

Closure Report

**File Number :** SRG/2019/001251

**Project Title :** Interactive Desktop Tool for Nonstationary Intensity-Duration-Frequency Curves under Climate Change

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**Total Sanctioned Amount :** 16,47,000 (INR)

**Total Released Amount :** 15,70,000 (INR)

**Start Date of the Project:** 21 Nov, 2019

**Date of completion:** 20 Nov, 2021 ( 24 months )

**Approved Objectives :**

- To develop a new framework for nonstationary IDF curves under climate change by integrating extreme precipitation and GCM outputs.
- To assess the skills scores of GCM outputs for nonstationary IDF curves.
- Development of an interactive desktop tool for the implementation of the nonstationary IDF curves.
- Dissemination of the tool by providing necessary training.

**Deviation made from original objectives (If Any) :**

-Dissemination of the tool by providing necessary training. Due to the pandemic, no training sessions were organised.

**Ph.D. Produced/ Likely to be Produced** : 0

**Technical Personnel Trained** : 2

**Total Expenditure :** 0 (INR)

**Concise Research Accomplishment :**

A Novel Non-stationary modeling framework for regionalization of extreme precipitation using non-uniform lagged teleconnections over monsoon Asia under changing climatic conditions

## Closure Details

### Experimental/ Theoretical Investigation carried out

.The proposed methodology can be summarized into six components, which include: (1) Selection of covariate: (i)non-uniform climate indices series using cross-correlation analysis; (ii) GCM model (2) NS-GEV model parameter estimation using maximum likelihood method (3) Best performing model (or covariate) selection based on corrected Akaike Information Criterion (AICc) (4) Formation of zones based on mean extreme precipitation using clustering algorithm (5) Zone-wise performance evaluation of the NS-GEV model (6) Zone-wise estimation of extreme precipitation for various return periods

### Detailed Analysis of result

• It is observed that there is a significant increase in the number of AMPs during the summer monsoon months, especially in May. On the other hand, the number of AMPs decreases in September, indicating that the fewer AMPs over AMR during this month. The transition could be plausibly due to the variations in precipitation in the tropics and subtropics, mainly from shifts in teleconnections, and these shifts are related to global climate variability. • Among the selected 15 covariates, GLBT and AMO teleconnections are found to be influential in AMR. • Non-stationary models outperform stationary models in 98.11% of grids with GCM models as covariates • GCM model uncertainty reduced: 8 GCM models are selected out of 27 • To reduce the uncertainty in the spatial variability of NS-GEV models, AMR is clustered into six zones with mean AMPs as an attribute using the GMM algorithm. • The Zone-wise NS-GEV model’s efficacy is evaluated using intra-comparison and inter-comparison of models and performed well based on RMSE measures. • The results indicate an increase in intensity and a decrease in extreme precipitation frequencies in all the zones across AMR. The Z-NS-GEV models reduce the drudgery associated with selecting models and their large spatial variations across AMR. • AMR will receive higher intensity rainfall in the future • Higher changes are expected for low precipitation zones compared to high precipitation zones • Higher changes are expected in for lower return periods • The higher intensity rainfall will occur more frequently due to climate change

### Conclusions

Identification of non-uniform time lags for climate indices Regionalization of extreme precipitation zones Development of Non-Stationary (NS) models for IDF curves under changing climate using: (a) teleconnections and (b) historical Global Climate Models (GCMs) as covariates. Estimation of Non-Stationary intensities of extremes events

### Scope of future work

.extension to link with teleconnections to improve the performance of the NS models

List of Publications (only from SCI indexed journals) :

Title of the Paper	List of Authors	Journal Details	Month & Year	Volume	Status	DOI No	Imp Factor
Non-stationary modeling framework for regionalization of extreme precipitation using non-uniform lagged teleconnections over monsoon Asia	Meghana N; Roshan Srivastav.	STOCHASTIC ENVIRONMENTAL RESEARCH AND RISK ASSESSMENT (International)	Mar-2022	(1-19)	Published	<a href="https://doi.org/10.1007/s00477-022-02211-4">https://doi.org/10.1007/s00477-022-02211-4</a>	3.81

List of Papers Published in Conference Proceedings, Popular Journals :

Title of the Paper	List of Authors	Journal Details	Month & Year	Volume	Status	DOI No	Imp Factor
Not Available							

List of Patents filed/ to be filed :

Patent Title	Authors	Patent Type	Country/Agency Name	Patent Status	Application Number No.
Not Available					

Equipment Details :

Equipment Name	Cost (INR)	Procured	Make & Model	Utilization %	Amount Spent (INR)	Date of Procurement
Printer	24,000	Yes	HPM226dw	50	24,990	13 Mar, 2022
Data Logger	2,00,000	Yes	Lenovo Thinkpad X1 Carbon	100	2,00,000	02 Mar, 2022
Network Attached Storage	3,00,000	Yes	Tyrone Unified Storage System FS2-D4AC-36JR-AP	100	3,33,438	29 Oct, 2022
Workstation (CPU only)	6,00,000	Yes	Tyrone Computer Workstation Camarero AD400TR-54iR JR-AP	100	5,66,584	29 Oct, 2022
Uninterrupted Power Supply (UPS)	19,000	No		0	0	
Monitor	30,000	Yes	HP Elite Display E273	100	24,990	13 Mar, 2022

Plans for utilizing the equipment facilities in future:

.For developing the tools and training/workshop