



CLIMATE AND
ENVIRONMENTAL
RESEARCH INSTITUTE

TRAINING PROGRAM REPORT

Open Data for Environmental Science

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Report Type

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1. INTRODUCTION

The **Climate & Environmental Research Institute (CERI)** organized and delivered the Open Data for Environmental Science Training Program, a structured capacity-building initiative aimed at developing practical skills in environmental data analysis, climate research, and scientific communication.

The program introduced participants to open environmental datasets, widely used analytical platforms, and applied research workflows. Across three sessions, participants engaged with real-world data, developed hands-on competencies, and were exposed to collaborative, research-oriented learning practices.

This report documents the program's structure, participation outcomes, tools and methods employed, and the internship and mentorship component established for selected participants.

2. PROGRAM OBJECTIVES

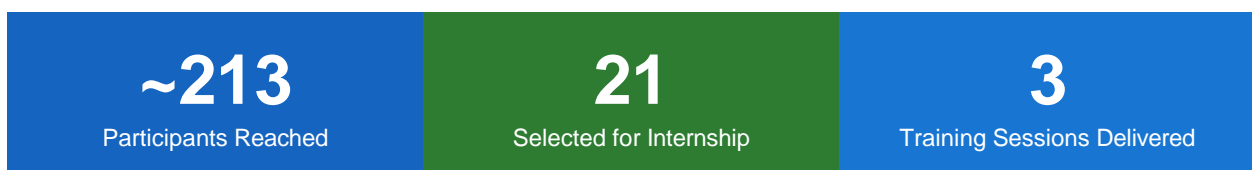
The training program was designed to achieve the following objectives:

- Develop practical competencies in environmental data retrieval, cleaning, analysis, and visualization.
- Introduce participants to major open-access environmental datasets and platforms.
- Strengthen understanding of climate data applications within research and policy contexts.
- Encourage collaboration, peer learning, and research-oriented thinking.
- Support participants in initiating research articles or data-driven environmental projects.

3. PROGRAM REACH & PARTICIPATION

The training program reached approximately 213 individuals from diverse academic and professional backgrounds, including undergraduate and postgraduate students, early-career researchers, and environmental practitioners.

The program was open to participants with varying levels of prior experience in data analysis and environmental science, with sessions designed to be accessible while progressively building analytical depth.



Following completion of all three sessions, 21 participants were selected to advance into the internship and mentorship phase. Selection was based on participation consistency, demonstrated effort, task completion, and fulfillment of program requirements.

4. TRAINING SESSIONS

The program comprised three structured sessions, each building upon the previous. The table below summarizes the content and focuses of each session.

Session	Title	Key Topics
Session 1	Foundations	Open environmental datasets; platform orientation (NASA Earth Data, NOAA, Copernicus, FAO, USGS Earth Explorer, World Bank Open Data); tool introduction (QGIS, RStudio, Google Colab)
Session 2	Data Handling & Analysis	Precipitation and climate datasets; data cleaning and formatting; rainfall trend analysis; statistical methods in R and RStudio; introductory spatial visualization in Google Colab
Session 3	Data Visualization & Dashboard Preparation	Data visualization principles; dashboard design; environmental reporting techniques; chart and graph construction for research outputs

Session 1: Foundations

The opening session-oriented participants to the landscape of open environmental data. Facilitators provided an overview of major data repositories and introduced the tools used throughout the program. Participants explored datasets from NASA Earth Data, NOAA, the Copernicus Climate Change Service, FAO, USGS Earth Explorer, and the World Bank Open Data portal. The session established a shared baseline for subsequent applied work.

Session 2: Data Handling & Analysis

The second session focused on applied data work, with emphasis on precipitation and climate datasets. Participants practiced data cleaning and formatting procedures, conducted rainfall trend analysis, and applied introductory statistical methods using RStudio. Spatial visualization exercises were introduced using Google Colab, allowing participants to observe geographic distributions of climate variables.

Session 3: Data Visualization & Dashboard Preparation

The final session addressed the communication of environmental data findings. Participants were introduced to data visualization principles and environmental reporting techniques, including the design of charts, graphs, and basic dashboard layouts. The session emphasized translating analytical outputs into formats suitable for research reports, presentations, and public communication.

5. ANALYTICAL TOOLS & PLATFORMS

Participants worked with the following tools and platforms throughout the training. Each was selected for its relevance to professional environmental research practice and its availability as a free or open-source resource.

