



National Action Plan on Antimicrobial Resistance

(NAP AMR) 2024-2029



Ministry of Health
Republic of Maldives



World Health
Organization
Maldives

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1st December 2024
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Ministry of Health
Republic of Maldives

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Foreword by Minister of Health

Antimicrobials are crucial to modern medicine for treating infections and supporting a range of medical procedures. However, misuse across human, animal, and agricultural sectors has led to rapid rise of “superbugs”—resistant pathogens that are no longer treatable with current medicines. In 2019 alone, these infections led to over 1.27 million deaths globally. Rapid spread of antimicrobial resistance (AMR), combined with a lack of new treatments, has posed AMR serious global health threat.

Recognizing this urgency, the Maldives adopted the World Health Organization's Global Action Plan (GAP) on AMR in 2015, becoming a regional leader in AMR containment efforts. The establishment of the National Multisectoral Coordination Committee in 2016 marked a crucial step, initiating our first National Action Plan (NAP) on AMR (2017–2022), which was aligned with GAP's strategic objectives. Despite challenges posed by the COVID-19 pandemic, the Maldives achieved significant progress under the first NAP, driven by the commitment of five technical committees focused on specific goals aligned with international standards.

To build on these achievements, a comprehensive review of the NAP was conducted in 2023, involving extensive stakeholder consultations and a second situation analysis to identify critical gaps and shape our next strategy. This led to the development of the second National Action Plan on AMR (2024–2029), which incorporates two new focus areas: strengthening governance structures and enhancing regulatory frameworks. These additions aim to establish a more resilient, sustainable approach, equipping the Maldives to manage AMR effectively and contribute to global containment efforts.

The importance of national AMR strategies was emphasized again on September 26, 2024, at the 79th United Nations General Assembly, where renewed commitments called for a strengthened global response to AMR through a One Health approach. As we embark on implementing the second National Action Plan on AMR (2024–2029), the Maldives reaffirms its dedication to addressing this urgent threat.

Having endorsed the first National Action Plan, I am honoured to support this second plan, which builds on past lessons and renews our commitment to combating AMR. I encourage all stakeholders to join in promoting the responsible use of antimicrobials, helping to preserve these essential medicines for future generations.

Abdulla Nazim
Minister of Health

Foreword WHO Representative



'Antimicrobial Resistance' (AMR) occurs when bacteria, viruses, fungi, and parasites change over time and no longer respond to medicines. This makes infections harder to treat and increases the risk of disease spread, severe illness and death. As a result of drug resistance, antibiotics and other antimicrobial medicines become ineffective and infections become increasingly difficult or even impossible to treat. As a result, Antimicrobial Resistance has become a huge threat to global health security, healthcare, global trade, agriculture, and the environment.

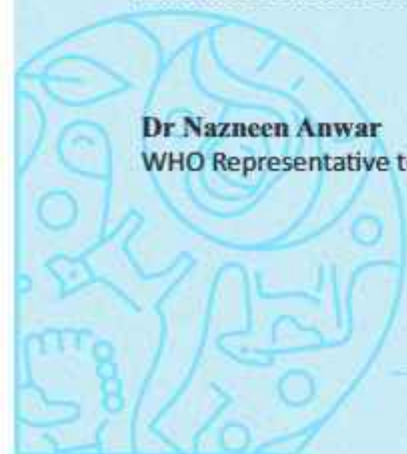
New global estimates show that in 2019, nearly 5 million human deaths worldwide were associated with bacterial Antimicrobial Resistance, of which 1.3 million human deaths were directly attributable to bacterial Antimicrobial Resistance. In a high-impact scenario, Antimicrobial Resistance will reduce global annual GDP by 3.8% by 2050. If left unchecked, in the next decade, it could result in a GDP shortfall of US\$ 3.4 trillion annually, pushing 24 million more people into extreme poverty. The consequences of Antimicrobial Resistance threaten the attainment of the Sustainable Development Goals which were recently agreed upon by UN member states.

Since 2014, preventing and combating Antimicrobial Resistance has been one of eight Flagship Priorities of the WHO South-East Asia Region, which is at high risk for the emergence and spread of Antimicrobial Resistance. With WHO's support, Maldives had developed its first National Action Plan to address Antimicrobial Resistance in 2016 and has continued to implement this action plan between years 2017-2022. Multisectoral working groups and coordination committees on Antimicrobial Resistance have been established at country level, in alignment with the Global Action Plan on Antimicrobial Resistance, adopted in 2015.

