Antimicrobial Resistance

National Action Plan

Pakistan

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Regulations & Coordination
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Abbreviations and Acronyms

ARI	Acute Respiratory Infection
AMR	Antimicrobial Resistance
ASP	Antibiotic Stewardship Programs
AST	Antibiotic Susceptibility Testing
CDC	Centre for Disease Control, Atlanta
CLSI	Clinical and Laboratory Standard Institute
CME	Continuous Medical Education
CSSD	Central Sterile Supply Department
DALYS	Disability-Adjusted Life Years
DGHS	Directorate General of Health Services
DHIS	District Health Information System
DHQ	District Headquarter
DRAP	Drug Regulatory Authority of Pakistan
DST	Drug Susceptibility Testing
EARS- Net	European Antimicrobial Resistance Surveillance Network
EML	Essential Medicine List
EMRO	Eastern Mediterranean Regional Office (WHO)
EPA	Environmental Protection Agency
ESBLs	Extended Spectrum Beta Lactamases
EQAP	External Quality Assessment Programme
EUCAST	European Committee on Antimicrobial Susceptibility
FAO	Food & Agriculture Organization
FELTP	Pakistan Field Epidemiology & Laboratory Training Program
GAP	WHO Global Action Plan
GARP	Global Antibiotic Resistance Partnership
GLASS	Global Antimicrobial Resistance Surveillance System
HAIs	Hospital Acquired Infections
HCWs	Healthcare Workers
HCP	Healthcare Professional
HEC	Higher Education Commission
HSA	Health Services Academy
ICC	Inter-sectoral Core Committee
ICUs	Intensive Care Units
IEC	Information Education & Communication
IHR	International Health Regulations
IPC	Infection Prevention & Control

LIS	Laboratory Information System
LQMS	Laboratory Quality Management System
MDR	Multi-drug Resistant
MDROs	Multidrug Resistant Organisms
MIS	Management Information System
MMIDSP	Medical Microbiology Infectious Diseases Society of Pakistan
Mo NHS&RC	Ministry of National Health Services Regulations & Coordination
Mo NFS&R	Ministry of National Food Security & Research
NACP	National AIDS Control Program
NARC	National Agricultural Research Centre
NAP	National Action Plan
NIH	National Institute of Health
NGOs	Non-Governmental Organizations
NTP	National TB Program
NVL	National Veterinary Laboratory
OIE	World Organization for Animal Health
OTC	Over the Counter
PARC	Pakistan Agricultural Research Council
PARN	Pakistan Anti-Microbial Resistance Network
PHRC	Pakistan Health Research Council
PNC	Pakistan Nursing Council
PVMC	Pakistan Veterinary & Medical Council
PPE	Personal Protective Equipment
SSI	Survey Sampling International
TB	Tuberculosis
TCH	Tertiary Care Hospital
USAID	United States Agency for International Development
VAP	Ventilator Associated Pneumonia
WASA	Water and Sanitation Agency
WHA	World Health Assembly
WHO	World Health Organization

Foreword

The growing problem of Antimicrobial Resistance (AMR) has emerged as a major health crisis in almost all countries of the world including Pakistan, resulting in an alarming increase in the burden of infections due to multi-drug resistant organisms while limiting the choice of Antimicrobials for treatment.

The Global Action Plan to tackle AMR was endorsed in the 68th session of the World Health Assembly (WHA) in Geneva in May 2015 by all countries including Pakistan. The first follow-up action to the commitment of the Minister of State, Ministry of National Health Services Regulations & Coordination (NHSR&C) was development of the ***'National Strategic Framework for Containment of Antimicrobial Resistance'*** through a comprehensive consultative process undertaken through January to April 2016.

The next logical step is translating the National AMR Strategic Framework into an AMR National Action Plan (NAP), with involvement and full participation of the health, veterinary, agriculture, and other sectors at the federal, provincial and regional levels in the One Health Approach. The process was undertaken through a consultative workshop conducted from 27th February to 3rd March 2017 in Islamabad, in close collaboration with the National Institute of Health, National Agricultural Research Centre and National Veterinary Laboratory as the designated focal points for AMR in health and veterinary sectors respectively. The workshop was technically supported and financed by the World Health Organization with a team of international consultants and national experts facilitating technical discussions during the workshop.

The development of National Action Plan is fulfilment of the commitment of the Government of Pakistan on WHA68.7 resolution on AMR. The work plan is aligned with objectives of the Global Action Plan and includes strategic and operational components as well as a framework for monitoring and evaluation. The AMR NAP will be shared with all the stakeholders including relevant Health Development Partners (HDPs) at the national, provincial/regional levels under the One Health Approach for adoption and development of respective provincial and regional implementation plans.

Executive summary

The increasing global trend of Antimicrobial resistance (AMR) has gradually emerged as a major public health challenge for the entire world. AMR has spread to almost all countries and regions, including Pakistan owing to the "misuse and overuse" of Antimicrobials, contributing to the increasing burden of infections due to resistant bacteria, viruses, parasites and fungi, while limiting the treatment options for managing such infections.

The growing burden of AMR in Pakistan requires a National Action Plan (NAP) as a commitment to h the World Health Assembly Resolution 2015 (WHA68.7) to tackle the issue of AMR through a 'One Health' Approach. The national action plan development process needs to be embedded in an overall multi-sectoral response for containment of AMR to ensure reduction of adverse impact of inappropriate Antimicrobial use on health in terms of the cost, resistance and poor outcomes in human, agriculture and veterinary sector, as well as finance, environment and consumers.

An AMR Oversight Committee representing different sectors, ministries, departments of health and provincial authorities along with subject matter experts were notified by the MNHS&RC vide Notification No F. No 8-30/2015-DDP-1 dated 27th November 2015. The committee members along with the subject matter experts from various sectors participated in the entire process of National Action Plan development. This process ensured national ownership as well as the commitment of all relevant stakeholders. The following major strategic priorities emerging from this all- inclusive consultative process form the basis of further elaboration in the NAP:

I. Development and implementation of a national awareness raising and behavioral change strategy on antimicrobial resistance;
II. Establishment of an integrated national AMR surveillance system (human, animal usage and resistance monitoring);
III. Improve prevention & control of infections in health care, community, animal health, food, agriculture and environment;
IV. Update and enforce regulations for human and veterinary antimicrobial utilization;
V. Phase out use of antimicrobials as Growth Promoters and provide appropriate alternatives (such as prebiotics, probiotics);
VI. Integration of AMR in all public health research agendas including research on vaccines; and,
VII. Estimation of health and economic burden of AMR for decision making.

The primary objective of the AMR National Action Plan is to ensure that current Antimicrobials remain effective as long as possible for all those who need them while minimising the expense associated with indiscriminate use. The country needs to have consistent, coherent, comprehensive and integrated approach at the national level to address AMR which is aligned with and complements the global and regional efforts. The NAP has long term implications for improving the health of both humans and animals. It will take priority actions incrementally to combat AMR in a phased process with involvement and commitment of all stakeholders to ensure successful implementation in all relevant sectors.

Background

Introduction

Antimicrobial resistance refers to intrinsic and extrinsic factors which make the microbes resistant to Antimicrobials, while limiting treatment options for infectious diseases. The increasing prevalence of resistance to a range and broad categories of Antimicrobial medicines being reported from all over the world significantly threatens both human and animal health. The direct consequences of infection with resistant microorganisms can be severe and may result in longer illness, prolonged hospital stay, loss of protection for patients undergoing even simple operations and other medical procedures, with increased mortality and health care costs. AMR is cross cutting and affects all areas of health, involves many sectors and has an overall impact on the society as a whole.

The World Health Assembly Resolution (WHA 68.7) endorsed in May 2015 (http://apps.who.int/medicinedocs/en/d/Js21889en/) urged the Member States on the critical need for development of Global Action Plan as a recognition and the global consensus on the profound threat of AMR to human and animal health. Accordingly, the 68th WHA through a resolution A68/20 Corr.1 adopted the Global Action Plan (GAP) on AMR in May 2015. The Global Action Plan aims to ensure, for as long as possible, continuity of successful treatment and prevention of infectious diseases with effective and safe medicines that are quality-assured, used in a responsible way, and accessible to all who need them. The Global Action Plan has defined the following five strategic objectives for containment of AMR:

1. Improve awareness and understanding of antimicrobial resistance;
2. Strengthen knowledge through surveillance and research;
3. Reduce the incidence of infection;
4. Optimize the use of antimicrobial agents; and
5. Develop economic case for sustainable investment based on country needs and increase investment in new vaccines, diagnostics and other interventions.

Likewise, at the 71st UNGA session on 21 Sep 2016 (http://www.un.org/en/ga/71/), for the first time, Heads of State committed to taking a broad coordinated approach to addressing the root causes of AMR across multiple sectors, especially human health, animal health and agriculture. Countries reaffirmed their commitment to develop NAPs on AMR based on the "Global Action Plan on Antimicrobial Resistance", as the blueprint developed for tackling AMR in 2015 by the World Health Organization in coordination with the Food & Agriculture Organization and the World Organization for Animal Health.

The resolution (WHA68.7) has also urged Member States to develop and implement inclusive and informed National Action Plans (NAP) for containment of AMR by May 2017 under the five-GAP strategic objectives. In this regard, a Regional AMR Steering Committee and Task Force were established by WHO EMRO in 2015 with the mandate to develop the outline of a Regional Operational Framework for implementation of the GAP on AMR and assist the member states to develop and implement national action plans with "One Health Approach". The action plans underscore the need for a cross-sectoral coordination among national governments and international partners in the human, veterinary, agriculture, environment and other sectors.

The Government of Pakistan following the commitment to the WHA Resolution, May 2015 has already taken several initiatives to address AMR. An early implementation of the National AMR Surveillance System in the health sector, aligned with the Global Antimicrobial Resistance Surveillance System (GLASS) in collaboration with the WHO, is in place through a sentinel approach.

An Intra-sectoral Core Committee (ICC) on AMR (Annex 1) was notified on 27th Nov 2015 by the Government of Pakistan, with the mandate to (i) identify key stakeholders and experts in policy making, infectious diseases, pharmaceuticals, animal health and agriculture sector, etc. (ii) assess the existing status of AMR in Pakistan through systematic review of WHO docs/ guidelines/reports and national literature on AMR in Pakistan (iii) prepare a policy document/ strategic framework outlining the details of the proposed areas for National AMR Framework and Action Plan narrated through a consultative process with key stakeholders and experts (iv) provide recommendations for engagement of public and private sector including professional societies in terms of resource mobilization for awareness, standardized testing, surveillance and monitoring of AMR and regulatory framework (v) provide recommendations for development of provincial plans of actions for implementation of AMR NAP.

The Mo NHSR&C in April 2016 completed the process of Joint External Evaluation (JEE) for assessment of IHR and GHSA core capacities in 19 technical areas (https://extranet.who.int/sph/sites/default/files/jeeta/WHO-WHE-CPI-2017.9-eng.pdf). AMR was recommended as one of the priority areas for action in the JEE report due to very limited capacity according to scoring on the 4 AMR indicators. The results of the JEE further reiterated the need and endorsed the parallel process of development of National Strategic Framework for Containment of AMR. In the ensuing focus, several other health development partners and professional organizations also indicated their interest and joined the on-going AMR activities in Pakistan.

The ICC under the technical oversight of the Ministry of National Health Services Regulations & Coordination (Mo NHSR&C) developed and endorsed the "National Strategic Framework for Containment of Antimicrobial Resistance" on 1st December 2016 through a comprehensive consultative process involving all relevant sectors (http://www.nhsrc.gov.pk/messageDetail5822.html?message_id=11). The National AMR Strategic Framework collated several policy statements and interventions which were aligned to the strategic objectives of the Global Action Plan.

The Mo NHSR&C subsequently notified a Core Group on AMR (Annex 2) on 7th March 2017, composed of technical members from relevant entities (Ministry of National Health Services Regulations & Coordination, NIH/ AMR Focal Point, Ministry of National Food Security & Research (NARC/NVL), Provincial IHR focal points, WHO, CDC & Shifa Hospital) to: (i) compile, refine and finalize AMR NAP; (ii) coordinate with One Health and other relevant stakeholders (National & Provincial) for follow-up activities; (iii) assist provinces to prepare Provincial AMR operational plans; and, (iv) provide technical, coordination and monitoring oversight for implementation of AMR activities in Pakistan.

A national consultative workshop was conducted from 27th Feb to 3rd March 2017 with the support of the World Health Organization. Very careful consideration and meticulous workshop planning resulted in a notable multi-sectoral participation of over 90 experts from all levels. The all-inclusive consultative process ensured consensus, commitment, and ownership of the participating stakeholders. The workshop methodology was able to generate in depth discussions and build consensus on defining strategic direction and priorities for systematically addressing AMR in Pakistan.

The guiding principles forming the basis of AMR National Action Plan which includes national strategic, operational and M&E plans are the seven strategic priorities defined earlier in the National Strategic Framework for Containment of AMR. The strategic interventions under these main priorities have been further elaborated into main activities, with outcomes, timeframe and assigned responsibilities of all relevant sectors at the Federal, Provincial and District levels including Health Development Partners.

The process of NAP development initiated and strategized in the national consultative workshop was subsequently compiled and collated by the technical Core Group.

Governance

The Governance in Pakistan is decentralized with the country administratively divided into four major provinces of Punjab, Sindh, Khyber Pakhtunkhwa, Baluchistan and four federating areas: Federally Administered Tribal Areas (FATA), Gilgit- Baltistan (GB), Azad Jammu & Kashmir (AJ&K) and Islamabad Capital Territory (ICT). Following devolution in 2011, the provincial governments are fully autonomous and responsible to define their health needs, develop and implement policies, strategies and operational plans. However, the Mo NHSR&C develops the national framework for policies, defines standards and fulfils international mandates and obligations on health.

In order to oversee the process of implementation of International Health Regulations 2005 (IHR) and Global Health Security Agenda (GHSA) across Pakistan, the Mo NHS&RC issued notification for designating the Health Planning, System Strengthening and Information Analysis (HPSIA) Unit as the focal point for IHR and GHSA. The unit is mandated to collaborate and work with the federal line ministries provincial/regional departments of health t and International Health Development Partners (HDP). The previously notified National Taskforce for IHR has also been revised to constitute a multi-sectoral "National Taskforce for IHR and GHSA' comprising of Health and Non-Health sectors and defined terms of reference to oversee and coordinate the process of IHR implementation in Pakistan.

