

VEGETATION STUDIES USING REMOTE SENSING

vibrations of vegetation in two different regions of Abu Dhabi

From pixels to plants: Harnessing the power of remote sensing
for greener insights.

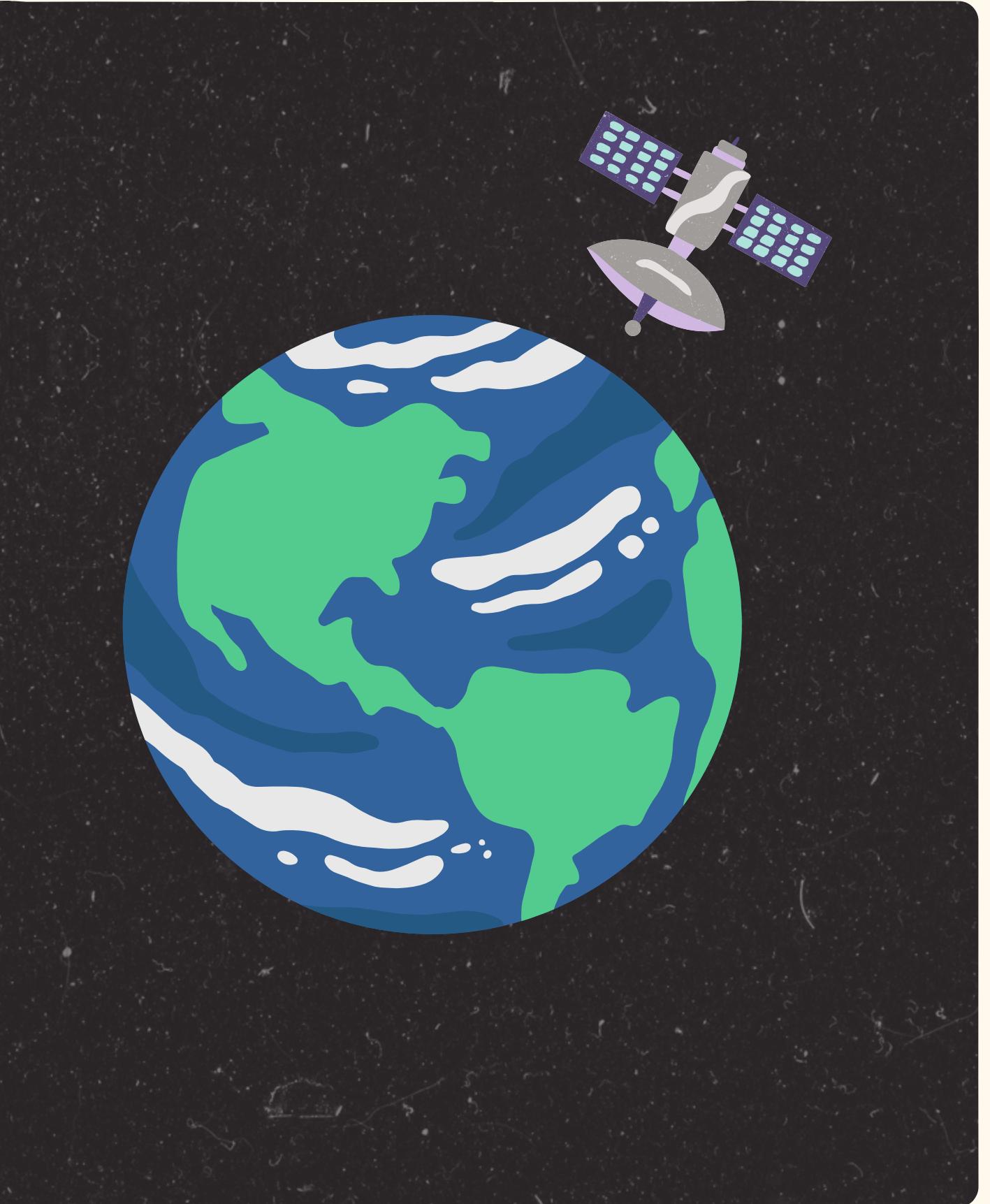
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What is Remote Sensing?

- **Remote sensing:** Gathering information about objects or areas from a distance without physical contact.
- **Earth observation:** Using sensors on satellites or aircraft to capture data about the Earth's surface, atmosphere, and oceans.



Importance of Remote Sensing

Significance: Remote sensing is crucial for monitoring and analyzing environmental changes.

- Enables effective tracking of vegetation, land use, and natural disasters.

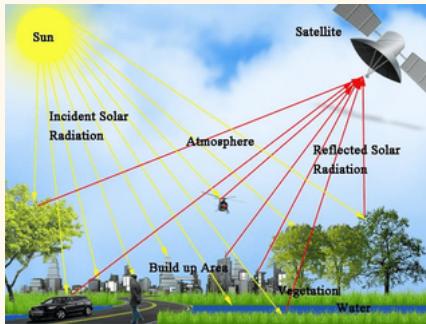
- Provides real-time data on critical environmental parameters such as water quality and air pollution.

- Facilitates informed decision-making for sustainable management and conservation efforts.

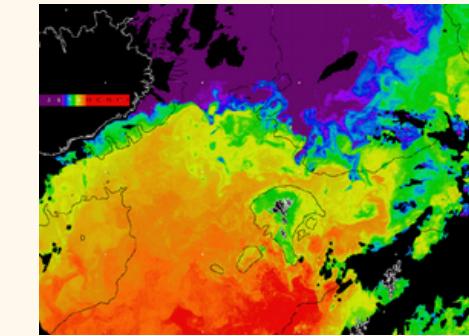


COMMON SENSORS USED FOR REMOTE SENSING

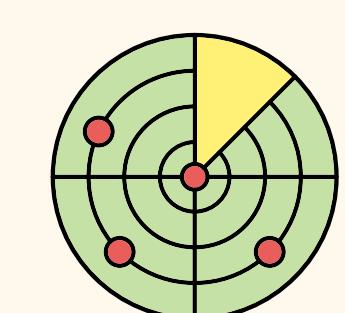
Types of Sensors: Various sensors are employed in remote sensing for different purposes.



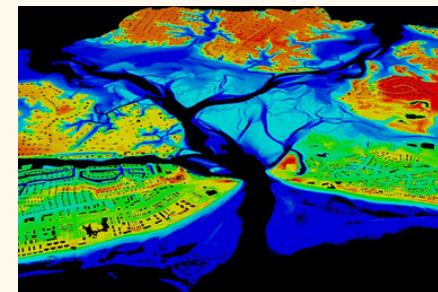
Optical sensors
(multispectral and hyperspectral cameras)



Thermal sensors



Radar sensors

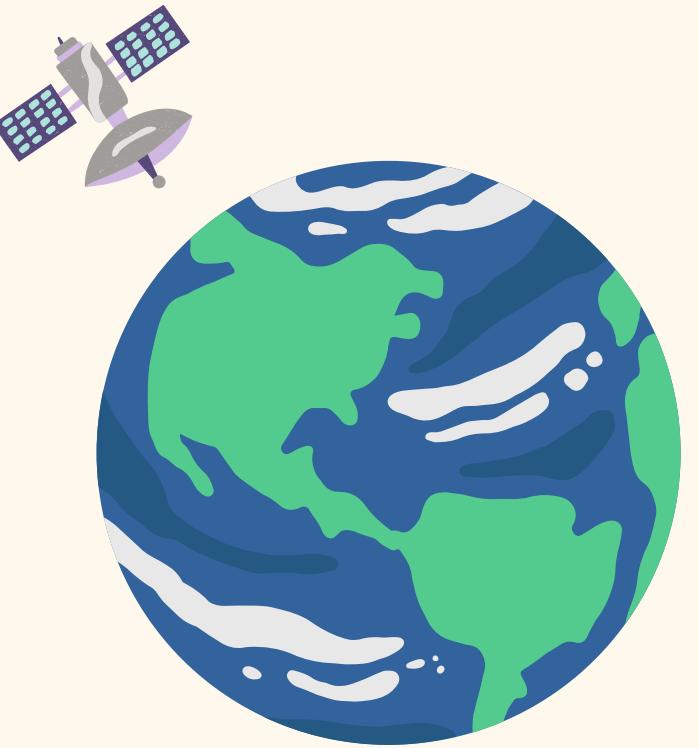


LiDAR (Light Detection and Ranging) sensors

HOW IS THIS TOPIC GOING TO BENEFIT US?

