National River Conservation Directorate
Ministry of Jal Shakti,
Department of Water Resources,
River Development & Ganga Rejuvenation
Government of India

Climatological Status of
Periyar River Basin

March 2025

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National River Conservation Directorate (NRCD)

The National River Conservation Directorate, functioning under the Department of Water Resources, River Development & Ganga Rejuvenation, and Ministry of Jal Shakti providing financial assistance to the State Government for conservation of rivers under the Centrally Sponsored Schemes of 'National River Conservation Plan (NRCP)'. National River Conservation Plan to the State Governments/ local bodies to set up infrastructure for pollution abatement of rivers in identified polluted river stretches based on proposals received from the State Governments/ local bodies.

www.nrcd.nic.in

Centres for Periyar River Basin Management and Studies (cPeriyar)

The Center for Periyar River Basin Management and Studies (cPeriyar) is a Brain Trust dedicated to River Science and River Basin Management. Established in 2024 by IIT Palakkad and NIT Calicut, under the supervision of cGanga at IIT Kanpur, the center serves as a knowledge wing of the National River Conservation Directorate (NRCD). cPeriyar is committed to restoring and conserving the Periyar River and its resources through the collation of information and knowledge, research and development, planning, monitoring, education, advocacy, and stakeholder engagement.

www.cPeriyar.org

Centres for Ganga River Basin Management and Studies (cGanga)

cGanga is a think tank formed under the aegis of NMCG, and one of its stated objectives is to make India a world leader in river and water science. The Centre is headquartered at IIT Kanpur and has representation from most leading science and technological institutes of the country. cGanga's mandate is to serve as think-tank in implementation and dynamic evolution of Ganga River Basin Management Plan (GRBMP) prepared by the Consortium of 7 IITs. In addition to this, it is also responsible for introducing new technologies, innovations, and solutions into India.

www.cganga.org

Acknowledgment

This report is a comprehensive outcome of the project jointly executed by IIT Palakkad (Lead Institute) and NIT Calicut (Fellow Institute) under the supervision of cGanga at IIT Kanpur. It was submitted to the National River Conservation Directorate (NRCD) in 2024. We gratefully acknowledge the individuals who provided information and photographs for this report.

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CLIMATOLOGIC DATA COLLECTION

Data Sources Data Sources

Sl No.	Type of Data	Source of Data
1	Historical Climate Data	1. Indian Meteorological Department (IMD)
2	GCM Data	Bias-corrected climate projections for South Asia from Coupled Model Intercomparison Project-6 (CMIP6) *Reference:* Mishra, V., Bhatia, U., & Tiwari, A. D. (2020). *Bias-corrected climate projections for South Asia from Coupled Model Intercomparison Project-6*. Scientific Data, 7, 338. https://doi.org/10.1038/s41597-020-00681-1

Historical Climate Data Collection – IMD DSP

Historical daily and hourly climate data collected from the IMD Data Supply Portal (DSP). IMD DSP provides access to station-level meteorological observations. The data was obtained for multiple observatory stations within and around the Periyar River Basin.

Data types available at IMD DSP are listed below.

1. Rainfall
2. Surface
3. Autographic
4. Agromet
5. Upper Air
6. Radiation

- The dataset spans multiple decades, with daily records available from the early 1900s and hourly data for recent years (depending on station and parameter).

Names of IMD Stations in the Periyar River basin

Sl No.	District	Station Name	Station Number	Latitude	Longi-tude
1	Ernakulam	Cochin International Airport (CIAL)	43336	10.15	76.4
		Alwaye pwd	101107603	10.1167	76.35
		CIAL Kochi (obsy)	101107653	10.15	76.40
		Ernakulam	101097623	9.98	76.28
		Kochi fort (obsy)	101097631	9.97	76.23
		Malayattur	101107601	10.20	76.52
		Muvattupuzha	101097603	9.97	76.58
		NAS Kochi (obsy)	101097627	9.95	76.27
		Neriamangalam	101107620	10.05	76.17
		Parur	101107602	10.15	76.21
		Perumpavur	101107619	10.12	76.48
		Piravam	101097639	9.8	76.47
		Kochi NAS	43353	9.96	76.23
2	Idukki	Chinnar	101097714	9.87	77.10
		Devikulam	101107712	10.07	77.10
		Idukki	101097641	9.83	76.92
		Karikode	101097625	9.83	76.6667
		Kumily	101097719	9.58	77.17
		Marayur	302107711	10.27	77.15
		Munnar (kseb)	101107717	10.10	77.07
		Myladumpara agri	101097745	9.13	77.03
		Peermade (to)	101097630	9.57	76.98
		Thodupuzha	101097642	9.82	76.67
		Vandanmettu	101097718	9.72	77.13
		Velloor	101097632	9.90	76.83

