Sudan Climate Resilience Training Workshop, September 7th - 9th 2021, University of Khartoum and Online (Zoom)

Workshop report

TABLE OF CONTENTS

1.0 INTRODUCTION

The Sudan Climate Resilience Workshop was held on 7th-9th September 2021 through a hybrid format. The participants from Sudan congregated physically at the University of Khartoum and a team from ICRAF in Nairobi joined online via Zoom conferencing. The workshop brought together eighteen participants and four instructors from Sudan. The participants from the Ministry of Agriculture, Ministry of livestock, Sudan Meteorological authority, Higher council for environment and University of Khartoum (Annex 1: List of participants). It was organized as part of the CTCN response plan on Developing Methodology and Capacity for Monitoring Climate Change and its Impacts on Agriculture in Sudan through Earth Observations.

1.1 Opening Remarks

The workshop was officially opened by Dr. Eltaib Ganawa, the project consultant. He provided a background of the project and the previous capacity building trainings conducted on Geoportal Database Building, Prototype of the Climate Vulnerability Atlas and Earth Observation Monitoring. Dr. Ganawa emphasized how data sharing has been a big part of realizing the project objectives and expects that this training will further support improved data management.

1.2 Objectives of the Workshop

1. To introduce participants to R Statistics for data analysis, including remote sensing analysis.
2. To introduce participants to remote sensing data processing and visualization.
3. To demonstrate how the Sudan Climate Vulnerability Atlas can support decision making.
4. To brainstorm on capacity building and sustainability approaches towards the Sudan Climate Vulnerability Atlas

2.0 Training on R statistics

Linkages between Data and Sudan Climate Vulnerability

Dr. Tor Vagen gave a background on the Climate Vulnerability Analysis while emphasizing the importance of land health data for climate vulnerability, Earth Observation and R statistics to conduct data analysis.

2.1 Introduction to R statistics

One of the objectives of the training was to build capacity to access and use the Sudan Climate Resilience Atlas “referred to as “Dashboard”. This includes an introduction to the R software used to develop and analyze the data visualized on the Dashboard. The following activities were facilitated by Dr. Amar and Mustafa with support from Dr. Tor-G Vagen and Clinton

Oyogo who led a hands-on session where they worked on the rainfall data to offer participants a practical experience.

- Installation of R Software
- Installation of R Studio
- Introduction to R analysis in R Statistics
- Processing, analysing and visualization

The Sudan Climate Resilience Atlas is developed in R open-source software and some of the module data is presented in the form of maps using leaflet library. Part of the coverage during the R Statistics training was on leaflet and mapping, this served to bring the participants to the understanding of the underworking of the Atlas in terms of data preprocessing and visualization.

Figure 1: Participants during the session on introduction to R statistics

2.2 Leaflet and Mapping

The participants were taken through an introduction to leaflet and mapping training session which consisted of introductory definition of terms and then an engaging coding exercise. The data used in the exercise was the temperature data for the project areas. The hands-on exercise was done in RStudio with the RMarkdown library for documentation and reporting.

The areas covered during the session were:

1. Gentle introduction to RMarkdown.
2. Definition of leaflet library.
3. Brief introduction to Spatial data (different types of spatial data).
4. Hands-on exercises:
    - Created a basic map using leaflet library.
    - Imported shapefile data into R.
    - Visualized the shapefile on leaflet map.
    - Added layers to the map.

At the end of the exercise, the participants were able to create an RMarkdown notebook with steps on how to import and map temperature data and adding layers to the map. The final leaflet map shows temperature data for the years 1970 – 1971, a legend, popup, minimap and a layers control legend for switching the years. The following image shows the output of the hands-on coding exercise.

