Monsoon Calamity Damages 2013

Special Financial Assistance Request

Submitted to

Hon'ble Prime Minister

By

All Party Delegation

Led by

Chief Minister, Kerala

9th August 2013

Contents

1. Monsoon Calamity-Damage - Assessment and request for financial assistance

1.1. Request for financial assistance

Monsoon rainfall in Kerala in 2013 has exceeded the forecast causing landslides and floods in several districts in the State and consequently heavy loss to life and property. Coastal erosion has accentuated damages all along the coastline of the State. Floods devastated several villages leading to evacuation and dislocation of large numbers of families now sheltered in relief camps. Many more were moved to the houses of relatives by the district administration. Till date, **175 deaths** have occurred in the State due to monsoon related calamity. Landslides and floods in Idukki district alone during the period between 4 to 7 August claimed 16 lives. In addition to these **lightning** inflicted deaths, by the end of last year is **35**. More than **60,000 dwelling units** have been fully and severely damaged. Out of the 1,51,652 kms of **roads in the State**, more than **50%** have been severely ravaged. Sectors such as agriculture, animal husbandry & dairy development, power and irrigation have all been affected by excessive and incessant rain. A total of **1049 villages out of the 1634 villages** (147 coastal and 902 non-coastal) have so far been **affected by monsoon calamity**.

It may be noted that almost the entire coastline of Kerala which is one of India's most densely populated belt has been affected by the severity of the on-going monsoon. Till date **70 landslides** were reported from the hilly districts of the State; in Idukki alone between 4 - 8 August, **fourty six (46)** landslides have occurred. Flood situation is still prevailing in the Kuttanad region of Alappuzha district, parts of Pathanamthitta district, the Kol lands of Thrissur district and the lower parts of Ernakulam and Kottayam districts due to heavy discharge from the rivers that drains in to these paddy cultivated area. It may be noted that Kuttanad is a globally important agriculture heritage site as recognized by the FAO and is the granary of the State. The entire Kuttanad belt has been affected 4 times during this sowing season due to flooding and is submerged under water. Further, the long term implications for labour and school days (a total of 25 days from 1 June to 8 August) lost cannot be quantified in financial terms.

In the light of the ongoing monsoon calamity, the Government of Kerala had submitted a memorandum on 1 August 2013 requesting Rs. 503 crores as immediate assistance from National Disaster Response Fund as the losses by then had crossed Rs. 887 crores which was completely beyond the reach of the State to handle. I also take this opportunity to bring to your kind notice that Kerala, until the end of May 2013, was facing a drought unheard in the history of the State which forced us to seek a Special Financial Package from Government of India for an amount of Rs. 3936 crores. Simultaneously, the Government of Kerala submitted two separate memoranda to Ministry of Agriculture, Govt. of India as the drought losses amounted to Rs. 7888 crores.

The drought and the ongoing extreme monsoon which immediately followed have pushed the State to a financial crisis, because of the heavy burden in undertaking the relief and rehabilitation measures. I bring to your kind notice that as the State Government machinery could not cope with the calamity situation, the National Disaster Response Force, Indian Army, Indian Navy and Indian Air force were pressed into service. The events that followed in Kerala since 1 June 2013 qualifies to be **disaster** as these *exceeded the ability of the 'affected people (the State Government)' to cope using their own resources*.

Hill terrain and inaccessible Idukki district of Kerala is unique due to the presence of hapless tribal, marginal farmers, landless labourers, plantation workers and other weaker sections that are very badly affected by the recent natural disasters. Marginal farmers have very low land holdings to the extent of 1 acre or less. They are economically devastated due to the natural calamity which calls for urgent support.

In order to restore the physical infrastructure and alleviate the poor and the downtrodden from the miseries of nature's fury, which is one of the most important priorities of the very determined & focused Union Government under your's and the UPA Chairperson's guidance, Government of Kerala in the perspective of building a disaster resilient society, solicit your intervention for a Special Financial Assistance from Government of India for Rs. 5660 crores for the measures which is appended to this request.

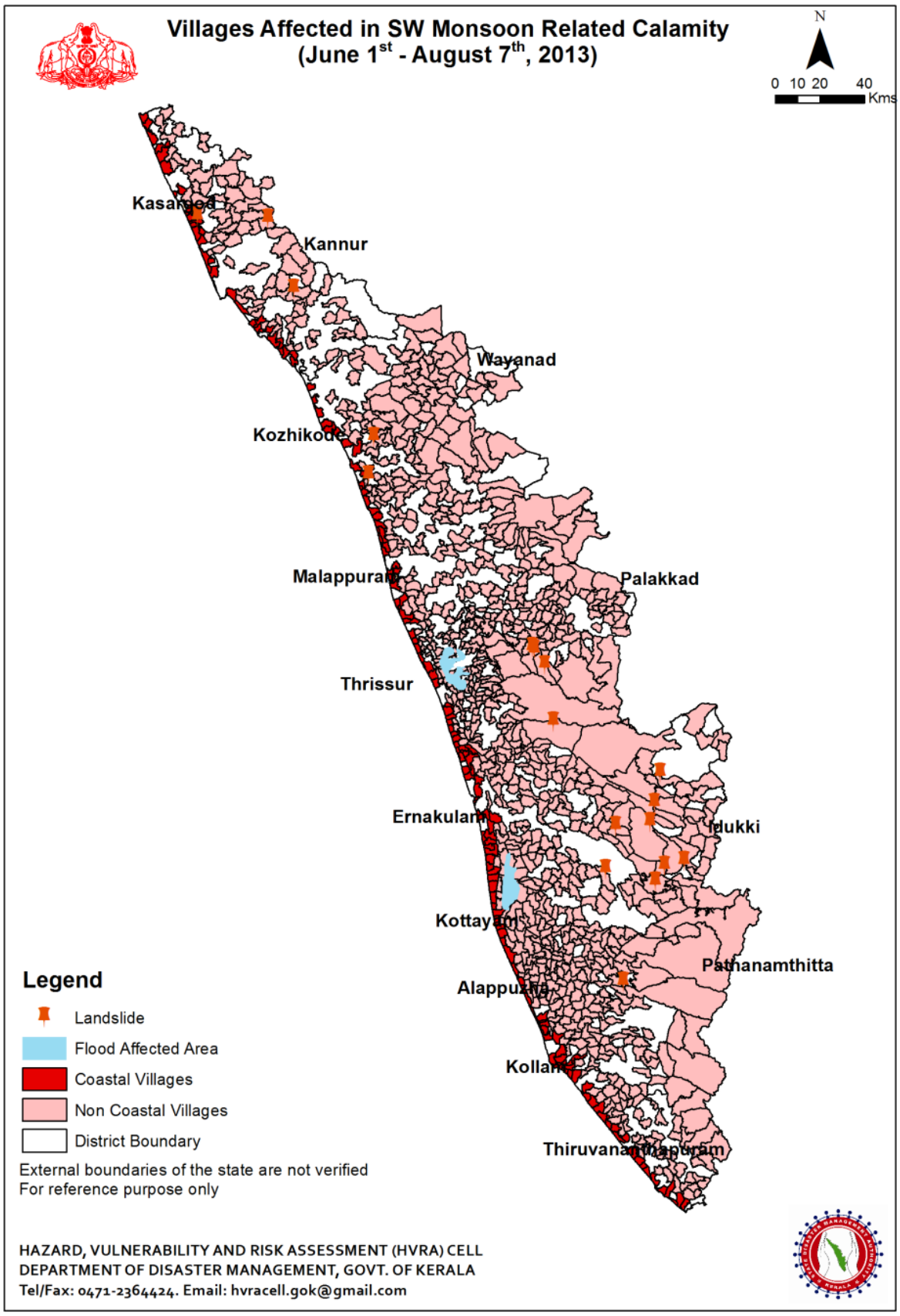
SPECIAL FINANCIAL ASSISTANCE REQUEST FROM GOVERNMENT OF INDIA IN THE LIGHT OF MONSOON CALAMITY IN KERALA - 2013

