics that address the highest priority public health needs.
8. The Fleming Fund builds partnerships across 24 countries in Sub-Saharan Africa, South and South-East Asia that support countries to collect, analyse, share and use high-quality data on antimicrobial resistance (AMR).
9. Global Research Collaboration for Infectious Disease Preparedness (GloPID-R) is the only alliance of its kind to bring together research funding organizations on a global scale to facilitate an effective and rapid research of a significant outbreak of a new or re-emerging infectious disease with epidemic and pandemic potential. India can leverage this fund through non-profit partners, research organizations, private organizations, etc.
10. Creating awareness among the public on AMR.
11. Highlighting the gravity of AMR using powerful voices - roping in celebrities as brand ambassadors.
12. Share success stories of AMR crusaders from across the country.
13. Delinking innovation with volume of sales for novel antibiotics.

VI. Strengthen India's leadership on AMR



A. The following suggestions and comments highlight the modification or additions to the strategic priority

i) International Role

- a. Strengthen India's commitment on AMR through collaborations & by strengthening intersectoral coordination mechanisms. identify priority areas of action to strengthen the coordination mechanisms.
- b. Strengthen and streamline international collaborations to promote India's contribution towards tackling AMR with donors and partners.

ii) National Role

- a. Strengthen national collaborations to tackle AMR with different disease control programmes by integrated AMR containment in alignment with vertical disease programmes. HIV/STI resistance activities Strengthen MDR/XDR-TB activities Strengthen drug resistance activities for malaria Strengthen drug resistance activities in Leprosy and NTDs Strengthen IDSP's AMR activities (IDSP).

iii) Sub-National

- a. Strengthen sub-national collaborations to tackle AMR. Establish AMR as a state-level priority that convene state-level advocacy meetings to prioritise action against AMR with One Health approach. Develop State Action Plans on Containment of Antibiotic Resistance (SAP-CAR) aligned to NAP-AMR.
- b. Establish mechanisms for global exchange of learnings and data across research institutions and consortiums engaged in AMR.
- c. India can play a bigger role in innovation of vaccines, diagnostics, and use of genomics.
- d. Strengthening surveillance for Animal Husbandry sector.

B. Implementation and assessment mechanisms to enable actionability of the strategic interventions & activities highlighted in the given strategic priority

1. Introducing scoring matrix to evaluate the lab performance across all sectors.
2. Continuous training of HR personnel across all sectors.
3. Establishment of technical working group with representations from all sectors. Developing TOR for TWG.
4. Conduct periodic review meeting of TWG to assess the progress.
5. Uniform SOP for AMR surveillance.
6. Expanding the AMR surveillance network.
7. Reward and recognition of best practices.
8. Share progress and achievements as well as challenges.

C. Framework to enable effective intersectoral coordination at the international, national and sub-national levels.

1. Planning and inter-sectoral activities.
2. Execution of planned activities across all the sectors.
3. Monitoring and evaluation of activities carried out, and identifying best practices and GAP analyses.
4. Taking corrective actions from weak areas and reimplementing the activity.
5. Joint monitoring of all the activities annually and submitting reports to the NAP committee.
6. India can play a bigger role in supporting data systems for HAI surveillance, as well as for genomic data sharing.
7. One Health Approach.
8. Partners forum where progress in NAP activities is shared transparently.

D. Incentives for effective intersectoral engagements with stakeholders at the international, national and sub-national levels; also highlighting disincentives, if any.

1. Investments promoting intersectoral engagements is usually a good incentive. Apart this, incentives in the form of token of appreciation like selecting program with the most intersectoral engagements e.g. once every six months could encourage more to step up.
2. The incentive could also be in the form of designing a mechanism of faster adoption of solutions that cut across wide priorities in AMR.
3. There may also be a performance-based scoring system for programs with a high weightage for intersectoral engagements. Disincentive thereby could be reflection of a low performance for program not diverging to the intersectoral priorities.
4. Joint collaborative research with the diagnostic kit manufacturers, equipment manufacturers and drug manufacturers to support the overall research need across all sectors, could be a good idea to improve engagement.
5. Support and rewards for intersectoral partnerships.
6. Sharing of surveillance data and Laboratory strengthening.