To further assess the content and determine alignment with the Global Action on Antimicrobial Resistance, WHO is pleased to have supported the review and updating of existing Maldives National Action Plan on Antimicrobial Resistance. This review supports realignment of Maldives priority activities for the Antimicrobial Resistance programme and paves the way towards ensuring and enhancing the country's renewed efforts to combat antimicrobial resistance. I am pleased to note that this plan has been developed after thoroughly reviewing the current situation of the country and all activities planned. Thanks to the efforts of all partners, the plan was completed in a time-bound operational manner, following a mapping exercise conducted to identify funding gaps and resources mobilized for implementation. I commend the efforts, contribution and commitment made by numerous stakeholders such as Ministry of Health, Ministry Environment and Ministry of Fisheries and Agriculture etc. in the development and implementation of this updated plan.

For the foreseeable future, we must accelerate concerted action while continuing to increase national, regional, international, and global awareness and support towards Antimicrobial Resistance. Time is of the essence. The development of a new antimicrobial can take between 10-15 years and cost can exceed US\$ 1 billion. Although Antimicrobial Resistance cannot be eradicated, it can be reasonably slowed down and contained. Therefore, WHO urges all stakeholders to continue their efforts into coordinating with the National counterparts to prevent, detect, and respond to the threat posed by Antimicrobial Resistance pathogens. As always, WHO remains a trusted technical partner to Ministry of Health and the Government of Maldives to support coordinated nationwide efforts to combat Antimicrobial Resistance in the country.

Dr Nazneen Anwar
WHO Representative to the Maldives



Acknowledgement



In 2019 alone, these infections led to over 1.27 million deaths globally. Rapid spread of antimicrobial resistance (AMR), combined with a lack of new treatments, has posed AMR serious global health threat. Recognizing this urgency, the Maldives adopted the World Health Organization's Global Action Plan (GAP) on AMR in 2015, becoming a regional leader in AMR containment efforts.

The National Multisectoral Coordination Committee in 2016 initiated the first National Action Plan on AMR, achieving significant progress despite COVID-19 challenges, with five technical committees focusing on international standards.

This AMR Action plan is the 2nd AMR plan of Maldives health sector which was formulated by the international consultant, Nazla M Luthfee, MD Msc.

In 2023, a review of the National Action Plan on AMR led to the development of a second plan, focusing on strengthening governance structures and regulatory frameworks to enhance resilience and sustainability in managing AMR effectively.

I take this opportunity to express sincere appreciation for the generous and continued support of the World Health Organization in developing this plan.

The overall formulation process was a collaborative and a consultative effort by national stakeholders (Maldives Food and Drug Authority (MFDA), Quality Assurance and Regulation Department, Ministry of Health, Health Protection Agency (HPA), Ministry of Fisheries Marine Resources and Agriculture (MoAAW & MoFOR, Ministry of Climate Change, Environment and Energy (MoCCEE), Policy Implementation and International Relations Division (PIIRD)). Consecutive meetings and discussions were carried out with stakeholders including public and private sectors by Maldives Food & Drug Authority.

The text and format verified, and the numbering was done by Policy Implementation and International Relations Division under the supervision of Aminath Shaina Abdulla, the Deputy Director General of Policy Planning and International Health Division.

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Executive summary


The Maldives has made significant progress in controlling and eliminating infectious diseases, including Tetanus, Polio, Leprosy, Malaria, Filaria, Measles, Rubella, and HIV/Syphilis transmission. This success is attributed to improved healthcare, sanitation, safe drinking water, and high vaccination coverage. In response to the WHO's call for action on Antimicrobial Resistance, a National Action Plan was formulated in 2017, covering 2017-2022. This initial plan, covering the period from 2017 to 2022, aligned seamlessly with the GAP AMR and delineated five primary objectives as follows:

1. Strengthen the knowledge and evidence base through surveillance and research.
2. Reduce the incidence of infection through effective sanitation, hygiene, and infection prevention measures.
3. Optimize the use of antimicrobial medicines in human and animal health.
4. Improve awareness and understanding of antimicrobial resistance through effective communication, education, and training.
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.