Sl. No.	Sector	Amount (Rs. in crs)
1	Disaster resilient Idukki	3090
2	Insurance scheme for coastal erosion and lightning affected communities	300
3	Repair of roads and bridges of Kerala damaged in the monsoon calamity	2170
4	Funding for equipping State Disaster Response Force	100
Grand Total (Rs. Five thousand six hundred and sixty only)		**5660**

09-08-2013

OOMMEN CHANDY
Chief Minister
Kerala

Some glimpses of the monsoon calamity damages in Kerala


Villages Affected in SW Monsoon Related Calamity
(June 1st - August 7th, 2013)
N
0 10 20 40
Kms
Kasargod
Kannur
Wayanad
Kozhikode
Malappuram
Palakkad
Thrissur
Ernakulam
Idukki
Kottayam
Pathanamthitta
Alappuzha
Kollam
Thiruvananthapuram
Legend
Landslide
Flood Affected Area
Coastal Villages
Non Coastal Villages
District Boundary
External boundaries of the state are not verified
For reference purpose only
HAZARD, VULNERABILITY AND RISK ASSESSMENT (HVRA) CELL
DEPARTMENT OF DISASTER MANAGEMENT, GOVT. OF KERALA
Tel/Fax: 0471-2364424. Email: hvracell.gok@gmail.com

2. Rainfall – 1 June to 7 August 2013

Figure 3 shows the comparison of actual and expected (normal) rainfall for the current and the preceding 7 years as per IMD data. From the figure it is evident that the state received excessive rainfall during the period. The intra-state variability of rainfall in Kerala is very high; instantaneous rainfall at 1000 m above mean sea level can be 150% higher than at 40 m above MSL. Figure 4 shows the district wise actual and expected (normal) rainfall from 1 June 2013. Figure 5 shows instances of cloud cover (INSAT Satellite Images) over Kerala from 1 June 2013 to 29 July 2013. The thick clouds covering the entire state indicate the intense nature of South West Monsoon and this intense of monsoon activity was confirmed by IMD. Considering the current trend, if the rainfall intensity and amount remains high in the coming months of the South West Monsoon, the figures of natural calamity is likely to increase significantly. This excessive rainfall has caused significant damage to life and property, the details of which is given in the subsequent chapters.

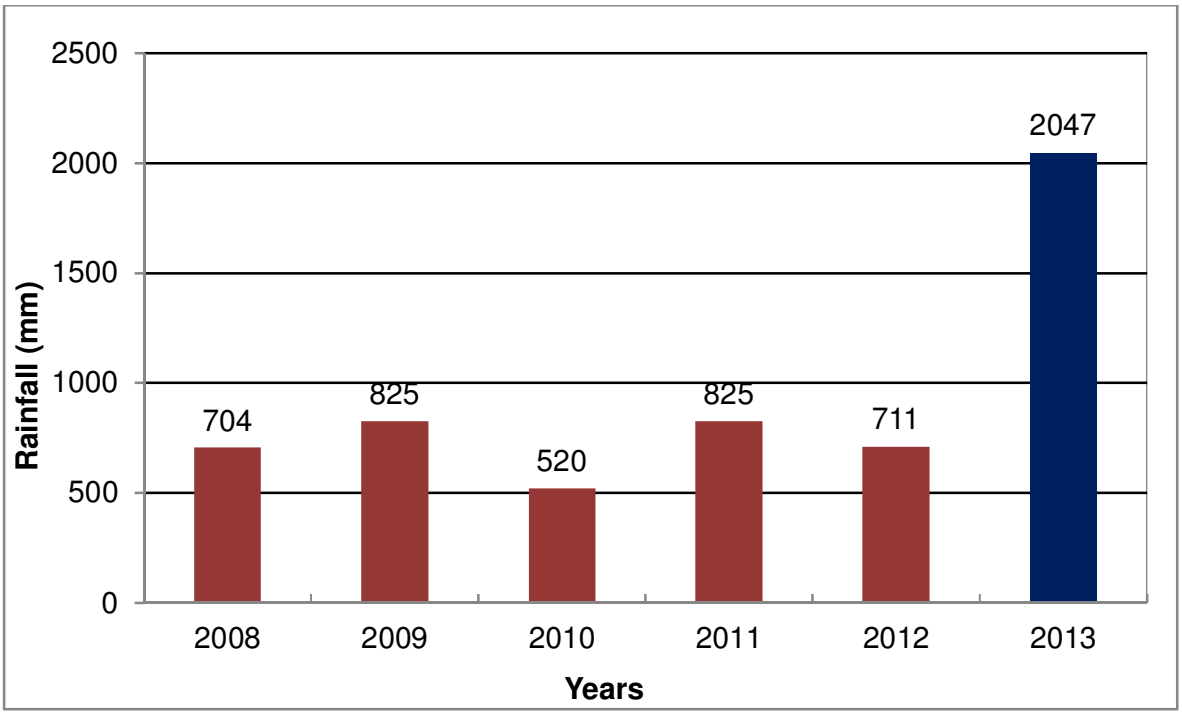


Figure 3: Rainfall from 1 June to 7 August 2013 - 2008 to 2013 (Data source: IMD)

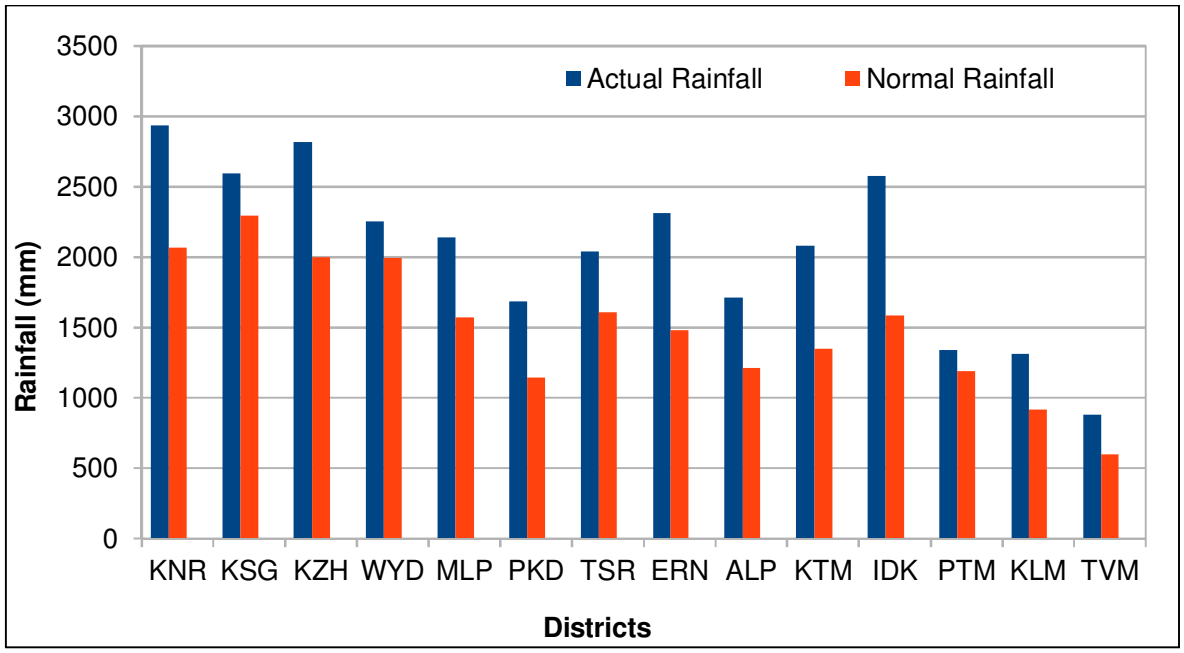


Figure 4: District wise actual and expected (normal) rainfall of 2013 (1 June to 7 August) (Data source: IMD)

