HEALTH NATIONAL ADAPTATION PLAN (HNAP)

FOR PREVENTING HEALTH RISKS AND DISEASES FROM CLIMATE CHANGE IN MALDIVES

2020 - 2024

Health Protection Agency

World Health Organization Maldives

Endorsement No: Plan/23/-MoH/2020/14

Endorsement numbered by: Strategic Planning Unit/PIH, MoH

Date: November 2020

Publication is available on the Ministry of health website (www.health.gov.mv). Requests for publication or for permission to reproduce or translate the publication can be obtained from Ministry of Health, Maldives.

HEALTH NATIONAL ADAPTATION PLAN (HNAP) FOR PREVENTING HEALTH RISKS AND DISEASES FROM CLIMATE CHANGE IN MALDIVES
Developed by Dr. Meghnath Dhimal
Health Protection Agency
WHO
Published in 2020

Contents

Figures

Tables

FOREWORD

Direct and indirect effects of climate change play a key role in determining human health in vulnerable populations all around the world. Global warming and sea level rise are a threat especially to countries like Maldives that are just one meter above sea level. Without proper adaptation and mitigation measures, Maldives face great health and environmental risks.

Extreme weather events, changes in water quality and ecosystems put communities at risk of communicable diseases, non-communicable diseases, water borne and airborne diseases, heat related illnesses and nutrition related illnesses to name a few. We must take human health into consideration whilst developing policies and plans for adaptation to climate change.

Health National Adaptation Plan (NHAP) integrates climate change into health care systems in Maldives. This plan is a stepping stone in accepting environmental health as a pressing issue and initiating sustainable and climate resilient adaptation measures. HNAP will provide opportunities for intersectional collaboration, fund mobilization and holistic approach for sustainable development.

I convey my sincere gratitude to Dr.Meghnath Dhimal (WHO consultant for HNAP) for his contributions in the development of this document. And I thank all stakeholders and relevant staff at Health Protection Agency and Ministry of Health for their dedicated efforts in the compilation of this important plan.

It is my belief that with the implementation of this plan, the existing gaps in the health care system will be addressed, further strengthening the nation's resilience to climate change. With inter sectorial collaboration and support, I am confident in ensuring safer, more prepared communities for all.

Abdulla Ameen

Minister of Health

ACKNOWLEDGEMENT

The development of the National Health Adaptation Plan (HNAP) was an initiation from the Environmental and Occupational Health and Safety Division of Health Protection Agency, Ministry of Health, Maldives.

The action plan was developed with technical and financial assistance from World Health Organization. We are grateful for the continuous support given by WHO throughout the development of the action plan.

The Ministry is also grateful to Dr.Meghnath Dhimal (WHO consultant for HNAP) in providing technical assistance and guidance in the development of the action plan.

The Ministry greatly appreciates the active participation of and valuable contributions of the members from relevant stakeholders which made the development of the action plan possible

ACRONYMS AND ABBREVIATIONS

ARI: Acute Respiratory Illness

COP: Conference of Parties

EPA: Environment Protection Agency

GCF: Green Climate Fund

GEF: Global Environmental Facility

HNAP: Health National Adaptation Plan

HPA: Health Protection Agency

IPCC: Inter-governmental Panel on Climate Change

IWRM: Integrated Water Resource Management

LDCS: Least Developed Countries

LECReD: Low Emission Climate Resilient Development Programme

LGA: Local Government Authority

LRA: Labour Relations Authority,

MACI: Maldives Association of Construction Industry

MFDA: Maldives Food and Drug Authority

MGDs: Millennium Development Goals

MHA: Mental Health Association

MMS: Maldives Meteorological Services

MNDF: Maldives National Defense Force

MNU: Maldives National University

MoE: Ministry of Education

MoE: Ministry of Environment

MoFA: Ministry of Fisheries and Agriculture,

MoFT: Ministry of Finance and Treasure

MoH: Ministry of Health

MoHI: Ministry of Housing and Infrastructure

MoT: Ministry of Tourism

MoYS: Ministry of Youths and Sports,

MPS: Maldives Police Services,

MRC: Maldivian Red Crescent

MTA: Maldives Transport Authority

MWSC: Male' Water and Sewerage Company (MWSC)

NAP: National Adaptation Plan

NAPA: National Adaptation Programme of Action

NCDs: Non-communicable diseases

NDMC: National Disaster Management Centre

NDP: National Development Programme

SIDS: Small Island Developing States

UN: United Nations

UNFCCC: United Nations Framework Convention on Climate Change

CHAPTER ONE

1.1. INTRODUCTION

Human health is considered as one of the most vulnerable sectors to climate change. Climate change is an emerging threat to global public health as population is sensitive to shifts in weather patterns and other aspects of climate change. Exposure to climate change is directly through extreme weather events such as frequent and intense storms, heat waves; and indirectly through changes in water, air, food quality and quantity, ecosystems, agriculture, and economy. Maldives is among the most vulnerable Small Island Developing State (SIDS) to the predicted impacts of climate change. Thus timely adaptation plan is of utmost importance for the country. Sea-level rise, even by 1 meter, could be a threat to many of the islands in the country.

The Maldives consists of about 1190 islands and the population is distributed over approximately 197 inhabited islands. The challenges Maldives faces in the context of climate change and development include, but are not limited to, the low-lying nature of the islands, frequent soil erosion, high population density, and a dispersed geography. Vulnerability of Maldives to impacts of climate change and associated extreme weather events and disasters are significantly higher due to limited ecological, socio-economic, and technological capacities. Despite continuous efforts being undertaken to increase the adaptation actions and opportunities, and to undertake low emission development, limited financial resources, capacity and technology remain major challenges in addressing the impacts of climate change in the country. Although Maldives is the country hard- hit by the effect of global warming and climate change, it has a track record of leadership in climate change mitigation.

According to the World Economic Forum's Global Risks Report 2018, extreme weather events and natural disasters, failure of climate change mitigation and adaptation, water crises, biodiversity loss, and air and soil pollution are the most pressing threats that are perceived as having the biggest impact in next 10 years[1]. Climate change and climate-induced extreme events will continue to accelerate the loss of lives and property and increase the burden of

diseases if adaptive actions are not taken timely. The 21st UN Climate Change Conference of the Parties (COP21) held in Paris in December 2015 came up with the Paris Agreement which framed a bold ambition to keep warming "well below" the 2°C point regarded as untenably dangerous by the scientists, and "pursuing efforts to limit the temperature increase to 1.5° C." The agreement includes a strong commitment to climate change mitigation and adaptation actions, recognizing the principle of loss and damage due to climate change and the protection of those most vulnerable populations.

The United Nations Climate Change Conference of Parties (COP23), WHO, in collaboration with the UN Climate Change secretariat and in partnership with the Fijian Presidency of the twenty-third Conference of the Parties (COP23), launched a special initiative to protect people living in Small Island Developing States from the health impacts of climate change. The vision of this initiative is that, by 2030, all Small Island Developing States will have health systems that are resilient to climate change and countries around the world will be reducing their carbon emissions both to protect the most vulnerable from climate risks and deliver large health benefits in carbon-emitting countries[2].

Increases in sea surface temperature and ocean acidification threaten both biodiversity and livelihoods of people. Primary health care facilities are available at each inhabited island, however in extreme weather events such as floods and storms, access to higher tiered health care facilities becomes a challenge due to the isolated nature of the islands.

1.2. Climate Change in Maldives

The Maldives' has a tropical climate which is warm and humid. The weather is dominated by two monsoon periods, the southwest monsoon (wet, May to November) and the northeast monsoon (dry, January to March). Annual average rainfall is 2,124 mm and average relative humidity is 80% [3]. The mean annual temperature is 28°C, with little variation throughout the year.

