The project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Sklodowska-Curie grant agreement No 860383.

How does the Source to Sink System impact human habitation patterns in the Indo-Gangetic basin?

Ekta Aggarwal, *Sanjeev Gupta, Alexander C. Whittaker*

Department of Earth Science and Engineering, Imperial College London

e.aggarwal21@imperial.ac.uk

ektaagg01

This presentation participates in OSPP

Outstanding Student & PhD candidate Presentation contest

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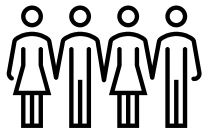
Current Research Problem



Increase In the human population

Stream/river/hydrological systems alterations/

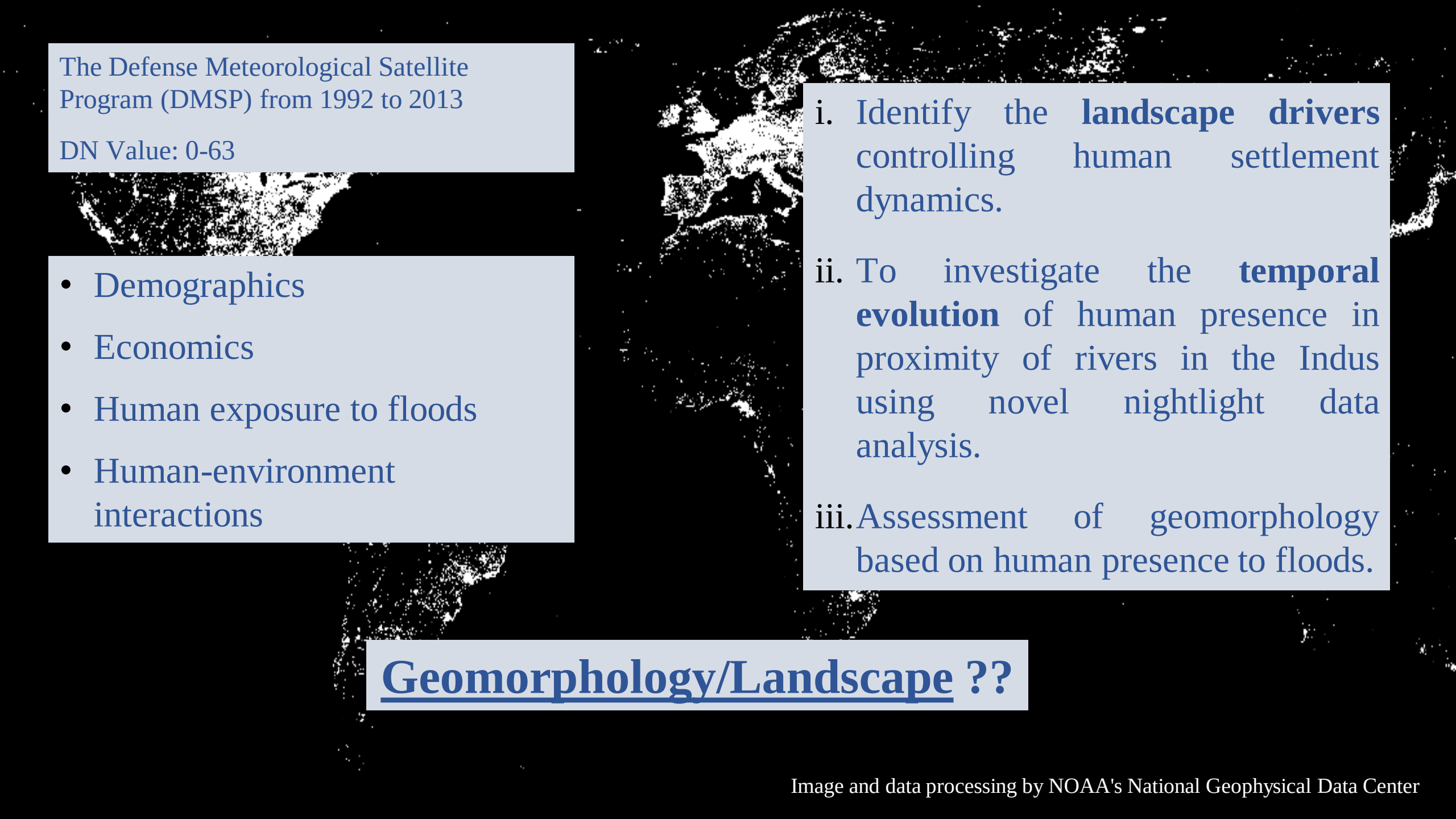
Source to Sink Systems factors

Settlements of early humans near river

Environmental Impacts

Human/Resources loss

Floods



The Defense Meteorological Satellite Program (DMSP) from 1992 to 2013

DN Value: 0-63

- Demographics
- Economics
- Human exposure to floods
- Human-environment interactions