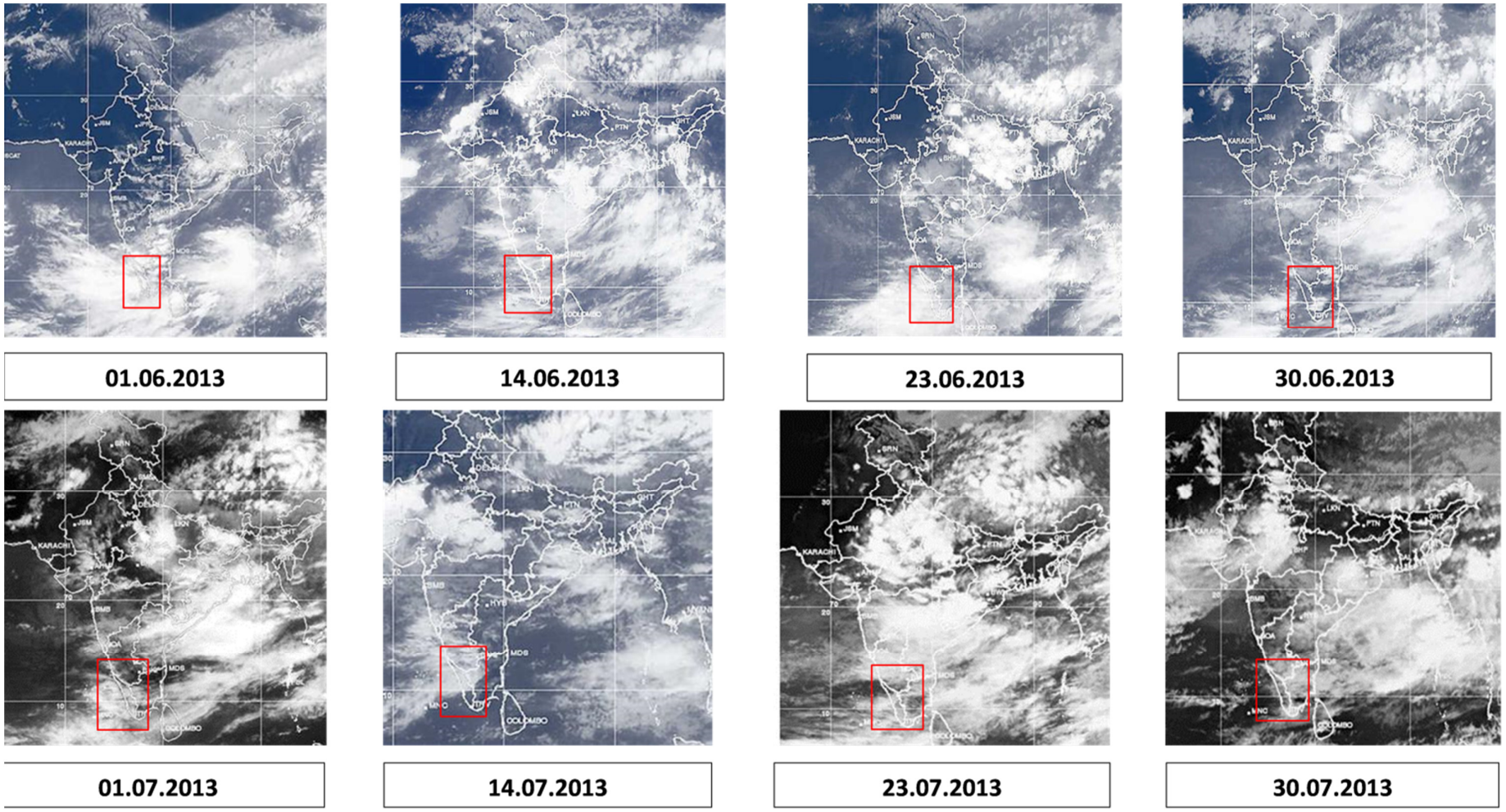


Figure 5: INSAT pictures from 1 June 29 July 2013 (Source: IMD)

Note that Kerala was covered with intense cloud all through from June and July

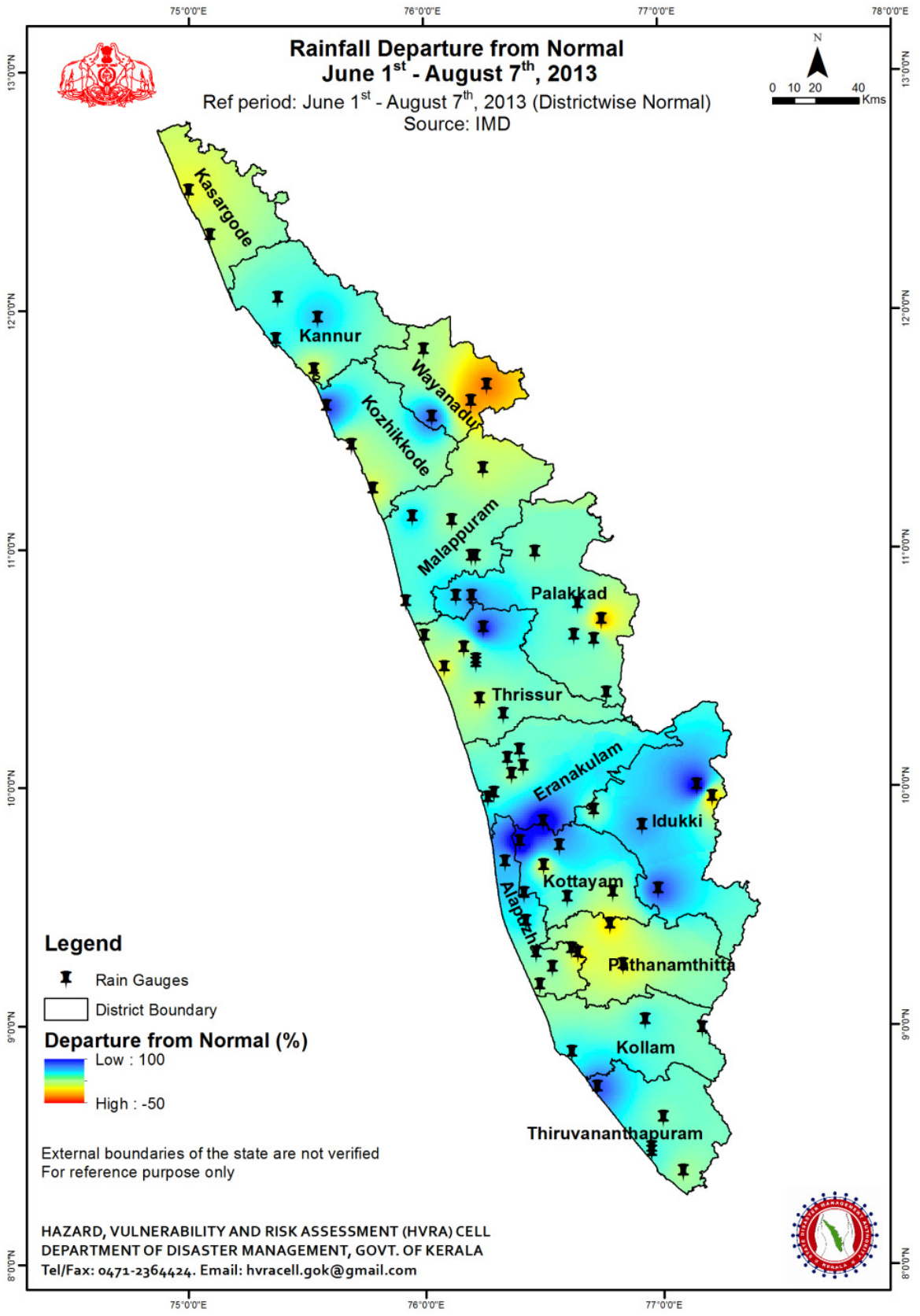


Figure 6: Rainfall departure from normal, 1 June 7 August 2013 (Source: IMD)

3. Disaster resilient Idukki – a special package request

In the heavy rains that hit the State, Idukki district suffered the most severe damages. An abstract of the losses till date in the district is given table 1 below. Figure 7 shows the weekly actual rainfall at different rainfall station in the District as compared to the long period average for the respective week and Figure 8 shows the road segments damaged.