According to Second Communication Report of Maldives to UNFCCC, following is the situation of current and projected trends of climate change in Maldives[4]:

1. **Current trends:**

- An overall decreasing trend is observed for annual rainfall over the 3 regions (9.5mm, 0.02 mm and 2.21 mm per year over Hanimaadhoo, Malé and Gan respectively).
- Number of rainfall days per year is decreasing
- Mean average temperature increases for Malé (0.267 °C/decade) and Gan (0.168 °C/decade) while a decrease is observed in the northern station in Hanimaadhoo (0.086°C/decade)
- Maximum temperature shows an increase in the northern part of the country (0.21°C per decade) and a decrease (-0.06 °C/decade) in the southern part of the country.
- Rising sea level trend with 3.753 and 2.933mm per year in Malé and Gan respectively
- An increasing trend, of 0.11 to 0.15 °C/decade, in SST throughout the country

2. **Future climate projections from the downscaled models are**

- increase in rainfall over northern and central regions and a decrease in the southern region for the years 2021-2050, while an overall increase in rainfall is shown from 2082-2100 years
- temperature projected to increase over different zones for the different time periods.
- Mean temperature increases by 1.8°C from baseline (1981-2000) by mid- (2021-2050)
- maximum sea surface height is projected to increase between 0.40 to 0.48m by 2100
- sea surface temperature (SST) has a rising trend in all four geographic zones in all selected special report on emissions scenarios (SRES)

1.3. Purpose of Health National Adaptation Plan (HNAP) for Climate Change

The 70th regional committee meeting of WHO SEARO held in Male' in 2017 passed Male' Declaration signed by health ministers which will be implemented through a regional framework for action. One of the activities outlined in the framework is for all countries to have an HNAP. Also Maldives Climate Change Policy Framework highlighted the importance for developing sectoral plans to adapt and mitigate the impact of climate change.

Maldives is currently strengthening its NAP process in accordance with its climate change policy framework and thereby developing a National Adaption Plan (NAP). Hence, sectoral Adaptation Plans are required to strengthen this process and increase adaptive capacity of vulnerable sectors. Taking into consideration of future health risks of climate change, HNAP is developed to ensure that the management of health risk of climate change is integrated into the overall NAP process including assessing risks, identifying, prioritizing and implementation of adaptation options. Therefore, key purpose of HNAP is to holistically address environmental health risk of climate change and to strengthen intersectoral approach in understanding and addressing the key environment and climate change key issues including social issues. HNAP will also provide better opportunities for fund mobilization for health adaptation process.

1.3.1. GOAL

Protect and promote the health and well-being of the present and future generations through sustainable and climate resilient adaptation measures

1.3.2. STRATEGIC OBJECTIVES

- Ensure the management of health risk of climate change is integrated into the overall NAP process
- Ensure health system is climate resilient
- To reduce the morbidity and mortality attributed to climate change
- Generate evidences on health effects of climate change
- Enhance health co-benefits of climate change mitigation and adaptation measures

- Build health workforce capacity on climate change adaptation and to raise public awareness about climate change and its effects on health
- Ensure financing for sustainable implementation of the HNAP for climate change
- Protect human health from climate change through multi-sectoral response ensuing health in all policies.

1.6. Guidance documents

1.6.1. National Guidance Documents

National Adaptation Programme of Action (2007)

Climate Change Policy Framework (2015)

Maldives' Intended Nationally Determined Contribution (2015)

Health Master Plan (2016–2025)

National Environmental Health Action Plan (2017–2021)

Second National Communication of Maldives to UNFCCC (2016)

Seventh National Development Plan (7NDP)

National Mental Health Policy 2015-2025

National Mental Health Strategic Plan 2016-2021

National Food Safety Policy (2017 - 2026)

National Healthcare Waste Management Policy 2016

National Healthcare Waste Management Strategic Plan (2016-2021)

National Water and Sewerage Policy 2017

Constitution of the Republic of Maldives (2008)

1.6.2. International Guidance documents

Initial National Communication to UNFCCC (2001)

WHO Country Cooperative Strategy Maldives (2018-2022)

Malé Declaration 2017 and Framework for Action for Building Health Systems Resilience to Climate Change in South-East Asia Region (2017- 2022)

Regional Plan of Action for SIDS in the African and South East Asian Regions (2019-2023)

CHAPTER TWO

2.1. HEALTH IMPACT OF CLIMATE CHANGE

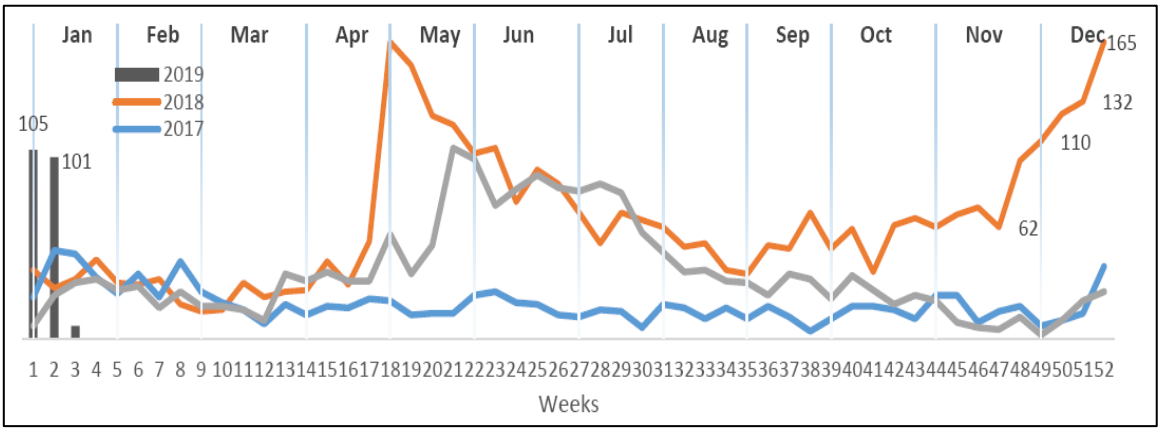
2.1.1 Climate Sensitive Diseases

2.1.1.1. Vector Borne Diseases

Climate factors, primarily high and low temperatures and precipitation patterns influence the prevalence of vector borne diseases. Climate change is likely to have both short term and long term effects on vector borne disease transmission.

Dengue is one of the prominent climate sensitive vector borne disease in Maldives. Dengue is expressed as a huge public health concern with the highest prevalence of dengue cases recorded in the year 2018 with total cases of 3404 (HPA). Serology confirms that Dengue Virus type 1, 2 and 3 is circulating in the Maldives with DEN 3 being the most common serotype[5].

Figure 2.1: National dengue trend from 2017 to 12 January 2019



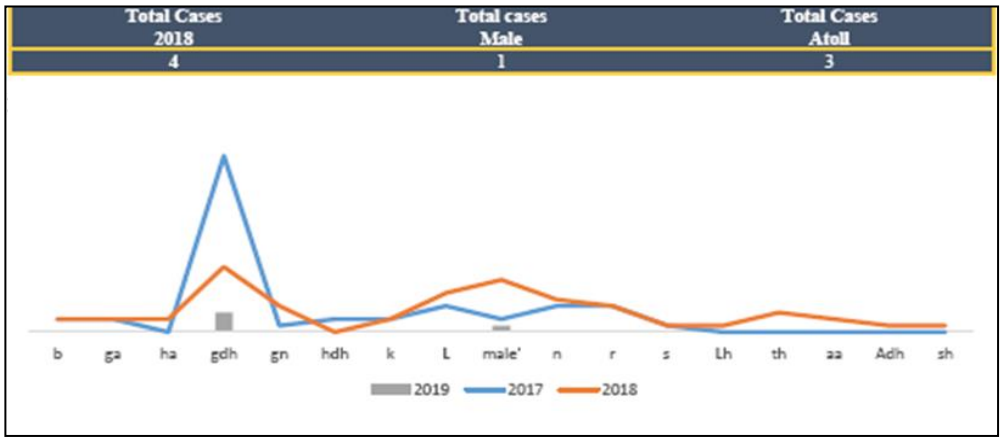
The available data in Maldives strongly suggest that the epidemic dynamics of dengue fever is strongly influenced by climate variability[5]. It is reported that dengue incidence is positively associated with the rainfall and mean relative humidity and inversely associated with increase in temperature[5]. Therefore, it is imperative to strengthen public health surveillance and conduct rigorous scientific research in this area. It is also important that the Ministry of Health, Maldives integrate these findings into the decision making process in order to improve

management of dengue, in combination with clinical laboratory (e.g. serotype determination), and entomological surveillance data.

