Economic consequence of natural disasters: A case study of flood victims of Thrissur district

Introduction

Kerala State has an average annual precipitation of about 3000 mm. The rainfall in the State is controlled by the South-west and North-east monsoons. About 90% of the rainfall occurs during six monsoon months. The high intensity storms prevailing during the monsoon months result in heavy discharges in all the rivers. The continuous and heavy precipitation that occurs in the steep and undulating terrain finds its way into the main rivers through innumerable streams and water courses.

Kerala experienced an abnormally high rainfall from 1 June 2018 to 19 August 2018. This resulted in severe flooding in 13 out of 14 districts in the State. As per IMD data, Kerala received 2346.6 mm of rainfall from 1 June 2018 to 19 August 2018 in contrast to an expected 1649.5 mm of rainfall. This rainfall was about 42% above the normal. Further, the rainfall over Kerala during June, July and 1st to 19th of August was 15%, 18% and 164% respectively, above normal. Month-wise rainfall for the period, as reported by IMD.

Due to heavy rainfall, the first onset of flooding occurred towards the end of July. A severe spell of rainfall was experienced at several places on the 8th and 9th of August 2018. The 1- day rainfall of 398 mm, 305 mm, 255 mm, 254 mm, 211 mm and 214 mm were recorded at Nilambur in Malappuram district, Mananthavadi in Wayanad district, Peermade, Munnar KSEB and Myladumparain in Idukki district and Pallakad in Pallakad district respectively on 9 August 2018. This led to further flooding at several places in Mananthavadi and Vythiri in Wayanad district during 8-10, August 2018. Water was released from several dams due to heavy rainfall in their catchments. The water levels in several reservoirs were almost near their Full Reservoir Level (FRL) due to continuous rainfall from 1st of June. Another severe spell of rainfall started from the 14th of August and continued till the 19th of August, resulting in disastrous flooding in 13 out of 14 districts. The water level records at CWC G&D sites for some of the rivers in Kerala are given at Annex-I. As per the rainfall records of IMD, it has been found that the rainfall depths recorded during the 15-17, August 2018 were comparable to the severe storm that occurred in the year 1924.

Earlier floods in Kerala

The 1924 witnessed unprecedented and very heavy floods in almost all rivers of Kerala. Heavy losses to life, property and crops etc. had been reported. The rainstorm of 16-18, July 1924 was caused by the South-west monsoon that extended to the south of peninsula on 15th July and caused rainfall in Malabar. Under its influence, heavy rainfall occurred in almost entire Kerala. The area under the storm recorded 1-day maximum rainfall on 17th of July, 2- day maximum rainfall for 16-17, July 1924 and 3-day maximum rainfall for 16-18, July 1924. The centre of the 1-day and 2-day rainstorm was located at Devikulam in Kerala which recorded 484 mm and 751 mm of rainfall respectively. The centre of 3-day rainstorm was located at Munnar in Kerala which recorded a rainfall of 897 mm in 3 days.

The fury of 1924 flood levels in most of the rivers was still fresh in the memory of people of Kerala the year 1961 also witnessed heavy floods and rise in the water levels of reservoirs. Usually in the State, heavy precipitation is concentrated over a period of 7 to 10 days during the monsoon when the rivers rise above their established banks and inundate the low lying areas. But in 1961, floods were unusually heavy not only in duration, but also in the intensity of precipitation. During the year 1961, the monsoon started getting violent towards the last week of June and in the early days of August the precipitation was concentrated on most parts of the southern region of Kerala. By the first week of July, the intensity gradually spread over the other parts of the State and the entire State was reeling under severe flood by the second week of July. The worst affected area was Periyar sub-basin and it also impacted other sub-basins. Many of the important infrastructures like highways etc. were submerged. After a brief interval, by the middle of July, the monsoon became more violent, affecting the northern parts of the State. In 2018 Authorities warned of more torrential rain and strong winds over the weekend, as hundreds of troops and local fishermen staged desperate rescue attempts in helicopters and boats across the southern state.

