

Spatio-temporal Water Quality Assessment of river Ravi over and surrounding of Lahore District

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TECHNOLOGY FOR WATER MANAGEMENT

Outline

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- **Study area**
- **Methodology**
- **Results**
- **Conclusion**
- **Recommendations**

Introduction

- 73% of earth surface is covered by water, only 2.5% of total water is fresh and 0.3% water is human use (WWAP, 2003)
- Most developing and under developing countries leaving about 80% and 90% of waste water without applying any water treatment (Unesco, 2017).
- Water pollution was observed most alarming in Latin America, Asia and Africa.
- In 2012, 800,000 people died due to either contaminated water or due to lack of hand washing and sanitation facilities (Unesco, 2017)

Water Facts

Oceans	97.2%
Ice Caps/Glaciers	2.0%
Groundwater*	0.62%
Freshwater Lakes	0.009%
Inland seas/salt lakes	0.008%
Atmosphere	0.001%
Rivers	0.0001%
TOTAL	99.8381%

Source: ("Water Facts - Worldwide Water | Bureau of Reclamation," n.d.)

Objectives

A quantitative comparison of these three parameters

- Chlorophyll Concentration
- Turbidity
- Water Surface Temperature

before Lahore, within Lahore and after Lahore metropolitan.

Turbidity

The definition of Turbidity is the cloudiness or haziness of a fluid caused by suspended solids.

The measurement of Turbidity is an important test when trying to determine the quality of water.

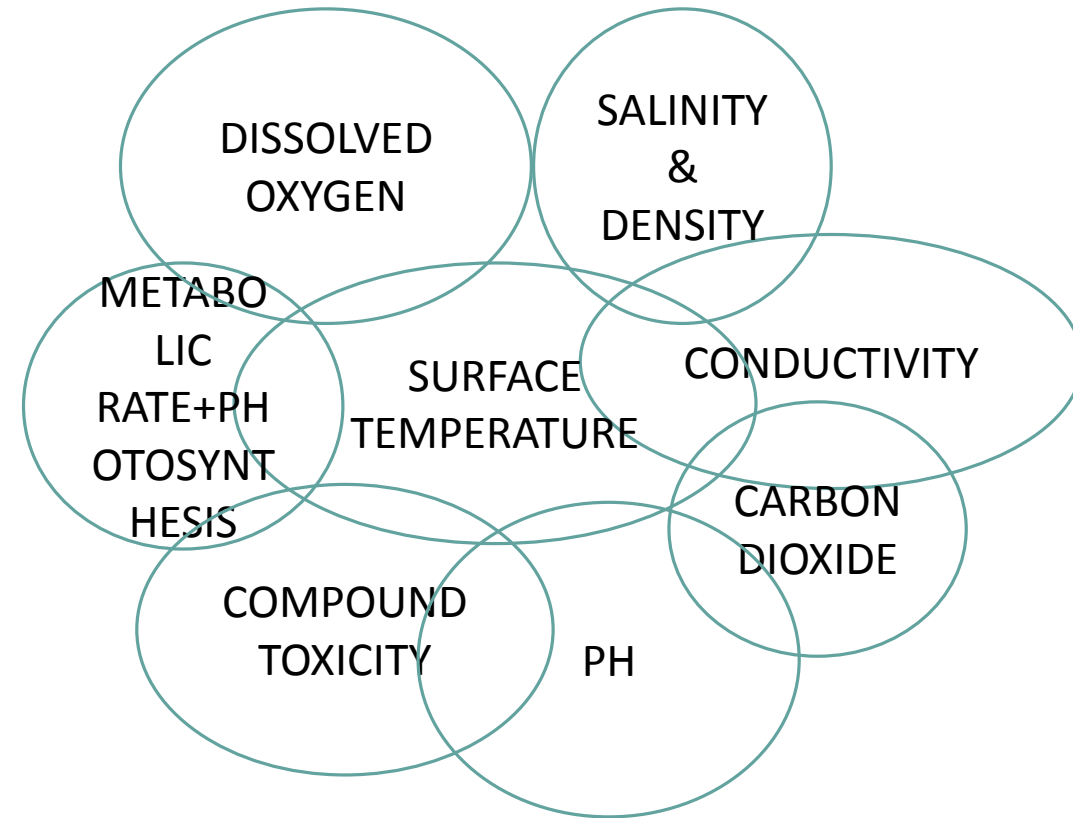
It is an aggregate optical property of the water and does not identify individual substances; it just says something is there.



Water Surface Temperature

Temperature influences several other parameters and can alter the physical and chemical properties of water

Water surface temperature is a key water body parameter as it characterizes the energy fluxes taking place within the water–atmosphere interface (Alcântara et al., 2010)



Chlorophyll

Chlorophyll is the pigment in all plants that makes them green

Chlorophyll is essential to the existence of phytoplankton. Phytoplankton can be used as an indicator organism for the health of a particular body of water.

Monitoring chlorophyll levels is a direct way of tracing algae growth.

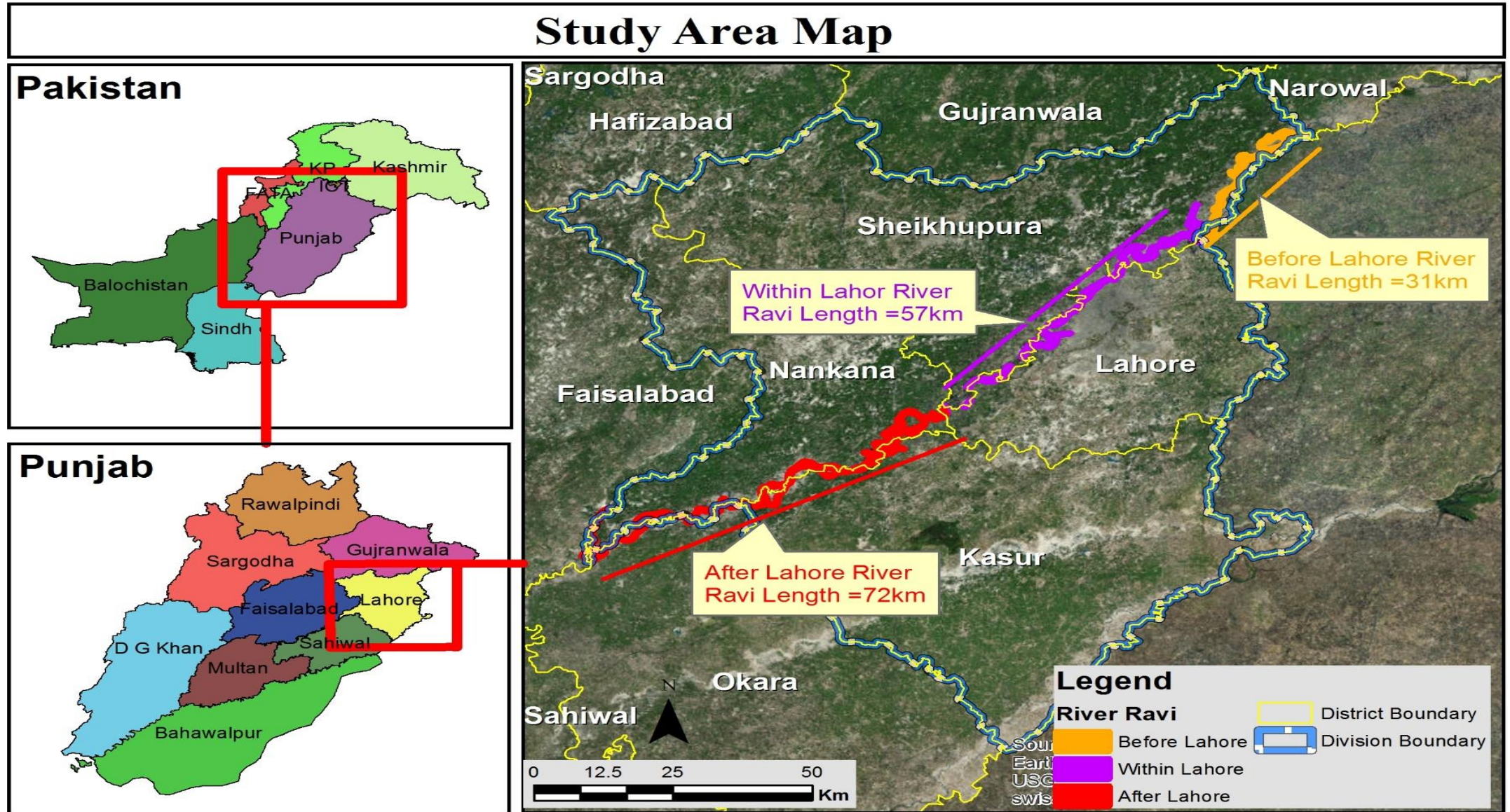
Rivers and streams are monitored for excessive growth of phytoplankton due to high concentrations of plant nutrients