The National Institute of Health (NIH) as the national focal point for IHR and AMR designated by Mo NHSR&C, is responsible for implementation of selected technical areas of surveillance &response, workforce development, laboratory system and AMR. Additionally provincial IHR focal persons are also assigned as provincial AMR focal persons. However, there is a need for policy dialogue and decision for establishment of dedicated federal and provincial setups for implementation and governance of AMR activities. Similarly, some donor funding is available for AMR, however, advocacy and focus on allocation of domestic resources for AMR is required for sustainability.

The Mo NHSR&C also intends to designate a National Focal Point for Infection Prevention and Control with defined responsibilities and terms of reference.

AMR Focal Point for the Veterinary sector is in the process of official nomination by the Ministry of National Food Security & Research (NFS&R).

Situation analyses and assessment

Antibiotic resistance is one of the major health crises in Pakistan with the overall situation being grimmer than indicated in many studies published over the last two decades. A number of factors have been contributory in this regard. These include unnecessary large number of registered products (approximately 50,000); unjustified or misleading advertisements with only about 15% promotional brochures meeting WHO criteria; self-medication in more than 50% of the population according to different studies/surveys; and, a high number of quacks in the country. The highest numbers of drugs are prescribed with more than 3 drugs per patient, and 70% of patients are prescribed antibiotics. This irrational and indiscriminate use is more common among General Physicians (GPs) and public sector hospitals with a bias towards costly broad spectrum antibiotics. Availability of over the counter (OTC) without prescription medications, especially antibiotics is a common practice and use of potent antibiotics for highly resistant infections is also a common phenomenon. These practices have created a vicious cycle with emergence of resistance in common bacteria resulting from antibiotic selection pressure. Only a few institutions have full or partial institutional policies on

optimal prescription of antibiotics. However, any impact at country level cannot be expected unless majority of the health care institutions and community based general practitioners are also fully implementing such policies.

Bacterial resistance has been well documented in several studies and surveys conducted over a decade in Pakistan. Resistance in Gram-negative organisms was increasingly recognized with extended spectrum beta lactamases (ESBLs) being a major concern. A study conducted by Aga Khan University, Karachi from 2001-2006 indicated an increase in ESBL and multidrug-resistant organisms (MDR) producing *K. pneumoniae* to >30% and 0.4% Carbapenem resistance. A study of blood stream infections (BSIs) from Lahore revealed an alarmingly high resistance in *Enterobacteriaceae* against 3rd generation Cephalosporins (93.7%); and 6.5% carbapenem resistance among *Pseudomonas* and *Acinetobacter* isolates. Infection with pan-drug resistant *Acinetobacter* is also increasing in many hospital settings across Pakistan with reported high mortality among patients. Different studies conducted during 2004 – 2013 also indicate increasing resistance of *E. coli* to 3rd generation Cepaholosporins ranging from 12.6% to 94% among clinical isolates. Similarly, high resistance i against 3rd generation Cephalosporins has been reported among *Klebsiella spp* isolates with increasing frequency.

Typhoid continues to be an important public health threat across the country due to drug resistance and associated treatment failure. A study conducted by Aga Khan University on sample size of over 5,000 isolates of *Salmonella typhi* and *S. paratyphi A between 2001-2006* indicated that MDR rate has increased significantly from 34.2% to 48.5% among *S. typhi isolates, while* quinolone resistance has increased from 1.6% to 64.1 % among *S. typhi and from 0% to 47% among S. paratyphi* A isolates.

Methicillin-resistant *S. aureus* (MRSA) commonly associated with soft tissue and skin infections (SSTIs), bone and joint infections, blood stream infections (BSIs) and hospital acquired infections (HAIs) has reportedly revealed high rates of resistance. . High prevalence (35%-40%) of MRSA isolates in different hospitalized patients has increasingly led to the use of second line costly drugs. Various studies published between 2004 – 2013 reports Methicillin resistance between 1.2% - >72 % among clinical isolates of *S. aureus.* Anecdotal evidence suggests that MRSA infections within the community may also be on the rise.

Tuberculosis and malaria are also major public health problems in Pakistan. Resistance has emerged with potential negative fallout on the National Programs and grave implications for the public at large. Antimalarial drug resistance has been closely monitored since the early 60s when the honeymoon period of Chloroquine and other aminoquinolines had just begun. However, the first ever report about Chloroquine resistant falciparum was first documented in 1980 and since then the level of resistance has reached >80% (2004)..

The incidence of *P. falciparum* as compared to *P. vivax* is increasing in Pakistan. One of the serious obstacles to Roll Back Malaria is resistance and poor cure rates of anti-malarial drugs. Over the years *P. faliciparum* has shown continuous increase in all endemic areas of Pakistan. Monitoring antimalarial drug efficacy and safety at selected sentinel sites is the regular feature of malaria control programme today. Based on the results of these surveys conducted every alternate year, choices for first and second line treatments for falciparum are defined through determining molecular markers by RT PCR on all samples. However, more studies to observe, find impediments and conduct drug resistance surveillance on antimalarials are required.

Drug-resistant tuberculosis is increasingly encountered with an estimated 14000 MDR TB cases annually; of these 50% are further resistant to fluoroquinolone, reflecting inadequate control and alarming high prevalence of antibiotic resistance in the country.

Most studies have shown a secular upward trend in resistance in all fields of human and veterinary medicine, with MDROs being isolated with increasing frequency across the country. However, there is no nationwide surveillance to capture data or any action plan to address the growing threat of AMR. The use of antimicrobial agents in animals, poultry and agriculture has recognized benefits but overuse has potentially serious implications for human health. Appropriate use of antimicrobials in the Veterinary sector (selection, administration, monitoring and assessment) is a highly skilled task requiring the experience and expertise of veterinarians and knowledgeable farmers. Commercial practices to increase production involving regular use of antimicrobials has potentially increased the selection pressure on bacteria to become resistant.

Transmission of animal origin resistant bacteria to humans is possible through the environment and food chain and to the agricultural workers by direct contact. Causality of AMR due to antibiotic use in animals is difficult to establish. However, there is some direct evidence to show a close association between the prevalence of livestock-associated resistant bugs in animals and humans, levels of antimicrobial use in animals and the prevalence of resistant bacteria in animals and humans.

In low- and middle-income countries there is a huge and unprecedented growth in demand for animal protein. The global consumption of antimicrobials in animal food production estimated at 63,151 (±1,560) tons in 2010 is projected to rise by 67% to 105,596 (±3,605) tons by 2030. Pakistan is one of the top ten producers of livestock and poultry in the world. The overuse and misuse of antibiotics is common in veterinary practice with the potential public health hazard for compounding the AMR situation. Few studies have been done on antibiotic residues in poultry; and, experts in the field have warned against this threat, urging the government to address this pressing issue on a priority basis.

In fast-growing Asian countries meeting the increasing demand for meat products constitutes a significant challenge, with the widespread antimicrobial resistance posing grave implications for densely populated countries like Pakistan. This is further compounded by the fact that regulations on antimicrobial use are not in place and surveillance data on antimicrobial consumption does not exist. A survey of World Organization for Animal Health (OIE) in 2012 in the OIE Member Countries revealed that only 27% countries have quantitative data on antimicrobial use in livestock with no regulations controlling the use of antimicrobial agents. Pakistan and other countries must learn these lessons for better surveillance to collect data, maintain resistant patterns, improve diagnostics and help in implementation and regulation that is acceptable and applicable.

Limiting the consumption of antimicrobials in countries like Pakistan, Bangladesh, Nepal, and Sri Lanka is likely to be beneficial on a broader regional scale given the interconnectedness of the pharmaceutical commerce and trade industries. This has far reaching concerns, as antibiotic use in animals, poultry and agriculture can be detrimental, with the potential to enhance AMR. However, limiting the non-essential use will mean safe and secure food, and also help in controlling the spread of AMR. In this regard, monitoring and regulatory framework in all sectors including animal and agriculture health needs to be in place and aligned with the GAP to tackle the growing menace of AMR.

All studies from human and animal sectors on resistance reinforce the assumption that the problem of AMR may already be out of control. There is great concern, that unless contributing factors such as antibiotic misuse and poor IPC practices are not tackled, we will become helpless in treating even the most common infections.

Deliberations during the National AMR Framework development in Pakistan, revealed dearth of relevant AMR experts at the national level, with almost complete lack of AMR

awareness among human and veterinary health professionals and the community. There is no antibiotic policy or stewardship programs (ASP) in most of the public and private hospitals in both sectors.

Infection Prevention Control (IPC) is compromised due to poor practices in antibiotic use and basic hygiene. Microbiology laboratories are not standardized and national AMR surveillance system is also not in place. There is lack of collaboration for containment of AMR between human health and other sectors such as veterinary and agriculture sector. Other threats related to AMR include lack of data on consumption, quality of antibiotics and vaccines, financial mismanagement and lack of sustained implementation of IPC programs in healthcare settings. Lack of AMR legislation, inclusion of AMR in human & veterinary medical curriculum and absence of IPC/ASP programs, and weak network of referral laboratories are some of the additional challenges.

However, there is optimism, as some existing health and livestock infrastructure can be used for AMR surveillance through up-gradation of the existing facilities, with the existing National Programs serving as a model for replication. Similarly, available specific expertise already existing in the human and animal health can be utilized to establish national bodies for implementation of AMR activities using the One Health Approach. Many professional national and international organizations have the capability and interest to work together and support the Government of Pakistan for addressing AMR through implementing the AMR National Action Plan.

A National Action Plan to contain and control the rapid spread of "superbugs" is a critical requirement at the country level. Strategies and interventions focusing on the prudent use of antimicrobials and limiting their random and irrational use in all healthcare settings have to be implemented as an immediate priority. These steps are expected to have a major impact on reducing infection rates, resistance patterns, costs and improving the clinical outcomes.

The aim to contain AMR can be achieved at both the institutional and community levels through multi-sectoral involvement of all key stakeholders from the Government, professionals, societies and policy makers, to public and private health care institutions. In this context, it is also necessary that the multi-sectoral AMR Oversight Committee designated by the Ministry of NHSR&C remains engaged not only in the process of AMR action plan development, but also continues to provide technical and monitoring oversight during subsequent operational implementation at the federal, provincial, district and community levels.

In many developed countries there have been recent initiatives at the national level to address AMR. These countries include USA, where an Executive Order has been passed calling for sustained, coordinated, and complementary efforts of individuals and groups including healthcare providers, healthcare leaders, veterinarians, agriculture industry leaders, manufacturers, policymakers, and patients to detect, stop, and prevent the emergence and spread of resistant bacteria. Other G7 countries (Canada, France, Germany, Italy, Japan, the United Kingdom and the United States), have shown similar urgency and a call for action. European Council, and Trans-Atlantic Task Force on Antimicrobial Resistance (TATFAR), aims to enhance cooperation between the USA and Europe in the field of antibiotic resistance. Similarly, in India, Kenya, Cambodia, Fiji, Japan, Philippines, Vietnam, Ethiopia and South Africa, initial steps for implementation of National action Plans have been taken over the last few years with involvement of all relevant sectors in the "One Health Approach". .

In the recent past there was limited attention and political prioritization of AMR in Pakistan. However, following commitment in the WHA and development of National AMR Strategic Framework for Containment of AMR, the focus has shifted to seriously address this important public health crisis. The development of AMR NAP is the next sequential

step and fulfilment of global, regional and national commitment by the Mo NHSR&C. This document addresses all the five objectives outlined in the WHO Global Action Plan for Antimicrobial Resistance. The main focus of the NAP has been on major critical aspects such as burden of AMR and surveillance, IPC practices, antimicrobial stewardship efforts and judicious use of antibiotics, in all fields including human, agriculture, poultry and veterinary medicine. Special emphasis has been on the 'low hanging fruits' such as improving awareness and understanding on AMR, education and training commencing from the school and undergraduate levels. Simple measures like effective compliance with sanitation and hygienic practices at the community and in health care settings can greatly reduce the incidence and transmission of infections.

Optimal use of antimicrobials both in human and animal health is essential for ensuring the continuing effectiveness of these medicines. The NAP includes activities to implement national measures for strengthening and developing steps to curtail antibiotic use in humans and animals. The vision for longer term containment of AMR, however, requires consideration and focus for investment on local solutions for new medicines and vaccines, diagnostic tools and other innovative interventions as part of the overall research agenda in Pakistan. There are activities to further assess resource needs, sustained technical and financial investment for integrated research, laboratories and regulatory capacities, as well as professional education and training. It is now expected that this joint effort of health, animal and agriculture sectors will galvanize national momentum to deal comprehensively and successfully with the critical issue of addressing and containing AMR in Pakistan.

