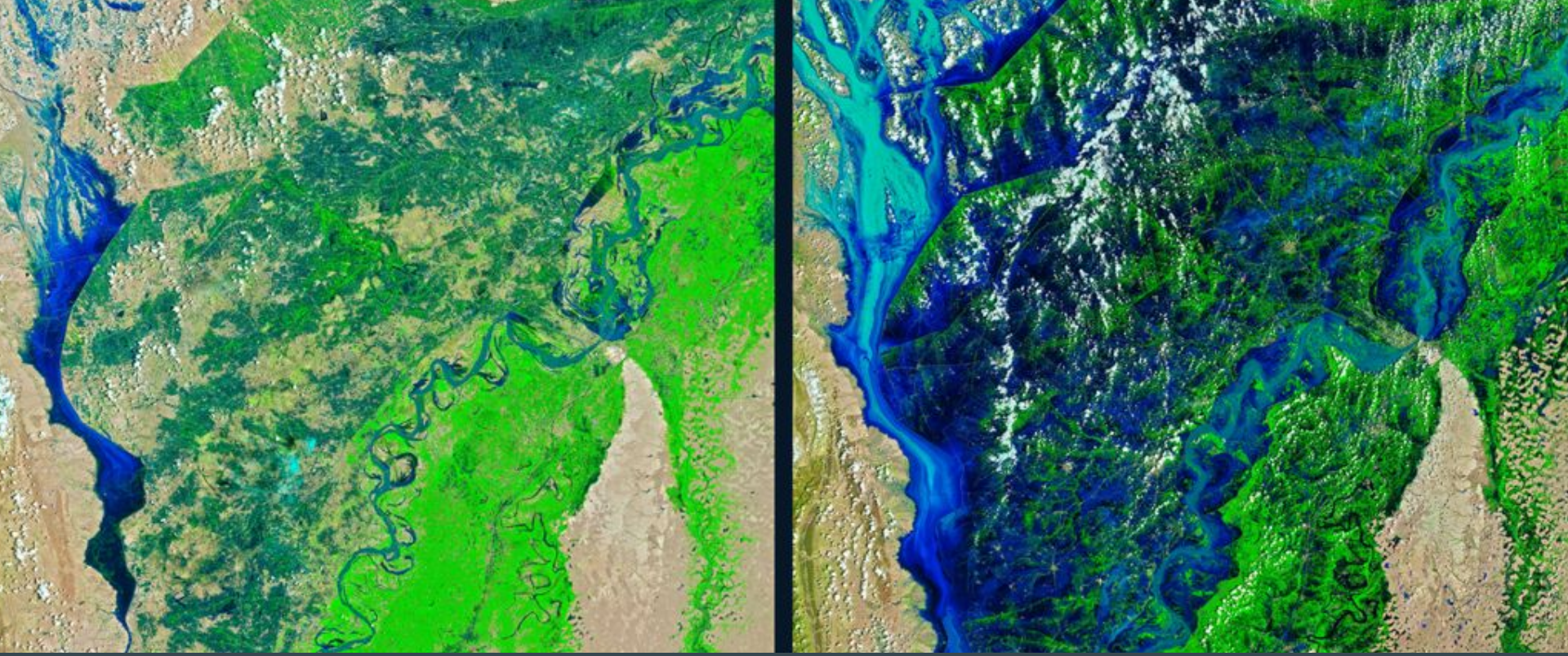


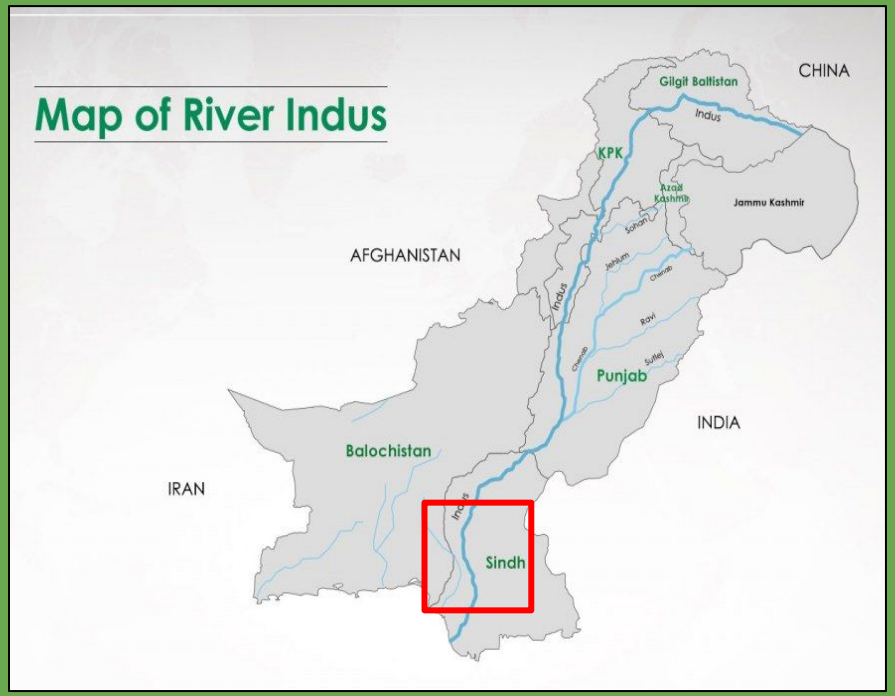
Mapping & Comparison of the Indus Floods of 2010 & 2022