Case Study Area

- Lahore is capital of Punjab province and largest city from five major cities of Pakistan. Lahore a metropolitan city is situated at 31.5204° N, 74.3587° E
- River Ravi has been serving Lahore since a long time ago before Lahore came into being. River Ravi is the smallest water catchment in comparison to other tributaries of Indus.
- River Ravi is approximately 720 kms in length including 320 kms in India and rest in Pakistan.
- River Ravi originates from Rohtang pass Idnia and enters through Pathankkot at Chaudh and forms a boundary between the state of Juamu and Kashmir for 23 miles. After crossing Gurdaspur District, it enters Shakrgarh Tehsil of Sialkot, Pakistan.
- The case study area is lying at 200 meters above mean sea level, with gradient of 1:3000 (JICA, 2010). Humidity level varies from 40% to 80% and average wind speed lies within 0.2 m/s to 1.5 m/s during the whole year (JICA, 2010).

Case Study Area Map



Methodology

- River Ravi has been selected as case study area to measure impact of Lahore over river Ravi in two different seasons 10 years span.
- Landsat 5 (TM) and Landsat 8 (OLI) products has been used for 2008-2009 and 2017-18 respectively.
- Three indices has been calculated for the estimation of three parameters.

Methodology

Normalized Difference Turbidity Index (NDTI) (Han & Jordan, 2005)

$$\text{NDTI} = \frac{\text{RED} - \text{GREEN}}{\text{RED} + \text{GREEN}}$$

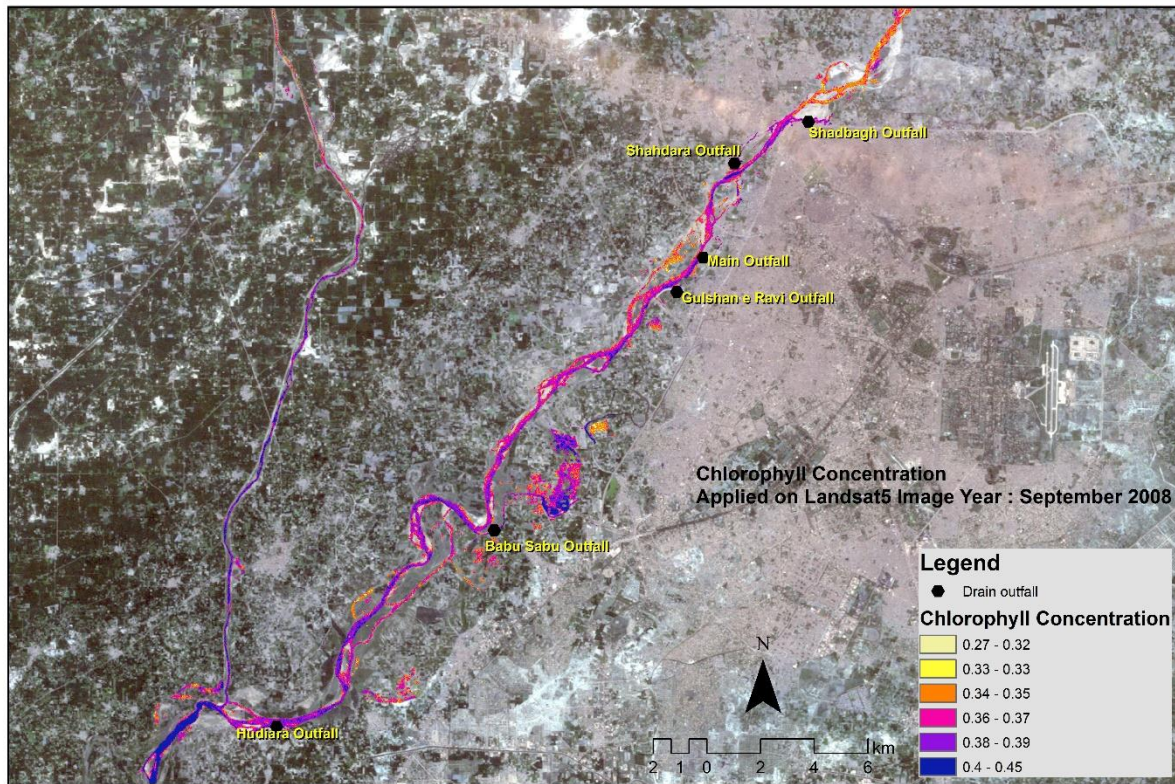
Normalized difference Chlorophyll Index (NDCI) (Mishra, 2014)

$$\text{Chlorophyll Concentration} = \frac{\text{BLUE}}{\text{RED}}$$

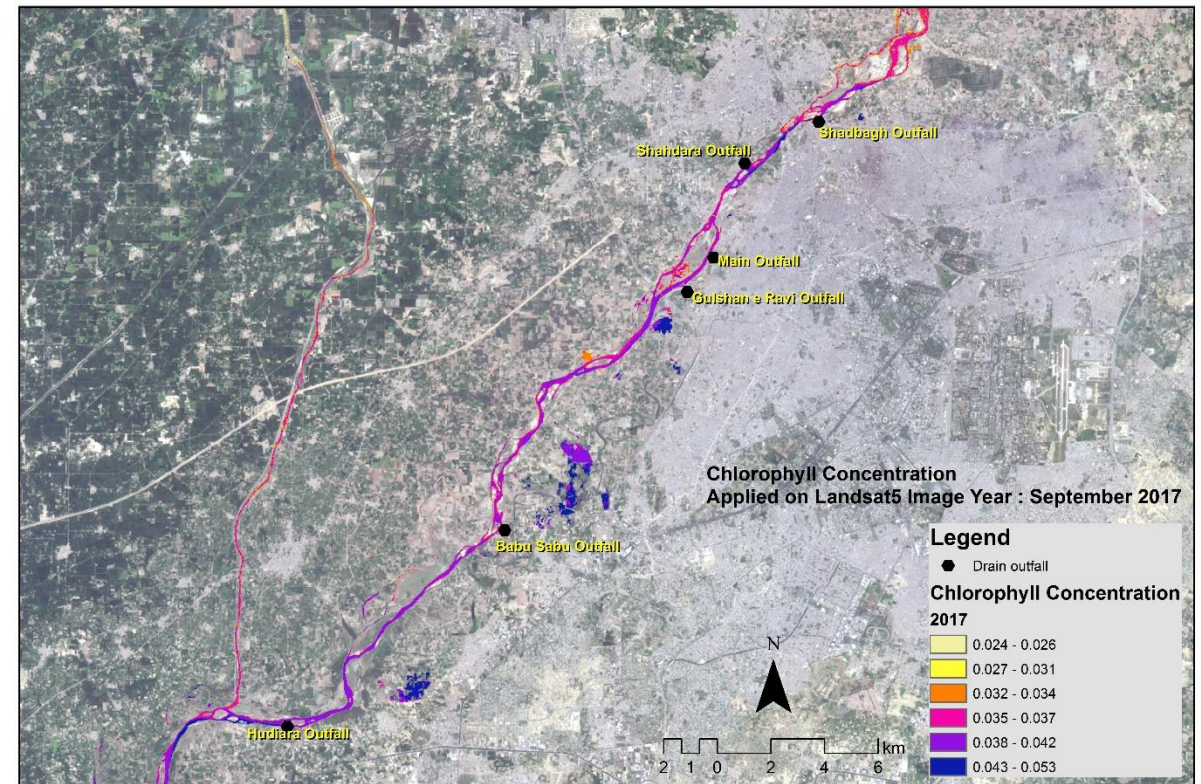
Water Surface Temperature (Chander, Markham, & Helder, 2009)