E. Capacities and capabilities required for a well-coordinated and fast responding mechanism to build on these partnerships. Suggest specific ways

1. Complementing the government activities and integrating to PM-ABHIM/ IPHL.
2. Innovative financial mechanisms like social impact bond.
3. Coordination mechanism like: Funding and creating regional hubs and scaling to other geographies, formation of TWG and developing TOR, and conducting annually and biannually meetings to evaluate and track progress.
4. Ability to move funds more rapidly; keeping flexibility in funding.
5. Communication Plan.
6. Reward and recognition for implementation level.

F. Top 5 global initiatives that India should participate to increase visibility and scale of its own national efforts in AMR, and suggest mechanisms how India can intersect with these efforts.

1. Sharing data to WHO, World Organization for Animal Health (WOAH) [formerly OIE], FAO on routine basis.
2. Representing India's NAP-AMR activities on international conferences.
3. Publishing scientific papers on India's efforts for NAP-AMR.
4. Connect through international networks- ICARS, WHO annual conference, link AMR and vaccine agendas globally, UNICEF and World Bank.
5. Conducting workshops in India on AMR.
6. Conducting cross-country workshops and learning series on AMR.
7. Call to Action, AMR R&D Hub, and WHO Vaccines/AMR prioritization framework.

8. Endorsement of Disease Control Programmes.
9. Implementation of Disease Regionalization.
10. Improved surveillance across the country.
11. Creating national repository around antibiotic supply chain management - provides real world evidence on supply versus demand.
12. Greater commitment to control antibiotic use in agriculture and veterinary medicines.
13. Leadership role in the global arena as a knowledge and responsive partner in AMR.

Summary: In the first five years of the National Action Plan for AMR saw a buildup of collective alignment and momentum, especially in the awareness of the healthcare challenges associated with the rise in AMR predominantly in LMICs, like India. It is now crucial to build on this momentum and to ensure that the next five years further accelerate and deliver specific interventions, policies and frameworks to curb further escalation of AMR in a cohesive and sustainable manner. This report has brought together some crucial insights from the different stakeholders across the AMR domains and could be an important reference to aid the drafting of the NAP for the next five years for greater on-ground impact.

Strategic Inputs:

Policy

- Policy needs to integrate human, animal, and environmental aspects of AMR at the state levels, in coordination with a central coordinating committee.
- Health literacy & advocacy; regulation of sale & usage of antibiotics; acceleration, adoption & access of innovations; surveillance & reporting; and stringent IPC norms are a few areas that can benefit from strong policy intervention.
- Policy framework should work across the care continuum and include awareness, prevention, diagnostics, and treatment, with a clear time-bound mandate that is assessed periodically.
- Instead of just recommending partners and resources, the policy framework can coalesce stakeholders with complementary attributes, to fulfil their joint mandates.

Funding

- The source of funding for the diverse activities needs to be varied and innovative, such that the collective efforts are coordinated, incentivized, non-repetitive, and justify the opportunity cost entailed for the desired outcomes.
- Enhancement of government funding through its agencies and existing programs are recommended with in-built mechanisms that incentivize milestone-based-, collaborative and time-bound deliverables.
- For the private sector, avenues should be explored for leveraging CSR funding, and investments to develop a business case for social investment. This needs to be done to complement the government's spending for AMR, as well as to bring key private partners as co-owners of solution development and dissemination.
- At an international level, the philanthropies, and non-profits working across different countries can partner to not just coordinate and support country-specific NAPs, but also enable scalability and uniform delivery of solutions across different geographies.
- Non-conventional funding and investment instruments need to be established across different disease verticals, and delivery models.

Ownership & Responsibility

- To overcome siloed, repetitive, and mis-coordinated efforts in AMR that could potentially lead to sub-optimal outcomes, a de-centralized working mechanism that leverages collective expertise, infrastructure, and mandates need to be put together, with clear ownership of task and deliverables.
- The ownership pyramid could span from health centers to hospitals, to inter-sectoral committees, to activity-specific working groups, to inter-ministerial representatives.
- All the major stakeholders should be signatories to the National Action Plan and assigned respective responsibilities that are timebound.