Tool / Platform	Category	Application in Training
RStudio	Statistical Analysis	Rainfall trend analysis, statistical computing, dataset manipulation
Google Colab	Cloud Computing	Spatial visualization, collaborative coding exercises, Python-based analysis
QGIS	GIS & Spatial Analysis	Geospatial data handling, map generation, environmental layer visualization
NASA Earth Data / NOAA / Copernicus	Open Datasets	Climate and satellite data retrieval for analysis exercises
FAO / USGS Earth Explorer / World Bank	Open Datasets	Agricultural, land cover, and socio-environmental datasets

The deliberate use of open-source and freely accessible tools ensures that participants can continue applying these skills beyond the training period without access constraints.

6. INTERNSHIP & MENTORSHIP COMPONENT

A two-month internship and mentorship phase was established for participants selected following the completion of the training sessions. This component bridges the transition from structured instruction to independent applied practice.

Support provided to selected Internship participants

- Weekly mentorship meetings with program facilitators
- Guidance on research design, methodology, and data use
- Technical assistance with analytical tools covered during training
- Support in developing research articles or data-driven environmental projects
- Access to collaborative working opportunities within the CERI network

The internship component is not structured around a rigid curriculum. Instead, it is organized around the individual research interests and project goals of each participant, with facilitators providing guidance tailored to their specific work.

Each participant is expected to produce at least one tangible output during the internship period either a research article suitable for institutional or peer-reviewed publication, or a data-driven environmental project with clear documentation and findings.

7. EXPECTED OUTPUTS

Participants in the internship phase are expected to work toward at least one of the following outputs:

- *A research article or analytical report drawing on environmental data and methods covered during training.*
- *A documented data-driven environmental project, including methodology, findings, and visual outputs.*

These outputs are intended to serve multiple purposes:

- *Strengthening research experience and academic or professional portfolios.*
- *Contributing to environmental knowledge sharing within participants' institutions and communities.*
- *Providing a foundation for continued research or further study.*
- *Supporting collaboration between participants and CERI's broader research network.*

8. KEY CURRENT OUTCOMES

The training program achieved the following outcomes:

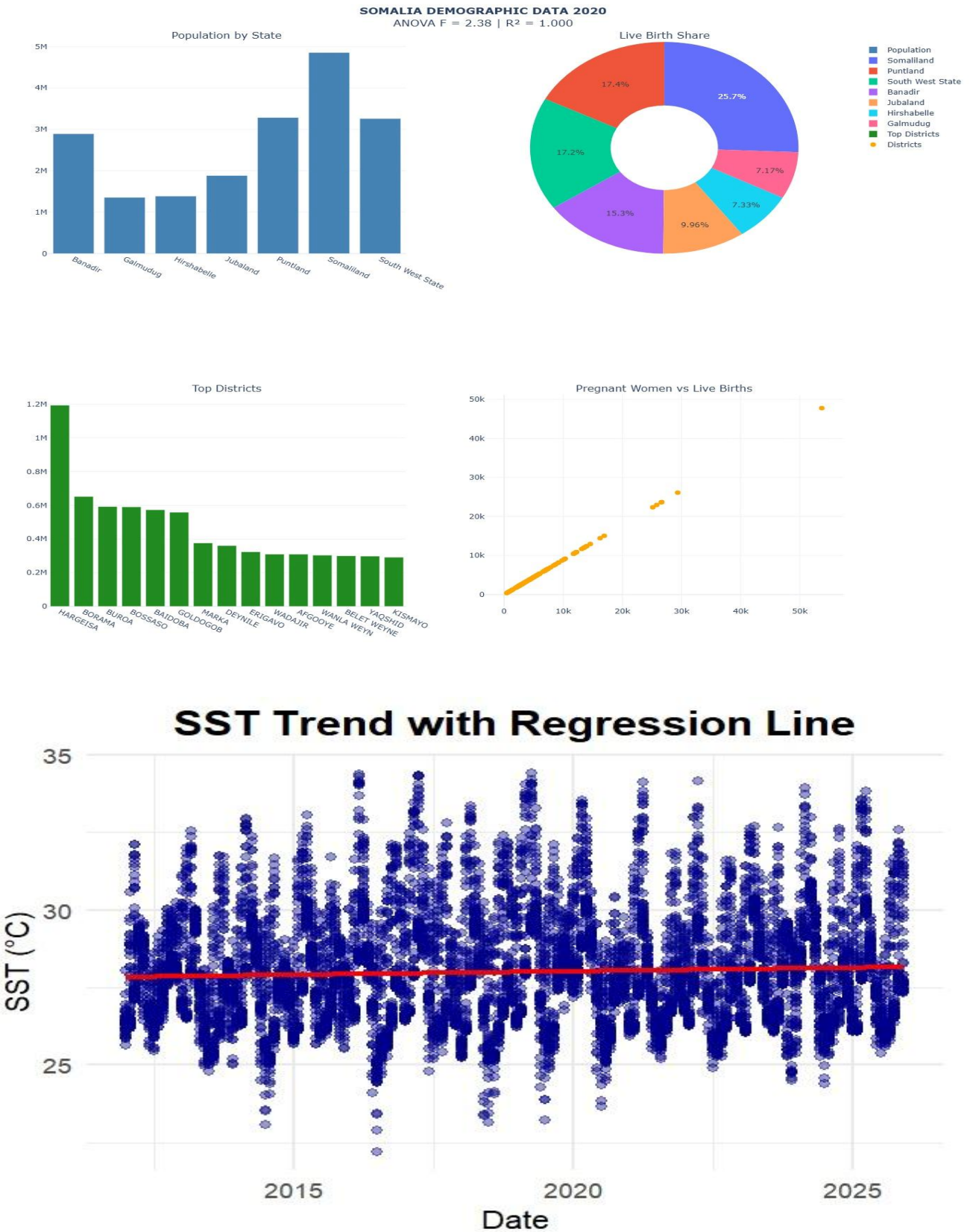
- *Approximately 213 individuals participated across all three training sessions.*
- *All planned sessions were delivered in full, covering data foundations, analytical methods, and visualization.*
- *21 participants were selected for the internship and mentorship phase based on demonstrated engagement and completion of program requirements.*
- *Participants gained practical introductory experience with R, RStudio, Google Colab, QGIS, and a range of open environmental datasets.*
- *A structured pathway was established for participants to continue applied environmental work through mentored project development.*

