



Ministry of Health and Family Welfare
Government of India



STATE ACTION PLAN FOR CLIMATE CHANGE & HUMAN HEALTH

Kerala

(Version -1)



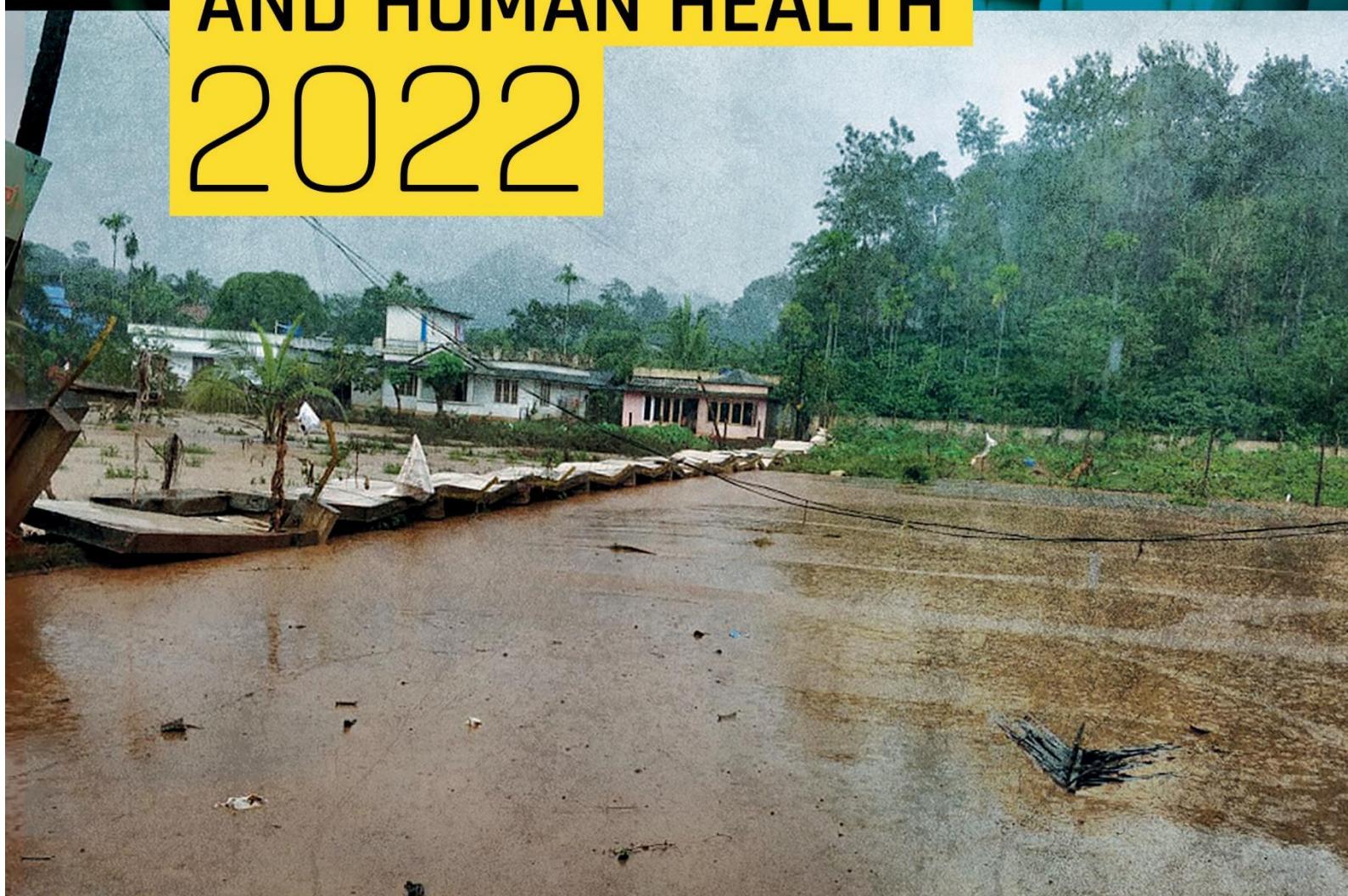
National Programme on Climate Change & Human Health
CEOH & CCH-National Centre for Disease
Control Ministry of Health and Family Welfare, Government
of India, 22, Sham Nath Marg, Delhi-110054
Email- npcchh.hq-ncdc@ncdc.gov.in, ceohcch-ncdc@ncdc.gov.in





KERALA STATE ACTION PLAN FOR CLIMATE CHANGE AND HUMAN HEALTH

2022



National Programme
on Climate Change
and Human Health

Message

Health Minister

The health impacts of climate change are already evident in Kerala as the state experienced extreme weather events like floods and heat-related illnesses in recent years. Kerala has also witnessed the emergence and re-emergence of many infectious diseases including vector-borne and zoonotic diseases in the recent years. Climate change has become an agenda for development planning in recent years and the honorable Chief Minister has announced to focus on Climate Resilient Kerala.

Much has been discussed on the effect of climate change on public health, primarily due to the rising sea levels and temperatures, and frequent occurrences of extreme weather events like droughts, extreme rainfall, floods, and cyclones. With an increase in temperature and water scarcity, incidents of extreme heat stress would be more common. With frequent occurrences of droughts, the progress being made on under-nutrition would be reversed whereas extreme rainfall and floods, ~~and~~ increases the incidence of water and vector-borne diseases.

Climate change directly affects human health, and hence, proactive framing of plans and policies to meet the health needs of the affected populations is essential. A well-prepared health system is fundamental in alleviating the impact of climate change on a population. The health systems should provide a basic foundation for preventive care through timely and appropriate communications on the health effects of climate change along with

provision of healthcare delivery. Fighting global health risks and diseases, including outbreaks with pandemic potential, is also, fundamentally, about fighting climate change.

I applaud the efforts of State Climate Change Cell for bringing out the State Action Plan on Climate Change and Human Health (SAPCCHH). This will guide and orient our team to combat the climate change and health impacts and work towards making public health climate resilient.

Principle Secretary – Health

Climate change is one of the greatest concerns of our times, especially the health impacts of climate change. Kerala has already experienced a range of extreme weather events and its impacts in the last five years. The effects of climate change will vary in its intensity in different parts within the State and requires a strategic and coordinated response to address the issue and build resilience. It is also the commitment of the State to become climate resilient in the future.

We have learned from our experience in combating the COVID-19 pandemic that scientific knowledge and clear information are key in addressing the issue. Our COVID-19 experience has also taught us that the health sector especially the health workforce has a key role to play in combatting the pandemic. To combat the health impacts of climate change, we will require the same strategies. We will need clear scientific knowledge and understanding of

the issue, a well-trained health workforce and a resilient health sector that promotes actions that address climate change and its impacts on health.

I am very happy to learn that the State Climate Change Cell has come up with the State Action Plan on Climate Change and Human Health (SAPCCHH). This guidance document will orient our health workers on climate change so that they can become trusted communicators on climate change and health impacts.

Director, DHS

Kerala is amongst the most vulnerable states to the impacts of climate change. Recent reports signal escalating climate change indicators and their worsening impacts on health. Prevention and mitigation of climate-sensitive illnesses with incorporation of environment-friendly practices into the healthcare sector will contribute significantly to achieve Sustainable Development Goals on health and climate action by 2030.

The Health system is resolved to tackle the Climate sensitive illnesses burden by equipping stakeholders, health care workers and facilities to track, prepare, and manage the cases. Development

and implementation of the State Action Plan on Climate Change and Human Health (SAPCCHH) is an appreciable step in this direction. I am confident that this action plan will be useful in managing and monitoring the health impact and shape our future course of action in building climate resilience.

SMD (NHM)

The effects of climate change may be local, statewide, or even national. The severity is likely to be different across different geographic regions within a state or even districts. Thus, it makes it challenging to respond to the medical needs of affected regions. To address such challenges, the State Action Plan on Climate Change and Human Health has been developed, that outlines the basics of various climate-sensitive diseases and their management through various approaches.

I am hopeful that this action plan will be able to guide the State and District officials on climate change and the nodal officers in the health facility from the primary to tertiary level. With this, I would like to congratulate the team on Climate Change and Human Health programme division and acknowledge the contribution of all the expert members from the various institutions.

Executive Summary

Climate change is a growing concern for sustainable development. The Sustainable Development Goal 13 emphasises to take urgent action to combat climate change and its impacts. Climate change poses several threats to the health of the population. The health effects of climate change occur either through direct effects (changes in temperature and precipitation and occurrence of heat waves, floods, droughts, and fires, etc) or Indirect effects (ecological disruptions resulting in crop failures, shifting patterns of diseases' vectors or displacement of populations).

National Action Plan on Climate Change and Health (NAPCCH) has been drafted and it called for state-specific action plans. It is true that adaptation challenges are experienced most acutely at the state level. The demographic, socio-economic, and physiographic situations in the states determine their specific vulnerabilities towards climate change and in such circumstances, it is imperative to work on precautionary and anticipatory measures for facing the expected changes and adapting to the changes in the long term.

The health impact of climate change is already evident in Kerala as the state experienced extreme weather events including a massive deluge—a calamity of severe nature in 2018 and increased environmental temperature leading to heat-related illnesses in 2019. Kerala also witnessed the emergence and re-emergence of many infectious diseases including vector-borne and zoonotic diseases in recent years.

Due to epidemiological transition, a large proportion of the population in the state is susceptible to water-borne diseases like hepatitis A leading to explosive outbreaks even with mild water contamination. In Kerala, the health of human populations is sensitive to shifts in weather patterns and other aspects

of climate change, owing to high population density, rapid urbanization, depletion of forest cover, high energy consumption, variation in food production, vector-borne diseases, widespread water contamination, inadequate sewage & waste management and issues of inaccessibility to health care by the marginalised population. In the view of the above requirement, Government of Kerala has been working on a strategy for action in the state in response to Climate Change and health.

The State Action Plan for Climate Change and Human Health (SAPCCHH) proposes a multipronged approach to address the health-related aspects of climate change. It envisioned to strengthen the health of citizens of Kerala against climate-sensitive illness. The goal is to reduce morbidity, mortality, injuries and health vulnerability to climate variability and extreme weather. Objective is to build the capacity of health care services against the adverse impact of climate change on human health.

This SAPCCHH endeavors to seek coordination and synergies with other departments and initiatives like Sustainable Habitat, Agriculture, Water, Natural Ecosystems and Biodiversity to help the state to address the vulnerability in terms of geography, vector prevalence, diseases pattern, health care facilities, etc. to adapt and to yield health benefits in the increasingly hot climate. The SAPCCHH opportunities also tried to leverage the opportunities in the state like empowered Local Self Governments implementing democratic decentralisation, Chief Minister's 'Aardram Mission' to make health institutions people's friendly and 'Haritha Keralam Mission' which aimed at integrating the components of Waste Management, Organic Farming, and Water Resources Management.

Acknowledgement

The guidance and oversight provided by Smt. Veena George, Hon'ble Minister for Health, Smt. Tinku Biswal IAS, Principal Secretary (Health), Ministry of Health and Family Welfare, Dr Rathan Kelkar, State Mission Director, NHM Kerala and senior officials from the National Centre for Disease Control to develop the Kerala Strategic Action Plan for climate change and Human health is gratefully acknowledged.

This document is based on the inputs provided by officials and experts from Kerala's State Departments of Health & Family welfare, Environment, and Disaster Management Authority. Active contributors include the experts from Health services department, Government Medical Colleges, State Pollution Control Board, Food safety department & UNDP.

The strategies and activities were planned under the guidance and administrative support from Dr. Preetha PP, Director of health services and Dr. Thomas Mathew, Director of Medical Education.

Technical coordination and documentation support was done under the leadership of Dr. Meenakshi V, Additional Director Public Health, supported by Dr. Joy Elamon, Director KILA, Nirmala Sanu George, Action on climate change, Shweta Narayan, Health care Without Harm, Dr. Bipin K Gopal, State NCD Nodal Officer, Dr. Jagadeeshan Deputy Director DHS, Dr. Binoy S Babu, Assistant Director DHS, Dr. Manu M S, State Nodal Officer NPCCHH, Nitha Thankam George, Healthy Energy initiative and Dr. Basil Saju, State Consultant, NPCCHH. Ms Jayshree Nandi, Technical Officer, NPCCHH, NCDC, Delhi.



Contents

Message

Executive Summary

Acknowledgement

Abbreviations

Part I

Chapter 1 Introduction

Chapter 2 Kerala Climate Change- Vulnerabilities, Challenges and Opportunities

Chapter 3 Climate-sensitive diseases prevalent in Kerala

Chapter 4 NPCCHH: Vision, Goal & Objectives

Chapter 5 Organization Structure of NPCCHH

Part II: Adaption plan on Climate sensitive Health Issues

Chapter 6 Health Adaptation Plan for Air Pollution Related Illnesses

Chapter 7 Health Adaptation Plan for Heat related illness

Chapter 8 Health Adaptation Plan for Vector-Borne Disease

Chapter 9 Health Adaptation Plan for Climate Resilient Healthcare facilities

Chapter 10: Health Action Plan for disaster management

Chapter 11: Budget

Annexure :

A : Reporting, Monitoring & Evaluation

B: Office orders

Abbreviations

- UNFCCC** United Nations Framework Convention on Climate Change
- IPCC** Intergovernmental Panel on Climate Change
- UNDRR** United Nations Office for Disaster Risk Reduction
- UNGA** United Nations General Assembly
- NPCCHH** National Programme on Climate Change and Human Health
- NCDC** National Centre for Disease Control
- SNO- CC** State Nodal Officer- Climate Change
- DNO- CC** District Nodal Officer- Climate Change
- LSG** Local Self Government
- ADS** Area Development Society
- CDS** Community Development Society
- ANM** Auxillary Nurse Midwife
- CSD** Climate Sensitive Diseases
- ARI** Acute Respiratory Illnesses
- IMD** India Meteorological Department
- AQI** Air Quality Index
- SPCB** State Pollution Control Board
- NDMA** National Disaster Management Authority
- EWS** Early Warning Signs
- UNDP** United Nations Development Programme
- PRI** Panchayat Raj Institutions
- PHC** Primary Health Centre
- CHC** Community Health Centre
- SDH** Sub Divisional Hospital
- DH** District Hospital Hospital

CHAPTER 1

INTRODUCTION

Climate change is defined by UNFCCC as: “*a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.*” It affects social and environmental determinants of health like –clean air, safe drinking water, sufficient food, and secure shelter.

Climate change may negatively affect human health through a number of ways, but the commonly experienced ones are increased frequency and intensity of heat waves leading to rise in heat related illnesses and deaths, increased precipitation, floods, droughts and desertification costing lives directly. High temperature is known to increase the level of ‘ground level ozone’ and other ‘climate altering pollutants’ other than carbon dioxide, which further exacerbate cardio-respiratory and allergic diseases and certain cancers. Beside these, there is increase in transmission and spread of infectious diseases, changes in the distribution of water-borne, food borne and vector-borne diseases and effects on the risk of disasters and malnutrition.

The *United Nations Framework Convention on Climate Change (UNFCCC)* came into force on 21st March 1994. Since then many steps were initiated to reduce the effect of climate change at meetings like “*Rio Convention 1992*”, *Kyoto protocol 1997*”, “*Male’ Declaration 1998*”, “*Convention of Parties*”, “*Cancun Agreement 2010*”, “*Durban Platform 2011*”, “*Nationally Determined Contributions*” (NDCs) at Conference of Parties 21”.

India is signatory to “*Male’ Declaration*” wherein health sector has to be strengthened so as to make it climate resilient. According to Male’ Declaration, it is desired that health-care facilities should be prepared & climate-resilient, particularly in promoting to encourage that these are able to withstand any climatic event, and that essential services such as water, sanitation, waste management and electricity are functional during such events. Further, for climate resilient, the health department has to undertake measures to initiate the greening of the health sector by adopting environment-friendly technologies, and using energy-efficient services.

Such initiatives undertaken by Government of India are: a) Identification of Ministry of Environment, Forest & Climate Change (MOEF&CC) as nodal ministry; b) Formulation of

National Environmental Policy2006; c) Formulation of Prime Minister's Council on Climate Change for matters related to Climate Change.

MoEFCC has developed National Action Plan on Climate Change with eight missions. Later on, four new missions (including Health Mission) were identified. The *Health Mission* aims to reduce climate sensitive illnesses through integration with other missions under National Action Plan for Climate Change (NAPCC) as well as through programmes run by various ministries. As a follow-up action, Ministry of Health and Family Welfare (MoHFW) constituted a National Expert Group on Climate Change & Health (NEGCCH) to prepare National Action Plan on Climate Change and Human Health (NAPCCHH) and recommend strategies for indicators, mitigation, capacity building etc.

National Centre for Disease Control (NCDC) is identified as the ‘technical nodal agency’ by MoHFW for the proposed National Mission on Health. The Centre for Environmental and Occupational Health and Climate Change & Health (CEOH&CCH), NCDC, is implementing the National Programme of Climate Change and Human Health (NPCCCHH), under which Kerala has prepared its State Action Plan on Climate Change and Human Health (SAPCCCHH). The SAPCCCHH is a long-term vision and planning document prepared by the Department of Health & Family Welfare, Kerala, applicable for up till year 2027. Based on this document, district specific action plans will also be prepared. The SAPCCCHH highlights the current and future vulnerabilities to climate change in the state, the disease burden and the initiatives to be undertaken by the state to reduce the disease burden and develop a climate responsive and sustainable healthcare ecosystem in the state.

Kerala- Geography and Demographics:

Kerala is a small state, tucked away in the south west corner of India. The state of Kerala has an area of 38,863 sq. km. and a population of 33.38 million. It is situated between the Arabian Sea to the west and the Western Ghats to the east. Kerala's coast runs some 580 km in length, while the width varies between 35 and 120 km. The state is divided into three geographical regions- high land, midland and lowland. It is separated from the rest of the peninsula by natural geographic boundaries. There are 14 districts, 152 blocks and 1364 villages. The state has a higher population density compared to the entire country (859 and 312 per square km respectively).

Climatic conditions

The climate of Kerala is predominantly tropical monsoon with seasonally excessive rainfall and hot summer. The Western Ghats play a major role in the climatic conditions that prevail all along the state. The year may be divided into four seasons. The period of March to the end of May is the hot summer months and is uncomfortable due to high temperature and humidity. This is followed by the South West Monsoon season that usually continues till the beginning of October. From October to December is the North East Monsoon season and two months, January and February, form the winter season. The climate is pleasant from September to February. The state is extremely humid due to the existence of Arabian Sea towards its western region. The annual precipitation varies between 100 cm (around Chinnar) to 500 cm (around Neriymangalam), with a state average of about 300 cm. March to May is the hottest in the state with maximum temperature reaching more than 32°C and the minimum temperature is attained between December to January. Winds over the state are seasonal; diurnal variation is felt owing to the maritime influence. Annual relative humidity varies between 79% – 80% in the morning and 73% – 77% in the evenings.

CHAPTER 2

Kerala Climate Change- Vulnerabilities, Challenges and Opportunities

Kerala can be classified as a climate vulnerable state because of its geographic location, population density, rapid urbanization, high proportion of population who utilize equipment with high carbon emission, increased vehicle density and problems related to waste management. Due to the fragile environmental conditions, Kerala faced Tsunami in 2004 followed by disastrous flood events in 2018 and 2019 during which a million people were affected. Extreme weather events including floods and unprecedented increase in temperature poses different sets of challenges to the state.

Challenges faced by the State

Kerala is witnessing an increasing burden of communicable and non-communicable diseases. Although the State has been successful in controlling a number of communicable diseases earlier, the emergence of chikungunya, leptospirosis, hepatitis and H1N1 in recent years has led to considerable morbidity and mortality. Instances of vector borne diseases like dengue, malaria, Japanese encephalitis, scrub typhus etc. have seen a marked increase in many districts.

Water-borne infections like different kinds of diarrhoeal diseases, typhoid and hepatitis are showing persistence in many districts. Cholera has also surfaced in many districts after a few years of relative low incidence. Incidence of Malaria is strongly affected by climate change. Dengue prevalence is expanding rapidly. Transmitted by Aedes mosquitoes, dengue is a fast growing challenge, particularly in the coastal areas of Kerala in recent years. Female Aedes aegypti mosquito, vector of dengue, Chikungunia and Zika are highly sensitive to climate conditions.

Any disease caused, transmitted or harboured by insects, snails and other cold-blooded animals can be affected by a changing climate e.g., Lyme disease and tick-borne Encephalitis, Salmonella and other food-borne infections. When infectious diseases appear in new locations, where people do not have immunity and health services may not have experience in controlling or treating infections, the effects can be dramatic. Also, a change in patterns of infectious disease with reference to the climatic factors is expected in coming years in the state. Also, people living in the coastal regions, water logged areas, and hilly areas are all particularly vulnerable in different ways. In the state, lack of access to clean water supply and sanitation, along with poor

hygiene is already the main contributor to the burden of diarrhoeal disease.

Kerala -Health and Vulnerability Assessment

Health and vulnerability assessment was conducted for the state of Kerala and published in 2017. This report focuses on the health impact of climate change that are relevant for Kerala, assessing the vulnerability of health issues, and providing insights into building the health sector-specific adaptive capacity. The impact of climate change on health are detailed and analysed at various levels, in relation to an increased frequency and/or intensity of extreme weather events, as well as those due to a progressive increase in temperatures. This report has primarily made use of indicative evidence rather than assertive evidence, due to the nature of the available data. It also assesses the various health programmes and their potential to serve as adaptation measures.

The methodology aims at validating an association between climate change and health outcomes by means of analysing:

- 1) Seasonality and vulnerability pattern of diseases
- 2) Changing vulnerability to specific diseases across regions
- 3) Correlation of health data with climate indices

Temporal and spatial analysis of health and weather parameters, over 2004-'14, as well as multivariate analysis controlling for other pertinent factors shows that by and large climate indicators are yet to show a significant association with hospitalisation cases for several climate-sensitive health ailments. However, there is some relationship between health parameters and climate parameters detected, such that individuals from central or southern regions of Kerala have higher chances of hospitalisation due to fever and infections than compared to those from northern region. Cases of fever and infection related hospitalisation is likely to be higher in regions with greater rainfall and greater difference between daily maximum and minimum temperatures, though the effects are not statistically significant.

