Building Climate Resilient Health Systems

Assessment of Response of Health System to Kerala Floods of August 2018

Conducted by

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Content

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Abbreviations

DFY	Doctors For You
DMO	District Medical Officer
ECG	Electrocardiogram
HI	Health Inspector
ILR	Ice Lined Refrigerator
IUCD	Intra uterine Contraceptive Devices
IDI	In-Depth Interview
JPHN	Junior Public Health Nurse
MCW	Mission Clean Wayanad
NABH	National Accreditation Board of Hospitals
NIMHANS	National Institute of Mental Health and Neurosciences
NGO	Non-Governmental Organisation
PI	Principal Investigator
PHC	Primary Health Centre
WIMS	Wayanad Institute of Medical Sciences

Banana Plantations that were ready for harvest destroyed by the floods

Photo: Vishvaja Sambath

Executive Summary

Kerala's decision to decentralise its administrative and emergency response to the **Kerala Floods of August 2018** resulted in prompt and efficient government and community response minimising losses of lives and infrastructure. The mass participation of citizens, and community networks across class, caste, geographical, political and religious lines, was globally appreciated.

Despite such immediate measures, the flood did leave a huge impact on the public health systems in the state. While there was minimal structural damage, improper infrastructure planning led to equipment such as computers, Ice Lined Refrigerator (ILR), autoclave, Intrauterine Contraceptive Device (IUCD) kits, and Electro Cardiogram (ECG) machines to be damaged. Several hospitals reported losing patient registries and records, leading to doctors being unable to refer to the individual's medical history.

Hospitals faced power outages anywhere from 3 to 9 days causing inadvertent shutdown of the cold storage systems. Many hospitals reported damage to entire stocks of vaccine and other essential refrigeration dependent medical supplies. Hospitals with diesel generators were forced to ration the fuel due to the severe shortage of diesel supplies. The power cuts also impaired the communication and mobile networks further impending timely relief and rescue efforts.

All hospitals reported a crisis like situation regarding medical waste and general waste disposal. The break down of waste evacuation services led to the accumulation of waste on site. The mixing of general and infectious waste posed the biggest threat. While the volunteers coordinated in the post flood clean up, it was not clear from the interactions if they were trained to handle medical waste.

There were insufficient arrangements in the relief camps for the antenatal women, lactating and menstruating women, children and elderly and bedridden patients, leading to several hardships.

Despite these challenges, there was a general sense of appreciation towards the government led efforts especially the extremely well coordinated clean up and sanitization activities ensured that affected neighbourhoods, wells were cleaned up and chlorinated and this played a role preventing outbreak of any infectious diseases. Given the large numbers of people being housed at relief camps, there was close monitoring of health status of the inmates. This was done to ensure effective isolation of infected people and quarantine of others.

Remarkably, a large part of the post relief work was dedicated to the mental wellbeing of the rescued population. Apart from general counseling, efforts were made to identify those with Post Traumatic Stress Disorder and referred them to higher centers for further support. This was possible due to the training offered to grass-root level health workers on identifying individuals who needed mental health support. Nevertheless, the participants noted the lack of attention given to the mental health of the health workers themselves.

Health Education Sessions were conducted for local people during the floods

Photo: Local Health Worker, Kerala

Assessment of Response of Public Health System to Kerala Floods of August 2018

Climate change induced risks have social and geographical dimensions, are unevenly distributed across the world, and are influenced by social and economic development, technology, and health service provision[1]. From this perspective India is in a precarious position. In its report titled 'Fragile Planet – Scoring Climate Risks Around the World', HSBC Global Research has ranked India as the most vulnerable country, followed by Pakistan, the Philippines and Bangladesh[2].

Public health is a strong social indicator that can anchor a diversity of issues and interventions ranging from finance, planning, transport, housing, education, to agriculture.

A **Climate Resilient Health System** is 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[3].

The Kerala floods of 2018 offer a unique opportunity to appraise the challenges within the health sector and also redesign the health sector to be the anchor for the communities in an event of any extreme climatic event in the future.

In order to achieve this, a preliminary multi stakeholder survey of Health System response to Kerala Floods of August 2018 was conducted to consolidate the experiences of health care systems.

<u>The survey particularly assessed the event and its aftermath through the metrics of:</u>

1. Emergency Rescue - availability and access to materials, mobility and ease of access to facilities by staff and patients
2. Governance and operations
3. Structural and technical integrity of hospitals and health centres
4. Access to reliable Energy, clean water, sewage and waste disposal
5. Health work force management
6. Preparedness for pestilence/vector and water borne diseases
7. Preparedness for Post-traumatic stress disorder (PTSD)

Building Climate Resilient Health Systems in Kerala:

A few important recommendations can be distilled from the survey finding which can be broadly divided into two categories:

a) *Adapting* to the challenges posed by extreme weather events.

b) Making health system *resilient* to withstand extreme weather events.

a) Adaptation:

The respondents were convinced that the collective response to a disaster has to be less reactive and more proactive. In that, the following suggestions were given:

1. Immediate check on illegal mining activities;

2. Immediate action to prevent deforestation that leads to landslides;

3. Adequate repair and maintenance of roads for smoother transportation of people to safer places.

4. Sufficient provision for power backups and water supply for hospitals and communities in case of emergencies;

5. Joint mapping of vulnerabilities and resources of the regions with in consultation with local administration, hospital and general public for better preparedness in the future.

Damaged compound wall of a healthcare centre due to floods

Photo: Local Health worker, Kerala

6. Develop and popularise effective alert systems during the disaster.

b) Resilience:

The suggestions given by the respondents are given below:

i) Preparation of definitive disaster management plan for hospitals;

ii) Training on disaster management for staff and public and specific plans for shifting inpatients for facilities in an event of an emergency;

iii) Establishing functional rapid response team in hospitals and making the general public aware of such system;

iv) Construction and remodeling of hospitals with experts' advice incorporating the topography, flood history and climate of the region in the planning of the building;

v) Creating a centralized emergency transportation system for shifting critically ill patients;

vi) Advance planning and provisions for medicines, conduct assessments in consultation with general public to map vulnerabilities and diseases, to determine the need for specific medicines;

vii) Provide sufficient power backup, water supply, food and medicines for hospitals in case of emergencies;

viii) Develop plans for relocating hospital equipment to higher floors during floods or permanent relocation of equipment to higher floors;

ix) Relocate critical backup power supplies and building infrastructure (electrical power, heating and cooling, drinking water, waste systems) above historical or anticipated flood levels;

x) Prepare maps of hospital evacuation routes that will be available during and after flooding;

xi) Document preparations for hospital boat evacuation/access during and after flooding;

xii) Store patient medical records in a flood safe area;

xiii) Developing a standard portable disaster management health kits to address the immediate medical needs during emergencies.