The first recorded Chikungunya outbreak in the Maldives was in December 2006 and after that no outbreaks have been recorded so far. However, cases are apparent in different parts of the country. There are no studies conducted to assess the relationship between Chikungunya cases and climate change.

Scrub typhus cases have been emerging since 1941 in the country. The prevalence of scrub typhus cases has decreased in the year 2018 with preventive measures and efforts in raising awareness.

Figure 2.2: Scrub Typhus cases within atolls (2017 to January 2019)



Maldives is a Malaria free nation since 1984 and after 1990 the malaria vector has not been detected. In December 2015 World Health Organization certified Maldives as the first malaria free country in the South East Asia Region[6]. However, there is constant threat of re-introduction of malaria vector via sea transportation and air transportation, especially considering the fact that all of its neighboring countries are endemic of Malaria[5].

Maldives is the first country in the WHO South East Asia Region to officially eliminate Lymphatic Filariasis. Transmission of Filariasis has been controlled in the country for almost 7 years, however the vector for this disease is found in the country and few imported cases are

detected[5]. Hence, there is need of reassessment and preparedness for the risk of re-emergence of malaria and filarial in the Maldives.

2.1.2. Non communicable Diseases and Mental Health

Climate related extreme weather events (heat waves, droughts, storms, floods, etc.) impacts physical, mental and community health and are likely to exacerbate the incidence of some NCDs including cardiovascular disease, cancers, respiratory diseases, mental disorders and injuries[12].

Changing weather patterns could increase food instability through drought, or spoiled or contaminated crops. Food insecurity leads to increased use of more intensive farming practices, including greater use of carcinogenic pesticides and preservatives[13].

Manifestations of disaster-related psychiatric trauma include severe anxiety reactions (such as post-traumatic stress) and longer-term impacts such as generalized anxiety, depression, aggression, and complex psychopathology. The National mental health policy was finalized and endorsed in the year 2017. It is important to integrate mental health in primary health care and train mental health workforce to ensure that proper care is provided and more emphasis is given to the cause.

2.1.3. Water Resources and Water-borne Diseases

2.1.3.1. Water Resources

Maldives rely on groundwater from fresh water lenses, harvested rainwater stored in tanks and desalinated water. However, groundwater is highly polluted in most densely populated islands[4]. Groundwater depletion, contamination through poor sewage disposal, and saltwater intrusion threaten the Maldives' water resources[5]. Similar to many other SIDS, most of the islands in Maldives are experiencing water scarcity which is bound to aggravate with time with the increasing population, the declining rainfall and incident of drought.

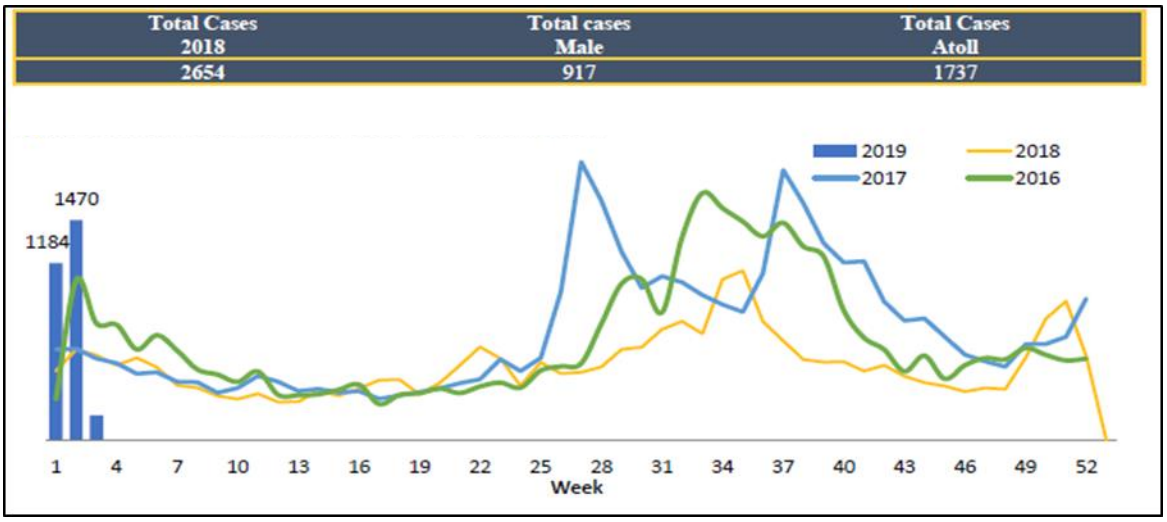
Climate projections show that the Maldives would experience issues with adequate availability of rainwater in future[5]. The northern and central islands are currently more vulnerable to elongated dry periods with the need for emergency water supplied during dry periods.

While the availability is an issue of concern, another important consideration is the quality of rainwater collected. It is important that safe methods are used in rainwater harvesting and storage and rooftops are thoroughly cleaned prior to use[5]. Maldives is currently moving towards an integrated water resource management (IWRM) approach to address cost-effective adaptation measure to water issues[5].

2.1.3.2 Water-borne Diseases

Climate-sensitive weather events, particularly floods and droughts, are linked to diarrheal diseases and Typhoid fever[7]. Rates of diarrhea have been associated with high temperatures and continue to cause significant morbidity both in adults and children.

Figure 2.3: National AGE trend from 2016 to 12 January 2019



Typhoid fever is a bacterial disease, caused by *Salmonella typhi* and is transmitted through the ingestion of food or drink contaminated by the feces or urine of infected people. Typhoid was also expressed as a concern during flood events. In the year 2013 a total of 143 cases of typhoid were reported[5].

2.1.4. Air Quality and Airborne Diseases

Air quality is strongly dependent on weather and is therefore sensitive to climate change. Both indoors and outdoors air we breathe are affected by changes in the climate. Weather patterns have been modified by the changing climate, which in turn have influenced the levels and location of outdoor air pollution such as ground level ozone and fine particulate matter [8]. According to WHO the top five causes of death includes heart diseases, lungs diseases, stroke and cancers and one quarter to one third of deaths from these diseases are due to air pollution[9]. Climate factors such as absolute humidity have been associated with Lower respiratory tract infection [10]. Similarly, In Maldives, Acute Respiratory Infections (ARI), Viral fever and conjunctivitis are likely to be associated with changes in climate[5]. Though there are no studies undertaken previously to confirm the causal relationship of ARI and allergies, some of the issues reported by qualitative studies include dust, humidity attributed to sea breeze and winds.