SWOT Analysis: GAP Strategic Objectives

SWTO analysis was undertaken during the development of strategic Framework for AMR though a consultative process. The analysis also involved discussions and deliberations with the subject matter experts, onsite visits and meetings with key informants and stakeholders from different sectors. The SWOT analysis has been further refined for the scope and purpose of the NAP as follows:

Objective 1: To improve awareness and understanding of antimicrobial resistance through effective communication, education and training

Strengths	**Weaknesses**
1. Availability of some relevant expertise within the country 2. Proactive media, availability and widespread use of internet across the country 3. Educational infra-structure available 4. Health infrastructure available	1. No Strategic Framework available at national and provincial levels 2. Shortage of skilled human resource regarding AMR related issues 3. Weak curriculum of professional education 4. Low quality of education regarding AMR at different levels 5. Weak understanding and lack of awareness of AMR among professionals 6. Poor general public awareness regarding AMR related problems
Opportunities	**Threats**
1. NGO and community based organizations can be engaged to improve AMR awareness 2. Expertise available at certain levels can be engaged for advisory and educational purpose 3. Experience from vertical programs like TB can be used to promote awareness and education regarding AMR 4. Strategic Framework makers and politicians can be sensitized to address the AMR related problems 5. Engagement of Federal and Provincial Governments for legislation and implementation 6. Integration of academia and research institutions with clinical/ field professionals 7. Highly proactive electronic media can conduct positive and effective media campaigns 8. International agencies and donors can provide funding for AMR awareness activities	1. Security situation at certain areas 2. Conflict of interest among stake holders 3. Non-availability of specific funds/domestic allocation for AMR 4. Shifting of focus and political will due to competing priorities

9. International commitments by the Government of Pakistan, for IHR and Global Health Security Agenda (GHSA) which includes AMR as a major action package and priority agenda of the Ministry of NHSR&C	

Objective 2: Strengthen the knowledge and evidence base through surveillance and research

Strengths	**Weaknesses**
1. Initiation of early implementation of GLASS through designated sentinel surveillance in Punjab and Sindh 2. Availability of potential laboratories across the country which can easily generate and share AMR data with federal level 3. Available expertise can be used for establishing surveillance system 4. Labs doing Drug Susceptibility Testing (DST) at different levels of human and animal health care system (in both private and public sector) can be involved in surveillance system (Some of them are Quality Assured) 5. Existence of regulations and models for surveillance in place e.g. for TB program, other communicable diseases (including those under One Health) 6. Disease surveillance systems that can be adapted / modified for AMR surveillance include DHIS and FELTP programs 7. Established research and academic base at institutions like NIH, PHRC, PARC, Academia can contribute towards system development 8. National Public Health Laboratories with infrastructure for AMR is available at NIH 9. Availability of functioning sentinel sites network and teams for antimalarial drug efficacy and safety monitoring in Sindh, Balochistan, FATA internationally trained in WHO testing protocols	1. No AMR related central coordinating body /unit/cell/ data centre 2. Partial diagnostic infrastructure available 3. Weak microbiology lab system with variable standardized system for DST 4. Lack of resources for performing DST 5. Limited EQA for labs 6. Cultures/ DST are not uniformly requested for diagnosing infection due to lack of diagnostic guidelines 7. Institutions reluctant to share AMR data 8. Limited AMR related diagnostic stewardship 9. Limited awareness and utilization of WHONET software 10. Lack of provincial labs that can serve as reference labs for AMR 11. Inadequate AMR surveillance infrastructure 12. Lack of AMR advocates for surveillance & research 13. Limited awareness /education / training regarding AMR surveillance 14. Lack of AMR research training/ programs 15. Lack of national policy on surveillance and enforcement mechanisms with political support 16. Many laboratories are publishing their anti-biograms regularly however complete clinical and epidemiological data of cases is not available.
Opportunities	**Threats**
1. Willingness exists at different levels (national & international & donors) for AMR surveillance including One Health partners 2. National Laboratory Strategic Framework available	1. Vested interests of professionals, pharmaceutical industry, veterinary and agriculture industry may influence AMR surveillance system

3. Provincial health regulatory authorities (KPK, Punjab) and Sindh Health Care Commissions are in place 4. IHR related provisions, programs and global demands for food safety can be utilized for strengthening surveillance system 5. Available labs can be upgraded to do DST through public private partnership models 6. DHIS/MIS can be modified for AMR surveillance in provinces 7. Several Academic Research units for AMR research are available for high level research 8. WHO guidelines for surveillance under GLASS protocol available and can be adopted 9. Capacity review mission conducted in 2015 by WHO for setting up AMR sentinel surveillance in Pakistan using GLASS protocol 10. Established health and livestock infrastructure can be used for surveillance system	2. Conflict of interest in antimicrobial prescription 3. Pressure to conceal information in some situations 4. Lack of sustainable resources for surveillance, which should be ensured by the public sector instead of the donors 5. New extreme resistance may create panic, if not detected in timely manner 6. Inadequate bio-risk management in surveillance network labs 7. High cost for existing and new diagnostics

Objective 3: Reduce the incidence of infection through effective sanitation, hygiene and infection prevention measures

Strengths	Weaknesses
IPC 1. Awareness among health care professionals in some settings 2. Expertise available within country 3. Potential media support for communication on IPC at mass level **Hygiene and sanitation** 1. Religious and social beliefs 2. Existing sanitation system available in some cities 3. Awareness through media 4. Know-how about Bio-remediation of waste water available at some institutions (Ministry of NFS&R, QAU etc.) **Vaccination** 1. Awareness among general public 2. Availability/support to masses 3. Parental intent 4. Fear of infections	**IPC** 1. No institutional, national, provincial, IPC policies / programs in place 2. No national IPC guidelines 3. Waste management Strategic Framework developed with weak implementation 4. Non-availability of accountability / audit systems 5. Shortage of trained IPC professionals 6. Negative attitude / behaviour towards IPC and prevention practices 7. Weak political will 8. Lack of dedicated funds and staff at national and provincial levels 9. Lack of vaccination of HCW in most hospitals **Hygiene and sanitation** 1. Standards of drinking water and food are not well defined 2. Irresponsible attitude of the relevant authorities 3. High cost of potable water

5. Manufacturing facilities available at some institutions **Sustainable animal husbandry practices** 1. Veterinary Hospitals Network exists at provincial level including some coordination with national institutions 2. Awareness in professionals 3. Trained manpower available 4. Adequate Vaccines availability and routine vaccination in health sector of the country **Public health** 1. National Institute of Health (NIH) has a key role at National level 2. Availability of trained workforce through academic institutions and other training programs like FELTP 3. Willingness and on-going campaigns by majority of the stakeholders	4. Weak sanitation systems 5. Untreated dumping of contaminated water 6. Poor awareness of personal and food hygiene 7. Limited funding **Vaccination** 1. Shortage of trained manpower 2. Cold chain and storage of vaccines due to extreme weathers conditions and frequent power failures 3. Inadequate vaccination coverage 4. Inadequate transportation facilities 5. Inadequate local manufacturing 6. Vaccination records and ledgers poorly maintained **Sustainable animal husbandry practices** 1. Unhygienic practices are common in almost all sectors 2. Weak implementation of existing national livestock policies 3. Quality of vaccines is not according to international standards and supply of vaccines is irregular 4. Low vaccination coverage 5. Lack of proper surveillance and monitoring systems for animal communicable diseases and zoonosis **Public health** 1. One Health integration at federal and provincial levels is poor 2. Weak public health system due to improper public health legislation and enforcement
Opportunities	**Threats**
IPC 1. Availability of guidelines and training modules at international level 2. Availability of donors to support IPC 3. Availability of supplies including PPE for IPC 4. International guidance can be availed through WHO or other organizations 5. Engagement of NGOs *Hygiene and sanitation* 6. Support from donors available in public health sector	**IPC** 1. Mismanagement of financial resources 2. Emerging new pathogens 3. Medical tourism 4. Transfer of resistant pathogens between hospitals 5. Overcrowded health care facilities *Hygiene and sanitation* 1. Misuse of funds and resources 2. Poor infrastructure

Vaccination 1. International donors support available 2. Requirement at international level under IHR and Global Health Security Agenda (GHSA) *Sustainable animal husbandry practices* 1. Evidence based research can help in improving practices 2. Public / private partnership in Research & Development 3. Capacity building on existing resources **Public health** 1. Support of Donors and international sources 2. Governmental requisites	**Vaccination** 1. Taboos and mind set in certain groups opposing vaccination *Sustainable animal husbandry practices* 1. Non -regulated private practice with large number of Quacks 2. Irrational use of antimicrobials as therapeutics, prophylaxis and animal growth promoters **Public health** 1. Outbreaks with MDR pathogens or any extensive epidemics that consumes the resources

Objective 4: Optimize the use of antimicrobial medicines in human and animal health

Strengths	**Weaknesses**
1. DRAP published guidelines with defined PHRC criteria for voluntary ethical marketing code 2. DRAP activities related to regulation and quality management improved in past 3 years 3. Some poultry farms have established labs and practicing culture based Antibiotic use 4. Development of the One Health forum/network on the National and Provincial level 5. Research and development and production of veterinary vaccines in Pakistan 6. Increase in number of trained ID physicians and microbiologists in the last 5-6 years 7. ASP in some hospitals showing benefit in prudent use of Antibiotics	1. Large number of unregistered medical and veterinary practitioners 2. Weak training and poor practices in healthcare provider (HCP) 3. Unethical incentives to doctors from pharmaceutical industry 4. Laboratory methodology not uniform 5. Community certified pharmacies are insufficient in number and run by non-trained personnel 6. Easy accessibility to over-the-counter Antibiotics 7. Overuse of Antibiotics in veterinary use responsible for drug resistance in human 8. Farmers self-prescribing Antibiotics as growth enhancers 9. Lack of efforts to introduce Antibiotic replacement products as growth promoters in animals 10. Limited activities to develop or enforce regulations to control promotional practices by industry 11. In-effective mechanisms for identification and reports on substandard and falsified antibacterial medicines.
Opportunities	**Threats**
1. Inclusion of certified infectious diseases specialists in the DRAP Advisory Committee for essential drugs	1. Enforcement / implementation of over the counter drug list of Antibiotics will not be easily accepted by community

2. List of drugs that are to be dispensed only on prescription by Registered Medical Practitioner to include antimicrobials 3. Standardized prescriptions bearing physician's name, address, telephone # and PMDC & PVMC registration number 4. Specific syndrome- related messages for health care providers, e.g. URTI, AGE, UTI 5. Discourage production of irrational Antibiotic combinations in human and veterinary practices 6. Media campaign for general public explaining the problems associated with Antibiotic use 7. Strengthening and upgrading of community pharmacies 8. Optimal harmonization of diagnostic kits and microbiology lab procedures 9. Remove obsolete tests like typhoid and TB serology 10. Certification program and incentives for institutions and individuals embarking on ASP 11. Certification of Antibiotic- free poultry, meat and milk products 12. PVMC and/or FAO guidelines to be implemented through the Ministry of National Food Security and Research (Mo NFS&R) 13. Education of farmers for judicious antimicrobial use in livestock and poultry 14. Drug sale rules should be implemented in letter and spirit to check injudicious use of Antibiotics 15. Non-registered medical practitioners should be given training in performing safe procedures where such qualified persons are not available	pharmacists 2. Lack of infrastructure to implement an electronic record of Antibiotic prescription 3. Lack of current human resources for building an ASP (trained ID specialist, microbiologist, IPC nurse, pharmacist) in most hospitals 4. Financial support for ASP is unlikely at this time 5. Lack of general health infrastructure in the country 6. Resistance from the farmers as lack of replacement of Antibiotics as growth promoters 7. Drug companies may resist wide-spread implementation

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

Strengths	Weaknesses
1. Availability of vaccine production facilities and infrastructure in public and private sectors in veterinary and human health sector 2. Availability of lab for drug residue testing in food of animal source (National Veterinary Laboratory (NVL) 3. Availability of skilled personnel in diagnosis and vaccine	1. Lack of evidence based research for proper intervention and therapeutics 2. Personnel available for diagnostics and vaccine are not well trained 3. No organization to regulate import of diagnostic kits/equipment according to WHO recommendation

production 4. Reports of several new antimicrobials under research in Pakistan 5. Availability of strong research system in agriculture including plant and animal health coordinated by PARC throughout out the country 6. Availability of funds through academia interest linkage programmes (e.g. through HEC) 7. Availability of Patent filing and intellectual property rights organization	4. Lack of data for financial impact of infectious diseases (e.g. DALYS) 5. No state of the art reference lab and weak microbiological support for diagnosis of infectious disease 6. Lack of interprovincial and interdepartmental harmony, collaboration and coordination 7. Lack of sustainability of diagnostic or treatment strategy due to ad-hoc solutions 8. No national proficiency scheme for standardized AMR testing in public (human and animal health sectors
Opportunities	**Threats**
1. International interest to develop regional and international linkages for AMR research 2. Some laboratories in academic institutes and private sector have advance research facilities	1. Massive negative economic impact on the country 2. Some stakeholders can create hurdles 3. Weakness and continuity of political will 4. Import of substandard antimicrobials and diagnostic kits/reagents 5. Insufficient investment in Research & Development by local pharmaceutical industry

Vision

No Pakistani should suffer from AMR in the coming years

Mission Statement

To have a functional coordinated, collaborative and sustainable AMR containment system in place using "One Health" Approach aligned with WHO Global Action Plan on AMR.

Strategic Priorities

1. Development and implementation of a national awareness raising and behavioural change strategy on antimicrobial resistance;
2. Establishment of an integrated national AMR surveillance system (human, animal usage and resistance monitoring);
3. Improve prevention & control of infections in health care, community, animal health, food, agriculture and environment;
4. Update and enforce regulations for human and veterinary antimicrobial utilization;
5. Phase out use of antimicrobials as Growth Promoters and provide appropriate alternatives (such as prebiotics, probiotics);
6. Integration of AMR in all public health research agendas including research on vaccines;
7. Estimation of health and economic burden of AMR for decision making.