Table 1: Monsoon calamity loss in Idukki – 1 June to 7 August 2013

Type of loss	Number/Area/kms	Amount (in crs)
Human fatalities	22	-
Crop loss	3000 ha	300
Houses damaged	8000	
Infrastructure loss (Roads & bridges; cf. Figure 7)	2000 km	1500
Displaced population	4000	-
Debris clearance from roads, houses, parks, agricultural land, canals etc.	4000	200
Search and rescue (NDRF, Army, Navy & State Forces)	1000 men deployed	250
Animal husbandry & dairy development	1500 animals perished	10
School days lost	15	-
Labour days lost	30	-
Total	-	**2260**

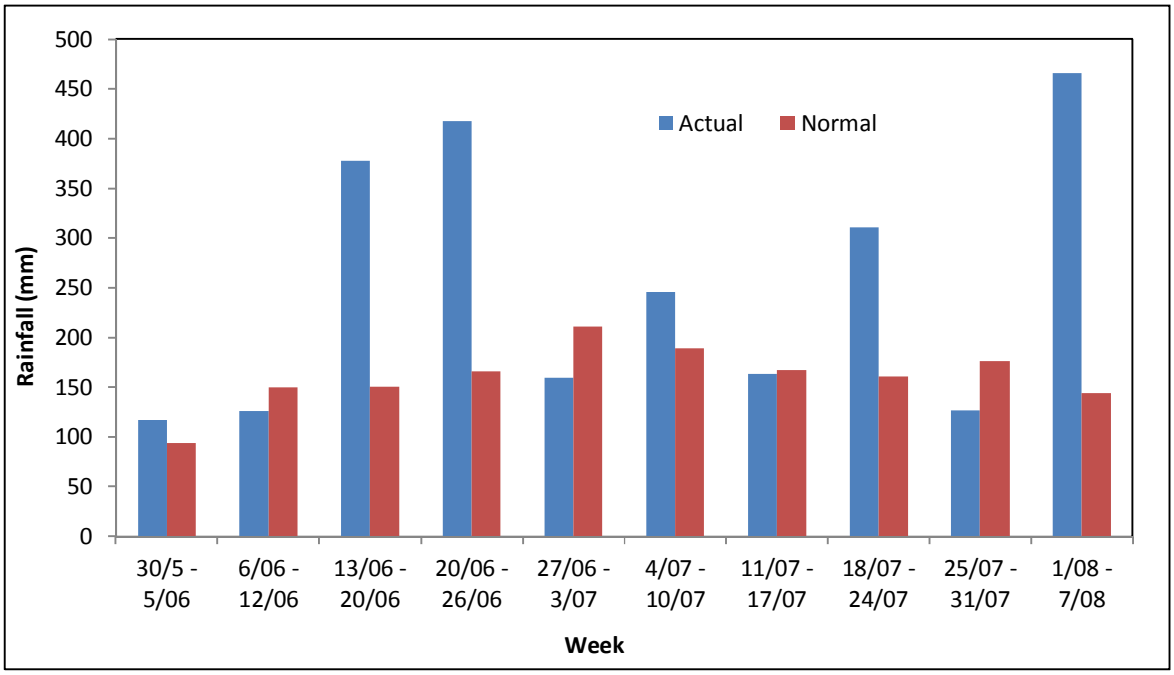


Figure 7: Weekly actual against long period average rainfall in Idukki (Source: IMD)

As it is evident from the figures in table 1, the calamity has dented the economic situation of this relatively backward district substantially. Hence, a special assistance is requested for reconstructing and making the Idukki district disaster resilient.

Table 2: Disaster resilient Idukki – a special package request

Requested head	Number/Area/kms	Amount (in crs)
Landslide resilient roads & bridges (PWD & Village roads)	1000 kms	2000
Input subsidy & crop insurance to farmers	1,00,000 farmers	200
Construction of disaster resilient houses for the affected, the tribal and BPL communities in the district by linking with the Zero Landless Programme	10,000 dwelling units	600
Permanent calamity shelters	40	100
Hazard early warning systems	-	20
Alternate communication systems	-	150
Mullaperiyar crisis management programme	-	20
Total	-	**3090**

3.1 Landslide resilient roads & bridges

Figure 8 shows the roads in Idukki district that were damaged in the last 2 months. It may be noted that almost all roads have been severely and partly damaged. Most of the roads and bridges in the district are constructed without proper side terracing, reinforcement or necessary water draining facilities such as weeping holes. Hence, in order to stabilize and make the roads and bridges of Idukki, landslide resilient, an amount of Rs. 2000 crs is requested.

Note the road side with steep slopes in the picture

3.2 Input subsidy & crop insurance to farmers

With over 1,00,000 small and marginal farmers and agricultural labourers, agriculture is a mainstay of economy of the District. Severe drought (2012-13) and the ongoing monsoon calamity has significantly affected the farmers and agricultural labourers of the district. In order to offer total crop insurance and provide an input subsidy for initiating fresh cropping, an amount of Rs. 200 crs is requested.

3.3 Disaster resilient housing

The Idukki district is one of the most backward districts of the State in terms of per capita income, as a sizeable population of the district are agricultural labourers and tribal. The Government of Kerala is currently implementing a prestigious programme named 'Zero Land Less Programme' whereby it aims to offer at least a piece of land to the landless with the aim that no family of the State will be without a title to land by 2015. The beneficiaries of this programme are the very downtrodden and poor. Usual housing schemes of the Governments are insufficient to ensure safe and disaster resilient housing particularly in such a multi-hazard prone district. Hence, in order to build 10,000 disaster resilient dwelling units by linking it with the 'Zero Land Less Programme', an amount of Rs. 600 crs is requested.

3.4 Permanent calamity shelters

The Idukki district is one of the most hazard prone districts of the State. Figure 9 shows the hazard zonation map of the District. Whenever a calamity strikes, in order to relocate displaced communities, relief camps are opened mostly in schools. This results in valuable school days being lost. So also schools are not equipped to cater to the needs of families and it also does not enable the administration to ensure sufficient safety and privacy to women and children. Hence, an amount of Rs. 100 crs is requested for construction of 40 permanent and dedicated calamity shelters in the district at various locations.

3.5 Hazard early warning systems

The Idukki district is one of the most hazard prone districts of the State. Landslides and earthquakes are common in the district. With about 15 small and large reservoirs the

district, the age of them ranging from 120 years to 10 years, is another major hazard potential. This implies that a hazard early warning system needs to be in place which includes video surveillance of major dams, hooter and siren systems to alert dwelling clusters, automated weather stations and discharge gauges, all collectively integrated to a single district emergency operation center. In order to establish such a system, an amount of Rs. 20 crs is requested.

3.6 Alternate communication systems

The Idukki district is a dark spot in the telecommunication sector of the State. Even the connectivity from BSNL is poor. Hence, the District administration needs to be provided with mobile alternate communication systems such as Very High Frequency and Utra High Frequency Radio networks. Further, it is also requested that Honb'le Prime Minister may kindly consider **directing the BSNL** to strengthen and increase the mobile and landline connectivity in the district and increase the availability time of these networks by establishing optical fiber cable. In order to establish such a system, an amount of Rs. 150 crs is requested.

3.7 Mullaperiyar crisis management programme

Historical database of earthquakes of Kerala shows occurrence of considerable seismic activity in Kottayam-Idukki region of central Kerala because of the presence of several lineaments and bed rock fissures that transects these districts. These two districts suffered three earthquakes in the recent history, viz. the 1988 Nedumkandam (4.5 M), the 2000 Erattupetta (5.0 M) and the 2001 Erattupetta (4.5 M) events and the districts experience several micro-tremors (events less than 2.5 in magnitude). These events often generate a great deal of public anxiety, especially when the disastrous consequences of earthquakes such as those in Sikkim, Wenchuan (China), Bam, Lattur etc. are all fresh in the minds of the people.

