Microsoft

Orbit AI

Azure Machine Learning Studio

Names of Team Members:

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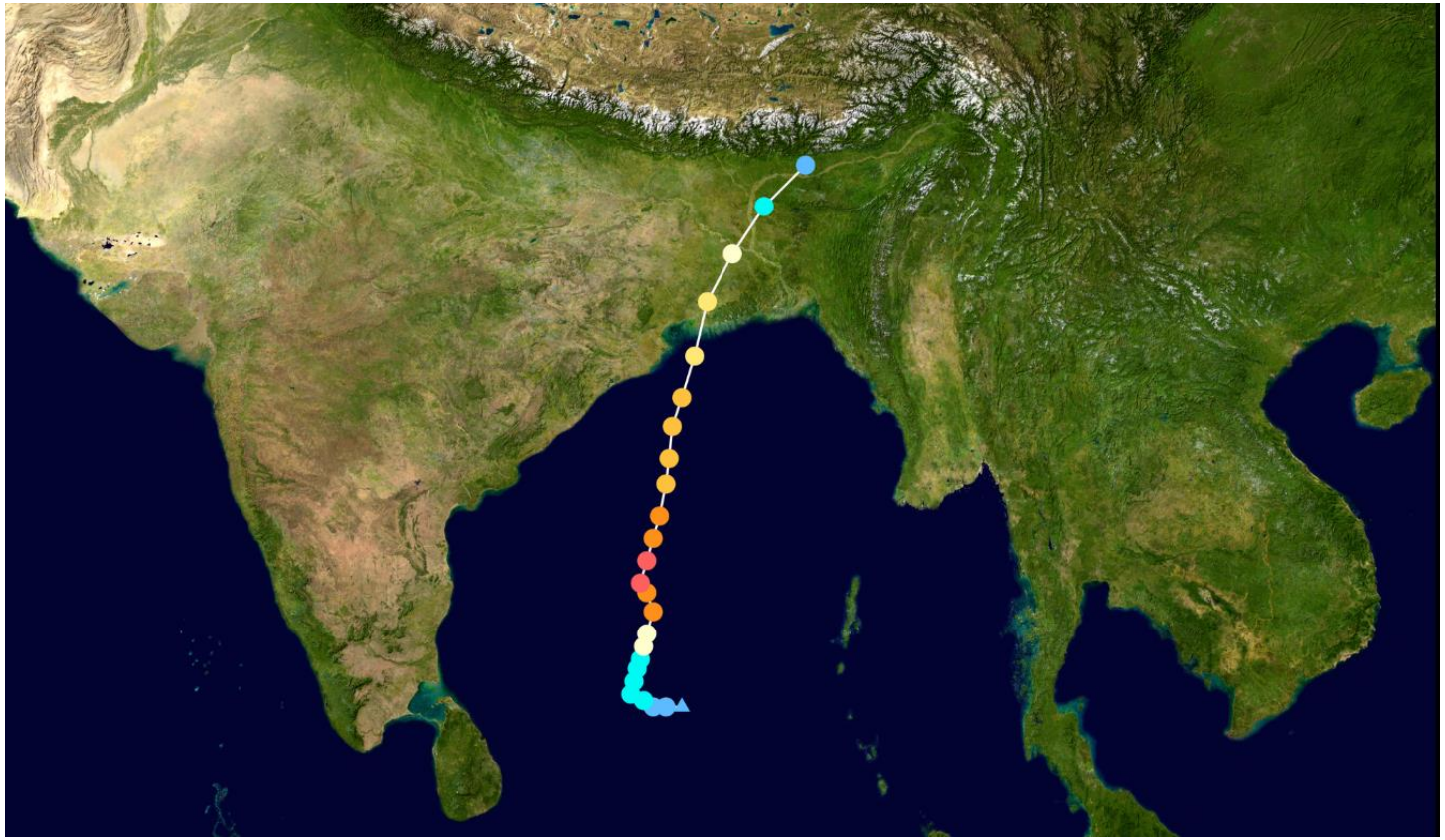
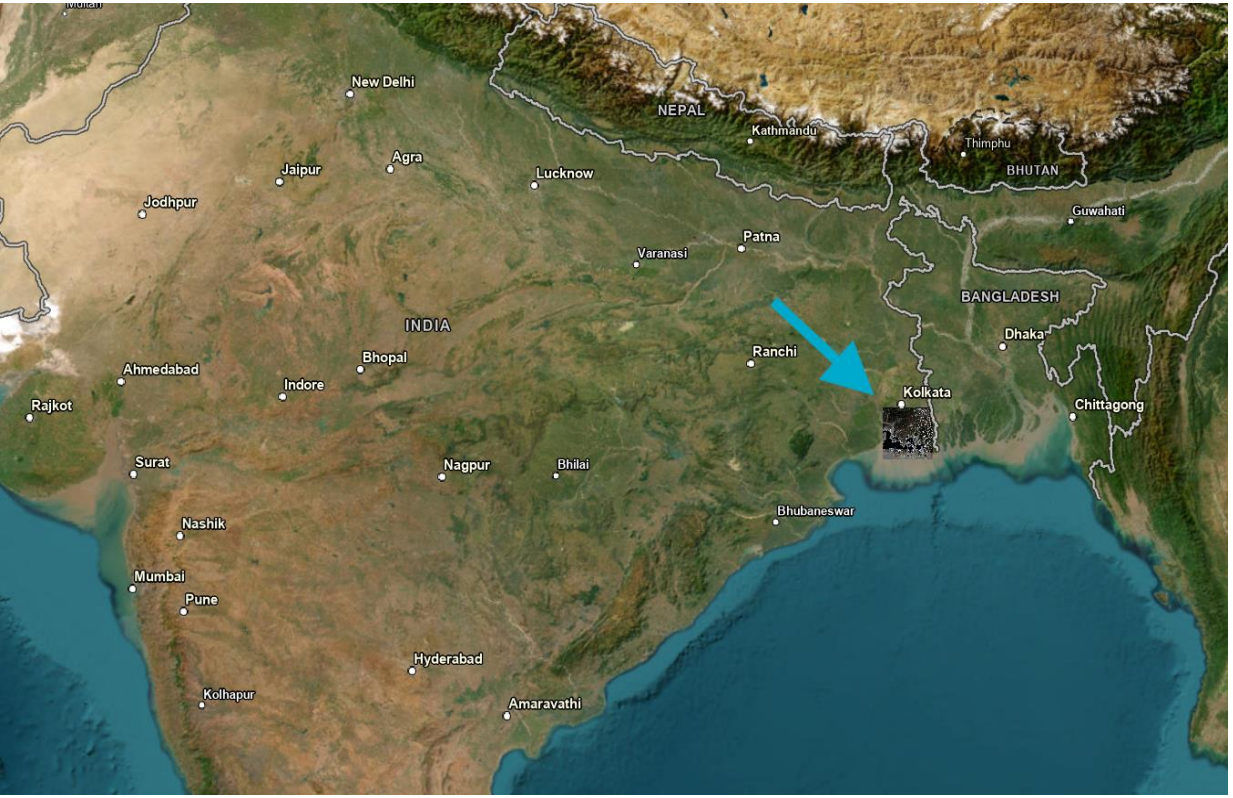
The Opportunity