Kerala popular among international tourists for its tropical hills and beaches has been battered by record monsoon rainfall this year. The state is “facing the worst floods in 100 years”, chief minister Pinarayi Vijayan said on Twitter, adding that at least 324 lives have been lost so far Roads are damaged, mobile phone networks are down, an international airport has been closed and more than 220,000 people have been left homeless after unusually heavy rain in the past nine days. Casualty numbers are expected to increase further, with thousands

more people still stranded. Many have died from being buried in hundreds of landslides set off by the flooding. More than one million people, like this young mother, were displaced by the devastating floods that swept across the state in early August. At least 445 others have died, mostly due to falling debris, collapsed buildings and lack of food and water. This coastal strip wedged between the Arabian Sea and the Western Ghats mountain chain is prone to inundation, but this year's unusually heavy monsoon rains brought the worst flooding the state had seen in nearly a century. "Due to severe rainfall from August 15-17, 2018, the gates of about 35 dams were also opened due to the extremely large inflow of water in the reservoirs. During August 2018, the reservoirs were either at FRL (full reservoir level) or only a few feet below the FRL. From the analysis it has been found that the dams in Kerala neither added to the flood nor helped in reduction of flood, as most of the dams were already at FRL or very close to FRL on August 14, 2018, due to more than normal rainfall in the months of June to July 2018," the report emphasised.
The CWC report even noted "had the reservoir been a few feet below FRL, the flooding conditions would not have changed much, as the severe storm continued for three days and even for four days at majority of the places, and in any case it would have been necessary to release from the reservoirs after first day of the extreme rainfall."
Review of literature
Several studies related with different aspects of Flood affected
Settlements have been carried out from different parts of the country and abroad.
Paui Bimal Kanti and Rasid Harun (1993): Present paper stated that, temporal andSpatial patterns of damage to rice crops in Bangladesh resulting from river flooding areanalyzed countrywide for the period 1962 to 1988 and at the district level from 1967 to 1988. Flood annually damaged approximately 4% of total rice production.Kulkarani A.K., Mandal B.N. and Sangam R.B. , Pune (1994): The paper studies of heavy rainfall 22-23 Augest 1990 over Vidarbha region of Maharashtra. PresentInformation is useful to the hydrologists for planning and design of water resourcesprojects in the Vidarbha region of Maharashtra.

Mangat H.S., Patiala (1994): Present paper consist to the July 1993 floods of Panjab Particularly Patiala city. The devastation associated with floods are directly related with their level and duration instead of the extent of area under floods, which are further associated with rainfall characteristics and manmade obstructions not only at local level but at regional scale.

Ram Satta. (1996): He studies Flood affected area of Badlapur Block and 12 villages of Khutahan Block. The area located in the North-Western part of the district Jaunpur (U.P.) He explain nature of flood, flood hazard zone and types of flood plains of its study area. Deosthali Vrishali (1997): The present paper is an attempt to investigate the rain spells over Pune obtained from histograms with respect to duration; yield and their contribution to seasonal rainfall. The monsoon rainfall over Pune is broadly characterized by 75% of the spells of less than one hour duration and 90% of the spells of less than 10 mm. yield.

Pande Anita and Jalal D.S. (1997): They stated that geomorphologic aspects connected with the flash-flood. Slope condition, litho-structural setting including presence of major geologic structures like fault and thrust, drainage aspects etc. are studied in detail. Munsi S.K. (1998): The present papers discuss various problem of flood management inIndia with associate policies and programmers.

Kale V.S. (1999): He studies major contribution of earth scientists and a few meteorologists, hydrologists and civil engineers. Intended to provide an overview of the field of flood hazard in India and some of the neighboring countries, and emphasized on 2 causes and consequences of flood in major Indian River systems of North and eastern India.

S onule B.B. and Changole V.B. (1999): They stated that, the river floods are the functions of topographic, fluvial and other activity factors. Certain decision-making processes must be followed to mitigate the danger of flood that causes tremendous loss of life and property. The major theme of this paper is to investigate the combined effects of topographic and fluvial aspects, taking the case of Shahanur River, a tributary of the Purna River in Vidarbha (Maharashtra).

Singh Yadvinder (2000): He focused on flood affected area of Inter-state ChandigarhRegion, flood affected area during 1988 and 1983, ISCR- flood intensity of affected area -1993. De U.S. and Dandekar M.M (2001): This paper analyses the data on disastrous weatherevents like tropical cyclones, severe thunderstorms, tornados and extreme weather events like floods, droughts, heat and cold waves in respect of fourteen major cities in India. The study brings out specific distribution of these hazards across the cities and proposes some measures to minimize the losses from natural disasters.