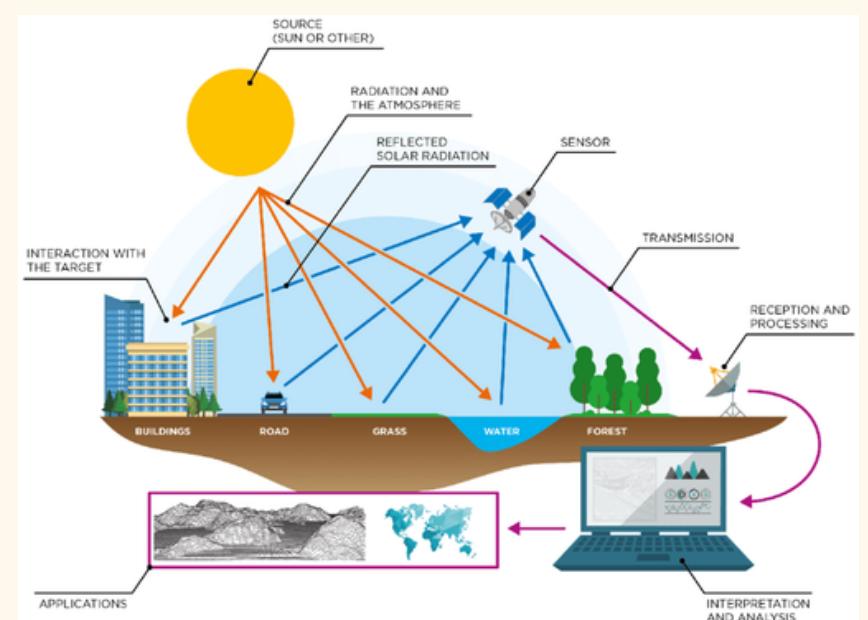
Studying vegetation variations using remote sensing benefits us in several ways:

- Monitor health and productivity of ecosystems
- Assess impacts of climate change and land use practices
- Detect deforestation and land degradation
- Identify areas for conservation or restoration efforts



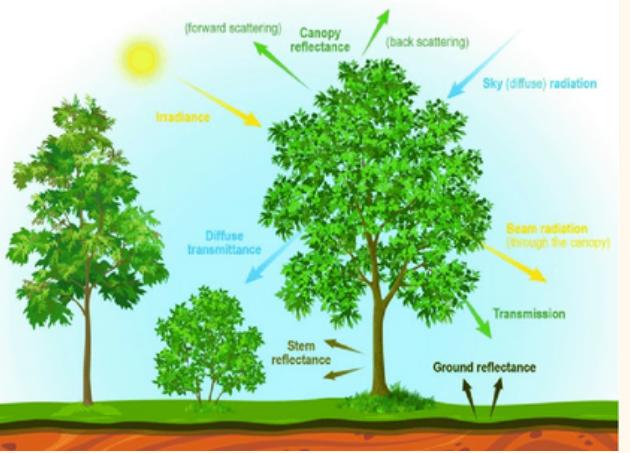
By analyzing remote sensing data, we can make informed decisions about:

- Sustainable land management
- Biodiversity conservation
- Agricultural practices
- Ecosystem resilience

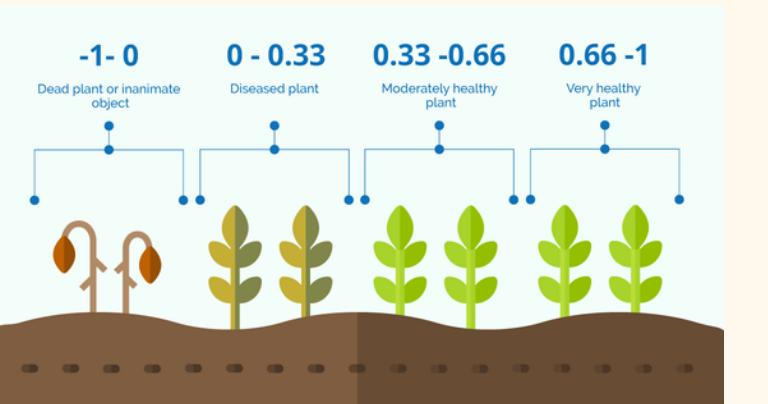


How Does Remote Sensing Help with Vegetation Analysis and Mapping?

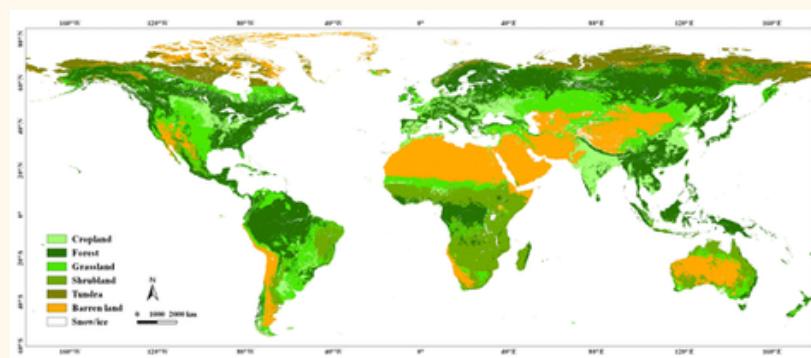
Provides detailed information about vegetation properties.



Derives vegetation indices to assess health, density, and growth.



Creates spatial maps of vegetation cover and changes over time.



Advantages of Remote sensing in vegetation

Remote sensing enables comprehensive and efficient monitoring of large-scale environmental changes over time through the following mechanisms:

Wide coverage :
Remote sensing instruments can capture data over vast geographic areas

Cost-Effective:
reduce the need for extensive field surveys and enabling timely decision-making in environmental management and conservation.

Multi-spectral imaging:
analyzes environmental parameters such as vegetation health, land use changes, and water quality using data from multiple spectral bands.

Spatial analysis:
combines GIS with remote sensing data to identify environmental patterns and hotspots.

What Did We Study?

Focus of the study: Analyzing vegetation variations using MODIS NDVI data in two regions,
Al Ain and Abu Dhabi regions of the UAE.

Steps we went through:

1. studied changes in vegetation cover
2. identified trends in NDVI values
3. compared vegetation variations between regions
4. explored factors influencing vegetation health and growth

Tools and Techniques Used in the Study.

Our study employed a range of tools and techniques, including:

- **Google Earth Engine (GEE)**: Used for data processing, analysis(Java code), and visualization of MODIS NDVI imagery.
- **MODIS NDVI Data**: Utilized for monitoring vegetation variations over a twelve-year period from 2010 to 2022.
- **GIS (Geographic Information Systems)**: Employed for spatial analysis, mapping, and visualization of vegetation trends (part of GEE).