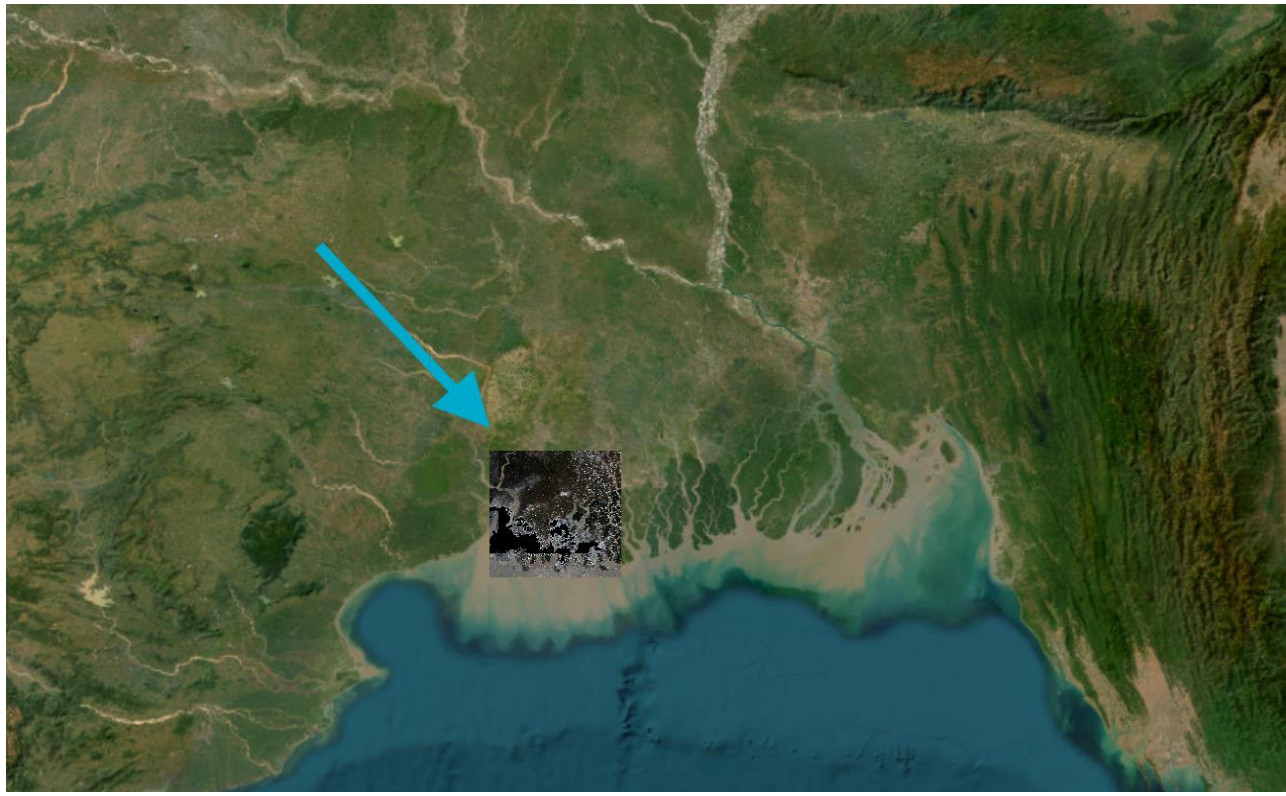
Climate impact is causing hurricanes and cyclones to be more frequent and with greater intensity. Machine learning gives us the opportunity to do change detection, categorization, and predictive analysis to help with resilience planning, emergency response and recovery. Our team examined impact of **Cyclone Amphan**, which struck the coastal regions of India and Bangladesh in May 2020. There were 128 fatalities as over $14 billion in damage (2020 USD).