Truly responsive and responsible health systems would take a lead before disaster strikes by taking necessary measures, be prepared to manage disasters, and also point to the harmful and inequitable effects of developmental activities in their local context. We need to expand the scope of Health for All to Health in All Policies (HIAP)[4].

Overview and Background:

Extreme weather events have become more frequent and intense globally over the recent decades[5]. In the past decade India experienced over 15 extreme flooding events – 4 in Assam, 3 in Bihar, and one each in the states of Kerala, Tamil Nadu (Chennai), Gujarat, Maharashtra (Mumbai), Kashmir, West Bengal and Uttarakhand. In all these cases, hospitals and public health facilities were the first to be affected and crippled and rendered useless at a time when they are most essential.

After the 2018 floods in the Kerala, the directorate of health services estimated a loss of almost Rs.110 crores to government hospitals alone[6]. In the worst affected districts of Ernakulam, Pathanamthitta, Thrissur and Alappuzha, several hospitals were forced to evacuate patients and suspend surgeries and critical care[7]. Similar experiences have been documented in Chennai[8], Mumbai[9], Patna[10] and Kashmir[11].

Furthermore, it is important to see health systems not merely as providers of healthcare, but equally as the basic foundation for preventive care and a department that adds to building resilient and equitable societies. Truly responsive and responsible health systems would take a lead before disaster strikes by taking necessary measures, be prepared to manage disasters, and also point to the harmful and inequitable effects of developmental activities in their local context. We need to expand the scope of Health for All to Health in All Policies (HIAP).

The 2018 Kerala floods have brought the concerns regarding climate change and our eroding environmental capital to the fore. Historically, floods have been linked to the positive benefits it brought to the riverine civilizations. Such civilizations thrived due to this natural phenomenon that ensured economic and food security for its masses. Floods replenish surface/sub-surface water resources and sustain the biodiversity of the flood plains. Effectively, flooding in river ecosystems should be regarded as a natural process and not as a disturbance.

However, since the early 20th century to the present day, there is a significant increase to the extent of “damages” caused by natural disasters like storms,

Ariel View of Bhavani River that Flooded and inundated bridges cutting off access.

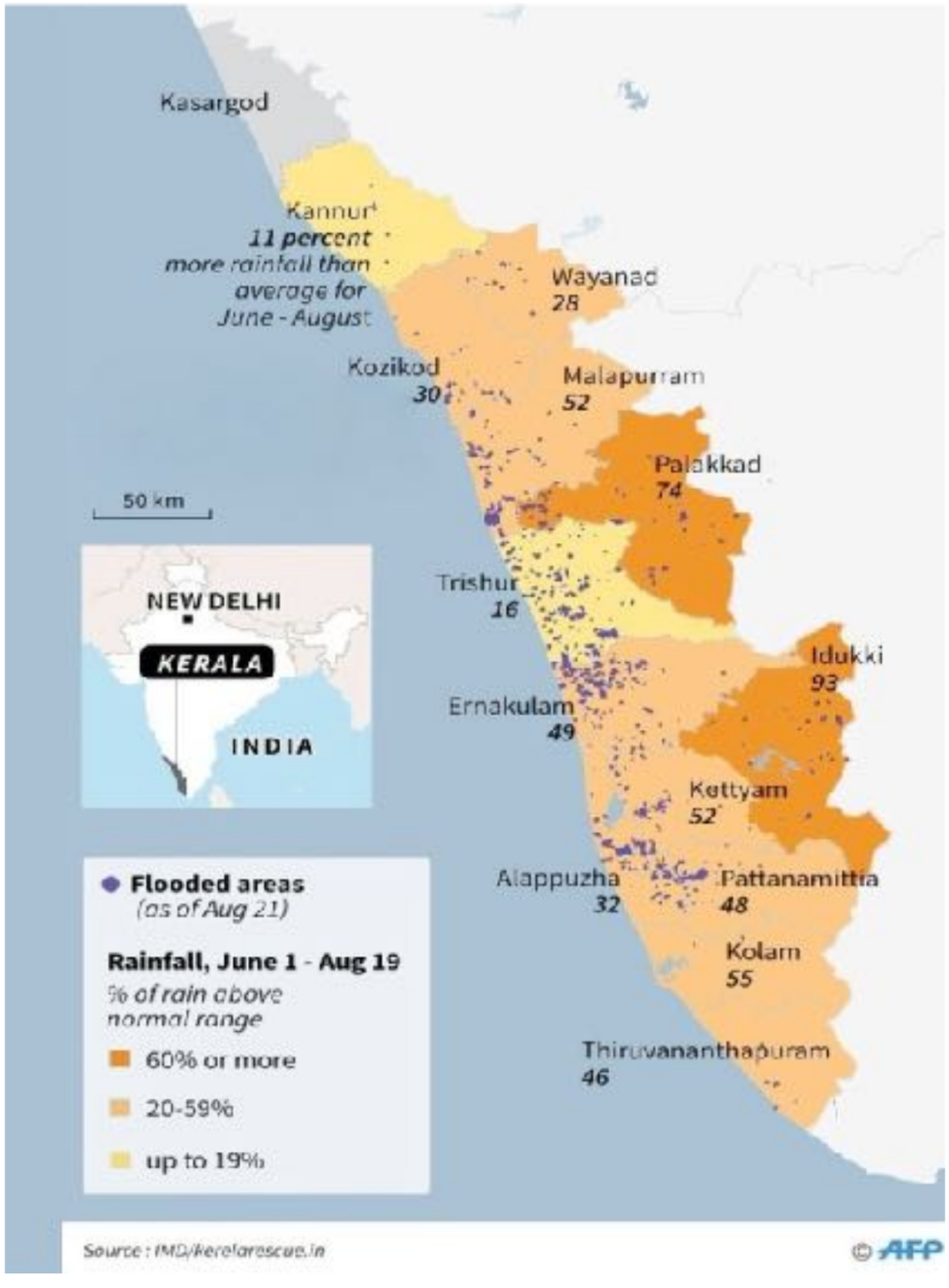
Photo: Vishvaja Sambath

droughts and floods. Only for the period since World War II the total average amount of damage per decade increased almost tenfold[12]. A recent report by The Lancet journal shows a 46% increase between 2000 and 2016 in the frequency of extreme weather events[13].

While there is an increasing acknowledgement of the link between poor urban planning, mal-development, deforestation and extreme weather events, the role of changing climate patterns and the imminent threat of sea level rise cannot be ignored. The risks of climate unpredictability are here to stay.

The obligation to be prepared is on us.

Flood affected areas, Kerala August 2018



Kerala: An Introduction

Kerala is located in the southwestern coastal region of India and spans about 38,863 km2. The geography of the state varies between mountainous highlands to coastal plains exposing it to varied climatic conditions across the state. The state is surrounded by Western Ghats on the east and Arabian Sea on the west and it is divided into 14 districts. As per 2011 census, the population of Kerala is around 33 million.