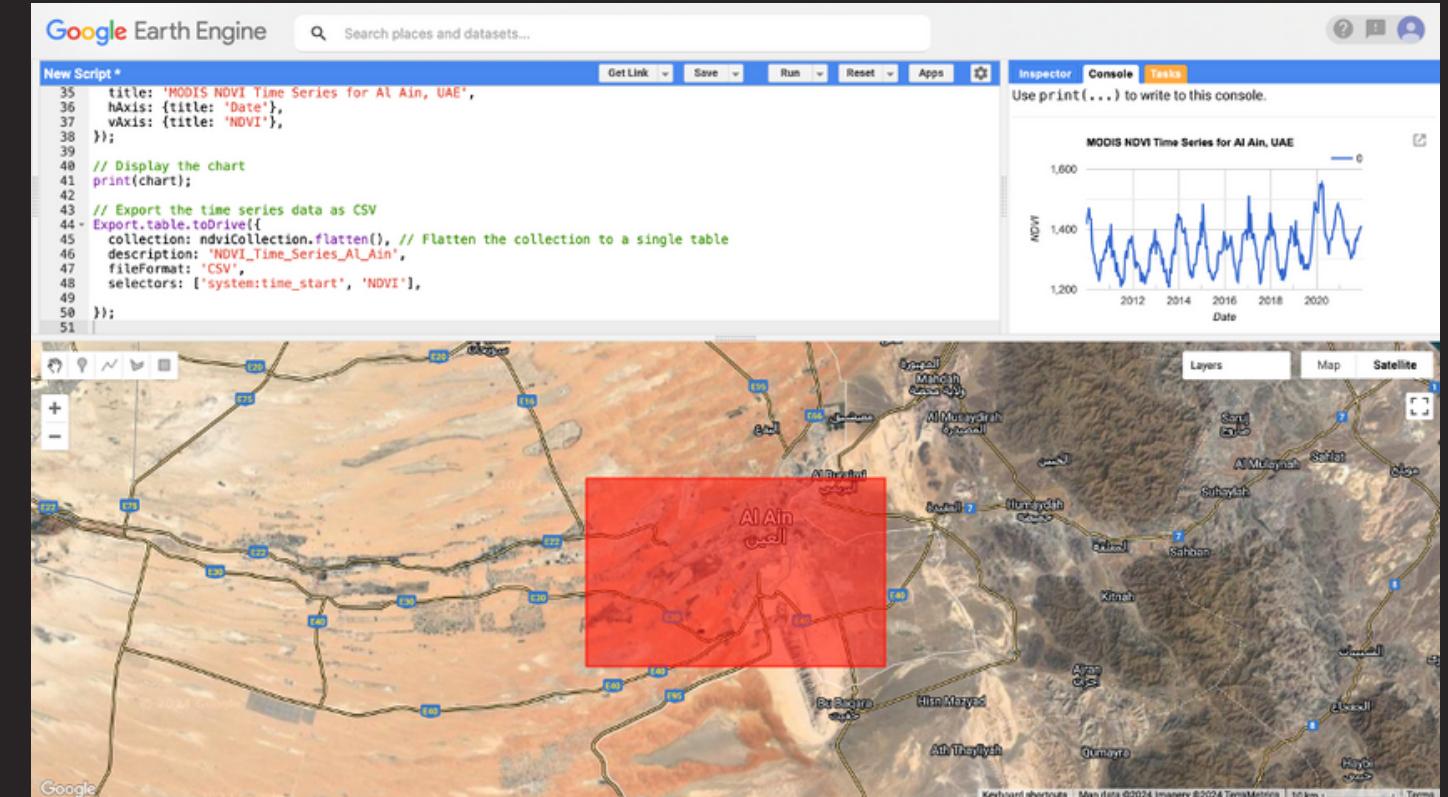
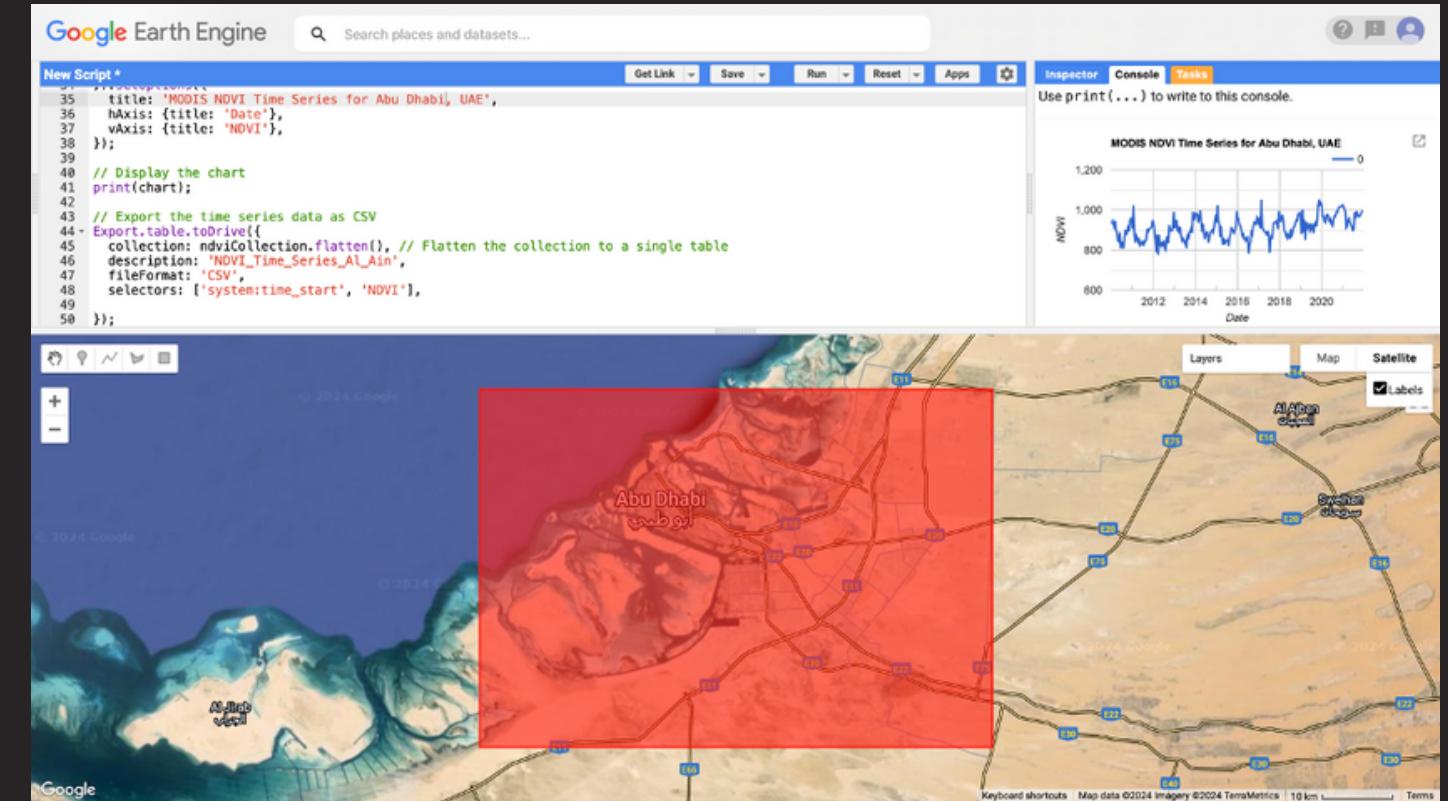
Tools and Techniques Used in the Study.