National Strategic Plan

Objective 1: Improve awareness and understanding of Antimicrobial resistance through effective communication, education and training	
1st Strategic Priority: Development and implementation of a national awareness raising & behavioural change strategy on AMR	
Approach 1 Ensure coordination and harmonization on AMR at regional level	
Intervention 1 Establishment of mechanism for coordination and harmonization on AMR	Mapping of high level platforms/forums at national level with the core mandate of public health Advocacy for inclusion of AMR in national public health agenda Constitution of national Coordination Group for AMR Establishment of multi-sectorial National AMR secretariat to ensure l information sharing and coordination of AMR interventions
Approach 2: Promote behaviour change through communication programs targeting different audience	
Intervention 1: Establishment and implementation of awareness and behaviour change strategy	Preparation of AMR awareness raising tools Preparation of customized training modules on AMR for professionals Training of practitioners in public & private hospital including community (Health and Veterinary sectors) Advocacy for administrative heads and policy makers Dialogue and advocacy for behaviour change and social norms on misuse of antimicrobials through comprehensive IEC campaigns Develop local programs for awareness campaigns aligned with the WHO world antibiotic awareness week

Approach 3: Promote education to improve knowledge of AMR and related topics	
Intervention 1: Establish and promote AMR in undergraduate and postgraduate education	Include AMR and IPC in school curricula Include AMR in professional education and training programs for HCPs and Veterinarians
Objective 2: Strengthen the knowledge and evidence base through surveillance and research	
2nd Strategic Priority: Establishment of an integrated national AMR surveillance system (human, animal usage and resistance monitoring)	
Approach 1: Establishment of comprehensive, integrated AMR surveillance system and quality assurance	
Intervention 1: Establishment of AMR coordinating centres and reference laboratories for AMR surveillance in all sectors (Health, Veterinary, Agriculture & Environment)	Designation of national & provincial AMR coordinating centres in all sectors Development of national AMR surveillance plans for all sectors Establishment of national & provincial /regional reference/referral labs in all sectors Strengthening of AMR surveillance capacities in all sectors Adapt the international standards to minimize and control AMR (OIE terrestrial & aquatic animal's health codes and FAO/WHO/ Codex Alimentarius) Development of formal mechanisms for coordination and collaboration on AMR surveillance among various stakeholders Establishment of common dashboard for data sharing among public,-private stakeholders from district to provincial to national level Development and implementation of mechanisms for data collection, reporting and data sharing in each sector

	(laboratories, private clinics and GPs)
Approach2: Strengthening of AMR surveillance sites	
Intervention 1: Development of functional AMR network in all sectors according to GLASS protocols	Identification and nomination of national focal point for GLASS Designation of AMR surveillance sites for Health & Veterinary sectors Resource mapping on AMR surveillance for all sectors Development of AMR surveillance & AST SOPs according to GLASS protocols and international standards/ (CLSI; EUCAST) Review priority pathogens and available antimicrobials for each sector based on local data
Intervention 2: Establishment of integrated AMR operational research plans	Integration between academia and research institutions/organizations for research on AMR Development of pathogen sharing mechanism for research
Objective 3: Reduce the incidence of infection through effective sanitation, hygiene and infection prevention measures	
3rd Strategic Priority: Improve prevention and control of infections in health care, community, animal health, food, agriculture and environment	
Approach 1: Establish National IPC Program	
Intervention 1: Create a formal organizational structure for development and implementation of IPC policies and strategies	Establishment of national, provincial/regional IPC Units Notify national, provincial/regional & district IPC coordinators Establishment of infection control team and committees in healthcare facilities Establishment of antibiotic stewardship programs in

	health facilities
	Development, dissemination and implementation of national IPC guidelines
Approach 2: Human Resource development for implementation of IPC	
Intervention 1: Availability of trained human resource at all levels	Ensure availability of IPC nurse for every 150-200 beds in healthcare facilities
	Ensure availability of ID physicians for each teaching hospital
	Microbiologists for every DHQ Hospital
	Clinical pharmacist for every DHQ hospital
Intervention 2: Training of human resource on IPC	Development and trainings on certified IPC courses for health & veterinary professionals
	Ensure regular continuous medical education (CME) on IPC
Approach3: Building conducive environment for IPC in healthcare settings & community	
Intervention 1: Enable conducive environment for IPC in health care settings	Ensure availability of clean water for drinking and clinical purposes in all health care facilities
	Implementation of IPC guidelines in all health care facilities
	Availability of CSSD and isolation facilities
	Identification and proper construction/design of high containment rooms/areas in reference hospitals of each province/region
	Apply IPC building codes for health care facilities
Intervention 2: Enabling conducive environment for IPC in the community	Integration of personal hygiene topic in primary and secondary education curriculum
	Improve awareness about hygiene & safety in the food chain

	Integrate IPC guidelines & protocols in farm buildings, biosecurity & food chain
Intervention 3: Provision of IPC supplies and waste management	Procurement of PPEs Implementation of waste management practices according to EPA Act
Intervention 4: Surveillance for assessment of compliance on IPC practices	Adapt WHO list of priority pathogens Monitor antibiotic utilization & stewardship compliance in human and animal healthcare settings Establish and strengthen healthcare associated infection surveillance Monitoring of compliance to occupational safety of HCWs: (vaccination, needle stick injury (NSI), blood & body fluid exposures) Monitoring of access and compliance to use personal protective equipment (PPE)
Intervention 5: Strengthen animal health and agricultural IPC practices	Development & implementation of policy guidelines to promote vaccination in animals Ensure availability of quality vaccines for all priority zoonotic diseases Promote hygienic slaughtering practices Establish quarantine/isolation facilities at Point of Entries (PoEs) Establish, maintain and monitor hygiene standards for food storage sites (silos/godowns) Establishment of disease detection, response and containment guidelines for zoonotic and food borne outbreaks
Intervention 6: Hygiene and sanitation at community level	Provision and monitoring of quality of safe drinking water

	Strengthen waste water treatment system Strengthen solid waste collection, transportation and management systems
Objective 4: Optimize the use of antimicrobial medicines in human and animal health	
4th Strategic Priority: Update and enforce regulations for human and veterinary antimicrobial utilization	
Approach1: Implementation of DRAP Act 2012 read with Drugs Act 1976 and rules framed thereunder regarding sale of antimicrobials on prescription	
Intervention 1: Advocacy & awareness on: prescribing, sales and use of antimicrobials	Implementation of Drugs Act 1976 and DRAP Act 2012 regarding sale of antimicrobials on prescription Advocacy & awareness/understanding of stakeholders on relevant clauses Training of drug inspectors to ensure prescription based sale of antimicrobials Strengthening and enforcement of market surveillance of antimicrobials
Intervention 2: Review/ amendment/ harmonization in drug sales rules (Human and Veterinary) to ensure supervision only by pharmacist (Category A)	Advocacy of policy makers and other relevant stakeholders Legislation procedure initiated with consensus of all stakeholders Review and up-gradation of essential medicines list (EML)
Intervention 3: Antimicrobials (human & veterinary) sale & utilization audit	Regular monitoring of antimicrobial sale and utilization at all levels and sectors Coordinate and synchronize record keeping mechanism for antimicrobial sale and use at all levels (pharmacies, medical & veterinary hospitals/ GPs in both sectors) Compilation of national sale and usage record
Intervention 4: Strengthening national mechanism for drug testing to ensure	Strengthening of drug testing laboratories (DTLs) in health

quality of antimicrobials	& veterinary sectors Accreditation of DTLs (federal and provincial level)
Approach 2: Establishment of Antibiotic stewardship program (ASP) at all levels	
Intervention 1: Antibiotic stewardship program implemented at all levels	Advocacy of all stakeholders for establishment of ASP at tertiary level hospitals Develop country specific standard treatment guidelines (STG) for antimicrobial use Development & implementation of ASP at provincial/regional levels* Conduct audit of ASP at tertiary care hospitals (public and private) *Market surveillance should precede this activity
Intervention 2: Promote use of vaccines for VPDs to minimize antimicrobial use in both human and vet sector	Advocacy of all stakeholders for promotion of vaccination Ensure availability, access and usage of effective vaccines in both sectors Formulation of legislation for mandatory vaccination against VPDs in both sectors
5th Strategic Priority: Phase out use of Antimicrobials as Growth Promoters and Provide Appropriate Alternatives	
Approach 1: Rationalize Use of antimicrobials as growth promoters and discourage prophylactic use of antibiotics in veterinary sector	
Intervention 1: Review and improve existing practices regarding use of antimicrobials as growth promoters & prophylaxis aligned with international standards	Conduct baseline survey on usage of antimicrobials as growth promoters in animal feed industry including assessment of feed (utilization audit) Review legislation for addition/inclusion of relevant clauses in DRAP Act 2012 and Drug Act 1976 for the control of antimicrobials usage as growth promoters and prophylaxis in veterinary sector Monitoring of antimicrobials as growth promoters

	Strengthening of food testing laboratories for antimicrobial residues
Objective 5 : Develop economic case for sustainable investment based on country needs and increase investment in new vaccines, diagnostics and other interventions	
6th Strategic Priority: Integration of AMR in all public health research agendas including research on vaccines and diagnostics	
Approach 1: Identification and integration of available indigenous resources for research	
Intervention 1: Develop mechanism for conducting survey and resource mapping on AMR research	Performa based survey of available resources for research (equipment; human resource; infra-structure; funding) Pooling of available resources for development of new vaccines, diagnostics & antibiotic alternatives
Intervention 2: Conducting research on clinical practices on AMR	Clinical research on existing practices and gaps in prescription, usage and availability/ manufacturing of antimicrobials Development of national AMR research priority agenda Development of effective vaccines and diagnostics
7th Strategic Priority: Eestimation of health and economic burden of AMR for decision making	
Approach 1: Development of economic case for sustainable national investment	
Intervention 1: Baseline national data collection on economic burden of AMR	Analysis of published data on AMR in Pakistan Design and conduct studies to estimate economic burden of AMR in health, veterinary and agriculture sector

National Operational Plan

Objective 1: Improve awareness and understanding of Antimicrobial resistance through effective communication, education and training				
1st Strategic Priority: Development and implementation of a national awareness raising & behavioural change strategy on AMR				
Approach 1 Ensure coordination and harmonization on AMR at regional level				
Intervention 1 Establishment of mechanism for coordination and harmonization on AMR				
Activity	**Outcome**	**Responsibility**	**Year**	**Quarter**
Mapping of high level platforms/forums at national level with the core mandate of public health	Mapping conducted	Ministry of NHSR&C/NIH	2018	Q2
Advocacy for inclusion of AMR in national public health agenda	AMR included in National public Health Agenda	Ministry of NHSR&C	2018	Q1 and Q2
Constitution of national coordination group for AMR	Group constituted and notified with defined TORs	Ministry of NHSR&C;NFS&R & Climate Change	2018	Q1
Establishment of multi-sectorial National AMR secretariat to ensure l information sharing and coordination of AMR interventions	AMR secretariat developed and mechanism for inter-sectorial information sharing developed	Ministry of NHSR&C, NFS&R & Climate Change	2018	Q3
Approach 2: Promote behaviour change through communication programs targeting different audience				
Intervention 1: Establishment and implementation of awareness and behaviour change strategy				
Preparation of AMR awareness raising tools	Guidelines, document and communication material developed	Ministry of NHSR&C, NFS&R, Provincial Health & Livestock Departments, WHO	2018	Q3 and Q4
Preparation of customized training modules on AMR for professionals	Training modules developed	Ministry of NHSR&C, NFS&R, Provincial Health & Livestock Departments, WHO	2018	Q3 and Q4
Training of practitioners in public & private hospital including community (Health and Veterinary sectors)	HCPs trained in public & private sectors	Ministry of NHSR&C, NFS&R, Provincial Health & Livestock Departments, WHO	2018	Q3 and Q4
Advocacy for administrative heads and policy makers	Advocacy sessions conducted	Ministry of NHSR&C, NFS&R, Provincial Health & Livestock Departments, WHO	2018	Q1 and Q2

Dialogue and advocacy for behaviour change and social norms on misuse of antimicrobials through comprehensive IEC campaigns	Change of behaviour and social norms in manufacturers, prescribers and consumers regarding misuse of antibiotics	Ministry of NHSR& C, DRAP, NFS&R, DOH, Relevant HDPs	2017-2022	All Qs
Develop local programs for awareness campaigns aligned with the WHO world antibiotic awareness week	Community awareness program developed	Ministry of NHSR&C, NFS&R, Provincial Health & Livestock Departments, WHO	2017-2022	All Qs
Approach 3: Promote education to improve knowledge of AMR and related topics				
Intervention 1: Establish and promote AMR in undergraduate and post graduate education				
Include AMR and IPC in school curricula	Curriculum adopted by regulatory bodies	Ministry of NHSR&C, Education, Depts. of Education,	2018	Q1-3
Include AMR in professional education and training programs for HCPs and Veterinarians	Curriculum adopted by PMDC; PVMC; PNC; Pharmacy Council; etc.	PMDC, PVMC, Nursing Council	2018	Q1-3
Objective 2: Strengthen the knowledge and evidence base through surveillance and research				
2nd Strategic Priority: Establishment of an integrated national AMR surveillance system (human, animal usage and resistance monitoring)				
Approach 1: Establishment of comprehensive, integrated AMR surveillance system and quality assurance				
Intervention 1: Establishment of AMR coordinating centres and reference laboratories for AMR surveillance in all sectors (Health, Veterinary, Agriculture & Environment)				
Activity	**Outcome**	**Responsibility**	**Year**	**Quarter**
Designation of national & provincial AMR coordinating centres in all sectors	Functional national & provincial coordinating centres	Ministry of NHSR&C, NFS&R, CC/ EPA, Provincial Health & Livestock Departments, WHO	2018	Q4
Development of national AMR surveillance plans for all sectors	AMR surveillance plans developed	Ministry of NHSR&C, NFS&R, CC/EPA, Provincial Health & Livestock Departments, WHO	2018	Q4
Establishment of national & provincial /regional reference/referral labs in all sectors	NRLs established and functional according to international quality standards (LQMS, EQA)	Ministry of NHSR&C, NFS&R, Provincial Health & Livestock Departments	2018	Q2 and 3
Strengthening of AMR surveillance capacities in all sectors	Integrated AMR surveillance system developed	Ministry of NHSR&C, NFS&R, Provincial Health & Livestock Departments, WHO	2018	Q4
Adapt the international standards to minimize and control AMR (OIE Terrestrial & aquatic animal's health codes and FAO/WHO/ Codex	Implementation of adopted international standards	Ministry of NHSR&C, NFS&R, CC/EPA, Provincial Health & Livestock Departments, WHO, FAO	2018	Q4

