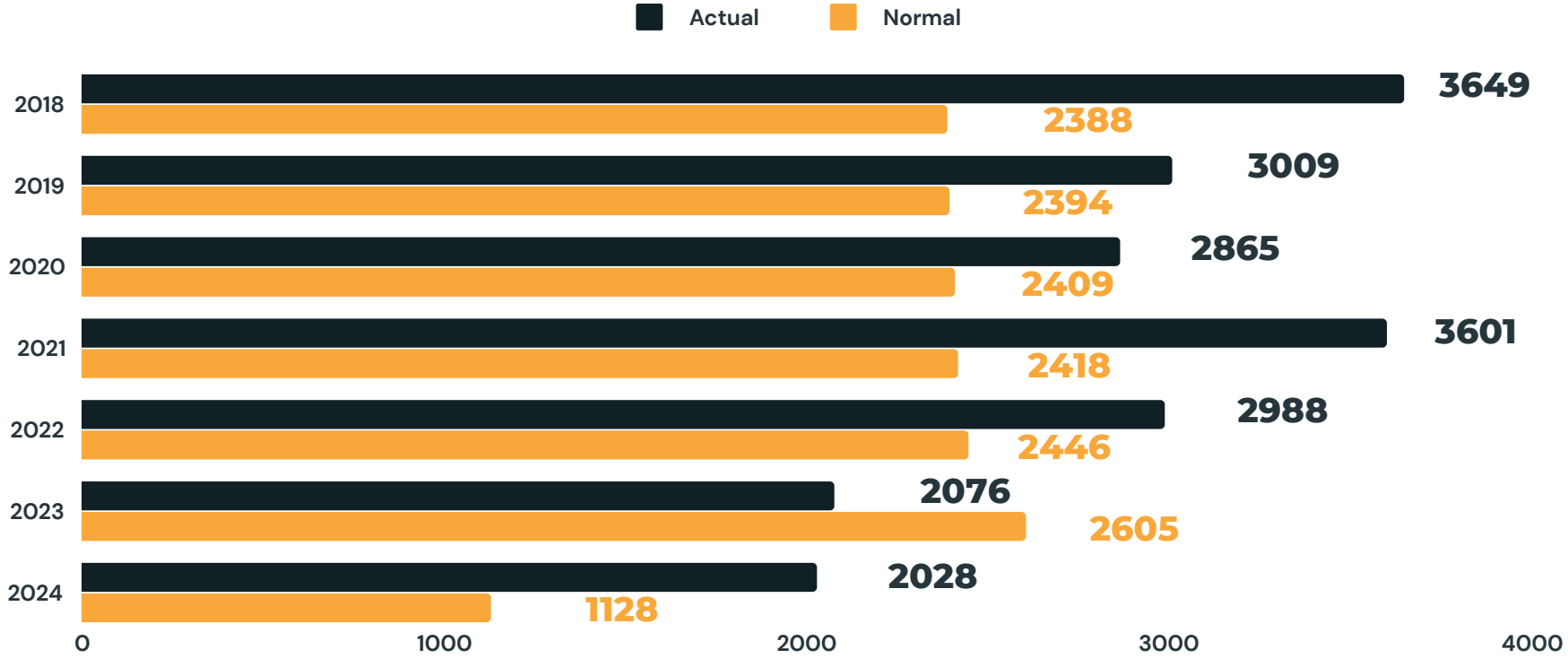
A DECADE OF DEADLY EXTREMES & UNPREDICTABLE WEATHER PATTERNS

infocrita™
DATA SOLUTIONS

Rainfall Over the Years (in mm)