Assessment Framework

- Effective high-level taskforces, with representation across sectors and expertise, should be constituted for each strategic priority.
- Proactive assessment of activities, while demonstrating a critical understanding of why certain interventions failed in the past, and how they need to be re-oriented for better outcomes.
- Assessment frameworks with the scope to troubleshoot mid-course, should the outcome appear to be sub-optimal, may be an important factor to be considered and implemented.
- Building transparency and openness in communication, knowledge, and data exchange across sectors should be mandatory and, thus must be facilitated. This enablement should also be assessed periodically to ensure that the stakeholders are well-supported in their initiatives.

Scaling & integrating India's efforts

- Aside from partnering with global forums for wider visibility of India's AMR-focused efforts; India should also identify opportunities where the Indian ecosystem could attract investments while enabling clinical development or large-scale manufacturing for AMR intervention.
- Regional centers of excellence in LMICs & UMICs for AMR solutions could play a key role in this coordination.
- Research and Innovations for new drugs and diagnostics; as well as regulatory frameworks for the ease of its procurement and distribution in challenging market conditions are other aspects that can give India an impetus at the global level.

Strategic priorities

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

- A uniform coordinated communication strategy should be developed, by experts from the field, targeting specific groups, like the general public, students, healthcare practitioners, pharmacies, farmers, industry etc.

- Assess understanding (through behavioral studies), knowledge (by mapping knowledge, attitude, practices & behavior), and awareness of antimicrobial resistance and antimicrobial use (AMU) amongst key stakeholders/target groups like the population, professionals in health (including AYUSH), veterinary, pharmaceutical and environment, farmers and food processing sector.
- A National Technical Working Group may be established to look at the AMR data from different institutions to recommend training and education requirements depending on the group for whom it is intended. This should be followed by a time-bound action plan.
- Pre- and post-training assessments should be uniform and be undertaken by a state committee, in coordination with a central committee, on personnel, data generated & shared, communications, etc. to assess the effectiveness. This may be done in person, or with the use of digital platforms.
- Good practices should be adopted in training, stewardship initiatives, etc., across sectors, and disciplines pertaining to AMR, or from other areas that can be applied to AMR. This should be facilitated both, domestically and internationally.

Strengthen knowledge and evidence through surveillance

- Identify, strengthen and designate national reference laboratories for AMR surveillance. Infrastructure and expertise for surveillance should be shared and incentivized in the public and private sectors.
- Testing laboratories should be well-equipped and should be uniformly upgraded to include the latest standardized tests and technologies. These laboratories may be audited, periodically to gauge the quality of output and other requirements. The performance of the laboratories should be linked to their inclusion in national and international surveillance efforts.
- Establish regional reference laboratories at National/ State Organizations to continuously monitor the progress of the work.
- Existing surveillance networks should be enhanced, ex. Inclusion of primary healthcare sites, the inclusion of more tertiary healthcare facilities, uniform geographic coverage, etc.
- Strengthening microbiology laboratories for antimicrobial resistance and residue testing in the environment is essential, including in waste from farms, factories, and effluent from healthcare settings.
- Linkages with Integrated Health Information Platform (IHIP) / IDSP may be considered.
- Data collection from the district, zonal, regional, and state-level (including urban, rural, government, private, and unorganized sectors) may be planned and facilitated through the participation of public and private sector entities. The same framework may be considered and data analytics and reporting while benchmarking for quality.
- Cross-sector surveillance in humans, animals, and the environment should be collated for causal associations, for prioritizing intervention, and for assessing the effectiveness of policies and programs at the national level.
- Resistant strains identified during the surveillance should be centrally maintained and further made available to contributing partners, and other, to accelerate research and innovation in AMR.