Gadgil Alaka and Dandekar Supriya (2001): Author attempted to study the various weather hazards with special reference to India. And analysis of flood events during the last three decades reveals that Assam ranks first followed by Bihar, U.P., and West Bengal. All these states account for 40% of total Floods reported.

Water Directors of the European Union (EU) (2003): The report gives guidelines on important issues regarding sustainable flood prevention, protection and mitigation etc. This document concerns only river and flash floods.

Department of Relief and Rehabilitation (2004): This report shows multi-disaster response plan which is including overview of Dhule district and Maharashtra flood report2005.

Ologunorisa T.E. and Abawua M.J. (2005): The paper explains some of the techniques of flood risk assessment using case studies from different countries in the word. These techniques are meteorological, hydrological, hydro meteorological and socio-economic and those based on Geographic Information System (GIS). The paper concludes that GIStechnique appears to be most promising as it is capable of integrating all the other techniques of flood risk assessment.

CBSC, DELHI (2006): The text book explains flood is a state of high water level along a river channel. Flood may happen gradually and also may take hours or even happen suddenly without any warning due to breach in the embankment, spill over, heavy rains etc. In this book also including causes adverse effects and distribution pattern of flood in India.

Hire PramodKumar S. and Kale Vishwas S. (2006): In this paper an attempt has been made to quantitatively evaluate the geomorphic effectiveness of three large magnitude floods occurred in 1959, 1968, and 1969 in the lower Tapi basin. Flood hydrographs of these and other flood events show that the duration of floods can range from 6 to 10 days, and in exceptional cases up to 15 days. Hence to produce substantial changes in the alluvial sections of the Tapi River.

Kewalramani Gita.(2006): This paper attempts to examine the factors contributing to flooding in Mumbai Suburban District in view of the need to implement a range of measures or management practices, which would help alleviate this problem. This is vital as extreme rainfall events are likely to become more common in future due to climate change.

Ray Ranjini, Sheth Hetu C., Mallik Jyotirmoy (2006): This work highlights some interesting and significant similarities, and contrasts, between the Nandurbar - Dhule dyke swarm and regional tholeiitic dyke swarms in Iceland, Sudan, and elsewhere.

SanyalJoy and Lu x.x. (2006): This paper addresses the need for an efficient and costeffective methodology for preparing flood hazard maps in dada poor countries, particularly those under a monsoon regime where floods pose a recurrent danger.

Sharma D.D. (2006): The present paper is based on the primary as well as secondary data and aims at giving an account of various incidences of flood and their multi-facet impacts on the state. The paper also tries to analyze the spatial similarities and differences in the flood prone areas to find out the policy imperatives for the sustainable development.

Bouchard Bethany, Goncalo Ashley, Susienka Michael Wilson Kevin (2007): This project will expectantly set the premise for the continuing efforts of the city to improve flood risk management within the settlements. 100lives and injure more than 60 people. Fish farms and rice fields were devastated and jute agriculture suffered. The capital city of Dhaka was in knee-high water during a recent flood. Due to an active monsoon rainfall 2007 water level in the majority of rivers are fast approaching the danger mark threatening to inundate more districts and areas.

Objectives
1: To study the economic consequences of flood.
2: To analyse the effectiveness of immediate governmental measures to rehabilitate the flood victims.
Methodology
Mainly based on primary data it is collected from flood victims.
Collected by sample survey (30 samples)
Limitation
Limitations
i. The rainfall analysis carried out in the present study is based on the rainfall records of 67 rain gauge stations of IMD spread across the entire State covering both plain and hilly regions. In hilly terrains of Chalakudy, Periyar, Pamba, Kabini and other sub- basins, rainfall records of some more rain gauge stations may provide a further finer estimate of rainfall and also the inflow volume into the reservoirs.

ii. The gauge records at some of the CWC G&D sites could not be observed on 16th and 17th of August 2018 because of inaccessibility of site due to severe flooding. Hence, the estimated discharge may differ from the one that actually occurred.

iii. Some of the observations regarding the discharging capacity of Thottappally and Thanneermukkom barrages, carrying capacity of Vembanad lakes etc. are based on the reports of the other institutions.