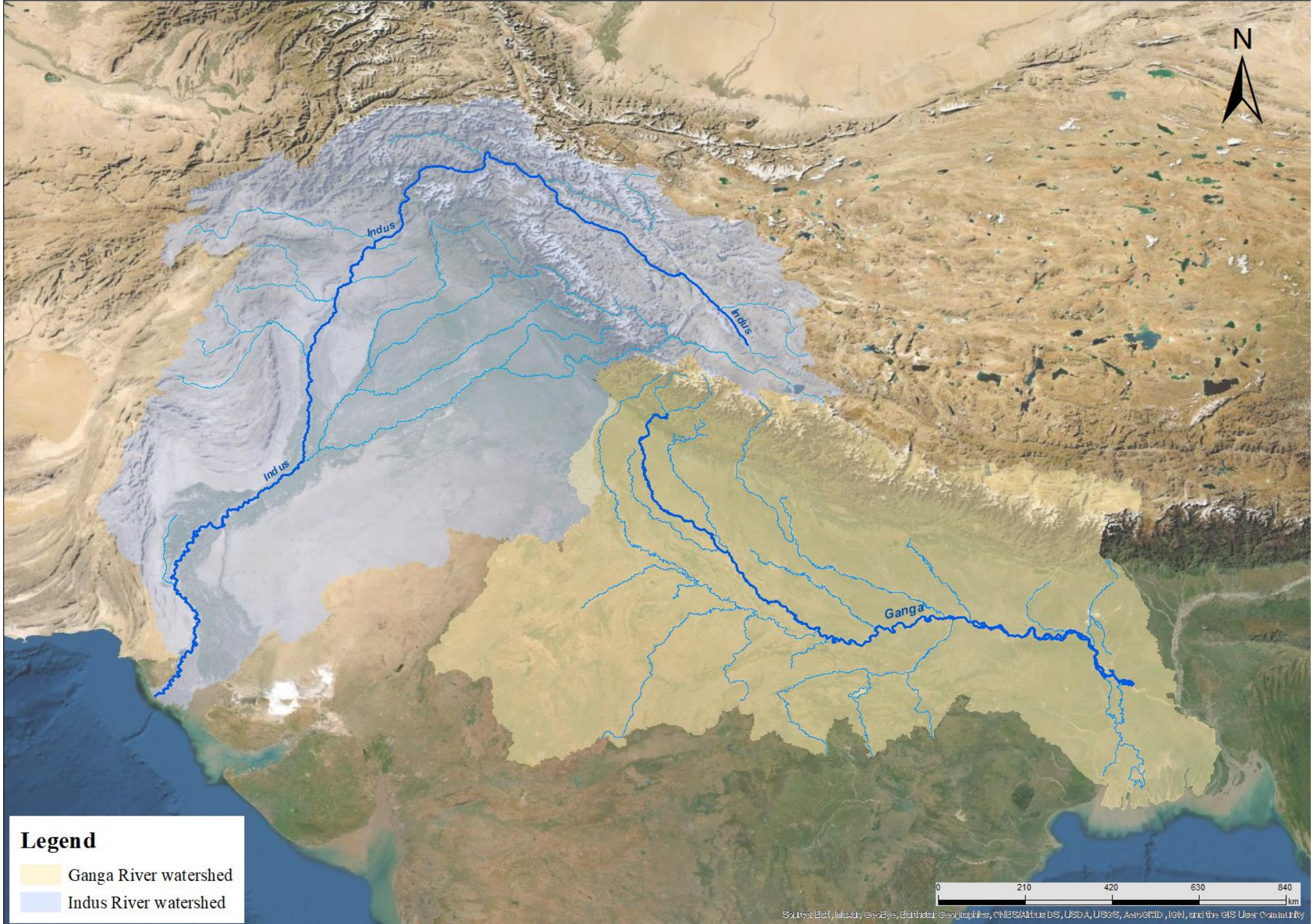
i. Identify the **landscape drivers** controlling human settlement dynamics.