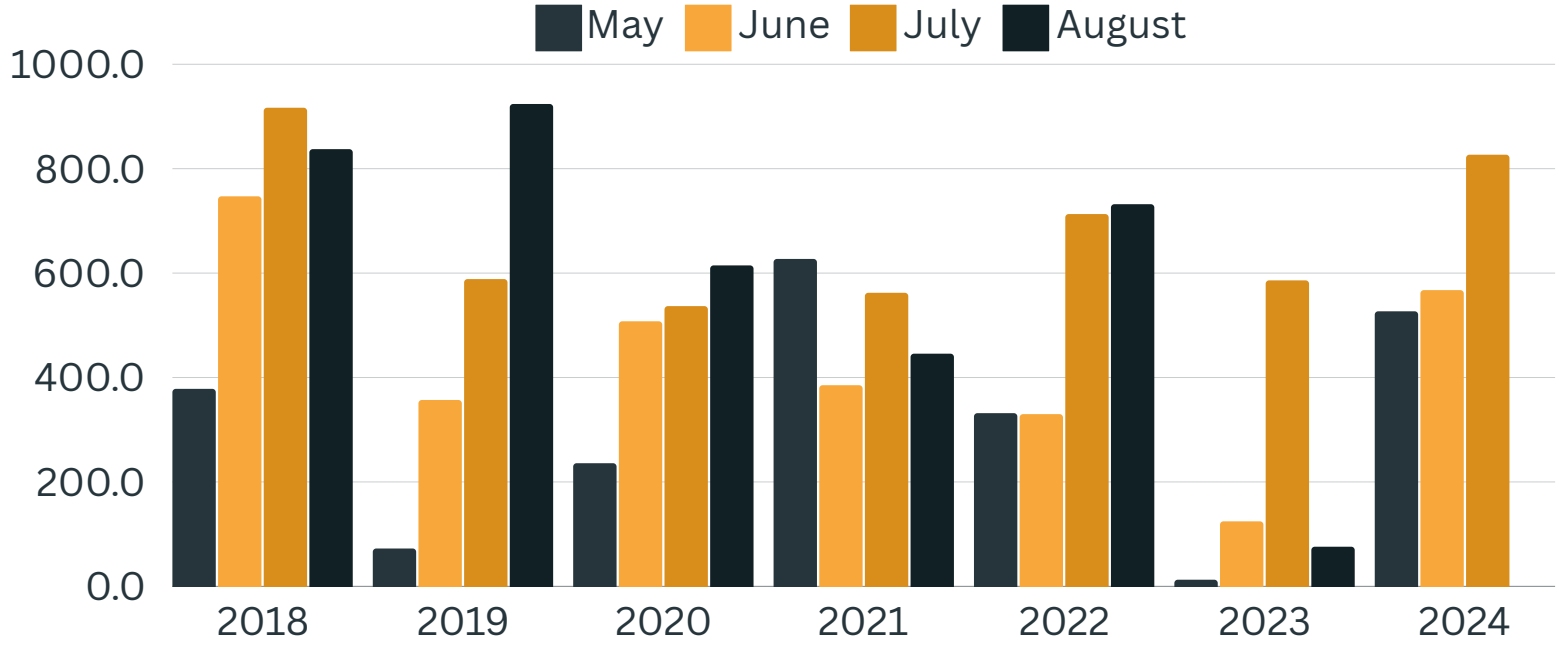
Kerala, a state known for its rich biodiversity and scenic landscapes, is also one of the most rain-dependent regions in India. However, over the past decade, the monsoon season has become increasingly unpredictable and dangerous. From record-breaking rainfall to deadly landslides and even severe droughts, Kerala's relationship with the monsoon has evolved into one of extremes.

Data sourced from Kerala WRIS highlights significant fluctuations in rainfall patterns from 2018 to 2024, revealing a worrying trend of both excess and deficit rainfall. These changes, coupled with the state's unique topography, have led to a series of catastrophic events that have claimed hundreds of lives and caused widespread destruction. This report delves into the key events and patterns of the past years, offering a comprehensive analysis of the challenges Kerala faces as it navigates through increasingly erratic monsoon seasons.

