

Presented at the FIG Regional Conference 2024,  
14-16 November 2024 in Kathmandu, Nepal

# Land Rights, Digital Governance, and Disaster Preparedness: A Case Study of PULSE Implementation in Punjab

FIG Nepal - 2024



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# Punjab Urban Land Systems Enhancement

The PULSE Project in Punjab digitizes land records using GIS and satellite imagery for accurate cadastral mapping. By incorporating historical hazard data, PULSE proactively identifies vulnerable areas and communities, impacts, and facilitates fair compensation following events. This system strengthens land governance, improves disaster resilience, and supports proactive disaster mitigation across the province.

**Project Director**

Ikram-Ul-Haq



# PULSE Project Objectives

**Provision of a parcel map linked to the land records**



**Improved access to land for urban development**



**Unified Land Information System**



**Improved land and property registries**

# Punjab Land Records Authority

**200+**  
Land Record Centers



**27**  
Million Owners Record

**6000+**  
Village Level Land  
Record Centers



**48.5**  
Million Land Parcels

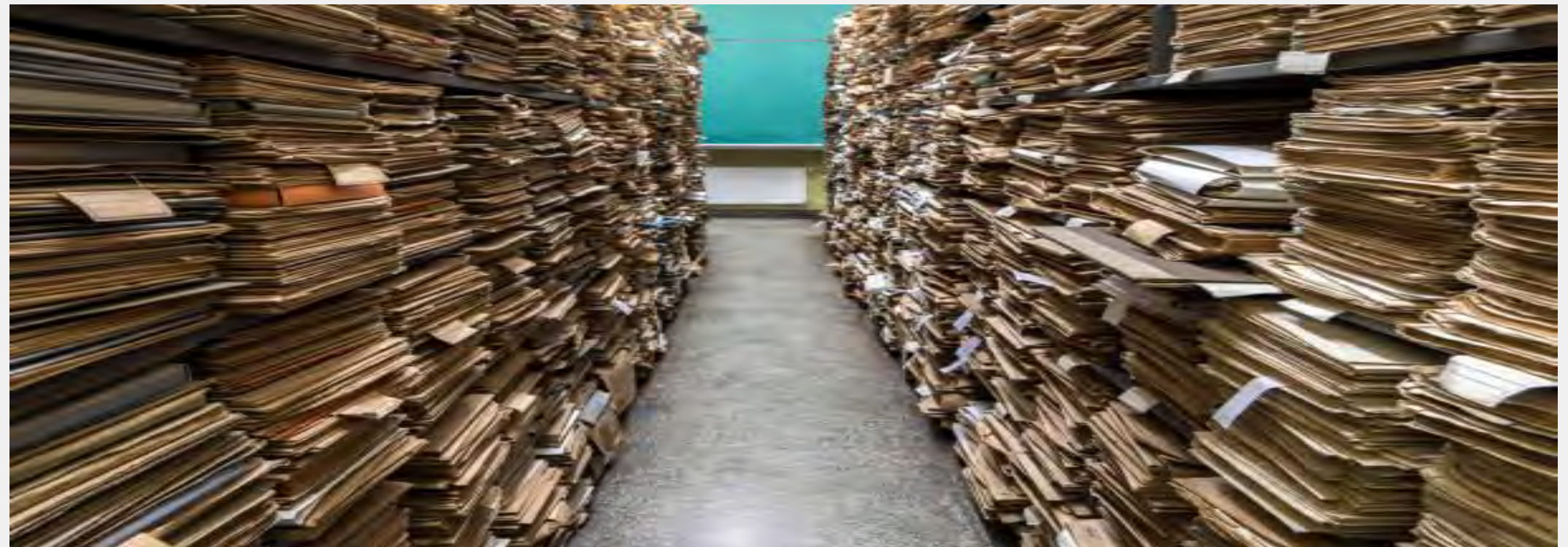
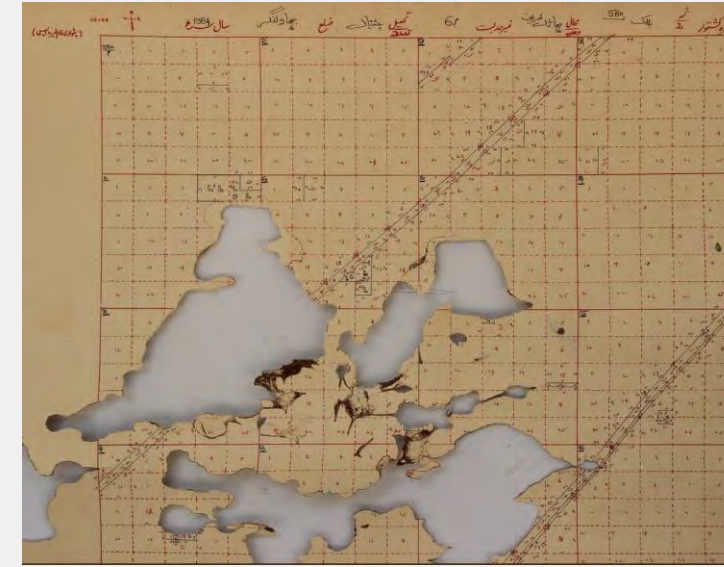
**24/7**  
Online Access