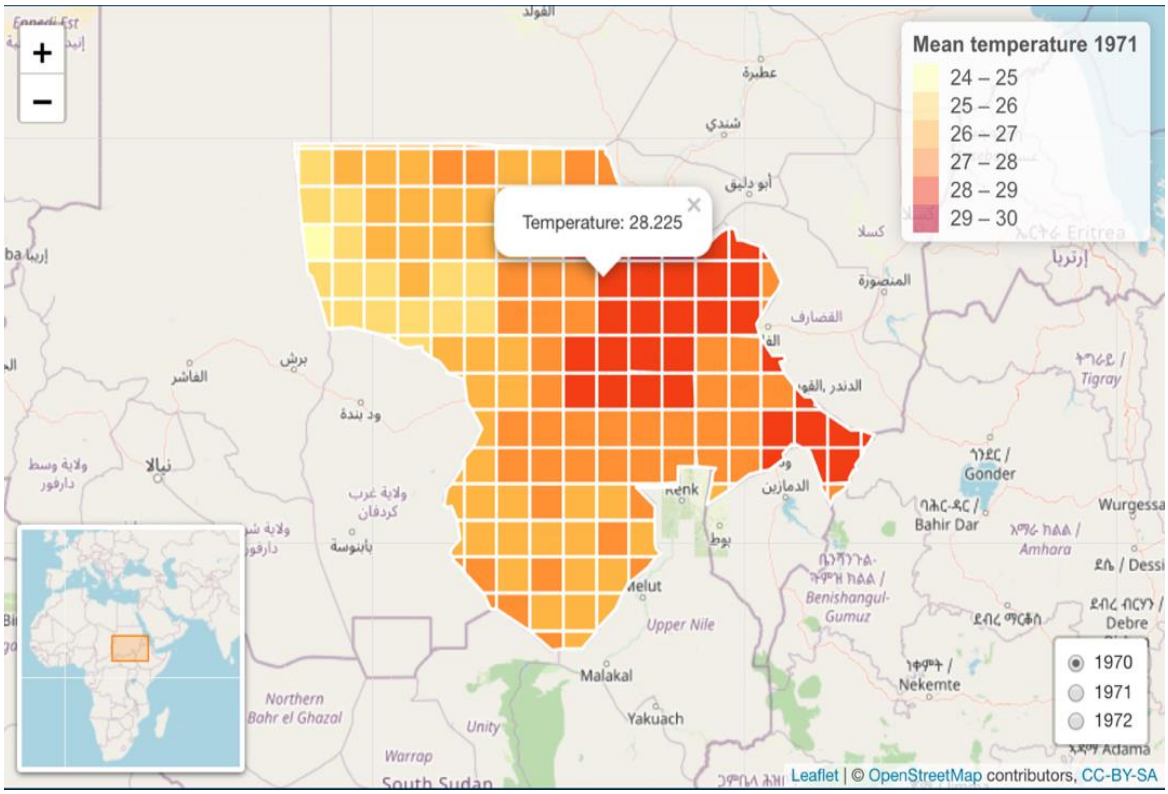

Figure 2: Leaflet map created by participants showing the temperature data for Sudan from 1970 - 1971

3. DATA AND DECISION MAKING

Once the participants had gained a basic understanding of R Statistics, an interactive session led by Dr. Ganawa and Edna Odhiambo on data and decision-making was conducted. The interactive session sought to address the following questions:

1. What are the current data realities in Sudan in the context of climate vulnerability?
2. What do the current data realities mean for decision making?
3. How can the current data situation be improved?
4. What are some of the pressing gaps you would like to address in the context of climate vulnerability?

Figure 3: Participants during an interactive hybrid session on data and decision making

Participants highlighted their data realties in relation to climate vulnerability, within their various departments. Some of the issues that were emphasized include data sharing, data synthesis, data repositories, and financial resources to improve data -collection quality.
Some snapshots of participants' comments:

Sudan Metrological Authority

- "One of our biggest challenges is collecting the data in a timely fashion, so sometimes it is not current as we would like it to be."
- "Data sharing policies can be bureaucratic and meetings for information sharing are needed to encourage simpler processes for data sharing."

Range land and Forage Department

- "We have a lot of field data. We need more coordination between projects for data sharing between different institutions and dashboard can some of the gaps**."**

Ministry of Agriculture

- "In relation to food security, there is need for more information on food storage and export from other institutes."
- "We are doing significant work in terms of conducting surveys and producing annual reports on hotspots and early warning information related to agricultural matters."
- "Capacity building is not only human resources and financial resources, but we also need the infrastructure and political good will."
- "We need to change the system towards transparency and efficiency. The data is available, but we need good policies and protocols on sharing data. We need robust systems with no vagueness on what comes in and what comes out."

Higher Council for Environmental and Natural Resource management

- "We have very good portals with information, the challenge is getting data from other stakeholders and synthesizing it. We need stronger data sharing systems, and we are working towards creating robust MRV systems"

Remote Sensing Authority

- "We have a lot of data on land use and land cover that we are willing to upload on the dashboard which may help in overcoming some of the infrastructure challenges such as servers."

Using the backdrop of the data realities shared, the participants were taken through an interactive session of the Sudan Climate Resilience Atlas by Tor Vagen. Emphasis was laid on how the Sudan Climate Resilience Atlas can be leveraged to support decision making. Many participants found it useful for encouraging data sharing among their departments and complementary to existing and planned data repositories. They highlighted that the Atlas will be useful in supporting NDC implementation plans and other activities to be identified.

3.1 Feedback on Sudan Climate Vulnerability Atlas

Participants gave their feedback on various tweaks to improve the user-friendliness of the Sudan Climate Resilience Atlas (Dashboard).