Figure 2.4: National ARI trend from 2016 to 12 January 2019

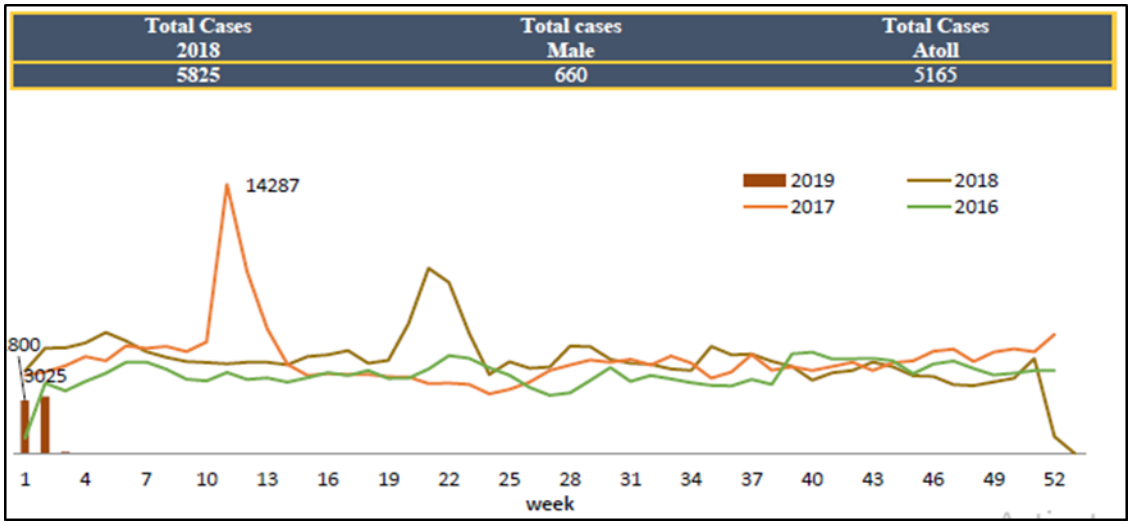


Figure 2.5: National Conjunctivitis cases from 2015 to 12th January 2019

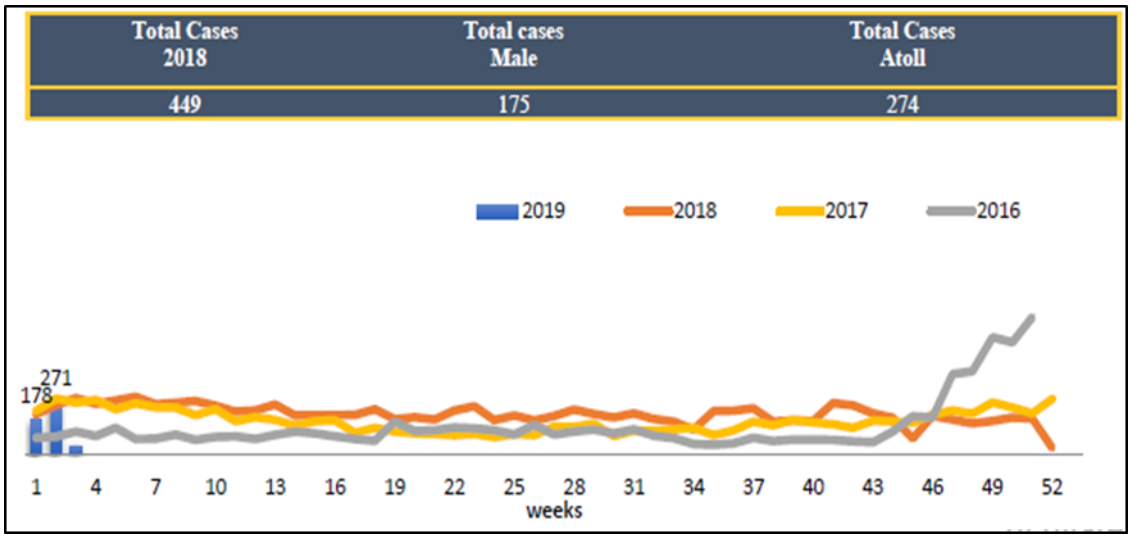
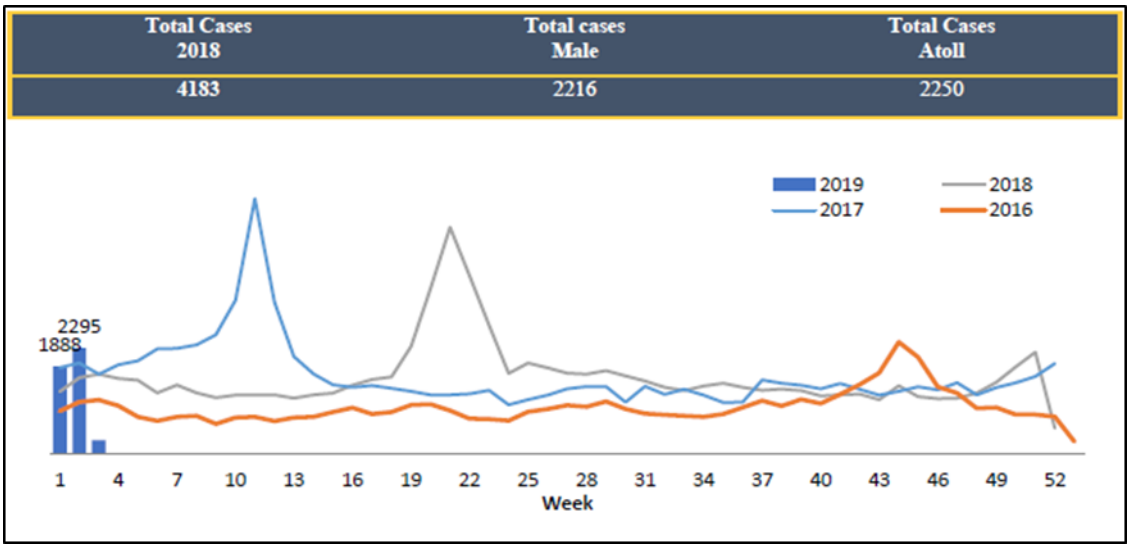


Figure 2.6: Viral Fever cases from 2016 to 12th January 2019



2.1.5. Heat Related Illness

Prolonged exposure to extreme temperature can worsen chronic conditions such as cardiovascular disease, respiratory disease, cerebrovascular disease and diabetes related conditions [8]. Heat-related morbidity and mortality increases in countries with limited adaptive

capacities and large exposed populations. However, there has been no assessment done in Maldives to find the exact relationship between extreme heat and related illness and deaths.

Workers that are exposed to extreme heat or works in hot environment may be at risk of heat stress which may result in heat stroke, heat exhaustion, heat cramps or heat rashes [11]. Workplace heat exposure is an increasing challenge in Maldives with majority of population working outdoors (Fisheries, Agricultures, construction workers, electricians etc.). To minimize heat related illnesses it is important to build awareness among workers regarding heat stress and how it affects their health and safety.

2.1.6. Food Security and Nutrition Related Illness

Limited cultivable land area, poor quality of the soil and scarce sources of freshwater makes it a challenge for agriculture in Maldives. Heavy import dependency, limitations in storage and challenges in the distribution of food across the nation are major threats to national food security in the Maldives[5]. Extreme weather events further exacerbate this vulnerability, especially when flooding due to surges or sea swells and high waves. About 90% of the food consumed in the country is imported and any impact on food production in the source countries or regions will directly affect food security in the country. In addition, any disruptions to transportation of food due to extreme weather events would put a halt to food supplies into the country and within the country as food distribution is mainly by sea.

Despite improvements in many areas of health, malnutrition among children continues to be an area of public health concern[5]. However, there are improvements and gains on nutrition as well. According to Maldives Demographic and Health survey 2009, percentage of children under 145years who are underweight has gradually declined from 43% in 1996 to 17.3% in 2009. Similarly, stunting declined from 30% in 1996 to 18.9 % in 2009; wasting declined from 17% in 1996 to 10.6 % in 2009. The extreme climatic events may increase food insecurity and nutrition related health problems[16].

2.2. PHYSICAL INFRASTRUCTURE

2.2.1. Built Environment

The built environment is broadly defined as surroundings that include buildings, public resources, land use patterns, the transportation system, and design features including health care infrastructures. Design and development of built environment can help to mitigate climate change, support adaptation and improve environment.