		Mayiladumpara	43396	9.13	77.03
3	Thrissur	Vellanikara	43357	10.53	76.28
		Vellanikara (CWS station)	43398	10.52	76.22
4	Pathanamthitta	Adur	101097618	9.15	76.73
		Konni	101097616	9.22	76.85
		Kurudamannil	101097646	9.33	76.73
		Pathanamthitta	101097614	96.27	76.77
5	Coimbatore (Tamil Nadu)	Coimbatore	A-43321	11.03	77.05
		Coimbatore	43319	--	--
		Valparai	43341	10.28	77
6	Kottayam	Kottayam	43335	9.53	76.6

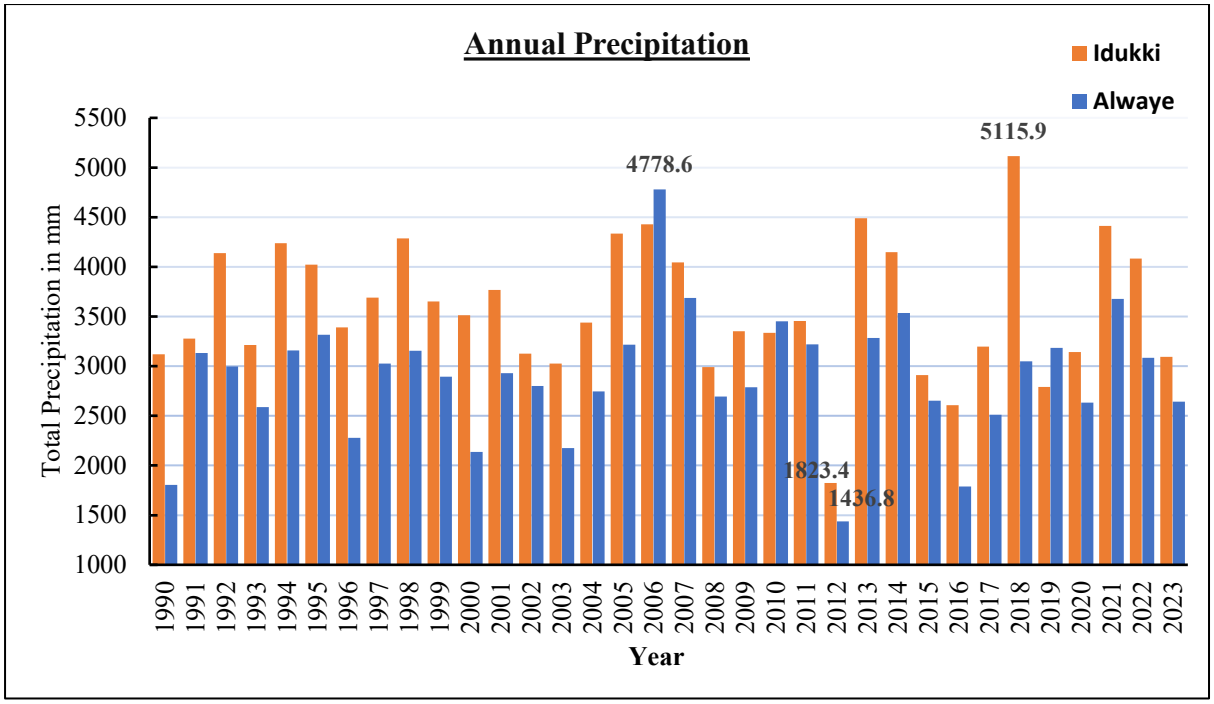
- Data from stations located within the basin, as well as from nearby stations, have been collected

IMD Rainfall Data Details

Data	District	Station	Available Year	Frequency	Unit	Accessed Date
Rainfall	Ernakulam	Alwaye pwd [101107603]	1990-2023	Daily	mm	19/09/2024
		Cial kochi (obsy) [101107653]	2000-2023			
		Ernakulam [101097623]	2013-2023			
		Kochi fort (obsy)[101097631]	1996, 2009, 2010			
		Malayattur [101107601]	Data Unavailable			
		Muvattupuzha [101097603]	Data Unavailable			
		Nas kochi (obsy) [101097627]	1990-2023			
		Neriamangalam [101107620]	2023			
		Parur [101107602]	1990-2000, 2005, 2009, 2023			
		Perumpavur [101107619]	1990-2023			
		Piravam [101097639]	1990-2023			
		Kochi NAS – 43353 (Autographic)	1969-2015	Hourly	mm	22/10/2024
		CIAL – 43336 (Autographic)	2006-2020			
	Idukki	Chinnar [101097714]	1908-1985	Daily	mm	13/09/2024
		Devikulam [101107712]	1905-2005			
		Idukki [101097641]	1990-2023			
		Karikode [101097625]	1901-1989			