2018: The Year of Catastrophic Flooding

The year 2018 was a watershed moment for Kerala—literally and figuratively. The state recorded an astounding 3649 mm of rainfall, far exceeding the normal 2388 mm, making it one of the wettest years in recent memory. This excessive rainfall, concentrated over a short period during the Southwest Monsoon, culminated in what has been described as the worst flood Kerala has experienced in a century. The floodwaters, driven by continuous heavy rainfall, submerged vast areas of the state, affecting almost every district. Rivers overflowed their banks, reservoirs were forced to release water to prevent dam breaches, and landslides occurred in several regions, further exacerbating the disaster. Over 483 lives were lost, and thousands were displaced, with many losing their homes and livelihoods in the deluge. The scale of the disaster was such that it garnered international attention, leading to widespread relief efforts both within India and from the global community. The floods caused an estimated ₹40,000 crore in damages, severely impacting the state's infrastructure, agriculture, and economy.

Kerala's 2018 flood was a stark reminder of the destructive power of nature, particularly in a region as dependent on the monsoon as Kerala. The event underscored the need for better disaster preparedness, improved infrastructure, and more sustainable land-use practices, especially in light of the changing climate and the increasing intensity of monsoon rains.



2019: Deadly Landslides Amidst High Rainfall

Following the catastrophic floods of 2018, Kerala entered 2019 with hopes of a less tumultuous monsoon season. However, those hopes were dashed as the monsoon once again turned deadly, this time through a series of devastating landslides. With a recorded rainfall of approximately 3009 mm—close to the annual norm—the year might not have seemed particularly extraordinary at first glance. But the intense concentration of rainfall in specific regions, particularly in August, led to tragedies that would leave a lasting impact on the state. One of the most harrowing events of 2019 occurred in Puthumala, Wayanad, where a massive landslide struck, burying entire houses and claiming 17 lives.

The hilly terrain, coupled with excessive rainfall, created the perfect conditions for this disaster. Not far away, in Kavalapara, Nilambur, another landslide claimed 59 lives, making it one of the deadliest in the state's recent history. Across Kerala, a total of 177 people lost their lives due to landslides and other rain-related incidents. The research conducted following these disasters pointed to a combination of natural and human-induced factors. Excessive rainfall, with some areas receiving 400% above normal over a span of just five days, was a primary trigger. However, the landslides were also exacerbated by deforestation, unplanned construction, and other human activities that weakened the already fragile landscape. 2019's landslides underscored the increasing vulnerability of Kerala's hilly regions to intense monsoon rains. The events highlighted the need for stricter land-use regulations, better early warning systems, and more sustainable practices to mitigate the risks of future disasters.

2020: The Pettimudi Tragedy

The year 2020 was yet another challenging monsoon season for Kerala, characterized by a series of deadly landslides and heavy rainfall. The state recorded 2865 mm of rainfall, slightly below the long-term average, yet the distribution of rain and its intensity during the monsoon season led to catastrophic outcomes. One of the most tragic events of 2020 was the Pettimudi landslide in the Idukki district. On the night of August 6, a massive landslide struck the Pettimudi area in the Western Ghats, a region known for its steep slopes and vulnerable geology. The landslide, triggered by torrential downpours, buried four workers' quarters under meters of mud and debris, resulting in the loss of 66 lives. The area received excessive rainfall, with the intensity reaching up to 200 mm in a single day, creating conditions ripe for such a disaster. In addition to Pettimudi, other regions in Kerala also experienced landslides during the 2020 monsoon. In total, the monsoon season of 2020 saw multiple incidents across the state, exacerbated by continuous rainfall over several days. The recurring pattern of heavy rain, combined with human-induced factors such as deforestation and unplanned construction, led to the destabilization of slopes, particularly in highland areas.