The seasonality and regional distribution of ailments was also examined, using datasets on diseases across districts over a period of about 15 years. Diseases such as leptospirosis, dengue, malaria, chikungunya, hepatitis A, hepatitis B, and typhoid all demonstrated some correlation with temperature, relative humidity, or rainfall (see table below). While the changing seasonality pattern of diseases is very much in place, it can at the most be said to be indicative when associated with weather patterns across regions within the state. Furthermore, it is observed that there is a shift in vulnerability to certain specific diseases like that of vector- borne diseases like dengue, chikungunya and malaria which are globally considered to be climate-sensitive.

Thirdly, this report examines the relationship between climate factors and non-communicable diseases, given the importance of Non-Communicable Diseases (NCD) in the state. This is based on a select set of studies with varying time duration to observe the changing intensity of NCDs beyond its response to age profile, life style factors, etc. Owing to limited exploration of this association with available time series data, this analysis was complemented with a select set of case studies on a few vulnerable individuals which provide anecdotal evidences on the

impact of climate change in health and how people adapt.

Opportunities

In Kerala, climate change has become an agenda for development planning in recent years. The Environment and Climate Change Department, Government of Kerala has been identified as the nodal agency for coordinating activities related to climate change in the state. The components of the scheme include the preparation of position papers on climate change through resource institutions and consultants, preparation of consultancy reports on carbon credits, initiating study reports, preparation of climate change action plan for the state and for organizing a workshop on climate change. In line with the concept of sustainable habitats, works is in progress for adopting the provisions of the Energy Conservation Building Code (ECBC) 2007, suitable for the state. Energy Management Centre (EMC) is pursuing the National Mission on Energy efficiency in the state. Department of Environment and Climate Change is organizing capacity building activities with EMC for adopting the ECCB

- Local Self Government in Kerala is quite aware about the imperative of scientific waste management in the urban civic management. Many of the village habitations are also highly urbanized. Waste minimization and treatment of municipal waste is a priority and Kerala Suchitwa Mission is providing technical back up to the local self-government for attaining scientific waste management capability.
- Kerala Institute of Local Administration (KILA) gives the sensitizing programme on climate change challenges to the Panchayat Raj Institution Members (PRIs) with the support of UNDP
- Kerala has initiated plan programmes on Eco-restoration of wetlands and river action plan for identifying vulnerabilities and designing interventions for conservation of its water resources.

Programmes and Policies related to climate change and health

Any decisions that affect climate change also have direct implications for human health. Hence, Kerala state requires a robust system with recommendations overarching between the climate change and existing health policies and surveillance plans. Various programmes that could be collaborated are;

1. **Integrated Disease Surveillance Programme (IDSP)** the integrated disease surveillance Programme is implemented in Kerala. Syndromic disease surveillance data collected from the field level (in S form) and health institution level data based on the presumptive diagnosis (P form) and Laboratory confirmed case (L form based) data are collected and analysed at the district level and forwarded to the state level and from there to the national level. Based on the disease surveillance data appropriate actions for the control of communicable diseases are taken at each level.

- 2.State- Prevention of Epidemics and Infectious Diseases Cell (State PEID CELL)** cell was established by Government of Kerala in 1982 in Medical College Hospital Thiruvananthapuram with a view to strengthen the surveillance system in the state.
- 3. Action Plan form Clean Kerala Mission is being launched for environmental cleanliness, maintenance of public hygiene and prevention of diseases. It is significant that this Mission is being put into action after the State has made efforts to create awareness and to mobilize public opinion on the issue.
- Vector borne diseases Malaria, Filariasis, Dengue, Kala-Azar, Japanese encephalitis, Chikungunya etc have brought into the umbrella of National Vector Borne Disease Control Programme (NVBDCP). A system of disease surveillance at the field level and health institution level, laboratory surveillance, case management and control measures of these diseases are being implemented as per the national programme guideline of these diseases in the state.
- Vector Surveillance:** Surveillance of the mosquitoes is done at the field level by the field staff. From the district level District Vector Control Units headed by the biologist / senior biologist do the vector surveys at areas with high vector density and execute appropriate vector control measures on coordination with the staff of the peripheral institutions.
- Water quality monitoring:** Occasional water quality monitoring especially at diarrhoea and other waterborne disease prone areas in the pre-monsoons season is also done by the health department and appropriate actions are being taken periodically.
- Ward level Health & Sanitation Committees and prevention of communicable diseases:** Formation of the ward level health and Sanitation committees under the leadership of the elected, ward member, with the filed Health staff as the convener, is one of the new initiatives under this scheme. In Kerala, ward level committees have been formed in all the rural and urban wards, with the related departmental representatives of the social welfare (Anganwadi worker), Kudumbasree health volunteers, Mahila Swasthya Sangam (MSS) volunteers, ASHA worker, school teachers and other NGOs' are involved in the public health work in the area.
- Aardram Mission:** Mission AARDRAM aims at creating "People Friendly" Health Delivery System in the state. The approach will be need based and aims at treating every patient with 'dignity'. Through the state-of-the-art investigation and intervention protocols it envisages transforming all Primary Health Centres into Family Health Centres as a first level Health delivery point. The mission envisages ensuring quality care at Primary Health Centres. All high

footfall hospitals will be transformed to patient friendly Out Patient service providers. The services include web-based appointment system, virtual queues, patient reception at registration centres, waiting rooms with Wi-Fi facilities and so on.

- **Haritha Keralam Mission:** Haritha Keralam is an Umbrella Mission integrating the components of Waste Management, Organic Farming, Water Resources Management. It has an ambitious outlook to address the issues of piling waste, impending drought and health hazards due to the consumption of pesticide treated vegetables and in general, the agricultural dependency of the State. The Haritha Keralam Mission aims to integrate the 3 most important and inter-related sectors through an orchestrated and cascading implementation of three sub-missions.

- Household level segregation and safe disposal of organic waste through feasible options like composting, biogas, arrangements for institutional waste disposal, re-use, recycling and safe disposal of non-degradable and electronic waste are given priorities. Local administrative bodies has initiatives for the effective collection, segregation, cleaning, storage and recycle of the non-degradable plastic waste.
- Rejuvenation of tanks, ponds, streams and rivers are the focus in the water resource sector.
- The thrust in promoting organic agriculture will be to produce safe to eat vegetables and fruits to make the state self-sufficient within the next 5 years.

There are several important institutions in the state under the aegis of Kerala State Council for Science and Technology, working on the various aspects of climate change. Centre for Earth Science Studies, Centre for Water Resource Development and Management, Kerala Forest Research Institute, National Transportation Planning and Research Centre are some of the institute especially equipped for the relevant work.

CHAPTER 3

CLIMATE SENSITIVE DISEASES PREVALENT IN KERALA

Climate change attributes new challenges for the public health around the world. Climate change is linked with rising instances of these diseases in the state, for instance through higher temperatures, water scarcity and flooding.

Following are the major climate sensitive diseases prevalent in Kerala-

- Vector Borne Diseases
- Water Borne Diseases
- Food Borne Diseases
- Acute Respiratory Illnesses attributed to Air Pollution
- Heat related illnesses
- Nutrition related diseases
- Allergic Diseases
- Cardio-pulmonary Diseases,
- Mental Health support,
- Zoonotic Diseases
- Disaster management - Extreme weather events (Floods, cyclones, drought) affecting health

The graph below indicates the trend of the impact of these diseases on the state's population between 2011-2018-

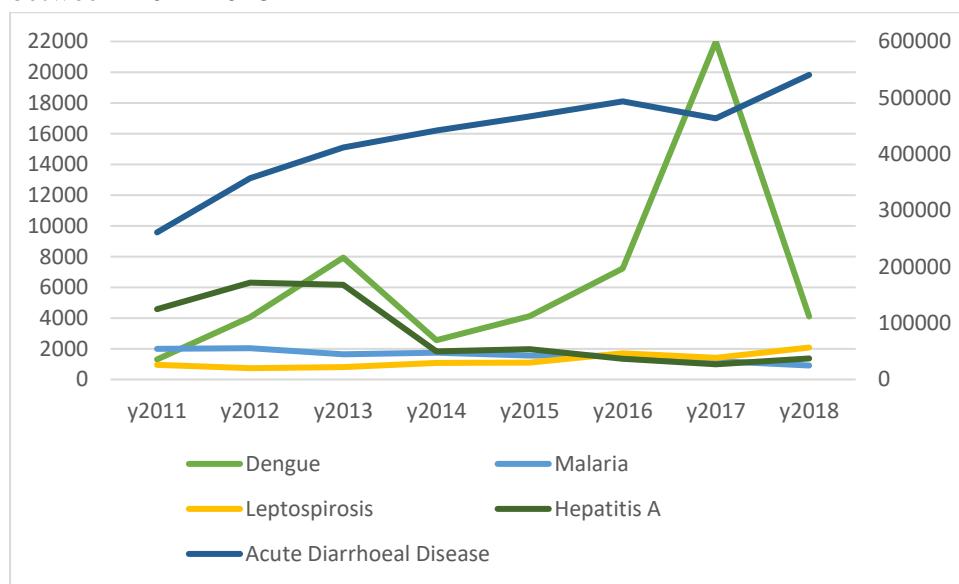


Fig 3.1 Trend of selected climate sensitive Communicable Diseases notified through Integrated Disease Surveillance Project in Kerala (2011-2018)

Dengue: Dengue fever, which surfaced in Kerala as early as 1998, has now become the single

largest vector borne disease. Till 2015, the disease was more prevalent in districts like Thiruvananthapuram, Kollam, Kottayam, Pathanamthitta, Kozhikode and Malappuram. But in 2017, all the districts reported dengue cases in large numbers. Districts located at higher altitudes were having low prevalence, but all others showed high incidence. The main reason for this wide spread distribution is believed to be due to the changes in the environmental factors causing proliferation of the dengue vector-Aedes mosquitoes. These mosquitoes, which in the earlier days seen more in rural settings have now, spread to urban areas also.

Leptospirosis: Leptospirosis is another emerging public health challenge in the state. Considered as a rare disease in the early 1980's, it has now spread all across Kerala. In 2012-13 a major epidemic of the disease occurred, affecting most of the northern districts, following which the disease has become endemic in Kerala. The disease is initially a rodent borne infection, spread through urine of the infected rodents, and the consequent contamination of the environment is the factor responsible for the disease. Over the years, the disease has been reported in many domestic animals like cows, dogs, pigs etc. and thus has become an occupational risk for those engaged in agriculture works. People, who have been involved in cleaning of stagnant canals and drains, were reported to have contracted the disease.

Chikungunya: Chikungunya is an emerging sickness among the vector borne infections. This disease is believed to have originated in the remote islands in Arabian Sea in 2005-06 and spread rapidly within the next two years in the state, affecting more than 80 per cent of the population. Fortunately, the disease is fading out, and has resulted in lifelong immunity for the affected population, a blessing in disguise. The past two years have seen only sporadic cases in Kerala, annual total being less than 200 cases and no deaths. Here again the vector responsible for disease transmission is the Aedes mosquitoes. Since both dengue and chikungunya are transmitted by same mosquito, and also since the same mosquitoes are responsible for transmission of the potential threat of Zika virus disease and Yellow fever, the state is being vigilant regarding these concerns.

Malaria: Though Kerala had controlled the disease in early 1970s, malaria has now remerged as a public health challenge. The problem has recently aggravated due to the presence of large-scale population movement from malaria endemic states. Proportion of falciparum malaria, the more severe form of the disease is slowly on the rise in Kerala. Though elimination of indigenous form of Malaria has been included in the SDG targets by the state, the issues in its

fulfilment are many. Annual cases of malaria in Kerala are less than 2,000 and the number of deaths reported is also very low, but the major issue is the increase in foci of indigenous malaria. Thiruvananthapuram, Kollam, Kozhikode, Malappuram, and Kannur districts have pockets of indigenous malaria over the past few years. Kasaragod district is persistently having high number of malaria cases, over many years, because of its proximity to the highly endemic districts of Karnataka. Movement of fishermen along the western coast of the state is a potential threat for spread of malaria along the coastal districts.

Japanese Encephalitis (JE): This is a form of encephalitis, an inflammatory disease of brain and its coverings, and is also a mosquito borne infection. Due to the presence of large paddy fields, Kerala is also at risk of this disease, as the virus responsible for the disease is spread by Culex mosquitoes, which are bred abundantly in water logged areas like paddy fields. The peculiar nature of the Culex mosquito to breed in contaminated water also, increases the potential threat in other areas as well. Role of migratory birds in transmission of JE is an extra risk for Kerala, because of the presence of multiple sanctuaries for migratory birds.

Water-Borne Diseases: There was a decrease in Acute Diarrhoeal Diseases (ADD) in 2018 compared to previous years. There was a considerable decrease in typhoid in 2018, but death due to suspected Hepatitis increased. The main reason for the cause of water-borne diseases is attributed to the unavailability of safe drinking water in many parts of the state especially in tribal and coastal areas. Unhygienic drinking water sources like wells, pump houses, water supplied through tanker lorry, leaks in public water supply pipes and the consequent mixing of unclean water with drinking water, dumping of wastes including sewage in water sources, use of commercial ice in preparation of cool drinks, habit of unsafe water in preparation of welcome drinks etc. are some reasons for spread of water borne diseases.

Table 3.1: Hepatitis A outbreaks reported from Kerala 2012-2016: 84 outbreaks in 5 years

Year	Total Number of outbreaks reported	Number of outbreaks with affected cases more than 20	Number of outbreaks with affected cases more than 50	Number of outbreaks with affected cases more than 100
2012	14	7	1	0
2013	19	12	3	0
2014	18	9	4	1
2015	20	11	3	0
2016	13	10	2	1

Emerging Infectious diseases - Kerala

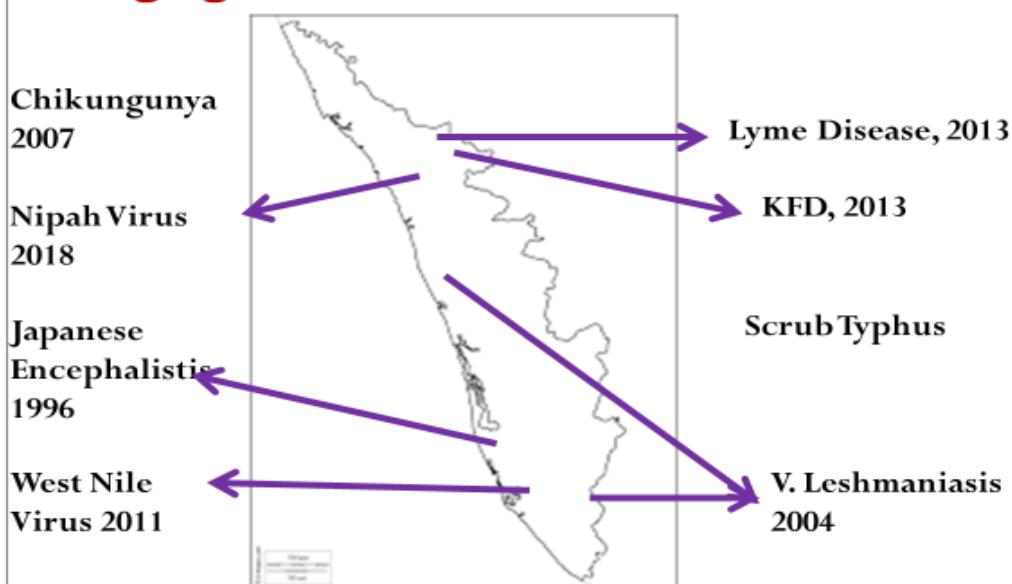


Fig 3.2: Emerging Infectious Diseases, Kerala

Kerala has witnessed emergence of many zoonotic and infectious diseases like Nipah Virus (2018 Kozhikode & 2019 Ernakulum), West Nile Virus (first reported in 2011 at Alappuzha), Kyasanur Forest Diseases (Wayanad, Malappuram), Lyme Disease (Malappuram), Visceral Leishmaniasis (Kollam, Thrissur).

Heat Related Illnesses

Sun burns, Heat rashes and sun stroke were reported increasingly since 2016 in Kerala. In the year 2020 and 2021 heat related incidents declined in the state as COVID19 restrictions confined people at their homes.

Table 3.2. Heat related illnesses in 2022

District	Heat rash	Sun Burn	Sun Stroke
Thiruvananthapuram	4	11	2
Kollam	0	0	0
Pathanamthitta	3	5	0
Idukki	0	1	0
Kottayam	3	0	0
Alappuzha	0	5	0

Ernakulam	0	0	0
Thrissur	0	0	0
Palakkad	0	5	0
Malappuram	0	3	0
Kozhikkode	0	1	0
Wayanad	0	0	0
Kannur	1	1	0
Kasargod	0	0	0
Total	11	32	2
Total	45		

Chronic Respiratory Diseases

As per the latest Global Burden of Disease (GBD) estimation, the major chronic respiratory diseases in the state are Chronic Obstructive Pulmonary Diseases (COPD) and Bronchial Asthma. The GBD has estimated a prevalence of 4250- 4749/100,000 population for COPD and >3750/ 100,000 population for Asthma in the state. The epidemiology of COPD in India studied by Dr. SK Jindal and team in the INSEARCH study estimated the burden of COPD (as measured by chronic bronchitis) as 3.5% in persons above the age of 35 years. However, the site in Kerala in INSEARCH, Trivandrum, had a high prevalence of COPD at 10%, which is much higher than the national average. Another study done in Kollam showed that the prevalence of self-reported asthma was 2.82% (95% CI 2.52-3.12) and that of chronic bronchitis was 6.19% (95% CI 5.76-6.62) while other CRDs which did not fit to either constitute 1.89%.

The mortality caused by COPD, COPD also places a huge burden on the health services in terms of OP and IP work load. Almost 10% - 20% of the patients coming to the general OPD of Health Service Department of Kerala come with COPD and asthma; and repeated hospital visits by the same patients take up a considerable amount of the time available for work for the medical care professionals.

Air Pollution

Under the National Ambient Air Quality Monitoring Programme (NAMP), financed by the Central Pollution Control Board, sixteen monitoring stations have been established at different locations in the state. Air quality within industrial, commercial, residential and sensitive zones are being monitored from these stations. At present 9 continuous ambient air quality monitoring stations are functional in the state.

As per the latest report (2021) presented by the Kerala State Pollution Control Board (KSPCB), on verifying the data obtained from the 9 continuous Ambient Air quality monitoring stations in the state during January to December 2021, it can be concluded that the air quality averages within the state is in “satisfactory” level . The report also showed that the AQI levels within the state are also showing a slight increase from the middle of December which might be due to the seasonal changes as the rainy season has a significant effect on the reduction of AQI.” Plam moodu in Thiruvananthapuram district and Vytilla in Ernakulam district were the two stations which showed a few unhealthy levels on a couple of days.

Health effects of Kerala Floods

According to the Central Water Commission Study report on Kerala floods of August 2018, the rainfall in Kerala during June, July and 1st to 19th of August 2018 was 15%, 18% and 164% respectively which was above normal (CWC, 2018). Severe spell of rainfall started from the 14th of August and continued till the 19th of August. Coming on top of an already above normal

rainfall which had filled all the reserve space to store water, this led unprecedented floods in 13 out of 14 districts of the state. National Disaster Management Authority had declared it a Level 3 Calamity, or "calamity of a severe nature". There were major landslides which left many hilly habitats isolated. It is estimated that 10319 houses were fully and over 100,000 partially damaged. Over 3,274 relief camps were opened to accommodate the flood victims. An estimated 1,247,496 people found shelter in these camps. Over 483 people died, and 15 are missing. There was an outbreak of leptospirosis following the flood. Psychological distress and PTSD were observed among many. Ensuring interruption of treatment of chronic diseases was another challenge.

Ministry of Earth Sciences; India Meteorological Department studied the daily rainfall data of Kerala for 30 years from 1989 to 2018 and observed that Kerala receives highest rainfall in July. In August, all the districts show an increasing trend except Thrissur and Alapuzha.

Kerala situated along the Western Ghats, has many towns and cities along the foothills with several small intra-State rivers which swell up very quickly. Further the state has a large network of small storage capacity reservoirs which makes the state vulnerable for floods.

CHAPTER 4

NPCCHH: VISION, GOAL & OBJECTIVES

Vision: Strengthening of healthcare services for all the citizens of the state especially vulnerable like children, women, elderly, tribal and marginalized population against climate sensitive illnesses.

Goal: To reduce morbidity, mortality, injuries and health vulnerability due to climate variability and extreme weathers

Objective: To strengthen health care services against adverse impact of climate change on health.

Specific Objectives

Objective 1:

To create awareness among general population (vulnerable community), health-care providers and Policy makers regarding impacts of climate change on human health.

Objective 2:

To strengthen capacity of healthcare system to reduce illnesses/ diseases due to variability in climate.

Objective 3:

To strengthen health preparedness and response by performing situational analysis at state, district and Local Self Government level.

