Linking Kerala floods to anthropogenic climate change ‘difficult’, finds a study

india.mongabay.com Updated Jan 15th, 2019

Linking Kerala floods to anthropogenic climate change ‘difficult’, finds a study

- *During a 66-year period, Kerala witnessed a significant decline in monsoon rainfall while the temperature rose.*
- *An IIT Gandhinagar study hypothesises that the 2018 event was not linked to long-term climate change, but may be an extreme event that was driven by a short-term natural variability of climate.*
- *Given the data, researchers feel that the key problem today in Kerala is drought. Rather than flood, drought is going to be the future problem.*
- *The impact of extreme events is significant irrespective of whether they are attributable to climate change or not.*

Is the devastating 2018 flood in Kerala linked to climate change?

Based on a study that does not find any long term increase in the mean or heavy monsoon rainfall in the south Indian state, researchers argue that attributing the 2018 event in Kerala to climate change can be “difficult.”The analysis is by researchers at the Water and Climate Lab at Indian Institute of Technology Gandhinagar, who looked at the 2018 event from the lens of hydroclimatology – the effect of large water bodies on climate.Factoring in the long-term (1951-2017) changes in mean and extreme precipitation, air temperature, and total runoff in the state of Kerala, researchers said that during this 66 year period the state witnessed a significant decline in monsoon rainfall while the temperature rose.“Therefore, long-term trends indicate drying and warming in the monsoon season in Kerala. Kerala had two remarkable extreme rain events in 1924 and 1961, which is prior to the global warming era,” Vimal Mishra, lead author of the IIT Gandhinagar study, told Mongabay-India.“Therefore, we hypothesise that the 2018 event

may be similar to earlier extreme events and also driven by the natural variability of climate. However, the role of climate warming on 2018 flood in Kerala needs to be diagnosed," Mishra said.The 2018 event threw up a "surprise" from the trends perspective."Both extreme rainfall and runoff during 1951-2017 show a decline. Moreover, there has not been a considerable increase in the frequency of extremes associated with rainfall in the state. Therefore, from the trends perspective the 2018 event was surprising," Mishra explained.

Photo by Sneha Binil.

"Climate change has posed profound implications on extreme precipitation and flood events globally. Therefore, there is no doubt that we should take climate change seriously in terms of the rising frequency of extreme events," said Mishra.Until we can scientifically attribute the 2018 flood to climate warming we can't say this was caused by climate change, he reasoned.

"Since there is no increase in mean and extreme precipitation in Kerala over the last six decades, the extreme event during August 2018 is likely to be driven by anomalous atmospheric conditions due to climate variability rather anthropogenic climate warming," the study said.

Did man-made factors other than climate change have a role?

The researchers also questioned if the flooding in Kerala was caused by the human activities other than climate change.

They believe the severity of the Kerala flood of 2018 and the damage caused might be affected by several factors including land use and/or land cover change, antecedent hydrologic conditions, reservoir storage and operations, encroachment of flood plains, and other natural factors.Climate scientist Arpita Mondal who works on detection and attribution of hydroclimatic change agrees with one aspect of the study in that attributing hydrological events are particularly difficult.“We must also understand that floods are hydrological events, and not necessarily an atmospheric one. Hydrology is what happens to rain when it falls on the ground,” IIT-Bombay’s Mondal told Mongabay-India.“Therefore, the translation of heavy rainfall to floods is also dependent on the catchment characteristics and local factors, such as antecedent moisture conditions, land-use characteristics such as perviousness of the surface, floodplain encroachment, reservoir releases and so on,” she said.

Flooding at the confluence of the Kanniyar, Nalla Thanniyar and Kuttiyar rivers in Munnar. Photo by Prasad Ambatt.

Since these are complicated, interlinked processes, she said, attributing hydrological events are particularly difficult. “This is one aspect highlighted in this study, and I completely agree with that,” Mondal said.