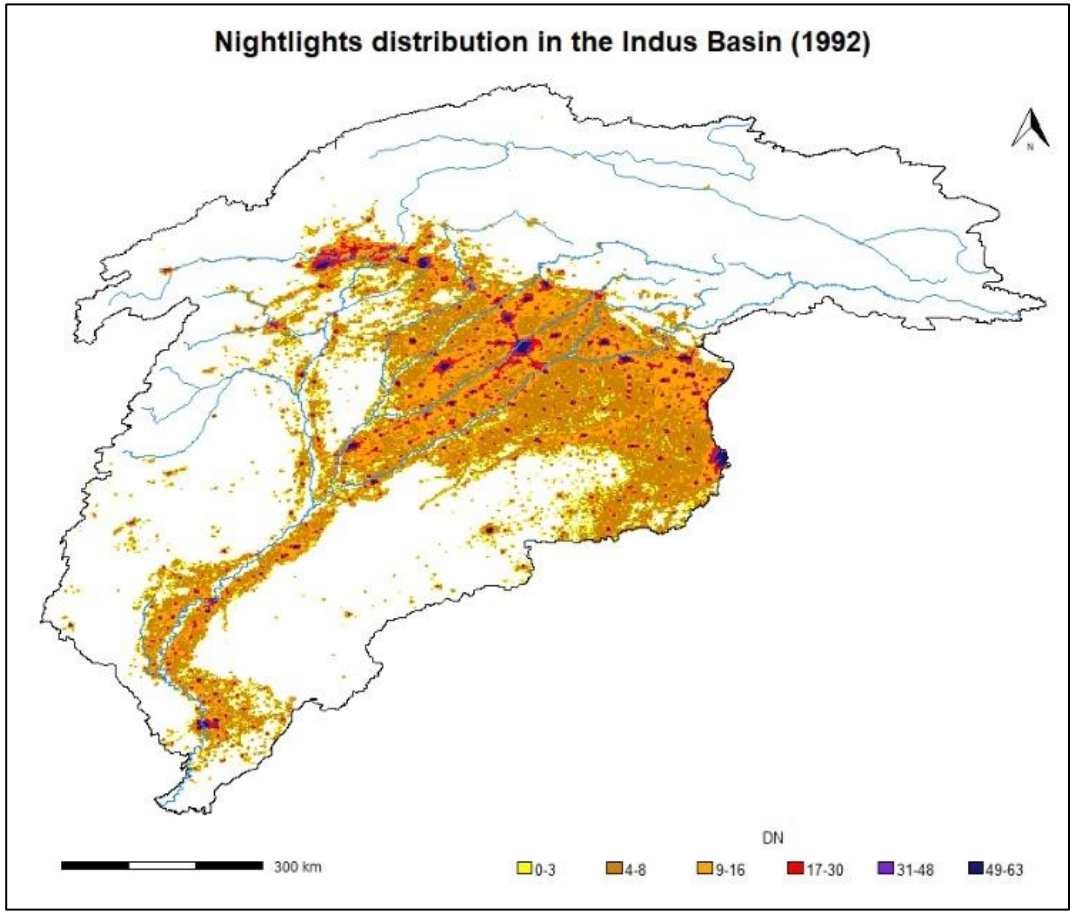
ii. To investigate the **temporal evolution** of human presence in proximity of rivers in the Indus using novel nightlight data analysis.

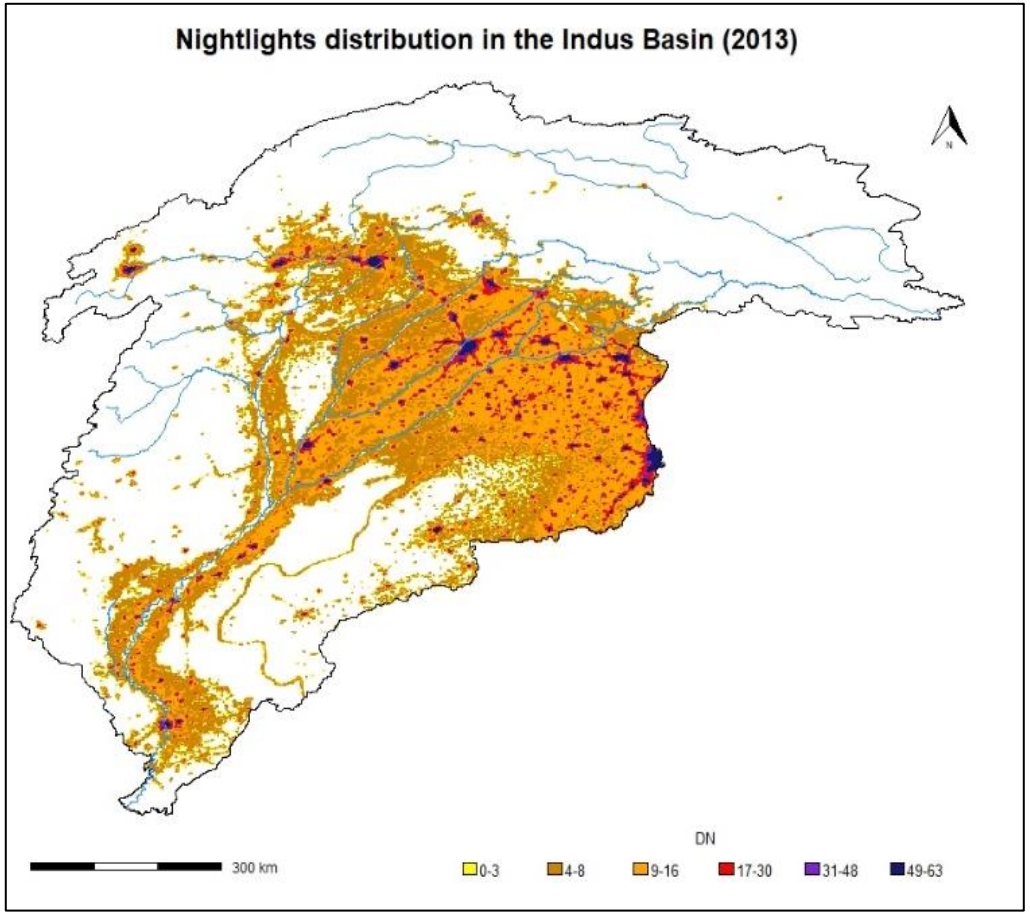
iii. Assessment of geomorphology based on human presence to floods.