Objective 4:

To develop partnerships and create synchrony/ synergy with other missions and ensure that health is adequately represented in the climate change agenda in the state

Objective 5:

To strengthen state research capacity to fill the evidence gap on climate change impact on human health

Chapter 5

NPCCHH: ORGANISATIONAL FRAMEWORK

NATIONAL LEVEL

Key Nodal Agency
Head, NPCCHH
(NCDC, MoHFW)

Prime Minister's Council on Climate Change (PMCCC)

Health Mission

Ministry of Health and Family Welfare (MoHFW),

STATE LEVEL

Key Nodal Point
SNO-CC

State Governing Body - Environmental Health

State level Task Force - Environmental Health

State Environmental Health Cell (EHC)

DISTRICT LEVEL

Key Nodal Point
DNO-CC

District Task Force – Environmental Health

District Environmental Health Cell (EHC)

BLOCK LEVEL (DNO-CC)

VILLAGE LEVEL (DNO-CC)

Block Level

Gram Panchayat Level

A) State Level - Governing Body - Environmental Health

The state level governing body for policy level decision shall be working under Chairmanship of Honourable State Health Minister. The other members may be as follows:

Hon'ble Minister (Health)	Chairman
Principal Secretary Health	Vice chairman
Director of Health Services	Member Secretary
Mission Director, NHM	Member
Director, Medical Education	Member
Regional Director, H&FW	Member

B) State Level Task Force - Environmental Health

This task force shall be working under the guidance of Principal Secretary (Health) of the state. It shall be directly overseeing the implementation of the State Action Plan for Climate Change and Human Health (SAPCCHH) in their state/UT. It shall be working through Directorate of Health Services (DHS) of the state, which will be the implementing agency for SAPCCHH.

Principal Secretary Health	Chairman
Director of Health Services	Vice Chairman
Public Health Expert from State Health Department	Nodal Officer
Director, ICMR institute/ centre	Member
Director, Meteorological department of State	Member
Chairman, Pollution Control Board	Member
Chairman, State Disaster Management Authority	Member
State Surveillance Officers	Member
Environmental Engineer/ Scientist from MOEFCC	Member
Secretary, Agricultural Department	Member
Secretary, State Groundwater Board	Member

Roles and Responsibilities of the State/ UT Environmental Health Cell

- Preparation and Implementation of State Action Plan for Climate Change and Human Health
- Conduct Vulnerability assessment and risk mapping for commonly occurring climate sensitive illnesses in the state/ UT.
- Assessment of needs for health care professionals (like training, capacity building) and organise training, workshop and meetings.
- Maintain State and District level data on physical, financial, epidemiological profile for climate sensitive illnesses.
- Ensure Convergence with NHM activities and other related programs in the State / District
- Monitor programme, Review meetings and Field observations.
- Timely issue of warning/ alerts to health professionals and related stakeholders as well as general public through campaign or using mass media (Electronic or printed)
- Social mobilization against preventive measures through involvement of women's self-help groups, community leaders, NGOs etc.
- Advocacy and public awareness through media (Street Plays, folk methods, wall paintings, hoardings etc.)
- Conduction of operational research and evaluation studies for the Climate change and its impact on human health.

District Level:

District level nodal officers were identified and given complete charge for coordination and implementation of NPCCCHH programme at district level . Deputy District medical officers who are in charge of NPCDCS programme is given the full charge as DNOs. (Details Annexed).

District Environmental Health Cells were constituted in all the districts under the chairmanship of District Medical Officer . All the district programme officers and consultants of concerned and allied programmes are the members this cell and their roles and responsibilities are as below.

Roles and Responsibilities of the District Environmental Health Cell

- Preparation and Implementation of District Action Plan for Climate Change and Human Health
- Conduct Vulnerability assessment and risk mapping for commonly occurring climate sensitive illnesses in the district
- Maintain and update district database of illnesses identified in the district
- Assess needs for health care professionals and conduct sub-district/ CHC level training/ workshop and meetings for capacity building
- Ensure appointment of contractual staff and engage them in the assigned task of data management under the NAPCCCHH
- Maintain District level data on physical, financial, epidemiological profile for these illnesses

Health Adaptation Plan on Air Pollution Related Illnesses

Air pollution is a major environmental risk to health. The formation, transport and dispersion of many air pollutants is determined partly by climate and weather factors such as temperature, humidity, wind, storms, droughts, precipitation and partly by human activities known to produce various air pollutants. It is thus logical to assume that climate change will influence the dynamics of air pollution. By reducing air pollution levels, states can reduce the burden of disease from stroke, heart disease, lung cancer, and both chronic and acute respiratory diseases, including asthma^{29, 30}.

Two Major Types of Air Pollution:

1. Ambient (Outdoor) Air Pollution
2. Household (Indoor) Air Pollution

The World Health Organization (WHO) defines **ambient air pollution** as potentially harmful pollutants emitted by industries, households, cars, and trucks. Of all of these pollutants, fine particulate matter has the greatest effect on human health. Most fine particulate matter comes from fuel combustion from vehicles, power plants, industry, households, or biomass burning.

Indoor air pollution refers to chemical, biological and physical contamination of **indoor air**. According to WHO, almost three billion people worldwide continue to depend on polluting fuels, including biomass fuels (wood, dung, and agricultural residues), kerosene and coal, for their energy

needs. Cooking and heating with polluting fuels on open fires or traditional stoves results in high levels of household air pollution. Indoor smoke contains a range of health-damaging pollutants, such as small particles and carbon monoxide, and particulate pollution levels may be 20 times higher than accepted guideline values.

Ambient (outdoor air pollution) in both cities and rural areas was estimated to cause 3.7 million premature deaths worldwide in 2012. Air pollution also affects health by causing acid rain; eutrophication due to nitrogen oxides, emission in air from power plants, cars, trucks, and other sources; haze; toxic effects on wildlife; ozone depletion; crop and forest damage etc. Over 4 million people die prematurely from illness attributable to the household air pollution from cooking with solid fuels. 3.8 million premature deaths annually from non-communicable diseases including stroke, ischemic heart disease, chronic obstructive pulmonary disease (COPD) and lung cancer are attributed to exposure to household air pollution.

Air quality is therefore under increased stress around urban areas. The number of vehicles on the roads in Kerala has increased more than 20 times since 1975. Kerala now has over 25 lakh licensed vehicles on the road when the total length of the carriage way is only 21347km. 40% of the vehicles in the state are registered in the three districts of Eranakulam, Thiruvananthapuram and Kozhikode.

Personal transport vehicles constitute 72% of the total vehicles in the state and 77% of these personal vehicles are scooters and motor cycles.

Vehicular emission and noise from these vehicles are severe in the three major cities of Kerala namely, Thiruvananthapuram, Kochi and Kozhikode. Urbanisation is occurring in Kerala, at a slower pace than in other states. However Thiruvananthapuram, Kochi and Kozhikode have been experiencing growth in urban spread. Unplanned growth has resulted in degradation of air quality due to crowding and traffic congestion. Air quality deterioration in urban areas is due to increased use of fossil fuels and personal transport.

A study conducted in Kerala estimated that air pollution accounted for 7.4% natural deaths and 96539 years of life lost (YLLs) due to premature mortality. This study projects that a 10% reduction in particulate matter concentration will save 15,904 life years.

A study of quality of air in all districts of Kerala for a period of nine years during the period 2008-2016 by College of Agriculture, Vellayani under Kerala Agriculture University shows Thiruvananthapuram as the most polluted city in Kerala and Idukki to be the least polluted one.

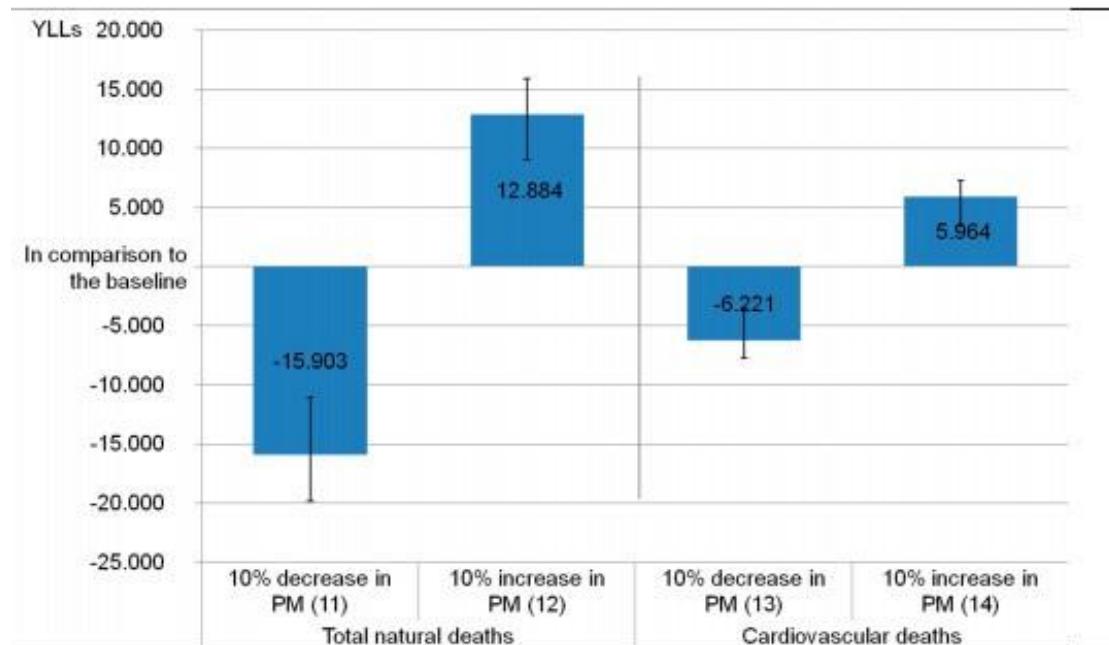
Table 6.1: District API (Air Pollution Index) including SPM (Suspended Particulate Matter) (2008-2016)

S. No	District	AQI
1	Thiruvananthapuram	87.84
2	Alappuzha	81.64
3	Palakkad	78.34
4	Kasaragod	76.09
5	Thrissur	72.89
6	Kollam	72.26
7	Wayanad	67.03
8	Ernakulum	66.87
9	Kottayam	63.04
10	Kozhikode	61.51
11	Kannur	54.08
12	Pathanamthitta	47.99
13	Malappuram	44.24
14	Idukki	37.02

Prominent Causes of Ambient Air Pollution in the state:

- ⦿ Pollution by Automobiles
- ⦿ Industrial Emission

Figure 6.1: Impact of air pollution on disease burden in urban Kerala



Source: Burden of Outdoor Air Pollution in Kerala, India—A First Health Risk Assessment at State level

- Urbanisation
- Improper collection and disposal of garbage (Burning)
- Tobacco smoke

Prominent causes of Household Air Pollution in the state:

- Use of biomass, kerosene as fuel for cooking
- Burning of waste, cow dung, coal
- Tobacco smoke
- Outdoor air pollution that invades indoor...
- Chemicals used in houses like floor cleaners
- Pollen, dust mites and pet hairs

Air Quality Index: Air Quality Index is a tool for effective communication of air quality status to people in terms, which is easy to understand. It transforms complex air quality data of various pollutants into a single number (index value), nomenclature and colour.

Table 6.2: Air Quality Index Category

Good	0-50
Satisfactory	51-100
Moderately Poor	101-200
Poor	201-300
Very Poor	301- 400
Severe	401-500

Number of AQI monitoring stations within state:

By Central Pollution Control Board (CPCB) - 11 By State Pollution Control Board (SPCB)- Number-6

No cities in the state have recorded AQI index more than 200 in previous years

Vulnerability Assessment for Air Pollution

Apart from geographical and local vulnerability for polluted air, air pollution is a leading cause for many health related issues and diseases in certain sessions of population like elderly, pregnant ladies, children under 5 years, those with chronic diseases

Table 6.3 Air Quality Index of major towns/cities of Kerala as of November 30 2021 & July 30 2022.

Town/ City	November 30 2021		July 30 2022	
	Index value	Air Quality	Index value	Air Quality
Ernakulam	55	Satisfactory	55	Satisfactory
Kannur	46	Good	46	Satisfactory
Kollam	65	Satisfactory	65	Satisfactory
Kozhikode	54	Satisfactory	54	Satisfactory
Thiruvananthapuram	37	Good	37	Satisfactory
Thrissur	34	Good	34	Good

etc. Being a state with high life expectancy, elderly population is comparatively more along

with high proportion of comorbidities, especially non-communicable diseases

Table 6.4: Vulnerable population estimates in the state for health impact of Air pollution based on census& NFHS5 data

S. No	Category of Vulnerable Population	Total count for the district
1	Elderly people age more than 60 years	3783953
2	Children's below 5 years of age	3628930
3	Pregnant women	504654
4	Women's not having clean fuel for cooking	According to NFHS 5 data 27.9% households in Kerala are not having clean fuel for cooking.

Health Sector Adaptation plan for adapting to Air Pollution related illnesses

- Awareness
- Vulnerability Assessment
- Establishing surveillance System
- Training and capacity building
- Strengthen the facilities
- Monitoring and evaluation

Awareness generation on the health impacts of air pollution

Public awareness needs to be enhanced through display of air quality indices and spatial air quality maps using print and electronic media. Public participation begins with informed citizens with raised awareness levels who can motivate the government for vigorous implementation or adoption of mitigation strategies. Public awareness is also a key aspect of participative vigilance over emitting sources. Along with the regulatory sticks, enhanced awareness levels will build additional pressure on the sources to limit their emissions. The main objectives will be to educate and empower young minds on aspects related to air pollutants, sources, emission factors, indoor air quality, reduction and control measures, etc. in relation to the existing social structure, cultural norms, economic realities and global trends of the present times, thus creating a multiplier effect within the peers and families.

1. Carry out mass media campaigns
2. Promote a culture of risk prevention, mitigation, and better risk management
3. Promote attitude and behaviour change in the awareness campaigns linking air pollution and climate change.
4. Engage local and regional media (community radio, TV)

Activities conducted and proposed to integrate air pollution in respective health programme or policy

1. Special campaigns are planned in connection with Kerala's AARDRAM and HARITHA KERALA Missions
2. Introduction of control of Air pollution as one of the preventive strategies in Kerala COPD Control Programme (SWAAS)
3. Integration and Inter-sectoral Coordination for more effective strategies for control of air pollution

Activities undertaken if any and further proposed to train health workforce on air pollution adaptation measures

1. Formulate and implement state level training and capacity building programmes.
2. Ensure the availability of qualified and experienced trainers
3. **Medical professional training:**
 - a. Expanded training of doctors and associate staff
 - b. Increased training of Field level workers and ASHA workers

4. Alert system

Automated Air Quality Warning devices in all the schools, offices, and other public buildings in the vulnerable areas for triggering warning manually by the local government.

- a. Radio communication system for district administration.
- b. Air quality alerts, based on the air quality index thresholds determined by the local government
- c. Leaflets and pamphlets describing prevention guidelines.
- d. 24/7 Tele-assistance communication services and devices.

Actions undertaken and further proposed to reduce the burden of Air pollution in the polluted cities of the State

5. Advertisement and promotion through IEC:

- Street plays in low-income communities
- Hoardings, billboards, as and other advertisement modes

6. Access to an air-conditioned space

- Air conditioners and air purifiers can be a useful addition to daily precautions to remove particulate matter from the indoor environment.
- To effectively remove airborne particulate matter a High-Efficiency Particulate Arrestance (HEPA) filter with a rating of at least H13 or above is needed.
- Avoid the use of ionization filter technology as it will generate ozone and may pose additional health hazards.

7. Masks or particulate respirators

- Masks may help in special circumstances if you have to be outside for long periods

during significant level of airpollutants is reported.

- Masks should be disposable, regularly changed and have a rating of at least N-95 meaning that the mask is adequate for filtering out 95% or most of the PM2.5 particles.

8. City planning and management: To an extent, pollution can be abated by urban design, topography, and meteorological factors, other than control of emissions. City planners can effectively plan spatial distribution of point sources of pollution, such as industries, landfills, treatment plants, transportation routes, open spaces, which impact the quality of air in an urban region

9. Supply of cleaner fuels, stoves to rural areas and urban slums: There is a need to widen the access of LPG or PNG and, wherever appropriate, smaller packaging and safe refilling options. Several government schemes designed to increase LPG/ PNG access across India have successfully enhanced the use of clean fuel.

10. Solar lighting options to rural areas and urban slums: There is need for an adequate institutional mechanisms and delivery channels for sale and after-sales service. Solar lanterns should be promoted to households in urban slums and rural un-electrified regions.

11. Complete ban on refuse burning: Ban on refuse burning needs to be strictly enforced with substantial penalties on non-adherence. State pollution control boards in collaboration with City Corporations can develop a mobile application for bringing any major refuse burning event to notice in a region.

12. Maintaining quality and cleanliness of roads: Re-suspended road dust is one of the significant contributors to PM10 concentrations in cities. Dust gets re-suspended in the air due to movement of vehicles. The particles re-suspended from road side are mainly coarse (>2.5mm) by nature but still can cause respiratory illnesses.

13. **Dust control at construction sites:** There is a boom in the construction sector in India, more specifically in urban regions in order to sustain an ever-increasing pressure of housing and commercial space. Different activities at the construction site cumulatively account for generation or re-suspension of dust. To control emissions from construction activities, wind speeds need to be reduced and moisture content can be enhanced at the construction site for reducing the possibilities of dust getting air borne
14. **Vegetation** on certain parts of the unstabilized land can reduce dust emissions from the ground.
15. **Transportation:** Use of public transportation can result in 90–95 per cent reduction in CO, VOCs, and 50 per cent reduction in CO₂ and NO_x emissions as compared to private

vehicles.

Non-motorized modes of transport are non-polluting modes of transport and traditionally used to have high modal shares in Indian cities, which is depleting rapidly due to lack of or poor-quality pedestrian infrastructure, amenities, and services.

The current share of walking and cycling in cities should be maintained and encouraged through physical intervention in terms of road design and other facilities such as provision of exclusive lanes providing safe, efficient, and integrated network for NMT movement. NMT exclusive lanes should be complemented by good shade, bike parking facilities, road crossing priorities, etc. Cycling in cities should be encouraged through public bike sharing systems, as available in cities such as Paris, Copenhagen, Amsterdam, London, etc.

Detailed IEC and Dissemination Plan-

Key Messaging	IEC material	Medium of Dissemination	Frequency	Timeline	Budget (year wise) in Lakhs					
					Year 1	Y2	Y3	Y4	Y5	
HCF level	Posters	Wall posters, Board posters, Wall painting	1-2 at each HF 1-2 at each HF 1-2 at each HF	Throughout the year	1	2	3	4	5	
	Audio clips	Audio clips broadcasted on mass media & social media platform on relevant CSI	1-2	March – May, June- August	1	2	3	4	5	
	Videos	Video clips broadcasted mass media & social media platform on relevant CSI	1-2	March -May, June – August	1	2	3	4	5	
	Outdoor activities	Advertisement on buses	5 -10 per district	Throughout the year	1	2	3	4	5	
Community Level	Awareness meetings	At community gatherings	3-4 per year / district	Festival, VHSND etc	1	2	3	4	5	
	Rallies	Community engagement or volunteering	2-3 per year / district	Relevant days eg: World environment Day	1	2	3	4	5	
	Competitions	Quiz, poster designing etc	2-3 per year / district	Relevant days eg: World environment Day	1	2	3	4	5	

a.

2. International and national Environmental related dates will be celebrated to create the awareness

In order to inspire others to take actions on climate change, it is important to increase environmental awareness. One way to do so is by encouraging people to observe and promote different environmental events and world day campaigns that are scheduled globally and nationally throughout the year. This provides an opportunity for people to collectively learn about and participate in sustainable practices together.

The key important days that will be celebrated in the state include following-

Key Days	Date	Activities	Budget
World Environment Day	June 5	Awareness talks, sapling planting	2 lakhs
International Day of Clean Air for blue skies	September 7	Clean air mission sensitization, air quality indices and spatial air quality maps display	2 Lakhs
World Environment Health Day	September 26	Awareness talks, environment clean up campaigns	1 Lakh
International Day for Disaster Risk Reduction	October 13	Risk awareness and disaster reduction sessions in vulnerable areas	1 Lakh
International Day for Climate Action	October 24	Awareness talks, Climate action pledges	1 lakh

Capacity building.

Medical professional training:

- a. Expanded training of doctors and associate staff
- b. Increased training of NGOs and ASHA workers

Capacity Building

Training Programme	Duration of Trainings	Refresher Training schedule	Prioritized districts	Budget (year wise) in Lakhs				
				Y1	Y2	Y3	Y4	Y5
Medical Officers	3 days	1 day	All districts	14	14	14	14	14
Community Health care workers	2 days	1 day	All districts	7	7	7	7	7
Panchayati Raj Institutions	1 day		All districts	14	14	14	14	14

Surveillance strengthening related to air pollution

1. Acute Respiratory Illness Surveillance Activity at State Level
2. Coordinated activity with State Pollution Control Board and Environment department.
3. Operational researches in connection with Air pollution Surveillance system

Six centres in three cities have been selected for ARI surveillance. The cities include Thiruvananthapuram, Ernakulum, and Kozhikode.

The current policies have to be strengthened and a more coordinated mechanism has to be established for more effective control and prevention of air pollution. Public awareness has to be increased and special focus has to be given to industrial areas. More community level surveillance and systems and monitoring mechanisms has to be established.