2021: “Highest Rainfall in 60 years”

The year 2021 was marked by unprecedented rainfall in Kerala, making it one of the wettest years in the state’s recorded history. Reports from various sources, including The Hindu (3610.2 mm), Mathrubhumi (3606 mm), and Manorama (3610 mm), all indicated that 2021 saw the highest rainfall in over 60 years. Even Hindustan Times reported that Kerala received 3523.3 mm of rainfall by November 24, according to IMD data. However, our data, covering January 1 to December 31st, suggests that while 2021 had substantial rainfall, the highest average annual rainfall recorded in recent years was still in 2018.

The extreme rainfall in 2021 was concentrated during the Southwest Monsoon, with particularly heavy downpours in July and October. The state's rivers swelled, reservoirs reached their limits, and the saturated soil became prone to landslides. The relentless rain led to a series of tragic events, with landslides occurring in multiple regions across the state, particularly in the hilly districts of Idukki and Kottayam.

One of the most devastating incidents occurred in Kokkayar, Idukki, where a massive landslide claimed several lives and destroyed homes. Similarly, the regions of Plappally and Kavali near Kottayam were also severely affected, with landslides burying houses and causing significant loss of life and property. These events were a direct consequence of the intense and prolonged rainfall, which destabilized the already vulnerable slopes in these regions.

The Kerala State Disaster Management Authority (KSDMA) and other state agencies were on high alert throughout the monsoon season, issuing warnings and mobilizing rescue operations in response to the severe weather. Despite these efforts, the sheer volume of rainfall and the frequency of landslides overwhelmed the state's disaster response systems, highlighting the challenges of managing such extreme weather events.

The events of 2021 underscored the growing unpredictability and intensity of the monsoon in Kerala. While the state is no stranger to heavy rains, the scale of the rainfall in 2021 and its devastating consequences have raised serious concerns about the future. As climate change continues to influence weather patterns, Kerala may need to brace for more such extreme monsoon seasons, requiring robust planning, improved infrastructure, and effective early warning systems to mitigate the risks.

2022: Landslides Amidst Moderating Rainfall

The year 2022 was marked by a slight moderation in overall rainfall for Kerala, with the state recording 2988 mm of rainfall, slightly below the normal. However, this reduction in total rainfall did not equate to a reduction in the severity of weather-related disasters. The monsoon rains were still intense enough to trigger landslides in various parts of the state, with one of the most notable incidents occurring in Thodupuzha, Idukki district.

In July 2022, heavy rains triggered a landslide in Thodupuzha, a hilly region in Idukki district. The landslide resulted in the deaths of five people and caused significant damage to homes and infrastructure. The incident once again highlighted the vulnerability of Kerala's highland areas, where even moderate rainfall can destabilize slopes, leading to deadly landslides.

The landslide in Thodupuzha, like many others in the region, was exacerbated by human activities such as deforestation and unplanned construction, which have weakened the natural stability of these areas. The event underscored the continuing need for improved land management practices and stronger enforcement of environmental regulations to mitigate the risk of such disasters.

2023: A Year of Drought

In stark contrast to the heavy rainfall and associated disasters of previous years, 2023 was characterized by a significant rainfall deficit in Kerala. The state recorded only 2076 mm of rainfall, far below the normal of 2605 mm. This marked a significant departure from the wet monsoon seasons of the past few years, raising concerns about water shortages and the impact on agriculture. The insufficient rainfall in 2023 had widespread implications for Kerala. The agricultural sector, which relies heavily on the monsoon, was particularly hard hit, with reduced water availability leading to lower crop yields. This, in turn, had a knock-on effect on food security and the livelihoods of thousands of farmers across the state.

Additionally, the drought conditions put a strain on the state's water resources, leading to concerns about water rationing and the long-term sustainability of Kerala's water supply. Reservoir levels fell to worrying lows, and the state government was forced to implement measures to conserve water and manage the limited supply more effectively. The sharp contrast between the excessive rainfall of 2021 and the drought of 2023 highlighted the increasing unpredictability of Kerala's monsoon. The state has had to contend with both extremes—devastating floods and droughts—within a short span of time, illustrating the challenges posed by climate change and the urgent need for adaptive strategies to manage these risks.