Results

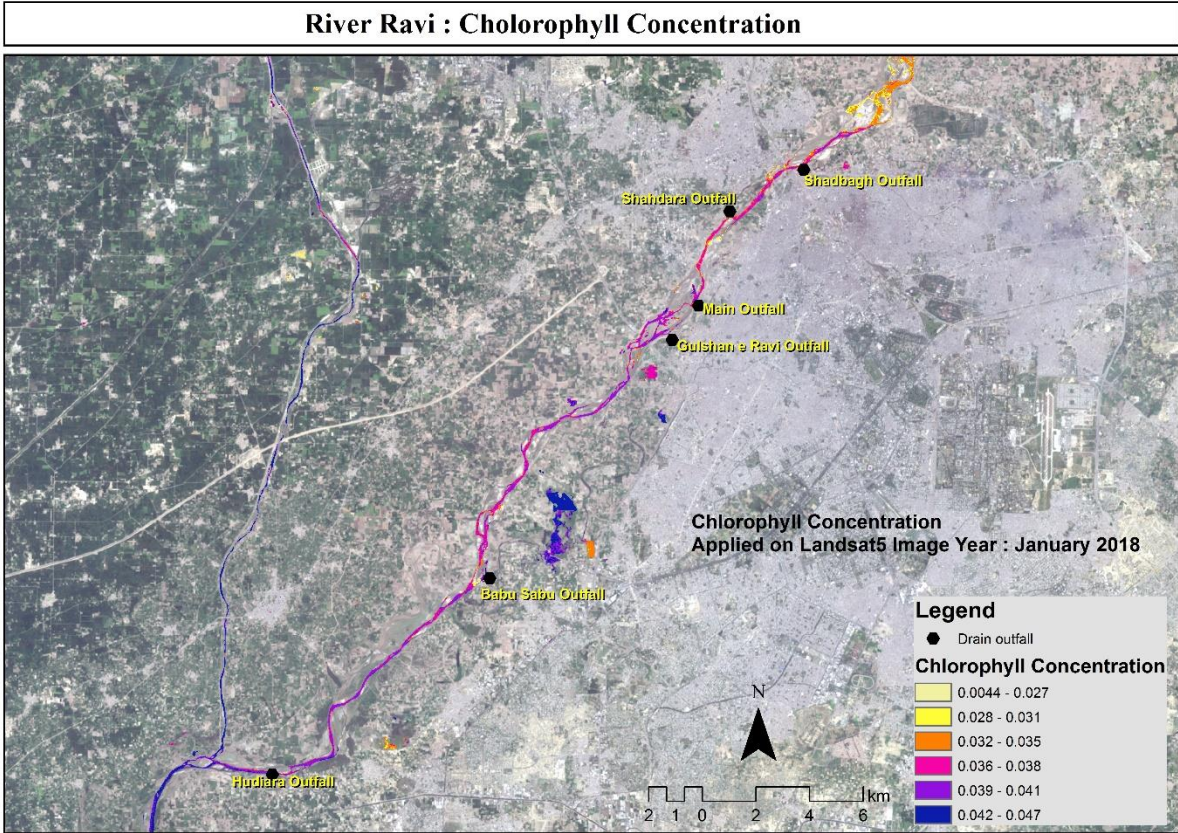
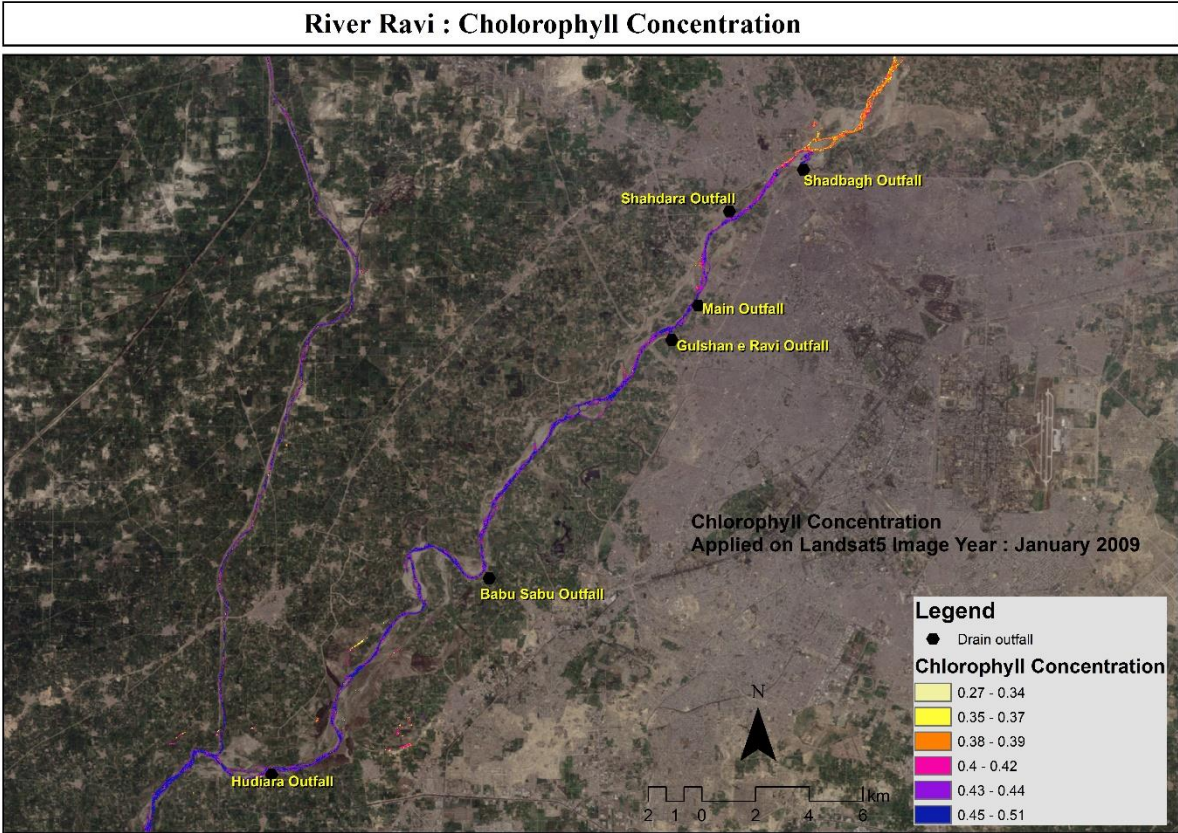
River Ravi : Chlorophyll Concentration