		Kumily [101097719],	1908-1983			
		Marayur [302107711]	1916-1988			
		Munnar (kseb) [101107717]	1916-2023			
		Myladumparaagri [101097745]	2013-2023			
		Peermade (to) [101097630]	1901-2023			
		Thodupuzha [101097642]	1991-2023			
		Vandanmettu [101097718]	1929-1987			
		Velloor [101097632]	1952-1983			
	Pathanamthitta	Adur [101097618]	1901-1999	Daily	mm	10-08-2024
		Konni [101097616]	1905-2023			
		Kurudamannil [101097646]	2013-2023			
		Pathanamthitta [101097614]	1905-1986			
		Thiruvalla [101097612]	1901-2013			
	Coimbatore	Valparai-43341 (Autographic)	2010, 2012	Hourly	mm	22/10/2024
		Coimbatore-43321 (Autographic)	1969-2023			

- Daily precipitation values from two stations were used to plot and understand the annual total precipitation received in the river basin from 1990 to 2023.
- Upstream side: Idukki [101097641]
- Downstream side: Alwaye pwd [101107603]



- The Idukki receives higher annual precipitation than Alwaye in most years.
- **Highest rainfall:**

  Idukki 2018-5115.9mm

  Alwaye 2006 – 4778.6
- **Lowest rainfall:**

  Idukki 2012- 1823.4mm

  Alwaye 2012 – 11436.8
- This indicates 2012 was a dry year for the entire basin.

IMD Surface Data Details

Data Type	District	Station	Available Year	Unit	Accessed Date
Surface: 1. Minimum Temperature 2. Maximum Temperature 3. Rainfall 4. Sunshine duration 5. Evaporation 6. Weather phenomenon	Ernakulam	CIAL-43336	2004 2006-2024	Temperature- °C(Daily) Rainfall- mm (Hourly) Sunshine duration (Hourly) Evaporation-mm (Hours)	13/09/2024
	Thrissur	Vellanikara-43357	2001-2024		
	Coimbatore	Coimbatore A-43321	1969-2024		
		Coimbatore-43319	1969-1991		
		Valparai-43341	2004-2023		
	Kottayam	Kottayam-43355	1970-2024		

IMD Autographic Data Details

Data Type	District	Station	Available Year	Frequency	Unit	Accessed Date
Relative Humidity (Hygrograph)	Ernakulam	NAS-43353	1969, 1972-2013	Hourly	~~%~~	29-04-2024
		CIAL-43336	2006, 2009-2020	Hourly	%	10-01-2024
Temperature (Thermograph)	Ernakulam	NAS-43353	1969, 1970, 1987, 2002-2011	Hourly	°C	10-01-2024
		CIAL-43336	2000, 2007-2020	Hourly	°C	10-01-2024
Wind	Ernakulam	NAS-43353	1990-1997	Hourly	kmph &In 16 points of compass of compass code	10-01-2024
Marine: RH, Wind, Cloud	For the River Basin		1990-2023	IMMT1 Format		25-09-2024

IMD Agromet Data Details

Data Type	District	Station	Available Year	Frequency	Unit	Accessed Date
Agromet - CWS: Vapor pressure, Relative Humidity, Wind velocity and direction, Sunshine hours, Evaporation	Idukki	Mayiladumpara-43396	2003-2014	Daily	Vapor pressure of Hg Relative Humidity-% Wind velocity and direction-kmph & 16 points of compass Sunshine hours-Hours Evaporation-mm	24/04/2024
	Kottayam	Kumarakom-43251	2017-2022			
		Kottayam-43394	1969-2022			
	Thrissur	Vellanikara-43398	1991-2022			
	Coimbatore	Coimbatore-43265	1948-1972, 1981-2022			
Agromet - SM: Rainfall, Evaporation, Relative Humidity, Temperature (Max, Min, Mean)	Thrissur	Vellanikara-43398	1991-2013	Daily	Raunfall-mm Evaporation-mm Relative Humidity-% Temperature (Max, Min, Mean)-°C	27/09/2024

IMD Upper Air Data Details

- Pilot Balloon data for the station, Kochi NAS – 43353 – Ernakulam District, is downloaded.
- **Parameters Available:** Wind direction in degrees east of north.
  Wind Speed in Whole meters per second.
- **Available Year:** 1956-1958, 1963-2012
- **Frequency:** Daily
- **Accessed Date:** 24/0/2024

Projected Climate Data Collection

Reference:

Mishra, V., Bhatia, U. & Tiwari, A.D. Bias-corrected climate projections for South Asia from Coupled Model Intercomparison Project-6. *Sci Data* 7, 338 (2020).