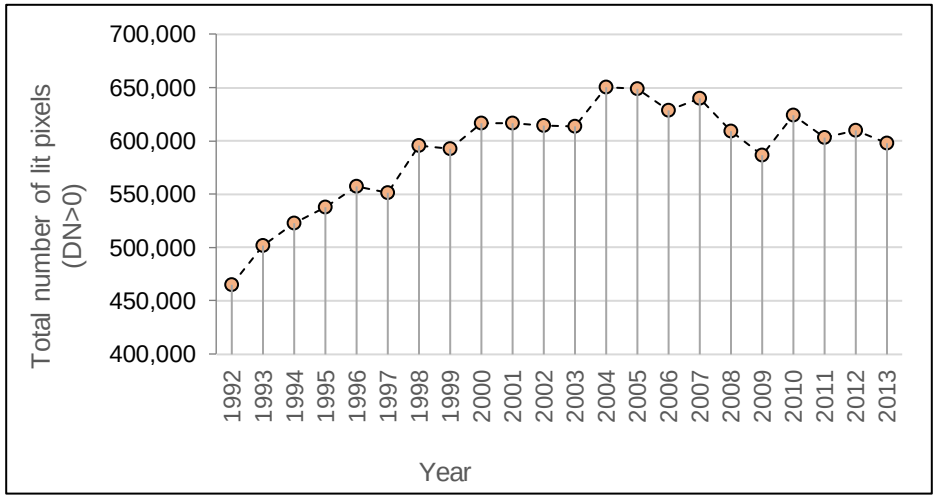
Geomorphology/Landscape ??

Image and data processing by NOAA's National Geophysical Data Center

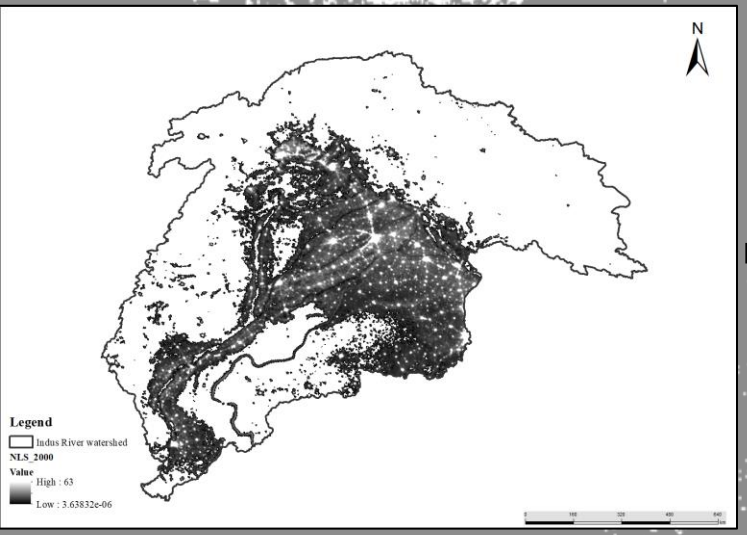

N
Indus
Indus
Indus
Ganga
Legend
Ganga River watershed
Indus River watershed
0
210
420
630
840
km
Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community


Nightlights distribution in the Indus Basin (1992)
300 km
DN
0-3
4-8
9-16
17-30
31-48
49-63

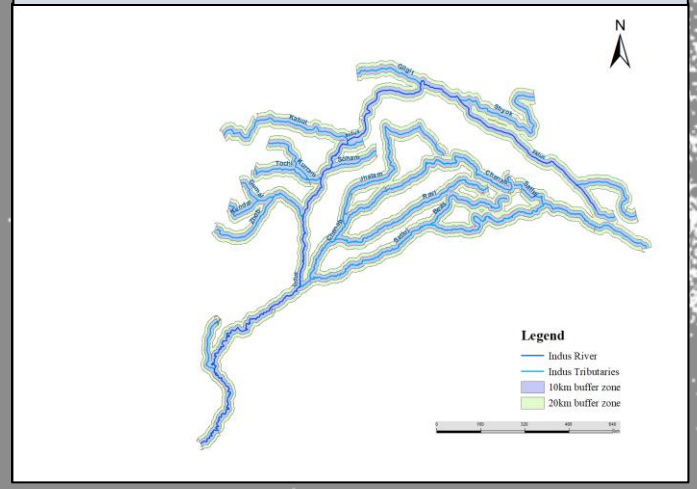

Nightlights distribution in the Indus Basin (2013)
300 km
DN
0-3
4-8
9-16
17-30
31-48
49-63