8.1 Student Practical Outputs and Applied Learning Results

A key achievement of the program was the successful translation of training content into hands-on analytical products developed by participants during practical sessions and assigned exercises. Throughout the training, students worked with real environmental datasets, analytical tools, and visualization techniques to produce original outputs that demonstrate their developing technical and research capabilities.

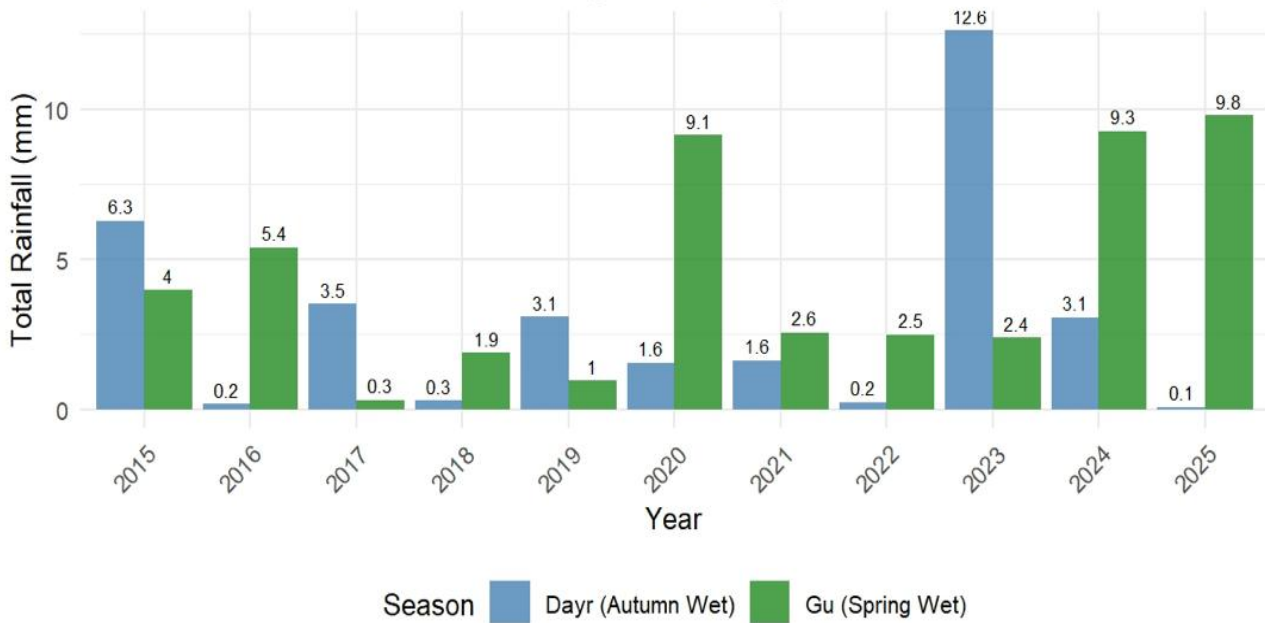
The figures presented below showcase examples of student-created work generated during practical sessions and assignments, including climate trend analysis, rainfall assessment, seasonal comparisons, statistical visualization, and geospatial mapping outputs.