In 2018, a comprehensive analysis of the NAP AMR 2017-2022 prevention and containment program was conducted, focusing on seven key areas: alignment with GAP AMR governance, awareness-raising, establishing a national AMR surveillance system, infection prevention and control, fostering research and innovation, and promoting One Health engagement. The analysis evaluated progress across 30 indicators and introduced 10 additional indicators for a more comprehensive evaluation. The 2018 situation analysis showed positive results, with indicators performing at or above phase 3.

The 2023 situation analysis of the National Action Plan on Antimicrobial Resistance (NAP AMR) for 2017-2022 revealed similar findings with only three indicators performing at or above level 3. The country's commitment to the NAP AMR plan was evident, but the lack of a proper governance structure, a dedicated AMR coordination unit, and a National Multi-Sectoral Steering Committee contributed to the inadequate implementation. The absence of trained skilled human resources and a lack of surveillance in all sectors, including human, animal, agriculture, food, and environmental, further weakened the system. A fully functional national drug regulatory authority was established to oversee regulation, licensing, pharmacovigilance, and market authorization. Initiatives include developing national standards and guidelines, strengthening infection prevention and control measures, and updating environmental protection policies. However, there is limited awareness on AMR-related environmental impact or coordination among stakeholders on NAP AMR-related activities.

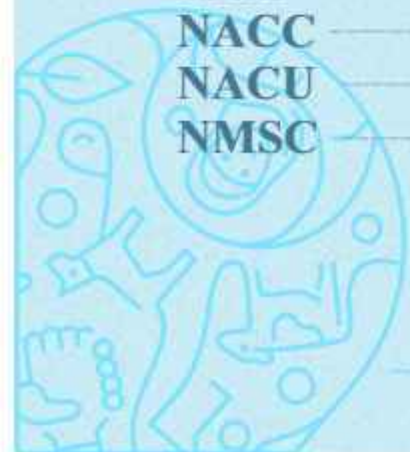
The NAP AMR 2024-2029 aims to strengthen governance, enhance regulatory aspects across all sectors, and establish a communication pathway between stakeholders. It builds on the initial NAP AMR of 2017-2022, focusing on universal healthcare, animal welfare, food security, and a safe environment using the ONE HEALTH concept. The new objectives include establishing a National Multi-Sectoral Steering Committee and a National AMR Coordination Unit, digitalizing surveillance reporting, integrating AMR activities into existing programs, and developing a monitoring and evaluation framework.





Abbreviations and Acronyms

AMA	Antimicrobial Agent
AMR	Antimicrobial Resistance
AMSP	Antimicrobial Stewardship Programme
AMU	Antimicrobial Use
ARO	Antimicrobial Resistant Organism
AST	Antibiotic Susceptibility Testing
CME	Continuing Medical Education
EML	Essential Medicines List
FAO	Food and Agriculture Organization
FHS	Faculty of Health Sciences
GAP	Global Action Plan
GDP	Gross Domestic Product?
GFN	Global Foodborne Infections Network
GLASS	Global Antimicrobial Resistance Surveillance System
GMP	Good Manufacturing Practices
HAI	Healthcare Associated Infection
HPA	Health Protection Agency
IPCC	Infection Prevention and Control Committee
MFDA	Maldives Food and Drug Authority
MoCCEE	Ministry of Climate Change, Environment and Energy
MoAAW	Ministry of Agriculture and Animal Welfare
MoFOR	Ministry of Fisheries Ocean Resources
MoH	Ministry of Health
NACC	National AMR Coordination Committee
NACU	National AMR Coordination Unit
NMSC	National Multi-Sectoral Steering Committee



Background

Introduction

The availability of effective antimicrobials have substantially reduced mortality and morbidity from infectious diseases and enabled multiple advancements in modern medical and veterinary practice ‘–(Australian Government 2015). The rise and spread of antimicrobial resistance (AMR) are creating a new generation of ‘superbugs’ that cannot be treated with existing medicines. The impacts of leaving AMR unchecked are wide-ranging and extremely costly, not only in financial terms but also in terms of global health, food sustainability and security, environmental wellbeing, and socio-economic development –’(HM Government 2019, World Health Organization 2023).