Our study employed a range of tools and techniques, including:

- **Time Series Analysis Methods:** Used to analyze temporal variations in NDVI values and identify trends in vegetation variations.
- **Analytical Techniques:** Applied for quantitative assessment and comparison of NDVI trends between study areas.

HOW DID WE USE REMOTE SENSING IN OUR STUDY?

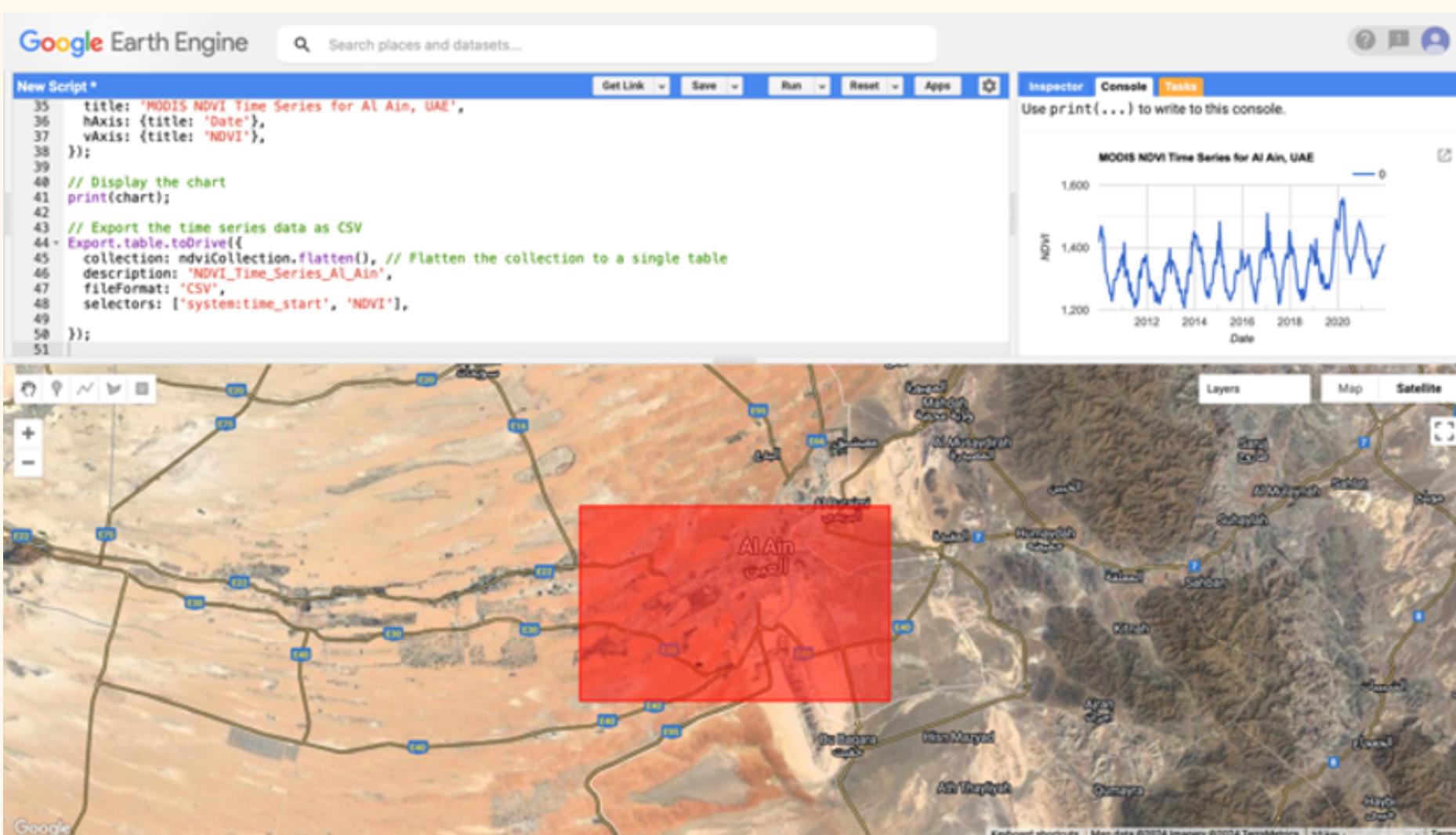
- Preprocessed data
- calculated NDVI values
- conducted time series analysis
- generated spatial maps
- compared vegetation variations.



RESEARCH DETAILS AND METHODS

Al Ain Region coordinates :

[55.470, 24.045], [55.470, 24.285], [55.890, 24.285], [55.890, 24.045]

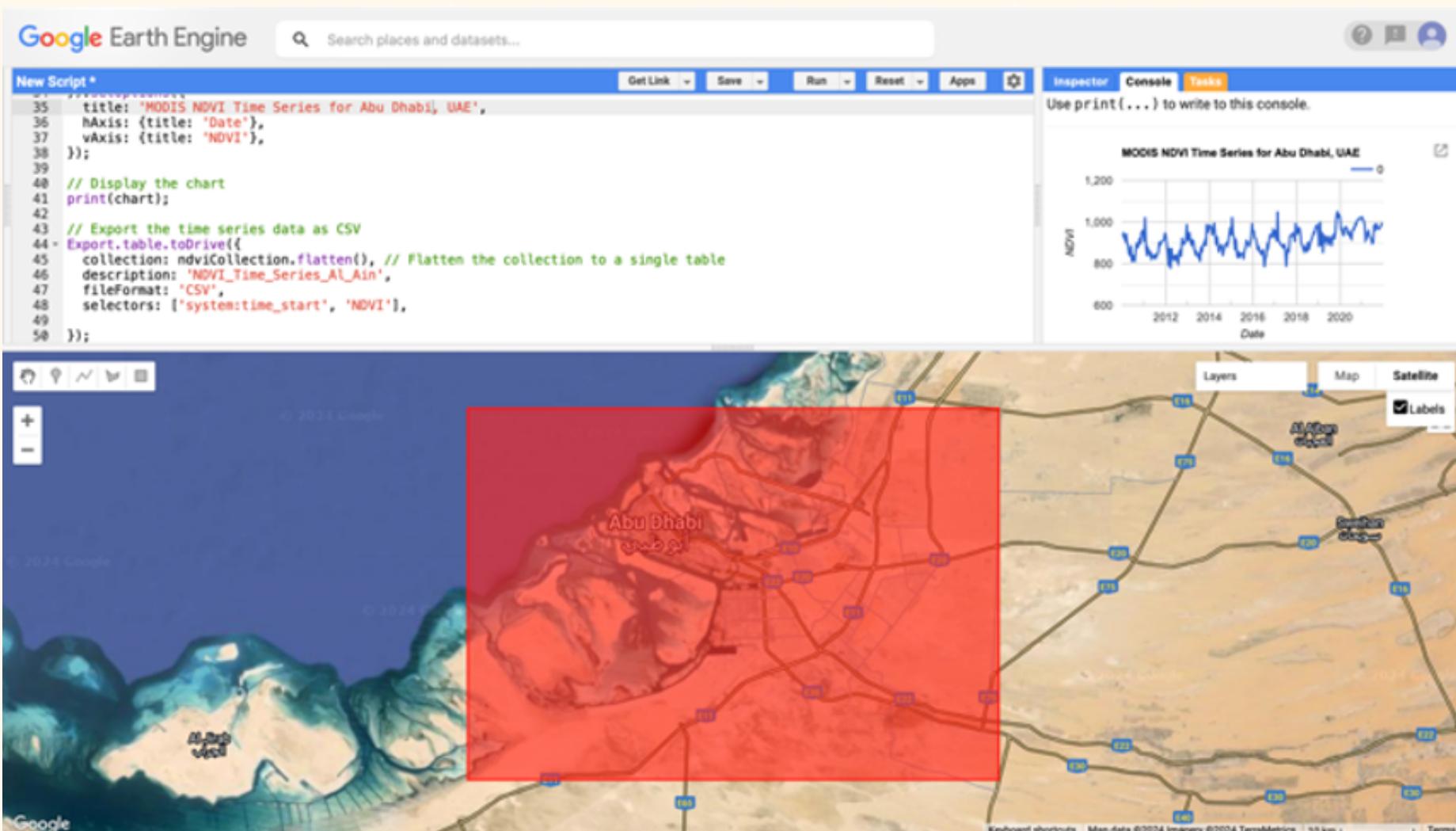


The region in Al Ain that we chose to see how the vegetation changed in that specific region.