Kerala is regarded as one of the well performing states in the country in terms of human development (Human Development Index – 0.712), literacy (Literacy rate – 93.91%), health (Life expectancy – 77years), sex ratio (1084:1000) and has the lowest population growth in the country (4.9%).

The major economy is through agriculture and fisheries followed by other industries like tourism, manufacturing of chemicals and fertilizers, food processing, weaving and banking.

Healthcare sector in Kerala is considered to be forerunners in implementing and following universal healthcare of the country[14].

Context of the Study

Public health is a strong social indicator that can anchor a diversity of issues and interventions ranging from finance, planning, transport, housing, education, to agriculture.

The recent floods offer a unique opportunity to appraise the challenges within the health sector and identify potential solutions to the challenges.

In order to achieve this, we conducted a multi stakeholder study to consolidate the experiences of health care systems from the 2018 floods. The assessment aimed to reflect on the role, performance and strengths and shortcomings of the health systems along with the perceptions and role of public health professionals, which would in turn inform public polices on building resilient health systems.

The survey particularly aimed to assess the event and its aftermath through the metrics of:

- Emergency-rescue (availability and access to materials, mobility and capacity);
- Governance and operations;
- Structural and technical integrity of hospitals and health centre.
- Access to uninterrupted Energy and clean Water; waste management
- Health work force management.
- Preparedness for pestilence/vector and water borne diseases
- Preparedness for PTSD - Post-traumatic stress disorder

Methodology

a) Study Design:

Qualitative study

b) Study setting:

Healthcare providers working in government and private hospitals in flood affected areas in Kerala.

c) Study tool:

A semi structured interview guide was developed and utilized to explore the experience of the healthcare providers (Annexure-I)

d) Study site selection:

The flood-affected districts were classified into three categories – mildly affected, moderately affected and severely affected; this categorization was done on the basis of ground experience of DFY doctors and volunteers. One district each was chosen from these three categories through purposive sampling technique. Field experience of ground level relief activities of DFY was instrumental in selection of districts from each category.

e) Duration of the study period:

October 2018: Proposal writing, and logistic arrangement

November 2018: Data collection

December 2018 – Mid January 2019: Drafting of the report

f) Duration of the interview:

The duration of the interview ranged from 20 minutes - 72 minutes with an average time of 32 minutes.

g) Study Participants:

Healthcare providers such as doctors, staff nurses and public health nurses /health inspectors/Pharmacists/ administrative personnel were the key participants of the study.

h) Study Process:

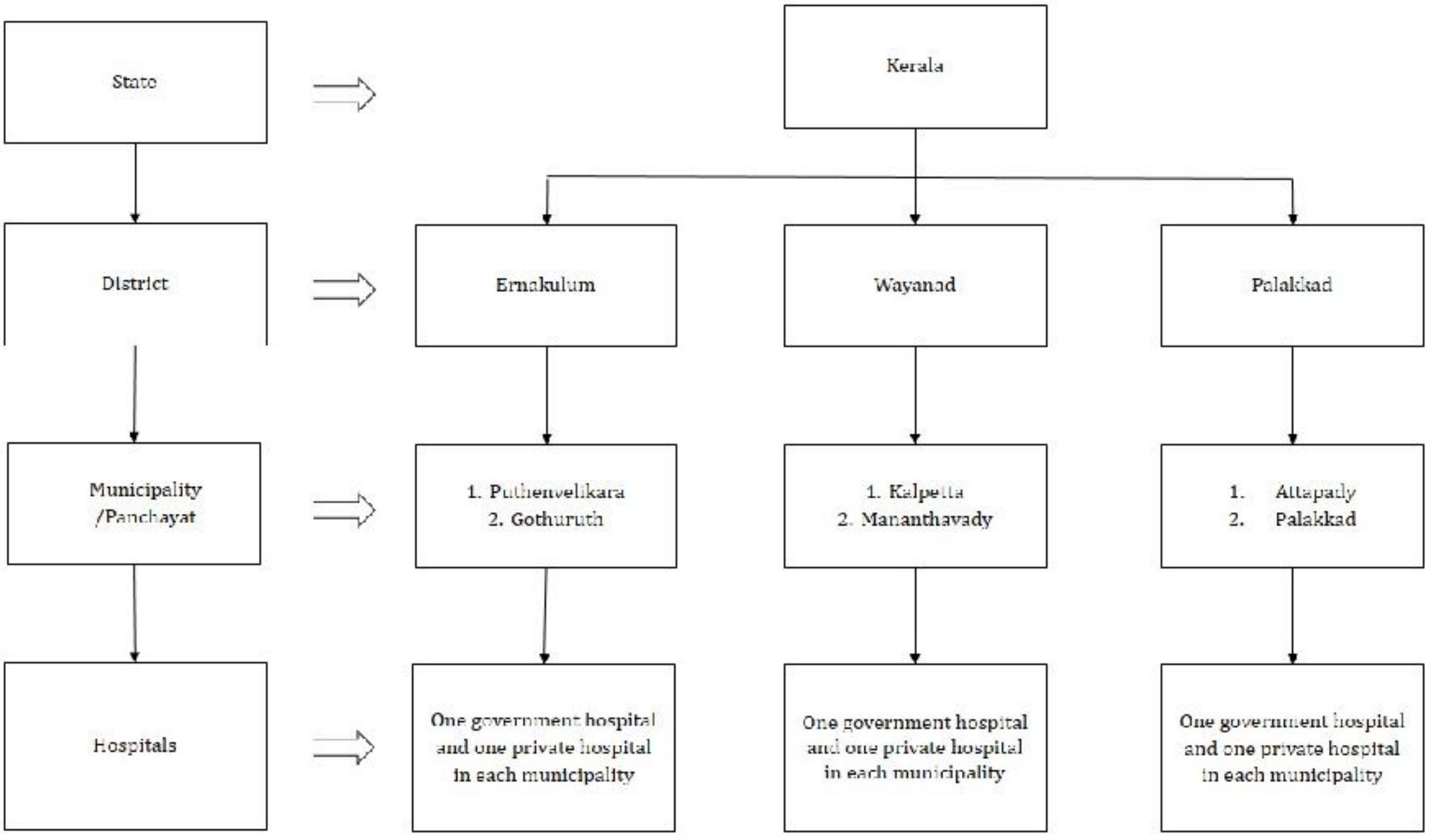
This study was initiated through the collaboration between Healthy Energy Initiative - India (HEI) and DFY with support from Climate Action Network South Asia (CANSA) and Community Environmental Monitoring (CEM), a program of The Other Media.

After the approval of the study proposal by the collaborators, volunteers were selected and trained for data collection in various districts. Total of 4 volunteers from DFY, 2 from Wayanad and 2 from Palakkad district were selected for the study. The volunteers underwent an orientation on the study and training on using the interview guide for study. The lead researcher, for guidance, accompanied the volunteers for the first few interviews.