Adding to this anxiety is also the presence of several major dams including the Idukki arch dam and the Mullaperiyar dam in the region. Mullaperiyar dam particularly arouses a great deal of genuine public anxiety when tremors strike Idukki and/or Kottayam districts. People are often concerned of a dam break scenario given the age of Mullaperiyar dam,

the material and technology that has been used for its construction and the possibility of reduced structural integrity occurred over the last one century.

The seismic activity in and around Idukki district was particularly more frequent in 2011 year during which 26 tremors were reported in a period 2 months. All this created significant panic amongst the people of Idukki. Realizing the need to alleviate the people from their fear and anxiety the Government of Kerala has created a Mullaperiyar Crisis Management Plan (MCMP) as part of which 2014 volunteers have been trained between Mullaperiyar dam and Idukki reservoir. This is in addition to various other activities including video surveillance and the creation of a Geodatabase of the people and property in the stretch. To continue the programme and to extent it further downstream of Idukki dam, an amount of Rs. 20 crs is requested.

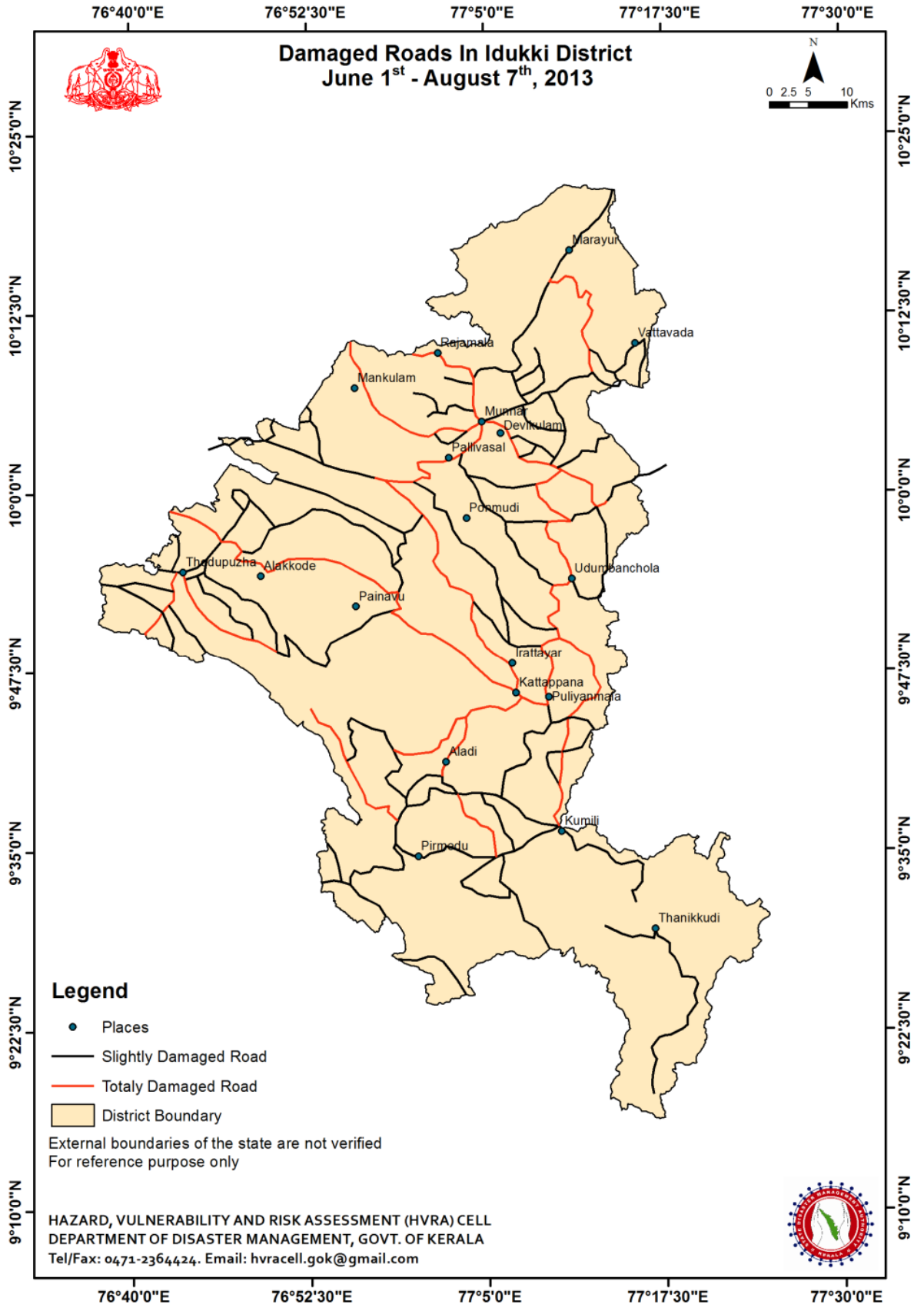
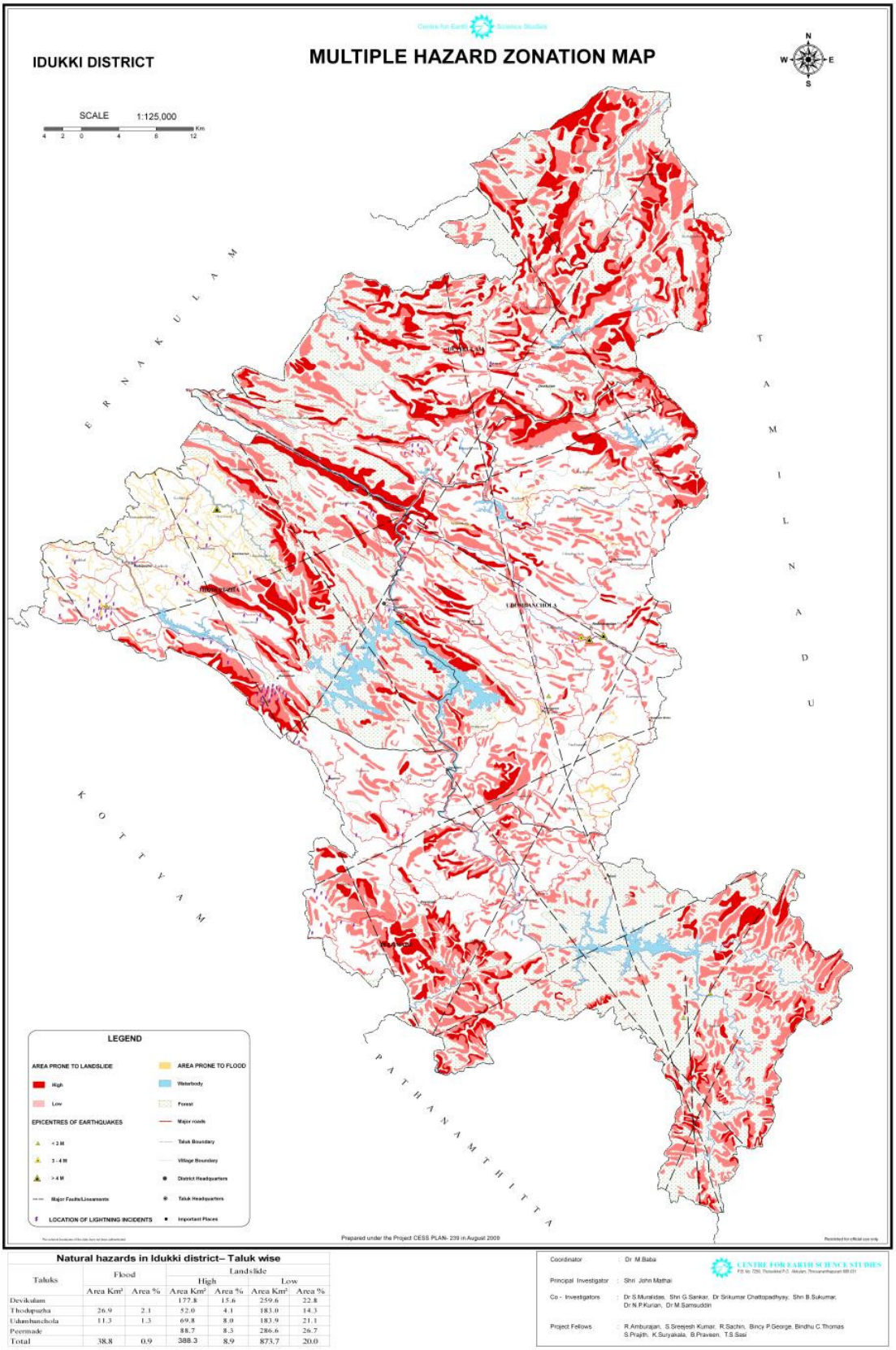