Figures 1–6 are examples of analytical and visualization outputs produced by students during practical training sessions and assignment activities.



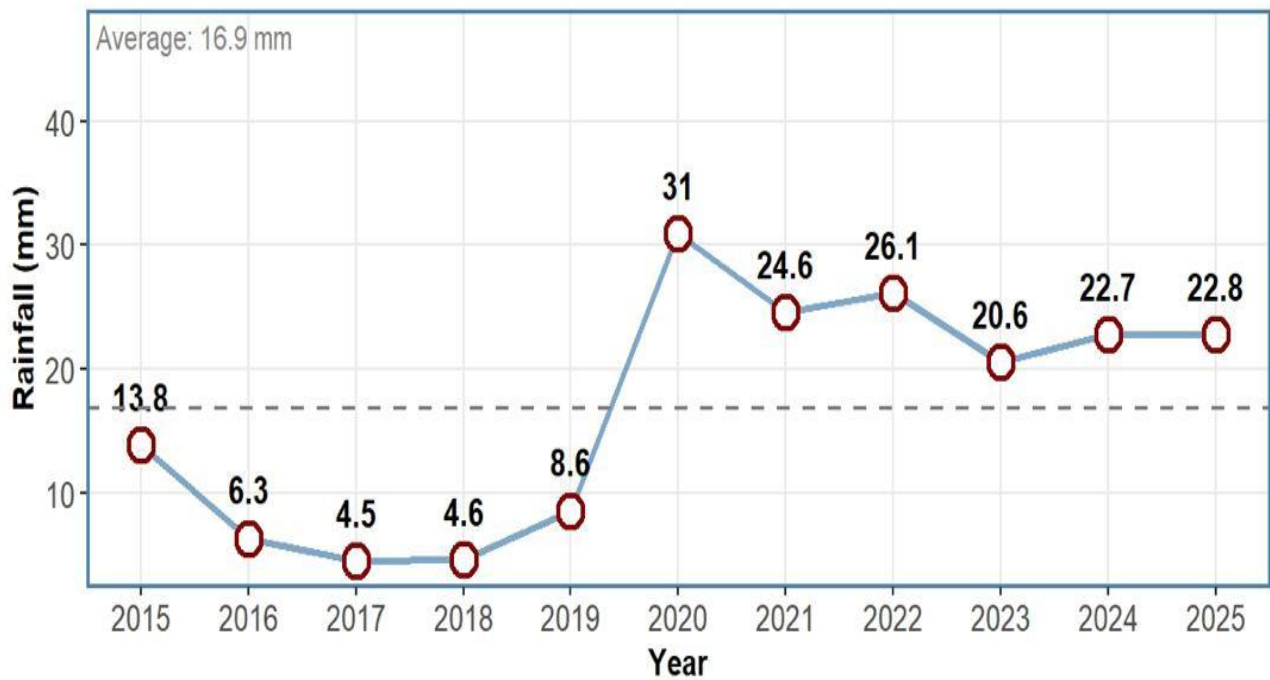
Comparison of Gu vs Dayr Seasonal Rainfall

