# GIS Application in Monitoring Climate & Global Warming Effects of Monasavu Reservoir

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## INTRODUCTION

Hydroelectric dams are source of clean and green energy urgently needed as an alternative to fossil fuels to help resolve climate crisis. However there are few challenges arise from the construction of dams in some of the major river bodies, firstly, operation of dams influence (Co2) carbondioxide emission especially in tropical region. Secondly, according to (G.Abril et al, 2005) dams influence the emission of (CH4) methane from the large amount of decaying organic matter retained in flooded reservoirs. In Monasavu, according to (Zhao, Liu et al. 2021), the immediate impact of the Dam construction will be the increased sedimentation which on the other hand river sedimentation is also a major influence of carbon and methane emmission.

## GIS MANAGEMENT APPROACH

### GIS GLOBAL WARMING MANAGEMENT APPROACH

- Help Map Forest Carbon to determine how much or how dams interms of flooding forest contribute to global warming.
- Map the amount of Deforestation or vegetation loss to trigger the movement of afforestation.

## RESEARCH OBJECTIVES

- Outline the impacts of dams on climate
- Outline environmental challenges induced by dams
- Demonstrate the use of GIS application in monitoring climate change and global warming.

## BACKGROUND

### MONASAVU RESERVOIR

WGS_1984_Web_Mercator_Auxiliary_Sphere
Projection: Mercator_Auxiliary_Sphere
False_Easting: 0.0
False_Northing: 0.0
Central_Meridian: 0.0
Auxiliary_Sphere_Type: 0.0
Linear Unit: Meter (1.0)
Geographic Coordinate System: GCS_WGS_1984
Angular Unit: Degree (0.0174532925199433)
Prime Meridian: Greenwich (0.0)
Datum: D_WGS_1984

1 cm = 394 km

## METHODOLOGY

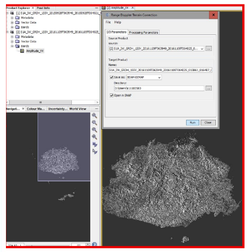
**Data Gathering**
- Sentinel Radar Imagery (Copernicus Open Access Hub)
- Temperature data (Power Data Access Viewer)
- Precipitation data (Power Data Access Viewer)
- Earth Skin Temperature (Power Data Access Viewer)

**Data Pre-processing**
- Cleaning Sentinel Radar Imagery using SNAP software's built in tools such as (Terrain Correction)
- Cleaning Precipitation Data in Excel
- Cleaning Temperature Data in Excel
- Cleaning Earth Skin Temperature Data in Excel

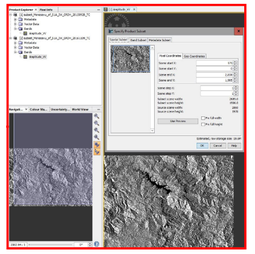
**Data Analysis**
- Create Flood Extent Map by 1. Terrain Correcting, 2. Create Subset, 3. Stacking the imagery and 4. Creating RGB composite to highlight flooded areas.
- Create Temperature graph showing annual temperature intensities in Celsisus Degrees from 2011 to 2021
- Create Precipitation graph showing annual precipitation distribution in millimeters from 2011 to 2021
- Create Temperature graph showing annual earth skin temperature in Pascal Unit from 2011 to 2021

**Finalize**
- Flood Extent Map highlighting flooded areas (red).
- Earth SkinTemperature graph displaying annual earth skin temperature in Pascal Unit from 2011 to 2021
- Precipitation graph showing annual precipitation distribution in millimeters from 2011 to 2021
- Temperature graph showing annual temperature intensities in Celsisus Degrees from 2011 to 2021

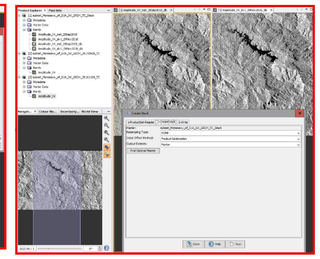
**The snip below is showing the different processes undertaken using the SNAP softw-are to derive the flooding extent of the Monasavu Reservoir in between 2015 and 2016.**