The volunteers assisted in data collection Wayanad and Pallakad districts. The lead researcher collected data from Ernakulum district.

Map of study sites, Kerala

Site selection method



Two flood affected municipalities or Panchayats were chosen from each district and then from those municipalities or Panchayat one government and one private hospital was identified for the study. Overall 6 government and 6 private hospitals from 3 districts were included in the study. (See the chart above)

Prior schedules were fixed for each district and volunteers and lead researcher collected the data during that time frame starting from Wayanad, then Pallakad and finally Erunakulum district.

The purpose of the study was explained to all the participants and an audio consent was sought. The interview was conducted in English or Malayalam as per the convenience of the interviewee. The recorded interviews were transcribed for further analysis. The interviews which were conducted in Malayalam were translated to English by a person proficient in both languages.

Overall 12 Doctors, 9 Staff Nurses, 3 Junior Public Health Nurses, 3 Health Inspectors or Junior Health Inspectors, 3 Pharmacists and 3 Administrative Staff were interviewed, making the total number of participants 33 for the study.

Damage inside a health center due to floods

Photo: Local Health worker, Kerala

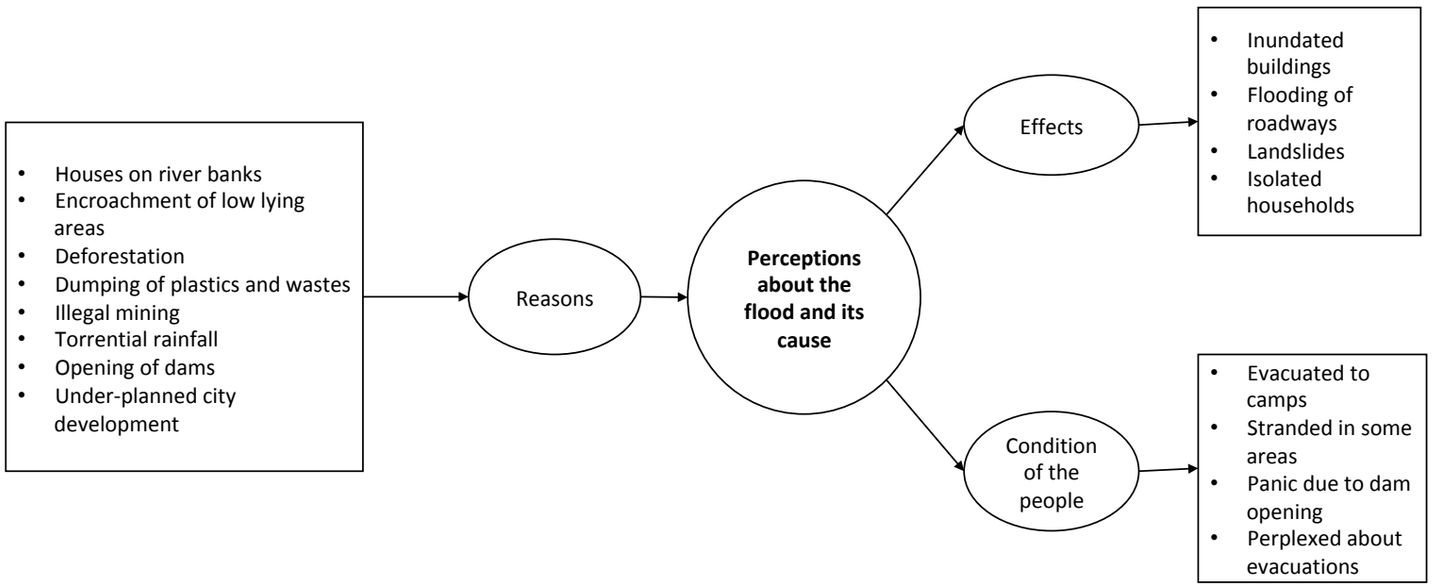
Images of devastation caused by floods in Kerala
Image courtesy - Down To Earth

Findings and Analysis:

The findings of the study have been described under the following categories:

Perceptions about the flood and its cause:

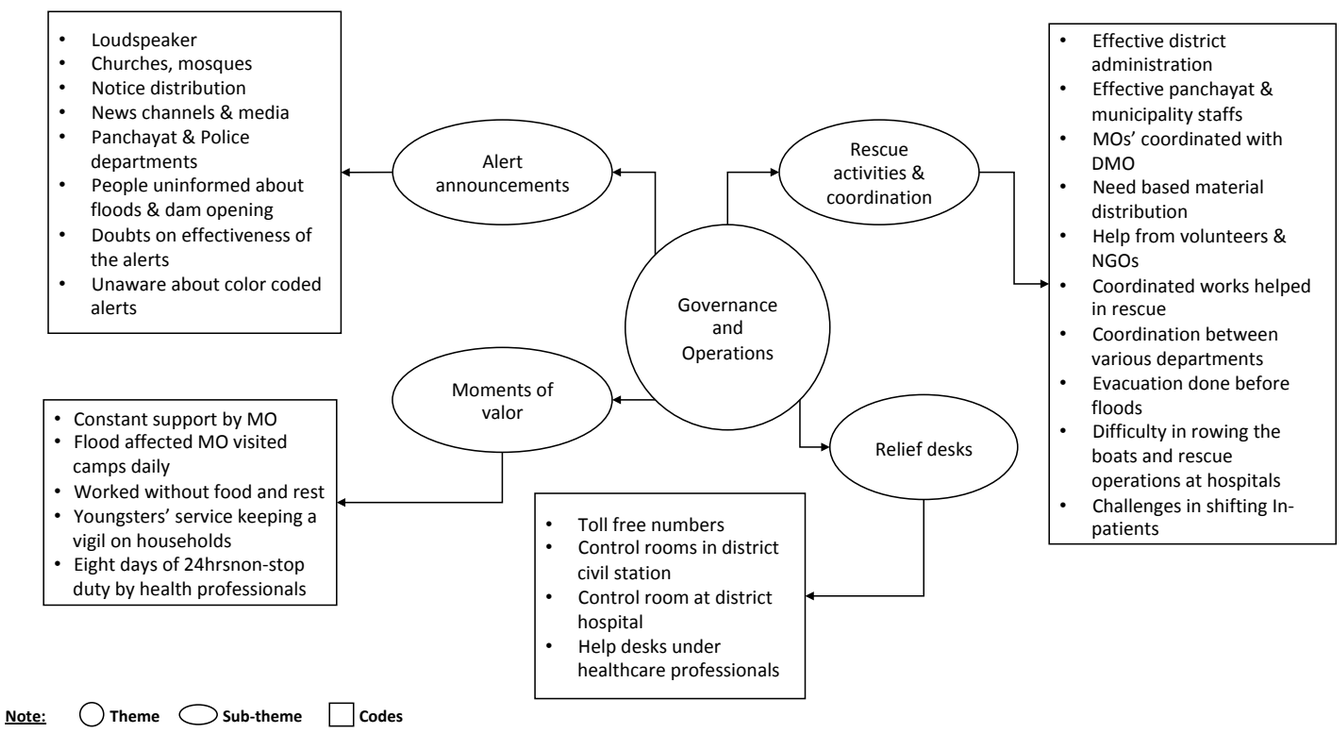
- **Cause of the flood:** Most of the participants believed that the floods were caused due to a combination of multiple factors such as torrential rainfall, unplanned growth of the cities, encroachment of the low lying areas and construction on the river banks. Some participants also indicated on factors like deforestation, improper waste management and plastics, illegal mining and opening of the dams also exacerbated the situation.