RESEARCH DETAILS AND METHODS

Abu Dhabi Region coordinates :

[54.122899, 24.605935], [54.122899, 24.148549], [54.842656, 24.148549],
[54.842656, 24.605935]



The region in Abu Dhabi that we chose to see how the vegetation changed in that specific region.

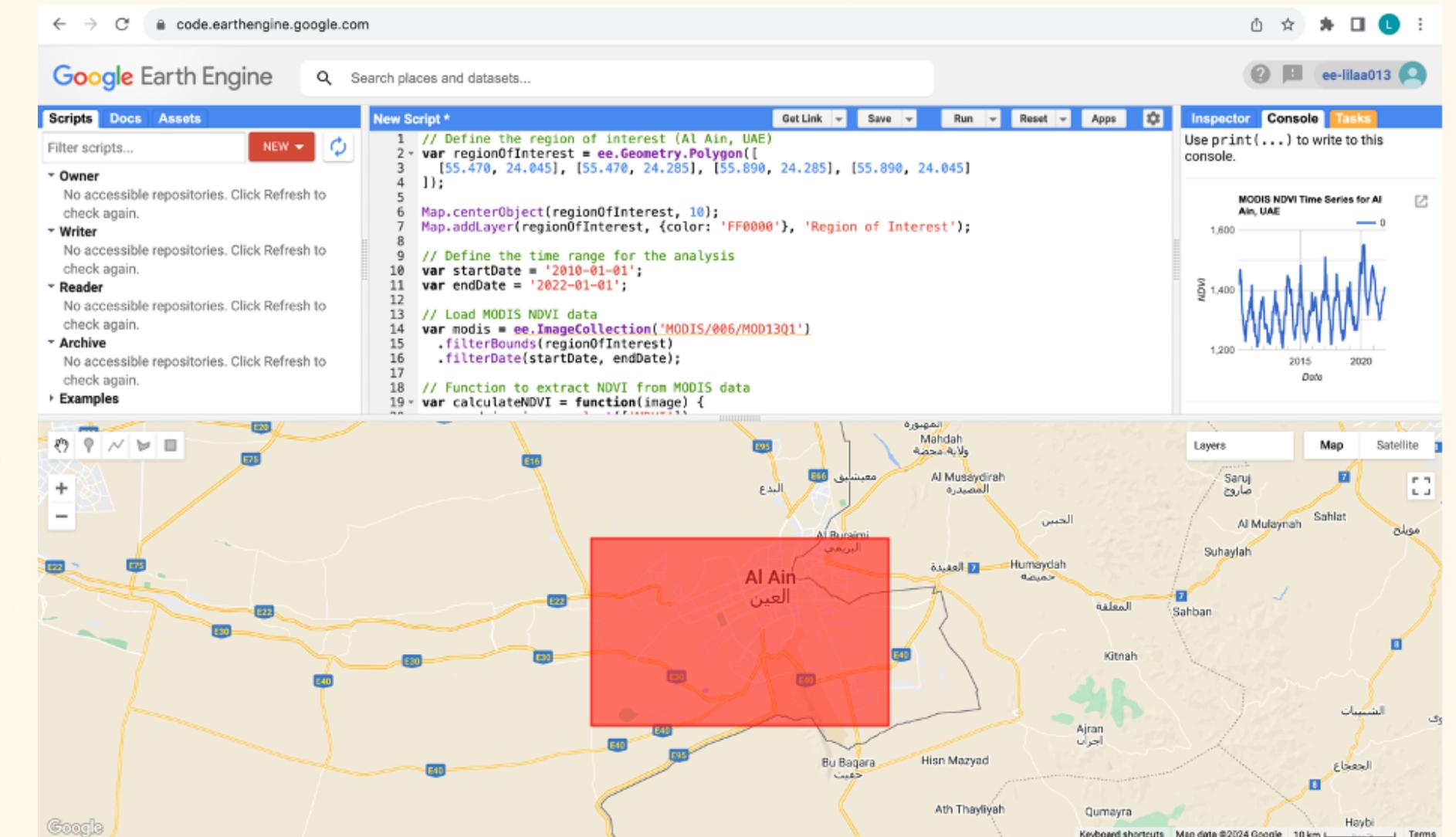
RESEARCH DETAILS AND METHODS

Data Collection:

We collected MODIS NDVI imagery spanning from 2010 to 2022, covering a twelve-year period to capture long-term vegetation variations.

Data Preprocessing:

Using Google Earth Engine (GEE), we preprocessed the MODIS NDVI data, filtered it by date and region, and prepared it for further analysis.



Screenshot of Google Earth Engine window in which we loaded the MODIS data estimated the NDVI and processed data to produce the time series.

RESEARCH DETAILS AND METHODS

NDVI Calculation: We calculated NDVI values from the MODIS imagery using the standard formula :

