

# Remote Sensing to prevent floods in Sudan

Floods are the most common sort of natural catastrophe, occurring when an overflow of water submerges normally dry ground. The Republic of Sudan is subjected to catastrophic floods on a yearly basis. This year is no exception. According to Al Hadath News, the caused the death of 136 people and injured 120 more as of September 18. Approximately 350,000 people were impacted by the floods, which destroyed their houses, health care institutions, infrastructure, and other assets. Early detection and warnings in such circumstances are critical for reducing flood damage and protecting people and infrastructure. Remote sensing imagery is very effective in simulating flood occurrences across broad catchment regions.

## INTRODUCTION

Flood forecasting is often based on a mix of meteorological and hydrological measurements. Satellites are used to collect data in places where the area to be examined cannot be reached. Satellites are not as precise as rain gauges, but they are quite valuable for gathering data from such places. Computerized flood modeling is currently the major tool for simulating probable flood scenarios. In order to fine-tune the findings and confirm the maps, remote sensing technologies such as Synthetic Aperture Radar (SAR) can be employed in conjunction with these computer models. The Synthetic Aperture Radar idea was created to enable the creation of high-resolution radar systems in space.

Sudan's rainy season lasts from the end of May until the end of October. Following that, cloud cover limits most satellite images. With this in mind, the Synthetic Aperture Radar is the ideal remote sensing tool to utilize in Sudan (SAR) because it is not affected by cloud cover. Aerial imaging will aid in determining the functionality of flood protection structures, as well as areas of weakness, overlapping, or prospective failures. Furthermore, SAR is unaffected by sunlight.

## OBJECTIVE

“ The objective of this poster is to analyze an area's susceptibility to flooding, identify the degree and severity of the flooding, and assess the damage caused by the flooding event.

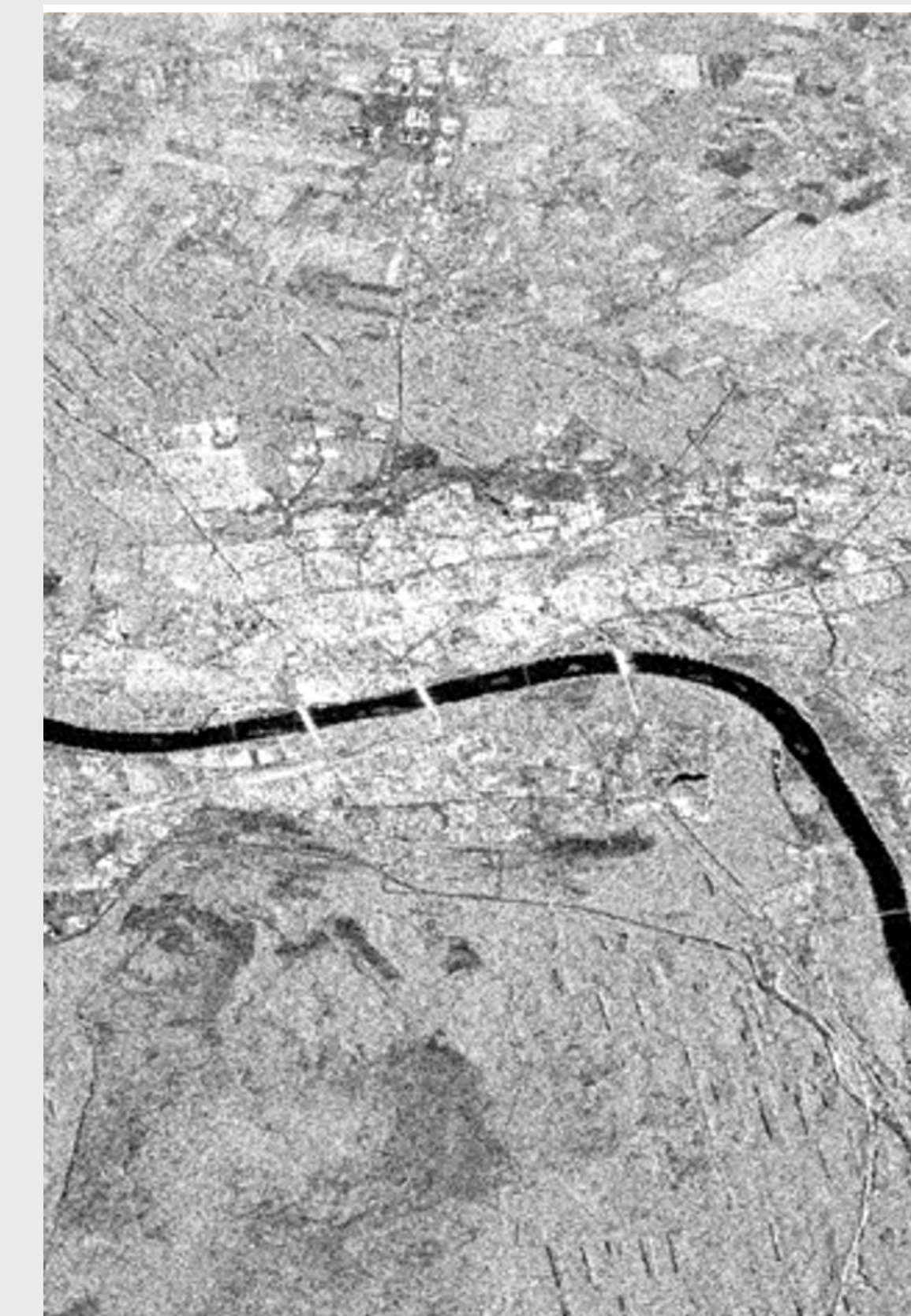
## RELATED LITERATURE

Sudan | Situation Reports. (n.d.). Retrieved October 8, 2022, from <https://reports.unocha.org/en/country/sudan/>  
EarthImages - Find and Order Satellite Imagery. (n.d.). Retrieved October 8, 2022, from [https://imagery.geocento.com/?\\_ga=2.72808275.1712466710.1665174247-1923001995.1665174247#mapviewer:query=YSaTqKVVaPy7LXEF](https://imagery.geocento.com/?_ga=2.72808275.1712466710.1665174247-1923001995.1665174247#mapviewer:query=YSaTqKVVaPy7LXEF)