Globally, unchecked antimicrobial resistance threatens many of the Sustainable Development Goals; such as ending poverty, ending hunger, ensuring healthy lives, reducing inequality, and revitalizing global development partnerships—are less likely to be achieved ‘(HM Government 2019). (Figure 1). According to World Bank unless AMR is contained an additional 28 million people could be forced into extreme poverty by 2050, through shortfalls in economic output (World Bank 2017). Already, AMR infections are estimated to cause 700,000 deaths each year globally. That figure is predicted to rise to 10 million, alongside a cumulative cost of \$100 trillion, by 2050 if no action is taken ref

Murray et al. estimated that 4.95 million deaths were associated with bacterial antibiotic resistance, including 1.27 million deaths attributable to bacterial AMR in 2019 (Murray, Ikuta et al. 2022).

Table 1: Impact of AMR on SDGs

Impact of AMR on SDGs ‘(HM Government 2019, World Health Organization 2021)



AMR strikes hardest on the poor. Treatment of resistant infections is more expensive. Substandard care and partial treatment can drive infection



Cost of AMR is predicted to be US\$ 100 trillion by 2050, driving extra 28 million people into poverty



Untreatable infections in animals threatens sustainable food production for growing populations



It is crucial to balance access and conservation of antimicrobials with innovation, to contain AMR



Antimicrobials are a component of all health systems. AMR will increase treatment costs, making effective care unaffordable for many, and UHC unattainable.



To effectively tackle AMR, collaboration and partnerships are needed across all relevant sectors and at all levels



Lack of access to clean water and effective sanitation results in spread of infectious diseases; in turn, this increases antibiotic use and thus drives the emergence and spread of AMR.



**Table 2: Five Objectives of Global Action Plan on AMR, 2015-2019
(World Health Organization 2015)**

- 1. Strengthen the knowledge and evidence base through surveillance and research**
- 2. Reduce the incidence of infection through effective sanitation, hygiene and infection prevention measures**
- 3. Optimize the use of antimicrobial medicines in human and animal health**
- 4. Improve awareness and understanding of antimicrobial resistance through effective communication, education and training**
- 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**

The 2015 World Health Organization Global Action Plan and other international policy documents have stressed the need for a "whole of United Nations approach" in addressing antimicrobial resistance (AMR) (World Health Organization 2015). This action plan also emphasise the need for an effective "one health" approach involving coordination among various international sectors and actors, including human and veterinary medicine, agriculture, finance, environment, and well informed consumers (World Health Organization 2015). One Health is an integrated, unifying approach that aims to sustainably balance and optimize the health of people, animals and ecosystems. It recognizes the health of humans, domestic and wild animals, plants, and the wider environment (including ecosystems) are closely linked and inter-dependent (*World Health Organization 2021*). One Health approach, linking humans, animals and the environment, addresses the full spectrum of disease control - from disease prevention to detection, preparedness, response, and management – and aim to improve and promote health and sustainability.