Mahnoor Naeem 2022

2010 Flood

2022 Flood

Study Area:
Indus River near Hyderabad, Sindh, Pakistan



RESEARCH TOPIC

Death toll in Pakistan floods passes 1,280 – and a third of them are children

CNN World Africa Americas Asia Australia China Europe India Middle East More Audio Live TV Log

BBC Sign in Home News Sport Reel Worklife

NEWS

Home | War in Ukraine | Coronavirus | Climate | Video | World | US & Canada | UK | Business | Tech

England | Regions | Leeds & West Yorkshire

Pakistan flood disaster 'gut-wrenching', says aid worker

How melting glaciers fueled Pakistan's fatal floods

Pakistan has more than 7,000 glaciers. Climate change is melting them into floodwater.

By Benji Jones | @BenjiSJones | Aug 30, 2022, 9:45am EDT

SHARE

CNBC MARKETS BUSINESS INVESTING TECH POLITICS CNBC TV INVESTING

WORLD NEWS

'Climate disaster of biblical proportions': Pakistan minister warns flood damage will exceed $10 billion

PUBLISHED FRI, SEP 2 2022•6:29 AM EDT

Emma Graham
@THEMMAGRAHAM

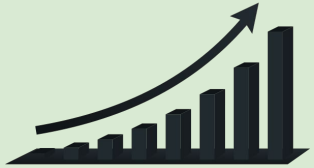
SHARE

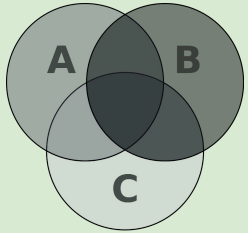
CTV NEWS

NEWS VIDEO LOCAL SHOWS ABOUT

CLIMATE AND ENVIRONMENT | News

Pakistan's deadly floods have created a massive 100 km-wide inland lake, satellite images show





1. Interpret N.D.V.I and N.D.W.I indices from before and during the floods.

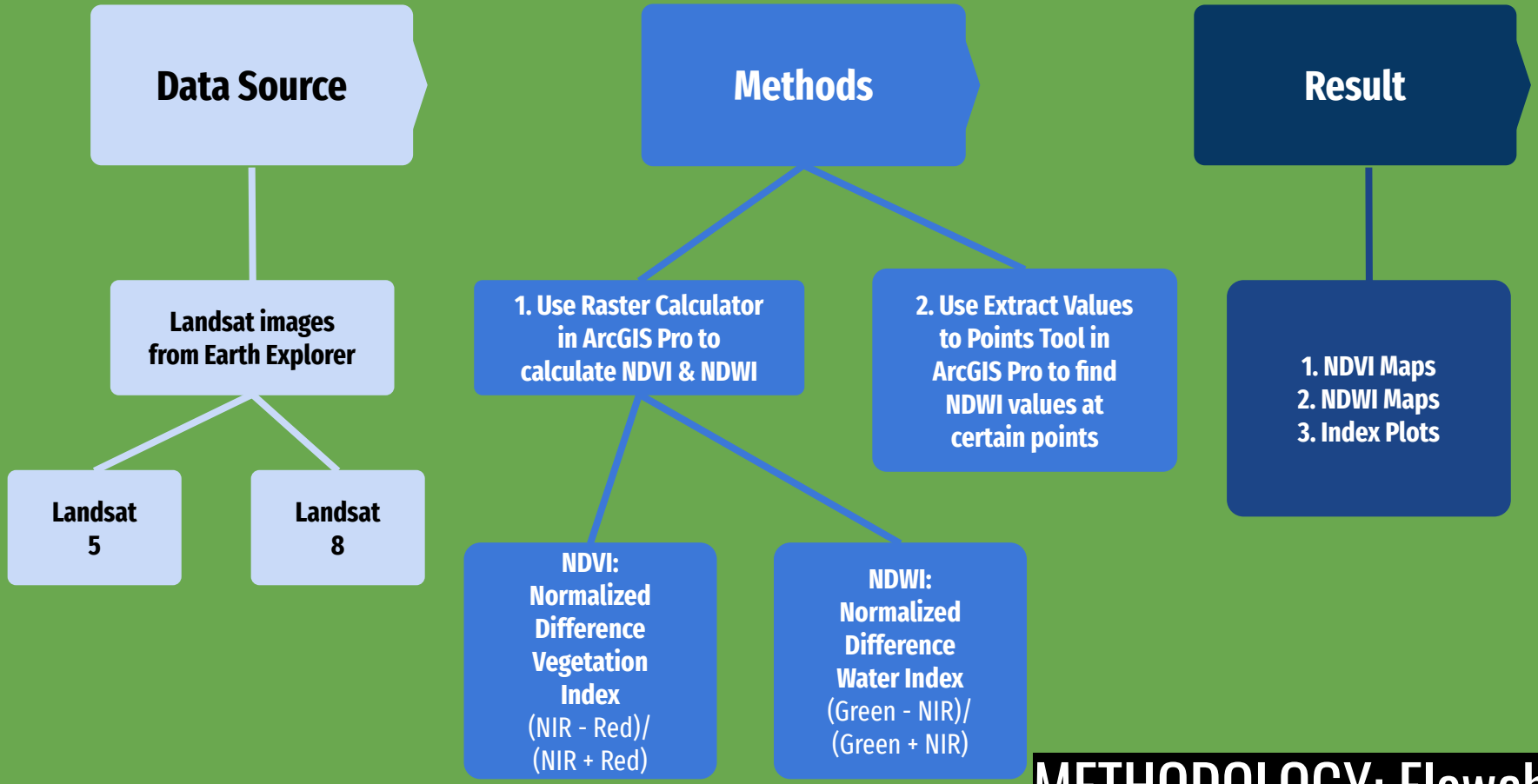
2. Quantitatively analyze N.D.W.I values by extracting points from images.