Figure 8: Roads damaged in Idukki due to monsoon calamity - 1 June to 7 August 2013



Natural hazards in Idukki district– Taluk wise

Taluks	Flood		Landslide			
			High		Low	
	Area Km²	Area %	Area Km²	Area %	Area Km²	Area %
Devikulam			177.8	15.6	259.6	22.8
Thodupuzha	26.9	2.1	52.0	4.1	183.0	14.3
Udumbanchola	11.3	1.3	69.8	8.0	183.9	21.1
Peermade			88.7	8.3	286.6	26.7
Total	38.8	0.9	388.3	8.9	873.7	20.0

Figure 9: Hazard zonation map of Idukki (Courtesy: Centre for Earth Science Studies)

4. Inclusion of coastal erosion and lighting in the list of natural calamities & insurance scheme for affected

4.1 Introduction

Lightning and coastal erosion are part of the natural evolutionary system of the earth which turn into 'hazards' when the human system started interacting with it. The human system itself was subjected to significant transformations over its history. These transformations and their links to the natural system have served as templates of the dynamics of naturally triggered hazards and therefore, of disasters (Alcantara-Ayala, 2002).

This 'template of disasters' is particularly apparent in the state of Kerala where, within a short period of last 80 years, a rapid socio-economic transformation from an agrarian society to a highly urbanized consumerist society has emerged. Parallel to this societal transformation, the population pressure along the coastline forced the then marginalized sections of the community to migrate from the coastal belt to the relatively inhospitable terrain of the Western Ghats (George and Chattopadhyay, 2001). A study conducted on migration suggested that in the past 80 years the coastal plains recorded a population growth of 306% where as the highlands, foot hills and uplands together experienced a growth of 1342% (Nair et al., 1997). This population with a density of ~819 people/km^2 (Census of India, 2001) is more or less widely distributed across all geomorphic units of the state, exposing them to multiple hazards including lighting and coastal erosion.

The international scientific community has had recognized lightning and coastal erosion as 'naturally triggered hazards' a couple of decades ago and has had ever since vested significant attention in understanding the scenarios that transforms these 'natural processes' into disastrous events.

There are some 24,000 lightning deaths and 240,000 injuries annually worldwide (NLSI, 2011). The United States of America and the European Union has dedicated lightning research centers, while it has received very little scientific attention in India as a hazardous natural phenomenon. Coastal erosion is well researched across the world as well as in India by research institutions such as the Indian National Centre for Ocean Information Services, Centre for Earth Science Studies, National Remote Sensing Centre etc. from an earth systems process as well as from a hazard perspective.

4.2 Lightning

In Kerala, research on lightning has been conducted for over a decade by the Centre for Earth Science Studies (CESS). The CESS maintains a regularly updated Geographic Information Systems based database of lighting felt reports which is collected from newspaper reports or compensation claims submitted by the affected to the Department of Revenue, Govt. of Kerala. It is known from studies that Cumulonimbus (Cb) clouds produce lightning. Kerala's typical topography favours frequent Cb formation especially during the months of April-May and October-November (Murali Das, 2007; Vishnu et al., 2010).

Figure 10 shows the spatial distribution of lightning in Kerala between 1986 and 2002. It can be seen from Figure 10 that there is a relative void of incidents in an area west of the Palakkad. This is because the mountain range has a gap in Palakkad and this absence results in less Cb formation and consequent lightning incidence. The figure indicates that the mid land of Kerala is significantly prone to lightning. The high lands have the least of incidence and the frequency and distribution in the low lands falls between the other two. A simple explanatory statistics derived from this database of 17 years shows that there has been on an average **71 deaths and 112 injuries due to lightning every year**. In the year 2012, between October and December, there were as many as 35 fatalities due to lightning. It

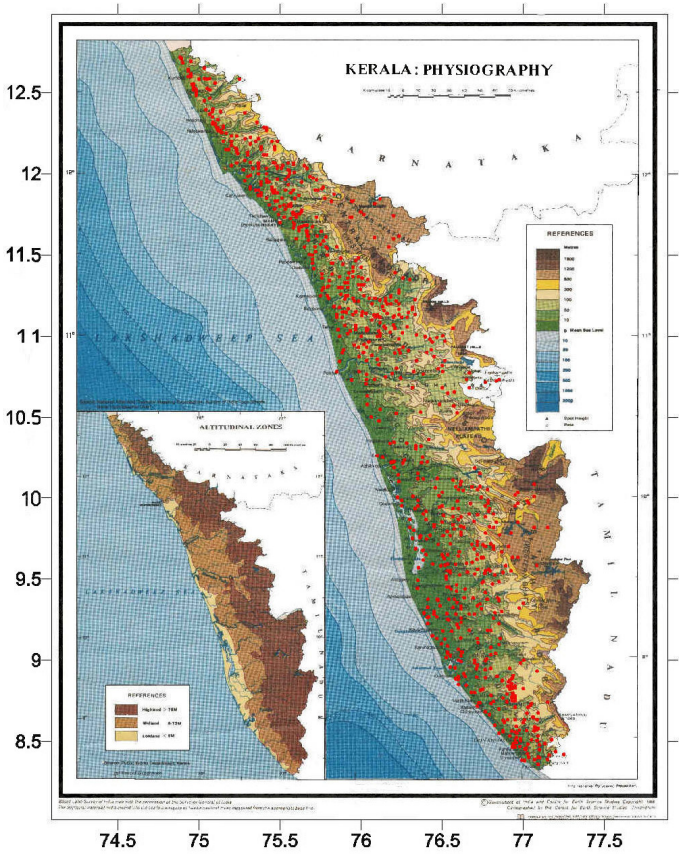


Figure 10: Spatial distribution of lightning incidents overlaid on the physiographic map of Kerala (red dots are individual events; note that there are numerous overlaps of dots) (Murali Das, 2007)

was noted that most of the demised and the injured due to lightning were bread earning members of relatively poor families, and often were women.

Figure 11 shows the district wise distribution of lightning incidents from which it is evident that lightning fatalities is the highest in Malappuram district, highest number of lightning hit injuries are reported from Thiruvananthapuram district and the highest number of lightning events are reported from Kannur district. It is as well apparent from Figure 11 that **no district of the state is devoid of lightning fatalities or injuries**.