2024: A Year of Tragic Landslides Despite Above-Normal Rainfall

As of July 2024, Kerala had already recorded 2038 mm of rainfall, well above the expected value of 1128 mm for this time of year. Despite this early and significant rainfall, the monsoon season has once again brought tragedy to the state, particularly in the hilly regions of Wayanad, which have been severely affected by landslides.

One of the most devastating events in 2024 occurred in Mundakkai, Wayanad, a region situated in the Western Ghats where the earth is inclined by 20 degrees—a topographical feature that makes it highly susceptible to landslides. This year, the region faced an unusual combination of factors that contributed to the disaster. The summer preceding the monsoon was exceptionally hot, which dried out the soil, making it more prone to erosion once the rains began.

The area received continuous heavy rainfall, with recorded amounts of 200 mm and 372 mm on consecutive days—well above the critical threshold for triggering landslides in such geologically sensitive areas. Unfortunately, despite the clear risks, no red warning was issued for Mundakkai on the day of the landslide. However, in regions like Mundakkai, which not only lie in the ecologically sensitive Western Ghats but also have a slope of 20 degrees, continuous rainfall above 100 mm can almost certainly lead to landslides. The absence of a red alert tragically left the community unprepared for the disaster that followed.

The landslide in Mundakkai claimed 240 lives, burying homes and cutting off entire communities. This event underscores the persistent danger posed by landslides in Kerala's mountainous regions, particularly in areas with steep inclines and deforested slopes. The combination of natural vulnerability and intense rainfall created a deadly situation, one that is becoming increasingly common as the effects of climate change exacerbate weather patterns.

The early and intense rainfall in 2024, coupled with the tragic landslides, highlights the growing unpredictability of Kerala's monsoon season. While the state has historically relied on the monsoon for its agricultural and water needs, the increasingly erratic nature of the rains—bringing both excess and deficit in recent years—poses significant challenges.

The events of 2024 have reinforced the urgent need for comprehensive disaster preparedness in Kerala, particularly in the most vulnerable regions. This includes improved early warning systems, stricter land-use planning, and the restoration of natural landscapes to mitigate the risk of landslides. The failure to issue timely warnings in areas like Mundakkai, where specific geographical conditions make the land especially vulnerable, demonstrates the need for more localized and accurate risk assessments.

Conclusion

The past decade has seen Kerala's monsoon transform from a predictable and life-sustaining season into a period marked by extremes—devastating floods, deadly landslides, and severe droughts. The state's unique topography, combined with the intensifying effects of climate change, has made it increasingly vulnerable to these extreme weather events.

The tragic landslides in 2024, particularly in **Mundakkai—a region identified as an ecologically sensitive zone by the Gadgil Report**—underscore the fragility of Kerala's environment. Mundakkai's designation as an ecologically sensitive area, one of 18 such zones identified in the report, highlights the broader risks that exist across the Western Ghats. As development encroaches on these sensitive areas, the potential for future disasters only grows.

The pattern of events from 2018 to 2024 illustrates that Kerala is facing a new normal where extreme weather events may become more frequent and severe. The lessons learned from these years must guide future planning and preparedness efforts. Strengthening early warning systems, enforcing land-use regulations, restoring natural landscapes, and heeding the recommendations of environmental reports like the Gadgil Report are critical steps in safeguarding the state and its people.

As Kerala navigates the challenges of a changing climate, the need for resilience and proactive measures has never been more urgent. The tragic events in Mundakkai and other parts of the state serve as a poignant reminder that while nature can be unpredictable, our response to it need not be. By taking informed and decisive action, Kerala can better prepare for the monsoons of the future and mitigate the risks posed by this increasingly volatile season.

Report Prepared by

Parthiev K S
Litty Adens
Kripa Jose