Alimentarius)				
Development of formal mechanisms for coordination and collaboration on AMR surveillance among various stakeholders	MoU between different stakeholders	Ministry of NHSR&C, NFS&R, CC/EPA, Provincial Health & Livestock Departments,	2018	Q3 and Q4
Establishment of common dashboard for data sharing among public, -private stakeholders from district to provincial to national level	National AMR dashboard established and linked with all relevant sectors	Ministry of NHSR&C, NFS&R, CC/EPA, Provincial Health & Livestock Departments	2018	Q3
Development and implementation of mechanisms for data collection, reporting and data sharing in each sector (laboratories, private clinics and GPs)	Data collection, reporting, data sharing mechanisms developed	Ministry of NHSR&C, NFS&R, Provincial Health & Livestock Departments	2018	Q3
Approach2: Strengthening of AMR surveillance sites				
Intervention 1: Development of functional AMR network in all sectors according to GLASS protocols				
Identification and nomination of national focal point for GLASS	National focal point for AMR & GLASS identified and notified	Ministry of NHSR&C, NFS&R	2017	Q3
Designation of AMR surveillance sites for Health & Veterinary sectors	Functional designated AMR surveillance sites	Ministry of NHSR&C, NFS&R, Provincial Health & Livestock Departments	2018	Q4
Resource mapping on AMR surveillance for all sectors	Resource mapping tool developed, distributed, information collected and compiled for mapping	Ministry of NHSR&C, NFS&R, CC/EPA, Provincial Health & Livestock Departments, HDPs	2017 and 2018	Q4 (2017) & Q1 & Q2 (2018)
Development of AMR surveillance & AST SOPs according to GLASS protocols and international standards/ (CLSI; EUCAST)	SOPs developed and in place	Ministry of NHSR&C, NFS&R, Climate Change, Provincial Health & Livestock Departments, HDPs	2017 and 2018	Q4 (2017) & Q1 (2018)
Review priority pathogens and available antimicrobials for each sector based on local data	List of priority pathogens and Antimicrobial agents finalized for all sectors	AMR & GLASS Focal point, NIH/ Ministry of NHSR&C/ DRAP/ DOH/ Ministry of NFS&R/ PL&DD	2017 and 2018	Q4 (2017) & Q1 (2018)
Intervention 2: Establishment of integrated AMR operational research plans				
Integration between academia and research institutions/ organizations for research on AMR	Established and functional integrated collaboration mechanisms	HEC/ PHRC/ PARC/ Ministry of NHSR&C/Ministry of NFS&R/ NIH/IPH/has/PSF	2018	Q2 onwards
Development of pathogen sharing mechanism for research	Pathogen sharing mechanism developed	Ministry of NHSR&C, NFS&R, Health & Livestock Departments, Academia, Research Institutes	2018	Q1 onwards

Objective 3: Reduce the incidence of infection through effective sanitation, hygiene and infection prevention measures				
3rd Strategic Priority: Improve prevention and control of infections in health care, community, animal health, food, agriculture and environment				
Approach 1: Establish National IPC Program				
Intervention 1: Create a formal organizational structure for development and implementation of IPC policies and strategies				
Activity	**Outcome**	**Responsibility**	**Year**	**Quarter**
Establishment of national, provincial/regional IPC Units	IPC national, provincial & regional units established District committees constituted	Ministry of NHSR&C, NFS&R, Provincial Health & Livestock Departments / District Management	2018	Q4
Notify national, provincial/regional & district IPC coordinators	National & Provincial & District IPC coordinators notified	Ministry of NHSR&C, NFS&R, Provincial Health & Livestock Departments /DOH	2018	Q4
Establishment of infection control team and committees in healthcare facilities	Notification of infection control teams in every healthcare facility	Ministry of NHSR&C, NFS&R, Provincial Health & Livestock Departments	2018	Q2 onwards
Establishment of antibiotic stewardship programs in health facilities	Antibiotic stewardship implemented in major teaching hospitals in public and private sectors	Ministry of NHSR&C, NFS&R, Provincial Health & Livestock Departments /DOH	2018	Q1 onwards
Development, dissemination and implementation of national IPC guidelines	National IPC guidelines implemented	Ministry of NHSR&C, NFS&R, Provincial Health & Livestock Departments /DOH	2018	Q4 onwards
Approach 2: Human Resource development for implementation of IPC				
Intervention 1: Availability of trained human resource at all levels				
Ensure availability of IPC nurse for every 150-200 beds in healthcare facilities	Nurses identified and trained	Ministry of NHSR&C/ DOH	2018	Q2 onwards
Ensure availability of ID physicians for each teaching hospital	Physician identified & trained	Ministry of NHSR&C/ DOH	2018	Q2 onwards
Microbiologists for every DHQ Hospital	Vacancies created where applicable	Ministry of NHSR&C/ DOH	2018	Q2 onwards
Clinical pharmacist for every DHQ hospital	Vacancies created and filled where applicable	Ministry of NHSR&C/ DOH	2018	Q2 onwards

Intervention 2: Training of human resource on IPC				
Development and trainings on certified IPC courses for health & veterinary professionals	Trainings imparted on certified IPC courses	Ministry of NHSR&C, NFS&R, Health & Livestock Departments, Academia	2018	Q4
Ensure regular continuous medical education (CME) on IPC	Regular sessions/trainings conducted for CME on IPC	Ministry of NHSR&C, NFS&R, Health & Livestock Departments, Academia	2018	Q4
Approach3: Building conducive environment for IPC in healthcare settings & community				
Intervention 1: Enable conducive environment for IPC in health care settings				
Ensure availability of clean water for drinking and clinical purposes in all health care facilities	Clean water for drinking and clinical purposes available	Ministry of NHSR&C, DOH/ Provincial allied departments	2018	Q2 onwards
Implementation of IPC guidelines in all health care facilities	Liquid detergents and hand sanitizers available in all tertiary care hospitals	DOH	2018	Q2 onwards
Availability of CSSD and isolation facilities	Areas for CSSD and isolation facilities identified and operational	DOH	2019	Q1
Identification and proper construction/design of high containment rooms/areas in reference hospitals of each province/region	Containment rooms in tertiary care hospitals of all regions identified, design approved & construction started	DOH	2019	Q1
Apply IPC building codes for health care facilities	IPC building codes for health care facilities adopted	Ministry of NHSR&C/ IPC FP/ NIH/ DOH	2019	Q1
Intervention 2: Enabling conducive environment for IPC in the community				
Integration of personal hygiene topic in primary and secondary education curriculum	Personal hygiene integrated in educational curricula	DOH/ Mo Education/ Department of Education/ HEC	2018	Q2 onwards
Improve awareness about hygiene & safety in the food chain	Awareness campaigns/ seminar & meetings conducted	Ministry of NHSR&C, NFS&R, Health & Livestock Departments, Academia, WHO, FAO	2018	Q1 onwards
Integrate IPC guidelines & protocols in farm buildings, biosecurity & food chain	IPC guidelines & protocols practiced in veterinary and food sector	Ministry of NHSR&C, NFS&R, Health , Livestock, Agriculture Departments	2018	Q2 onwards

Intervention 3: Provision of IPC supplies and waste management				
Procurement of PPEs	Availability of PPEs	Ministry of NHSR&C, NFS&R, Health & Livestock Departments, Academia	2018	Q1 onwards
Implementation of waste management practices according to EPA Act	Waste management protocols implemented	Ministry of NHSR&C, NFS&R, Climate Change, Health & Livestock Departments and provincial EPAs, Academia WASA, WHO	2018	Q1 onwards
Intervention 4: Surveillance for assessment of compliance on IPC practices				
Adapt WHO list of priority pathogens	National and WHO priority list of pathogens developed & adopted as per GLASS protocols	Ministry of NHSR&C, NFS&R, Health & Livestock Departments, Academia, WHO	2017	Q3
Monitor antibiotic utilization & stewardship compliance in human and animal healthcare settings	Monitoring of antibiotic utilization & stewardship compliance	Ministry of NHSR&C, NFS&R, Health & Livestock Departments, Federal & Provincial Drug Regulatory authorities	2018	Q4
Establish and strengthen healthcare associated infection surveillance	Healthcare associated infection surveillance system established	DOH	2018	Q2
Monitoring of compliance to occupational safety of HCWs: (vaccination, needle stick injury (NSI), blood & body fluid exposures)	Monitoring mechanism in place for occupational safety of HCWs	DOH	2019	Q2
Monitoring of access and compliance to use personal protective equipment (PPE)	Monitoring mechanism for PPEs in place	DOH	2019	Q2
Intervention 5: Strengthen animal health and agricultural IPC practices				
Development & implementation of policy guidelines to promote vaccination in animals	Promotion and enhanced vaccination guidelines & policies developed & implemented in animal husbandry	Ministry of NFS&R, Livestock Departments, WHO, FAO	2018	Q3
Ensure availability of quality vaccines for all priority zoonotic diseases	Quality vaccines available	Ministry of NFS&R/L&DD	2019	Q3
Promote hygienic slaughtering practices	Slaughter houses implementing hygiene practices	Ministry of NFS&R, Livestock Departments, Local Governments	2018	Q4

Establish quarantine/isolation facilities at Point of Entries (PoEs)	Quarantine/ isolation facilities operationalized at PoEs	Ministry of NFS&R	2018	Q4
Establish, maintain and monitor hygiene standards for food storage sites (silos/godowns)	Hygienic standards for food storage sites established, maintained and monitoring system in place	Ministry of NFS&R, Agriculture & Livestock Departments, FAO, WHO	2018	Q4
Establishment of disease detection, response and containment guidelines for zoonotic and food borne outbreaks	Zoonotic & food-borne outbreaks guidelines developed & in place	Ministry of NFS&R, Livestock Departments, WHO, FAO	2018	Q2
Intervention 6: Hygiene and sanitation at community level				
Provision and monitoring of quality of safe drinking water	Provision of safe drinking water with periodic lab testing performed	Mo Climate Change/ PCRWR/ WASA/ Municipalities/ District Governments	2017	Q3-4
Strengthen waste water treatment system	Installed & functional water treatment plants	WASA/ Municipality/ District Governments /DOH	2018	Q1 onward
Strengthen solid waste collection, transportation and management systems	Protocols and mechanisms developed for solid waste collection, transportation, dumping & recycling	WASA/ DOH/ Ministry of Climate Change	2018	Q1 onward
Objective 4: Optimize the use of antimicrobial medicines in human and animal health				
4th Strategic Priority: Update and enforce regulations for human and veterinary antimicrobial utilization				
Approach1: Implementation of DRAP Act 2012 read with Drugs Act 1976 and rules framed thereunder regarding sale of antimicrobials on prescription				
Intervention 1: Advocacy & awareness on: prescribing, sales and use of antimicrobials				
Activity	**Outcome**	**Responsibility**	**Year**	**Quarter**
Implementation of Drugs Act, 1976 and DRAP Act 2012 regarding sale of antimicrobials on prescription	Drugs Act disseminated & implemented	DRAP/ Ministry of NHSR&C, NFS&R, Health & Livestock Departments	2017	Q4
Advocacy & awareness/understanding of stakeholders on relevant clauses	No of advocacy meetings for stockholders conducted	DRAP/ Ministry of NHSR&C, NFS&R, Health & Livestock Departments, / WHO	2018	Q4
Training of drug inspectors to ensure prescription based sale of antimicrobials	No. of drug inspectors trained for antimicrobial sale on prescription	DRAP/ DOH	2018	Q3

Strengthening and enforcement of market surveillance of antimicrobials	*Baseline survey conducted for establishing mechanism/ body for regular market surveillance on antimicrobials use	Ministry of NHSR&C, NFS&R, Health & Livestock Departments,	2018	Q3
Intervention 2: Review/ amendment/ harmonization in drug sales rules (Human and Veterinary) to ensure supervision only by pharmacist (Category A)				
Advocacy of policy makers and other relevant stakeholders	Consensus developed for review/amendment/harmonization of Drug Sales Rules	DRAP/ Ministry of NHSR&C, NFS&R, Health & Livestock Departments,	2018	Q1
Legislation procedure initiated with consensus of all stakeholders	Amended and harmonized Drug Sales Rules with consensus of all stakeholders at national & provincial/regional level	DRAP/ Ministry of NHSR&C, NFS&R, Health & Livestock Departments, / Ministry of Law & Justice Division	2018	Q4
Review and up-gradation of essential medicines list (EML)	EML revised as per WHO requirement with categorization of antimicrobials	DRAP/ Ministry of NHSR&C, WHO,	2018	Q1
Intervention 3: Antimicrobials (human & veterinary) sale & utilization audit				
Regular monitoring of antimicrobial sale and utilization at all levels and sectors	Audit mechanism for antimicrobial sale & utilization developed and implementation initiated	DRAP/ Ministry of NHSR&C, NFS&R, Health & Livestock Departments,	2018	Q4 onward
Coordinate and synchronize record keeping mechanism for antimicrobial sale and use at all levels (pharmacies, medical & veterinary hospitals/ GPs in both sectors)	Mechanism of record keeping for antimicrobial sale & use developed, implemented with initiation of periodic monitoring	DRAP/ Ministry of NHSR&C, NFS&R, Health & Livestock Departments,	2018	Q1 onward
Compilation of national sale and usage record	Antimicrobials sale & usage data compiled and analysed	DRAP/ Ministry of NHSR&C, NFS&R, Health & Livestock Departments	2018	Q3 onward
Intervention 4: Strengthening national mechanism for drug testing to ensure quality of antimicrobials				
Strengthening of drug testing laboratories (DTLs) in health & veterinary sectors	Strengthened / upgraded DTLs as per international standards	DRAP (federal and provincial)/ DOH	2018	Q4
Accreditation of DTLs (federal and provincial level)	ISO/IEC: 17025 certified and WHO accredited laboratories	DRAP (federal and provincial)/ DOH	2018	Q4