Cyclone Amphan path showing intensity as it traveled north

Study Area





Location: Sundarbans region, straddling India and Bangladesh
Impact: Significant damage to mangroves, coastal erosion, and impacts on local communities

Solution

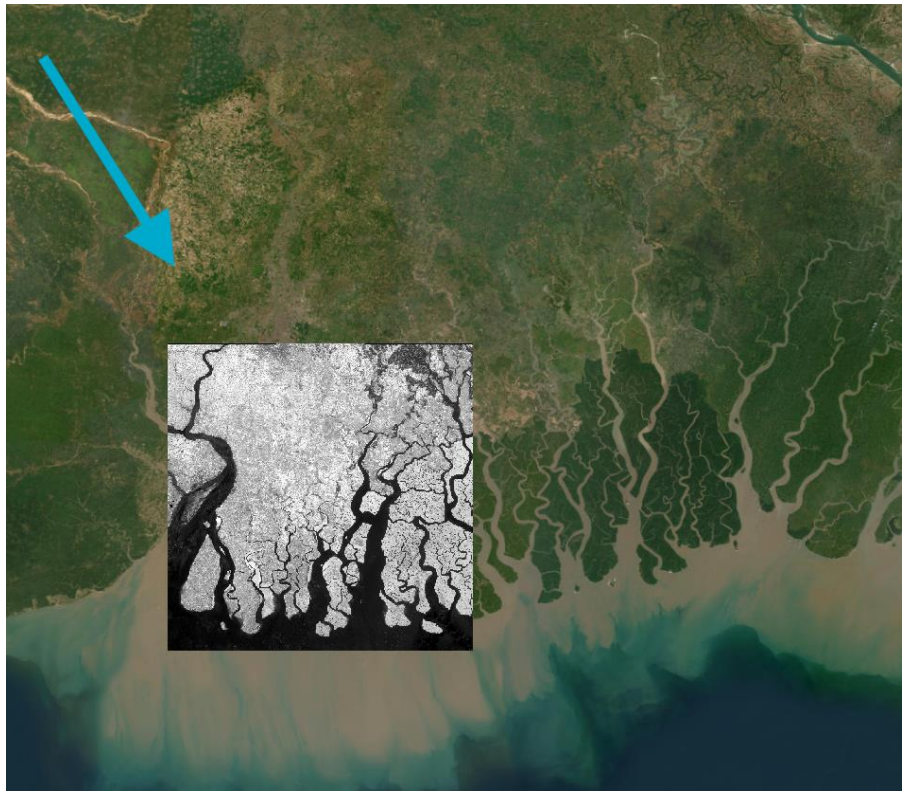
By analyzing the impact of Cyclone Amphan in May 2020, using satellite imagery, we can gain insights into:

- The extent of environmental damage, such as mangrove destruction and coastal erosion.

- The effectiveness of recovery efforts over subsequent years.

- The ongoing challenges faced by the region in terms of land use, habitat changes, and community resilience.

This analysis is crucial for informing future disaster preparedness and climate resilience strategies, ensuring that vulnerable communities are better protected against similar events in the future.