3. Use maps and plots to compare the impact of the floods.

OBJECTIVES

METHODOLOGY: Data

Pre-Flood (2009)	During Flood (2010)	Pre-Flood (2021)	During Flood (2022)
Satellite: Landsat 5	Satellite: Landsat 5	Satellite: Landsat 8	Satellite: Landsat 8
Acquisition Date: **September 17, 2009**	Acquisition Date: **September 4, 2010**	Acquisition Date: **August 17, 2021**	Acquisition Date: **September 21, 2022**



METHODOLOGY: Flowchart

METHODOLOGY: Calculations

Calculating N.D.V.I Values

Landsat 5:

$$NDVI = \frac{Band\ 4 - Band\ 3}{Band\ 4 + Band\ 3}$$

Landsat 8:

$$NDVI = \frac{Band\ 5 - Band\ 4}{Band\ 5 + Band\ 4}$$

Calculating N.D.W.I Values

Landsat 5:

$$NDWI = \frac{Band\ 2 - Band\ 4}{Band\ 2 + Band\ 4}$$

Landsat 8:

$$NDWI = \frac{Band\ 3 - Band\ 5}{Band\ 3 + Band\ 5}$$

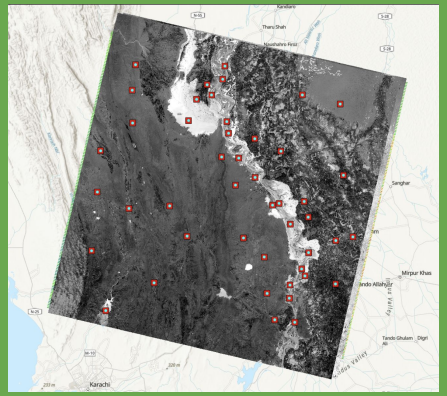
Index Plots

Tool: Extract Values to Points

Plotted NDWI points to quantitatively analyze the difference in water levels between both floods.

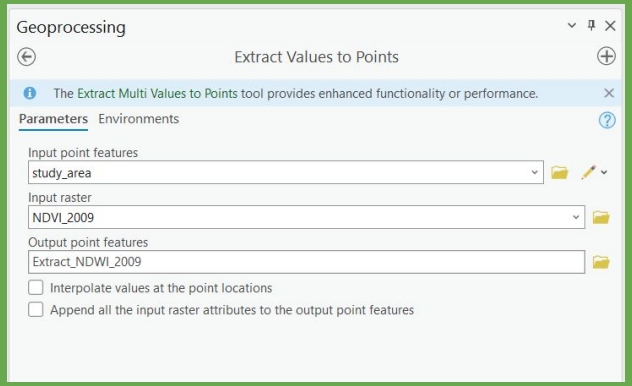
METHODOLOGY: Extraction

1



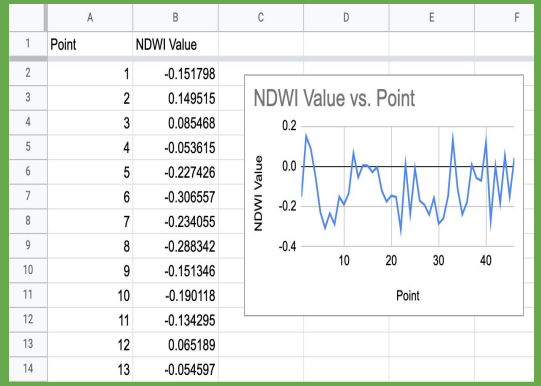
Created a point shapefile and took 45 random points along the image from different land cover types

2



Used the Extract Values to Points Tool to find the index values at the study area points