Figure 6.2: ARI Surveillance at State – Data Flowchart

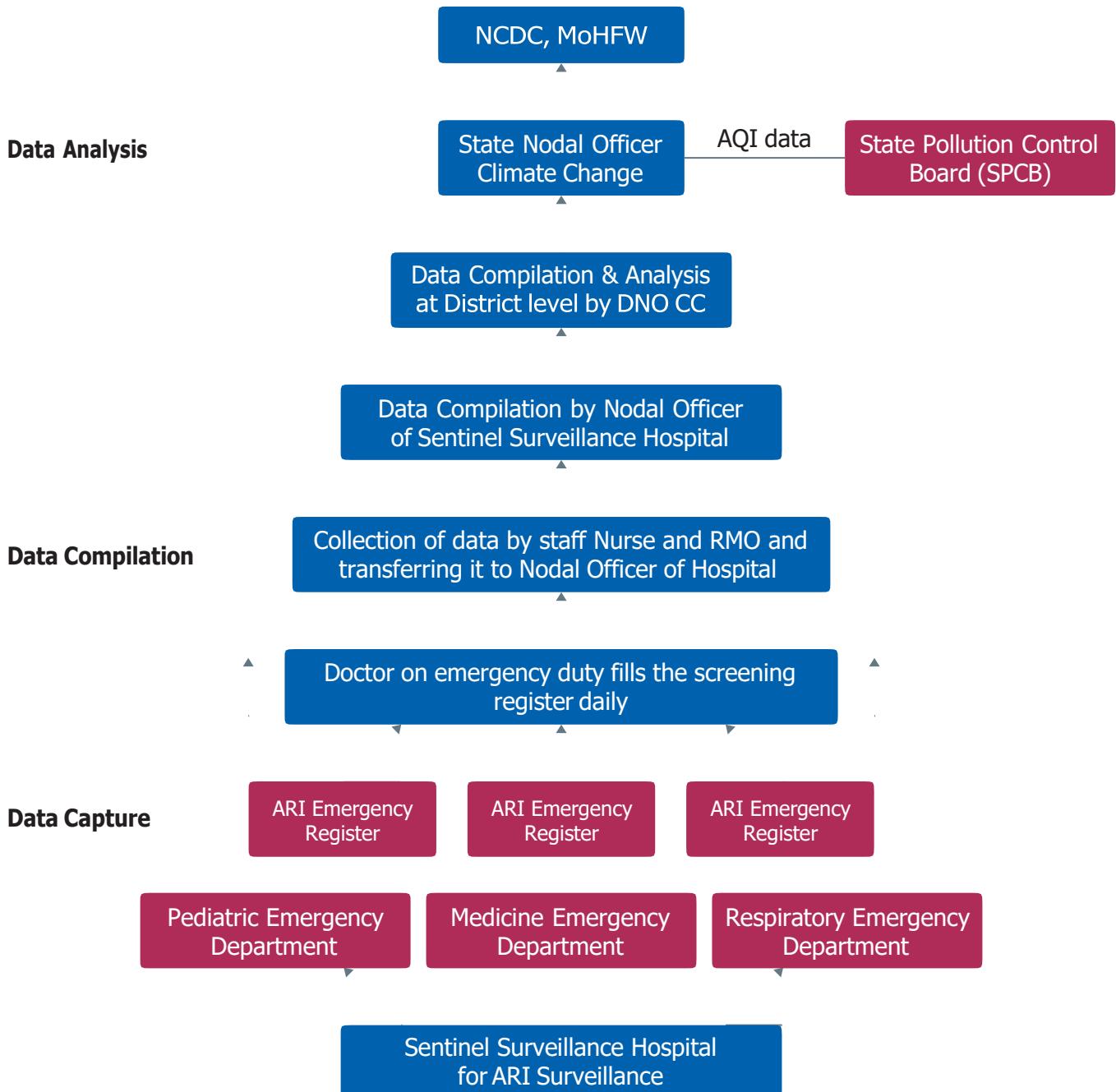


Table 6.5: Roles and Responsibility of Task Force Members

S. No	Task force Member	Role and Responsibility for Air Pollution control in state
1	SNO-CC	<ul style="list-style-type: none"> • Overall responsibility is to co-ordinate the activities of assessing the impact of air pollution on health and to suggest measures to reduce the same. • Co-ordinate with the Directorate of Medical Education to- <ul style="list-style-type: none"> ✓ Collect and compile data of patients with respect to Air Pollution effects on human health. ✓ Assist research on Air pollution impact on Health initiated by central/state govt., ministry, ICMR or any other agencies
2	Director, from any research Institute	<ul style="list-style-type: none"> • To create evidence of Air Pollution impact on health by undertaking various studies, research for the same.
3	Director, Meteorological department of State	<ul style="list-style-type: none"> • To provide timely data of temperature, rainfall, wind speed or any other relevant meteorological factors having relation with increase or decrease of air pollution for particular city/district. • To give inputs for reducing air pollution in relation to Meteorological factors.
4	Chairman, State Pollution Control Board	<ul style="list-style-type: none"> • To provide Air Quality Data for the cities identified under the Sentinel Surveillance for assessing the impact of Air Pollution. • To undertake measures to reduce the Air pollution and improve quality of air. • To monitor the progress of activities undertaken for reduction of Air Pollution.
5	Chairman, State Disaster Management Authority	<ul style="list-style-type: none"> • To monitor the situation of the Air Pollution in different cities of state.
6	State Surveillance Officers	<ul style="list-style-type: none"> • To take necessary actions in regular data collection and analysis of data. • To prepare and disseminate IEC on regular basis to the cities where air pollution is the big issue for public health.

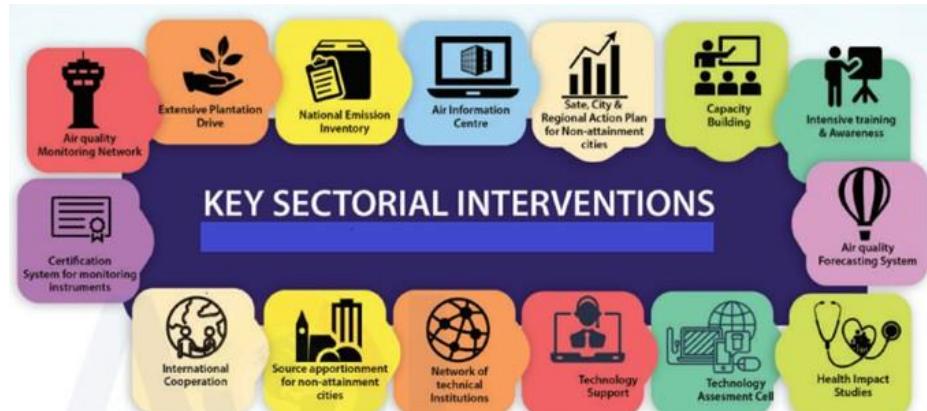
S. No	Task force Member	Role and Responsibility for Air Pollution control in state
7	Environmental Engineer/ Senior Scientist from MOEFCC	<ul style="list-style-type: none"> To enlist and share probable causes of increase in air pollution within cities of the state. To give necessary inputs to reduce air pollution as per the causes identified.
8	Secretary, State Agriculture Ministry	<ul style="list-style-type: none"> Prevent on-farm burning of crop residue.

Table 6.8: Role of ministries in Air pollution management

Disease	Department	Roles and Responsibilities
Acute Respiratory Illness	<i>Ministry of Environment, Forests and Climate Change</i>	<ul style="list-style-type: none"> Ensure that State Pollution Control bodies set standards for industry-specific emission and effluent, monitor levels of pollutants, and enforce penalties. Enforce strict air quality standards for pollution Strict implementation of Environment Impact Assessments (EIA) to minimize the adverse impact of industrial activities on the environment Effective implementation of 'National Green Tribunal' directives on trash burning/ waste disposal from different sources Take strict measures for unregulated sectors (such as brick kilns, trash burning, stone crushing) which contributes to ambient air pollution
	<i>Ministry of Human Resource Development</i>	<ul style="list-style-type: none"> Regular screening of school children for early detection of diseases, this can be attributed to the existing air pollution Inclusion of harmful health effects of environmental pollution (AAP and HAP) in the school curriculum (state board), including current policies and mitigation practices that are designed to reduce air pollution Improve indoor air quality of educational institutions state-wide Improve workability and access to educational institutions by non-motorised transport, thus minimizing the air pollution in the school surroundings Sensitize students and teachers on using the Air Quality Index in planning outdoor school activities
	<i>Ministry of Agriculture</i>	<ul style="list-style-type: none"> Policy in place to promote multiple uses of crop residues and prevent their on-farm burning.
	<i>Ministry of Rural Development</i>	<ul style="list-style-type: none"> Include health promotion (like clean air) guidelines as part of "Nirmal Gram Puraskar"/ Model Villages evaluation criteria/ create alternate awards with specific criteria based on air pollution at the state level. Under integrated rural development, develop and implement micro level planning policies/schemes with Panchayat Raj Institutions to address the social determinants of health for reducing the hazards of air pollution (lack of education, unemployment, poverty, poor housing conditions, etc.)
	<i>Ministry of Urban Development</i>	<ul style="list-style-type: none"> Formulate/revise urban transport policy which reduces vehicular pollution Implement policies to reduce indoor air pollution (like disincentivizing diesel gensets and promoting clean cooking fuels thus 'making available clean and making clean available')

Disease	Department	Roles and Responsibilities
		<ul style="list-style-type: none"> • Enforcement of ban on burning garbage or biomass (especially during winter months) • Help cities develop air pollution alerts and emergency plans based on the Air Quality Index or CPCB continuous air monitoring data
	<i>Ministry of New & Renewable Energy</i>	<ul style="list-style-type: none"> • Implement policies for truly clean cook stoves and support research and development. • Research and development of other non-conventional/renewable sources of energy and programmes relating thereto, including locally generated power to supply cooking appliances; • Support and strengthen Integrated Rural Energy Programme (IREP) with emphasis on indoor air pollution • Create a consensus action plan for replacing biomass fuels with alternative clean fuels
	<i>Ministry of Petroleum & Natural Gas</i>	<ul style="list-style-type: none"> • Expand new initiatives to increase the availability of LPG and other cleaner fuels to the rural & tribal areas • Expand the piped natural gas network to reach out to a larger population
	<i>Ministry of Power</i>	<ul style="list-style-type: none"> • Promote/develop more efficient cooking devices • Evaluate the potential for electric cooking appliances to substitute for biomass and LPG
	<i>Ministry of Road Transport and Highways</i>	<ul style="list-style-type: none"> • Ensure effective implementation of New Motor Vehicles Act, once approved • Ensure proper engine checks for vehicles to assess pollution levels
	<i>Ministry of Information and Broadcasting</i>	<ul style="list-style-type: none"> • Develop hard-hitting, high impact and cost-effective media plans, strategies and conduct activities for awareness generation on harmful effects of air pollution and options for their mitigation. • Ensure enforcement of relevant provisions in the Cable Television Networks Act to regulate advertisements of tobacco etc. • Involvement of Songs & Drama division; Department of Field Publicity to promote health promotion activity for air pollution and its impact on respiratory and NCD risk factors • Develop policies to ensure that media houses allocate free airtime for health promotion messages as a corporate social responsibility activity
	<i>Ministry of Communications & Information Technology</i>	<ul style="list-style-type: none"> • Use of mobile phones to encourage healthy choices and warn people about air pollution (both AAP and HAP, using Air Quality Index) • Establish Telemedicine linkages between different levels of health care in the state
	<i>Ministry of Labour and Employment</i>	<ul style="list-style-type: none"> • Regular health check-ups for early screening of pollution-related diseases. • Frame guidelines and conduct workshops for health-promoting workplaces, (guidelines on indoor air quality) • Showcase and support companies that employ workplace policies that can reduce vehicular travel such as telecommuting, or placing the workplace in sites that are accessible through public transportation (e.g. Metro) or non-motorized transport.
	<i>Ministry of Women and Child Development</i>	<ul style="list-style-type: none"> • Advocate through Self Help Groups and Mahila Mandal for protection of women and children from significant exposure to smoke from biomass while inside the house. • Awareness-raising can be done to improve household ventilation to reduce smoke inhalation from lighting (ex. kerosene) or cooking fuel
	<i>Ministry of Finance</i>	<ul style="list-style-type: none"> • Analysis of the economic and financial implications of the health and other impacts of air pollution in the state
	<i>Ministry of Law and Justice</i>	<ul style="list-style-type: none"> • Support enforcement on bans of burning trash for heating or as a way of disposal

Figure 6.3: Key Sectoral Interventions for Clean Air Programme



Source: <https://ncdc.gov.in/WriteReadData/linkimages/HealthSectorPreparednessforAirPollution.pdf>

Promotion of public participation and engagement to reduce air pollution

- Encourage people's contribution by maintaining vehicles properly, following traffic rules, lane discipline & speed limits and avoid prolonged idling and turning off engines in red traffic signals
- Promote use of clean smokeless fuels for cooking and heating purposes.
- Avoid using private vehicles and instead use public transport, bikes or walk and carpool; use smaller vehicles.

State Health Adaptation Plan for Heat Related Illnesses

Heat-related illnesses (HRI) encompass a spectrum of disorders from heat syncope, muscle cramps, and heat exhaustion to life-threatening emergency such as heat stroke. These illn

esses arise when there is a disruption in the regulation of the body's temperature because heat input from the environment and body metabolism is increased compared with output from the skin via radiation, evaporation, and convection.

In India, heat wave is considered if maximum temperature of a station reaches at least 40°C or more for plains, 37°C or more for coastal stations and at least 30°C or more for hilly regions.

Following criteria are used to declare a heatwave:

A. Based on departure from Normal

- Heat Wave: Departure from normal is 4.5°C to 6.4°C
- Severe Heat Wave: Departure from normal is >6.4°C

B. Based on Actual Maximum Temperature (for plains only)

- Heat Wave: When actual maximum Temperature $\geq 45^{\circ}\text{C}$
- Severe Heat Wave: When actual maximum Temperature $\geq 47^{\circ}\text{C}$

To declare a heat wave, the above criteria should be met at least two stations in a meteorological sub-division for at least two consecutive days. A heat wave will be declared on the second day.

Heat Situation in Kerala

A heat wave is a period of unusually hot weather that typically lasts two or more days. The temperatures have to be outside the historical averages for a given area. The United Nations has warned of more heat wave deaths across the world, especially in tropical countries as climate change pushes up temperatures. The year 2016, closely followed by 2019 was declared as the top two warmest years by the World Meteorological Organization. In 2019 alone, more than 65% of Indians were exposed toheat waves. According to a November 2018 study by Indian Institute of Technology-Gandhinagar, India will see a four-fold rise in heat waves if global temperature rise is restricted to 1.5°C by the turn of this century.

Kerala Statistics on Heat Wave:

- For the first time, heat wave was officially declared in Kerala in 2016
- The State Executive Committee (SEC) of State Disaster Management Authority (SDMA)

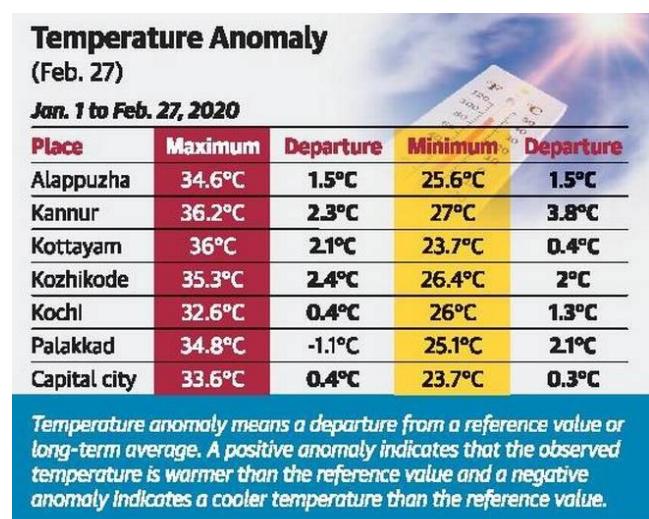
declared Heat wave, Sun stroke and Sunburn as “State Specific Disasters” on March 6, 2019 (GO (Ms) No. 9/2019/DMD)⁵

- According to IDSP, 1671 heat related issues (764- Heat rash, 875-Sunburn, 32-Sunstroke) had been reported in the state from 25.02.2019 to 01.06.2019. 1 death was reported in Ernakulam district in that year.

According to G. Byju, Principal Scientist (Crop Production), Central Tuber Crops Research Institute (CTCRI) “The mean atmospheric temperature in Kerala is increasing at a rate of about 0.4 to 0.5 degree in a decade.”⁶

Kerala State Disaster Management authority and Health Department has been issuing heat advisories and alerts during the season when temperature increases. According to the data from IDSP, 1671 heat related illness were reported between 25 February and 1 June 2019.

Figure 5.1: Temperature Anomaly



Although Kerala might not have as high a temperature as compared to the meteorological subdivisions from north-west and central India, the temperature is still going to be high. The possibility of heat waves occurring in some pockets remains very high. The state of Kerala is

specifically vulnerable to the changing climatic dynamics owing to its location along the seacoast and steep gradient along the western slopes of the Western Ghats. Though high potential growth rate of forests and perennial agriculture in Western Ghats provide high resilience against mild climatic variations, high population density, especially in the coastal areas, adds to the vulnerability to the climate related problems. Unprecedented events of heat extreme conditions were reported in many parts of Kerala during the summer months of April-May, during 2015 and 2016. The excess amount of humidity in the atmosphere intensifies the adverse effect of heat on human and animal body by slowing the natural evaporative cooling mechanism.

In the first report on “Impact of climate change in four regions of the country” submitted to the Government of India by the Indian Network for Climate Change Assessment (INCCA), it is estimated that the temperature is likely to increase by 2°C by 2050. The minimum surface air temperature in the Western Ghats region may rise by 2°C to 4.5°C. The average temperature in the region bordering Kerala is likely to rise by 1°C to 3°C. Maximum temperature increase can be seen in the Southern and Central Districts of Kerala while most of the districts in the southern Kerala will typically observe the increase in the temperature of 1.66° C to 1.77°C.

The State Action Plan on Climate Change (2014) has identified four districts – Alappuzha, Palakkad, Idukki and Wayanad – as climate change ‘Hot Spots’ in Kerala due to the high degree of vulnerability to natural hazards like flood and drought, and impact on biodiversity and human life.

As predicted in the studies, the temperature has been on the rise since past many years in Kerala as is the case with many Indian states. For example, the maximum temperature in Kozhikode was 34.5 °C in 2008 and has increased upto 38.6°C in 2016.

- 5 Government of Kerala. Disaster Management (B) Department G.O (Ms) No. 9/2019/DMD) [Internet]. 2019. Available from: <https://sdma.kerala.gov.in/wp-content/uploads/2019/03/DM-SDRF-State-Specific-Disasters-Heat-wave-Sun-stroke-Sun-burn-Orders-issued.-G.O.Ms-No.-9-DMD.pdf>
- 6 <https://www.thehindu.com/news/national/kerala/its-alarm-bells-for-the-farm-sector/article30936165.ece>
- State Relief Commissioner, Disaster Management, Kerala Floods – 2018 1 st August to 30th August 201

It is now established that the sea level is on the rise due to global warming and the projected Sea Level Rise (SLR) along Kerala coast on a conservative estimation is about 100 to 200 mm over the next 100 years.

Indian Meteorological Department issued heatwave warning on 27-04-2016 in the State. This is the first time that such a warning was issued in the State. Temperature of Palakkad district was 6° C above normal, touching a record high of 41.9 °C. Even maritime districts such as Alappuzha and Kozhikode experienced an increase

of more than 4 °C above long period average on 27th April. Temperature in 2016 was 2 to 3°C higher than normal in all districts in the state. Several sunburn incidents were reported from various parts in 2016. Instances of sunburn deaths have been reported in the years of 2007, 2009 and 2010 from Palakkad*.

Table 5.1: Heat related illness district wise data from 2019-20

District	2019				2020			
	Heat rash	Sun burn	Sun stroke	D	Heat rash	Sun burn	Sun stroke	D
TVM	18	20	3		0	0	0	
KLM	144	59	3		0	0	0	
PTA	113	94	2		18	22	0	
IDK	57	1	0		1	0	0	
KTM	6	48	3		1	0	0	
ALP	87	146	1		5	26	0	
EKM	56	56	6		0	0	0	1
TSR	26	56	1		0	1	0	
PKD	72	101	6		9	13	1	
MPM	25	45	1		5	5	0	
KKD	80	172	4		2	0	0	
WYD	7	34	0		0	20	0	
KNR	61	30	2		0	0	0	
KSD	12	13	0		0	0	0	
Total	764	875	32	0	41	87	1	1

The different kinds of heat related illnesses are indicated in the table below-

Table 5.2: Heat Related Illnesses: Clinical Manifestations

Clinical Entity	Cardinal Symptoms	Cardinal / Important Signs	Pertinent Negative findings
Heat rash/Prickly heat/ Miliaria	Itchy Rash with Small Red BUMPS at pores in the skin. Seen in setting of heat exposure; bumps can sometimes be filled with clear or white fluid	Diffused Red Color Skin Or Vesicular Rash , itching of the skin without visible eruption	Not Focal-ly Distributed like a contact dermatitis
Heat Cramps	Painful Spasms of large and frequently used muscle groups	Uncomfortable appearance, may have Difficulty in Fully Extending Affected Limbs/Joints	No contaminated wounds/tetanus exposure; no seizure activity

Clinical Entity	Cardinal Symptoms	Cardinal / Important Signs	Pertinent Negative findings
Heat Exhaustion	Feeling overheated, light headedness, Exhausted and Weak , unsteady, feeling of Vomiting, Sweaty and Thirsty , inability to continue activities	Sweaty/diaphoretic ; flushed skin; hot skin; Normal Core Temperature ; +/- dazed, +/- generalized weakness, slight disorientation	No coincidental signs and symptoms of infection; no focal weakness; no difficulty in swallowing food or speech; no drug/overdose history
Heat Syncope	Feeling hot and weak; light headedness followed by a Brief Loss of Consciousness	Brief, generalized loss of consciousness in hot setting, short period of disorientation, if any	No Seizure Activity , no loss of bowel or bladder continence, no focal weakness, no difficulties in swallowing or speech
Heat Stroke	Severe overheating; profound weakness; Disorientation, Not Fully Alert, Convulsion, Or Other Altered Mental Status	Flushed, Dry Skin (not always), Core Temp $\geq 40^{\circ}\text{C}$ OR 104°F ; altered mental status with disorientation, incoherent behavior, Coma, Convulsion ; tachycardia. +/- hypotension	No coincidental signs and symptoms of infection; no focal weakness; no difficulties in swallowing or speech, no drug/overdose history