Approach 2: Establishment of Antibiotic stewardship program (ASP) at all levels				
Intervention 1: Antibiotic stewardship program implemented at all levels				
Advocacy of all stakeholders for establishment of ASP at TERTIARY LEVEL HOSPITALS	Advocacy meetings/ seminars conducted for establishment of ASP at Tertiary Care Hospitals	DRAP, Ministry of NHSR&C, NFS&R, Health & Livestock Departments, WHO	2018	Q4 onwards
Develop country specific standard treatment guidelines (STG) for antimicrobial use	National standard treatment guidelines developed	Ministry of NHSR&C, NFS&R, Health & Livestock Departments, WHO	2018	Q3
Development & implementation of ASP at provincial/regional levels*	ASP developed and implemented with monitoring of ASP in Tertiary Care Hospitals	Ministry of NHSR&C, NFS&R, Health & Livestock Departments, WHO	2018	Q3 onwards
Conduct audit of ASP at Tertiary Care Hospitals (public and private)	Regular audit of ASP at Tertiary Care Hospitals	Ministry of NHSR&C, NFS&R, Health & Livestock Departments, WHO	2018	Q4 yearly
*Market surveillance should precede this activity				
Intervention 2: Promote use of vaccines for VPDs to minimize antimicrobial use in both human and vet sector				
Advocacy of all stakeholders for promotion of vaccination	Improved vaccination plans/schedules	Ministry of NHSR&C, NFS&R, Health & Livestock Departments, WHO	2017	Q4 onwards
Ensure availability, access and usage of effective vaccines in both sectors	Increased utilization of VPD vaccines in both sectors	Ministry of NHSR&C, NFS&R, Health & Livestock Departments, WHO	2017	Q4
Formulation of legislation for mandatory vaccination against VPDs in both sectors	Legislation enacted in both sectors	Relevant Regulatory bodies; Ministry of NHSR&C, NFS&R, Health & Livestock Departments, WHO	2018	Q2 onwards
5th Strategic Priority: Phase out use of Antimicrobials as Growth Promoters and Provide Appropriate Alternatives				
Approach 1: Rationalize Use of antimicrobials as growth promoters and discourage prophylactic use of antibiotics in veterinary sector				
Intervention 1: Review and improve existing practices regarding use of antimicrobials as growth promoters & prophylaxis aligned with international standards				
Conduct baseline survey on usage of antimicrobials as growth promoters in animal feed industry including assessment of feed (utilization audit)	Baseline data available for strategizing interventions	DRAP/ Ministry of NFS&R	2018	Q1

Review legislation for addition/inclusion of relevant clauses in DRAP Act 2012 and Drug Act 1976 for the control of antimicrobials usage as growth promoters and prophylaxis in veterinary sector	Necessary amendments incorporated, approved & promulgated	DRAP/ Ministry of NFS&R/ DOH	2018	Q3
Monitoring of antimicrobials as growth promoters	Monitoring mechanism on antibiotic utilization, sale & prescription established and functional	DRAP/ Ministry of NFS&R/ PL&DD	2019	Q1
Strengthening of food testing laboratories for antimicrobial residues	Food testing labs performing antimicrobial residues detection	Ministry of NFS&R/ DOH	2018	Q3
Objective 5 : Develop economic case for sustainable investment based on country needs and increase investment in new vaccines, diagnostics and other interventions				
6th Strategic Priority: Integration of AMR in all public health research agendas including research on vaccines and diagnostics				
Approach 1: Identification and integration of available indigenous resources for research				
Intervention 1: Develop mechanism for conducting survey and resource mapping on AMR research				
Activity	**Outcome**	**Responsibility**	**Year**	**Quarter**
Performa based survey of available resources for research (equipment; human resource; infra-structure; funding)	Identified and mapped resources for integrated research on AMR	Ministry of NHSR&C/ Ministry of NFS&R/ PHRC/ DOH	2018	Q1
Pooling of available resources for development of new vaccines, diagnostics & antibiotic alternatives	Availability of new vaccines, diagnostics & antibiotic alternatives	Pharmaceuticals/ Academia/ / Ministry of NFS&R/ VRIs/ PHRC/PRIs/CASVAB/SPVC	2018	Q1 onwards
Intervention 2: Conducting research on clinical practices on AMR				
Clinical research on existing practices and gaps in prescription, usage and availability/ manufacturing of antimicrobials	Availability of guidelines for prescription, usage and availability/ manufacturing of antimicrobials	Ministry of NHSR&C/ PHRC/ / PSF/ Ministry of NFS&R/ HEC/ Academia/ Pharmaceuticals	2018	Q4 onwards
Development of national AMR research priority agenda	Research agenda developed with domestic allocation	Ministry of NHSR&C/ NFS&R/NIH/PHRC /HEC/ Mo S&T/DOH/PL&DD	2018	Q2
Development of effective vaccines and diagnostics	No of research projects conducted	Ministry of NHSR&C/ PHRC/ / PSF/ Ministry of NFS&R/ HEC/ Academia/ Pharmaceuticals	2018	Q4 onwards

7th Strategic Priority: Estimation of health and economic burden of AMR for decision making				
Approach 1: Development of economic case for sustainable national investment				
Intervention 1: Baseline national data collection on economic burden of AMR				
Analysis of published data on AMR in Pakistan	Economic impact derived from published data	HEC/ Academia/ Ministry of NHSR&C/ / Ministry of NFS&R/ DOH	2018	Q4
Design and conduct studies to estimate economic burden of AMR in health, veterinary and agriculture sector	AMR economic burden estimated	Ministry of NHSR&C, NFS&R, Health & Livestock Departments, WHO, FAO	2019	Q2

Monitoring & Evaluation Plan

Planning element (activity linked to the strategic plan)	Indicator	Type and purpose	Value (calculation)	Frequency of data collection	Data source	Method	Baseline
Objective 1: Improve awareness and understanding of Antimicrobial resistance through effective communication, education and training							
1st Strategic Priority: Development and implementation of a national awareness raising & behavioural change strategy on AMR							
Approach 1 Ensure coordination and harmonization on AMR at regional level							
Intervention 1 Establishment of mechanism for coordination and harmonization on AMR							
Mapping of high level platforms/forums at National level with the core mandate of public health	Mapping conducted	M&E of Input	Yes/No	Once	Ministry of NHSR&C and NFS&R, DRAP, Environment, Education, Information, Food, Law, IT, Inter Provincial Coordination	Meeting of stakeholders	Inter-sectoral Core Committee (ICC) for AMR in place Multi-sectorial IHR Task force
Advocacy for inclusion of AMR in national public health agenda	AMR included in national public health agenda	M&E of Input	Yes/ No	Once	Ministry of NHSR&C, DOH	Meetings	JEE and IHR-GHSA Roadmap
Constitution of National Coordination Group for AMR	Group constituted and notified with defined TORs	M&E of Input/ process	Yes/ No	Once	Notification	Relevant correspondence	TWG/Core group for AMR; Inter-sectoral Core Committee
Establishment of multi-sectorial National AMR secretariat to ensure information sharing and coordination of AMR interventions	AMR secretariat and mechanism for inter-sectorial information sharing developed	M&E of Input	One National Unit	Once	Notification	Relevant correspondence	NIH as National Focal Point
Approach 2: Promote behaviour change through communication programs targeting different audience							
Intervention 1: Establishment and implementation of awareness and behaviour change strategy							
Preparation of AMR awareness raising tools	Guidelines, document and communication material developed	M&E of Input	Yes/No	Once in Three years	TWG, National & International communication experts & Academia	Consultative meeting for development of tools & communication material	No tools & communication materials exist locally
Preparation of customized training	Training modules	M&E of Input	Yes/No	Once in Three	TWG, National & International	Consultative meeting for development of	No training material exists

modules on AMR for professionals	developed			years	communication experts & Academia	tools & communication material	locally
Training of practitioners in public & private hospital including community (Health and Veterinary sectors)	HCPs trained in public & private sectors	M&E Output M&E of Outcome	Proportion knowledge scores stratified by target groups (composite indicator)	10 % Increase Annual	Mo NHSR&C, Mo NFS&R, National Focal Point for AMR, DOH, TWG	Knowledge survey	No data available. Measured by baseline survey
Advocacy for administrative heads and policy makers	Advocacy sessions conducted	M&E of Input	No of sessions/ proportion of policy makers sensitized	At least once per departme nt	Health, Livestock, Agriculture, Food, Environment, DRAP, Wildlife	Briefing and advocacy meetings	National Strategic Framework; WHO resolutions and GoP commitments, NAP
Dialogue and advocacy for change of behaviour and social norms on misuse of antimicrobials through comprehensive IEC campaigns	Change of behaviour and social norms in manufacturers, prescribers and consumers regarding misuse of antibiotics	M&E of Input	No of advocacy sessions and IEC campaigns	Ongoing	Relevant Ministries/Department of Health/DRAP/MNFS&R	KAP Surveys/Studies	No baseline assessment available
Develop local programs for awareness campaigns aligned with the WHO world antibiotic awareness week	Community awareness program developed	M&E of input	No of programs developed for relevant sectors	Once in three years	Relevant Ministries/Department of Health/DRAP/MNFS&R	Consultations for program development	No community programs available
Approach 3: Promote education to improve knowledge of AMR and related topics							
Intervention 1: Establish and promote AMR in undergraduate and post graduate education							
Include AMR and IPC in school curricula	Curriculum adopted by regulatory bodies	M&E of input	No of consultative workshops No of regulatory	Every 5 years	school curricula, National and Provincial/regional Education Department	Curriculum review	AMR not included in the present school curriculum

			authorities adopting the revised curriculum				
Include AMR in professional education and training programs for HCPs and Veterinarians	Curriculum adopted by PMDC; PVMC; PNC; Pharmacy Council; etc.	M&E of Input	Yes/No	Every 5 years	PMDC, PCP, PNC, HEC, PVC etc.	Curriculum review	AMR not included in the present medical and veterinary curricula
Objective 2: Strengthen the knowledge and evidence base through surveillance and research							
2nd Strategic Priority: Establishment of an integrated national AMR surveillance system (human, animal usage and resistance monitoring)							
Approach 1: Establishment of comprehensive, integrated AMR surveillance system and quality assurance							
Intervention 1: Establishment of AMR coordinating centres and reference laboratories for AMR surveillance in all sectors (Health, Veterinary, Agriculture & Environment)							
Designation of national & provincial AMR coordinating centres in all sectors	Functional national & provincial coordinating centres	M&E Input	Yes/No	One time activity	Ministry of NHSR&C, Ministry of MNFS&R, DOH, Livestock Departments	Communication with institution	Not available
Development of National AMR surveillance plans for all sectors	AMR surveillance plans developed	M&E Input	yes/no	One time activity	Ministry of NHSR&C, Ministry of NFS&R, DOH, Livestock Departments	Laboratory assessments	Not available
Establishment of national & provincial /regional reference/referral labs in all sectors	NRLs established and functional according to international quality standards (LQMS, EQA)	M&E Input	yes/no	One time activity	Ministry of NHSR&C, Ministry of NFS&R, DOH, Livestock Departments	Livestock Departments Communication with institution	4 sentinel sites (2 each in Sindh and Punjab)
Strengthening of AMR surveillance capacities in all sectors	Integrated AMR surveillance system developed	M&E Input	yes/no	One time activity	Ministry of NHSR&C, Ministry of NFS&R, DOH, Livestock Departments	Communication with institution	Not available
Adapt the international	Implementation of adopted	M&E process	Yes/No	on-going	Ministry of NHSR&C, Ministry of NFS&R, DOH,	Facility based technical assessment	WHO LQMs Tool

standards to minimize and control AMR (OIE Terrestrial & aquatic animal's health codes and FAO/WHO/ Codex Alimentarius)	international standards				Livestock Departments	LQSI Tool	
Development of formal mechanisms for coordination and collaboration on AMR surveillance among various stakeholders	MoU between different stakeholders	M&E of Input/ outcome	2017	Q3 and Q4	NIH/ Ministry of NFS&R	Development of EQAS Panel with implementation (Shipment and Feedback)	EQAS Lab established at NIH
Establishment of common dashboard for data sharing among public & private stakeholders from district to provincial to national level	National AMR dashboard established and linked to all relevant sectors	M&E Input	No of stakeholders linked	One time for dashboard Linkages on-going	Ministry of NHSR&C, Ministry of NFS&R, DOH, LIVESTOCK DEPARTMENTSD	Infrastructure and relevant correspondence	Not available
Development and implementation of mechanisms for data collection, reporting and data sharing in each sector (laboratories, private clinics and GPs)	Data collection, reporting & data sharing mechanisms developed	M&E Input	No of public and private stakeholders involved	on-going	Ministry of NHSR&C, Ministry of NFS&R, DOH, LIVESTOCK DEPARTMENTSD	Relevant correspondence	Not available
Approach2: Strengthening of AMR surveillance sites							
Intervention 1: Development of Functional AMR Network in All Sectors according to GLASS Protocols							
Identification and nomination of national focal point for GLASS	National focal point for AMR & GLASS identified and notified	M&E Input	Yes/No	One time	Ministry of NHSR&C and Ministry of NFS&R	Communication with institution	NIH as AMR Focal Point notified
Designation of AMR surveillance sites for health & veterinary sectors	Functional designated AMR surveillance sites	M&E Input	Yes/No	One time activity	NIH/ Ministry of NFS&R	Communication with institutions	GLASS Framework