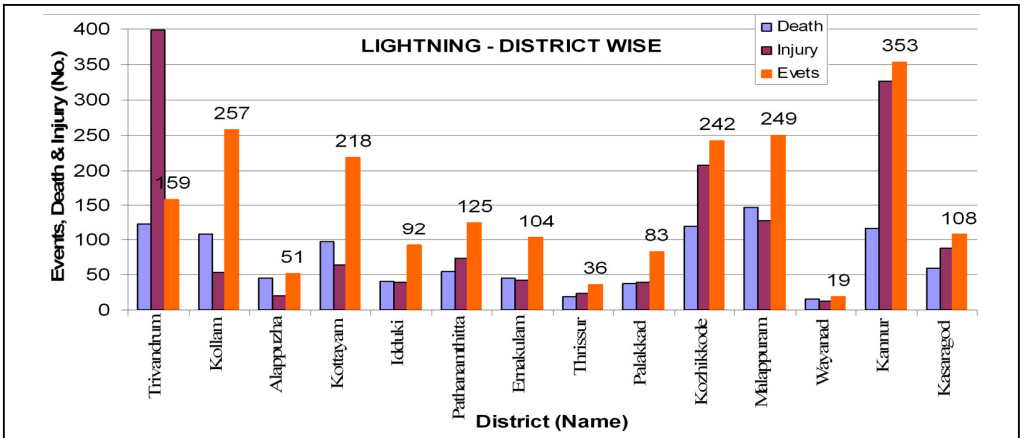


Figure 11: District wise distribution of lightning incidence in Kerala (Murali Das, 2007)

Property damage due to lighting is also very high in the state. Sample data from the BSNL on lightning affected telephone connections for a small period in 2002 shows that the losses were as high as about Rs. 20 million and the total number of subscribers affected were ~18000 (Murali Das, 2007). Lightning hits burning down several coconut palms and rubber trees are quite common in the state, but are never reported or compensated for and hence goes excluded from the database. This implies that the ***cumulative revenue loss due to lightning may run to a tune of several million rupees every year***. It may be noted that lightning hits on 10 or 20 cash-crop stands often devastate the economic stability of the affected farmer. Unlike elsewhere in the country, majority of the cash crop farmers of Kerala have very small land holdings (~0.7 acre) due to high population density and consequent land fragmentation, and their sole livelihood may be the earnings from these cash crops. Thus, unlike other states, the high population density, high frequency of lightning and high vegetation density supplements each other in causing more frequent lightning fatalities, injuries and property loss in the state.

The pressing need to understand lightning from a hazard and disaster risk reduction perspective was recognized by the Kerala State Science Technology and Environment Council (Department of Science and Technology, Govt. of Kerala) and hence they included lightning as one of the six hazards, each being described as a chapter, in the 'Status of Environment Report 2007 – Vol. II, Natural Hazards' (Yesodharan et al., 2007). Further, in October 2010, a consultative workshop on hazard, vulnerability and risk assessment was convened by the UNDP Disaster Risk Reduction Programme under the guidance of Dr. P.K Champathi Ray, Scientist SG, Head - Geosciences Division, Indian Institute of Remote Sensing (IIRS), ISRO which was attended by scientists working in the research and development laboratories of the state on various hazards. This consultative workshop recommended lightning as a priority hazard to be addressed from a disaster risk reduction perspective in the state.

4.3 Coastal erosion

The 590 km coast of Kerala is one of the most densely populated land areas in the country. This coastline is exposed to high waves, rogue waves, 'Kallakadal' and Tsunami. These natural phenomena in turn results in rampant coastal erosion and consequent beech loss. The very recent 'Fact sheet of shoreline changes – Kerala, National Assessment of Shoreline Change' published by the Ministry of Environment and Forests, Govt. of India (NCSCM et al., 2011) shows that a major stretch of Kerala's coastline (~63%) is eroding rapidly. Figure 12 shows the erosion prone areas of the Kerala coast.

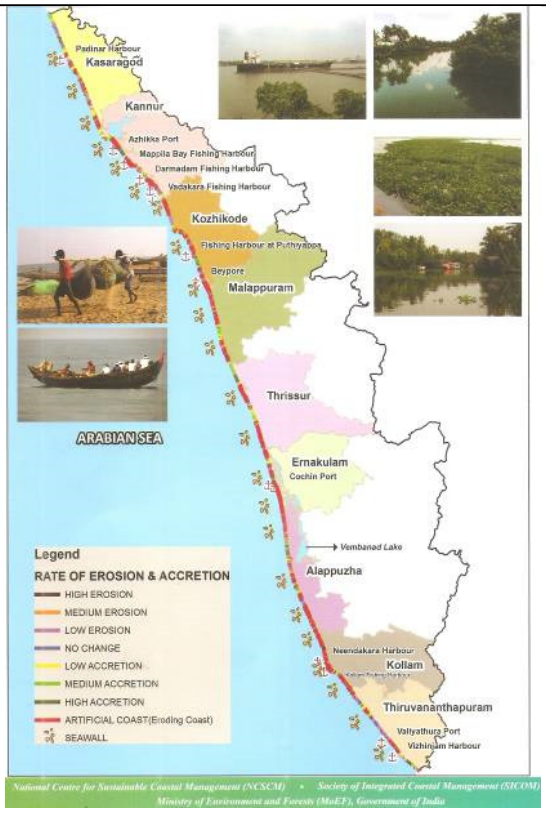
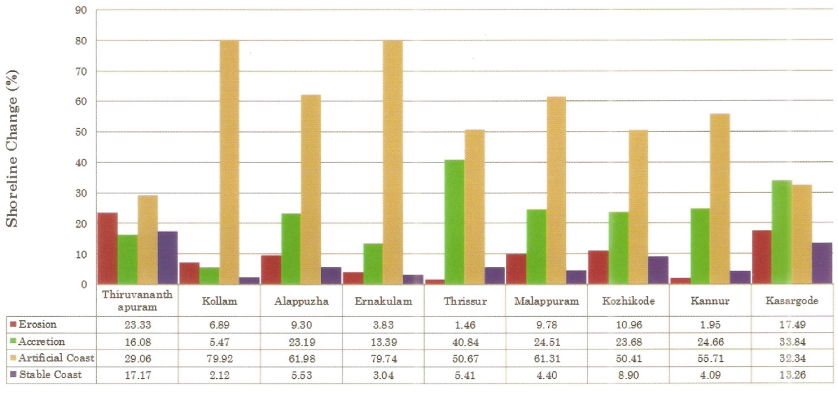


Figure 12: Erosion and accretion prone areas of Kerala (NCSCM et al., 2011)

Of the nine coastal districts, the coastline of Thiruvananthapuram district is the most prone to erosion. About 23% of

Thiruvananthapuram coastline is affected by erosion. About 310 km of the coastal stretch of Kerala has seawalls, riprap revetments, groynes etc. These are marked as 'Artificial Coast' in Figure 12. These artificial coasts are essentially eroding coasts and therefore it is appropriate to consider them as eroding coasts (NCSCM et al., 2011). Figure 13shows district wise erosion/accretion characteristics of Kerala coast. The other districts that are highly prone to erosion, but are partly safeguarded by artificial means are Kollam and Ernakulam (80% of the coastline of the respective districts). The Department of Irrigation has identified coastal erosion prone zones, they being: Poovar-Vizhinjam, Kovalam-Valiathura, Perunnathuruthu to Neendakara, Kayamkulam, Ambalappuzha, Thumboli, Chellanam, Cochin Harbour, Azikkode, Kozhipram, Chavakkad, Ponnani, Kadalundi, Elathur, Tikkodi, Murad, Puthiyappa Angadi, Neelaswaram and Manjeswaram, spread along the nine coastal districts of Kerala.

Coastal erosion results in the loss of life and property of the coastal fisher population who are one of the most downtrodden communities of the state. One of the most apparent losses of property is the damages that come about to the dwelling spaces of the fisher population. Every year hundreds of houses are damaged due to the furry of the sea. Almost all fisher families prefer to live along the coast and very few of them tend to have landed property or houses further inland. The Tsunami of 2004 exposed the weakness of our coastal fisher population in terms of their resilience and coping capacity. Almost **13 lakh people in 187 villages** of Kerala were **affected by Tsunami** with a death toll of **177 persons and 13735 of house damage**. The waves also damaged livelihood of the fishermen community. Thus every year when a coastal dwelling space is affected the family has to be **accommodated in relief camps costing substantial loss to the exchequer**.



