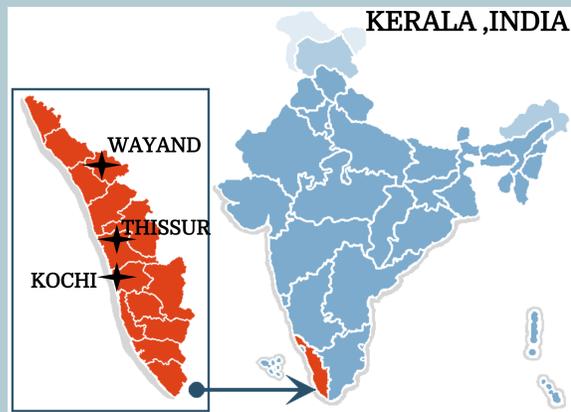


Study Area



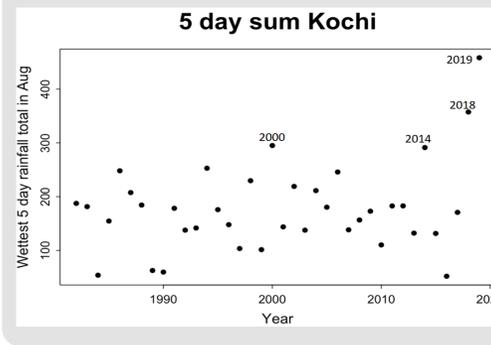
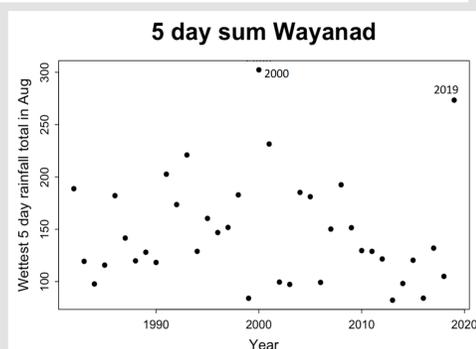
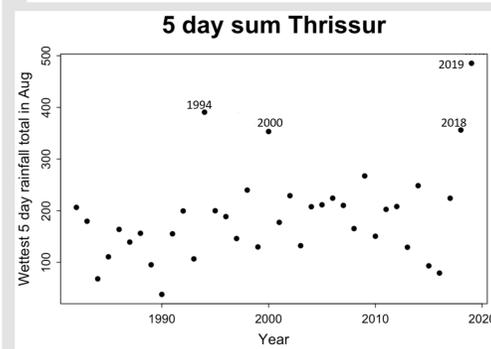
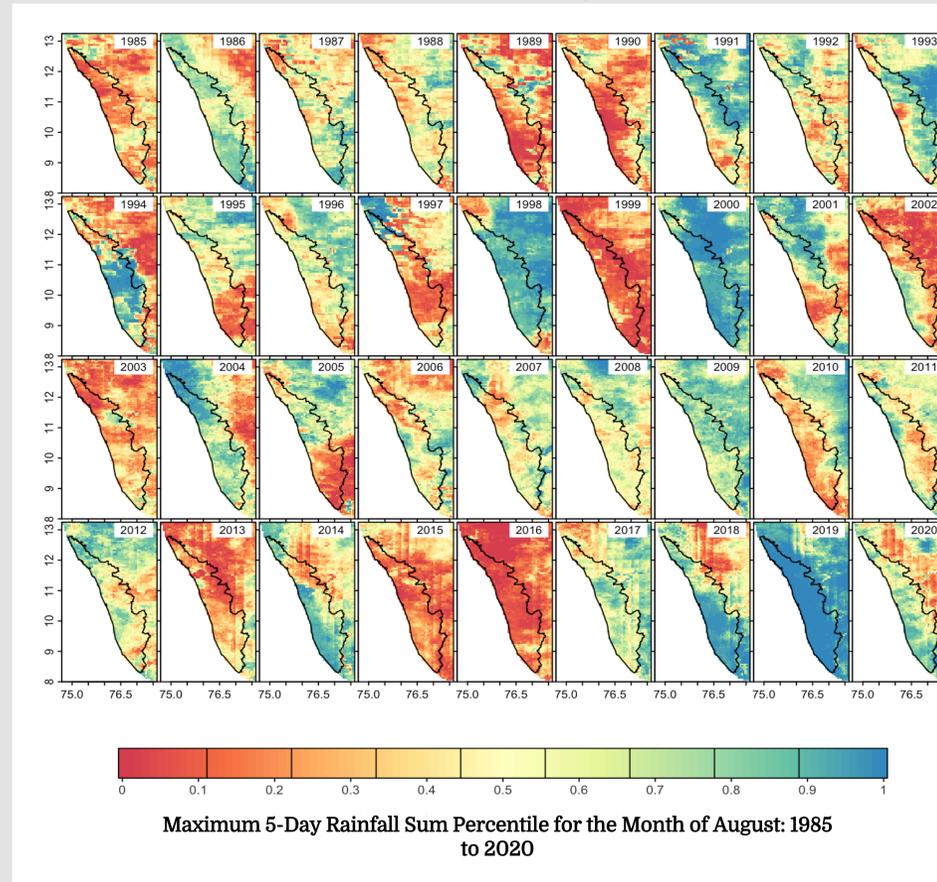
Research Set-Up