- Vulnerability atlas of the 6 states needs to be downloadable. There was a suggestion to make it a shared file with raw data, that anyone can access and use.
- Provision of the data processing and modelling and details on what they require will be sent on email
- Upload and download data functions need to be activated
- Categorization of information into 3 main categories: Climate, Soil and Agriculture

4. RESOLUTONS AND NEXT STEPS

An outcome of the data realities session was the identification of the *need to bring decision makers from the various government entities to discuss information sharing and address the attendant barriers.* There were suggestions that *jointly developing a uniform data sharing protocol* may go a long way in addressing some of these barriers related to information sharing.

The proposed data sharing protocol will build on the guidelines for data collection developed earlier in the project. Participants noted that, in addition to high level political good-will, *including junior and mid-level technical staff in data sharing conversations is also important to ensure follow through and sustainability.* Participants highlighted that they would seek to explore experiences from other countries on data sharing, which can form part of a possible second phase of the project.

In terms of capacity building, participants noted that this training was akin to a training of the trainers' session, and *they will seek to transfer the knowledge gained to their colleagues within their departments, to encourage using data for decision making*. Additionally, they expressed their desire to *build national experts in earth observation and to build capacity on the whole knowledge management value chain for the Atlas*

As discussions were brough to a close, the sustainability of the Dashboard was emphasized. The need to encourage conversations on data sharing were highlighted as a starting point towards feeding the dashboard with quality data. To this end, a high-level meeting with decision makers from the relevant authorities is being planned for the month of September. The meeting seeks to encourage political good-will on data sharing, and in the long run, embed a culture of data for decision making to secure climate resilience.

5. ANNEXES

Annex 1: workshop Agenda

Sudan Climate Resilience training workshop, September 7th - 9th 2021, University of Khartoum and Online (Zoom)

Workshop objectives:

1. To introduce participants to R Statistics for data analysis, including remote sensing analysis.
2. To introduce participants to remote sensing data processing and visualization.
3. To demonstrate how the Sudan Climate Vulnerability Atlas can support decision making.
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Draft Agenda

Time (Khartoum)	Activity	Lead
	Day 1	
9.00 – 9.15	Introductions, workshop objectives and opening Remarks	Dr. Ganawa
9.15 -9:25	Expectation Setting	Dr. Ganawa
9.25 -9.40	Linkages between data and Sudan Climate Vulnerability assessment	Dr. Tor-G Vagen
9.40 -13.00 *Health Break at 11.00 – 11.20*	Introduction to R - Installation of R software - Introduction to data analysis in R Statistics - Processing, analyzing and visualization	Dr. Ganawa and Dr. Amar with support from Dr Tor-G Vagen and Clinton Oyogo
13.00 – 14.00	Lunch	University of Khartoum
14.00 – 16.00	R session continued - Tour of R and Functions	Dr. Amar and Mustafa with support from Dr. Tor-G Vagen and Clinton Oyogo
Time	Activity	Lead
	Day 2	
9.00 – 13.00 *Health Break at 11.00 – 11.20*	R session continued - Leaflet library - Mapping	Dr. Amar and Mustafa with support from Dr. Tor-G Vagen and Clinton Oyogo
13.00 – 14.00	Lunch	University of Khartoum

Annex 2: **List of Participants**

ID	Name	Organization
1	Nafisa Elfatih Abdelrahman Bakrawy	Range land and Forage Department
2	Waleed Fathalrahman Mohammed Khairy	Range land and Forage Department
3	Huyam Ahmed Abdalla Ahmed	Higher Council of Enviornement and Natural Resources
4	Tahani Othman Slieman Osman	Higher Council of Enviornement and Natural Resources
5	Esra EdreesAbdallahElamin	Higher Council of Enviornement and Natural Resources
6	Esraa Nasreldin AbasJacksa	Ministry of Agriculture
7	Esraa ElshafiMudawiElshafi	Ministry of Agriculture
8	Amani SanhouriElrayahElsheikh	Sudan Metrological Authority
9	Mohmed Awad	Sudan Metrological Authority
10	Omnia Omer DaffelseedHamed	Remote Sensing Authority
11	Mesoud AbdelBagi	University of Khartoum
12	Nora AbdelRaheimKhojali	Ministry of Agriculture
13	Nihal Hassan Elhaj Ibrahim	Ministry of Agriculture
14	Gawahir SiddigSalimAbashar	Ministry of Agriculture
15	Hisham Mohammed Osman Alhussein	Ministry of Agriculture
16	Munzer Abdelwahid Mohammed Ahmed	Ministry of Agriculture
17	Mona Ali Mohammed Alameen	Ministry of Agriculture
18	Awatif Ibrahim Ahmed Mohamed	Ministry of Agriculture

Main Instructors:

ID	Name	Specialization
1	Eltaib Saeed Ganawa	RS/GIS
2	Ammar Bashir	Data Science and Spatial Statistics
3	Fathrahman Yousif	Geoinformatics
4	Fatima Awad Allah	Geoinformatics