- **Immediate effect of the flood in the region:** The participants highlighted that in general, the flood had inundated the houses and even cut off access to several regions. Some participants also detailed that there were regions that were impacted due to the landslides more than the flood itself.
- **Impact of flood on people**: Most participants described a sense of panic and anxiety among the population in general during the flood. They were of the view that a large population was shifted to flood relief camps immediately after the disaster. In places affected by landslides there were people stranded in their homes as access was cut off.

Governance and Operations:

- On the issue of alert announcements of floods, most of the participants expressed no prior knowledge of the possibility of a flood-like situation due to rains. They also had no prior information of the opening of the dams. Only a few participants indicated that there were alerts about the imminent floods were announced on loudspeakers by panchayats, police and even at religious places like churches and mosques. Only one participant was aware of flyers distributed to alert people on the possibility of a flood like situation. Some of the participants were doubtful of the authenticity of the alerts itself. Participants also felt that most of the citizens, farmers and fisherfolk heard about the colour coding system of the alerts for the first time and could not understand its implication completely.



- There was overwhelming consensus among the participants that the state government, district administration, municipalities and panchayats did an excellent job of executing the rescue operations. The participants were also of the opinion that there was smooth and effective coordination between the various departments over rescue operation. The participants also appreciated the role of Non-Governmental Organizations (NGOs) and the fisherfolk in the rescue efforts. Only few participants indicated that preventive evacuation took place, most of the participants reported that evacuations took place after the water inundated homes and facilities. Most participants appreciated the role of the Medical Officers (MOs) and the Deputy Medical Officers (DMO) in coordinating the rescue operations. However, the some participants did highlight that evacuation operations among the patients of the hospitals in particular, was very challenging and there were difficulty in accessing the hospitals with boats. Some participants also detailed how they had to arrange big trucks (Taurus) to move patients from the inundated hospitals to safer spaces.
- Only some of the participants expressed awareness about control rooms and relief desks set up at various places for coordination of the rescue operations. This could perhaps be because of the nature of their role in the relief operations and frequency of their interactions with such desks. In Erunakulam a health desk under the supervision of healthcare professionals was set up and most of them were aware of it.
- Discussions with the participants indicated the extraordinary service the public health professionals provided in the rescue and relief operations. Participants described how, even after being

personally affected by the floods and landslides, did not deter the public healthand medical professionals from reporting to duty and taking care of the affected population. There were some doctors who worked non-stop for 8 days in a row. The dedication of public health and medical professional was paramount in controlling the post-disaster situation and preventing an epidemic.

Structural and technical integrity of the healthcare facilities:

- **Infrastructure damage:** Three out of the 12 healthcare facilities surveyed in this study were directly affected due to flooding. Out of the 3, two facilities were in regions that were totally inundated and one was constructed in a low lying area thus making it more vulnerable.
- Other 9 facilities were either situated in the flooded locality or catered services to the affected populations. Though the three healthcare facilities did not sustain any structural damage to their building, rising water levels did damage windows and doors at their facility. The equipment in these facilities such as computers, ILR, autoclave, IUCD kits, and ECG machine were damaged too. Hospitals also lost their registries and records of all their patients gathered over the years.

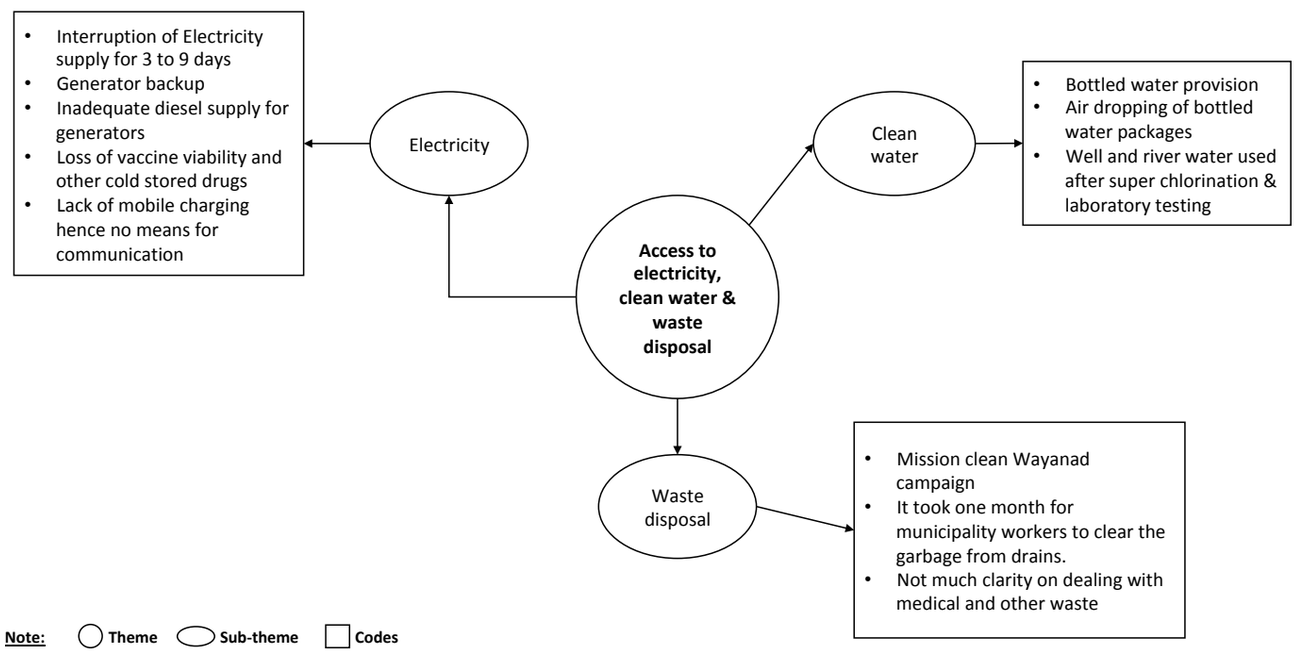
- **Barriers in providing health services:** Most of the health facilities surveyed (both government and private), expressed lack of adequate number of skilled staff in disaster management, as one of the key barriers in providing effective services to the affected populations. Most of the respondents also felt that the lack of knowledge of personal medical history among population, especially those from tribal communities, was also a roadblock in the provision of effective services post disaster. There were stray incidents of people opposing precautionary medication being administered to population to prevent epidemics like leptospirosis. Few participants also reported lack of availability of medicines, sanitary napkins and inability to quickly reach the affected areas as reasons for delay in services post flood.