Table 5.3: Heat-related illnesses: Summary of Spectrum & treatment

Heat Related Illness	Clinical Presentation	Treatment
Heat edema	<ul style="list-style-type: none"> Mild swelling of feet, ankle and hands Appears in few days of exposure to hot environment Does not progress to pretibial region 	<ul style="list-style-type: none"> Usually resolves spontaneously within days to 6 weeks Elevate leg Compressive stocking Diuretics are not effective
Prickly Heat	<ul style="list-style-type: none"> Pruritic, maculopapular, erythematous rash normally over covered areas of body Itchiness Prolonged or repeated heat exposure may lead to chronic dermatitis 	<ul style="list-style-type: none"> Antihistamine Wear clean, light, loose fitting clothing Avoid sweat generating situations Chlorhexidine in a light cream or lotion base Calamine lotion
Heat Cramps	<ul style="list-style-type: none"> Painful, involuntary, spasmodic contractions of skeletal muscle (calves, thighs and shoulder) Occur in individuals sweating profusely and only drinking water or hypotonic solutions Limited duration Limited to certain muscle group 	<ul style="list-style-type: none"> Fluid and salt replacement (IV or oral) Rest in cool environment
Heat Tetany	<ul style="list-style-type: none"> Hyperventilation Extremity/s and circumoral paresthesia Carpopedal spasm 	<ul style="list-style-type: none"> Calm the patient to reduce respiratory rate Remove from hot environment
Heat Syncope	<ul style="list-style-type: none"> Postural hypotension Commonly in non-acclimatized elderly 	<ul style="list-style-type: none"> Rule out other causes of syncope Removal from hot environment Rest and IV drip

Heat Related Illness	Clinical Presentation	Treatment
Heat Exhaustion	<ul style="list-style-type: none"> • Headache, Nausea, Vomiting • Malaise, Dizziness • Muscle cramps • Temperature less than 40°C or normal • May progress to heat stroke if fails to improve with treatment • No CNS involvement 	<ul style="list-style-type: none"> • Remove the patient from heat stress area • Volume replacement • If there is no response to treatment in 30 minutes, then aggressively cool the patient to core temperature of 39°C
Heat Stroke	<ul style="list-style-type: none"> • Core body temperature greater than 40°C • Signs of CNS dysfunction: Confusion, delirium, ataxia, seizures, coma • Other late findings: anhidrosis, coagulopathy, multiple organ failure 	<ul style="list-style-type: none"> • Remove the patient from heat stress area • Volume replacement • If there is no response to treatment in 30 minutes, then aggressively cool the patient to core temperature of 39°C (further details later in document)

Table 5.6: Health Adaptation plan for heat related illnesses

Diseases	Vulnerability Assessment	Health Sector Role	Risk Reduction Activities
Heat-related Illness	<p>Identifying the heat: vulnerability and the vulnerable groups allow public health practitioners to best prioritize actions and effectively create public health prevention measures. It will help the administration to allocate necessary resources and develop action plans</p> <ul style="list-style-type: none"> • Identify vulnerable groups • Location of vulnerable groups • Isolated members • Power outage area • Maintenance of Data on Heat-Related Deaths and Illness 	<p>Pre-heat season:</p> <ul style="list-style-type: none"> • Create a list of high-risk areas (heat-wise) of districts/blocks/cities • Update surveillance protocols and programs, including tracking daily heat-related data • Develop/revise and translate IEC in local language • Make a communication plan for the dissemination of heat-related alerts or education materials • Check inventories of medical supplies in health centers • Identify cooling centres and barriers to access cooling centres • Capacity building of health care personnel to detect and treat heat-related illnesses • Issue health advisory to healthcare personnel based on IMD seasonal prediction or warning 	<p>Standard Operating Procedure to manage heatwaves</p> <p>Pre-Heat Season (February)</p> <p>Pre-Heat Season is devoted to develop early warning systems, communication plan of alerts to the general public, health care professionals, and voluntary groups (caregivers) with emphasis on training and capacity building of these groups</p> <p>During the Heat Season (March to May)</p> <p>High alert, continuous monitoring of the situation, coordination with all the department's agencies concerned on one hand and general public & media, on the other hand, is the focus of this phase.</p>

Diseases	Vulnerability Assessment	Health Sector Role	Risk Reduction Activities
		<ul style="list-style-type: none"> • Reassess 'Occupational Health Standards' for various types of Occupation. • Ensure Inter-sectoral convergence and coordination for improving architecture, design, energy-efficient cooling and heating facility, increase in plantation i.e. Climate Resilient Green Building Design. • Train medical officers and paramedics to handle heat stress • Coordinate outreach efforts with other community groups, non-profits, and higher education • Coordinate outreach efforts with other community groups, non-profits, and higher education <p>Heat season</p> <ul style="list-style-type: none"> • Ensure real-time surveillance and monitoring system in case of an extreme event. • Equip health facilities with additional materials and manpower • Prepare rapid response team • Distribute "Dos and Don'ts" to the community • Ensure access to Medical Mobile Van in the Red Zone • Ensure strict implementation of legislative/regulatory actions as per Occupational Health Standards. • Expedite recording of cause of death due to heat-related illnesses <p>Post-heat season</p> <ul style="list-style-type: none"> • Participate in the annual evaluation of heat action plan • Review revised heat action plan 	<p>Post -Heat Season (June to October)</p> <p>In Phase – III concentration is on evaluation and updation of the plan. It is important at the end of the summer to evaluate whether the heat-health action plan has worked. Continuous updation of plan is a necessity. Global climate change is projected to further increase the frequency, intensity and duration of heat waves and attributable deaths. Public health prevention measures need to take into consideration the additional threat from climate change and be adjusted over time.</p>

Table 5.7: Role of ministries in heat related illnesses management

Disease	Department	Season	Roles and Responsibilities
Heat-Related Illness	<i>Meteorological Department</i>	Pre-Heat	<ul style="list-style-type: none"> Issue weather forecasts on Short/Medium/Long range duration
		Heat	<ul style="list-style-type: none"> Issue Heat wave alerts Coordination with the health department for analyzing cases and death data with meteorological variables like maximum temperature and relative humidity
		Post-Heat	<ul style="list-style-type: none"> Participate in the annual evaluation of heat action plan Review revised heat action plan
	<i>Department of Drinking Water & Sanitation</i>	Pre-Heat	<ul style="list-style-type: none"> Identify vulnerable places
		Heat	<ul style="list-style-type: none"> Provide drinking water points at identified places and worksites
		Post-Heat	<ul style="list-style-type: none"> Participate in the annual evaluation of heat action plan Review revised heat action plan
	<i>Public Health & Engineering Department</i>	Pre-Heat	<ul style="list-style-type: none"> To construct cool shelters/sheds at public places, bus stands, etc
		Heat	<ul style="list-style-type: none"> To maintain shelters/sheds, bus stands
		Post-Heat	<ul style="list-style-type: none"> Participate in the annual evaluation of heat action plan Review revised heat action plan
	<i>LSGD</i>	Pre-Heat	<ul style="list-style-type: none"> Review the heat preparation measures
		Heat	<ul style="list-style-type: none"> Ensure implementation of guidelines of the heat action plan
		Post-Heat	<ul style="list-style-type: none"> Review the heat preparation measures and make a note of the lessons learned for the next season
<i>Department of Education</i>		Pre-Heat	<ul style="list-style-type: none"> Train and Sensitize teachers and students towards the health impact of extreme events and disseminate health ministry approved prevention and first-aid measures Proper seating and ventilation in classrooms
		Heat	<ul style="list-style-type: none"> Rescheduling school timing during summer During extreme events keep a check on outdoor activities Close teaching institutes in case of issue of alert from Government
		Post-Heat	<ul style="list-style-type: none"> Participate in the annual evaluation of heat action plan Review revised heat action plan
	<i>Department of Labour & employment</i>	Pre-Heat	<ul style="list-style-type: none"> Reassess 'Occupational Health Standards' for various types of Occupation Utilize maps of construction sites to identify more high-risk outdoor workers Heat illness orientation for factory medical officers and general practitioners Communicate directly about heat season with non-factory workers
		Heat	<ul style="list-style-type: none"> Encourage employers to shift outdoor workers' schedules away from peak afternoon hours (1 pm-5 pm) during a heat alert or consider extended afternoon break or alternate working hours for workers Provide water at work sites
		Post-Heat	<ul style="list-style-type: none"> Participate in the annual evaluation of heat action plan Review revised heat action plan

Disease	Department	Season	Roles and Responsibilities				
	Department of Power supply	Pre-Heat	<ul style="list-style-type: none"> Maintenance of electrical lines 				
		Heat	<ul style="list-style-type: none"> Ensure uninterrupted supply of electricity 				
		Post-Heat	<ul style="list-style-type: none"> Participate in the annual evaluation of heat action plan Review revised heat action plan 				
	Department of Forest & Climate change	Pre-Heat	<ul style="list-style-type: none"> Develop/encourage projects to decrease the 'Urban Heat Island effect' 				
		Heat	<ul style="list-style-type: none"> Ensure implementation of guidelines of the heat action plan 				
		Post-Heat	<ul style="list-style-type: none"> Review the heat preparation measures and make a note of the lessons learned for the next season 				
	Department of Transport	Pre-Heat	<ul style="list-style-type: none"> Review the road map for preparation for the heat season 				
		Heat	<ul style="list-style-type: none"> Ensure implementation of guidelines of heat action plan 				
		Post-Heat	<ul style="list-style-type: none"> Participate in the annual evaluation of heat action plan Review revised heat action plan 				
	Media or Press Officer	Pre-Heat	<ul style="list-style-type: none"> Secure commercial airtime slots for public service announcements Identify areas to post warnings and information during heat season Activate telephone heat hotline Begin placing temperature forecasts in newspapers Increase installed LED screens with scrolling temperature 				
		Heat	<ul style="list-style-type: none"> Issue heat warnings in heat and electronic media Contact local FM radio and TV stations for announcements Use SMS, text and WhatsApp mobile messaging and centralized mobile databases to send warnings Contact transport department to place warnings on buses 				
		Post-Heat	<ul style="list-style-type: none"> Evaluate reach of advertising to target groups and other means of communication such as social media 				

Detailed IEC and Dissemination Plan-

Key Messaging	IEC material	Medium of Dissemination	Frequency	Timeline	Budget (year wise) in Lakhs				
					Year 1	Y2	Y3	Y4	Y5
HCF level	Posters	Wall posters, Board posters, Wall painting	1-2 at each HF 1-2 at each HF 1-2 at each HF	Throughout the year	1	2	3	4	5
	Audio clips	Audio clips broadcasted on mass media & social media platform on relevant CSI	1-2	February – June,	1	2	3	4	5
	Videos	Video clips broadcasted mass media & social media platform on relevant CSI	1-2	February - June,	1	2	3	4	5
	Outdoor	Advertisement	5 -10 per	Throughout	1	2	3	4	5

	activities	on buses	district	the year						
Community Level	Awareness meetings	At community gatherings	3-4 per year / district	Festival, VHSND etc	1	2	3	4	5	
	Rallies	Community engagement or volunteering	2-3 per year / district	Relevant days eg: World environment Day	1	2	3	4	5	
	Competitions	Quiz, poster designing etc	2-3 per year / district	Relevant days eg: World environment Day	1	2	3	4	5	

b.

2. International and national Environmental related dates will be celebrated to create the awareness

In order to inspire others to take actions on climate change, it is important to increase environmental awareness. One way to do so is by encouraging people to observe and promote the different environmental events and world day campaigns that are scheduled globally and nationally throughout the year. This provides an opportunity for people to collectively learn about and participate in sustainable practices together.

Please include a table-

Key Days	Date	Activities	Budget
World Environment Day	June 5	Awareness talks, sapling planting	1 lakh
World Heat Action Day	June 14	Awareness talks, Ralleys, Cool Roof Campaigns	1 Lakh
World Environment Health Day	September 26	Awareness talks, environment clean up campaigns	1 Lakh
International Day for Disaster Risk Reduction	October 13	Risk awareness and disaster reduction sessions in vulnerable areas	1 Lakh
International Day for Climate Action	October 24	Awareness talks, Climate action pledges	1 lakh

Capacity building.

Medical professional training:

- c. Expanded training of doctors and associate staff
- d. Increased training of NGOs and ASHA workers

Capacity Building

Training Programme	Duration of Trainings	Refresher Training schedule	Prioritized districts	Budget (year wise) in Lakhs				
				Y1	Y2	Y3	Y4	Y5
Medical Officers	3 days	1 day	All districts	14	14	14	14	14
Community Health care workers	2 days	1 day	All districts	7	7	7	7	7
Panchayati Raj Institutions	1 day		All districts	14	14	14	14	14

CHAPTER 8

HEALTH ADAPTATION PLAN FOR VECTOR BORNE DISEASES

Introduction

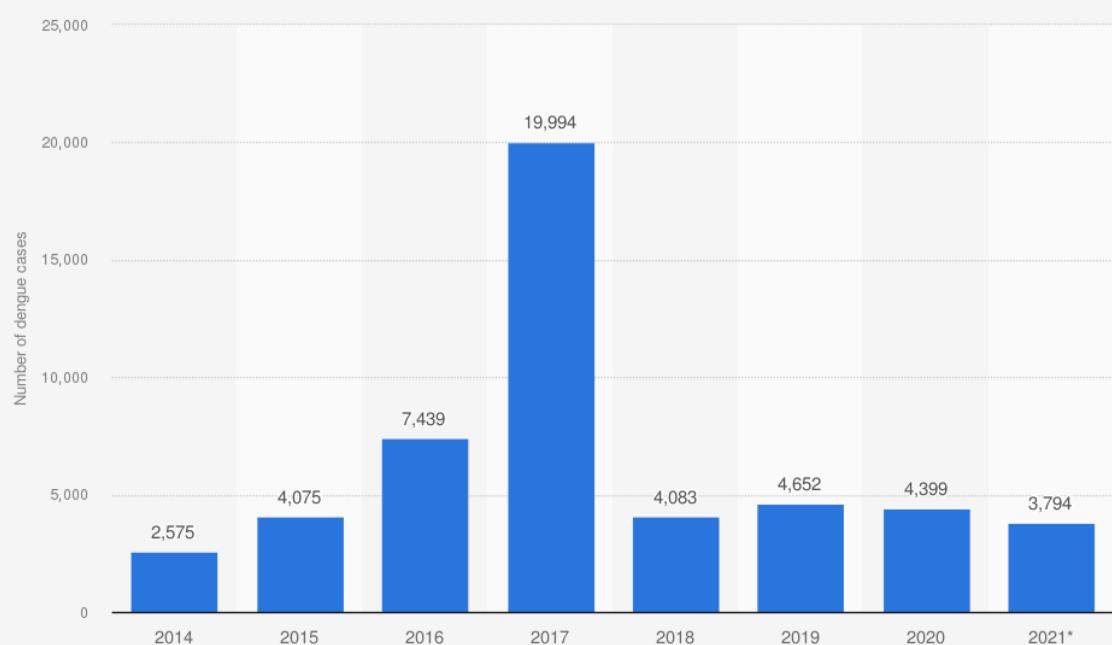
a. Vector Borne diseases and vulnerable districts

Instances of vector borne diseases like dengue, malaria, Japanese encephalitis, scrub typhus etc. have seen a marked increase in many districts of the state adding to the morbidity and mortality. Transmitted by Aedes mosquitoes, dengue is a fast-growing challenge, particularly in the coastal areas of Kerala in recent years. Female Aedes aegypti mosquito, vector of dengue, chikungunya, and zika are highly sensitive to climate conditions. Any disease caused, transmitted, or harboured by insects, snails, and other cold-blooded animals can be affected by a changing climate e.g., lyme disease and tick-borne encephalitis, salmonella, and other food borne infections. Change in pattern of infectious disease with reference to the climatic factors is expected in coming years in the state. Considering the geography of the state, people living in coastal regions, water logged areas, and hilly areas are all particularly vulnerable in different ways.

Dengue

Dengue has now become the single largest vector borne disease in the state, endemic in all the districts. Till 2015, the disease was more prevalent in districts like Thiruvananthapuram, Kollam, Kottayam, Pathanamthitta, Kozhikode and Malappuram. But in 2017, all the districts reported dengue in large numbers. The main reason for this wide spread distribution is believed to be due to the changes in the environmental factors causing proliferation of the dengue vector-Aedes mosquitoes. During the rainy seasons, survival of the virus increases which leads to outbreak of the disease all most throughout the state. The below table shows number of dengue cases reported in Kerala between 2015 – 2021.

Number of dengue cases across Kerala in India from 2014 to 2021



Majority of dengue fever cases in 2017 was reported in the Trivandrum district with 8955 confirmed cases. This was followed by Kollam district which lies close to Trivandrum with 2857 confirmed cases. In 2021 Ernakulam and Trivandrum districts reported the majority of cases with 945 and 485 cases respectively.

Leptospirosis

The only epidemic-prone infection which can be transmitted directly from contaminated water is leptospirosis, a zoonotic bacterial disease. In 2012-13 a major epidemic of Leptospirosis occurred affecting most of the northern districts, following which the disease has become endemic in Kerala. Transmission occurs through contact of the skin and mucous membranes with water, damp soil or vegetation or mud contaminated with rodent urine. The occurrence of flooding after heavy rainfall facilitates the spread of the organism due to the proliferation of rodents which shed large amounts of leptospirosis in their urine. In 2020, there were 568 cases and 19 deaths reported up to August 2020. District wise number of patients treated and death reported affecting Leptospirosis in 2019-20 and 2020-21 are given below.

District wise number of Patients treated and death reported – Leptospirosis 2019-20 and 2020-21 (up to August 31)					
Sl. No.	District	Leptospirosis			
		2019-20		2020-21	
		Patients Treated	Death reported	Patients Treated	Death reported
1	2	3	4	5	6
1	Thiruvananthapuram	220	10	122	6
2	Kollam	68	6	34	3
3	Pathanamthitta	78	1	69	0
4	Idukki	22	1	12	0
5	Kottayam	80	3	60	2
6	Alappuzha	188	4	74	1
7	Ernakulam	41	4	11	0
8	Thrissur	16	9	10	1
9	Palakkad	55	2	9	1
10	Malappuram	129	3	18	0
11	Kozhikode	168	6	25	2
12	Wayanad	83	7	108	3
13	Kannur	42	1	14	0
14	Kasaragod	21	0	2	0
STATE		1211	57	568	19

Chikungunya

According to the WHO, Chikungunya has been identified in over 60 countries in Asia, Africa, Europe and the Americas. Believed to have originated in the remote islands in Arabian Sea in 2005-06, it spread rapidly over Kerala within the next two years, affecting more than 80 per cent of the population. Fortunately, the disease is fading out, and has resulted in life long immunity for the affected population, a blessing in disguise. The virus is transmitted from human to human by the bites of infected female mosquitoes. Most commonly, the mosquitoes involved are Aedes aegypti and Aedes albopictus. The past few years have seen only sporadic cases in Kerala. The below table gives the total number of confirmed cases of Chikungunya in Kerala. In 2021, out of 334 cases in the state 315 cases were reported from Trivandrum district.

	Cases	Cases	Cases	Cases	Cases	Cases
	74	77	109	752	334	26

source: National Centre For Vector Borne Disease Control.

Malaria

Malaria is caused by Plasmodium parasites. The parasites are spread to people through the bites of infected female Anopheles mosquitoes. Though Kerala had eliminated the disease in early 1970s, Malaria has now re-emerged as a public health challenge. The problem is recently aggravated due to the presence of large-scale population movement from malaria endemic states. Rapid urbanisation, extensive infrastructure development in many districts, uncontrolled construction works in urban area, and climate related changes in life cycle of mosquitoes remain big hurdles. Annual cases of malaria in Kerala are less than 2,000 and the number of deaths reported is also very low, but the major issue here is the increase in foci of indigenous malaria. Thiruvananthapuram, Kollam, Kozhikode, Malappuram, and Kannur districts have pockets of indigenous malaria over the past few years. Kasaragod district is persistently having high number of malaria cases, over many years, because of its proximity to the highly endemic districts of Karnataka. Movement of fishermen along the western coast of Kerala is a potential threat for the spread of malaria along the coastal districts. In 2021, Ernakulam and Trivandrum districts reported the maximum cases with 41 and 39 cases respectively. The below table gives total number of Malaria and deaths in Kerala.

State	2017		2018		2019		2020		2021	
Kerala	No. of cases	Deaths								
	1194	2	908	2	656	1	268	1	309	1

source: <http://www.kerenvis.nic.in/> and DHS

Japanese Encephalitis, Acute Encephalitis Syndrome

Japanese Encephalitis (JE), a mosquito borne zoonotic viral disease is one of the causes under AES. The outbreak of JE usually coincides with the monsoon and post monsoon period when the density of mosquitoes increases while encephalitis due to other viruses specially enteroviruses occurs throughout the year as it is a water borne disease.

Disease	2018		2019		2020		2021	
	Cases	Death	Cases	Death	Cases	Death	Cases	Death
AES (Sus JE)	28	15	49	7	15	4	36	1
JE	5	2	11	2	0	0	0	0

source: IDSP, DHS

Scrub typhus

Scrub typhus is a mite-borne infectious disease caused by *Orientia tsutsugamushi* (previously called *Rickettsia tsutsugamushi*). Scrub typhus is manifested clinically by high fever, intense generalized headache, diffuse myalgias, and, in many patients, rash and an eschar at the site of the chigger bite. The diagnosis is suggested by the clinical history (including visit to an endemic area) and physical findings and confirmed by serologic testing or biopsy of an eschar. 423 cases of scrub typhus was reported in the year 2020, and 438 cases were reported in 2021. In both these years three out of four cases got reported from Trivandrum district.

Disease	2018		2019		2020		2021	
	Cases	Death	Cases	Death	Cases	Death	Cases	Death
Scrub typhus	400	6	579	14	423	8	438	6

source: IDSP, DHS

Lymphatic filariasis

Two important strategies coined for elimination of Lymphatic Filariasis is to reduce the transmission of Lymphatic Filariasis and to prevent the morbidity and disability of already affected people with lymphoedema and hydrocele. As a part of it, Kerala is conducting Annual Mass Drug Administration

Programme since 2004 so as to enable the state to achieve reduction in Lymphatic Filariasis transmission in 9 out of 11 endemic districts. Pathanamthitta, Idukki and Wayanad are the non-endemic districts. In addition to MDA, migrant screening is an important activity in all districts that have completed MDA programme, to prevent the resurgence.