Maldives being a small island nation there is little or no option other than to build critical infrastructure in close proximity to the shoreline making it extremely vulnerable to adverse impacts of climate change. Sea swells, storm surges, and coastal flooding are among the major costal hazards associated with climate change that Maldives experiences[4]. Critical infrastructures such as transport, utility, communication infrastructures, health care facilities, etc. are more vulnerable to the coastal hazards and are at risk of service disruptions during extreme events.

2.2.2. Waste Management

Solid waste management is a bigger environmental threat and a major public health concern in Maldives with limited land area, technology, financial and human resources. The waste management in islands varies depending on the availability of disposal facilities and local custom. Segregation of wastes is not commonly practiced in the country and all types of wastes are mixed and openly burnt in the island waste sites. It is estimated that 312,075 metric tons of solid waste are generated per year throughout the country[4].

Over the past years waste management is considered as a high priority by the Government of Maldives, and has been working towards establishing a proper waste management system in the country. Hence, Waste Management Regulation was enacted in 2013, National Solid Waste Management Policy developed in 2015 and National Health Care Waste Management Policy

and Strategic Plan were endorsed in 2016, and waste management projects in different zones of Maldives are being implanted.

2.3. EMERGENCY PREPAREDNESS AND MANAGEMENT

Emergencies or disasters associated with extreme weather events are among the clearest dangers of climate variability and climate change. Health systems should emphasize preparedness, and aim to holistically manage overall public health risks, through climate-informed preparedness plans, emergency systems, and community-based disaster and emergency management. Health operations including healthcare and public health infrastructure should be prepared to address changing population catchments, service demands, increasing emergency events, and to operate under changing environmental conditions[14].

In the year 2018 Health Emergency Operations Plan was endorsed to ensure efficient and effective response and to strengthen health sector emergency preparedness. To build capacity among the health workforce and relevant organizations Hospital emergency drills was conducted among 13 Islands in Maldives.

However, there is a need to focus on the community knowledge of local risks and vulnerabilities as communities are the forefront in protecting health and responding in emergencies. Health-care facilities should increasingly prepare to address changing demand of disasters and extreme weather events. This include infrastructure like water supplies, drainage, waste disposal and sanitation as well as telecommunication, energy supplies and medical transport.

2.4. RESEARCH AND ADVOCACY

There is growing evidence done globally to support the scientific theory indicating that climate change is adversely affecting human health. However, the impact of climate change on health is quite complex and the same factor may sometimes act as a cause and other times as an effect. The consequences of climate change are expected to increase the demand on health services, which will require implementation of adaptation measures to reduce the incidences of climate-related health issues. The need to identify and prevent adverse health impacts is rising to the

forefront of climate change policy debates and is becoming a growing priority of the public health community[15].

There is limited research done in Maldives to see the association of climate change and health, hence it is essential that an integrated, cross-sectoral and long-term programme of research be initiated to ensure that decisions and planning are evidence-based, and that adaptation measures implemented are the most cost-effective and efficient[15].

2.5. CLIMATE AND HEALTH FINANCING

Protecting health from climate change will gain financial costs for health systems. Health systems may need to increase investments to expand the geographic or seasonal range or population coverage of surveillance and control programmes for climate-sensitive infectious diseases, or to retrofit health facilities to withstand more extreme weather events. Additional investment may also be needed in other sectors in order to achieve health goals, such as implementing climate resilient water safety plans, or enhanced food security forecasting and nutritional screening during droughts[14].

The health sector must ensure to train adequate numbers health personnel, and basic health infrastructure and services, which also help to address climate change risks. Resources can also be mobilized through mainstreaming climate change and health considerations in investments in key health determining sectors. Adding criteria for climate resilience and health promotion to investment strategies can ensure that these investments bring the greatest possible benefit in terms of human health, climate adaptation and social return on investment, over the long term[14].

The Paris Climate agreement commits to raise US$100 billion a year in climate finance by the year 2020, with the Green Climate Fund, the funds of the Global Environmental Facility and the Adaptation Fund as the main multilateral financing mechanisms, alongside bilateral and regional channels. The development of a clear action agenda will be fundamental to accessing climate finance for health resilience[14].

CHAPTER THREE

Table 3.1. IMPLEMENTATION STRATEGIES FOR STRATEGIC AREAS

Expected Result	Planned Activities	Implementing Agency Collaborating partner	Indicator	Budget (USD)					Total Budget
				2020	2021	2022	2023	2024	
Goal of the HNAP: Together as a nation to protect and promote the health and well-being of the present and future generations through sustainable and climate resilient interventions									
Strategic Component 1: Climate sensitive communicable diseases									
Morbidity and mortality from vector borne, zoonotic and other climate sensitive communicable diseases reduced	**Objective :** - Reduce morbidity and mortality from vector borne and climate sensitive communicable diseases - Strengthen vector control and vector surveillance								
	1. Conduct vector surveillance and monitoring including risk mapping	Lead: HPA	Number of surveillance report received	1000	1000	1000	1000	1000	**5000**
	2.Conduct training on climate sensitive vector borne diseases to the communities and carry out advocacy with relevant stakeholders	Lead: HPA	Number of people trained	3000	2000	3000	2000	3000	**13000**
	3.Develop proper Information management and response capacity	Lead: HPA	No. of relevant officials trained		-	3000	3000	-	**6000**
	4.Develop models for forecasting and predicting	Lead: PHPSE	No. of outbreak notification	-	3000	-	-	-	**3000**

	diseases such as chikungunya and dengue	Partners: MNU, Maldives Meteorological Services	shared/predicted.						
	6.Update guidelines on diagnosis and treatment of existing and emerging vector borne diseases	Lead: Health Protection Agency, MOH	Number of guidelines developed Number of guidelines developed updated	1500	-	-	-	1500	**3000**
	7. Strengthen entomology lab with basic equipment and monitor insecticide resistance.	Lead: HPA Partner MoH	Number of entomology lab set up Number of monitoring reports on insecticide resistance	3000	-	2000	-	-	**5000**
	8. Strengthen the surveillance and control of vectors at port of entry as per international health regulation	Lead: PHPSE Partners: HPA	Number of outbreak notification shared. Number of collaborative control operation performed.	1000	1000	1000	1000	1000	**5000**
	9.Conduct research on climate change and vector-borne diseases at national and sub-national level	Lead: HPA Partners: PHPSE	Number of research studied published (1 in 5 years)	-	-	3000	-	-	**3000**

	10.Sensitize community on common climate sensitive communicable diseases for their prevention and control	HPA	Number of Community Action Group formed Number of sensitize programs conducted.	1500	1500	1500	1500	1500	**7500**
	Total for Vector-borne , zoonotic and other climate sensitive communicable diseases control programme			14,000	8,500	19,000	5,500	6,500	**50,500**
Strategic component 2: Non communicable Diseases and Mental health									
	Objective: • Prevent and control mental health illness • Establish green space for outdoor activities								
Improved Health through Promotion of healthy living environment	1.Advocate to establish green space	Lead: HPA Partners: MHAF, SHE, ICP and MNNU	Number of green areas established	-	-	-	-	-	**-**
	2.Conduct Inter-sectoral collaboration and Community engagement programs / sessions on socialization, mental health and well being	Lead: HPA (Mental Health Program)	Number of people reached	1500	1500	1500	1500	1500	**7500**
	3.Create awareness among farmers and public on safe use of pesticides and fertilizers.	Lead: MoFA Partners: HPA	Number of People reached	1000	1000	1000	1000	1000	**5000**
	Total budget for Mental Health			2,500	2,500	2,500	2,500	2,500	12,500
Strategic component 3: Water Resources and water borne diseases									
Morbidity and mortality from	**Strategic objective** - Ensure provision of safe drinking water for all - Reduce morbidity and mortality from water borne diseases								