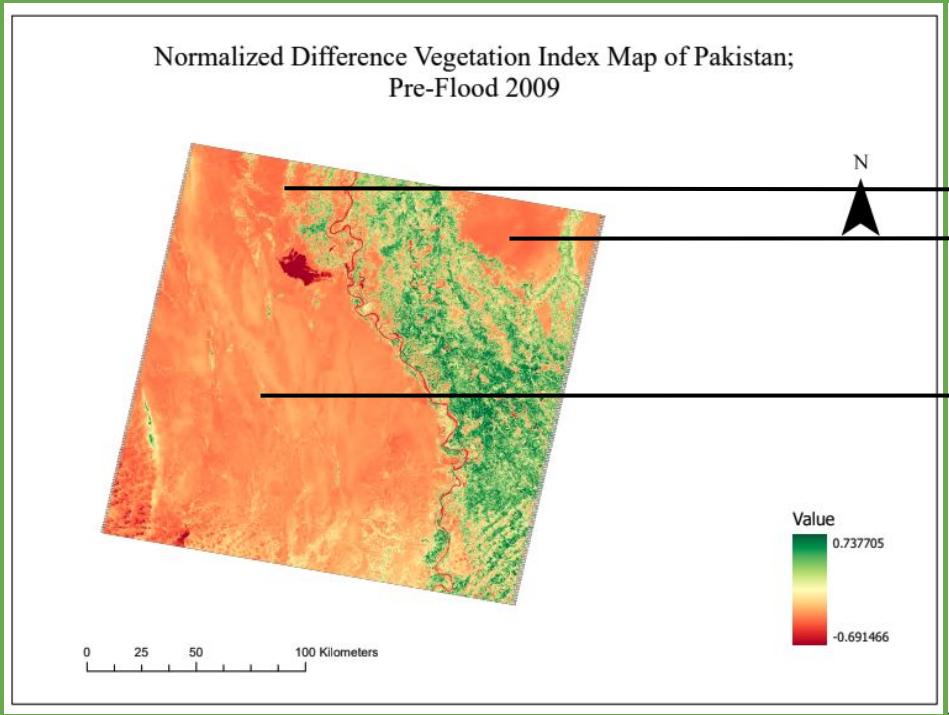
3

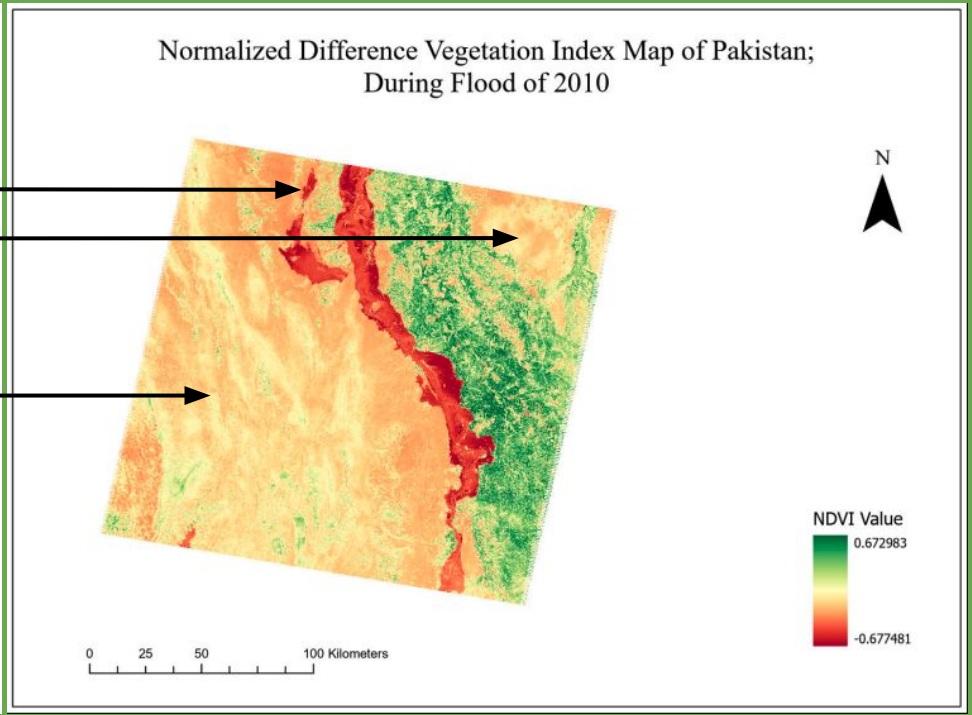


	A	B
1	Point	NDWI Value
2	1	-0.151798
3	2	0.149515
4	3	0.085468
5	4	-0.053615
6	5	-0.227426
7	6	-0.306557
8	7	-0.234055
9	8	-0.288342
10	9	-0.151346
11	10	-0.190118
12	11	-0.134295
13	12	0.065189
14	13	-0.054597