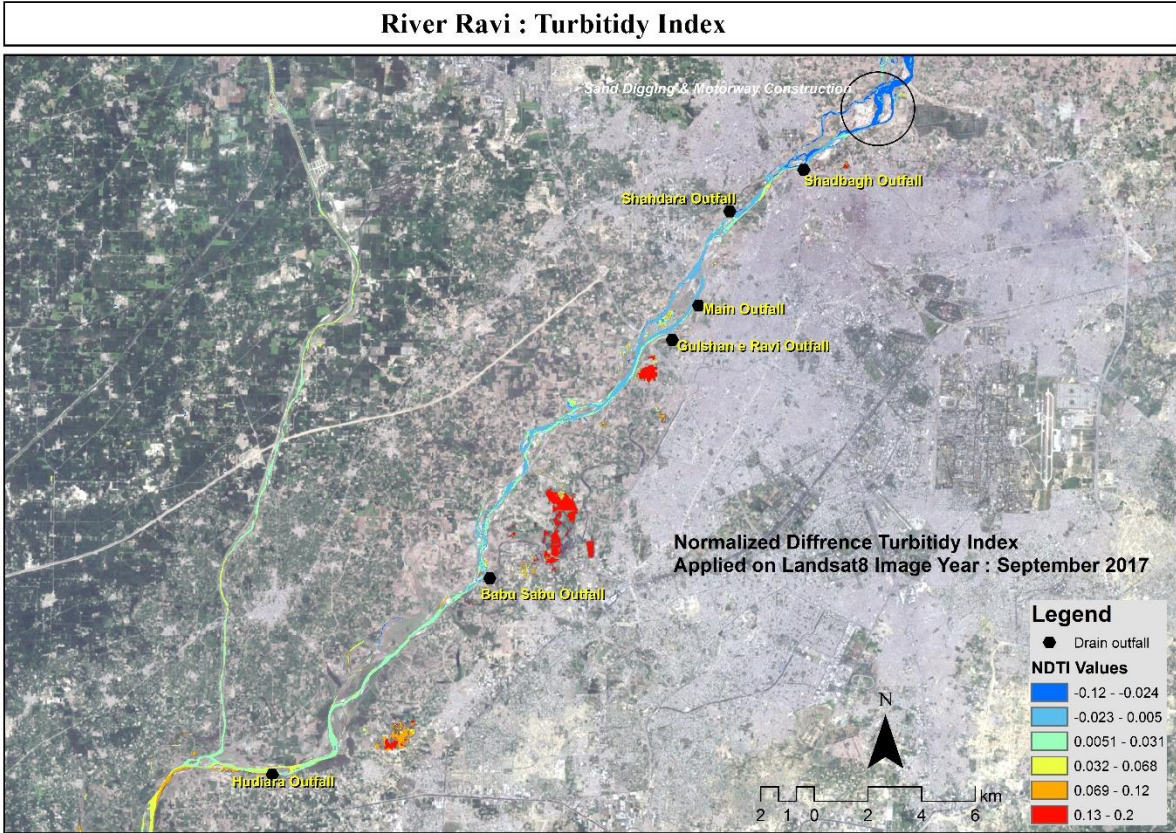
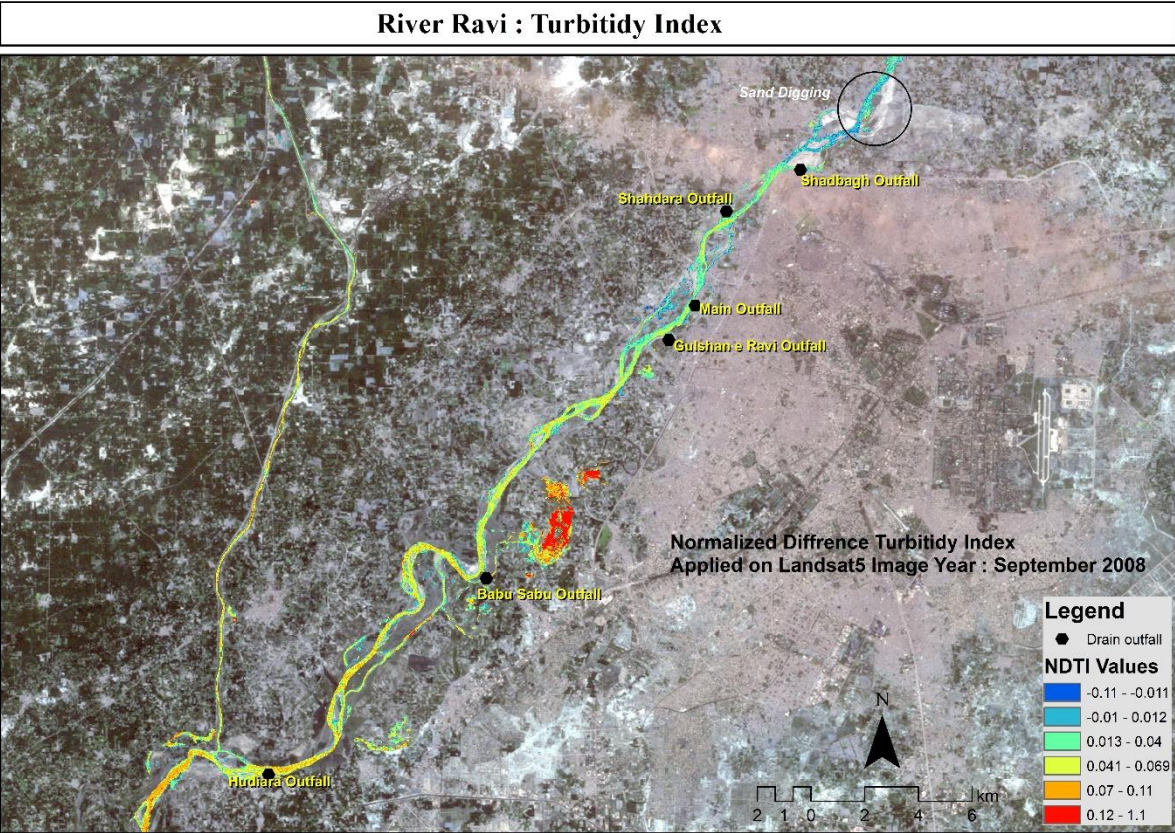
River Ravi : Chlorophyll Concentration