	Thiruvananthapuram	Kollam	Alappuzha	Ernakulam	Thrissur	Malappuram	Kozhikode	Kannur	Kasargode
Erosion	23.33	6.89	9.30	3.83	1.46	9.78	10.96	1.95	17.49
Accretion	16.08	5.47	23.19	13.39	40.84	24.51	23.68	24.66	33.84
Artificial Coast	29.06	79.92	61.98	79.74	50.67	61.31	50.41	55.71	32.34
Stable Coast	17.17	2.12	5.53	3.04	5.41	4.40	8.90	4.09	13.26

Figure 13: District wise distribution of coastal erosion and accretion prone areas of Kerala (NCSCM et al., 2011)

4.4 Conclusion

According to UNISDR (2009), *natural hazard* is a ***natural process or phenomenon that may cause loss of life, injury*** or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage and *disaster* is a serious disruption of the functioning of society, causing widespread human, material or environmental losses which ***exceed the ability of the affected people to cope using their own resources****.*

Following the above definitions of the UN, ***lightning and coastal erosion are natural hazards*** which occurs randomly **which can neither be predicted nor be prevented** by the present state of the art techniques of humans. It is evident from the above description based on the reliable database collected and analyzed by CESS and NCSCM, that lightning and coastal erosion cause numerous fatalities (second to no other natural hazard) and significant damage to life and property in Kerala.

It is often the poor and the marginalized of the state that are affected by the disastrous consequences of lightning hits or coastal erosion and often it is the sole bread earning member or the leading woman of the house who is killed or fatally injured by the events. Property loss is also substantial as illustrated by a sample data from the BSNL and the case of 2004 December and the cumulative revenue and economic loss may be of several million rupees. Thus, ***lightning*** and ***coastal erosion*** is ***disasters*** which exceed the ability of the affected people to cope using their own resources. Hence lightning and coastal erosion qualify to be defined as natural calamities.

Given the aforesaid scientific and verifiable facts, the Government of Kerala herewith requests Government of India to ***declare 'lightning*** *and* ***coastal erosion' as Natural Calamities eligible for compensation from National Disaster Response Fund.***

In light of the above stated verifiable facts the State is also proposing to create an **insurance scheme** for which the State Government is requesting Rs. 200 crs, the split up of which is given in Table 3.

Table 3: Insurance scheme for coastal erosion and lighting affected communities

Requested head	Amount (in crs)
Insurance for lightning fatality (premium for a period of 10 years assuming the death toll to be 70 per year) – Rs. 10 lakhs each	Rs. 75 crs
Insurance for lightning injury (premium for a period of 10 years assuming the injury rate to be 70 per year) – Rs. 1 lakh to Rs. 5 lakh each	Rs. 50 crs
Insurance for coastal erosion total house damage (premium for a period of 10 years assuming the number of damaged houses to be 100/year) – Rs. 1 lakh to Rs. 8 lakh each	Rs. 150 crs
Insurance for coastal erosion fatality (premium for a period of 10 years assuming the death toll to be 15 per year) – Rs. 10 lakhs each	Rs. 25
Total	**300**

5. Repair of roads and bridges of Kerala

The State had hardly one year ago with its own funds and through Kerala State Transport Project, developed and repaired almost all roads. As detailed in chapter 1 of this request document, the roads and bridges of Kerala suffered significant damages due to the onslaught of the excessive monsoon. Even National Highways are not motorable. In the State, a kilometre of road repair costs about Rs. 1 cr on an average. To ensure that all roads are motorable and pothole free, major repair works have to be undertaken which cannot be undertaken by the already cash starved State Government. Table 4 shows the cost per district for undertaking this. Hence, an amount of Rs. 2170 crs is required for making the roads of Kerala motorable.

The hilly road segments of Kerala are also affected by an uncommon phenomenon named 'Soil Piping'. Soil piping results in the development of large cavities in the subsurface and thus affects the land as a 'cancer'. Unlike most other hazards (landslides, flash floods, earthquakes, lightning etc.) that Kerala is prone to, soil piping is a 'slow hazard', the implications of which are long lasting. The top soil will cave in overtime and as a consequence the area will turn into a 'badland'. Badlands, as the name suggests, will not be able to support any cultivation. Infrastructural development in such areas will be dangerous as soil piping can be noticed only when the top soil caves in and huge caves or pot holes develop at locations over night. Piping affected soils will not be able to hold water thereby lowering ground water levels in such areas. As they occur at depths deeper

than the depth at which most structural foundations are laid at, no one gets to notice the existence of such soil pipes. Initiation of the piping process also goes unnoticed as it is usually not discernible for laymen.

Table 4: District wise funding required for road repair

District	Km	Amount (in crs)
Thiruvananthapuram	265	100
Kollam	125	125
Pathanamthitta	200	200
Alappuzha	800	400
Kottayam	400	300
Idukki	Requested in chapter 3	
Ernakulam	100	100
Thrissur	300	150
Palakkad	50	50
Malappuram	360	260
Kozhikode	200	160
Wayanad	135	80
Kannur	255	155
Kasargode	90	90
Total	**3280**	**2170**

6. Stationing of National Disaster Response Force & equipping State Disaster Response Force

6.1 Stationing NDRF companies

The State is willing to offer sufficient land for stationing the NDRF companies in Kerala. Being a multi-hazard prone State with rainfall amount to over 2500 mm on an average per year, landslides and floods are common in the State. By the time the NDRF teams from Arkonam reach Kerala, the precious time for saving life is lost as Arkonam is about 12 hrs from most parts of the State. The Government of Kerala is hence, requesting your kind self to **direct Ministry of Home Affairs** to station **3 companies of NDRF in Kerala** at the following locations:

1. Kozhikode district – to respond to landslides and floods in the Malabar region
2. Ernakulam district – to respond to petro-chemical disasters in light of the port, petro-chemical storages and the GAIL LNG project
3. Pathanamthitta district – to respond to Sabarimala and Attukal pilgrimage related disasters and landslides and floods in Idukki, Kottayam, Kollam and Thiruvananthapuram

6.2 Equipping State Disaster Response Force

The Government of Kerala has created a 300 member State Disaster Response Force. However, the force is not yet completely trained and is in want of sufficient response equipment. Table 5 shows the requirement of funds for equipping the SDRF.

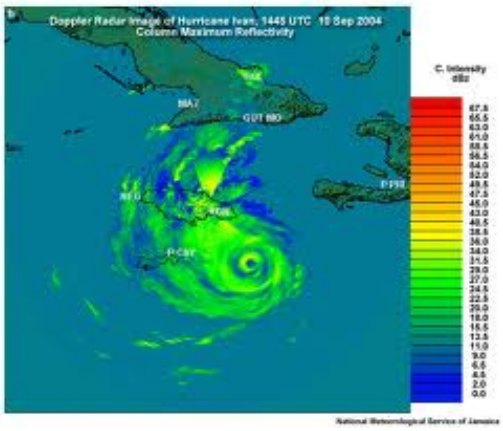
Table 5: Equipping State Disaster Response Force

Requested head	Amount (in crs)
Emergency response vehicle including Hazmat Vehicle	20
Ground penetrating radar (Rs. 1 cr./instrument)	20
Tube cameras (Rs. 75 lakhs/instrument)	10
Fire and water proof clothing (Rs. 2 lakhs/clothing set)	15
Life saving gear including portable oxygen separators and cylinders	20
Inflatable boats	15
Total	**100**

7. Doppler radar for cloud monitoring and accurate heavy rainfall warning

The Indian Meterological Department announced 3 years before that they would deploy 2 Doppler Weather Radars in Kerala, one at Cochin and another at Thiruvananthapuram. Doppler radars are superior to other weather monitoring systems for reasons being:

1. Spatial and temporal coverage
2. Can help in monitoring approaching storm, its speed, center of the storm, intensity, probability of rainfall etc.
3. Needs lesser number of trained staff
4. Long term recurring costs lesser than deploying AWS in over 400 locations (@ 1 per 100 km^2 based on IMD standards)



The setting up of the Doppler Radars by IMD has not happened yet. The Cochin station is said to be under construction while construction of Thiruvananthapuram station has not even began.

Further, a State like Kerala with its complex geomorphic setup requires at least 3 Doppler weather radars. Hence, it is requested that you may kindly **direct the Department of Earth Sciences** to sanction one additional Doppler Weather Radar for Kerala. This may be in addition to the two already sanctioned and the newly sanctioned may be fixed in Kannur district which receives the highest amount of rainfall in the State.