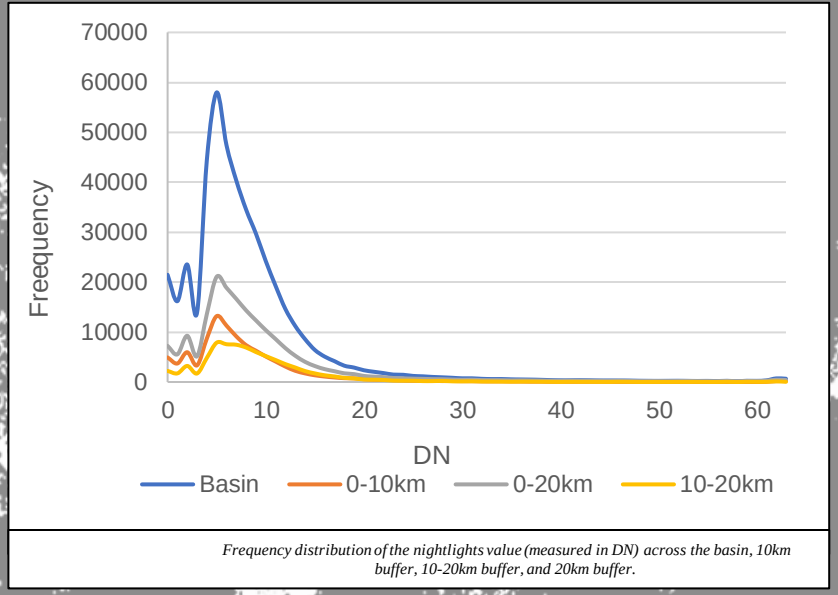

Total number of lit pixels (DN>0)
700,000
650,000
600,000
550,000
500,000
450,000
400,000
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
Year

Human Presence



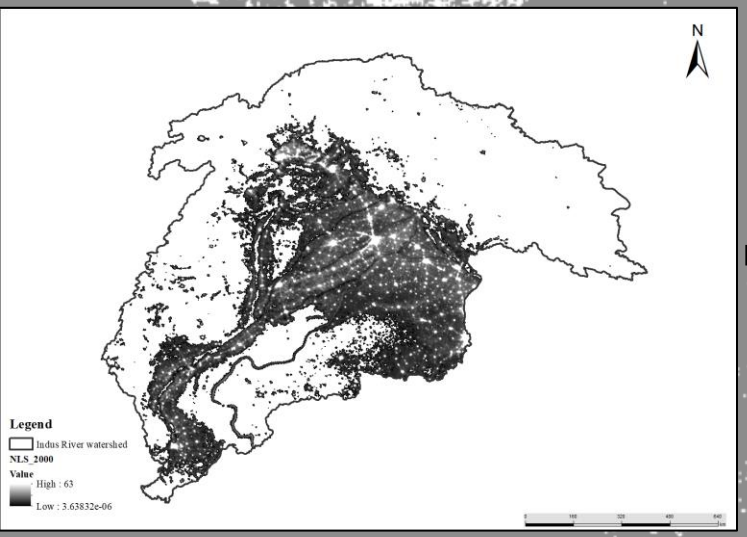
Proximity to River



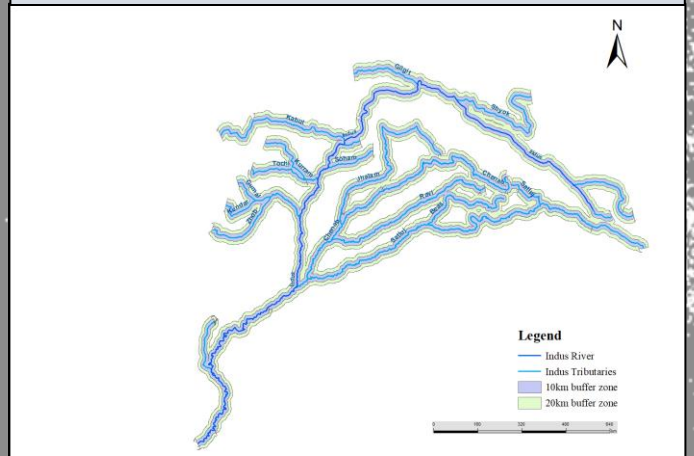


Frequency distribution of the nightlights value (measured in DN) across the basin, 10km buffer, 10-20km buffer, and 20km buffer.