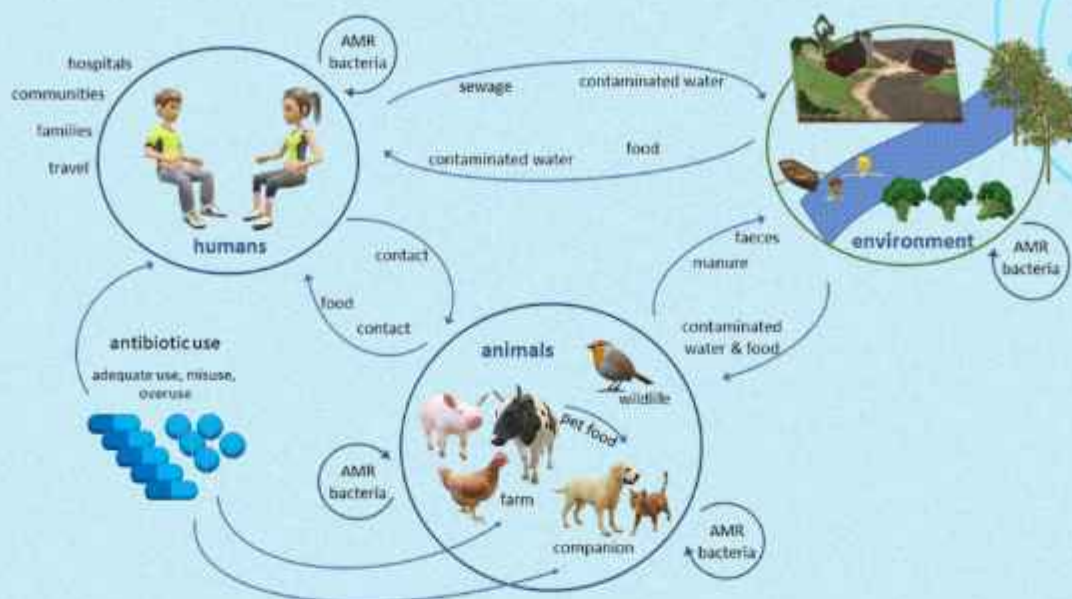


Figure 1: Schematic of potential transmission between human, environment and animal reservoirs — (Pattis, Weaver et al. 2022)

The antibiotics used to treat infections may be the same or similar in humans and animals; the manufacture, use, and disposal of antibiotics in all settings can potentially drive the emergence of resistance. When antibiotic-resistant bacteria arise, they may spread among humans, animals, and the environment.

The WHO Global Antimicrobial Resistance and Use Surveillance System (GLASS) was launched in 2015 to foster AMR surveillance and inform strategies to contain AMR (World Health Organization 2022). The GLASS 2022 report highlighted effect of COVID-19 pandemic and reiterated the need to Enhanced collective efforts to ensure the continuity of crucial programmes such as AMR and AMC surveillance and to seize the opportunity to develop more sustainable infection prevention and control programmes, promote integrated antibiotic stewardship guidance, and leverage increased laboratory capabilities and other system-strengthening efforts (World Health Organization 2022).

The GLASS 2022 report found an increase in AMR rates by more than 15% in 2020 compared with 2017 for meropenem and third-generation cephalosporin resistance in bloodstream *E. coli* BCIs, ciprofloxacin resistance in *Salmonella* spp. bloodstream bacteriologically confirmed infections (BCIs), and azithromycin resistance in gonorrhoea BCIs (Section 3.3). Although further studies would be needed to verify whether a real upward trend occurred for these combinations, the negative impact of the COVID-19 pandemic on both AMR surveillance activities and AMR rates has been reported previously and may have contributed, at least in part, to these findings. The very high 2020 levels of AMR in pathogens causing bloodstream infections, regardless of testing coverage, are of major concern. Third-generation cephalosporins are recommended as a first-line empiric treatment for this type of infection. High levels of third-generation cephalosporin resistance have been reported in *Klebsiella pneumoniae*, the third most frequent pathogen causing bloodstream infections, which may drive the increase in the use of 'last resort' carbapenems. Although the reported rate of carbapenems resistance in *K. pneumoniae* was lower in countries, territories and areas (CTAs) with better testing coverage, the pooled rates from all reporting CTAs showed carbapenem resistance in more than 8% of bloodstream infections caused by this pathogen and may indicate the emergence of this type of resistance worldwide. The global spread of carbapenemase producing Enterobacteriaceae and the high rates of carbapenem and aminoglycoside resistance in *Acinetobacter* spp. ($\geq 56\%$ regardless of testing coverage) are of great concern. Carbapenem resistant isolates are usually multidrug-resistant and are often associated with treatment failure (World Health Organization 2022)