$$NDVI = \frac{NIR - Red}{NIR + Red}$$

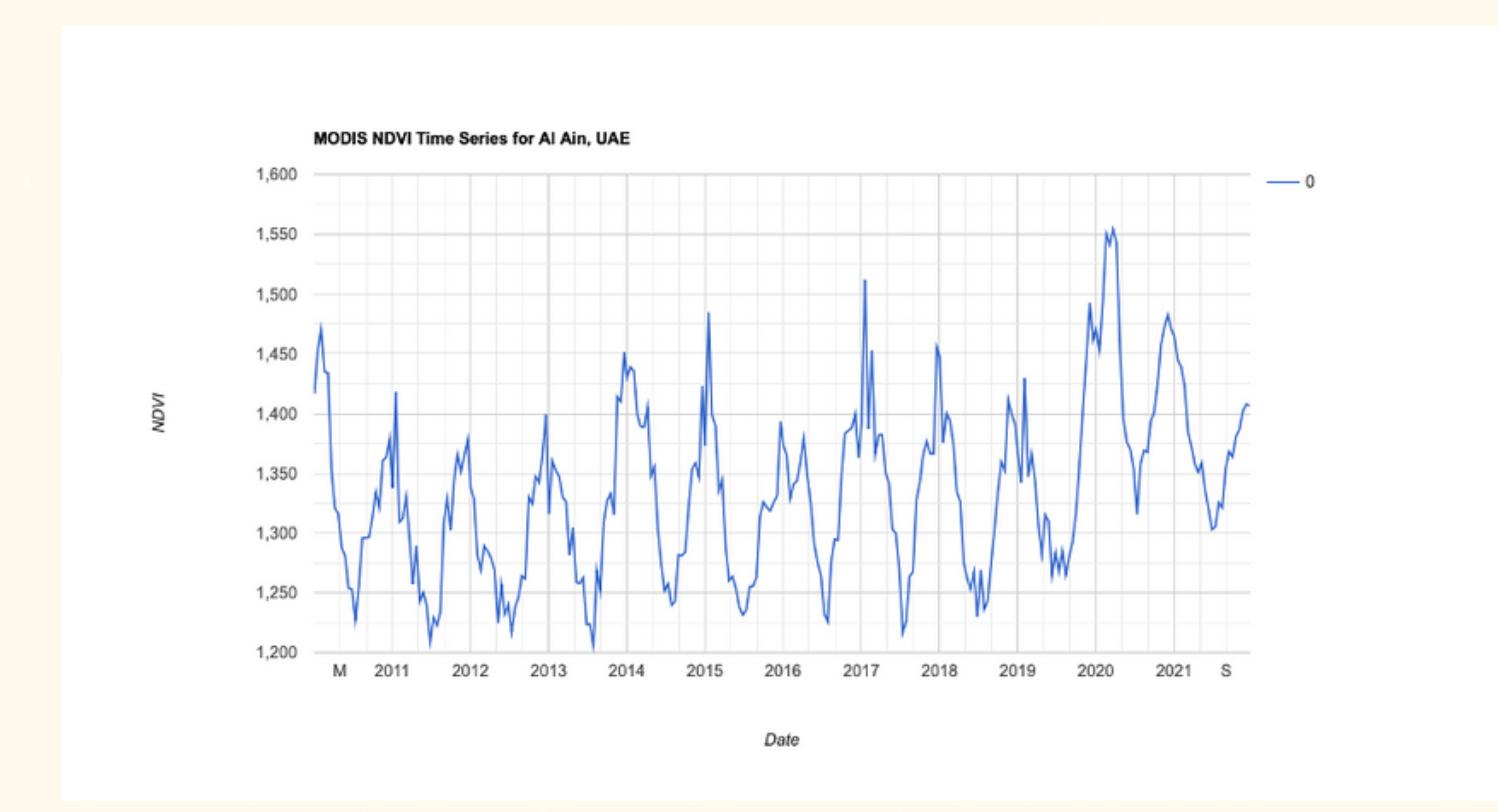
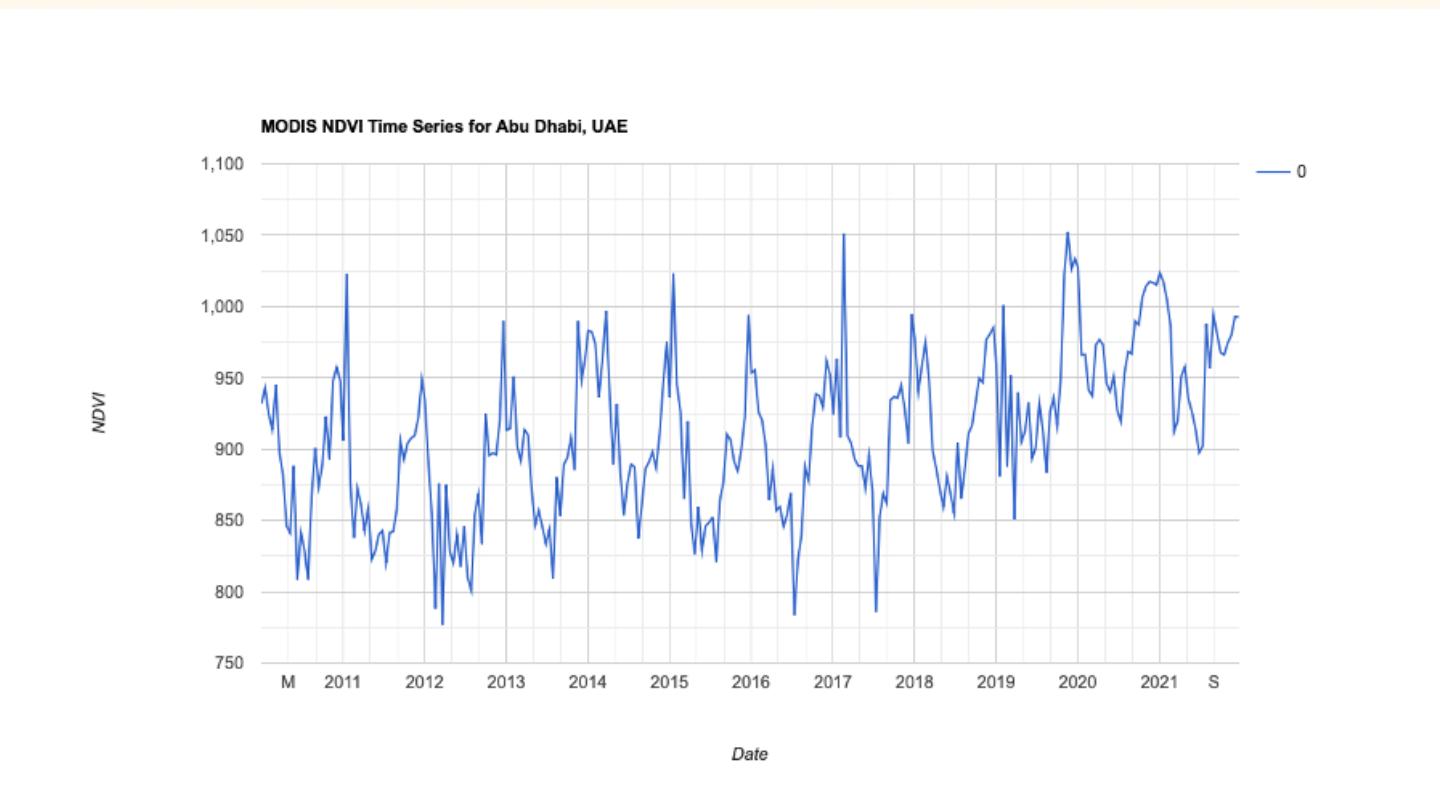
NIR is near-infrared ← → Red is red wavelength reflectance.

Time Series Analysis: We employed time series analysis techniques to map NDVI values over time, generating time series charts depicting temporal variations in vegetation variations for Al Ain and Abu Dhabi.