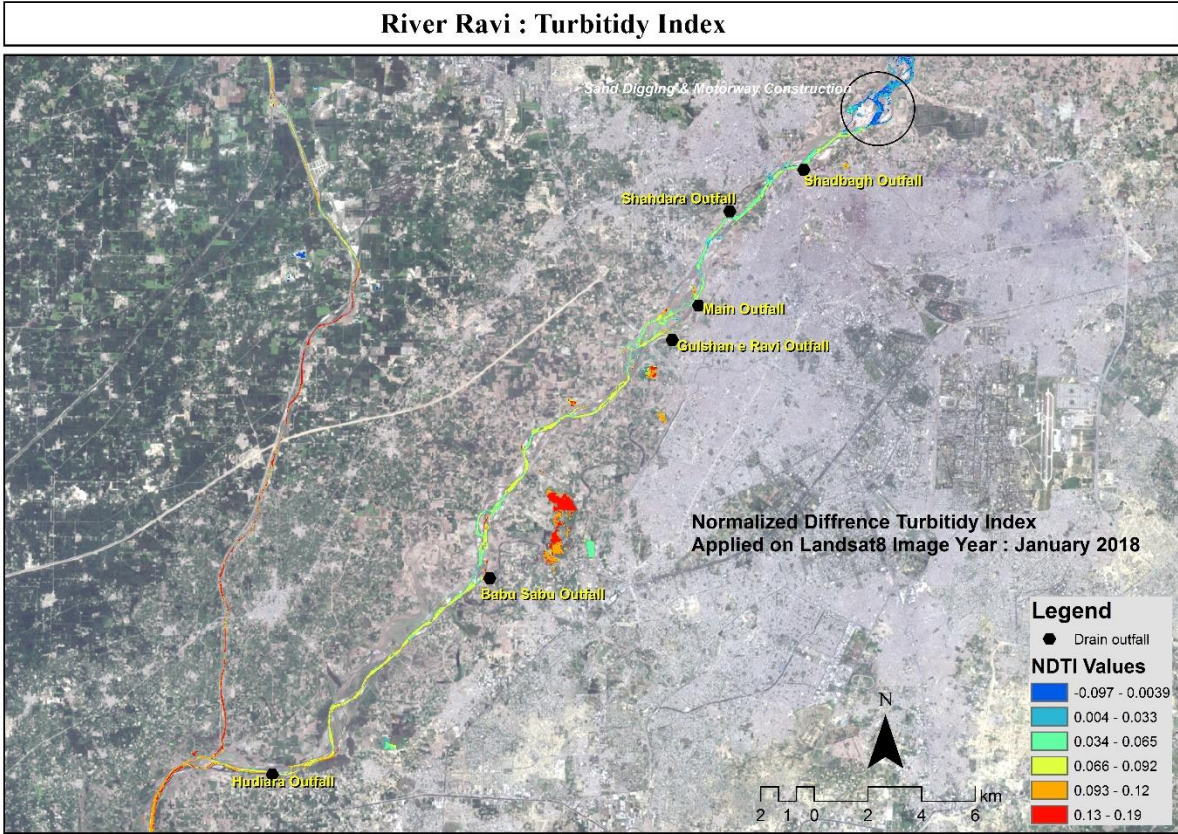
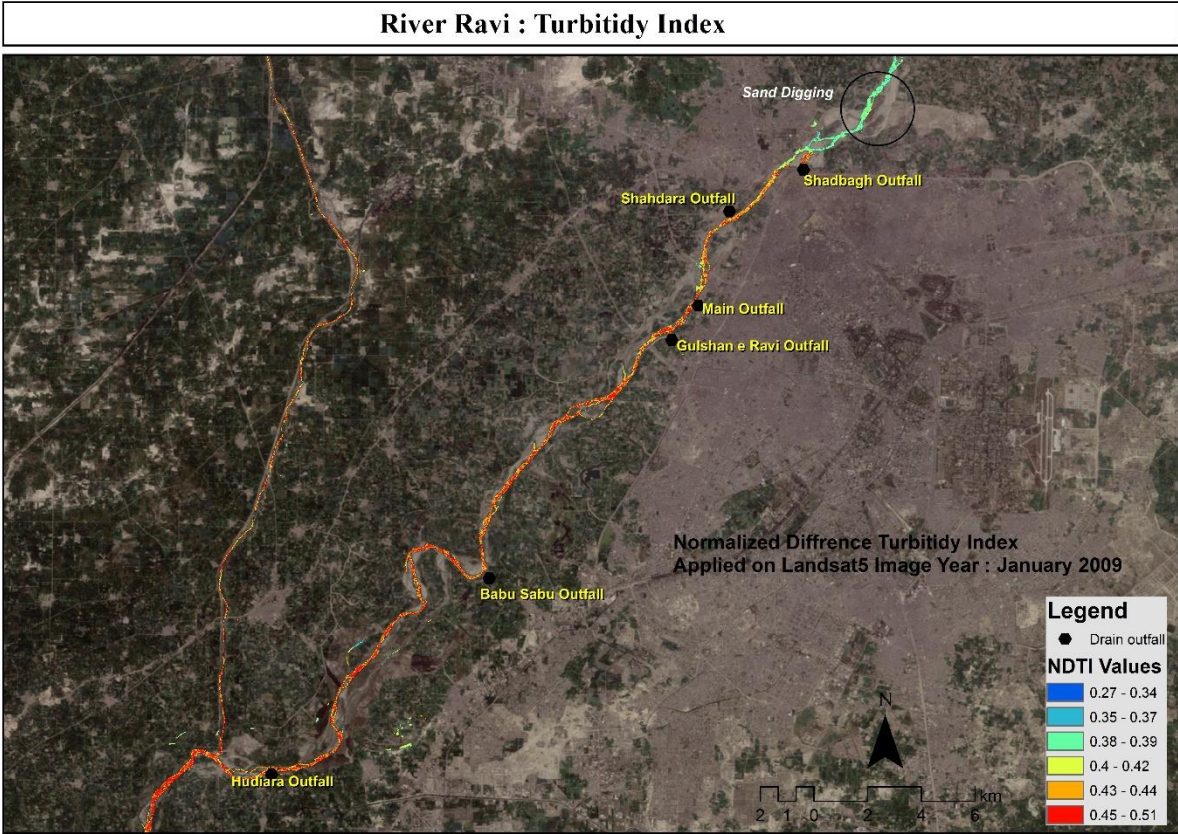
Results