water borne and water related diseases reduced	1.Develop/update national standards for quality of drinking water	Lead: MFDA	Number of standards developed/Updated.	1500	-	-	1500	-	**3000**
	2.Develop/update standards for water carrier vessels to supply water during disasters	Lead: MFDA	Number of standards developed/Updated.	-	1500	-	-	-	**1500**
	3.Strengthen inter sectoral collaboration	Lead: MFDA/HPA	Number of meetings conducted with stakeholders	500	-	-	500	-	**1000**
	4.Develop a mechanism for testing quality of water at regional level	Lead: MoH/ MFDA	Water quality testing mechanism established.	3000	3000	3000	3000	3000	**15000**
	5.Create awareness and promote advocacy through media.	Lead: MFDA/HPA	Number of video spots/Audio spots/Social and mass media materials telecasted or broadcasted or delivered to public	1000	-	-	1000	-	**2000**
	Total for Water, Sanitation and Hygiene			6,000	4,500	3,000	6,000	3,000	22,500
Strategic Component 4: Air Quality and Airborne Diseases									
Morbidity and mortality related to air pollution is reduced	**Strategic Objective:** - Reduce incidence of air quality related morbidity and mortality								
	1. Strengthen monitoring mechanism for ambient air pollution from vehicular	Lead: EPA Partner: MoE	Monitoring mechanism established/Strengthened.	-	-	-	2000	-	**2000**

	emission								
	2. Establish the recycle mechanism at national and regional levels	Lead: MoEE/EPA	Recycle mechanism established at regional level. Recycle mechanism established at national level.	-	5000	-	2000	-	**7000**
	3. Conduct research on air pollution and occurrences of respiratory illness and diseases	Lead: HPA Partners: MoEE/MNU/EPA	Research conducted within 5 years	-	-	-	3000	-	**3000**
	Total for Air quality and airborne diseases			-	5,000	-	7,000	-	12,000
Strategic Component 5: Heat related illnesses									
UV radiation and Heat related morbidity and mortality reduced.	**strategic Objective:** - Reduce heat related illnesses and occupational hazards - Foster a safe and healthy environment for people at work. - Maintain the physical, mental and social wellbeing of workers								
	1.Create awareness among the general population on health risk associated with excessive heat	Lead: HPA Partner: MoEE, MoE, MoFA, MoT, MoHI, LGA, MNDF, MPS, Higher Education Sector, Fishermen's Association, MACI etc.	Number of awareness program conducted	1000	-	-	1000	-	**2000**
	2.Advocate and initiate greening of the work environment by adopting	Lead: MoH, Partner: MoEE, MoE, MoHI, LGA,	Number of work environment initiated green	1000	1000	1000	1000	1000	**5000**

	user friendly technologies and using energy efficient services		technology						
	3.Conduct assessment on heat related illnesses and its effect on vulnerable groups	Lead: HPA, Partners: MNU, MoEE	Assessment conducted	2000	2000	-	-	-	**4000**
	4.Increase awareness on heat related illnesses for general public and workers in different occupations	Lead: HPA	Number of Community action group formed Number of education programs conducted	2000	2000	2000	2000	2000	**10000**
	5.Identify health hazards and reduction risk of occupational related illness by proper infrastructure designs and creating friendly working environments.	Lead: MoH/HPA Partner: MoHI, LGA	Number of occupational injuries reported, Number of occupational diseases reported	2000	2000	2000	2000	2000	**10000**
	Total for Heat related illnesses			8,000	7,000	5,000	6,000	5,000	31,000
Strategic component 6: Food security & nutrition									
Improved food and Nutritional security	**Strategic objective** - Ensure access to safe food at all times								
	1. Strengthen implementation of national guideline/standards on food security and safety	Lead: MFDA/HPA	Number of standards/guidelines implemented	-	2000	-	-	-	**2000**
	2. Endorse and implement food Act	Lead: MFDA	Bills endorsed and	1000	1000	-	1000	-	**3000**

			implementation started						
	3. Establishment of regional food storage facilities	Lead: MFDA Partners: HPA and STO	No of food storage facilities established	5000	5000	5000	5000	5000	**25000**
	Total for Food security & nutrition related illness			6,000	8,000	5,000	6,000	5,000	30,000
Strategic Component 7:Waste Management									
Health and wellbeing of the population promoted through proper waste management	**Strategic Objective :** - Manage waste in an environmental friendly way to protect human health and environment								
	1. Strengthen implementation of Health care waste management strategic plan	HPA	Number of goals/ Objectives achieved	5000	5000	5000	5000	5000	**25000**
	2. Create awareness among waste handlers and the general population on health risk associated to improper handling of health care waste	Lead: HPA ME, EPA	Number of awareness program conducted	2000	2000	2000	2000	2000	**10000**
	3.Establish waste management facilities for waste segregation, autoclaving, incineration and storage in domestic industrial waste. • Establish community level waste management facilities in Male' and outer islands. • Proper handling, transportation, storage	Lead: MoEE, Partner: MoH, HPA, LGA	Number of community level waste management facilities established. Number of waste treatment plant established, Number of waste treatment plants established.	4000	4000	4000	4000	4000	**20000**

	and disposal Establish waste treatment plants								
	4.Establish proper mechanisms for Monitoring and Evaluation of solid waste management in the country	Lead: MoEE, Partner: MoH, HPA, LG	Monitoring and Evaluation report	2000	-	-	2000	-	**4000**
	Total Budget for Waste Management			13,000	11,000	11,000	13,000	11,000	59,000
Strategic Component 8: Built Environment									
Improved Health through Promotion of healthy living environment	**Strategic Objectives** - Promote healthy and sustainable built environment that creates better environment for healthier life - Promote green climate smart healthy concept in all health care facilities (HCF)								
	1. Build outdoor recreational spaces for each island for kids, adults, elderly etc. (selective islands in a year)	Lead: MoPI Partners: MoH/HPA, LGA.	Number of outdoor recreational spaced built for kids, adults, elderly etc. Number of island where outdoor recreational spaced built for kids, adults, elderly etc.	5000	5000	5000	5000	5000	**25000**
	2.Advocate and initiate greening of the work environment by adopting environment friendly technologies and using energy efficient services	Lead: HPA Partner: MoEE, MoE, MoFA, MoT, MoHI, LGA, MNDF, MPS, Higher Education	Proportion of workers using safety measures, Number of industries/instituti	3000	3000	3000	3000	3000	**15000**

	• Plant trees in open spaces, parks, roads etc. • Develop domestic and public infrastructure enabling UV protection Access of quality protective measures to minimize UV radiation	Sector, Fishermen's Association, MACI etc.	ons establishing outdoor activities in morning and evening Number of industries assessing quality of protective measures						
	3.Advocate to develop safe swimming areas in each island (selective islands in a year)	Lead: HPA Partners: LGA., MoT	Number of safe swimming areas built Number of islands where safe swimming space is built	1500	1500	1500	1500	1500	**7500**
	4.Incooporate and Strengthen policy implementation regarding disable and environment friendly infrastructural designs	Lead: Planing Ministry Partners: MoH/HPA, LGA.	Number of disability and environmental friendly infrastructure	2500	1500	1500	1000	1000	**7500**
	5.Develop and disseminate awareness materials on ventilation and noise reduction in public places	Lead: MoH/HPA Partners: MoHI, LGA.	Number of awareness program conducted	-	-	1500	-	-	**1500**
	6.Develop standards for Green Climate Smart health care facility	Lead: MoH/HPA Partner: HCF's	Number of green health care facilities	-	3000	-	-	-	**3000**
	Total Budget for Built Environment			12000	11000	15500	10500	10500	**59500**
Strategic Component 10: Emergency Preparedness and Management									
Strengthen country capacities to	**Strategic Objective:** - Effectively respond to climate change and disaster risk reduction								
	1.Streamline sectoral	Lead: NDMC	Number of	-	1500	1500	-	-	**3000**