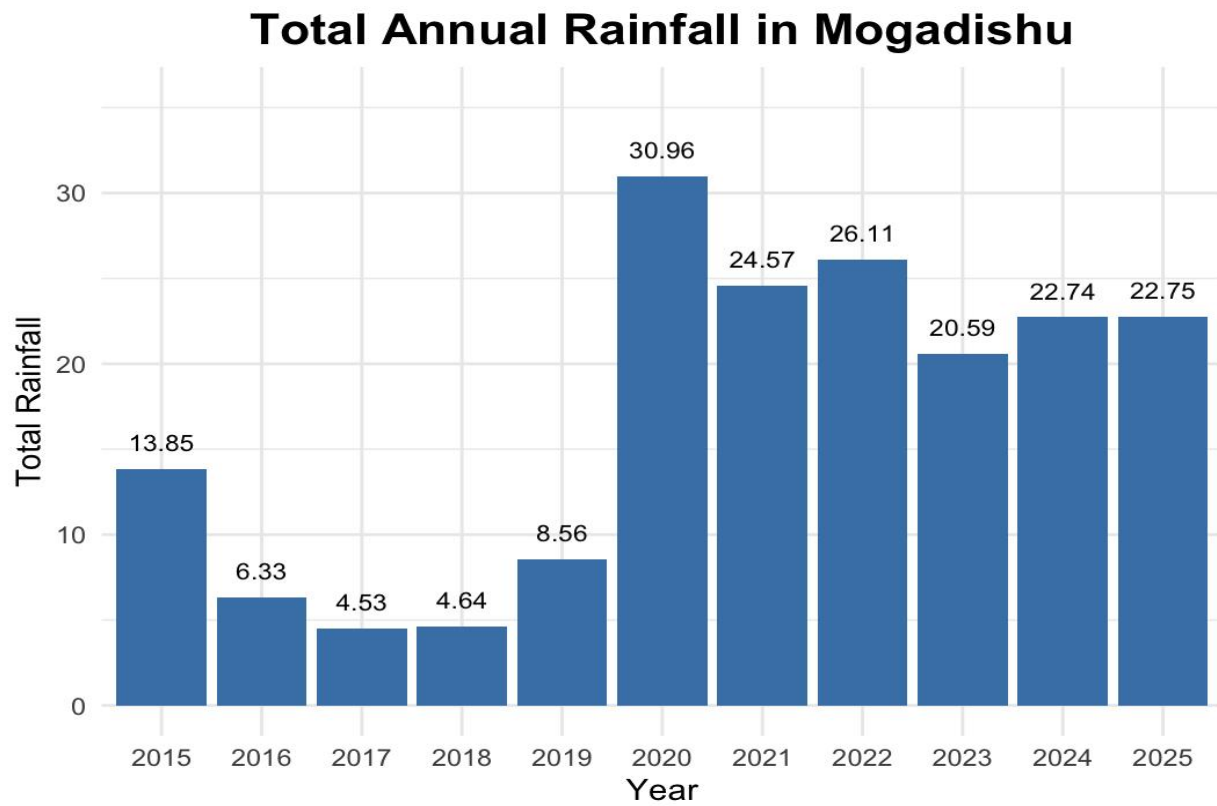
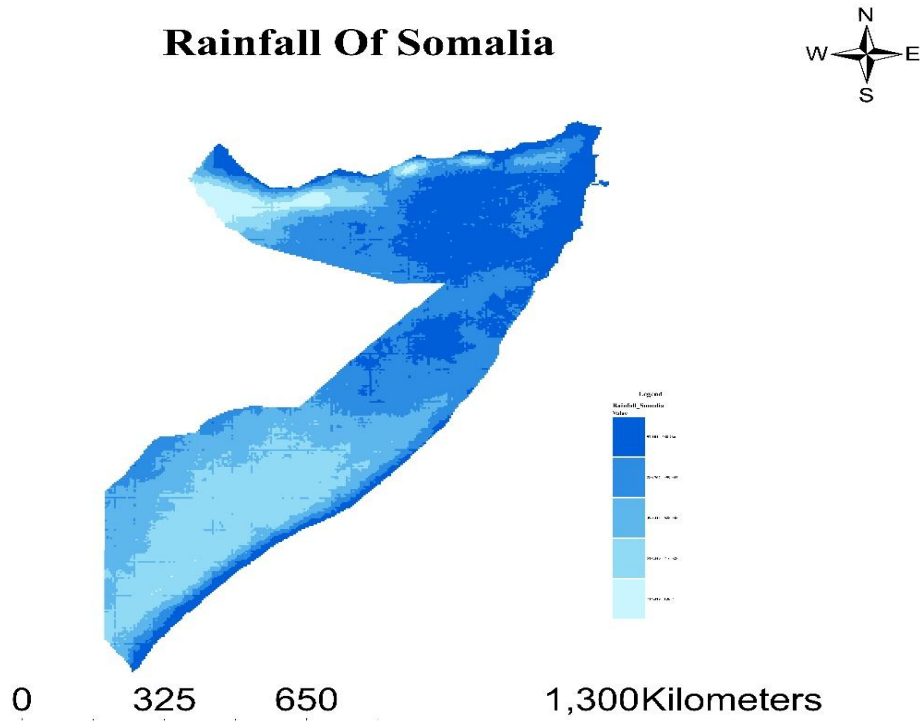
Main rainy seasons in Mogadishu