- **Services to inaccessible area:** In few places the participants faced challenges in reaching populations that were isolated because of landslides or the access roads being cut off due to floods. Reaching those areas and providing emergency services was difficult and rescuers had to take help in airdropping supplies and even airlifting people with medical conditions. Taking alternate routes to reach such areas delayed the services further.

- **Hospital Preparedness:** Most hospitals generally stock up drugs during rainy season in anticipation of infectious diseases. The hospitals that were not inundated with floodwater had more or less adequate supply of drugs and medicines. One of the hospitals had also, in anticipation of flood, shifted some of its expensive equipment to the first floor of the building. A few of the hospitals had rapid response teams and staff trained in disaster management. One hospital even had dress banking system and hence was able to provide clothes to the people evacuated from homes in the relief camps. The hospitals that were flooded faced shortage of medicines to provide to the populations as the flood had destroyed their stock.

Access to electricity, clean water & waste disposal:

- **Electricity:** All the hospitals are dependent on the grid for electricity. Due the floods and disruption in power services, hospitals faced power outages anywhere from 3 to 9 days. All the hospitals had diesel generator backup but had to ration the use, as there was shortage of diesel post floods. Lack of electricity severely impacted the hospitals' effectiveness to treat people. It also affected their cold storage system and many hospitals reported damage to their entire vaccine and medical stocks, thus impacting their immunisation programs and schedules. Lack of electricity also meant no mobile charging and hence communications during relief and rescue were affected drastically. The hospitals or participants in the survey were not aware of the options of harnessing renewable energy (solar) to meet the needs of electricity during disasters.
- **Clean Water:** The main sources of water for most of the hospital are wells and river, and during the floods these sources were contaminated causing temporary scarcity of water. Most of the hospitals managed with their existing stock for the first couple of days after the flood and soon they were able to access bottled water, in some places water was even air-dropped. Once the flood water receded, in most places, the hospitals coordinated with the governmental agencies to "super-chlorinate" the well water, sometime up to six times, and lab tested it before clearing it for use by the general public.
- **Waste Disposal:** Waste disposal was another challenge post flood. After the hospitals were inundated medical waste and general wastes got mixed posing a bigger threat in most places. In addition there was muck from the flood that damaged the region and was difficult to remove. A coordinated team of volunteers worked in most of the regions to clear up the waste and disinfect homes and places. However, it was not clear if the volunteers were trained in handling medical waste or not. It took almost a month for the volunteers to clear up the waste and bring normalcy back to the facilities. In Wayanad, the health workers appreciated the role of Mission Clean Wayanad in removing the waste post floods.



Resource Management:

- **Health Workforce Management:** During any emergency, the capacity to manage available resources and mobilize additional resources determines the effectiveness and efficiency of the healthcare systems. The first challenge before most of the hospitals was to handle the stream of patients coming into the facilities post disaster. A human resources crisis occurred as many of the hospital staff themselves were affected by flood. In many places, hospital workers signed up for 2 to 3 shifts to compensate for the lack of staff. In many places hospital staff hardly took leave or break from the relief work. Given the priority was to look at the mental health of the people evacuated due to floods, general physicians in most places were trained by psychiatric volunteers from District Mental Health Program, NIMHANS, IMHANS etc, to look for symptoms of PTSD among patients and intervene. Some hospitals mobilised staff from unaffected health centers to make up for their strength. In Erunakulam district, community members were mobilised under *Shradhha* program to assist with health work like waste management, chlorination of drinking water sources and distribution of preventive medicines. The army doctors also helped significantly in restoring the health services in Erunakulam district.

- **Financial Assistance:** In most places, the hospital staff pooled in resources to help their colleagues who were affected by flood. The NGOs mostly mobilised basic kit containing of clothes and utensils for the general population affected by floods. In Erunakulam district, some people received sum of Rs. 10000 from the State as interim relief.

- **Social Assistance:** Hospital staff played a vital role in providing social assistance to the affected population. They assisted with counseling those who were suffering from trauma, mobilised monetary assistance and even assisted with cleaning up communities and chlorinating water bodies post flood. Overall all the participants of the study felt that there was a great display of community service by volunteers and general public to help each other in restoring the situation back to normalcy.

Relief camp in Ernakulam

Photo: Local Health Worker, Kerala

Social Determinants Influencing Flood Relief:

- **Vulnerable groups:** Almost all of the respondents detailed difficulties in relief measures to the antenatal women, lactating and menstruating women, children and elderly and bedridden patients. They felt that the measures taken were not adequate enough. There were cases where some pregnant women went into pre-term labour, in one case the newborn could not survive for more than a month after delivery. Similarly there were no separate space arrangements made for lactating women resulting in discomfort and hardships to them. Sanitary napkins were not available in most of the relief and rescue places resulting in hygiene issues for menstruating women. Health workers remarked that most of the children were traumatised due to the floods and the subsequent evacuations, and the noise of the relief camps further aggravated their situation. Resource crunch made evacuation of bedridden patients and the aged, complicated and difficult, leading to moments of severe anxiety and confusion in everyone.

- **Social Barriers and Community Response:** The respondents of the study described that the relief work was a remarkable show of community ownership and unity in the time of distress. While there were a few cases where social barriers like caste or religious beliefs disrupted the relief work in the camps, it was a common opinion that people rose above the lines of caste, class and religion. Health workers also encountered cases where they had to convince patients suffering from serious diseases to be hospitalised, since they did not believe in the hospital-based system of medicine.

Disease Prevention and Management and Challenges thereof:

The role of the health workers in disease prevention and management was explored in detail in the interviews. The respondents were specifically asked to share their experience of immediate impacts of flood on health, handling issues of mental health of the affected populations, strategies of prevention and management of diseases overall.

- **Immediate Health Impacts:** Most of the health workers noticed an increase in cases of cold, fever, flu like symptoms and respiratory disorders in the immediate aftermath of the floods. There were also cases of injuries during the rescue and cases of snakebites that were reported. Some of the respondents also reported cases of foot fungus/ athlete's foot among the people. Overall no major disease outbreaks were reported during the rescue period post floods, however fatalities were reported due to landslides as a result of incessant rain.