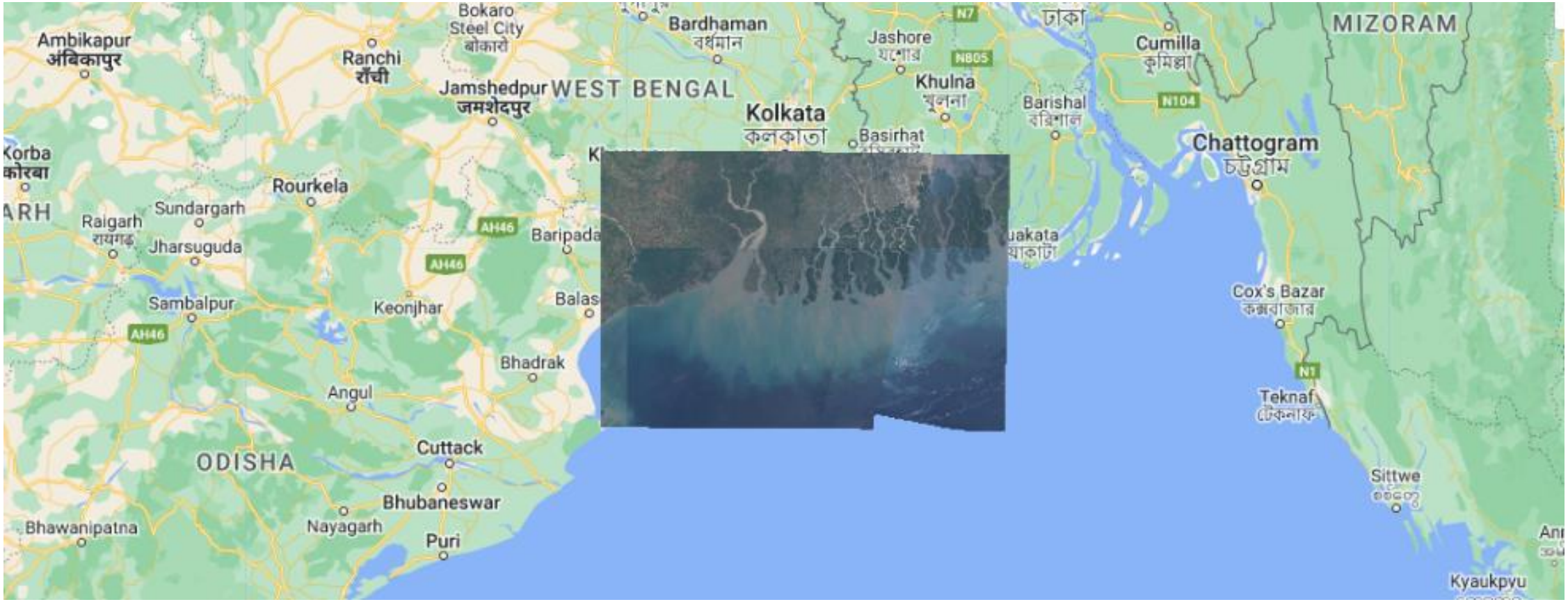
Our study data overlayed on satellite imagery basemap of Sundarbans region, straddling India and Bangladesh

Technologies

- Sentinel-2 Satellite Imagery
- Azure Storage Blob
- Azure Machine Learning Studio
- Python Notebook
- GitHub
- Microsoft Teams
- ArcGIS Pro

```
!pip install azure-storage-blob

# Import the required libraries
from azure.storage.blob import BlobServiceClient, BlobClient, ContainerClient
import os
import pandas as pd

# Set up your Azure Storage Blob client
# Copy your connection string from the Azure portal
connect_str = "DefaultEndpointsProtocol=https;AccountName=mslateamprojects;AccountKey=h9
container_name = "orbitai"  # Container name for your project

blob_service_client = BlobServiceClient.from_connection_string(connect_str)
container_client = blob_service_client.get_container_client(container_name)

# Function to download a blob to your local directory
def download_blob(blob_name, download_file_path):
    blob_client = blob_service_client.get_blob_client(container=container_name, blob=blo

    with open(download_file_path, "wb") as download_file:
        download_file.write(blob_client.download_blob().readall())
```