Ecologist Rajiv Chaturvedi said that generally for Kerala published literature pointed to increasing droughts, so it’s no surprise that the trends associated with extreme and total rainfall in Kerala for 1951-2017 do not show an increase, but decrease.

“It is agreed by most of the researchers that in Kerala the key problem today is drought, and drought is going to be the future problem as well (based on high resolution climate model projections) and not flood,” Chaturvedi, an assistant professor at BITS Pilani, KK Birla Campus, Goa, said.

Mishra emphasised that research is needed to understand what impact the historic land cover change in Kerala caused on the severity of flood in August 2018.

The role of reservoirs might have played a key role in at least worsening the flood situation in the state during August 2018, the researchers stress.

For instance, the group had earlier reported that excess rainfall had caused above-normal reservoir storage even before the onset of extreme rainfall (15-16 August) in the Kerala.

“The extreme rainfall in the catchments of major reservoirs forced reservoir operators to open the gates and release a considerable amount of stored water, which might have added to the severity of floods in the state,” they observed in the study.

But India’s Central Water Commission (CWC), in its report on the Kerala floods, has held that “dams in Kerala neither added to the flood nor helped in reduction of the flood” while squarely holding the heavy rainfall responsible for the disaster.

According to the historical records, Kerala had witnessed one of its most severe floods in 1924 and the CWC report noted that the rainfall of August 15-17, 2018 in Kerala was “almost of the same order as that of rainfall which occurred during July 16-18, 1924.”

Chaturvedi believes the sudden flood was so devastating (from the dam management perspective) as water resources in the state were managed for drought mitigation (keeping dams in full capacity).

“… and prolonged drought in the state could certainly be linked to climate change going by previous studies. Kerala is certainly experiencing the impacts of climate change in form of declining rains, and its subsequent effect on vegetation productivity and carbon stock growth in vegetation,” the ecologist said.

Changes in land use patterns led to massive landslides during the August floods in Idukki and Wayanad districts. Photo by S. Gopikrishna Warrier / Mongabay-India.

Extreme weather events significant

Both Mondal and Chaturvedi batted for a thorough probabilistic event attribution process involving observations, and model simulations to conduct a clear attribution study.

“Attribution to climate change is carried out through the science of probabilistic event attribution (PEA), which this particular study hasn’t done. Probabilistic event attribution requires climate modeling efforts,” said Mondal.

This means looking at climate model simulations of the actual world (with human effects) and that of the counterfactual world (a world that could have been, without human effects), and see how the chances of extreme events such as the Kerala floods have changed in these two simulated worlds.“I think the conclusion of this particular study is based on long-term trends in the observed mean, which may not be sufficient to make a physically-based conclusion on attribution,” she said.

But at the same time, Mondal underscored that impact of extreme events are significant irrespective of whether they are attributable to climate change or not. “There’s no doubt that efforts should focus on minimising loss and damage from such events,” she said.“What I can say safely in the absence of an attribution study is that increased extreme weather events in the recent years are in line with the projections made by the United Nation’s Intergovernmental Panel on Climate Change (IPCC),” Chaturvedi said.

Though scientists are generally not comfortable in attributing a single weather event to climate change, in recent years evidence is increasingly growing to link the greenhouse gas build up in the atmosphere to weather extremes, Chaturvedi explained pointing to a 2015 study.

The study concludes that the observed average global warming of 0.85 degree Celsius is responsible for three-fourth of the daily heat extremes and 18 percent of the precipitation extremes.

The study further suggests that for a two degree Celsius of warming the fraction of rainfall extremes attributable to human influence increases to about 40 percent from the present 18 percent.

CITATION:

Mishra, V., & Shah, H. L. (2018). Hydroclimatological Perspective of the Kerala Flood of

2018. *Journal of the Geological Society of India*, *92*(5), 645-650.

The southwest monsoon as it hits the Kerala coast. Photo by Raji Warrier.