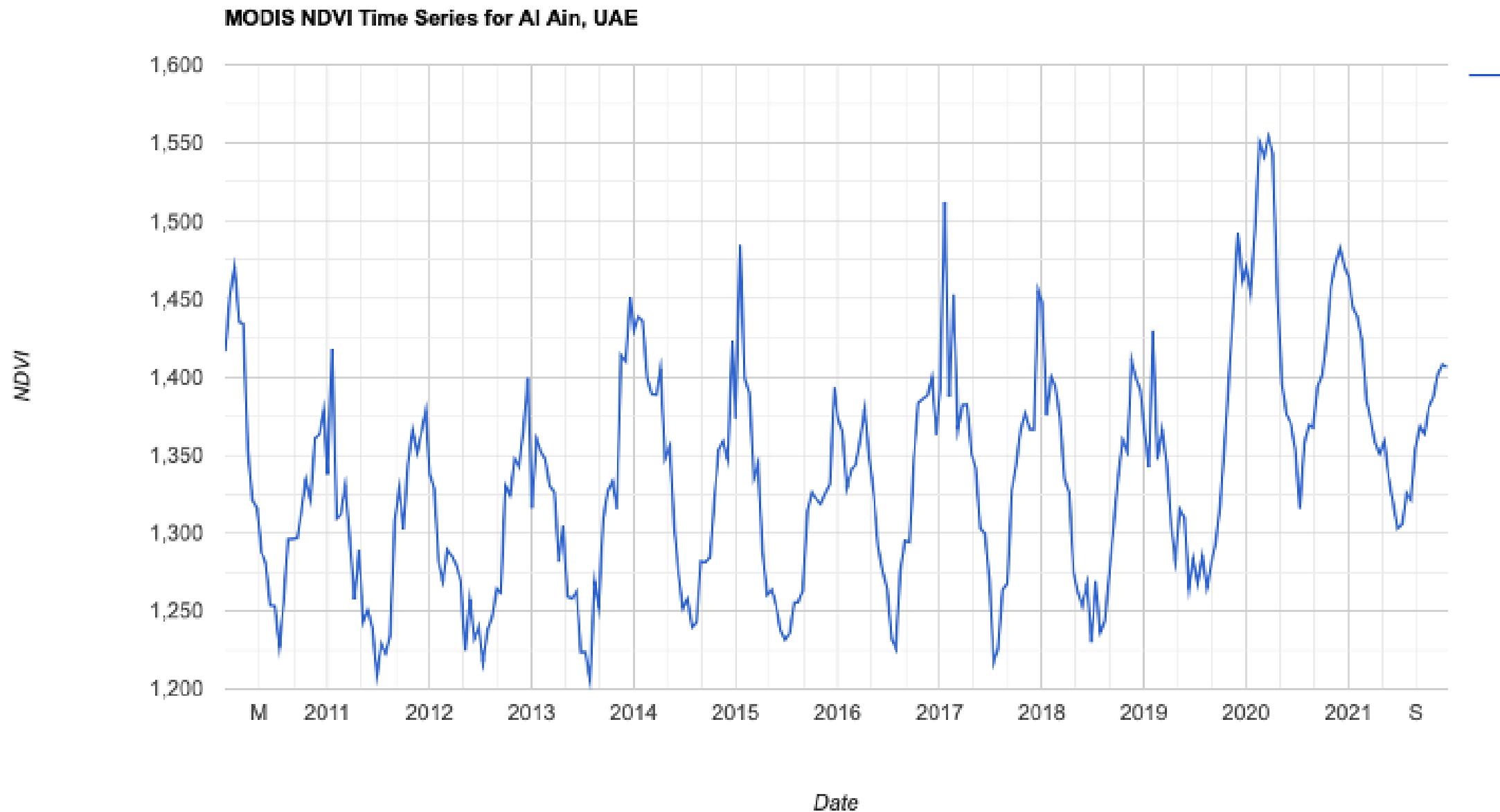
RESEARCH DETAILS AND METHODS

Comparison of Vegetation Variations: We compared NDVI trends between Al Ain and Abu Dhabi, focusing on:

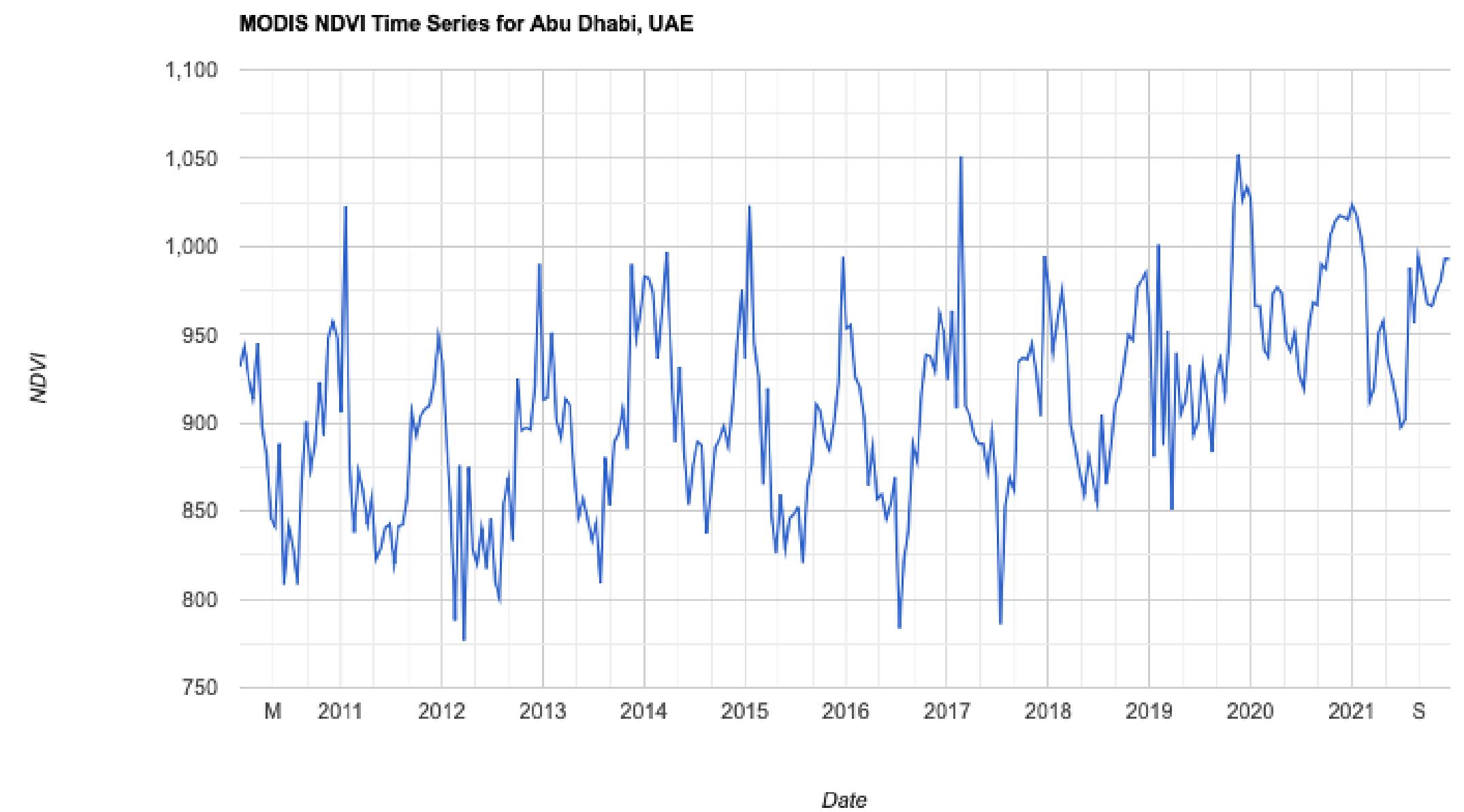
- identifying peaks and trends in vegetation variations
- analyzing spatial patterns of vegetation variations