- **Mental Health Impacts:** Almost all of the participants reported severe mental health impacts on the population due to the floods and landslides. Most of the people who came to the relief camp were severely distressed and even in state of shock about leaving their homes, life savings and important documents behind. For the families who lost their loved ones in the landslide there was emotional distress and required intense counseling. Many people showed signs of anxiety given the uncertainty of the extent of damage the flood and landslides had on their farms, homes and livelihood. Health workers also outlined various

Health Professionals Monitoring Flood Affected Areas in Ernakulam

Photo: Local Health Worker, Kerala

measures taken to identify people who needed counseling at the relief camps so that help could be provided to them. In the interviews, it the respondent remarked that while the health workers took care of mental health of the rescued population, there was not much attention given to the mental health of the health and rescue workers themselves. Somehow the health workers were expected to continue to provide the services without any disruptions or breaks. There were cases where people at relief camps got very upset when the health workers providing medical attention took a short break after a long shift, forcing the person to come back to desk and resume the task.

- **Prevention of Major Outbreaks:** The respondents credit quick thinking by the government and coordinated cleanup and sanitization activities instrumental in preventing major epidemics post floods. The health workers started administration of *Doxycycline Prophylaxis* (prevention of leptospirosis) among the populations over the age of 2 years except in pregnant and lactating women. Similarly the task of chlorination of wells and tanks and clearing out the waste was taken up immediately after the water receded. Similarly relief camps were stocked up with ORS kits and awareness sessions were held with inside relief camps on preventing vector borne diseases and on personal hygiene practices. Staff and volunteers were specially trained to use personal protective equipment for cleanup. There was a central team of public health professionals and entomologist who carried out entomological surveillance. Fever survey was carried out in all the flood-affected houses to ensure reporting of diseases.
- **Health Management:** Healthcare providers efficiently managed the emergency situation by (i) documenting all illness in the health camps and making sufficient drugs available; (ii) monitoring the health status of individuals at camps on daily basis; (iii) hospitalizing the severely ill patients; and (iv) providing training for ASHAs on PTSD identification and referral to higher centers. Public health nurse and a junior nurse was in-charge of each health camp for monitoring of health of the people. The District Mental Health Program (DHMP) trained the ASHA workers in identifying individuals with PTSD and intervening.

Recommendations:

Moving forward, the respondents consolidated their experience of the 2018 floods and recommended certain measure for future. Their recommendations can be divided into two sub categories: a) Adapting to challenges in the future; b) Suggested improvement in the current intervention to make it more robust and health centers more resilient.

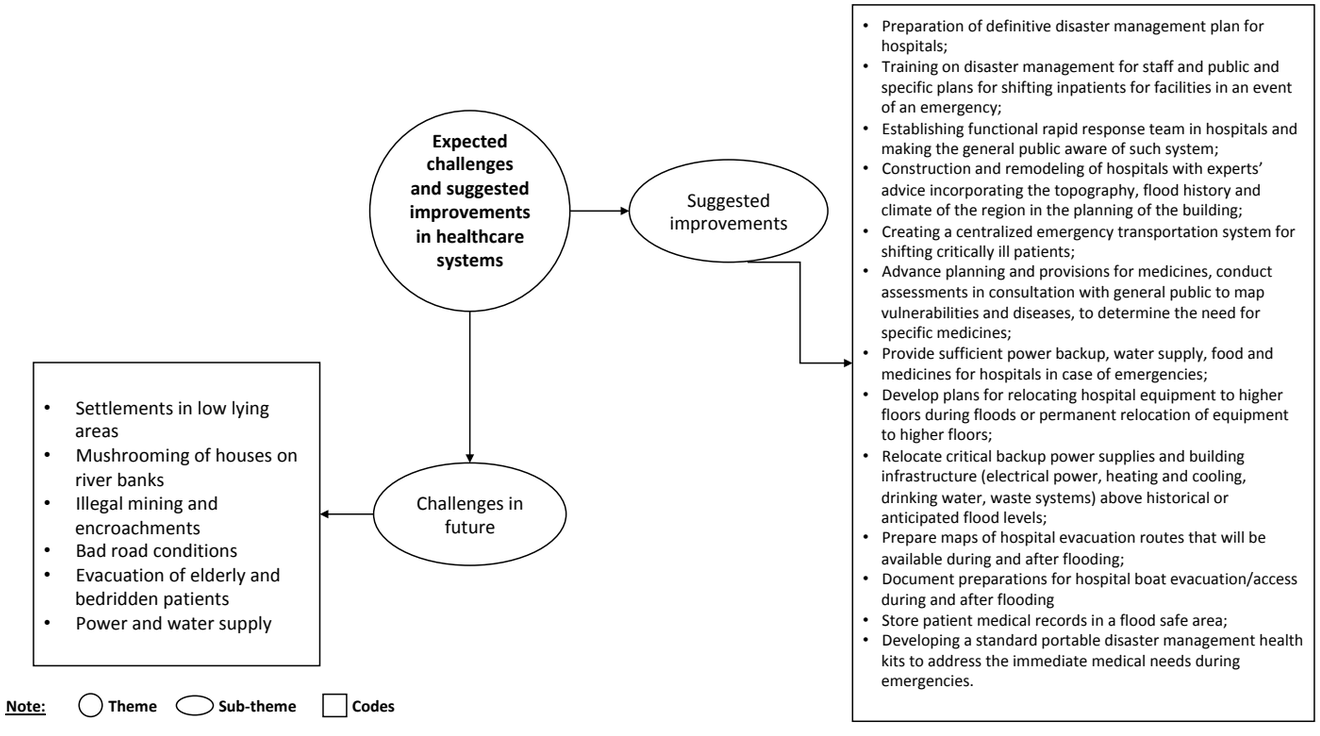
a) Adapting to challenges in future: The respondents were convinced that the collective response to a disaster cannot just be reactive but there has to be proactive. The respondents were of the opinion that measure has to be immediately taken to prevent any future flood-like situation. In order to do so, they suggested that:

- The town and country planning measure have to be made more robust to prevent encroachments of water bodies and low-lying areas;
- Immediate check on illegal mining activities;
- Immediate action to prevent deforestation that leads to landslides;
- Adequate repair and maintenance of roads for smoother transportation of people to safer places.
- Sufficient provision for power backups and water supply for hospitals and communities in case of emergencies;
- Joint mapping of vulnerabilities and resources of the regions with in consultation with local administration, hospital and general public for better preparedness in the future.
- Develop and popularise effective alert systems during the disaster.

b) Suggested improvements for building resilience: The respondents suggested some changes that can be brought in the healthcare systems in order to provide more effective and efficient care during the emergency situations. The following are the suggested improvements:

- Preparation of definitive disaster management plan for hospitals;
- Training on disaster management for staff and public and specific plans for shifting inpatients for facilities in an event of an emergency;
- Establishing functional rapid response team in hospitals and making the general public aware of such system;
- Construction and remodeling of hospitals with experts' advice incorporating the topography, flood history and climate of the region in the planning of the building;
- Creating a centralized emergency transportation system for shifting critically ill patients;

- Advance planning and provisions for medicines, conduct assessments in consultation with general public to map vulnerabilities and diseases, to determine the need for specific medicines
- Provide sufficient power backup, water supply, food and medicines for hospitals in case of emergencies
- Develop plans for relocating hospital equipment to higher floors during floods or permanent relocation of equipment to higher floors
- Relocate critical backup power supplies and building infrastructure (electrical power, heating and cooling, drinking water, waste systems) above historical or anticipated flood levels;
- Prepare maps of hospital evacuation routes that will be available during and after flooding;
- Document preparations for hospital boat evacuation/access during and after flooding
- Store patient medical records in a flood safe area;
- Developing a standard portable disaster management health kits to address the immediate medical needs during emergencies.