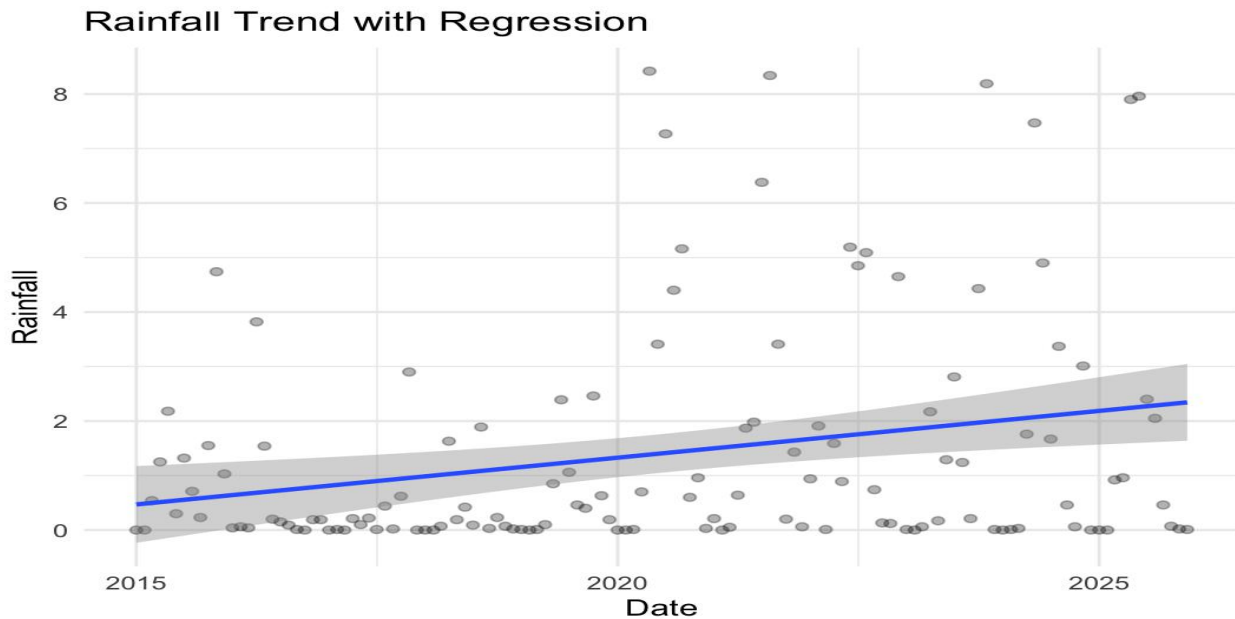


Total Annual Rainfall Trend in Mogadishu

2015-2025







9. RECOMMENDATIONS

Based on the experience of this program, the following recommendations are offered for the design of future training initiatives:

- Continue delivering practical, dataset-focused training that builds directly applicable skills.
- Expand the mentorship and follow-up phase to allow more time for iterative project development and feedback.
- Introduce more advanced technical sessions in future programs to serve participants who wish to deepen their analytical capabilities.
- Establish a structured channel for participants to share and publish completed projects and articles, supporting broader knowledge dissemination.
- Explore inter-institutional collaboration opportunities to broaden participation and diversify research topics addressed.

10. CONCLUSION

The Open Data for Environmental Science Training Program provided a structured, practical introduction to environmental data analysis for approximately 213 participants. By grounding instruction in real datasets, open-source tools, and applied exercises, the program equipped participants with skills directly applicable to research and professional work in the environmental sector.

The internship and mentorship component extends the program's impact by supporting 21 selected participants as they develop independent research outputs and continue their professional development.

CERI intends to continue delivering capacity-building initiatives of this nature, with a commitment to practical learning, research collaboration, and the responsible use of open environmental data.