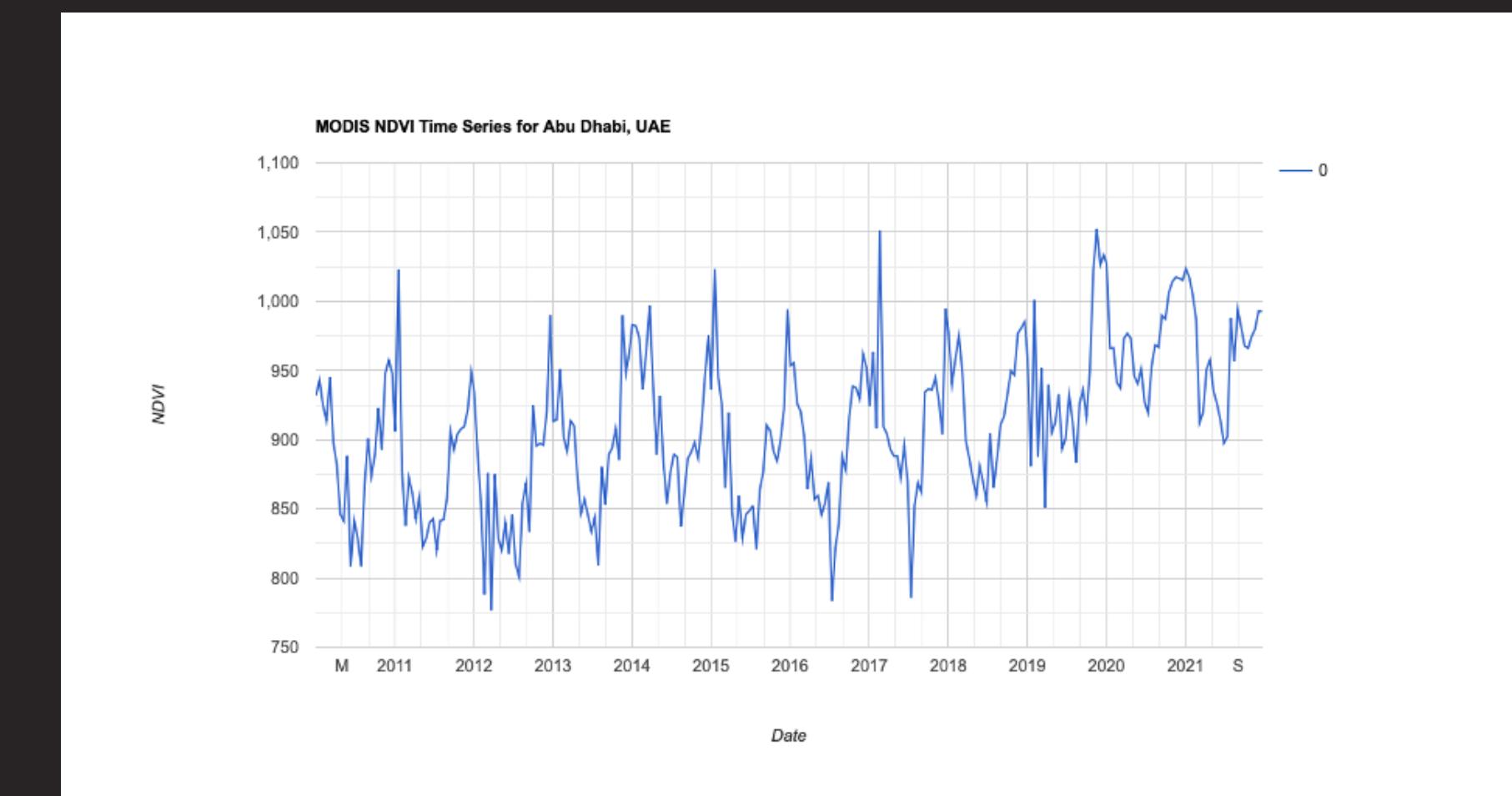
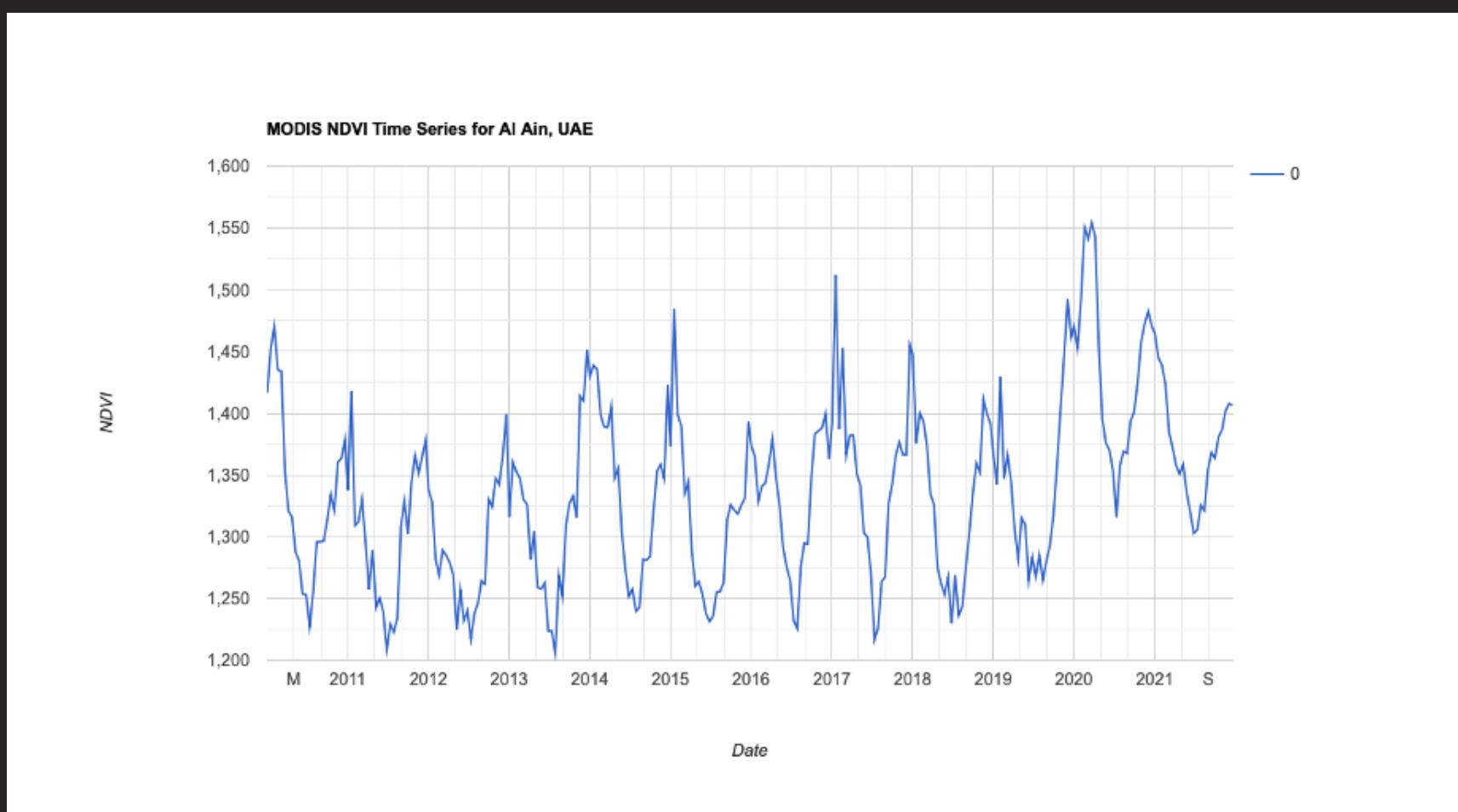
RESULTS



RESULTS



SIMILARITIES AND DIFFERENCES



WHAT DID WE LEARN FROM THIS STUDY?

- climate variability
- land management practices
- water availability
- natural events like the COVID-19 pandemic



BENEFITS OF THIS KIND OF SCIENTIFIC STUDY?

- Complex interactions between environmental factors and vegetation variations.
- Importance of long-term monitoring and remote sensing in environmental management.

FUTURE RESEARCH DIRECTIONS

- Incorporating additional datasets
- exploring advanced algorithms
- conducting field studies
- collaborating with stakeholders
- investigating new technologies.



Thanks For Listening