Kala azar

Visceral leishmaniasis, also known as kala-azar is fatal if left untreated in over 95% of cases. It is characterized by irregular bouts of fever, weight loss, enlargement of the spleen and liver, and anaemia. Most cases occur in Brazil, East Africa and in India. When Kannur district reported a single case of Kala azar in 2020, another case was reported in 2021 from the Palakkad district.

Kyasanur Forest Disease (KFD)

KFD is a tick-borne viral haemorrhagic fever endemic in Karnataka state. It is also referred as monkey fever by local people. During 2012-13, disease was reported from new districts and new states in India. These include Charmarajanagar district of Karnataka, Wayanad and Malappuram districts of Kerala and Nilgiri district in Tamil Nadu. Also, 29 cases of KFD got reported in Kerala and 4 cases got reported at Wayanad district in 2021.

Districts vulnerable to VBD

Name of Disease	Priority districts
Malaria	Kasaragod, Kozhikode, Ernakulam, Thrissur, Malappuram and Kannur
Dengue	Thiruvananthapuram, Kollam, Palakkad, Alappuzha, Malappuram, Kozhikode
Chikungunya	Thiruvananthapuram, Thrissur
JE	Kozhikode, Thrissur
Kala azar	Malappuram, Kollam, Kannur, Thrissur
Scrub typhus	Thiruvananthapuram, Wayanad, Kozhikode, Kollam
West Nile	Kozhikode, Malappuram
KFD	Wayanad, Malappuram

Table 9.2 The Priority Districts for Vector Borne diseases (according to Prevalence in the past years)

Role of Health Sector (State Nodal Officer and Task Force)

1. Programme Officer for National Programs for control of vector borne diseases (NVBDCP) must consider climate variability as an important factor for assessment of morbidity and mortality statistics and develop/ adapt health micro-plan based on recent VBD diseases trend in integration with NPCCHH Programme
2. Map vulnerabilities: population at risk, geo-climatic conditions, seasonal variation, change in population demography, migration (in & out), available resources, healthcare infrastructure, laboratories, etc.
3. Strengthen/ Develop active and passive surveillance and establish sentinel sites for vector borne diseases.

4. Capacity building and increasing awareness for individuals, communities, health care workers through involvement of various media as well as campaigns and training workshops.
5. Develop or translate IEC on effects of climate change on VBDs in local language, and make a communication plan for dissemination of health-related alerts/ education materials.
6. Ensure adequate logistic support, including equipment and other treatment modalities and supplies for case management at all levels of health care and also under ‘Emergency response Plan’ in case of any disaster or an outbreak
7. Vaccination of animals and animal handlers for vaccine preventable diseases.
8. ‘Environmental Health Impact Assessment’ of new development projects
9. Early warning system for vector borne diseases.
10. Enforce legislation and regulations of vector borne diseases

Coordination with other sectors for reducing Zoonotic diseases

(As per the suggested sectors in the NVBDCP)

- Inter-sectoral collaboration for vector control
- Providing equipment and other related logistics for control of vectors
- Elimination and reduction of vector breeding sites.
- Encourage research on new safe and effective control measures

Intervention by veterinary task force

- Prevention and control of animal diseases and zoonoses
- Vaccination of animals & control on population of stray animals
- Safe destruction of carcasses and other material of animal origin
- Piggeries must be protected with mosquito nets
- Involve in surveillance, epidemiological investigation of VBDs.
- The care of ‘food animals’, including collection, feeding, sheltering, slaughtering etc

Intervention by Community & Individual

- Eliminate/ control small & manmade vector breeding sites
- Make barriers for human dwellings to keep stray animals away from human dwellings by fencing the residential areas especially if in approximation to forests etc.
- House protection by using screening windows, doors and fencing the garden etc.
- Use self-protection measures like protective clothing etc,

2.2 Mechanism of Generation of Alert system for the outbreak of Vector Borne diseases.

Early Warning Signals recognised by Syndromic, presumptive and laboratory surveillance and vector surveillance will be utilised for generating alert system for the outbreaks.

Make a detailed action plan with checklist for the Vector Borne diseases:

- Logistics required at health care facilities
- Preparedness of health system and personnel
- List activities for prevention of illnesses (IEC, pamphlets, advisories, training, workshop etc).
- Operational communication channel
- Mechanism to ensure data maintenance, surveillance, timely sharing with concerned departments and stakeholders.

Action Plan for prevention and control of VBDs

Activities to be conducted in connection with NPCCHH

1. IT based Information System- NAMMIS/IDSP/IHIP- IT based data management system.

Necessary financial & logistic support, building technical capacity of programme officers for timely analysis & interpretation of data, ensuring proper communication channels- SMS, email, telephone calls etc will be done. Data entry operators needed at state and districts.

2. Notification- immediate reporting of all confirmed cases and deaths from public and private sectors to nearest local health authority/DMLO/SSO through **SMS/Mail/Phone**. Concerned MOs/Supdts/RMOs will be responsible in Govt institutions and in private hospitals one nodal person will be identified and designated for this.

3. Epidemic preparedness- monitoring of early warning signals through IDSP & NVBDCP and timely investigation and initiation of control measures to be done by the RRT/DSO/DMLO/PHC team. Establishment of state, district and block level rapid response teams for rapid outbreak investigation and containment. Logistic availability including drugs, insecticides, equipment and other items for outbreak control to be ensured by DMLO.

4. Entomological Surveillance- all major breeding places will be mapped and anti-larval operations will be carried out on regular and systematic manner by the Biologist and his team (DVCU) and also by the regional entomology units. The activity will be monitored by the State entomology team.

- Larval surveys
- Adult mosquito survey

5. Health System Strengthening

Infra structure- by the concerned DMOs through Superintendents/MOs/DMLO/Biologists

- Ensure adequate diagnostic and treatment facilities in all SC/PHCs/CHCs & Hospitals.
- Strengthening of all District Vector control units (DVCU) with necessary HR & other
- Logistics including insecticides, equipment and vehicle for vector control.
- Upgrading of existing two DVC units at Ernakulum& Kozhikode as regional entomology units with adequate supportive staff on contract basis &necessary logistics including mobility support. A new zonal entomology unit is proposed at PTA.

- Strengthening of State Entomology unit at head-quarters with adequate supportive staff & necessary logistics including vehicle/mobility support by SPO.

6. Inter-sectoral Involvement-

Define the roles and responsibilities of concerned departments like LSGD, Labour, Irrigation, Water resources, PWD, Fisheries, Industries/Corporate sectors, Forest, Agriculture, Public Relation etc in disease control and monitoring of their activities will be done at State level by Chief Secretary (SMC) and at district by the District Collectors (DCC).

Private health sector involvement- through IMA/IAP/QPMPA- for proper patient care, timely reporting of health outcomes including deaths. Involvement of Private laboratories in testing and reporting malaria cases to the local health authority is also to be ensured. Other health sectors like Insurance dept, Medical education, Military, Railways and other systems like AYUSH to be ensured.

7.1 Awareness generation on the health impacts of VBDs

1. Advertisement and promotion through IEC:

- Street plays
- Notices, Posters, Hoards, billboards, as and other advertisement modes
- Arogya sandesayathra
- Press releases, press conferences

As per the above suggested, IEC dissemination plan to be included

2. Trainings

- For doctors and paramedical staff
- Awareness classes to people's representatives, teachers, students, other dept staff, NGOs and Asha workers , Health squads

3. Carry out awareness cum action campaigns

4. Promote a culture of risk prevention, mitigation, and better risk management

5. Promote attitude and behaviour change in the awareness campaigns linking air pollution and climate change.

6. Engage local and regional media (community radio, TV)

7. Observation of Day/Week/Month with respect to VBDs

Capacity Building.

Strengthening of surveillance related to Vector-Borne illnesses

Data collection and analysis being conducted through IDSP and NVBDCP staff from sub centre level to the state level.

EWARS: Under EWARS in the state, 3 districts has been identified to pilot activities and data regarding dengue reporting in the web based data collection. Through the data analysis from the EWARS data base,

dengue outbreaks can be predicted and measures can be obtained to prevent these outbreaks.

Activities proposed-

1. GIS to be utilised for data collection and analysis
2. Computer or Laptop facility for all Field staff
3. Posting of sufficient number of manpower in urban areas for data collection as well as prevention and control activities.
4. Posting of sufficient no. of JHIs so as to make it equal to no. of JPHNs

9. Operational Research through Medical colleges, VCRC, NCDC, ICMR, ISRO etc

Studies on anti-malarial Drug resistance, Insecticide susceptibility in mosquito vectors, disease and vector mapping using GIS etc will be done for evaluating progress of elimination activities.

In Kerala, 1st and 2nd TAS were successfully completed in 9 districts.

District Vector Control Unit will be involved in Vector surveillance and vector control activities against all Vector- borne diseases including lymphatic filariasis.

Detailed IEC and Dissemination Plan-

Key Messaging	IEC material	Medium of Dissemination	Frequency	Timeline	Budget (year wise) in Lakhs				
					Year 1	Y2	Y3	Y4	Y5
HCF level	Posters	Wall posters, Board posters, Wall painting	1-2 at each HF 1-2 at each HF 1-2 at each HF	Throughout the year	1	2	3	4	5
	Audio clips	Audio clips broadcasted on mass media & social media platform on relevant CSI	1-2	May-August (premonsoon & Monsoon season)	1	2	3	4	5
	Videos	Video clips broadcasted mass media & social media platform on relevant CSI	1-2	May - August	1	2	3	4	5
	Outdoor activities	Advertisement on buses	5 -10 per district	Throughout the year	1	2	3	4	5
Community Level	Awareness meetings	At community gatherings	3-4 per year / district	Festival, VHSND etc	1	2	3	4	5
	Rallies	Community engagement or volunteering	2-3 per year / district	Relevant days eg: World environment Day	1	2	3	4	5
	Competitions	Quiz, poster designing etc	2-3 per year / district	Relevant days eg: World environment Day	1	2	3	4	5

c.

2. International and national Environmental related dates will be celebrated to create the awareness

In order to inspire others to take actions on climate change, it is important to increase environmental awareness. One way to do so is by encouraging people to observe and promote the different environmental events and world day campaigns that are scheduled globally and nationally throughout the year. Following key days will therefore be celebrated in the state-

Key Days	Date	Activities	Budget
World Malaria Day	April 25	Awareness Talks, Ralleys, Source reduction Activities	1 Lakh
World Dengue Day	May 16	Awareness Talks, Ralleys, Source reduction Activities	1 Lakh
World Environment Day	June 5	Awareness talks, sapling planting	1 Lakh
World Environment Health Day	September 26	Awareness talks, environment clean up campaigns	1 Lakh
International Day for Climate Action	October 24	Awareness talks, Climate action pledges	1 lakh

Capacity building.

Medical professional training:

- e. Expanded training of doctors and associate staff
- f. Increased training of NGOs and ASHA workers

Capacity Building

Training Programme	Duration of Trainings	Refresher Training schedule	Prioritized districts	Budget (year wise) in Lakhs				
				Y1	Y2	Y3	Y4	Y5
Medical Officers	3 days	1 day	All districts	14	14	14	14	14
Community Health care workers	2 days	1 day	All districts	7	7	7	7	7
Panchayati Raj Institutions	1 day		All districts	14	14	14	14	14

CHAPTER 9

Health Adaptation Plan for Climate Resilient Healthcare facilities

‘Resilience’ may be defined as the “capacity of a social-ecological system to cope with a hazardous event or disturbance, responding or reorganizing in ways that maintain its essential function, identity, and structure, while also maintaining the capacity for adaptation, learning and transformation.” Accordingly, a climate resilient health system may be defined as the one that is capable to anticipate, respond to, cope with, recover from and adapt to climate-related shocks and stress, so as to bring sustained improvements in population health, despite an unstable climate. (WHO,2015)

To strengthen the healthcare system in the state and make it resilient, the state will engage in following-

- a) Undertake reviews of the State’s health infrastructure and potential climate change related vulnerabilities and risks (and where such infrastructure is found to be at high risk, retrofit to make these more climate resilient), for example prepare contingency plans for alternative methods of energy generation during electricity blackouts in health facilities
- b) Set up early warning systems and emergency response to deal with climate induced extreme weather events like floods, storm surges, cyclones, heat waves, droughts etc.
- c) Set up systems of effective monitoring the spread of infectious diseases, heat stress and air pollution and setting up of early warning systems and health advisories
- d) Undertake measures to manage increased vector borne and water borne disease burden
- e) Design and deploy improved approaches to deal with heat and wave conditions
- f) Set up mechanisms to deal with the physical and psychological impacts post-extreme weather events
- g) Inter sectoral collaboration in addressing floods, drought, malnutrition, and food security issues
- h) Addressing food safety arising due to increased ambient temperature and extreme events
- i) Create awareness in public on the health hazards from climatic change
- j) Produce Information Education and Communication and Behavioral Change Communication material on disease/risk specific contexts like air pollution, floods, droughts etc
- k) Build capacity among the health professionals through trainings and sensitization programs;
- l) All medical and paramedical staff to be sensitized and have to accept responsibility for taking action to mitigate climate change. Capacity building and training of the all-medical personnel of districts including the frontline functionaries and personnel associated with various programs such as the Integrated Disease Surveillance Program (IDSP), Sentinel Surveillance on Acute Respiratory Incidence (ARI) etc in the State to identify the early signs of extreme climatic effects on the population

m) Developing and strengthening of disaster management teams in every district hospital specifically to respond to the effect of extreme climate changes.

Green (Environmentally friendly and sustainable measures) and Climate Resilient Infrastructure

Initial activities considered on adoption of Green and Climate Resilient healthcare facilities infrastructures are as following

1. Energy Auditing of the Healthcare Facilities for Energy Efficiency level in the HCFs (Carbon Emissions Reduction Measures from health sector)

- The Healthcare Facilities is one of the major contributors to energy consumption and greenhouse gases (GHG) emissions. The fundamental goal of energy management is to produce goods and provide services with the least cost and least environmental effect.
- The scope of the activity would be the identification of energy saving schemes in the facility along with the cost-benefit analysis. The study would cover field measurements and data analysis to identify saving possibilities in the utilities. All the level of Healthcare facilities (PHC and above) will be considered for conducting the energy audit

2. Replacement of existing (non-LED) lighting with LED in Healthcare Facilities (Energy Efficiency Measures to reduce carbon emissions HCFs)

- LEDs use one-third of the energy consumed by fluorescents, and their lifespan is five years longer. By making the switch to LEDs, hospitals and health systems can minimize maintenance costs, improve quality of lighting, and reduce emissions.
- So, in order to reduce the carbon emission Healthcare facilities (PHC and above) to preferably utilize LED in Healthcare Facilities.

3. Installation of Solar Panels in Healthcare Facilities

- Health-care facilities can significantly cut greenhouse gas emissions and energy costs over time by using alternative forms of clean and renewable energy – such as solar energy.
- For hospitals, alternative energy means an initial investment with potential savings later on. For regions that have no access to electricity, alternative energy sources can fuel primary health-care facilities in even the most remote areas.
- Finally, alternative sources of energy give health facilities an advantage in terms of disaster preparedness, since alternative energy sources are less vulnerable to disruption than traditional fossil fuel systems.

4. Install Rainwater Harvesting System in Healthcare Facilities

- Rainwater harvesting (RWH) is promoted as a climate change adaptation measure to relieve urban water supply and drainage pressures. Rainwater harvesting for healthcare facilities has the potential to save thousands of litres of mains water every year. This turn can result in substantial cost savings and of course contribute to alleviating stormwater run-off.
- **5. Retrofitting Healthcare Facility Infrastructure (Climate/ Disaster resilient) in Districts as per IPHS guidelines.**
- A climate resilient healthcare system is one that ensures an adaptive framework that helps it respond adequately and appropriately in the event of an acute climatic event.
- Health care facilities need to take effective measures to withstand the impacts of increasing extreme weather events and other climate-related hazards such as higher temperatures, increasing precipitation over longer periods of time (causing increased flooding), intense but short-lived rainfall (causing flash flooding), decreasing precipitation (affecting places where rainwater harvesting contributes to the water supply systems of health care facilities), and higher winds and storms.
- Thus, with climate change increasing the risk of severe impacts on health care facilities and placing complex, multifaceted and unpredictable demands on health systems, all new investments in the health sector should contribute to building resilience to climate change.

Green & Climate Resilient Healthcare Infrastructure

A Green & Climate Resilient Healthcare Infrastructure

Output	Activities	Unit Cost				Target	
			2022-23	2023-24	2024-25	2025-26	2026-27
Green Measures in Healthcare Facilities	Energy auditing in PHC	@Rs.10,000 for CHC @ Rs.30,000 for DH	100% of the districts in which 20% of health care facilities done energy audit	100% of districts in which 35% of health care facilities done energy audit	100% of districts in which 50 % of health care facilities done energy audit	100% of districts in which 75% of health care facilities done energy audit	100% of districts in which 100 % of health care facilities done energy audit
	Replace existing lighting (Non- LED) with LED	@Rs.25000 for PHC @Rs.75000 for CHC @Rs.2,00,000 for DH	100% of the districts in which 10% of health care facilities have replaced existing lighting facility with LED	100% of districts in which 30% of health care facilities have replaced existing lighting facility with LED	100% of districts in which 50% of health care facilities have replaced existing lighting facility with LED	100 % of districts in which 75% of health care facilities have replaced existing lighting facility with LED	100% of districts in which 100% of health care facilities have replaced existing lighting facility with LED
	Installation of Solar Panels	@ Rs.2,00,000 for PHC @Rs.5,00,000 for CHC @Rs.10,00,000 for DH	20% of the districts in which 5% of health care facilities have installed solar panel	35% of districts in which 20% of health care facilities have installed solar panel	50% of districts in which 50% of health care facilities have installed solar panel	75% of districts in which 75% of health care facilities have installed solar panel	100% of districts in which 100% of health care facilities have installed solar panel
	Install Rainwater Harvesting System	@Rs.1,00,000 for PHC @Rs.2,00,000 for CHC @Rs.3,00,000 for DH	100% of the districts in which 5% of health care facilities installed rain water harvesting system	100% of districts in which 30% of health care facilities installed rain water harvesting system	100% of districts in which 50% of health care facilities installed rain water harvesting system	100% of districts in which 75 of health care facilities installed rain water harvesting system	100% of districts in which 100% of health care facilities installed rain water harvesting system

Clima te Resili ent Healthcare faciliti (Climate/ es Disaster infras tructu re in Districts as per IPHS guidelines.	Retrofittin g Healthcare Facility Infrastruct ure faciliti (Climate/ es Disaster infras tructu re in Districts as per IPHS guidelines.	@5,00,000 per Healthcare facility	10% Districts with at least one climate resilient healthcare facility complying IPHS guideline	20% Districts with at least two climate resilient healthcare facility complying IPHS guideline	50% Districts with at least five climate resilient healthcare facility complying IPHS guideline	75% Districts with at least ten climate resilient healthcare facility complying IPHS guideline	100% Districts with at least ten climate resilient healthcare facility complying IPHS guideline
--	--	---	--	---	--	---	--

By these short term and long term activities, the state plans to promote green hospitals utilising natural resources in an energy efficient manner. Main focus is to reduce energy consumption and reduce CO2 emission. Optimum use of solar energy, maximising day light and optimising artificial lighting requirement with low energy LED lighting and task lights, maximising cross ventilations, maintaining indoor gardens, safe handling and disposal of hospital wastes, waste recycling and purchasing products which are environmentally friendly and safe, incorporating measures in building design for making it climate resilient, promoting technologies which reduce harmful chemicals emission and carbon foot-print and more use of energy-efficient equipment and services. The plan for greening hospitals will be incorporated to Chief Minister's Aardram Mission to make hospitals people's friendly.

Chapter 10

Health Action plan on Disaster management

Kerala state is frequently ravaged by the disastrous consequences of numerous hazards and hence it is a multi-hazard prone State. The State is prone to natural disasters like;

- Flood (Riverine, Urban and Flash Floods)
- Landslides (includes debris flows, rock fall, rock avalanche, rock slide, landslips and mud slips)
- Drought
- Coastal hazards (High waves, Storm surges, Kallakadal, Tsunami, Salt Water Intrusion, Coastal erosion)
- Wind (Cyclone, Gusty winds)
- Lightning
- Earthquakes.

The high density population of 860 people/ sq kms (2011 Census), narrow roads, high density of road network, density of coastal population and the general higher standard of living of the public as compared to the rest of the country are factors that increase the vulnerability of the population to disasters.

Alappuzha is the most flood susceptible district with flood prone area of 762.6 sq kms. This is closely followed by Ernakulam district with 718.9 sq kms of flood prone area. Idukki with 388.38 sq kms in high hazard zonation area is the most susceptible district to landslides. Further there are 24 taluks which are susceptible to coastal hazards. The below attached are the maps showing susceptible areas of State to various hazards.