Health Camp in Ernakulam

Photo: Local Health Worker, Kerala

One of the flood affected hospitals, Wayanad

Photo: Vishvaja Sambath

Conclusion:

Health sector is at the forefront in the fight against impacts of extreme weather events and in protecting public health. The exercise undertaken to assess the response of Health Systems in Kerala, post 2018 floods, outlined the complexities of the post disaster interventions and showed us the way in which the health system can be better prepared and even assist in mitigate the effects of disasters. A climate resilient health system will further build resilience in the communities.

It is clear that decentralization of the health systems helped immensely in effective response to the disaster. There is a need to further strengthen local bodies and engage in a joint exercise to map out climate vulnerabilities of the regions in their local contexts and prepare a mitigation plan. There is also an urgent need to design and remodel the health systems not only based on the patient need, but also keeping in mind the ecological vulnerabilities of the locality.

Overall, truly responsive and responsible health systems would take a lead before disaster strikes by taking necessary measures, be prepared to manage disasters, and also point to the harmful and inequitable effects of developmental activities in their local context. We need to expand the scope of Health for All to Health in All Policies.

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Annexure I

Interview guide for In-Depth Interview

Introduction:

I am _____, _____. I am here to conduct In-Depth Interview with you on the topic "Building climate resilient health systems – Role of Public Health Systems in Extreme Climatic Events". We are doing this study in order to understand lessons that you learnt from the 2018 floods and to apply the same for developing climate resilient health systems to withstand the future floods. To understand this, we will be discussing on the above mentioned topic for a maximum period of one hour. For the reliability of the findings, audio recording of the interview will be taken for the purpose of analysis. I will be having the record for a period of three years. The confidentiality of the data will be maintained and only the aggregate data will be used for any publications or presentations, the individual's personal information will not be revealed. Through this study we will be able to know the challenges and threats faced by the health sector affected due to the floods that occurred during August 2018, through which the policy makers can make strategies to build a climate resilient health systems to withstand the extreme climatic events and to suggest policy recommendations for the government in building and rebuilding the climate resilient health care systems for facing future adverse climatic events.

Are you willing to participate in this study?

Questions to be discussed:

1. What was the size of geographic area affected and numbers of people affected?
2. What do you think as perceived underlying causative factors and drivers of the floods?
3. Is there any ongoing outbreaks related to the flood?
4. What are the associated health risks?
5. What are the primary and secondary effects?
6. What was the conditions of the affected population?
7. Can you provide your insight on vulnerable groups and impact on them due to floods?
8. Was there physical damage to your health facilities and other vital infrastructure?
9. Was there any disruption of health service delivery?
10. What were the national and local response?
11. How was the coordination capacity – in rescue action, health camps, alerts announcements, rescue desks, etc?
12. What were the access related challenges?
13. What were the challenges related to coverage of essential health services and other related services?

Probes:

1. Would you give me an example?
2. Can you elaborate on that idea?
3. Would you explain that further?
4. Is there anything else that you feel you want to add?
5. In terms of timeline probes, local or regional event would be a significant. Like before floods or after floods etc.

Conclusion:

Thank you for spending your precious time with me for this In-Depth Interview. This recording will be with me confidentially for a period of three years. I will be transcribing the audio recordings and use it for the analysis. Once again thank you for your contribution. Have a good day.

Healthy Energy Initiative India (HEII) is a program of Health Care Without Harm and Community Environmental Monitoring, that aims to mobilize the health sector to play a central role advocating to move away from fossil fuel-based power generation, towards clean, renewable healthy energy options and in the process building climate resilient communities. HEI India also works with health professionals in developing policies on environmental health in India, and aims to assist with the development of climate resilient and climate smart health system policies in Indian states. For more details: http://www.healthyenergyinitiative.org/countries/india/

Doctors For You (DFY) is a pan India humanitarian organisation with international presence and is working in various disaster hit zones for last 11 years. DFY focuses on providing medical care to the vulnerable communities during crisis and non-crisis situation, emergency medical aid to people affected by natural disaster, conflicts and epidemics. DFY is committed to reducing disaster risk to human society by delivering trainings and capacity development in emergency preparedness and response. The work of DFY is guided by humanitarian principles of humanity, impartiality, and neutrality. It offers services and assistance to people based on need, irrespective of race, class, caste, religion and gender. Doctors for You was founded in India in 2007, by doctors, medical students and like-minded people with a vision of “Health for all.” Currently, DFY is working on various projects in >15 states of India involving health professional, Disaster Management Practitioners, Social Workers and Administrative Staff. DFY is a registered society under the Societies Registration Act 1860 Section 21 - Registration no. F-56886(Mum). For more details: http://doctorsforyou.org

Climate Action Network South Asia (CANSA) is a coalition of over 185 civil society organisations from 8 South Asian countries. Its goal is to promote equity and sustainable development in the design and development of an effective global strategy to reduce greenhouse gas emissions, and ensure its implementation. With around 60 NGO members in India, the membership of CANSA ranges from organisations mobilising local communities to national organisations playing an influential role as technical partners with government agencies. Together the member organisations endeavor to promote solutions to bridge the gap between policies and practice among policy makers and civil society. For more details: https://www.cansouthasia.net

Community Environmental Monitoring (CEM) is a program of The Other Media and was created in December 2003 to work on issues of environment, pollution, toxics, health, justice and corporate accountability. CEM’s objective is to open up and strengthen the democratic space for pollution-impacted communities and communities fighting industrial pollution. It pursues this objective by providing communities with capacity-enhancing resources (technical, legal, solidarity, strategic) through meetings, skills exchanges and trainings, and through interactions with others impacted communities similarly placed. CEM believes that for the environmental health work in the country to mature into a movement, alliances need to be promoted among pollution-impacted communities, between communities fighting same/similar adversaries and/or issues, and between such communities and other non-traditional partners such as labour, public interest professionals, the health sector and most importantly, middle-class city-dwellers. For more details: http://theothermedia.in/community-environmental-monitoring/