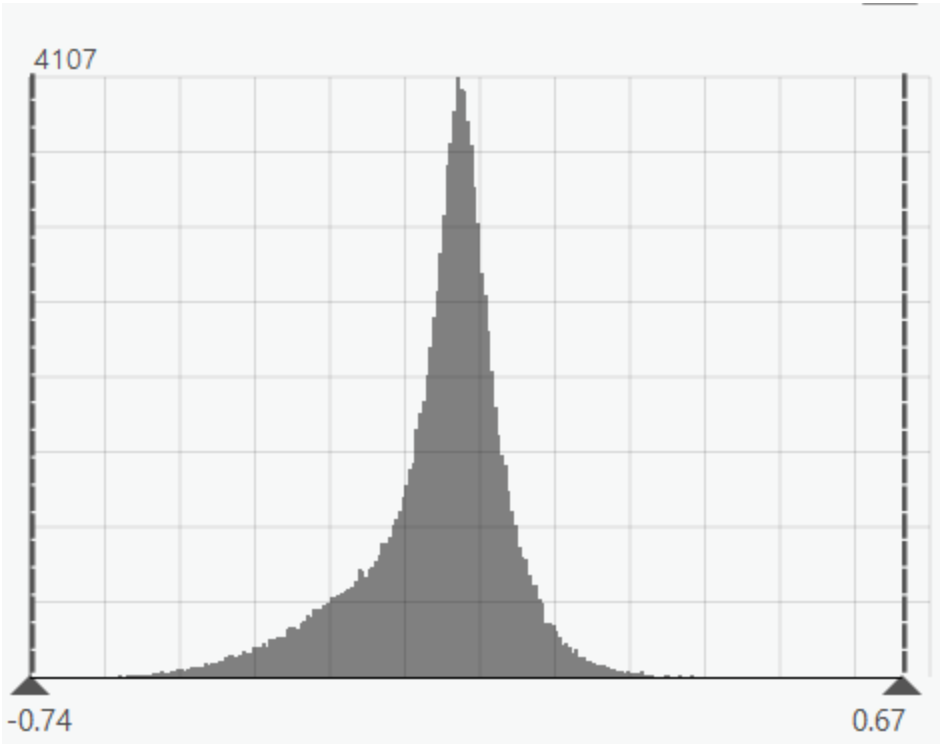
Data: Sentinel-2 Satellite Imagery



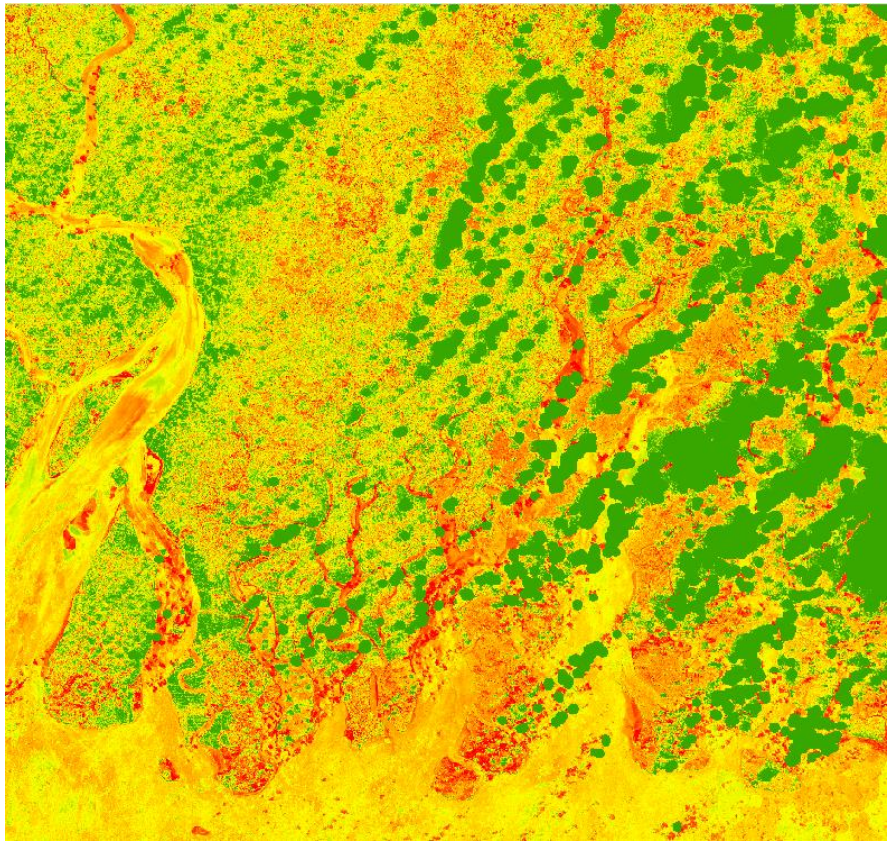
Downloaded imagery for analysis from Google Earth Engine with JavaScript code for Natural Color and NDVI (Normalized Difference Vegetation Index) for before and after the Cyclone in May 2020.