respond to emergencies.	emergency plans from different sectors	Partner: MoH/HPA	sectoral emergency plan streamlined						
	2.Endorse national emergency operations and national disaster plan	Lead: NDMC Partner: MoH/HPA	Endorsement of national emergency operation and national disaster plan	-	2000	-	-	-	**2000**
	3.Update and monitor disaster resources inventory twice a year.	Lead: NDMC	Inventory of disaster resources	500	500	500	500	500	**2500**
	4.Establish and build community emergency response forces in each inhabited islands	Lead: NDMC, Partner: MNDF, MRC, MoH/HPA, LGA.	Number of community emergency response forces established	2000	2000	2000	2000	2000	**10000**
	5.Conduct Training to TOTs on peripheral islands	Lead: NDMC Partner:MoH, MRC, LGA, NGOs.	Number of TOT conducted Number of peripheral island covered by TOT	-	2500	1000	1000	1000	**5500**
	6.Conduct awareness trainings among the communities about climate change and disaster risk reduction	Lead: NDMC	Number of awareness program conducted at community level on climate change and disaster risk reduction	1500	1500	1500	1500	1500	**7500**
	7.Conduct regular drills to test current emergency plans	Lead: MoH/HPA Partner: LGA/councils, MNDF, MRC etc	Number of drills conducted	500	500	500	500	500	**2500**
	Total budget for Emergency Preparedness and Management			4500	10500	7000	5500	5500	33000

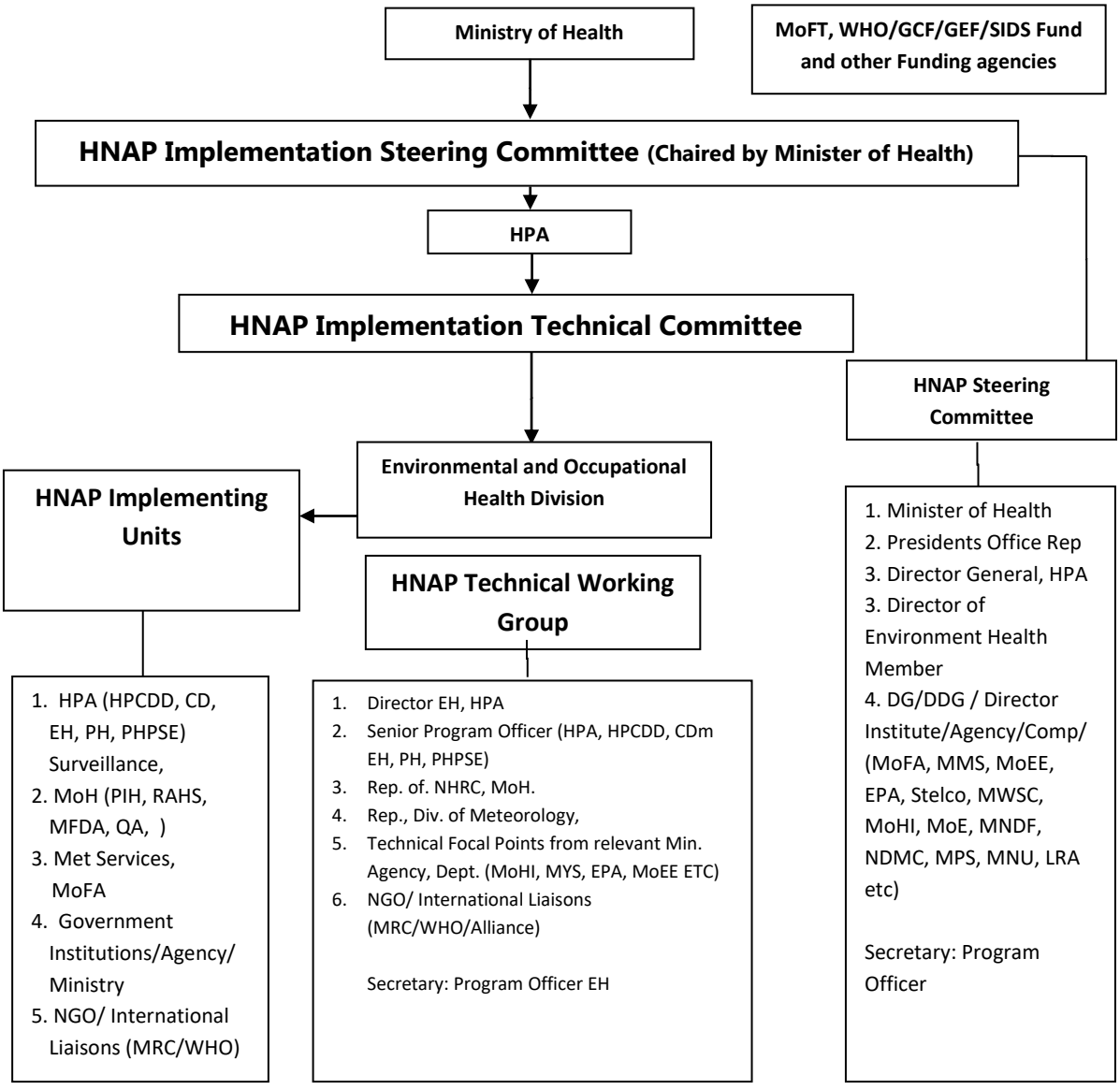
Strategic Component 12: Evidence Generation and Advocacy									
Health system strengthened to protect and improve population health in the face of changing climate	**Strategic Objective:** - Reduce morbidity and mortality related to climate sensitive diseases								
	1.Conduct evidence based research study on climate change and health	Lead: HPA Partner: MoH, NDMC, MNDF, MRC and other related agencies	Research conducted on climate change and health	-	3500	2000	-	-	**5500**
	2.Conduct annual policy level meeting to foster related policy updates and awareness among policy makers	Lead: MoH/HPA	Number of policy level meetings focused to climate change and health	-	-	-	-	-	**-**
	3.Conduct public awareness campaigns nationwide to create awareness on health and climate change	Lead: MoH/HPA Partner: NDMC, MNDF, MRC and other related agencies	Number of nationwide awareness campaign conducted on climate change and health	1500	1000	1000	1500	1000	**6000**
	Total budget for Health and Climate Change			1500	4500	3000	1500	1000	**11500**
Strategic Component 13: Climate and Health Financing									
Ensured Sustainable funding HNAP for implementation	**Strategic Objective:** - Ensure sustained financing on health and climate change adaptation and mitigation								
	1.Conduct high level advocacy meetings to establish healthcare funds	Lead: MoH/HPA Partner: NDMC, MOFT	Establishment of healthcare funds	-	3000	-	2000	-	**5000**
	2.Identify existing donor funded programmes/projects and map potential donors to approach for future funding	Lead: MOEE Partner: MoH/HPA NDMC and MoFT.	Inventory of climate financing	-	-	-	-	-	**-**
	3. Establish monitoring mechanism to track the financial records and documentations.	Lead: MoH/HPA	Establishment of monitoring mechanism	-	-	2500	-	-	**2500**

	4.Integrate Climate Change aspects into health planning and programs	Lead: MOH/HPA	Number of policies developed from climate change perspectives	-	2000	-	-	-	**2000**
	Total budget for climate change and health financing			**-**	**5000**	**2500**	**2000**	**-**	**9500**

4.2 Cross Sectorial Collaboration

A memorandum of understanding can be signed between Ministry of Health and other relevant partners to establish a stronger understanding with specific roles and responsibilities to ensure the implementation of HNAP.