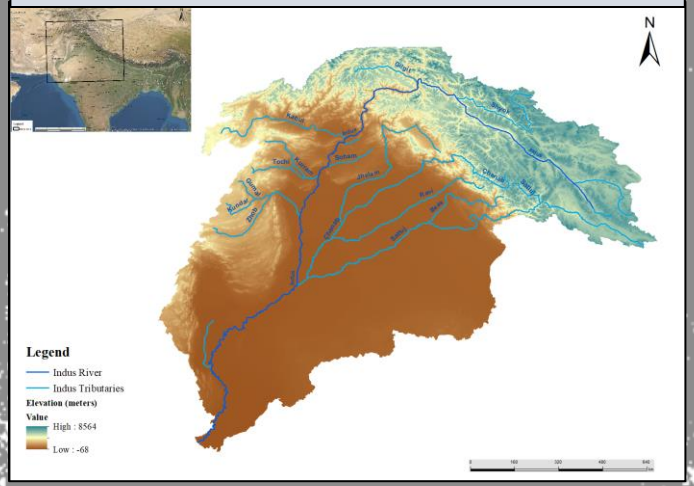
Human Presence

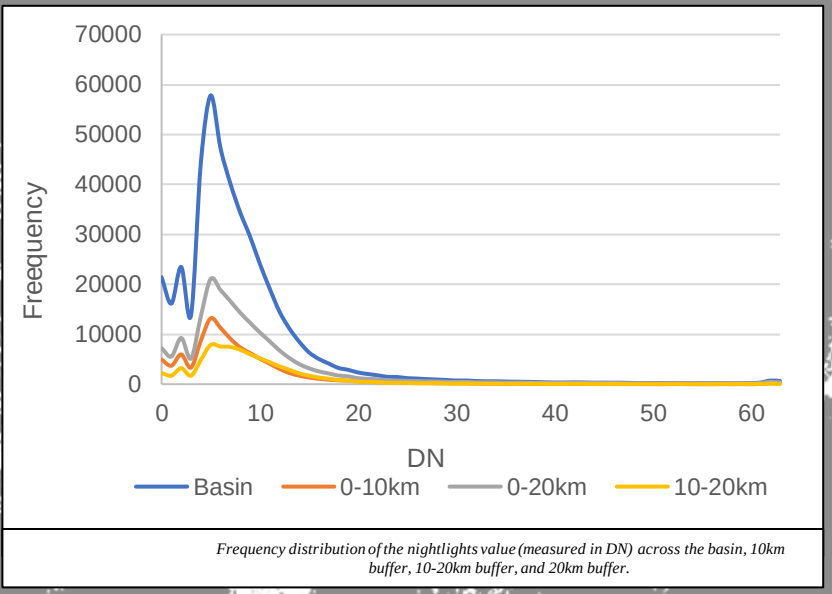


Proximity to River



Terrain

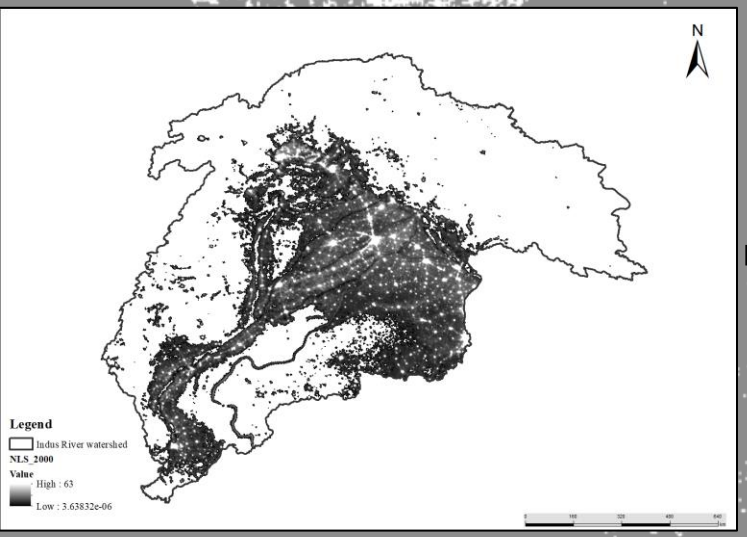




Frequency distribution of the nightlights value (measured in DN) across the basin, 10km buffer, 10-20km buffer, and 20km buffer.

Category	Geographical Area (km²)	Nightlights area (km²)	
Basin	1,168,436.00	447,963.50	38.3%
Plains (elevation<=800 m)	633,477.2	414,647.33	65.56 %
	54.21%	92.56%	