Rahman, M. R., & Thakur, P. K. (2018). Detecting, mapping and analysing of flood water propagation using synthetic aperture radar (SAR) satellite data and GIS: A case study from the Kendrapara District of Orissa State of India. The Egyptian Journal of Remote Sensing and Space Science, 21, S37-S41. <https://doi.org/10.1016/J.EJRS.2017.10.002>

## SYNTHETIC APERTURE RADAR (SAR)

- As a complex picture, it provides the amplitude and phase.
  - The quantity of returned energy is represented by amplitude.
  - Time delay information is represented by phase.
- Images are extended into decibel values (dB). Low values denote flat water surfaces, while high values denote man-made objects.



## POTENTIALS

According to studies, SAR can identify around 55% of the total area to be inundated by applying derived flood inundation models, which may be utilized by water managers, planners, and policymakers to implement suitable flood mitigation measures.

## COSTS

Statistics show that an average house construction in Sudan costs from 67\$ to 167\$ per km<sup>2</sup> where a SAR image of the capital of Sudan costs 3.8\$ per km<sup>2</sup> daily. This year more than 10,000 lost their homes in the floods and those losses could be way less if the flood's behavior was known and the right precautions were set in place.

## AUTHORS

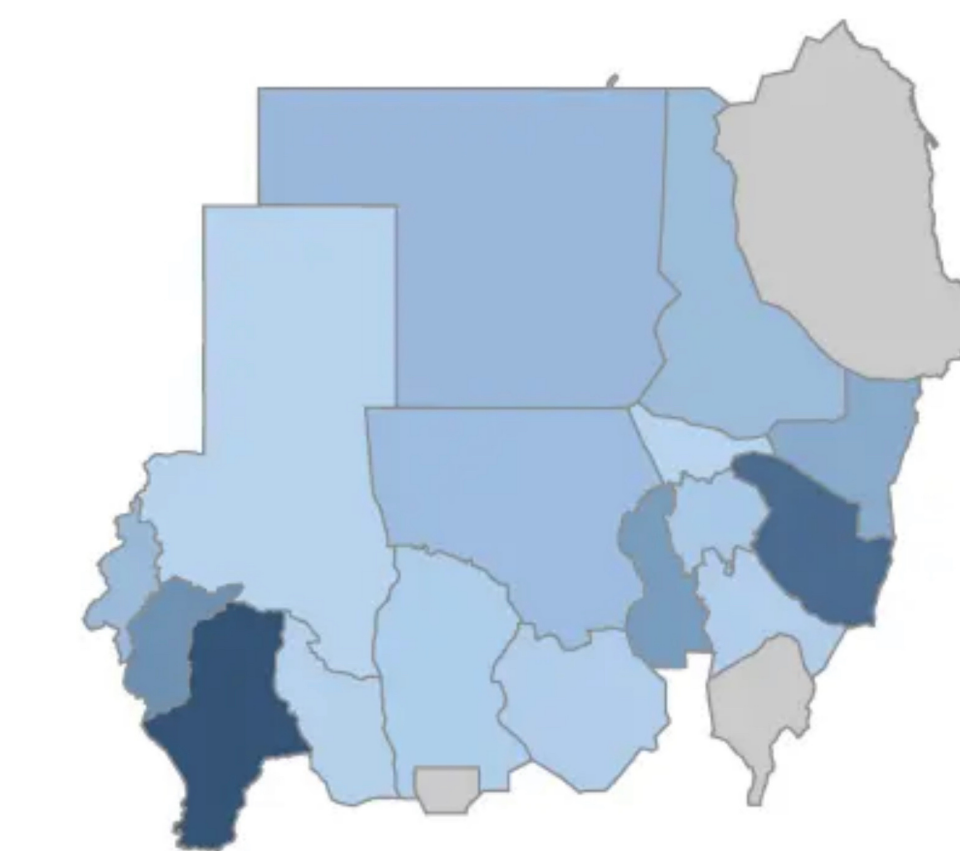
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## Non-governmental organizations (NGOs)

United Nations and other NGOs have stated that they were still working on mitigating last year's flood aftermath when they were faced with the effects of this year's flood. As of 22nd of August, the United Nations have stated that they have acquired the amount of 607.8\$ million from donors for the 2022 Sudan Humanitarian Response Plan (HRP), which is about 31% of the required amount. As the government is going through an economic crisis after the revolution in 2019, donations toward floods crisis should be before the disaster to significantly mitigate the effects.



This figure shows the people affected per state in 2022. The severity of the color indicates that the number is larger.

## Turn Around Don't Drown

Most flood-related deaths and injuries could have been averted if individuals had followed these basic guidelines.  
Before a flood: 1- Be proactive and evacuate before the flooding begins, and 2- Develop an emergency communication plan.  
During a flood: 1- avoid the floodwaters, and 2- seek higher land.  
Following a flood: 1- wait for the "all clear" before returning, and 2- avoid disaster areas.