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- CMIP6 GCMs that are used for bias-corrected projections.

S. No.	Model name	Latitude resolution (degree)	Longitude resolution (degree)
1	ACCESS-CM2	1.25	1.875
2	ACCESS-ESM1-5	1.25	1.875
3	BCC-CSM2-MR	1.1215	1.125
4	CanESM5	2.7906	2.8125
5	EC-Earth3	0.7018	0.703125
6	EC-Earth3-Veg	0.7018	0.703125
7	INM-CM4-8	1.5	2
8	INM-CM5-0	1.5	2
9	MPI-ESM1-2-HR	0.9351	0.9375
10	MPI-ESM1-2-LR	1.8653	1.875
11	MRI-ESM2-0	1.1215	1.125
12	NorESM2-LM	1.8947	2.5
13	NorESM2-MM	0.9424	1.25

- **Scenarios:** Historical, SSP1-2.6, SSP2-4.5, SSP3-7.0, SSP5-8.5
- **Variables:** 1. Daily Precipitation
  2. Maximum Temperature
  3. Minimum Temperature

- **Resolution:** 0.25^0 x 0.25^0
- **Time Period:** Historic: 1951-2014

  Projected: 2015-2100
- Basin Coverage: The dataset covers 18 major Indian sub-continental river basins, with the Periyar River Basin included under the South Coast region.
- The location details of grid points inside and near the basin are given below.

Sl no.	Latitude	Longitude
1	10.125	76.375
2	10.125	76.625
3	10.125	76.875
4	10.125	77.125
5	9.875	77.125
6	9.625	77.125
7	9.625	77.375
8	9.375	77.375
9	9.625	76.875
10	9.875	76.875

APPLICATIONS OF CLIMATOLOGIC DATA

1. Rainfall Data

The rainfall data has a wide range of applications in areas like environmental, agricultural, and hydrological applications also plays a critical role in understanding the Earth's hydrological and atmospheric systems. Used in the analysis of long-term precipitation trends to assess regional and global climate variability and change. Rainfall records contribute to the development of drought and flood indices for monitoring and assessing the conditions. They also aid in the calibration and validation of climate models. It can be considered as the major input for flood forecasting and early warning systems. In water resource management, rainfall data supports the planning and operation of reservoirs, irrigation systems, and groundwater recharge estimation.

2. Temperature Data

Analysing long-term trends in temperature helps to identify global warming and regional climate shifts. Daily maximum temperature data are used to define and monitor heatwaves and their intensities. In agriculture, temperature data supports the estimation of growing degree days (GDD), crop suitability assessments. In hydrology, temperature influences evaporation, snowmelt, and runoff, making it important for water resource modeling. By integrating

temperature data with other meteorological variables, it helps to generate climate indices, validate climate models, and develop accurate forecasts and early warning systems, thereby supporting informed decision-making in climate adaptation and mitigation strategies.

3. Evaporation and Relative Humidity

Evaporation and relative humidity are critical parameters in understanding the Earth's hydrological and atmospheric processes. These variables are important to assessing water loss from surfaces, plant-water relations, and the moisture content of the atmosphere. These datasets can be used to estimate evapotranspiration, which is used for hydrological modeling, irrigation scheduling, and agricultural planning.

4. Wind Velocity

Wind velocity, which consists of both wind speed and direction, is a crucial meteorological parameter in climate studies and environmental monitoring. In climate modeling, wind data is essential for understanding energy transfer, evaporation rates, and atmospheric mixing processes. Wind velocity is also critical in estimating potential evapotranspiration, which influences drought assessment and water resource management.

5. Sunshine Duration and Weather Phenomenon

Sunshine duration data reflects the amount of solar radiation received at a location, which directly affects surface temperature, evaporation, and photosynthetic activity. Observed weather phenomena (e.g., rain, fog, thunderstorms, hail, dust storms) provide direct insights into short-term climate variability and help in developing early warning systems for extreme events. These observations are critical for validating weather forecasts and understanding seasonal patterns in a region.