Resource mapping on AMR Surveillance for all sectors	Resource mapping tool developed, distributed, information collected and compiled for mapping	M&E Input	Yes/No	One time activity	NIH/ Ministry of NFS&R/DOH/LIVESTOCK DEPARTMENTSD	Survey	WHO/ GLASS tools/ OIE
Development of AMR surveillance & AST SOPs according to GLASS protocols and international standards/ (CLSI; EUCAST)	SOPs developed and in place	M&E Input	No of SOPs available	One time	NIH/ Ministry of NFS&R/DOH/LIVESTOCK DEPARTMENTSD	Facility based technical assessment	WHO/ GLASS/ CLSI/ EUCAST/ OIE
Review priority pathogens and available antimicrobials for each sector based on local data	List of priority pathogens and Antimicrobial agents finalized for all sectors	M&E Input	Yes/No	One time	Ministry of NHSR&C/ Ministry of NFS&R	Consultations	Not available
Intervention 2: Establishment of integrated AMR operational research plans							
Integration between academia and research institutions/ organizations for research on AMR	Established and functional integrated collaboration mechanisms	M&E Input	Yes/No	One time	HEC, PHRC, PARC, Ministry of NHSR&C, Ministry of NFS&R, IPH, HSA, FP AMR	Consultations	Not available
Development of pathogen sharing mechanism for research	Pathogen sharing mechanism developed	M&E Input	Yes/No	One time	Ministry of NHSR&C, Ministry of NFS&R	Sample referral & reference testing	Not available at present
Objective 3: **Reduce the incidence of infection through effective sanitation, hygiene and infection prevention measures**							
3rd Strategic Priority: Improve prevention and control of infections in health care, community, animal health, food, agriculture and environment							
Approach 1: Establish National IPC Program							
Intervention 1: Create a formal organizational structure for development and implementation of IPC policies and strategies							
Establishment of national, provincial/regional IPC	IPC national, provincial & regional units	M&E of Input	Yes/No	Once & revise after	Ministry of NHSR&C, Ministry of NFS&R	Notification to all stakeholders	Not available

units	established District committees constituted			every 2 years	DOH, District Management		
Notify national, provincial/regional & district IPC coordinators	National, provincial & district IPC coordinators notified	M&E of Input	Yes/No	Once & revise after every 2 years	NHSR&C, NFS&R DOH, District Management	Notification to all stakeholders	Not available
Establishment of infection control team and committees in healthcare facilities	Notification of infection control teams in every healthcare facility	M&E of Output	25% of the healthcare facilities with IPC team in first year	Ongoing	DOH	Survey/ visits/ District Record	Not available/ Only available in some private sector
Establishment of antibiotic stewardship programs in health facilities	Antibiotic stewardship implemented in major teaching hospitals in public and private sectors	M&E of Input	25% of the healthcare facilities in first year	DOH	Ministry of NHSR&C, NIH, FP AMR, DOH	Survey/ visits/ District Record	Not available
Development, dissemination and implementation of national IPC guidelines	National IPC guidelines implemented	M&E of Input	Yes/No	Once in three years	Ministry of NHSR&C and NFS&R, DOH, NIH, FP AMR	Archives & updated through consultations	Guidelines available in archives (public health programs)
Approach 2: Human Resource development for implementation of IPC							
Intervention 1: Availability of trained human resource at all levels							
Ensure availability of IPC nurse for every 150-200 beds in healthcare facilities	Nurses identified and trained	M&E Input	Proportion of nurses available per 150-200 beds annually	Ongoing	Ministry of NHSR&C, DOH, PNC	Facility survey/ assessments	Not available
Ensure availability of ID physicians for each teaching hospital	Physician identified & trained	M&E of Input	Proportion of ID Physicians available	Ongoing	Ministry of NHSR&C, DOH	Facility survey/ assessments	Not available

			annually				
Microbiologists for every DHQ hospital	Vacancies created where applicable	M&E of Input	25% annual increase in number	Ongoing	Ministry of NHSR&C, DOH	Facility survey/ assessments	Not available
Clinical pharmacist for every DHQ hospital	Vacancies created where applicable	M&E of Input	25% annual increase in number	Ongoing	Ministry of NHSR&C, DOH	Facility survey/ assessments	Not available
Intervention 2: Training of human resource on IPC							
Development and trainings on certified IPC courses for health & veterinary professionals	Trainings imparted on certified IPC courses	M&E of Input	Yes/No	Annual	Ministry of NHSR&C and NFS&R, DOH, NIH, FP AMR, Academia	Consultations & training sessions	Not available
Ensure regular continuous medical education (CME) on IPC	Regular CME on IPC	M&E of Input	Yes/No	Ongoing	Ministry of NHSR&C, Medical Colleges/ Universities/ PMDC	Communication with institutions	Some institutions are providing CME
Approach3: Building conducive environment for IPC in healthcare settings & community							
Intervention 1: Enable conducive environment for IPC in health care settings							
Ensure availability of clean water for drinking, and clinical purposes in all health care facilities	Clean water for drinking and clinical purposes available	M&E of Output	30 % in first year	Ongoing	DOH/MS Hospitals	Survey/Site assessments	Not available
Implementation of IPC guidelines in all health care facilities	Liquid detergents and hand sanitizers available in all tertiary care hospitals	M&E of Output	25 % annually	On going	DOH/MS Hospitals	Survey/Site assessments	Not available
Availability of CSSD and isolation facilities	Areas for CSSD and isolation facilities identified and operational	M&E of Input	25 % annually	On going	DOH/MS Hospitals	Site assessment/ physical verification	Not available
Identification and proper	Containment rooms in	M&E of Input	25 % annually	On going	DOH/MS Hospitals	Survey/Site assessments	Not available

construction/design of high containment rooms/areas in reference hospitals of each province/region	Tertiary Care Hospitals of all regions identified, design approved & construction started						
Apply IPC building codes for health care facilities	IPC building codes for health care facilities adopted	M&E of Input	25 % annually	On going	DOH/MS Hospitals	Facility Assessment	Not available
Intervention 2: Enabling conducive environment for IPC in the community							
Integration of personal hygiene topic in primary and secondary education curriculum	Personal hygiene integrated in educational curricula	M&E of Input	Yes/No	Every 5 years	Ministry of Education/ NHSR&C/Education departments	Consultations	Not available
Improve awareness about hygiene & safety in the food chain	Awareness campaigns/ seminar & meetings conducted	M&E of Outcome	Yes/No	Ongoing	NIH, Ministry of NHSR&C, Ministry of NFS&R,	Pre-post campaign surveys	Not available
Integrate IPC guidelines & protocols in farm building, biosecurity & food chain	IPC guidelines & protocols practiced in veterinary and food sector	M&E of Outcome	Yes/No	Annually	Ministry of NFS&R&C, Livestock Departments, Food Departments	Survey	Not available
Intervention 3: Provision of IPC supplies and waste management							
Procurement of PPEs	Availability of PPEs	M&E of Output	10% increase every year	Annually	Ministry of NHSR&C, NFS&R, DOH/Livestock Departments	Survey	Not available
Implementation of waste management practices according to EPA Act	Waste management protocols implemented	M&E of Output	10% increase every year	Annually	EPA/ Ministry of NHSR&C, NFS&R, DOH/Livestock Departments	Survey	Not available
Intervention 4: Surveillance for assessment of compliance on IPC practices							
Adapt WHO list of priority pathogens	National and WHO priority	M&E Input	Yes/No	One time	Ministry of NHSR&C and NFS&R, DOH, WHO, CDC	Consultation	GLASS framework

	list of pathogens developed & adopted as per GLASS						available
Monitor antibiotic utilization & stewardship compliance in human and animal healthcare settings	Monitoring of antibiotic utilization & stewardship compliance	M&E Input	Yes/No	Ongoing	Ministry of NHSR&C and NFS&R, NIH, DOH, Livestock Departments	Regular assessments and audits	Not available
Establish and strengthen healthcare associated infection surveillance	Healthcare associated infection surveillance system established	M&E Output	Yes/No	Annually	NIH, DOH	Survey	M&E tools available
Monitoring of compliance to occupational safety of HCWs: vaccination, needle stick injury (NSI), blood & body fluid exposures	Monitoring mechanism in place for occupational safety of HCWs	M&E Input	Yes/No	Ongoing	DOH	Regular reporting to Provincial & National IPC Focal Points	M&E tools available
Monitoring of access and compliance to use personal protective equipment (PPE)	Monitoring mechanism for PPEs in place	M&E Output	Yes/No	annually	DOH	Regular reporting to Provincial & National IPC Focal Points	Not available
Intervention 5: Strengthen animal health and agricultural IPC practices							
Development & implementation of policy guidelines to promote vaccination in animals	Promotion and enhanced vaccination guidelines & policies developed & implemented in animal husbandry	M&E of Output	Yes/No	One time	Ministry of NFS&R, LIVESTOCK DEPARTMENTSD	Notification Consultation	Not available
Ensure availability of quality vaccines for all	Quality vaccines	M&E of Input	Yes/No	Once	Ministry of NFS&R, LIVESTOCK	Consultation	Not available

priority zoonotic diseases	available				DEPARTMENTSD		
Promote hygienic slaughtering practices	Slaughter houses implementing hygiene practices	M&E of Output	Percentage of vaccines	Annually	Ministry of NFS&R, Livestock Departments	Annual stock situation review	some vaccines available
Establish quarantine/isolation facilities at Point of Entries (PoEs)	Quarantine/ isolation facilities operationalized at PoEs	M&E of Output	Percentage of vaccine units	Annually	Ministry of NFS&R, Livestock Departments	Vaccine trials/ review of technical reports	Some centres available
Establish, maintain and monitor hygiene standards for food storage sites (silos/godowns)	Hygienic standards for food storage sites established, maintained and monitoring system in place	M&E of Output	Yes/No	Annually	Ministry of NFS&R, Livestock Departments	Notification & reporting	Not available
Establishment of disease detection, response and containment guidelines for zoonotic and food borne outbreaks	Zoonotic & food-borne outbreaks guidelines developed & in place	M&E of Output	Yes/no	Ongoing	Municipalities and Livestock Departments	Survey	Not available
Intervention 6: Hygiene and sanitation at community level							
Provision and monitoring of quality of safe drinking water	Provision of safe drinking water with periodic lab testing performed	M&E Outcome	Yes/ No	Annually	Municipalities/ WASA/ PCRWR/ Ministry of Climate Change	Survey	Not available
Strengthen waste water treatment system	Installed & functional water treatment plants	M&E Outcome	Yes/ No	Annually	Municipalities/ WASA	Review of reports	Not available

Strengthen solid waste collection, transportation and management systems	Protocols and mechanisms developed for solid waste collection, transportation, dumping & recycling	M&E Outcome	Yes/ No	Annually	Municipalities/ WASA	Consultations, communications and assessments	Not available
Objective 4: Optimize the use of antimicrobial medicines in human and animal health							
4th Strategic Priority: Update and enforce regulations for human and veterinary antimicrobial utilization							
Approach1: Implementation of DRAP Act 2012 read with Drugs Act 1976 and rules framed thereunder regarding sale of antimicrobials on prescription							
Intervention 1: Advocacy & awareness on: prescribing, sales and use of antimicrobials							
Implementation of Drugs Act, 1976 and DRAP Act 2012 regarding sale of antimicrobials on prescription	Drugs Act disseminated & implemented	M&E Outcome	Yes/ No	Ongoing	Ministry of NHSR&C, DRAP, DOH	Review of implementation status	Drug Act, 1976 and DRAP Act 2012 available
Advocacy & awareness/understanding of stakeholders on relevant clauses	No of advocacy meetings for stockholders conducted	M&E of Input	25 % in first Year	Ongoing	DOH, DRAP, Livestock Departments	Review of reports and departmental record	Not available
Training of drug inspectors to ensure prescription based sale of antimicrobials	No. of drug inspectors trained for antimicrobial sale on prescription	M&E of Output	25 % in first Year	Ongoing	DRAP, DOH	Review of reports and departmental record	Not available
Strengthening and enforcement of market surveillance of antimicrobials	*Baseline survey conducted for establishing mechanism/ body for regular market surveillance on antimicrobials	M&E of Input	Yes/ No	Once	DRAP, DOH, WHO, HDP	Survey	Not available

	use						
Intervention 2: Review/ amendment/ harmonization in drug sales rules (Human and Veterinary) to ensure supervision only by pharmacist (Category A)							
Advocacy of policy makers and other relevant stakeholders	Consensus developed for review/amendment/harmonization of Drug Sales Rules	M&E of Input/ process	Yes/ No	Quarterly	Ministry of NHSR&C and NFS&R, DRAP, DOH, Livestock Departments	Departmental records	No data available
Legislation procedure initiated with consensus of all stakeholders	Amended and Harmonized Drug Sales Rules with consensus of all stakeholders at national & provincial/regional level	M&E of Input/ process	Yes/ No	Once	Ministry of NHSR&C, DRAP, Ministry of Law & Justice, DOH	Review of legislature, consultations	Not available
Review and up-gradation of essential medicines list (EML)	EML revised as per WHO requirement with categorization of antimicrobials	M&E of Input/ process	Yes/ No	Once	Ministry of NHSR&C and NFS&R, DRAP, DOH, WHO	Review of literature, consultation	Baseline EML available
Intervention 3: Antimicrobials (human & veterinary) sale & utilization audit							
Regular monitoring of antimicrobial sale and utilization at all levels and sectors	Audit mechanism for antimicrobial sale & utilization developed and implementation initiated	M&E of Input/ process	Yes/ No	Once	Ministry of NHSR&C and NFS&R, DRAP, DOH,	Consultations, review of reports	Not available
Coordinate and synchronize record keeping mechanism for antimicrobial sale and use at all levels (pharmacies, medical	Mechanism of record keeping for antimicrobial sale & use developed,	M&E of Input/ process	Yes/No	Once	Ministry of NHSR&C and NFS&R, DRAP, DOH	Consultations, Review of reports	Not available