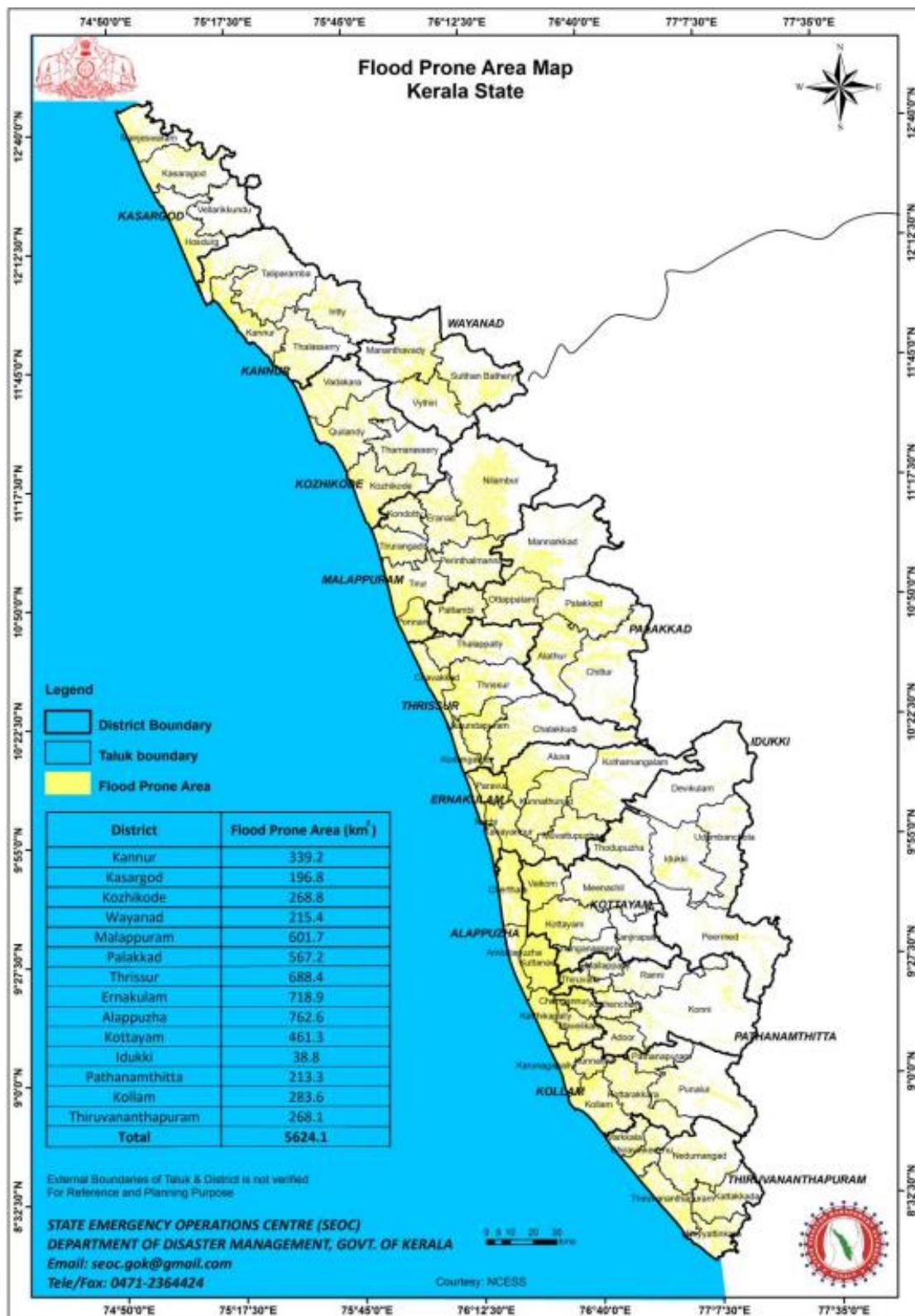


Figure: Flood susceptibility map of Kerala

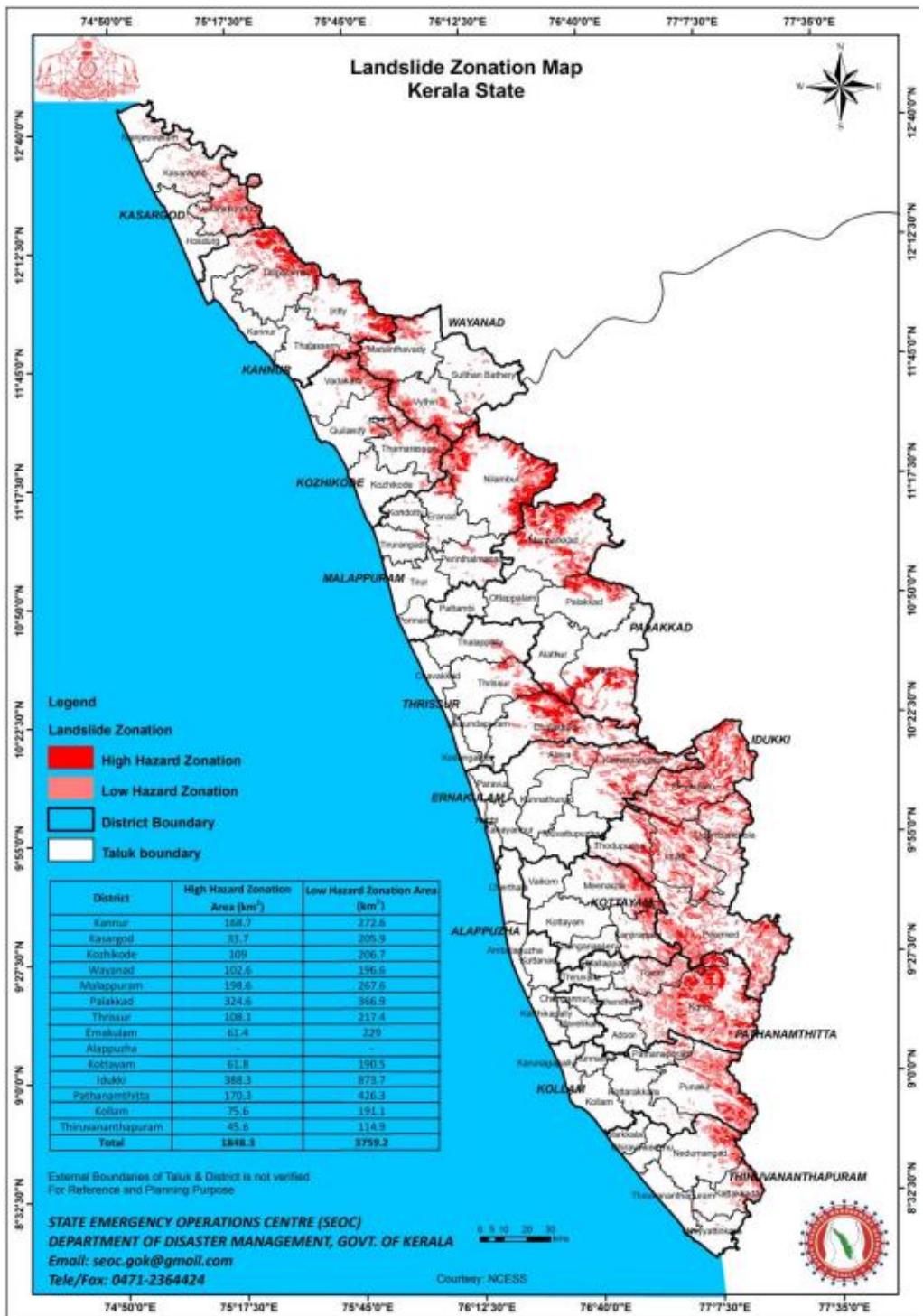


Figure: Landslide susceptibility map of Kerala

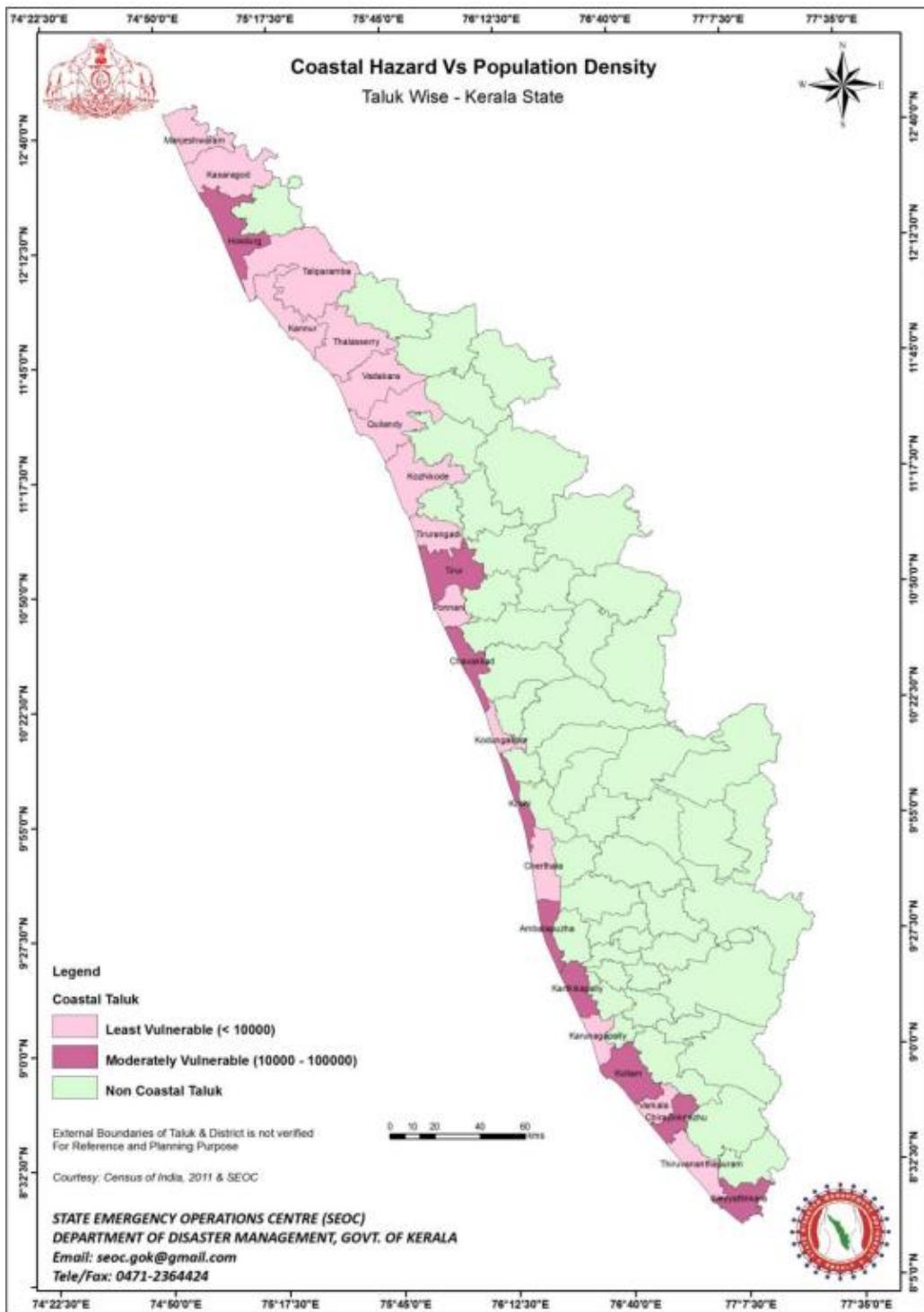


Figure: Coastal taluk susceptibility map of Kerala

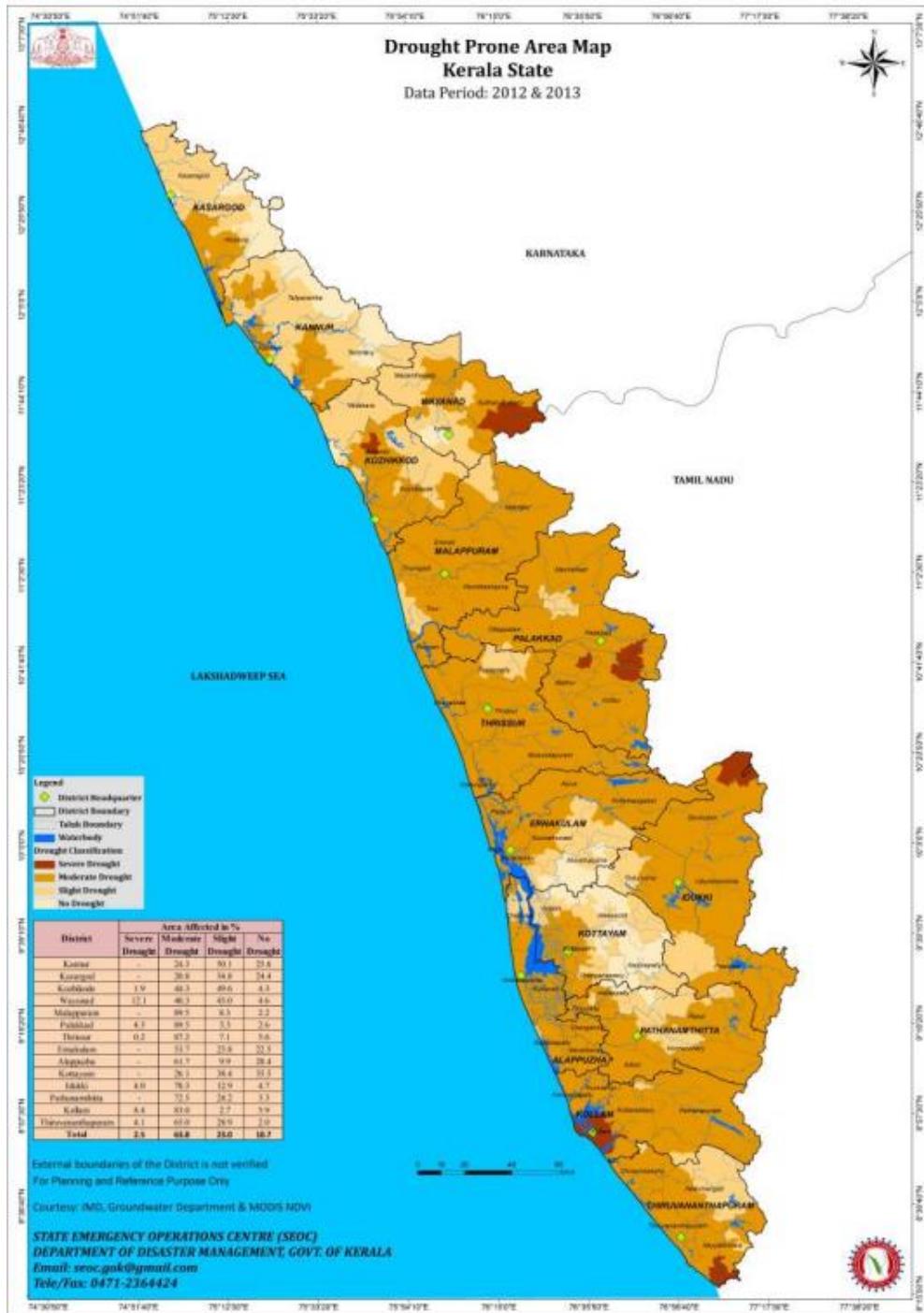


Figure: Drought susceptibility map of Kerala

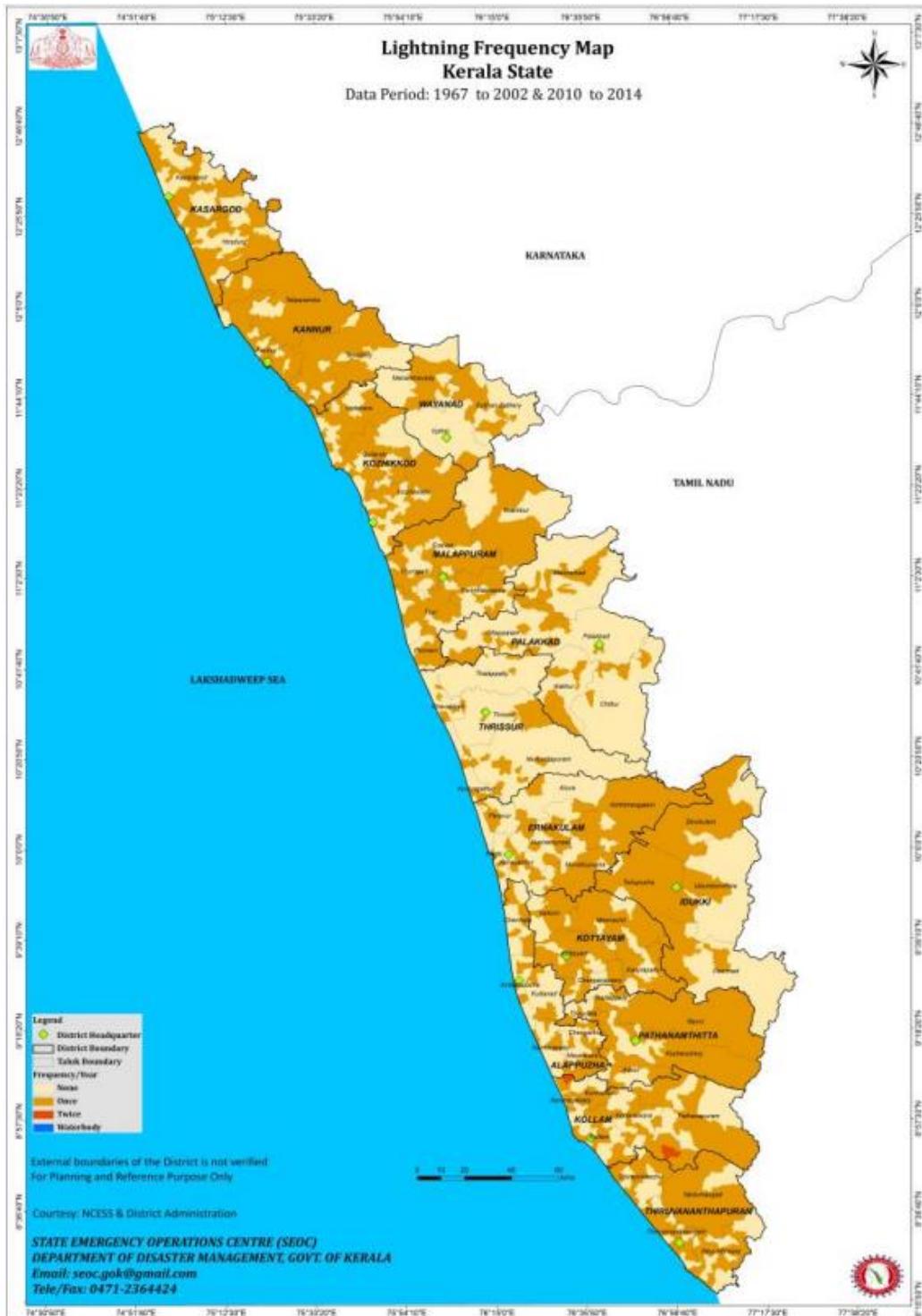


Figure: Lightning susceptibility map of Kerala

(A) IEC activities

Target population: Demographically vulnerable population to the specific disaster, people at extremes of age(>65yrs, children), Socioeconomically vulnerable communities, people occupationally susceptible to the disaster, unplanned and overcrowded urban housing areas, remote and isolated areas.

Annual IEC dissemination plan for extreme weather events and their health impact under NPCCHH

IEC type	Material	Timeline	Mechanism
Early warning	Bulletins/ advisory by IMD, CWC sent by NPCCHH	As needed for extreme weather events	<ul style="list-style-type: none"> • Health department/other government website, mass media, social media
Posters	Posters on various extreme weather events and its health impact (Conversion of IEC into local language and locality specific)	Seasonal as needed	<ul style="list-style-type: none"> • State-level dissemination at health facilities, public places/buildings • By email to DNO for printing at district level and dissemination to health facilities, schools and other public places /government buildings.
Wall painting	Paintings on various extreme weather events and its health impact (Conversion of IEC into local language and locality specific)	Seasonal as needed	<ul style="list-style-type: none"> • Educational institutions • health facilities • public places • State Transport buses
Audio messages	Audio Jingles (Conversion of IEC into local language and locality specific)	Seasonal as needed	<ul style="list-style-type: none"> • Local radio channels, social media
Video messages	Video messages (Conversion of IEC into local language and locality specific)	Seasonal as needed	<ul style="list-style-type: none"> • Mass media channels/ social media handles/ government websites
Observing relevant days	International Day for Disaster Risk Reduction	October 13	<ul style="list-style-type: none"> • Targeted awareness sessions • Mock drills with support with other stakeholders

(B) Capacity building

Annual training plan for Extreme Weather Events and Health under NPCCHH.

Training Programme for	Trainer	Topics	Timeline
District level (DNO-CC, trainers)	State Level Trainers	<ul style="list-style-type: none"> - Climate change and impact of extreme weather events in India - Formation of disaster management committees and plans - Health facility vulnerability, resilient measures and disaster preparedness - Disaster response in coordination with state/district disaster management authority - Post-disaster health impact assessment and response 	January
Health facility level (MO of	District Level Trainers	<ul style="list-style-type: none"> - Health facility disaster vulnerability assessment - Disaster management committee and plan 	January

DH/CHC/PHC)		<ul style="list-style-type: none"> - Climate resiliency measures (structural/functional) - Health facility preparedness for EWE/disaster response - Post-disaster surveillance and damage assessment 	
Community Health care workers (ASHA, ANM etc)	District Level Trainers, MO	<ul style="list-style-type: none"> - Climate change and health impact of extreme weather events - Disaster planning and response 	February
Panchayati Raj Institutions	District level trainers, MO, Health care workers	<ul style="list-style-type: none"> - Climate change and health impact of extreme weather events - Disaster planning and response with community participation 	February

(C) Actions for health system strengthening and preparedness.

- To Undertake reviews of the State's health infrastructure and potential climate change- related vulnerabilities and risks (and where such infrastructure is found to be at high risk, retrofit to make these more climate-resilient), for example, prepare contingency plans for alternative methods of energy generation during electricity blackouts in health facilities;
- Set up early warning systems and emergency responses to deal with climate-induced extreme weather events like floods, storm surges, cyclones, heatwaves, droughts etc.
- Supply of logistics required at healthcare facilities
- Preparedness of health system and personnel
- Activities for prevention of illnesses (IEC, pamphlets, advisories, training, workshop, etc).
- Make sure of the availability of operational communication channel.
- Establishment of mechanism to ensure data maintenance, surveillance, timely sharing with concerned departments and stakeholders.