Processed the data and created plots to visualize data points

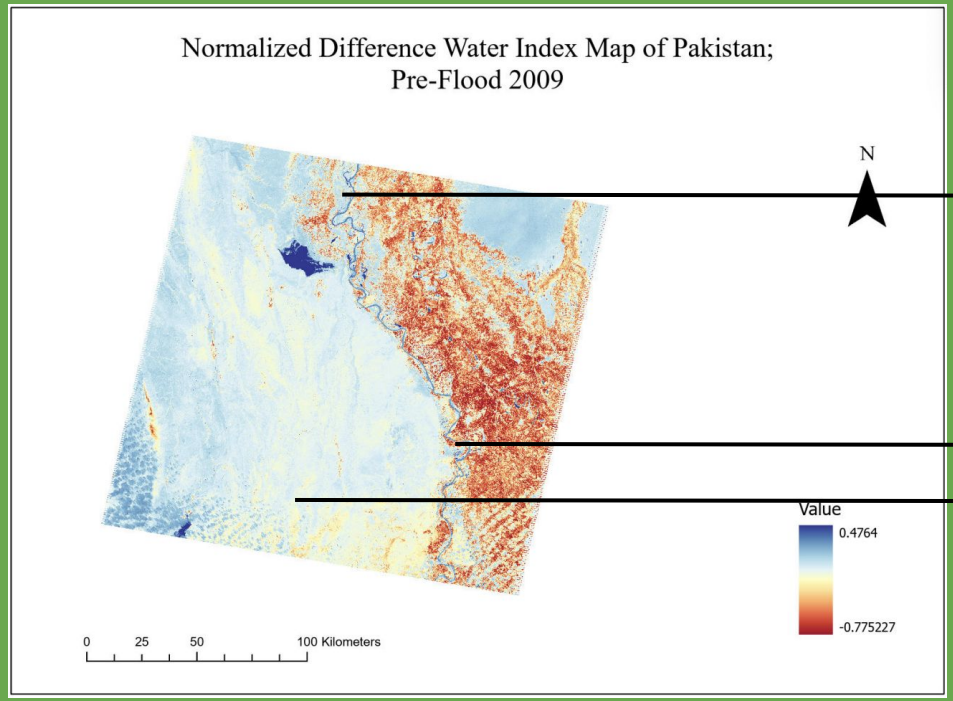
N.D.V.I

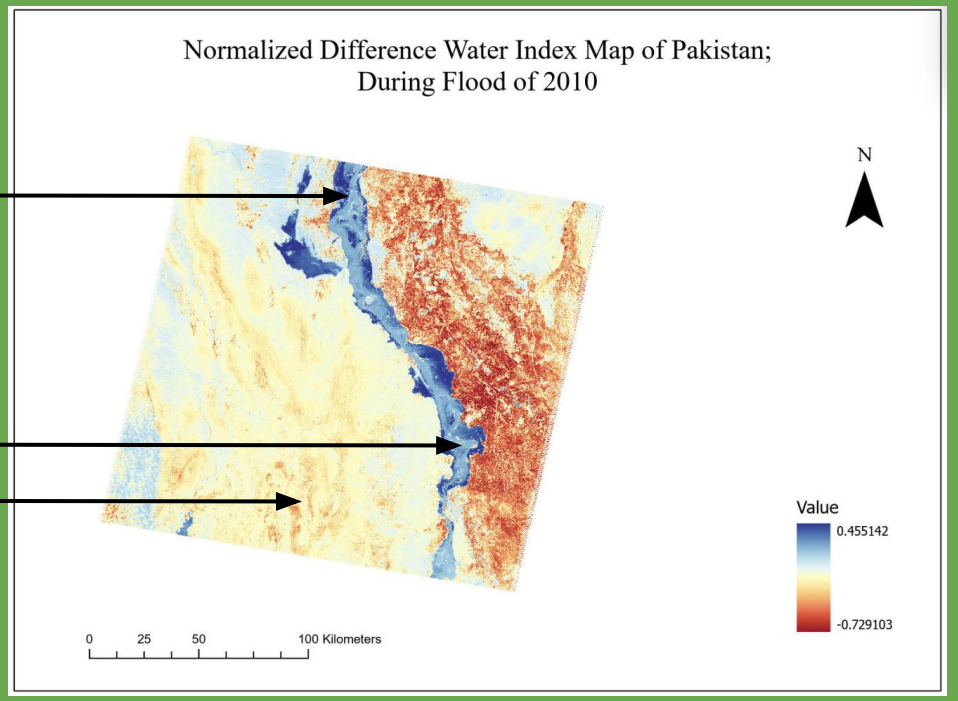




RESULTS: 2010 Floods

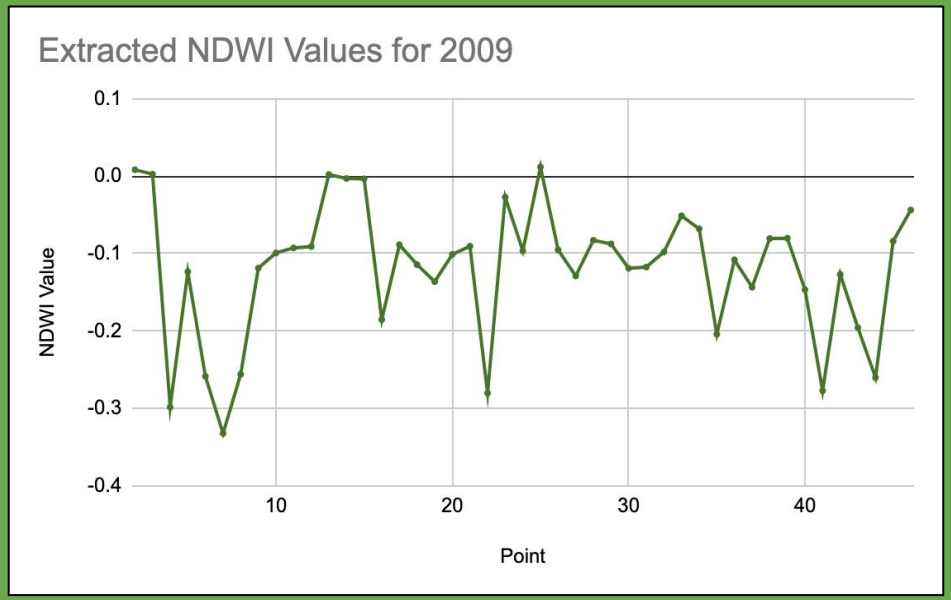
N.D.W.I

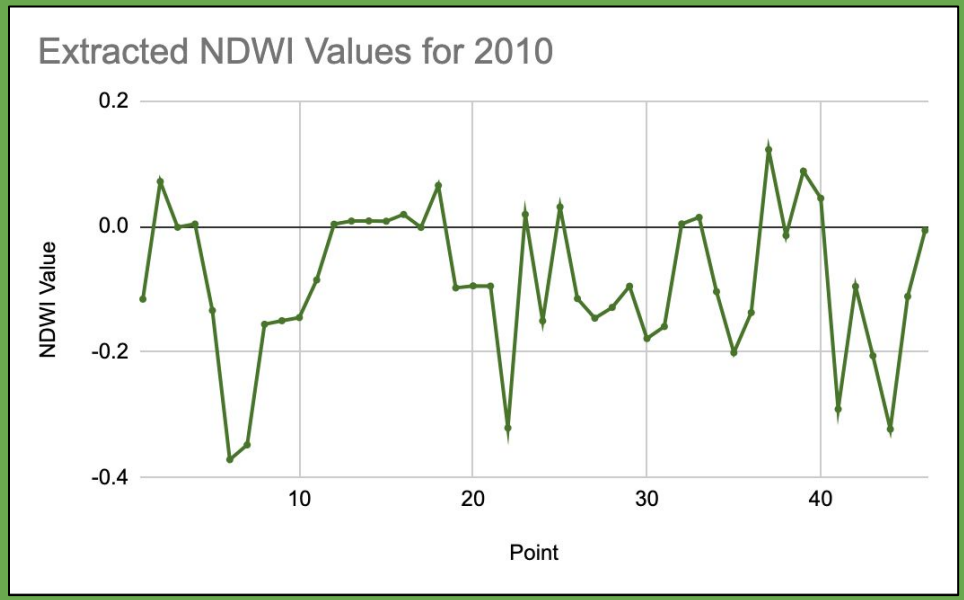




RESULTS: 2010 Floods

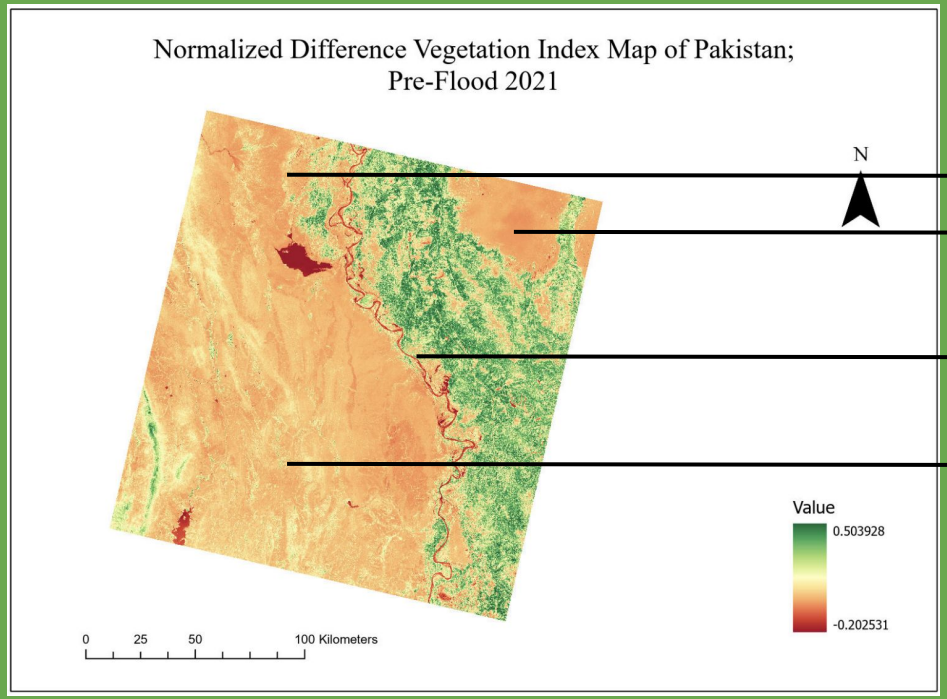
N.D.W.I Values

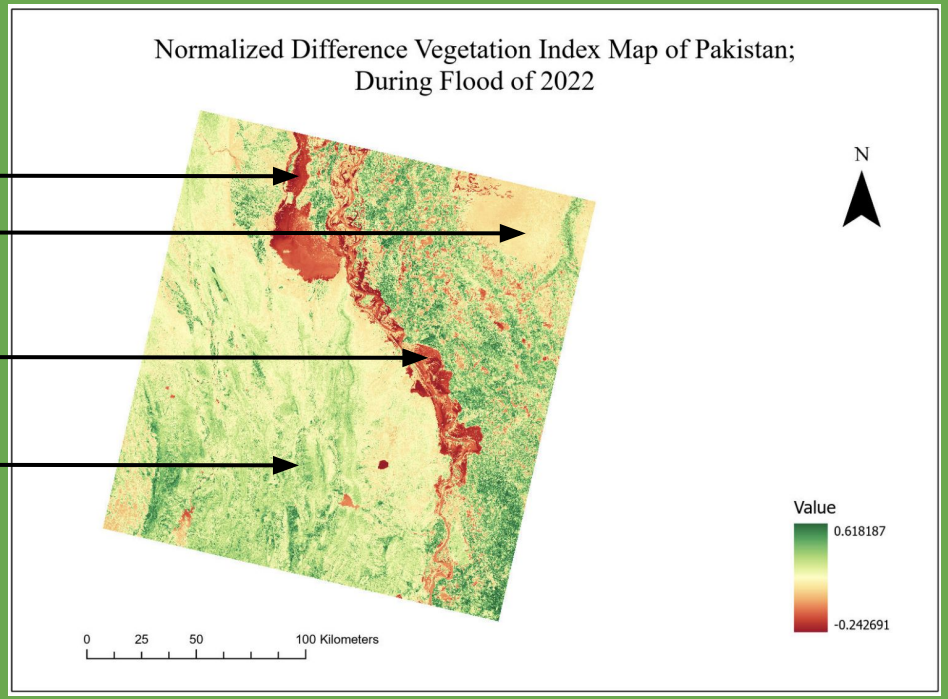