Results

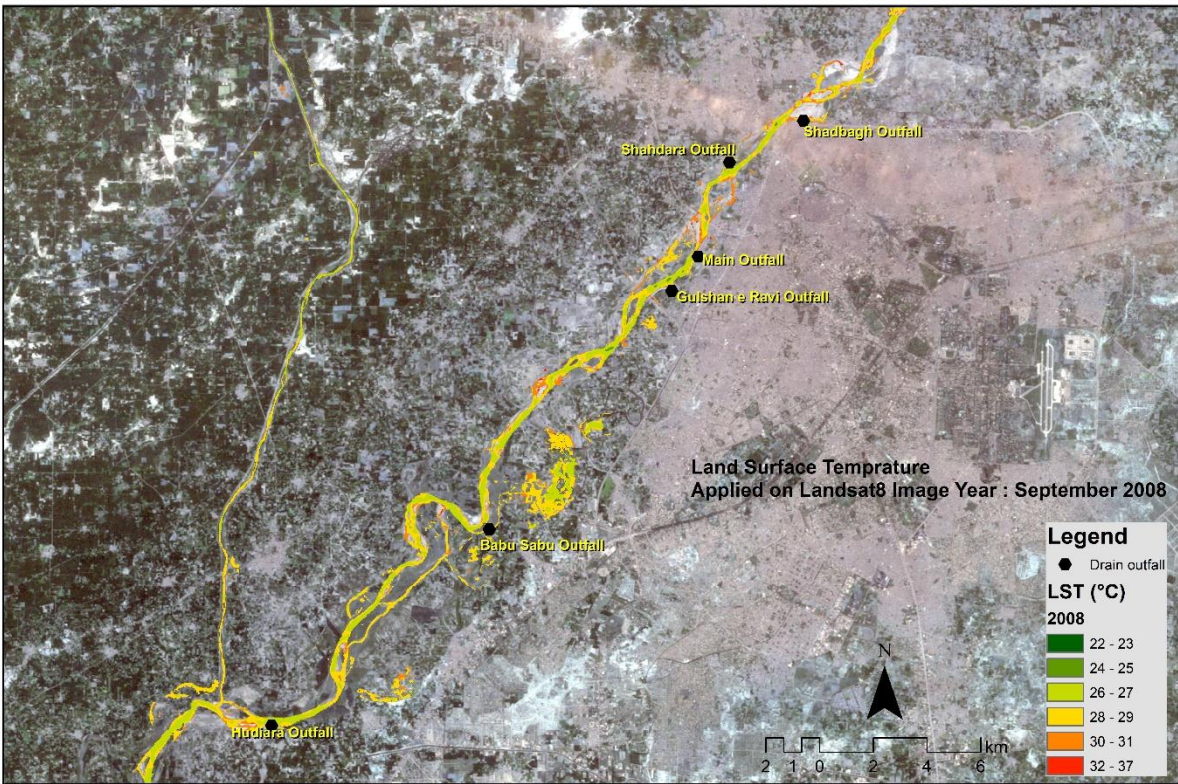


Results

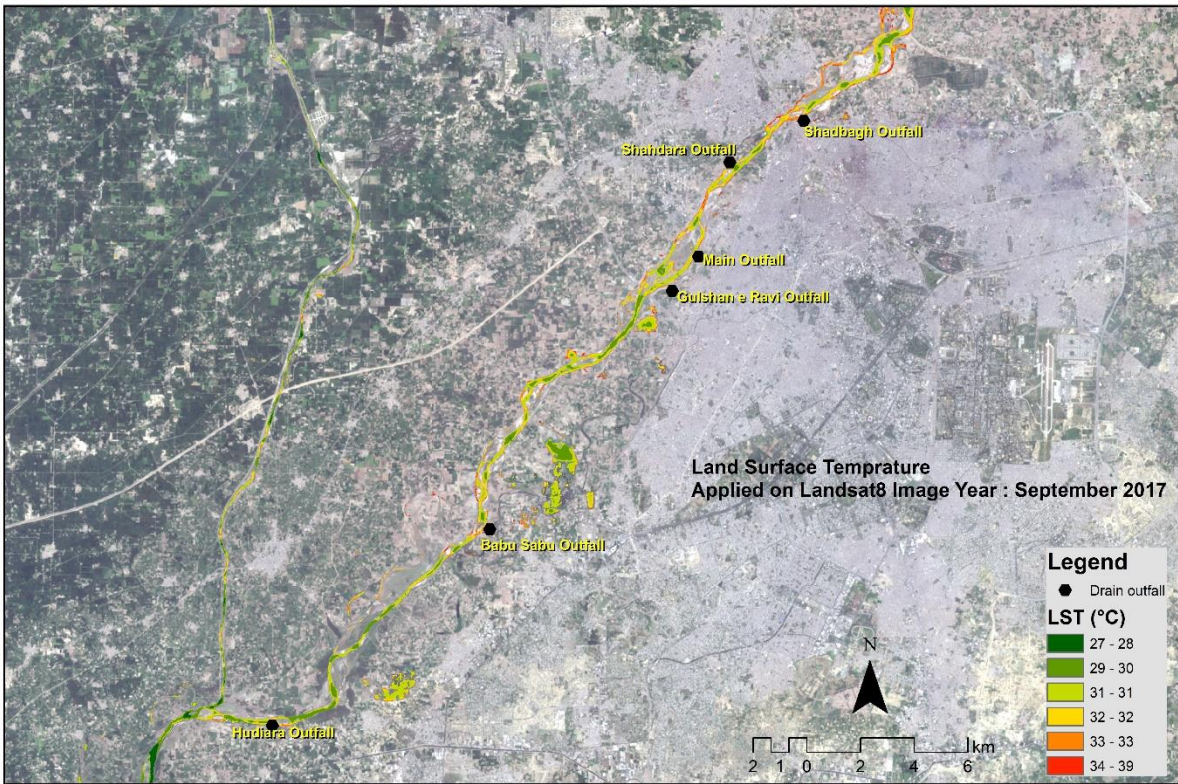


Results

River Ravi : Land Surface Temperature

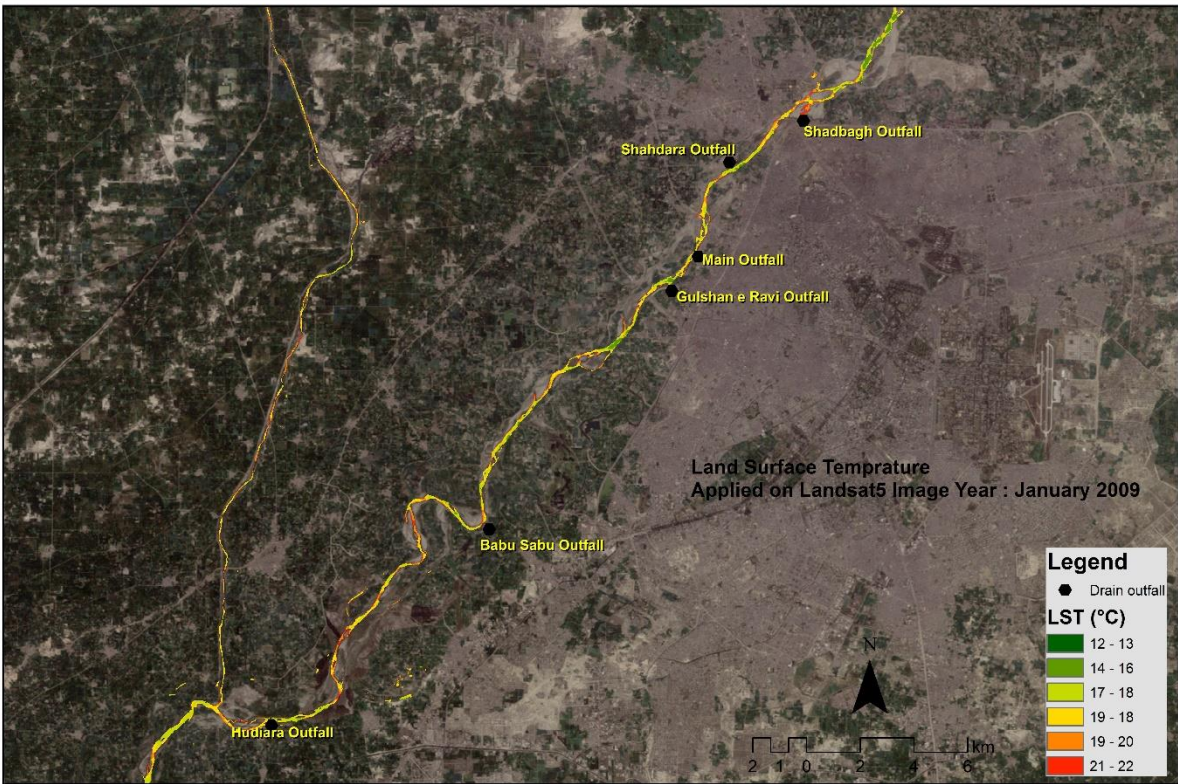


River Ravi : Land Surface Temperature

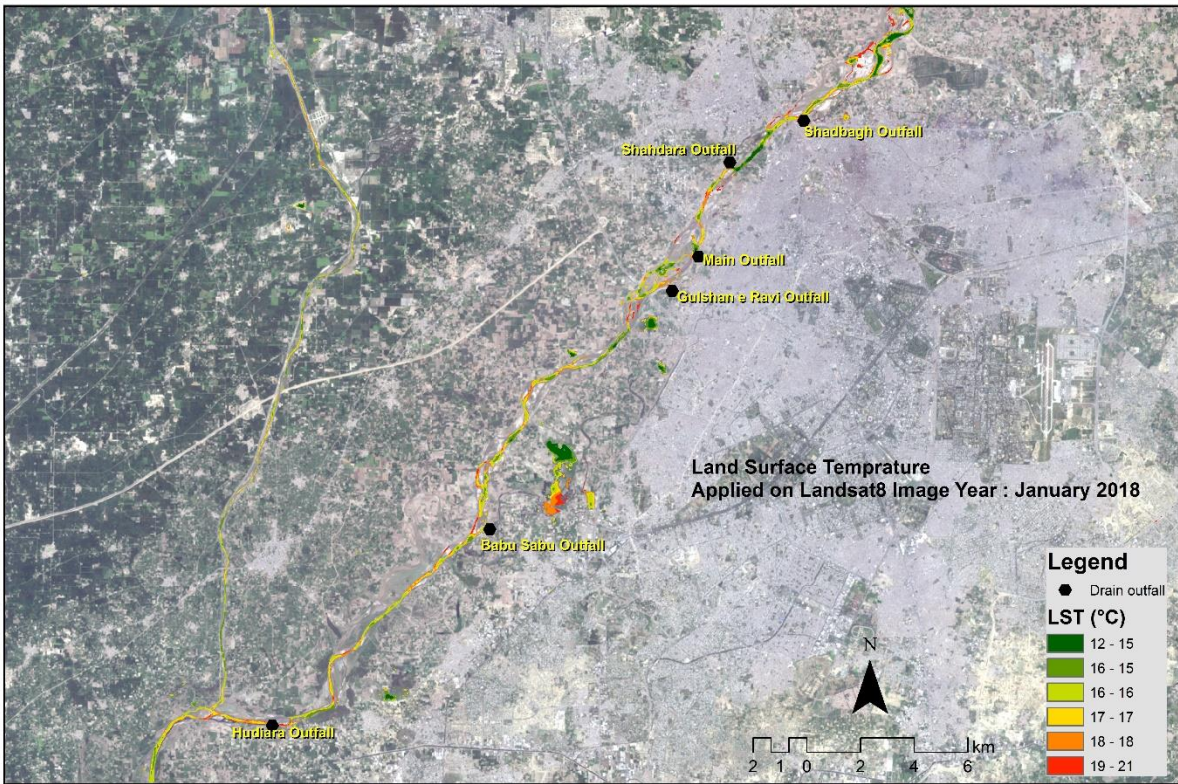


Results

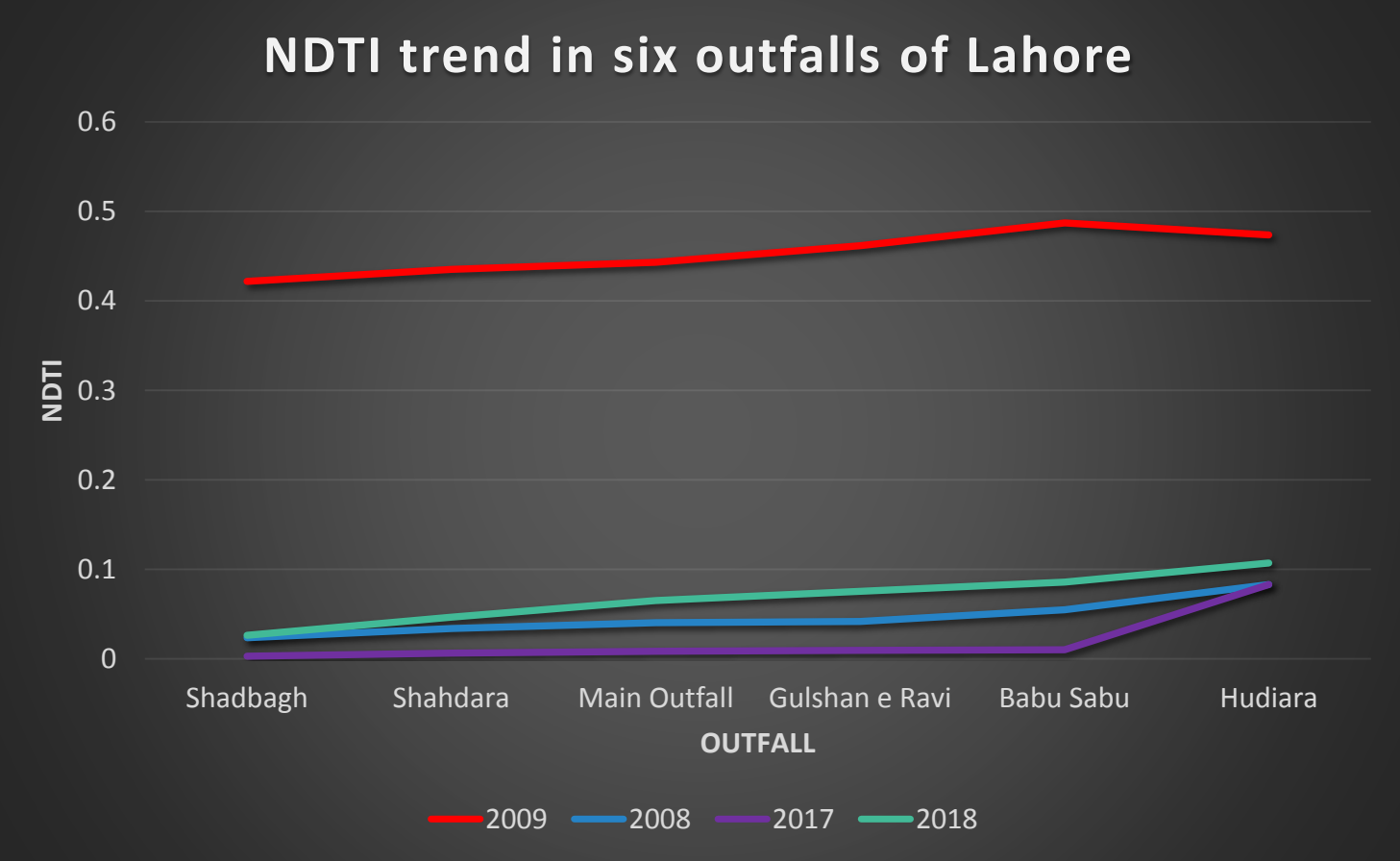
River Ravi : Land Surface Temperature



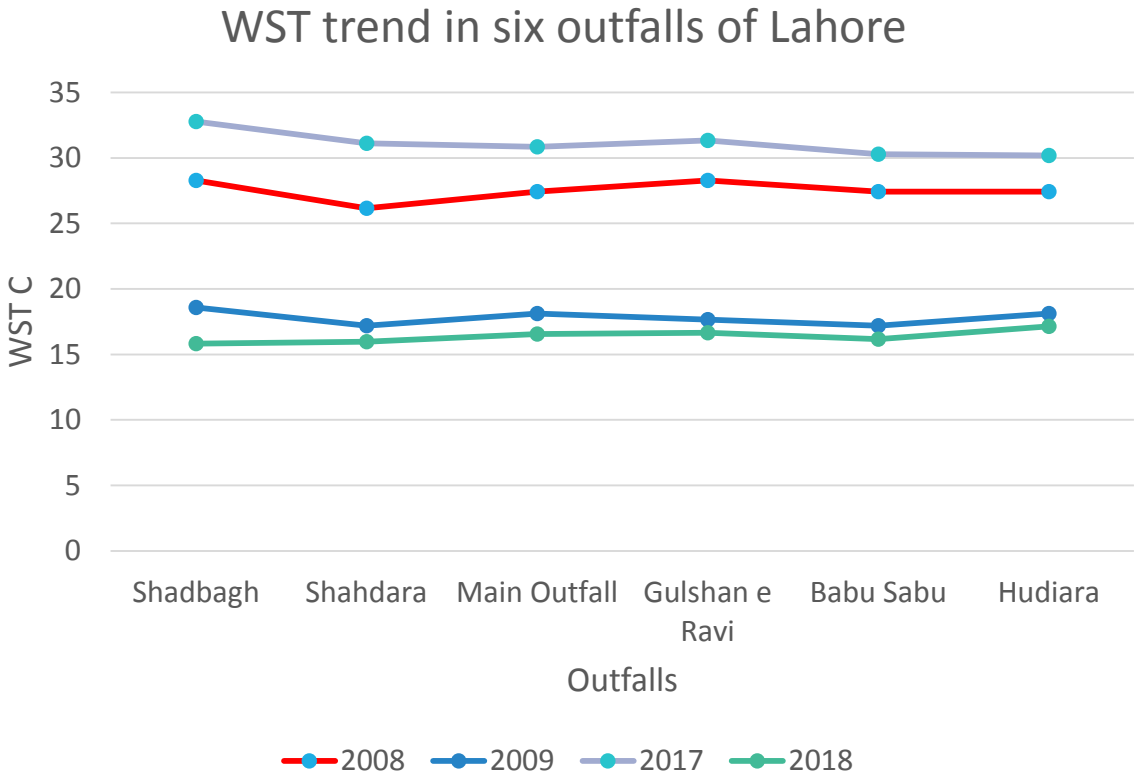
River Ravi : Land Surface Temperature



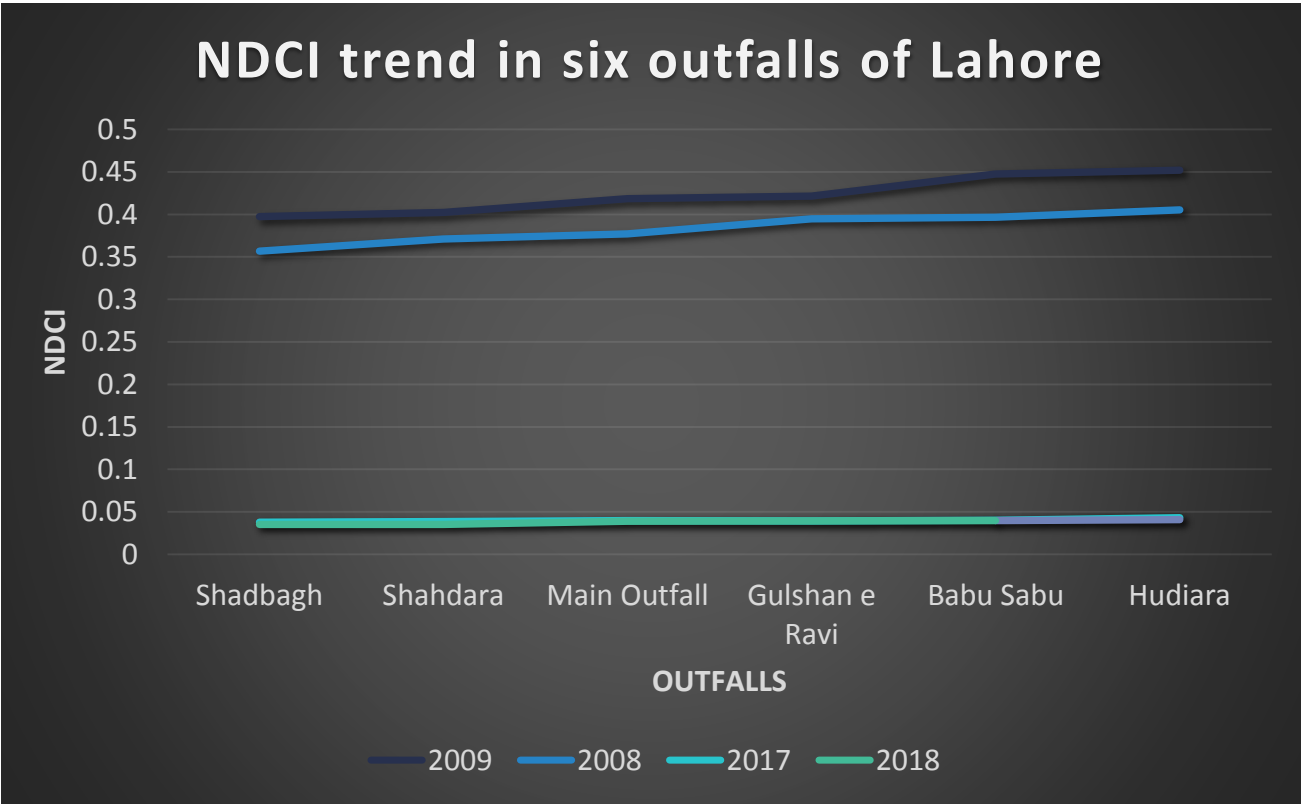
Results



Results



Results



Discussion

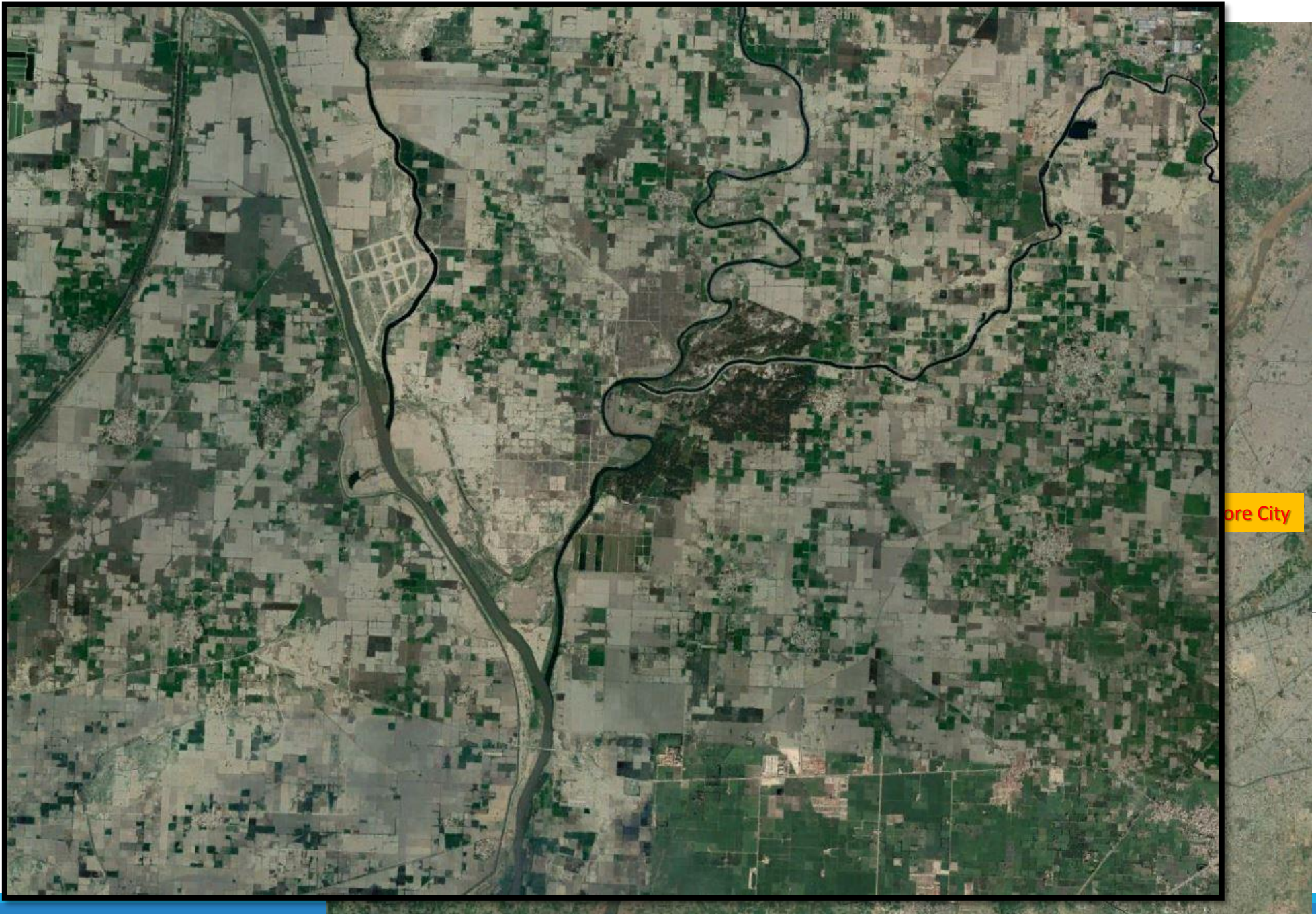
- The evolution of human civilization is associated with rivers and its adjoining fertile flood plains. However, a dynamic shift in human civilizations resulted in variation of water use patterns along with unavoidable discharge of sewage and solid wastes into water bodies (Song & Kim, 2010).
- Similar is the case of River Ravi, which is significantly polluted due to excessive **discharge of untreated sewage and waste water released from Lahore** and its associated industrial estates (Ahmed & Ali, 1998) through **six wastewater drain outfalls** and a surface drain (WWF, 2007).
- This discharge is estimated to be **40 m³/s**, which would be increased approximately to 56 m³/s by 2025 (Haider, 2010).

Discussion



Discussion





ore City

Conclusion & Recommendations

- there should be regulations or bye laws relevant to treatment over discharge of waste water
- It will also remove the waste water flow into the river Ravi through development of new strategies in form of plans and policies which will be part of comprehensive master plan.
- Although the bacteria in river water cause communicable diseases using water for drinking and irrigation purposes, which is due to waste water sources attached to the river Ravi.
- Plan of river Ravi front project, Plan is in active flood plan area

Conclusion & Recommendations

- Hudiyara drain mixes at Head Works , it a danger to eco system
- Strategy for heritage site
- Mining should be planned

References

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Thank You