Figure 4.3 Implementation Framework



5.4 Monitoring and Evaluation of climate change adaptation/ mitigation measure Indicators for M&E

The Ministry of Health will primarily be responsible for monitoring and evaluating the implementation of this Health National Adaptation Plan (HNAP). The MoH will prepare and implement monitoring and evaluation indicators. The concerned divisions of Ministry of Health and other ministries will be responsible for maintaining work progress and resolving implementation issues. The local institutions will implement, monitor and evaluate the local level programs in a prescribed format and report to the MoH. The budget, annual program and progress of the projects/programs related to climate change will be submitted to the MoH. Monitoring of both the implementation of this HNAP and the extent to which its aim to build climate resilient health systems is achieved, is fundamental for it to be effective. The intended ultimate impact of implementing the M&E operational framework will be a decrease the burden of climate-sensitive diseases, and a strengthening in the overall climate resilient health system.

REFERENCE

1. The Lancet Planetary Health.(2018). The world's biggest threats are environmental risks, *The Lancet Planetary Healt.* 2(2): p. e51. doi: https://doi.org/10.1016/S2542-5196(17)30164-X
2. WHO. (2017). Launch of special initiative to address climate change impact on health in small developing states. Retrieved from https://www.who.int/en/news-room/detail/12-11-2017-launch-of-special-initiative-to-address-climate-change-impact-on-health-in-small-island-developing-states
3. Ministry of Environment. (2006). National Adaptation Programme of Action. Retrieved from https://unfccc.int/resource/docs/napa/mdv01.pdf
4. Ministry of Environment and Energy. (2016). Second National Communication of Maldives to the United Nations Framework Convention on Climate Change. Retrieved from file:///C:/Users/mariyam_shyz/Downloads/20161030-Pub-Second_National_Communication_of_Maldives%20(2).pdf
5. Latheef, A. (2014). Overview of Climate Change Health Impacts in Maldives. retrieved from
6. WHO. (2019). Malaria- free Maldives, Malaria. Retrieved from http://www.searo.who.int/entity/malaria/documents/maldives_free/en/
7. Grace,I,D., Lachlan, M., Yoonhee, K., Masahiro, H., Steven,I., & Vibol,C. (2015). Water borne diseases and extreme weather events in cambodia: Review of impacts and implications of climate change, *Environmental Research and Public health*. Doi 10.3390/ijerph120100191
8. U.S. Global Change Research Program. (2016). Climate and Health Assessment, The impacts of climate change on human health in united states: a Scientific assessment. Retrieved from https://health2016.globalchange.gov/
9. Climate and Clean air coalition. (2017). New WHO report: Air pollution is a leading contributor to noncommunicable diseases, *Environmental factors are main causes of NCD with 12.6 million deaths a year linked to the environment.* Retrieved from http://www.ccacoalition.org/en/news/new-who-report-air-pollution-leading-contributor-noncommunicable-diseases
10. European Centre for Disease Prevention and Control. (2017). Climate change in Europe, *Air borne diseases*. Retrieved from https://ecdc.europa.eu/en/climate-change/climate-change-europe/air-borne-diseases
11. Centers for Disease Control and Prevention. (2018). the National Institute for Occupational Safety and Health, *Hear Stress* 24/7. Retrieved from https://www.cdc.gov/niosh/topics/heatstress/
12. Friel. S., Bowen.K., Lendrum. C.D., Frumkin.H., McMicheal.AJ., Rasanathan.K. (2011). Climate change, noncommunicable disease, and development: the relationships and common policy opportunities. 32:133-47. doi: 10.1146/annurev-publhealth-071910-140612.
13. The Lancet. (2016). Climate change and non-communicable diseases, *The Lancet Oncology*, *1*(17), P1. doi: https://doi.org/10.1016/S1470-2045(15)00568-9
14. WHO. (2014). Strengthening Health Resilience to Climate Change. Retrieved from https://unfccc.int/files/parties_observers/submissions_from_observers/application/pdf/684.pdf

15. Herlihy. N, et al. (2016). Climate Change and human health: what are the research trends? A scoping review protocol, *British Medical Journal 6*(12). Doi 10.1136/bmjopen-2016-012022
16. Ministry of Health and Family (2009). Maldives Demographic health survey, *Preliminary Report*. Retrieved from http://www.health.gov.mv/Uploads/Downloads//Informations/Informations(60).pdf
17. T.F. Stocker, et al. (2013). Climate change 2013 the physical science basis, *Working Group I Contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Chang.* Retrieved from https://www.ipcc.ch/site/assets/uploads/2017/09/WG1AR5_Frontmatter_FINAL.pdf
18. Ministry of Environment and Energy. (2015). Maldives' Intended Nationally Determined Contribution. Retrieved from file:///C:/Users/mariyam_shyz/Downloads/20150913-Dld-Draft_Maldivian_INDC_for_public_commenting.pdf
19. Ministry of Planning and National Development. (2006). Key priorities and sectors in the seventh National Development Plan 2006–2010. Retrieved from http://www.maldivespartnershipforum.gov.mv/doc/paper%20on%20ndp%20final.pdf
20. Dokken, K.J et.al. (2014). IPCCC. Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. *Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Chang.* Retrieved from https://www.eea.europa.eu/data-and-maps/indicators/heating-degree-days/ipcc-2007-contribution-of-working
21. Descloux, E., et al. (2012).Neglected Tropical diseases*, Climate-based models for understanding and forecasting dengue epidemics*. Doi https://doi.org/10.1371/journal.pntd.0001470
22. Jingchun, F. et al., (2014). Environmental Research and Public Health, *A Systematic Review and Meta- Analysis of Dengue Risk with temperature change.* Doi 10.3390/ijerph120100001
23. Bettadapura, J., Lara,J H., Adam,T & Suresh,M. (2013). Indian Journal of Medical Research, *Approaches to the treatment of disease by chickungunya virus.* Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3928707/
24. Lewis, M.D., et al., (2013). Emerging infectious diseases, *Scrub Typhus re-emergence in the Maldive*s 9(12), p. 1638-1641. Doi 10.3201/eid0912.030212
25. WHO. (2015). Review of climate change and health activities in SEARO member states, *Synthesis Report.* Retrieved from http://www.searo.who.int/entity/water_sanitation/review-of-cc.pdf?ua=1
26. WHO. (2013). Country Cooperation Strategy Republic of Maldives 2013-2017. 2013. p. 1-86. Retrieved from https://apps.who.int/iris/bitstream/handle/10665/161129/B5000.pdf;jsessionid=FA1235573CC6B3DF531A63FEC71AD735?sequence=1
27. Ministry of Health and Family. (2009). Maldives Demographic and Health Survey, *Preliminary Report.* Retrieved from http://www.health.gov.mv/Uploads/Downloads//Informations/Informations(60).pdf
28. Ministry of Health and Family, National Micronutrient Survey. 2007, UNICEF: Male', Maldives.

CONTRIBUTORS

Adam Manik (Ministry of fisheries and Agriculture)

Ahmed Hassan (Male Water and Sewerage Company)

Aishath Azla (Ministry of Fisheries and Agriculture)

Aishath Rashfa (Ministry of environment)

Ali Sajidh (State Electric Company pvt.ltd)

Aminath Adheela (School of Nursing)

Aminath Aroosha (Health Protection Agency)

Aminath Shaufa (Health Protection Agency)

Fathimath Rasheedha (Health Protection Agency)

Fathimath Shaushan (National Disaster Management Center)

Haleemath Nahula (Health Protection Agency)

Mariyam Saadha (Ministry of youth and Sports)

Mariyam Sheeza (Health Protection Agency)

Moosa Haneef (Health Protection Agency)

Sana Saleem (Health Protection Agency)

Sarah Jamal (Health Protection Agency)

Shaheeb Abdul Azeez (Maldives National University)

Shamhooza Ahmed (Ministry of Housing and Infrastructure)

Shifza Mohamed (Ministry of Health)

REVIEWERS

Aminath Shaufa (Health Protection Agency)

Mariyam Sheeza (Health Protection Agency)