Vulnerable Sundarbans Coastal Region

Change analysis between 2020 (before) and 2021 (after) Cyclone Amphan

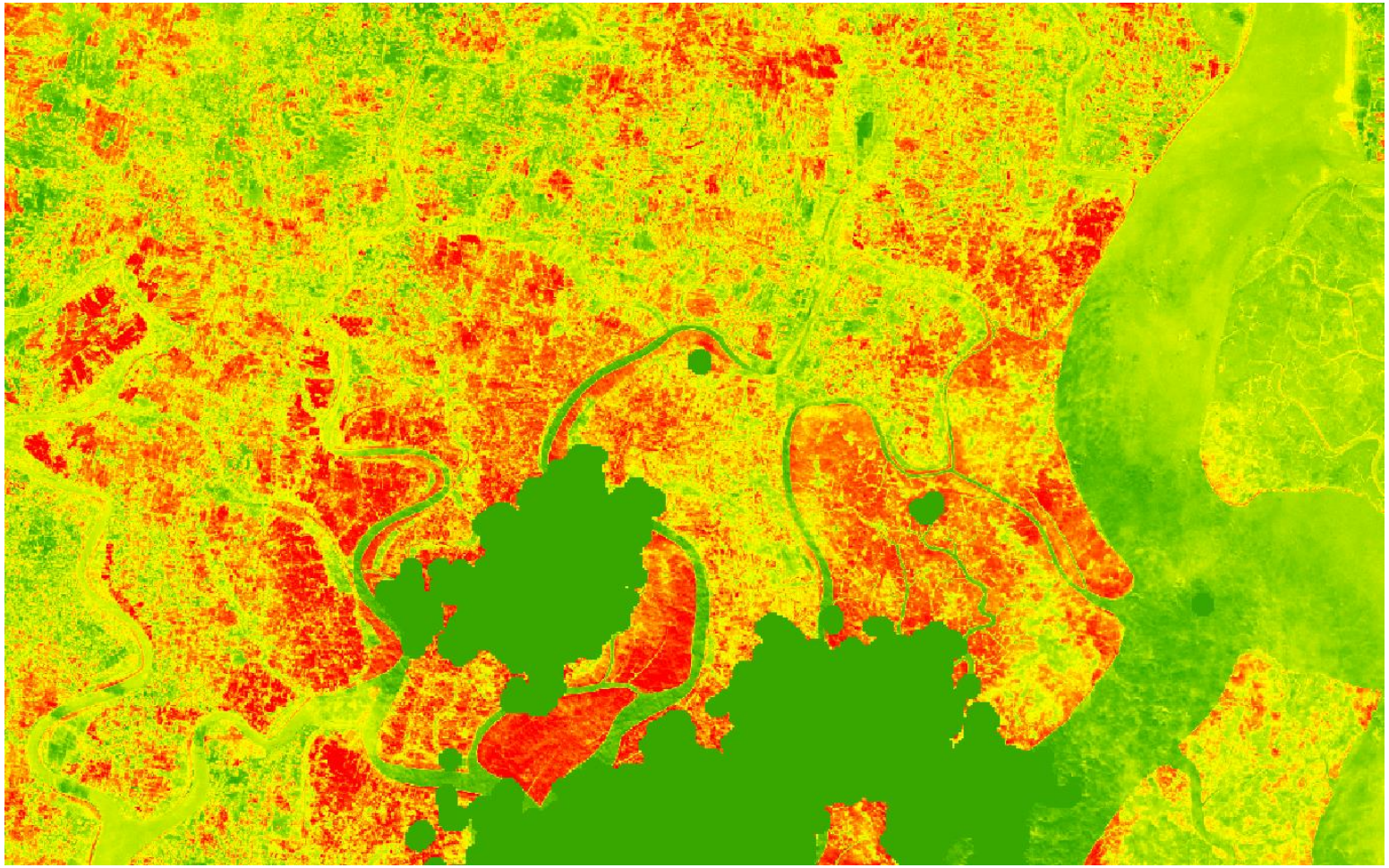


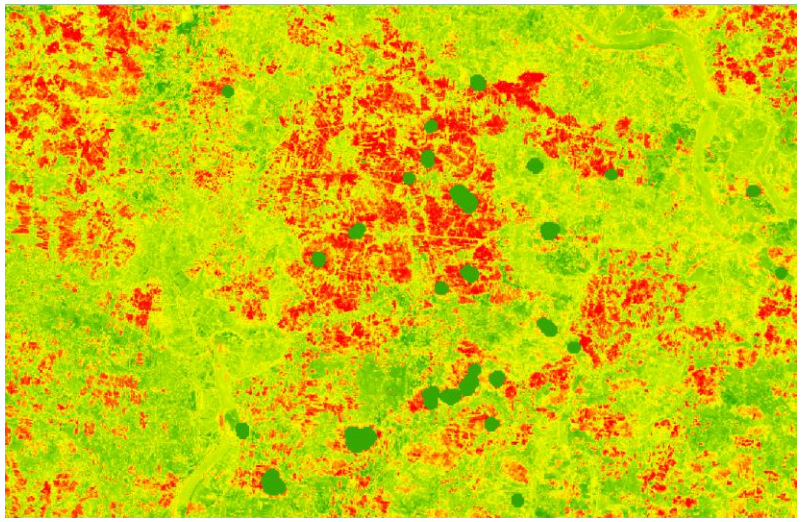
Statistical Change from Change Analysis

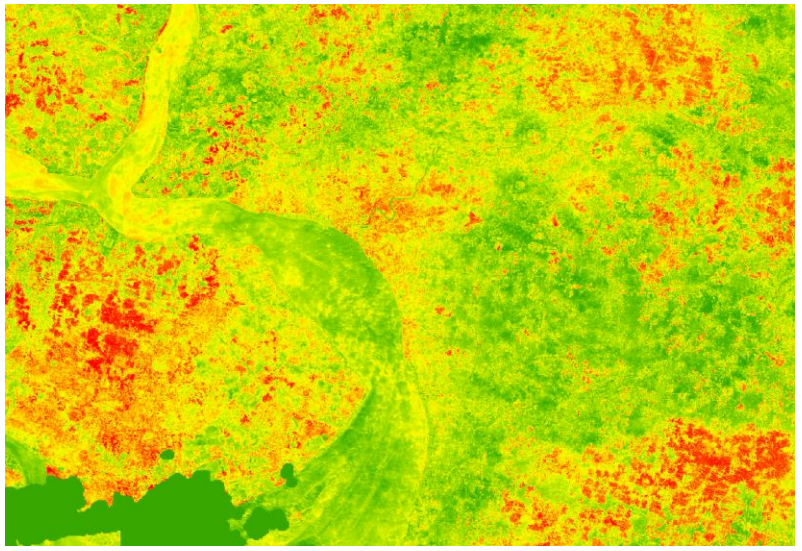


Red and orange in NDVI is loss of vegetation which typically indicates infrastructure and agricultural damage as well showing long lasting impact to the region after the cyclone.

Change Detection







Change Analysis from before and after Cyclone Amphan

Transforming Coastal Resilience and Recovery

Start Leveraging Cutting-Edge Technologies: Utilize the power of satellite imagery, remote sensing, and machine learning to accurately assess the environmental impact of natural disasters like Cyclone Amphan on vulnerable coastal regions.

Stop Depending on Inefficient Methods: Traditional methods of damage assessment are often slow and lack precision. Our advanced approach provides quicker, more detailed, and accurate analysis, enabling more effective disaster response.

Accelerate Rehabilitation Efforts: By offering precise, real-time data on the extent of damage to the mangrove forests, coastal erosion, and affected human settlements, our solution helps expedite recovery efforts, ensuring timely aid to the impacted communities.

Future-proof Coastal Management: Use the insights gained from our analysis to develop more resilient coastal management and disaster preparedness strategies. This will help mitigate the impact of future cyclones and other climate-related events on the Sundarbans and similar vulnerable regions.