Human Presence



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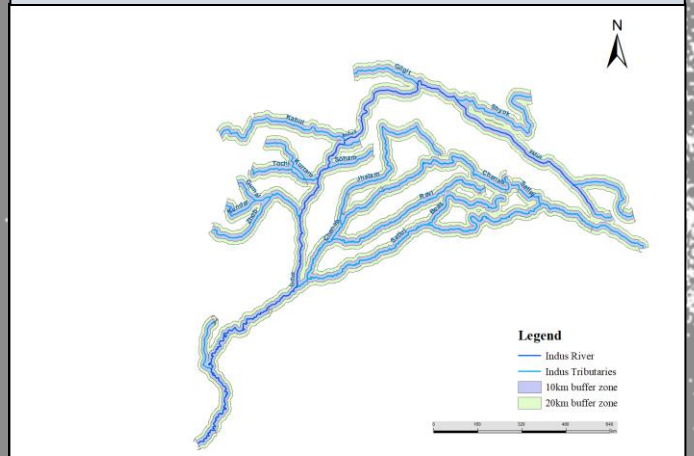
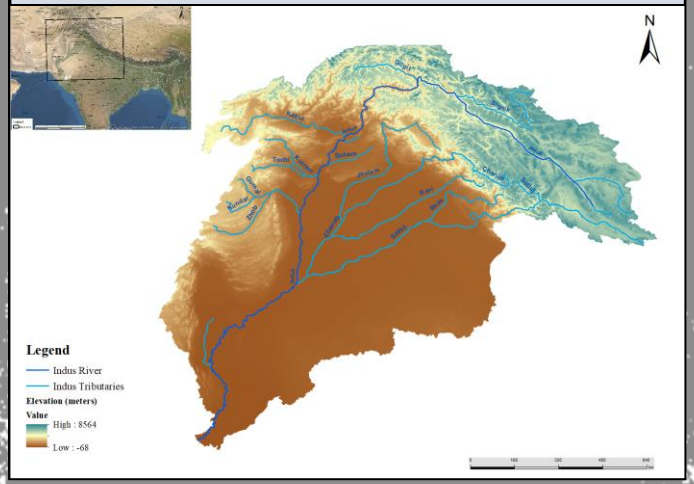
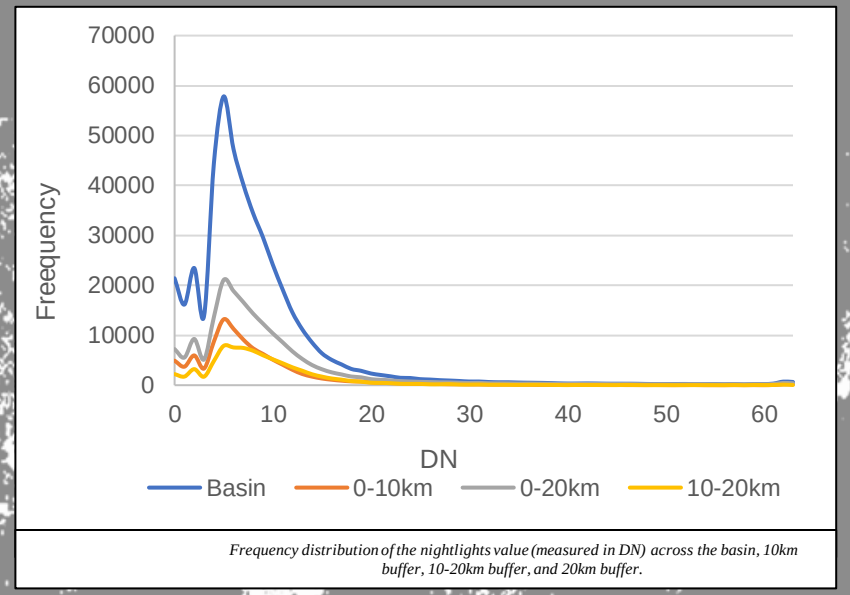


Terrain





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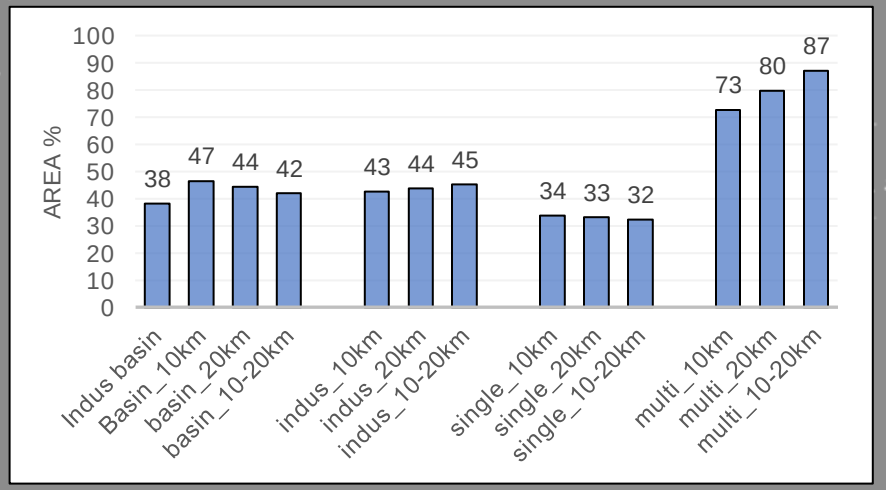
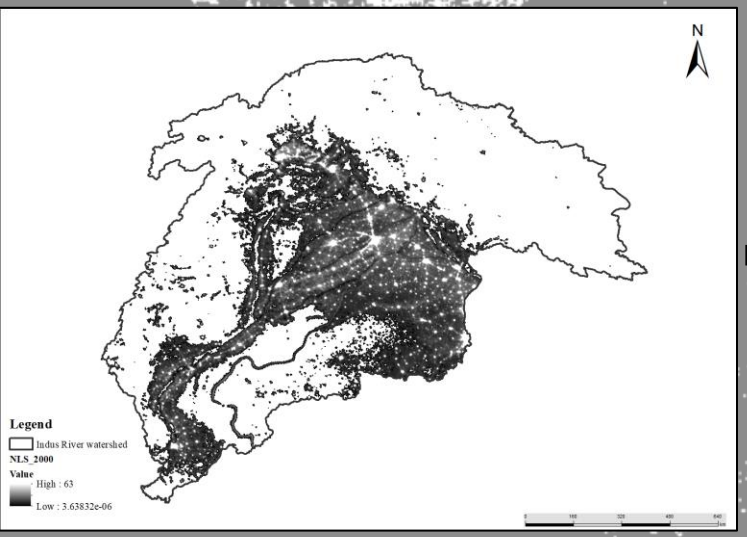
Channel Pattern type