Roles and responsibilities

Health sector	<ul style="list-style-type: none"> • Develop/ adapt health micro- plans for extreme weather events based on meteorology warnings and changes in the trend of illnesses in recent years. • Map vulnerable population based on demography, land cover, water bodies, potential exposure, available resources health insurance coverage, and burden of chronic illnesses in the community. • Develop or translate IEC in the local language, and make a communication plan for the dissemination of health-related alerts/ education materials for the target or general population. • Build capacity of health care personnel to detect and treat illnesses associated with extreme weather events • Issue health advisory to healthcare personnel based on IMD seasonal prediction or warning • Ensure health-related Real-time Surveillance and Monitoring System in case of extreme event
----------------------	--

	<ul style="list-style-type: none"> • Explore collaborative mechanisms (e.g., memoranda of understanding) with other departments, stakeholders, such as meteorological, pollution control board, etc for sharing data and for coordinating efforts to manage health risks. • Ensure Inter-sectoral convergence and coordination for improving architecture, design, energy-efficient cooling and heating system at the health facility, increase in plantation i.e. Climate Resilient Green Building Design. • Reassess 'Occupational Health Standards' for various types of Occupation. • Ensure strict implementation of legislative/ regulatory actions as per Occupational Health Standards.
SNO	<ul style="list-style-type: none"> • Disseminate early warnings to district level • Finalization of IEC material and dissemination Plan • Formalize intersectoral coordination for disaster planning, management and response with SDMA/IMD and other response departments • Organize training of district level officers • Facilitate assessment and implement of climate resilient measures in health facilities • Review implementation of IEC, training and surveillance activities at all levels • Evaluate and update relevant section of SAPCCHH with support from State Task Force • Create organizational support and strengthen Environmental Health cell to implement NPCCCHH vision, Goal and Objectives • Organize sensitization workshops for other stakeholders and line departments • Collaborate with academic institute/s for support in updating SAPCCHH, Surveillance activity monitoring, training of health care professionals, vulnerability assessment and applied research <p>Submit reports of activities on extreme weather events and health under NPCCCHH</p>
DNO	<ul style="list-style-type: none"> • Disseminate early warning to block and health facility level • Ensure IEC dissemination to community level and facilitate community level IEC activities • Organize training for block health officers and MO • Formalize intersectoral coordination for disaster planning, management and response with SDMA/IMD and other response departments • Liaison with other departments for combined IEC campaigns, coordinated response and information sharing of health indicators for targeted action • Identification and communication of Evacuation routes & relief camps • Support planning and management of health care services in relief camps • Provide necessary IEC on health and sanitation in relief camps • training for block health officers, medical officers, with relevant training manuals • Conduct sensitization of vulnerable groups: police officers, outdoor workers, women, children etc • Organize IEC campaigns at district level on observance of important environment-health days • Facilitate disaster vulnerability assessments in health facilities and maintain records of such assessment and health facility damage due to extreme weather events • Update DAPCCHH with support from District Task Force <p>Submit reports of activities on EWE and health under NPCCCHH</p>
MO	<ul style="list-style-type: none"> • Conduct health facility-based IEC activities • Support community level IEC activities • Preparation of Disaster Management Plans and hospital safety plan • Assessment of health facility in context of climate change-extreme weather events • Identifying structural changes/retrofitting measures at the facility level to equip the healthcare facility • Ensuring routine monitoring and maintenance of support functions (Water quality, waste management) • Health facility preparedness for seasonal events. • Coordinate, plan and involve PRI before, during and after extreme weather events

Part III - Chapter 11
Budget NPCCHH Kerala, 2022-27 (in Lakhs)

SL.NO	ACTIVITIES	INDICATOR	BUDGET (in lakhs) for 5 years with 20 % increase every year					TARGET for five years 22-27				
			22 to 23	23 to 24	24 to 25	25 to 26	26 to 27	22 to 23	23 to 24	24 to 25	25 to 26	26 to 27
PROGRAMME MANAGEMENT												
01.	Taskforce meeting to draft health sector plan for heat and air pollutionSensitization workshop/meeting of the state programme Officers and District level Health Officers.	• % State Task Force Quarterly Meetings conducted in a year	29	34.8	41.76	50. 11	60.1 3	25%	50%	75%	100%	100%
		• % Districts conducted quarterly District Task Force Meetings in a year						20%	40%	60%	80%	100%
02.	Planning M&E, Surveillance, Research, Review, Evaluation (SRRE)							50%	75%	100%	100%	100%
GENERAL AWARENESS												
03.	Development of IEC material, campaigns, Innovative IEC/ BCC Strategies	• % of Districts implemented IEC campaign on all climate sensitive issues	44	52.8	63.36	76	91.2	50%	100%	100%	100%	100%
		• % Districts included climate sensitive issues in the VHSNCs						50%	100%	100%	100%	100%
CAPACITY BUILDING												
04.	Orientation/ Training /capacity	• % Of Districts completed TOT	23	27.6	33.12	39. 74	47.6 8	100%	100%	100%	100%	100%
		• % of Medical Officers trained in Districts						50%	80%	100%	100%	100%
		• % of health workers and ASHA/AWW trained on NPCCHH in District						30%	50%	70%	100%	100%

	Building of healthcare staffs/	<ul style="list-style-type: none"> % of targeted sensitization trainings planned for vulnerable population in district (PRI Training) 						50% of district having trained 10% of pop	80% of district having trained 30% of pop	80% of district having trained 50% of pop	100% of district having trained 80% of pop	100% of district having trained 100% of pop
STRENGTHENING OF THE HEALTH SYSTEM												
05.	Adoption of Green/ Environment Friendly Measures in Health facilities	<p><i>Energy Audit:</i></p> <ul style="list-style-type: none"> % of healthcare facilities per district per year that have conducted energy audit. 	72.3	86.7	104.1	124.9	149.88	20% of district covering 20 % of healthcare facilities	35% of district covering 35 % of healthcare facilities	50% of district covering 50 % of healthcare facilities	75% of district covering 75 % of healthcare facilities	100% of district covering 100 % of healthcare facilities
		<p><i>LED lighting:</i></p> <ul style="list-style-type: none"> % of healthcare facilities per year that installed solar panel 						10% of district covering 10 % of healthcare facilities	20% of district covering 20 % of healthcare facilities	50% of district covering 50 % of healthcare facilities	80% of district covering 80 % of healthcare facilities	100% of district covering 100 % of healthcare facilities
		<p><i>Solar Panel:</i></p> <ul style="list-style-type: none"> % of healthcare facilities per district per year that installed solar panel 						20% of district covering 5 % of healthcare facilities	35% of district covering 10 % of healthcare facilities	50% of district covering 40 % of healthcare facilities	80% of district covering 70 % of healthcare facilities	100% of district covering 100 % of healthcare facilities
		<p><i>Rain water harvesting:</i></p> <ul style="list-style-type: none"> % of healthcare facilities per district per year that installed rain water harvesting system. 						10% of district covering 5% of healthcare facilities	30% of district covering 10 % of healthcare facilities	50% of district covering 20 % of healthcare facilities	80% of district covering 50 % of healthcare facilities	100% of district covering 100 % of healthcare facilities

Annexure :A

Reporting, Monitoring & Evaluation

The Monitoring & Evaluation of the implementation of SAPCCHH has been stipulated with a mix of internal and external approaches similar to NAPCCHH. The State DoHFW, District Health Officers, and the individual health facilities along with MoHFW will be involved in regular internal monitoring. External Monitoring will be done by an independent agency.

- a) Internal: Monthly/quarterly progress monitoring for climate-sensitive illnesses has to be done at all levels, i.e. District to

State to MoHFW. These Monthly / Quarterly Progress Reports should include a collation/aggregation of the data/information compiled in each health care facility. The District Cell will have the responsibility of collation/aggregations of the data/information compiled in each health care facility and submit to the State Cell which will validate and forward the data to the National Cell.

The following indicators are regularly monitored:

Table 8.1: Indicators monitored as a part of NPCCHH

S. No	Indicators	Frequency of reporting
1	Human resources in place	Quarterly
2	Trainings- TOT, HCWs	Quarterly
3	Measures to reduce carbon footprint at healthcare facilities	Quarterly
4	IECs done on climate sensitive issues	Quarterly
5	Climate sensitive diseases reporting	Quarterly
6	Observation of public health days related to Climate Change	Quarterly

- b) External: An independent agency for evaluation should be commissioned every 2 years. At the minimum, the audit should cover one well-performing district and one slack-performing district. The agency to conduct the SAPCCHH Implementation Audit

should be chosen based on the background, experience in the State's health sector, environmental auditing, and reputation of reliability. The recommendations of the audit should be developed into an action plan to strengthen the existing system.

a. Roles and Responsibilities

	Responsibilities
SNO	<ul style="list-style-type: none"> • Disseminate early warnings to district level • Finalization of IEC material and dissemination Plan • Organize training sessions for district level officers and trainers • Identify health facilities for priority implementation based on disaster and health facility vulnerability • Identify relevant state and district level nodal agencies and collaborate with them for assessment of health facilities for implementation of measures • Facilitate and monitor necessary assessments at health facility level • Facilitate implementation of structural and functional measures at health facility level • Submit report of activities on heat-health under NPCCHH • Advocate for reduction in source of greenhouse gas emissions
DNO	<ul style="list-style-type: none"> • Conduct training for block health officers, medical officers, with relevant training manuals • Support conduction for following assessment at health facility level <ul style="list-style-type: none"> - Energy audit - Water audit - Disaster-vulnerability assessment • Support following functional measures at health facility level <ul style="list-style-type: none"> - Water committee - Sustainable procurement committee - Operational measures to make health facility functioning during disasters or power cut • Coordinate with other agencies for assessment and implementation of identified structural and functional measures • Update DAPCCHH with support from District Task Force • Submit report of activities on heat-health under NPCCHH
Block health officer	<ul style="list-style-type: none"> • Ensure training of medical officers • Organize PRI sensitization workshop • Coordinate with other agencies for assessment and implementation of identified structural and functional measures
Medical officer	<ul style="list-style-type: none"> • Conduct health facility assessment <ul style="list-style-type: none"> - Energy audit - Water audit - Disaster-vulnerability assessment • Lead following functional measures <ul style="list-style-type: none"> - Water committee - Sustainable procurement committee - Operational measures to make health facility functioning during disasters or power cut • Support community level IEC activities • Identify local funding opportunities: e.g. CSR initiative, NGO funding
Panchayati Raj Institution	<ul style="list-style-type: none"> • Support retrofitting and new health facilities with local funding source and community involvement

Annexure B : Office orders

Governing body

File No. **HEALTH-G1/361/2019-HEALTH**
G.O.(Ms)No.179/2021/H&FWD



GOVERNMENT OF KERALA
Abstract

H&FWD ± State Action Plan for Climate change and Human Health State Level Governing Body and Task Force constituted ± Orders - issued.

HEALTH & FAMILY WELFARE (G) DEPARTMENT
G.O.(Ms) No. /2021/H&FWD Dated, Thiruvananthapuram, 08/10/2021

Read: Letter No. PH3-80529/2019/DHS dated 28/09/2019 from the Director of Health Services.

ORDER

The United Nations Framework Convention on Climate Change (UNFCCC) and its Kyoto protocol in 1997 refers to the legal frame work for climate change process internationally. The National Action Plan for Climate Change & Human Health (NAPCCHH) has identified 8-12 missions and among it Health Mission was undertaken by the Ministry of Health & Family Welfare, Government of India. The Director of Health Services vide letter read above furnished proposal for the formation of State Level Governing Body and State Level Task Force as per the approved draft of National Action Plan for climate Change & Human Health received from the Government of India.

Government have examined the matter in detail and have pleased to constitute State Level Governing Body and State Level Task Force for operational Frame work for implementation of National Action Plan for Climate Change and Human Health with the following constituents.

STATE LEVEL GOVERNING BODY

Hon e le Minister (Health)	Chairman
Principal Secretary Health	Vice Chairman
Director of Health Services	Member Secretary
Mission Director, NHM	Member
Director, Medical Education	Member
Regional Director, H& FW	Member

Annexure

State level task force

G.O.(Ms)No.179/2021/H&FWD

STATE LEVEL TASK FORCE

Principal Secretary	Chairman
Director of Health Services	Vice Chairman
Public Health Expert from State Health Department	Nodal Officer
Director, ICMR Institute/Centre	Member
Director, Meteorological Dept of State	Member
Chairman, Pollution Control Board	Member
Chairman, State Disaster Management Authority	Member
State Surveillance Officers	Member
Environmental Engineer/Scientist from MOEFCC	Member
Secretary, Agriculture Department	Member
Secretary, State Ground Water Board	Member

(By Order of the Governor)

Dr. RAJAN N KHOBRAGADE
PRINCIPAL SECRETARY TO GOVT.

To

The Director of Health Services, Thiruvananthapuram
Mission Director, National Health Mission
Director, Medical Education, Thiruvananthapuram
Regional Director, H& FW
Public Health Expert from State Health Department
Director, ICMR Institute/Centre
Director, Meteorological Dept of State
Chairman, Pollution Control Board
Chairman, State Disaster Management Authority
State Surveillance Officers
Environmental Engineer/Scientist from MOEFCC
Secretary, Agriculture Department
Secretary, State Ground Water Board
The Principal Accountant General (Audit), Kerala, Thiruvananthapuram.
The Accountant General (A&E), Kerala, Thiruvananthapuram.
The Information & Public Relations Department (Web and news media)
Stock File/Office Copy

Forwarded/By Order

Section Officer

Copy to : P S to the Hon'ble Minister, Health & Women-Child Development
P A to Principal Secretary to Health Department
C A to Joint Secretary, Health & FWD.



GOVERNMENT OF KERALA

Abstract

Disaster Management Department-State Disaster Response Fund Norms -State Specific Disasters-Heat wave, Sun stroke, Sun burn-Notified- Orders issued

DISASTER MANAGEMENT(B) DEPARTMENT

G.O.(Ms)No.9/2019/DMD Dated,Thiruvananthapuram, 09/03/2019

- Read
- 1 Letter No. 32-7/2014-NIDM-I dated 8-4-2015 from the Disaster Management Division, Ministry of Home Affairs, Government of India
 - 2 GO (Ms) No. 194/2015/DMD dated 20-05-2015
 - 3 Minutes of the State Executive Committee meeting held on 06-03-2019

ORDER

Government of Kerala had revised the norms of relief assistance from State Disaster Response Fund (SDRF) to the victims of natural calamities for 2015-20 in accordance with the recommendations of 14th Finance Commission (FFC) approved by Government of India, Ministry of Home Affairs as per Government Order read as 2nd paper above. As per the revised norms issued by Government of India vide letter read as 1st paper above, it has been permitted to use 10% of the annual SDRF/NDRF allocation for relief assistance to 'State Specific Disasters' within the local context of the State and instructed that such local disasters and the relief assistance norms have to be declared and approved by the State Executive Committee (SEC) of State Disaster Management Authority (SDMA).

2. Accordingly the SEC has declared the following items as State Specific Disaster and approved the norms for relief assistance as given as Annexure to this order.

- a) Heat Wave
- b) Sun Stroke
- c) Sun Burn

3. Government have examined the matter and are pleased to order that the norms and scale of assistance declared and approved by the SEC of KSDMA and given as annexure to this order will be followed for providing relief assistance to victims of State Specific Disasters in the State.

0005259

GOVERNMENT OF KERALA

Abstract

Disaster Management Department - Natural Calamity Norms for Relief Assistance to the victims from State Disaster Response Fund / National Disaster Response Fund for the period of 2015-2020 – Declaration of 'Soil Piping' as State Specific Disaster Notified – Sanctioned - Orders issued

DISASTER MANAGEMENT (REVENUE-K) DEPARTMENT

G.O(Rt)No. 149/2017/DMD Dated, Thiruvananthapuram, 18 January, 2017

- Read: 1 Letter No.32-7/2014-NIDM-I, dated 08.04.2015 from the Disaster Management Division, Ministry of Home Affairs, Government of India
2 G.O.(Ms)No.194/2015/DMD dated 20.05.2015
3 G.O.(Ms) No.343/2015/DMD dated 23/07/2015
4 Minutes of the meeting of the State Executive Committee of Kerala State Disaster Management Authority dated 20.10.2016

ORDER

Government of Kerala had revised the norms of relief assistance from State Disaster Response Fund (SDRF) to the victims of natural calamities for 2015-20 in accordance with the recommendations of 14th Finance Commission (FFC) approved by Government of India, Ministry of Home Affairs as per Government Order read as 2nd paper above. As per the revised norms issued by Government of India vide letter read as 1st paper above, it has been permitted to use 10% of the annual SDRF/NDRF allocation for relief assistance to 'State Specific Disasters' within the local context of the State and instructed that such local disasters and the relief assistance norms have to be declared and approved by the State Executive Committee (SEC) of State Disaster Management Authority (SDMA).

(2) Accordingly as per the Government Order read as 3rd paper above. Government have declared the following items as State Specific Local Disasters based on the recommendations of the State Executive Committee meeting held on 16.06.2015

- (a) Lightning
- (b) Coastal erosion, and
- (c) Strong wind less than cyclone or cyclonic storms which causes damages to life and property



NATIONAL HEALTH MISSION
General Hospital
Junction, Thiruvananthapuram 695035
Tel fax: 91-471 2301181, 2302784
email: smdnrhm@gmail.com
Website: www.arogyakeralam.gov.in

No. NHM/3466/ADMIN1/2021/SPMSU

Dated: 23.07.2022

From

State Mission Director

To

DR. BASIL SAJU,
MALAIKUDYIL HOUSE, NEAR KURUPPAMPADY POLICE STATION, KURUPPAMPADY P O,
PERUMBAVOOR, PIN - 683545.

Dear Doctor,

Sub:- Appointment under State Health & Family Welfare Society – Consultant (NPCCHH) – reg.
Ref:- Interview held on 18.07.2022.

1. You are hereby offered the post of **Consultant (NPCCHH) under State Health & Family Welfare Society, Trivandrum** on contract basis for a period of three months initially with consolidated fee of **Rs 46,000/- per month**.
2. The terms of your appointment will be as given in the *Terms of Contract* document attached to this offer letter (**Form-I**) and sign in stamp paper worth Rs.200/- at the time of joining your duties under the Society.
3. Other conditions of your service under the Society will be governed by such rules as may be adopted by the Society from time to time.
4. Please note that your appointment is also subject to:
 - i. Production of a certificate of fitness from the Competent Medical Authority viz. Civil Surgeon in the prescribed form enclosed (**Form-II**).
 - ii. Submission of declaration in the prescribed form (**Form-III**). In the event of a candidate having more than one spouse living or being married to a person having more than one spouse living, the appointment will be subject to his/her being exempted from the enforcement of the general rule in this behalf.
 - iii. Taking of an oath of allegiance/ faithfulness to the Constitution of India (Or making of a solemn affirmation to the effect) in the prescribed form attached (**Form-IV**).
- Iv Production of the original certificates along with the copies:
 - a. Certificate to prove educational and other technical qualifications.
 - b. Certificate to prove age.
 - c. Character certificate in the prescribed form (**Form-V**) from the Head of Educational Institution last

- attended by him/her or a similar certificate from his/her present employer.
- d. Discharge certificates in the prescribed form from previous employer, if any.
5. If any declaration given or information furnished by you proves to be false or if you are found to have willfully suppressed any material/ information, you will liable to be removed from the said post under the Society and as such other action by the Society may deem necessary.
6. **Please communicate your acceptance or otherwise to the undersigned immediately within 15 days of the receipt of this Offer Letter and thereafter appear before the competent medical authority along with the enclosed letter for medical examination and report for duty along with the Medical fitness Certificate and other documents to the State Mission Director, SPMSU, Thiruvananthapuram.**
7. If you fail to join your duties by the above stipulated date, the offer of appointment made to you is liable to be treated as cancelled.
8. No traveling allowance will be allowed to join the appointment.
9. If you already enrolled in Employees Provident Fund Scheme, Form 6 is attached for updating the details.

Yours faithfully

State Mission Director

Copy to

1. State Programme Manager (NHM)
2. Director (Finance), NHM
3. State Admin & HR Manager (NHM)
4. State Nodal Officer (NPCCHH)
5. Admin 2
6. Stock file / Spare.

Approval Valid

Digitally Approved By

Dr.Rathan U. Kelkar IAS

Date: 23.07.2022

Reason: Approved

The document is digitally approved. Hence signature is not needed.

9245-
29/7/15-



GOVERNMENT OF KERALA

Abstract

Disaster Management Department – Natural Calamity Norms for Relief Assistance to the victims from SDRF/NDRF for the period 2015-2020 – State Specific Disasters – Notified – Sanctioned – Orders issued

DISASTER MANAGEMENT(REVENUE-K) DEPARTMENT

G.O.(Ms)No. 343/2015/DMD. Dated, Thiruvananthapuram, 23rd July, 2015

- Read: 1) Letter No.32-7/2014-NIDM-I, dated, 8-4-2015 from the Disaster Management Division, Ministry of Home Affairs, Government of India.
2) G.O.(Ms)No.194/2015/DMD., dated, 20th May 2015
3) Minutes of the State Executive Committee meeting held on 16.6.2015

ORDER

Government of Kerala had revised the norms of relief assistance from State Disaster Response Fund (SDRF) to the victims of natural calamities for 2015-20 in accordance with the recommendations of 14th Finance Commission (FFC) approved by Government of India, Ministry of Home Affairs as per Government Order read as 2nd paper above. As per the revised norms issued by Govt. of India vide letter read as 1st paper above, it has been permitted to use 10% of the annual SDRF/NDRF allocation for relief assistance to 'State Specific Disasters' within the local context of the State and instructed that such local disasters and the relief assistance norms have to be declared and approved by the State Executive Committee (SEC) of State Disaster Management Authority (SDMA).

2) Accordingly the SEC has declared the following items as State Specific Local Distasters and approved the norms for relief assistance as given as annexure to this order.

- a) Lightning
- b) Coastal erosion, and
- c) Strong wind less than cyclone or cyclonic storms which causes damages to life and property.

3) The Government have examined the matter and are pleased to order that the norms and scale of assistance declared and approved by the SEC of KSDMA and given as annexure to this order will be followed for providing relief assistance to victims of State Specific Disasters in the State. This order will have retrospective effect from 1.4.2015.

(By Order of the Governor)

Dr. VISHWAS MEHTA

Principal Secretary to Government

To

The Secretary to Government of India, Ministry of Home Affairs (DM Division), 'C' Wing, 3rd Floor, NDCC-II, Jai Singh Road, New Delhi – 110001 (with covering letter)

[Signature]