Reduce the incidence of infection through effective infection prevention and control

- Conduct IPC assessments and gap analyses at different levels and all categories of health care settings, and animal farms.
- Develop uniform protocols and facilitate capacities for effective implementation of standardized IPC measures. Periodic assessments (M & E framework), and audits should be conducted.
- Define terms of reference, and scope and establish National Coordinating Unit (NCU) for infection prevention and control at different tiers of health care settings in public and private facilities.
- Employ digital means of data interpretation, predictive analysis, hotspot mapping etc. at the national level, across sectors. The best practices may be shared for scale and impact.
- Performance monitoring/performance payment within different schemes or quality programs like Swachh Bharat Abhiyaan, Kayakalp, and Swachh Swasth Sarvatra initiatives.
- Include AMR as part of the course curriculum in Medicine/ veterinary/fisheries /aquaculture and school students. Include biosafety, biosecurity, hygiene, and infection prevention and control in curricula for education and training of animal health, food professionals, and workers.
- Strict enforcement of penalties should be imposed on violators polluting the environment via uncontrolled effluents.
- Based on environmental risk assessment develop guidelines for locating farms, factories, slaughterhouses, wet markets, processing units, feed manufacturers, health care facilities, and veterinary care facilities; ensuring compliance by strengthening existing guidelines and enforcement strategies related to payments, benefits, etc.

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

- Creation of an accountable authority that will report on metrics related to the sale of antibiotics without prescriptions and non-therapeutic use of human sector antibiotics.
- Strengthen national regulatory authorities for improved quality, safety and efficacy of antimicrobials.
- Expedite regulatory processes to ensure uninterrupted supply of quality-assured antimicrobials; regulate the availability of probiotics without resistance determinants.
- Establish a framework for triangulating antimicrobial data for estimating the antimicrobial utilization patterns across different sectors and at the population level.
- The development of guidelines needs to be evidence based.
- Establish an independent veterinary regulatory authority.
- Restrict, and phase-out non-therapeutic use of antimicrobials.
- Develop tools & capacities to estimate national consumption of antibiotics measure the consumption of antibiotics at healthcare facilities registers and collect data from manufacturers, sellers, prescribers, and bulk users to measure the consumption of antibiotics in animal health facilities, food, and agriculture.

- Create a centralized dashboard to map hot spots to identify the notification of threatful pathogens and usage of large volumes of antibiotics.
- Usage of high-end antibiotics (oral and injectable) can be supplied via a restricted distribution network. Government can control the access & use of effective medicines through a government network (using an online portal similar to CoWin), or through restricted private networks. Such medicines should not be available at local pharmacies.
- Establish antimicrobial stewardship programmes for rational use of antimicrobials in animal facilities, agriculture, and food processing units.
- Linking the diagnostic results for the type of infection for which the antibiotic is prescribed.

Promote investments for AMR activities, research, and innovations

- Establishment of a technical working group with representations from all sectors.
- There also needs to be a merging point –an apex body that looks after the different sectors in a One Health Approach including Monitoring, Evaluation, and Learning, and even management and sharing of research output among the multisectoral stakeholders.
- Strengthen the marketplace for diagnostics and other solutions to combat AMR by bringing investment, de-risking the manufacturers in the stages of product development, fast-tracking regulatory approvals, building an efficient system of procurement.
- The economic case is important, the goals need to be more specific.
- Pooled purchase model by Government of India to support speedy approval and rewards for novel antibiotics.
- Resource mobilization plan to be endorsed and implemented with clear role of the stakeholders.
- Innovative financial mechanisms like social impact bonds. Other than this pooled funding mechanisms and conditional investments should be explored in the domain.
- Examples of global investment and funding coalitions can be referred to for constituting similar models, or aligning with the entities.

Strengthen India's leadership on AMR

- Strengthen and streamline international collaborations to promote India's contribution towards tackling AMR with donors and partners.
- Strengthen national collaborations to tackle AMR with different disease control programmes by integrated AMR containment in alignment with vertical disease programmes.
- Develop State Action Plans on Containment of Antibiotic Resistance (SAP-CAR) aligned to NAP-AMR.
- Leadership role in the global arena as a knowledge and responsive partner in AMR.

Note: Insights and perspectives included in the document were shared by invited domain experts, stakeholders, and partners associated with the India AMR Innovation Hub.

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