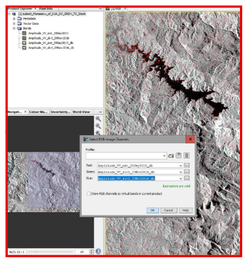
1. Terrain Correction



2. Create Subset

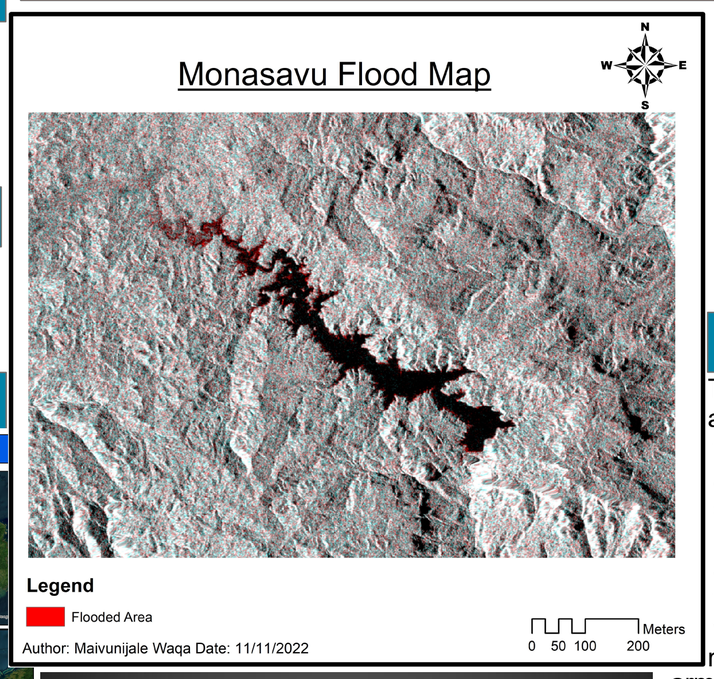


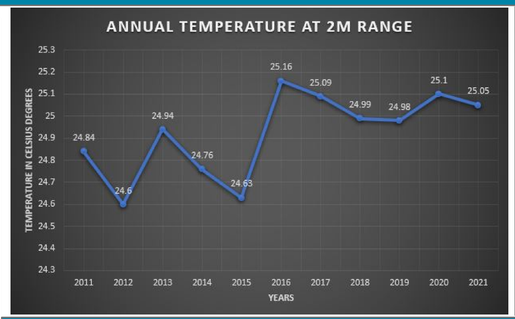
3. Create Stack

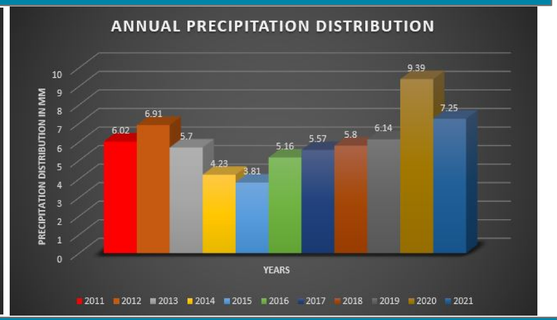


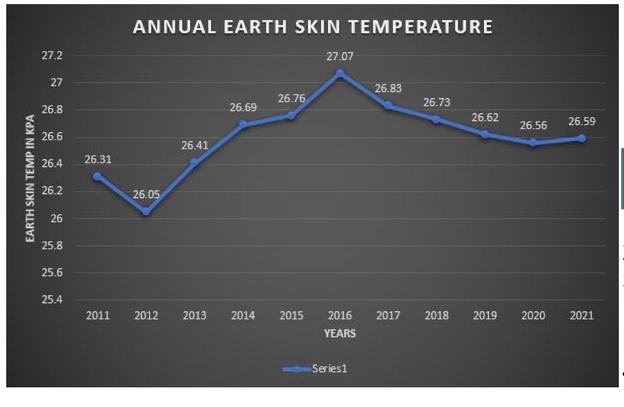
4. Create RGB Composite

## RESULTS, GRAPHS & MAPS




## DISCUSSION

This analysis aim is to highlight the impacts of dam or reservoirs construction on the climate and how it contributes to the warming up of our pacific environment. Firstly, the Monasavu flooded Map was created using 2 sentinel radar imagery one from June 2015 (archive) and one from Dec 2016 (crisis), which both has a vertical vertical (VV) polarization and same satellite orbital status acquired from Copernicus data hub. The areas symbolized in red on the map, illustrates the areas that usually flooded in between 2015 and 2016. These are the areas that mostly contribute to the emission of methane. Secondly, submerging of forest in the Monasavu area has led to uncertainty in precipitation distribution overtime which altered the climate and also the temperature and surface temperature of the area (surface and soil radiance). The submerging of forest, flooding of vegetated areas and global w-arming are highly correlated, where submerging of vegetation or forest led to the decaying of organic matter in which when they get exposed to the sun, the chemical bond retained durring flooding which is methane evaporates in to the atmosphere contributing to increase in temperature. This is a long term process which happens overtime. To conclude, this is just a simple analysis in which GIS application can help manage global warming.

## REFERENCE

1. Copernicus Open Access Hub
2. Power Data Access Viewer
3. G. Abril et al., "Carbon Dioxide and Methane Emissions and the Carbon Budget of a 10-Year Old Tropical Reservoir (Petit Saut, French Guiana)," Global Biogeochemical Cycles 19, GB4007 (2005).
4. Zhao, Y., et al. (2021). "Impacts of dams and reservoirs on local climate change: a global perspective." Environmental Research Letters 16(10).