Table S1. Cauvery river basin observation stations description

S. No	Station	Station ID	Latitude	Longitude	S. No	Station	Station ID	Latitude	Longitude
Upper Cauvery River Basin					**Middle Cauvery River Basin**				
1	**Akkihebbal**	1	12°36'10"	76°24'3"	**1**	**Biligundulu**	4	12°10'48"	77°43'48"
2	**Bendrehalli**	3	12°2'8"	77°0'53"	**2**	**E-Managalam**	6	11°1'59"	77°53'31"
3	**Chunchunkatte**	5	12°30'25"	76°18'0"	**3**	**Hogenakkal**	8	12°7'15"	77°47'7"
4	**K.M.Vadi**	9	12°20'32"	76°17'15"	**4**	**Kanakpura**	10	12°32'41"	77°25'37"
5	**Kollegal**	12	12°11'17"	77°5'59"	**5**	**Kodumudi**	11	11°5'5"	77°53'18"
6	**Kudige**	13	12°30'6"	75°57'40"	**6**	**Kudlur**	14	11°50'26"	77°27'45"
7	**M.H.Halli**	15	12°49'9"	76°8'2"	**7**	**Musiri**	17	10°56'40"	78°26'1"
8	**Sakleshpur**	24	12°57'8"	75°47'12"	**8**	**Muthankera**	18	11°50'49"	76°7'15"
9	**T.Narasipur**	28	12°13'54"	76°53'29"	**9**	**Nalammaranpatti**	19	10°52'54"	77°59'3"
10	**Thimmanahalli**	33	12°58'56"	76°2'16"	**10**	**Nellithurai**	21	11°17'17"	76°53'29"
Lower Cauvery River Basin					**11**	**Savandapur**	25	11°31'22"	77°30'24"
1	**Annavasal**	2	10°58'21"	79°45'27"	**12**	**Sevanur**	26	11°33'16"	77°42'52"
2	**Gopurajapuram**	7	10°51'4"	79°48'0"	**13**	**T.Bekuppe**	27	12°30'58"	77°26'15"
3	**Menangudi**	16	10°56'55"	79°42'19"	**14**	**T.K.Halli**	29	12°25'0"	77°11'33"
4	**Nallathur**	20	10°59'28"	79°47'18"	**15**	**Thengumarahada**	31	11°34'21"	76°55'8"
5	**Peralam**	22	10°58'10"	79°39'38"	**16**	**Thevur**	32	11°31'42"	77°45'6"
6	**Porakudi**	23	10°54'13"	79°42'27"	**17**	**Thoppur**	34	11°56'18"	78°3'18"
7	**Thengudi**	30	10°54'56"	79°38'21"	**18**	**Urachikottai**	35	11°28'43"	77°42'0"

Table S2. CLIMDEX indices.

S.No	CLIMDEX ID	Indicator name	Definition	UNITS
1	**DTR**	Diurnal temperature range	The monthly mean difference between TX and TN	ºC
2	**RX1day**	Max 1-day precipitation amount	Monthly maximum 1-day precipitation	Mm
3	**Rx5day**	Max 5-day precipitation amount	Monthly maximum of consecutive 5-day precipitation	Mm
4	**TN10p**	Cool nights	Percentage of days when TN<10th percentile	Days
5	**TN90p**	Warm nights	Percentage of days when TN>90th percentile	Days
6	**TNn**	Min Tmin	The monthly minimum value of daily minimum temp	ºC
7	**TNx**	Max Tmin	The monthly maximum value of daily minimum temp	ºC
8	**TX10p**	Cool days	Percentage of days when TX<10th percentile	Days
9	**TX90p**	Warm days	Percentage of days when TX>90th percentile	Days
10	**TXn**	Min Tmax	The monthly minimum value of daily maximum temp	ºC
11	**TXx**	Max Tmax	The monthly maximum value of daily maximum temp	ºC
12	**CDD**	Consecutive dry days	Maximum number of consecutive days with RR<1mm	Days
13	**CSDI**	Cold spell duration indicator	The annual count of days with at least 6 consecutive days when TN<10th percentile	Days
14	**PRCPTOT**	Annual total wet-day precipitation	Annual total PRCP in wet days (RR>=1mm)	mm
15	**R95p**	Very wet days	Annual total PRCP when RR>95th percentile	Mm
16	**R99p**	Extremely wet days	Annual total PRCP when RR>99th percentile	mm
17	**WSDI**	Warm spell duration indicator	The annual count of days with at least 6 consecutive days when TX>90th percentile	Days
18	**SDII**	Simple daily intensity index	Annual total precipitation divided by the number of wet days (defined as PRCP>=1.0mm) in the year	Mm/day
19	**SU25**	Summer days	Annual count when TX(daily maximum)>25ºC	Days

Text S1.

a. Generalized Linear Model (GLM)

In GLM, each outcome (Y) of the dependent variables is presumed to be produced from a specific distribution in an exponential family. The mean μ, of the distribution, depends on the independent variables, X, through:

$$E(Y) = \mu = g^{-1}(\mathrm{X}\beta)$$

where E(Y) = expected value of Y,

Xβ = linear predictor,

β = a linear combination of unknown parameters,

g = link function.

In this framework, the variance is a function of the mean (V)

$$\mathrm{Var}(Y) = V(\mu) = V(g^{-1}(\mathrm{X}\beta))$$

b. Partial Least Squares Regression (PLS)

Partial Least Squares is a multi-variate technique used to develop models for factors. The variables are calculated to exploit the covariance between the nicks of an independent block (X) and the scores of a dependent block (Y). X and Y blocks are modeled to find out the variables in an X matrix that will best describe the Y matrix.

Model of X: $X = TP^T + E$

Model of Y: $Y = TC^T + F$

The PLS models are not affected by regular variation in the X block that is not related to the Y block, which is not part of the joint correlation structure between X and Y.

c. Neural Network (NNET)

A neural network is a classifier that predicts the value of a categorical value. A neural network could be used to predict discharge based on the precipitation and temperature data of the concerned location. Fit single-hidden-layer neural network, possibly with skip-layer connections. If the response in the formula is a factor, an appropriate classification network is constructed, this has one output and entropy fit if the number of levels is two, and several outputs equal to the number of classes and a softmax output stage for more levels. If the response is not a factor, it is passed on unchanged to nnet.default.

d. K Nearest Neighbors (KNN)

The K Nearest Neighbors (KNN) is a non-parametric method for classification and regression. The output depends on whether KNN is used for classification or regression.

1) KNN classification - The output is a class membership. A variable is classified based on the range of votes of its neighbors, with the object being assigned to the class most common among its K nearest neighbors. When K = 1, the object is assigned to the class of a single nearest neighbor.
2) KNN regression - The output is the property value for the object and it is the average of the values of K nearest neighbors. KNN is a type of lazy learner, where the function is only approximated and all computation is deferred until function evaluation.

e. principal component regression (PCR)

Principal component regression is a regression-based technique that uses Principal Component Analysis (PCA). More explicitly, PCR is used for assessing the unknown regression coefficients in a linear regression model. In PCR, as a replacement for regressing the dependent variables directly, the principal components of the variables are used as regressors.

$$Y = XB + e$$

Where, Y = dependent variable,

X = independent variables,

B = regression coefficients to be estimated,

e = errors or residuals.