Human Presence



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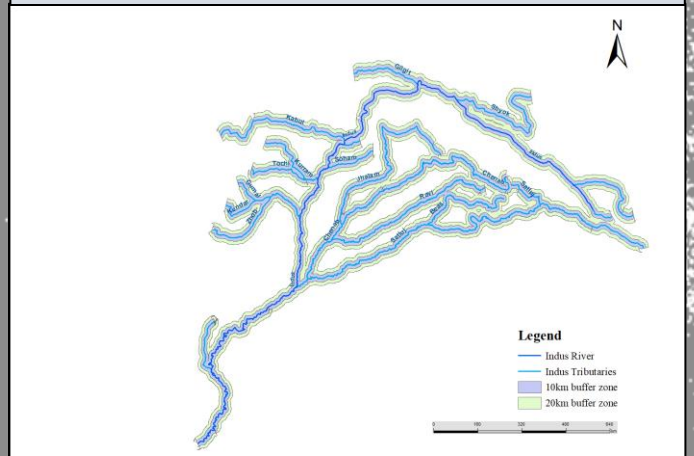
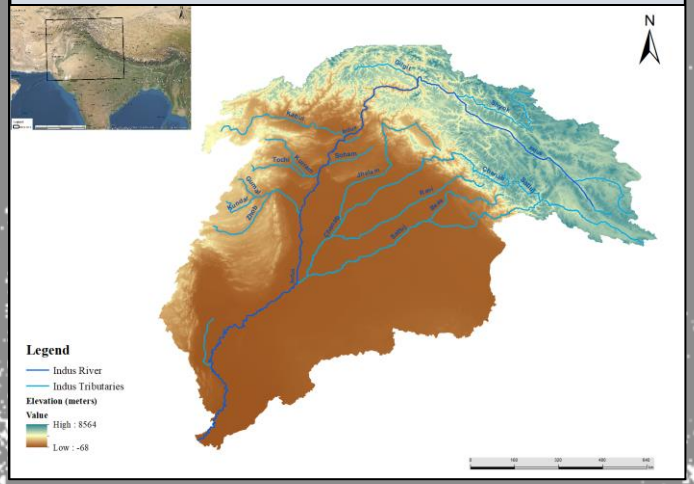
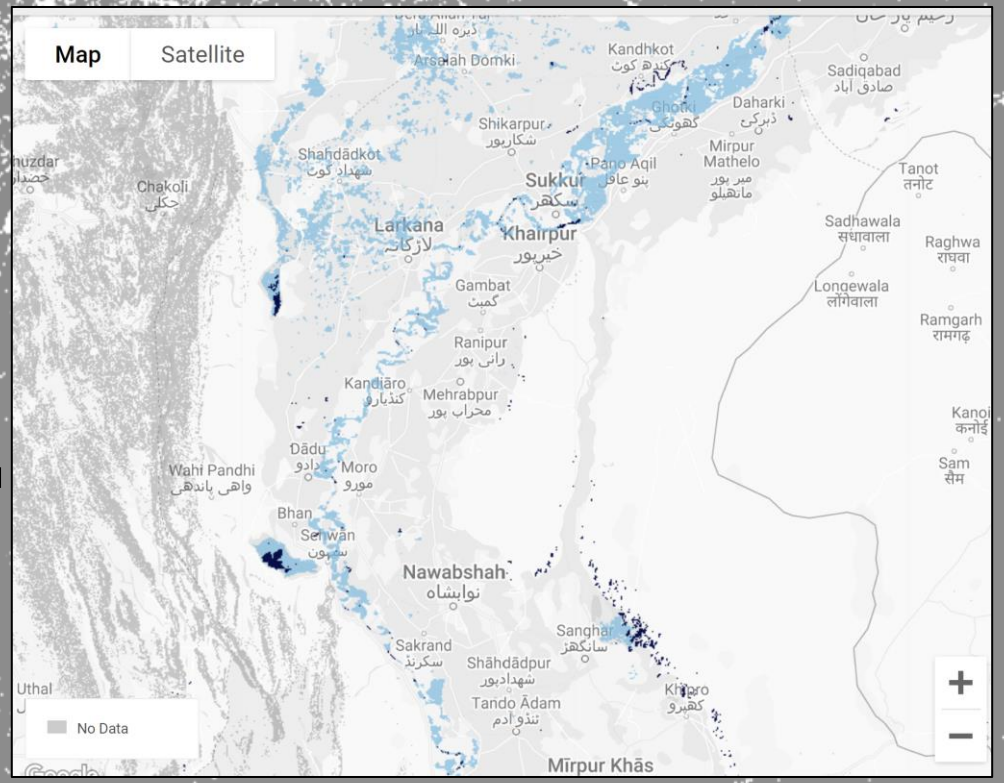


Terrain



Global Flood database



Tellmann, et.al., 2021

Channel Pattern type

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CONCLUSION

- Understanding the temporal evolution of the human settlement pattern in floodplain regions associated with the proximity of the river.
- Develop a methodology characterizing the human presence in a basin based on channel types.
- Lastly, will assess the role of geomorphic factors in determining the flood vulnerability and susceptibility to the human population.

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THANK YOU

e.aggarwal21@imperial.ac.uk

ektaagg01