Problem. Flash floods are multifaceted and complicated hazards that claim the lives of thousands globally every year. Our study aims to assess whether a convergent parallel mixed-methods study design can capture the physical and human complexity of a flash flood event, focusing on a case study in Kerala, India. It is projected that both extreme climate events and urbanization will continue to influence flooding in the region.

Questions. 1) what factors cause impactful flash floods in Kerala; 2) what are the government and public's perceptions on flash flooding, especially given its increased frequency over the past few years; and 3) what spatial-temporal rainfall statistic capture impactful flash flood events?

Methods. This project draws on research from socio-political geography to examine the relationship between government institutions and people's perceptions of flash floods through semi-structured interviews with government officials who create flood management policies and analysis of policy documents and newspapers. In parallel, we analyzed rainfall remote sensing data from the Climate Hazards Group's Infrared Precipitation with Stations (CHIRPS) dataset between 1986 and 2020; using results from the interviews to guide the analysis and to suggest avenues for further qualitative research.

Satellite Analysis



A **convergent parallel design** was chosen for this study to concurrently collect satellite and interview data to enable comparison among sources, compensation for weaknesses among different methods, and expansion of knowledge. We interpreted from the interviews that a 5-day sum successfully captured extreme rainfall in Kerala.

Interview Analysis

Government Official: "So, the 2-first flood happened within the span of 3 days of intermittent rain. We have been facing this kind of monsoon-like for the past-like all the monsoons are like this. But the intensity of this monsoon happened with the built-up area. The rain happened 3-4 days exactly in the catchments areas and the dams become full in 1 or 2 days."

Social Worker: "Even the dam management is basically done by IMD (Indian Meteorological Department) and we depend on IMD data. IMD prediction in 2018 was that rainfall in 2018 will be almost similar to what happened in 2017 the previous. Actually, why IMD failed in predicting intense rainfall? Because we believe in IMD data."

Researcher and Native : "Landlock cities for them not proper drainage system and at the same time it is hard for them to flush out the water. Yeah, I mean not just cleaning but to re-work they have to extend the drainage system. Even if cities might [have them], they might be having a one side drainage system [in one part of the city]."

Results

The results from our studies of both interviews and satellite data show that flash flooding is an influential and reoccurring phenomenon that disrupts states such as Kerala socially and economically. We have identified that a triangulation approach through a convergent parallel method enabled us to examine the complexities associated with flash flooding. This nuanced approach concluded that five-day maximum rainfall sum percentiles successfully capture spatial-temporal rainfall events associated with flash flooding. These years are comparable to the years in people's perceptions.

People's interpretation of flash floods in Kerala fell under two themes: climatological causes and anthropogenic causes. Climatological causes such as climate change have increased the intensity of rainfall experienced over a short period. Anthropogenic causes such as insufficient drainage systems, obsolete infrastructure, dam mismanagement, unplanned construction, and unreliable IMD predictions also have an equally important role during flash flooding.

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The map of Kerala was retrieved from <https://indianceo.in/news/kerala-startup-mission-establish-50-labs/>