RESULTS: 2010 Floods

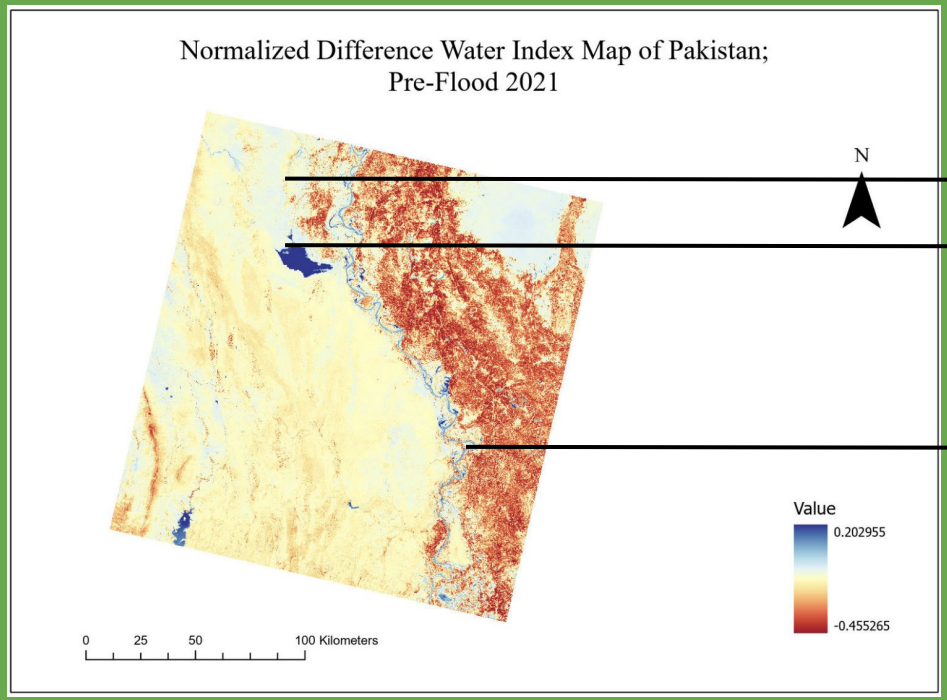
N.D.V.I

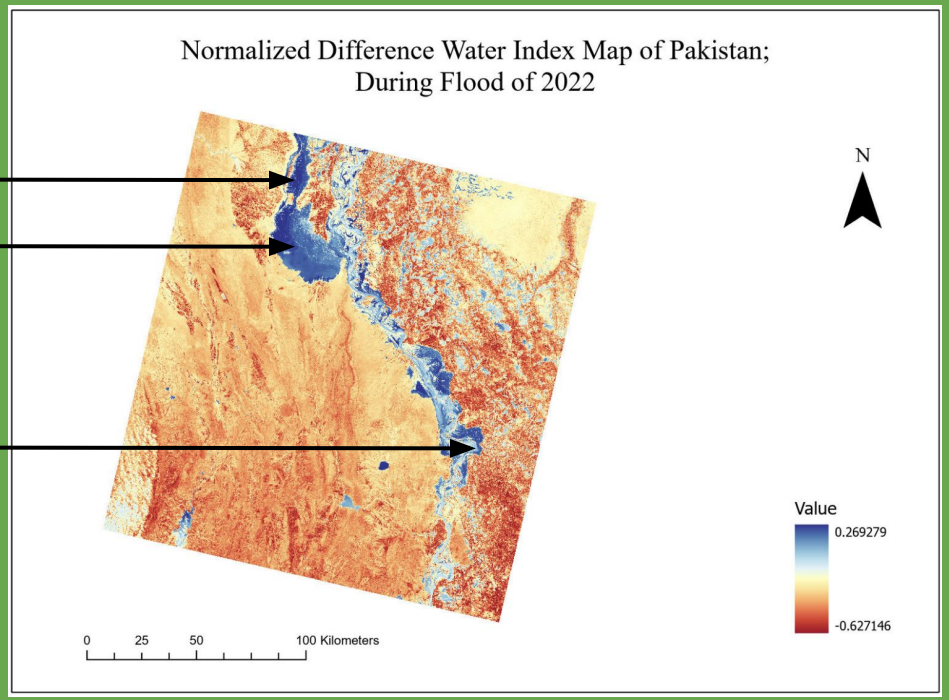




RESULTS: 2022 Floods

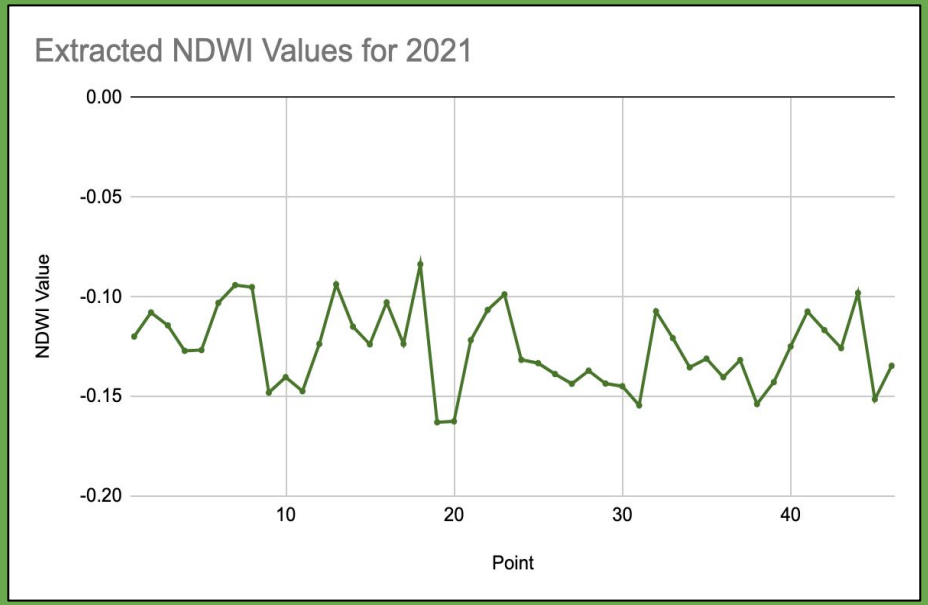
N.D.W.I

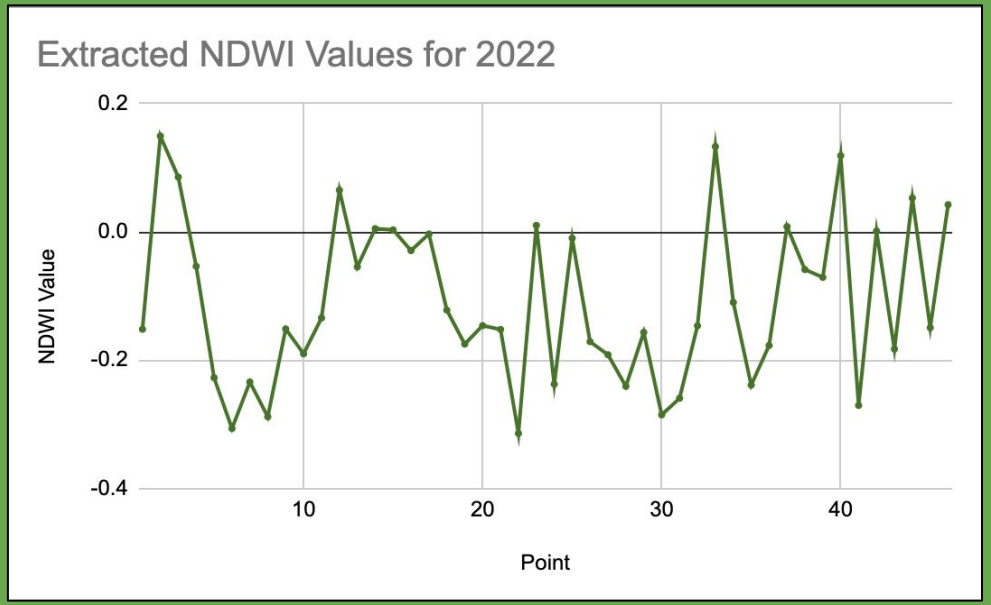




RESULTS: 2022 Floods

N.D.W.I Values





RESULTS: 2022 Floods

1

The 2022 floods caused a lot more damage than in 2010. This is shown from the NDWI and NDVI maps depicting a lot more water in the 2022 images than in 2010.

2

Both of the floods brought a lot of destruction to surrounding land areas as regions that used to be for vegetation, agriculture, and suburban were flooded.

3

The extracted NDWI points show the major difference between pre flood and during flood index values between 2010 and 2022 further proving the intensity of the floods in 2022.

DISCUSSION

Countries like Pakistan are vulnerable to climate change and each time a natural disaster occurs, it only gets worse.

“Pakistan is responsible for less than 1% of the world’s planet-warming gases, European Union data shows, yet it is the eighth most vulnerable nation to the climate crisis”
(CNN, 2022)

CONCLUSION