& veterinary hospitals/ GPs in both sectors)	implemented with initiation of periodic monitoring	M&E of Input/ process	Yes/No	Once			
Compilation of national sale and usage record	Antimicrobials sale & usage data compiled and analysed	M&E of Input/ process	Yes/No	Annually	Ministry of NHSR&C, and NFS&R, DRAP, DOH	Information Management System	Not available
Intervention 4: Strengthening national mechanism for drug testing to ensure quality of antimicrobials							
Strengthening of drug testing laboratories (DTLs) in health & veterinary sectors	Strengthened / upgraded DTLs as per international standards	M&E of Input/ process	Yes/No	One time	Ministry of NHSR&C and NFS&R, DRAP, DOH, WHO	Departmental records, facilities assessments	Some facilities available
Accreditation of DTLs (federal and provincial level)	ISO/IEC: 17025 certified and WHO accredited laboratories	M&E of Input/ process	Yes/No	Ongoing	Ministry of NHSR&C and NFS&R, DRAP, DOH, WHO	Departmental records, facilities assessments	Some ISO/ WHO standards available
Approach 2: Establishment of Antibiotic stewardship program (ASP) at all levels							
Intervention 1: Antibiotic stewardship program implemented at all levels							
Advocacy of all stakeholders for establishment of ASP at tertiary level hospitals	Advocacy meetings/ seminars conducted for establishment of ASP at tertiary care hospitals	M&E of Output	25% of tertiary hospitals where ASP has been established annually	Annually	Ministry of NHSR&C, DRAP, DOH	Departmental facility records	ASP available in Limited number of tertiary care hospitals
Develop country specific standard treatment guidelines (STG) for antimicrobial use	National standard treatment guidelines developed	M&E of Output	Yes/No	One time	Ministry of NHSR&C, DRAP, DOH	Consultation	Archives
Development & implementation of ASP at provincial/regional levels*	ASP developed and implemented with monitoring of ASP in	M&E of Input	Yes/No	Every 3 Years	Ministry of NHSR&C, DRAP, DOH	Archives	Not available

	tertiary care hospitals						
Conduct audit of ASP at tertiary care hospitals (public and private)	Regular audit of ASP at tertiary care hospitals	M&E of Input	Yes/No	Annually	Ministry of NHSR&C, DRAP, DOH	Documents & Records review	Not available
*Market surveillance should precede this activity							
Intervention 2: Promote use of vaccines for VPDs to minimize antimicrobial use in both human and vet sector							
Advocacy of all stakeholders for promotion of vaccination	Improved vaccination Plans/schedules	M&E of Output	Proportion of tertiary hospitals where ASP has been established annually	Annually	Ministry of NHSR&C, f NFS&R, DRAP, DOH	Departmental facility records	ASP available in limited number of tertiary hospitals in private sector
Ensure availability, access and usage of effective vaccines in both sectors	Increased utilization of VPD vaccines in both sectors	M&E of Output	Yes/ No	Ongoing	Ministry of NHSR&C, DOH	Departmental records	vLMIS implemented
Formulation of legislation for mandatory vaccination against VPDs in both sectors	Legislation enacted in both sectors	M&E of Output	Yes/ No	One time activity	Ministry of NHSR&C and NFS&R, DOH, relevant regulatory bodies	Consultative process or consensus building	Draft bill on immunization in health sector
5th Strategic Priority: Phase out use of antimicrobials as growth promoters and provide appropriate alternatives							
Approach 1: Rationalize use of antimicrobials as growth promoters and discourage prophylactic use of antibiotics in veterinary sector							
Intervention 1: Review and improve existing practices regarding use of antimicrobials as growth promoters & prophylaxis aligned with international standards							
Conduct baseline survey on usage of antimicrobials as growth promoters in animal feed industry including assessment of feed (utilization audit)	Baseline data available for strategizing interventions	M&E of Outcome	Yes/No	One Time	Ministry of NHSR&C and NFS&R, DRAP,	Survey	Not available
Review legislation for addition/inclusion of relevant clauses in	Necessary amendments incorporated,	M&E of Outcome	Yes/No	Every 5 Years	Ministry of NHSR&C and NFS&R, DRAP, DOH, Ministry of Law and	Review of literature and consultation	Parliament Archives

DRAP Act 2012 and Drug Act 1976 for the control of antimicrobials usage as growth promoters and prophylaxis in veterinary sector	approved & promulgated				Justice		
Monitoring of antimicrobials as growth promoter	Monitoring mechanism on antibiotic utilization, sale & prescription established and functional	M&E of Output	Proportion reduction in usage of antimicrobials as growth promoters and prophylaxis	Annually	Ministry of NHSR&C and NFS&R, DRAP, DOH	Survey	Not available
Strengthening of food testing laboratories for antimicrobial residues	Food testing labs performing antimicrobial residues detection	M&E Output	% of Food Labs meeting International standards in first year	Annually	Federal & provincial food, health, livestock and agriculture departments	Laboratory assessment	Not available
Objective 5 : Develop economic case for sustainable investment based on country needs and increase investment in new vaccines, diagnostics and other interventions							
6th Strategic Priority: Integration of AMR in all public health research agendas including research on vaccines and diagnostics							
Approach 1: Identification and integration of available indigenous resources for research							
Intervention 1: Develop mechanism for conducting survey and resource mapping on AMR research							
Performa based survey of available resources for research (Equipment; Human Resource; Infra-structure; Funding)	Identified and mapped resources for integrated research on AMR	M & E Output	Yes /No	One time activity	PHRC , NIH, Ministry of NHSR&C, Ministry of NFS&R,	Survey	Not available
Pooling of available resources for development of new vaccines, diagnostics & antibiotic alternatives	Availability of new vaccines, diagnostics & antibiotic alternatives	M & E Output	Yes /No	Ongoing	PHRC, NIH, Ministry of NHSR&C and NFS&R, Academic Institutions, PSF, Pharmaceuticals, HEC	Applied basic research support, clinical trials, applied research, operational research	Various health research projects currently supported

Intervention 2: Conducting research on clinical practices on AMR							
Clinical research on existing practices and gaps in prescription, usage and availability/ manufacturing of antimicrobials	Availability of guidelines for prescription, usage and availability/ manufacturing of antimicrobials	M & E Output	Yes / No	Ongoing	PHRC, NIH, Ministry of NHSR&C and NFS&R, Academic institutions, PSF, Pharmaceuticals, HEC	Applied basic research support, clinical trials, applied research, operational research	Various health research projects currently supported
Development of national AMR research priority agenda	Research agenda developed with domestic allocation	M & E Output	Yes / No	Ongoing	NIH, Ministry NHSR&C and NFS&R, Academic institutions, pharmaceuticals	Basic research	Not known
Development of effective vaccines and diagnostics	No of research projects conducted						
7th Strategic Priority: Estimation of health and economic burden of AMR for decision making							
Approach 1: Development of economic case for sustainable national investment							
Intervention 1: Baseline national data collection on economic burden of AMR							
Analysis of published data on AMR in Pakistan	Economic impact derived from published data	M & E Output	Yes/ No	Ongoing	Ministry NHSR&C and NFS&R	Literature review & report writing	Expertise available
Design and conduct studies to estimate economic burden of AMR in health, veterinary and agriculture sector	AMR economic burden estimated	M & E Output	Yes/ No	Ongoing	Ministry of NHSR&C and NFS&R, NIH, DOH	Survey	Reference labs

List of Publications & References Cited in the Document

1. World Health Organization 2014. Antimicrobial resistance: global report on surveillance 2014. (Available at http://apps.who.int/iris/bitstream/10665/112642/1/9789241564748_eng.pdf
2. World Health Organization.2015. Country Capacity Review Mission for Early Implementation of AMR Surveillance in Pakistan, November 2015
3. World Health Organization 2015. Global Action Plan for AMR. . (Available at http://www.wpro.who.int/entity/drug_resistance/resources/global_action_plan_eng.pdf
4. National Strategic Framework for AMR containment in Pakistan 2016. (In press)
5. World Health Organization 2012. The evolving threat of antimicrobial resistance: options for action. Available at *http://whqlibdoc.who.int/publications/2012/9789241503181_eng.pdf*
6. Diaz. Antimicrobial use in animals: Analysis of the OIE survey on monitoring of the quantities of antimicrobial agents used in animals [Internet]. 2013; Paris. Available from: http://www.oie.int/eng/A_AMR2013/Presentations/S2_4_Fran%C3%A7oisDiaz.pdf
7. Basnyat B. Antibiotic resistance needs global solutions. Lancet Infect Dis 2014;14(7):549–550.
8. Dutil L et al. Ceftiofur resistance in Salmonella entericaserovar Heidelberg from chicken meat and humans, Canada. Emerging Infectious Diseases 2010;16(1):48-54.
9. Cogliani C, Goossens H, Greko C. Restricting antimicrobial use in food animals. Lessons from Europe. Microbe 2011;6(6):274–279.
10. WHO 2015. World Health Assembly addresses antimicrobial resistance, immunization gaps and malnutrition. http://www.who.int/mediacentre/news/releases/2015/wha-25-may-2015/en/
11. HO 2016. Antimicrobial resistance: A manual for developing national action plans. Available at http://apps.who.int/iris/bitstream/10665/204470/1/9789241549530_eng;
12. WHO "Antimicrobial resistance: global report on surveillance 2014." April 2014. http://www.who.int/drugresistance/documents/surveillancereport/en/.
13. WHO EMRO. "Pakistan Antimicrobial Resistance Surveillance System." 2015. http://www.emro.who.int/pdf/health-topics/drug-resistance/pakistan-antimicrobial-resistance-surveillance-system.pdf
14. PARN- Pakistan Antimicrobial Resistance Network. Available at: http://www.parn.org.pk/ ResistanceMap.org; Accessed April 13, 2017.
15. IMS-Health
16. Van Boeckel TP, Brower C, Gilbert M, Grenfell BT, Levin S a., Robinson TP, et al. Global trends in antimicrobial use in food animals. Proc Nat Acad Sci. 2015; (16):201503141–201503141.
17. National Drug Policy- Pakistan, 2003. http://apps.who.int/medicinedocs/en/d/Js17118e/. Accessed April 13, 2017.
18. DRAP ACT 2012.Drug Regulatory Authority of Pakistan LAWS http://www.na.gov.pk/uploads/documents/1352964021_588.pdf. Accessed April 13, 2017.
19. DRUG Act 1976.Drug Regulatory Authority of Pakistan LAWS http://www.dra.gov.pk/drap/userfiles1/file/The%20Drugs%20Act,%201976%2011-11-15%20F.pdf. Accessed April 13, 2017.
20. The Punjab Animals Feed Stuff and Compound Feed Act 2016. http://punjablaws.gov.pk/laws/2675.html. Accessed April 13, 2017.

21. Ashfaq M, Nawaz Khan K, Saif Ur Rehman M, et al. Ecological risk assessment of pharmaceuticals in the receiving environment of pharmaceutical wastewater in Pakistan. Ecotoxicology and Environmental Safety. 2017;136:31-39. doi:10.1016/j.ecoenv.2016.10.029.

22. Khan GA, Berglund B, Khan KM, Lindgren PE, Fick J. 2013. Occurrence and abundance of antibiotics and resistance genes in rivers, canal and near drug formulation facilities: a study in Pakistan. PLoS ONE 8, e62712.

Government of Pakistan
Ministry of National Health Services Regulations & Coordination
LG&RD Complex, Sector G-5/2, Islamabad
*****

Islamabad, the 27th November, 2015

NOTIFICATION

F. No.8-30/2015-DDP-I The Secretary, Ministry of National Health Services, Regulations and Coordination (NHS,R&C), Islamabad is pleased to constitute an Intra-Sectoral Core Steering Committee to oversee the whole process of developing National Policy on AMR, with the following composition and Terms of References:-

Composition:-

1. Secretary, M/o NHSR&C	**Chairperson/ Convener**
2. Director General Health, NHSR&C	Member
3. CEO, DRAP, NHSR&C	Member
4. Executive Director NIH, Islamabad.	Member
5. Representative, M/o National Food Security & Research	Member
6. Chairman, Pakistan Agriculture Research Council (NARC/PARCs Agricultures Research Institution Executive Director PMR&C, Islamabad,	Member
7. President, Pharmacy Council of Pakistan	Member
8. President, Pakistan Nursing Council	Member
9. Representative, National Laboratory Working Group	Member
10. Representative, Public Sector Hospital	Member
11. Representative, Private Sector Hospital	Member
12. Representative Pakistan Medical Association	Member
13. Representative, Pakistan Antimicrobial Resistance Network	Member
14. Representative, General Practitioner Association	Member
15. Representative, Medical Microbiology and Infectious Diseases Society of Pakistan	Member
16. Representative, Pakistan Pharmaceutical Manufacturers Association	Member
17. Representative WHO, Islamabad	Member
18. Representative, Pakistan Medical Veterinary Council	Member
19. Director General Health Services, Punjab, Sindh, KP, Baluchistan	Member
20. Director General Agriculture & Livestock, Punjab, Sindh, KP, Baluchistan	Member
21. Director Health Services, GB, FATA	Member
22. Representative AFIP, Rawalpindi.	Member
23. Focal Person, International Health Regulations (IHR)	Member/ Secretary

(Dr. Sabeen Afzal)
Deputy Director

Cont`d.....P/2

-2-

Terms of References:-

Sr. #	Terms of References	Time
1.	To identify key stakeholders and experts in policymaking, infectious disease, microbiology, pharmaceuticals, animal health and agriculture sector etc.	2 weeks
2.	To assess the existing status of AMR in Pakistan through systematic review of WHO documents/guidelines/reports on AMR and national literature on AMR in Pakistan	2 weeks
3.	To prepare a policy document outlining the details of the Proposed areas for National AMR policy and Action Plan narrated here through a consultative process with the key stakeholders and experts	4 weeks
4.	To provide recommendations for engagement of public and private sector including professional societies in terms of resource mobilization for awareness, standardize testing, surveillance and monitoring of AMR and regulatory framework	2 weeks
5.	Provide recommendations for development of Provincial plans of actions for AMR implementation.	2 weeks

(Deputy Director)

Distribution:-

- All Members.

Copy to:-

1. Sr. PS to Secretary, M/o NHS, R&C, Islamabad.
2. PS to DG Health, M/o NHS, R&C, Islamabad.

Government of Pakistan
Ministry of National Health Services Regulations & Coordination
LG&RD Complex, Sector G-5/2, Islamabad
*****

Islamabad, the 07th March, 2017

NOTIFICATION

F. No.8-30/2015-DDP-I The competent authority, Ministry of National Health Services, Regulations and Coordination (NHS,R&C), Islamabad, is pleased to constitute a Core group on AMR having following composition and Terms of References:-

Composition:-

1. **Dr. Malik Muhammad Safi Director (Program)**	**Chairman**
2. Dr. Muhammad Salman, NIH, Islamabad	Member/Secretary
3. Dr. Sabeen Afzal, Deputy Director (P-I), M/o NHSR&C	Member
4. Brig Aamir Ikram Pathologist Armed Forces	Member
5. Dr. Jamil Ansari, NIH	Member
6. Dr. Mumtaz NIH	Member
7. Dr. Farah Sabih, WHO, Islamabad	Member
8. Mr. Ahmed Liban, CDC	Member
9. Provincial IHR Focal Persons	Member
10. Representative of HPSIU	Member
11. Representative NARC/NVL	Member
12. Dr. Ijaz Khan Pediatrician / Infectious disease, consultant Shifa Int. Hospital	Member
13. Co-Opted / Technical Area Expert	Member

ToRs:-

1. Compile, refine and finalize the National Action Plan for AMR
2. Coordinate with one health & other relevant stakeholders (National / Provincial) for follow up activities.
3. Assist provinces to prepare provincial AMR operational plans
4. Provide technical, coordination and monitoring oversight for implementation of AMR activities in Pakistan.

Sabeen

(Dr. Sabeen Afzal)
Deputy Director (P-I)

Distribution:-

- All Members.

Copy to:-

1. Sr. PS to Secretary, M/o NHS, R&C, Islamabad.
2. PS to DG Health, M/o NHS, R&C, Islamabad.