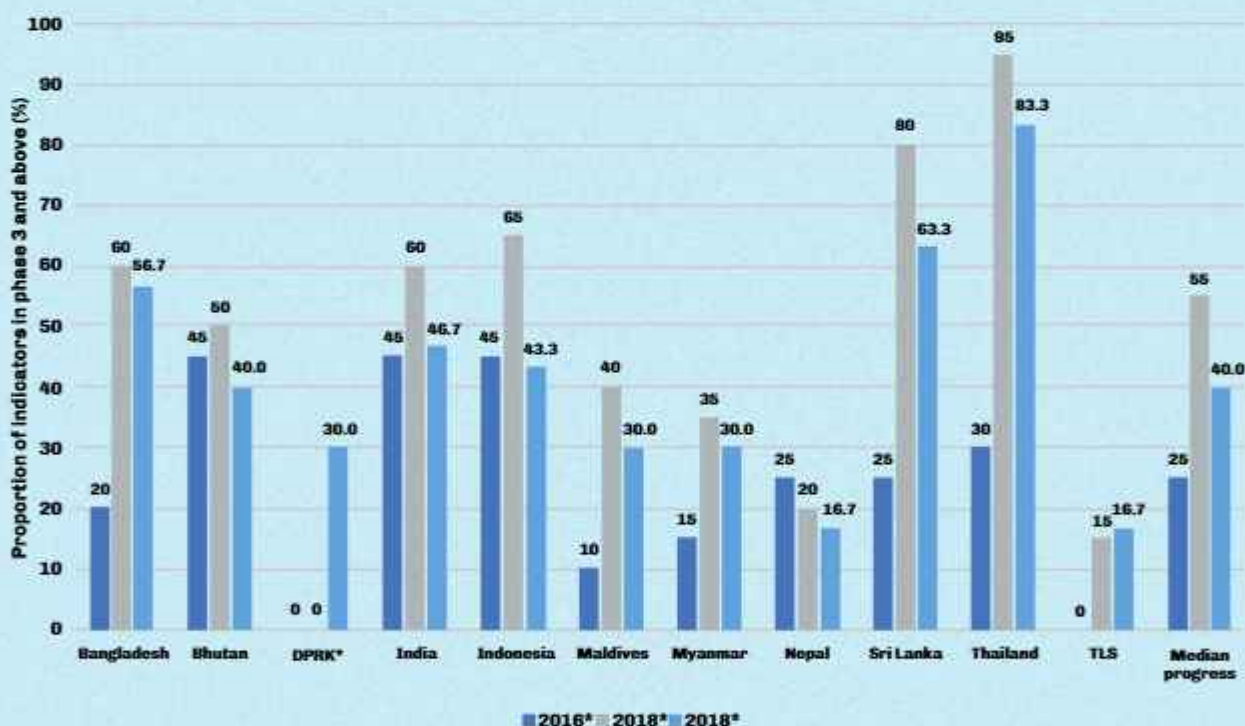
Lower respiratory infections accounted for more than 1.5 million deaths associated with resistance in 2019, making it the most burdensome infectious syndrome. The six leading pathogens for deaths associated with resistance (*Escherichia coli*, followed by *Staphylococcus aureus*, *Klebsiella*

pneumoniae, Streptococcus pneumoniae, Acinetobacter baumannii, and Pseudomonas aeruginosa) were responsible for 929 000 (660 000–1 270 000) deaths attributable to AMR and 3.57 million (2.62–4.78) deaths associated with AMR in 2019 (Murray, Ikuta et al. 2022). The broad benefits of AMR surveillance include the opportunity to introduce evidence-based policies and interventions data and information on levels and patterns of resistance. Such evidence based interventions in turn contribute to reduced disease burden, lower treatment costs, and reduced mortality (World Bank 2017).

It is a concern that in many low-income settings where the threat of AMR is very high there is serious data gaps, emphasising the need to expand microbiology laboratory capacity and data collection systems to improve our understanding of this important human health threat (Murray, Ikuta et al. 2022).

Though the Global Action Plan on AMR of 2015 while extensive in its scope some issues that have since emerged as it was not addressed include: governance, laboratory strengthening, the patient perspective and the need to integrate AMR into broader health systems such as primary health care, universal health coverage and pandemic preparedness (World Health Organization 2022).

In response, WHO is now encouraging a programmatic public health approach that recognizes the interdependence of the six building blocks: political commitment and governance that brings leadership, funding, education, human resources and use of data; access to early diagnosis in a quality assured laboratory network; access to appropriate treatment; prevention of infection including IPC and vaccination; an uninterrupted supply chain for both treatment and diagnostics; and, surveillance and evidence generation.



*Progress assessed for 20 indicators based on Situation Analysis was not conducted in DPRK in 2016 and compared in 2018
 *progress assessed for 30 indicators (10 newly introduced indicators) based on Situation Analysis toll 2018

Figure 2: Progress of NAP-AMR implementation by country (2016-18)

Situation analysis of NAPAMR implementation in SEARO region done on the basis of the 30 indicators (including the 10 additional indicators), The median country progress in 2018 was at 30% (on basis of 30 indicators assessed); maximum country progress was in Thailand at 83.3% and minimum in Nepal and Timor-Leste at 16.7% (World Health Organization 2019).