**22**  
Million Tenant Record

# KEY CHALLENGES

- **Outdated manual cadastral maps**
- **Significant mis-match between textual records and actual ground realities**
- **Missing/damaged *Massavi* maps**



# Digitalization Process

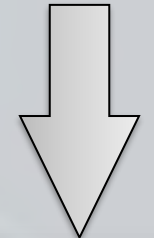
Step -1  
Collection of Maps



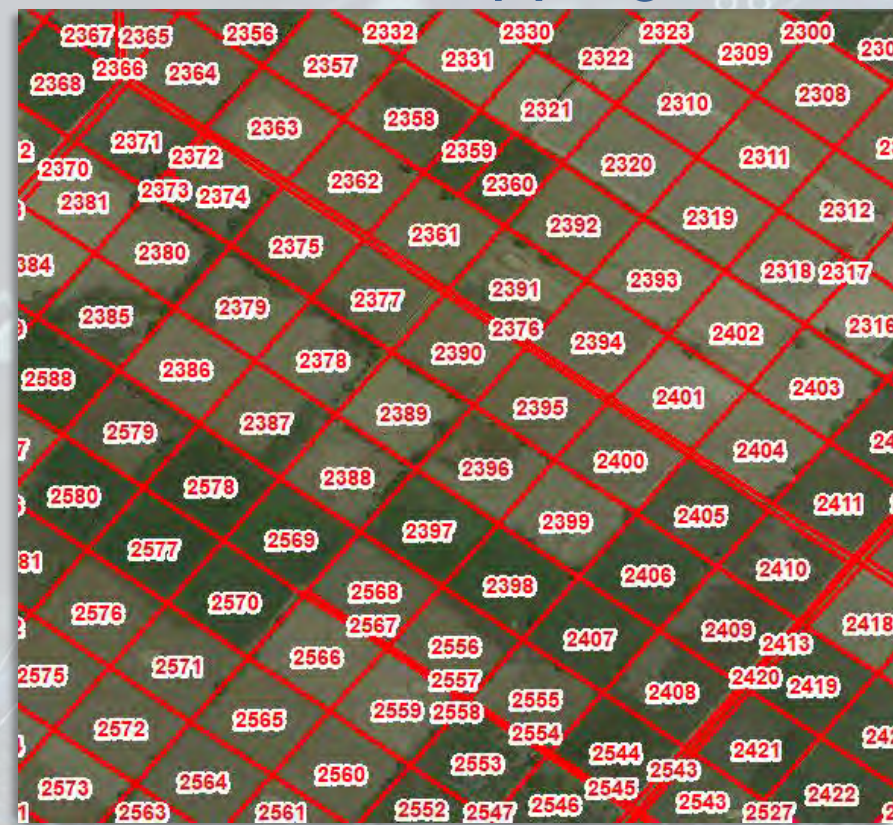
Step -2  
Scanning of Maps



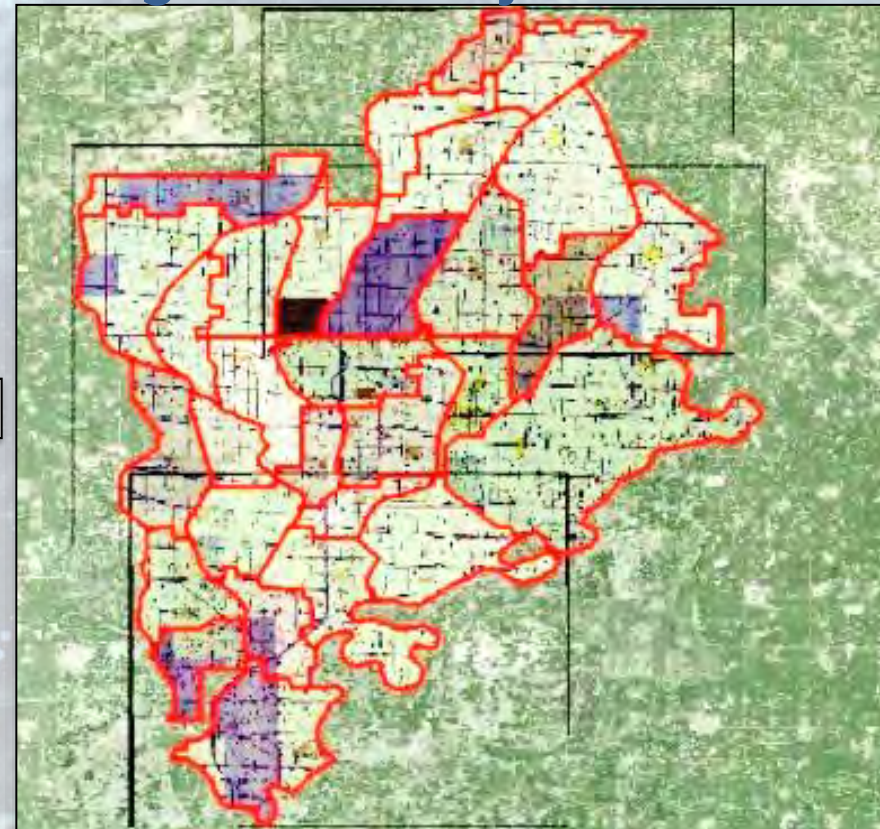
Step -3  
Stitching of Maps



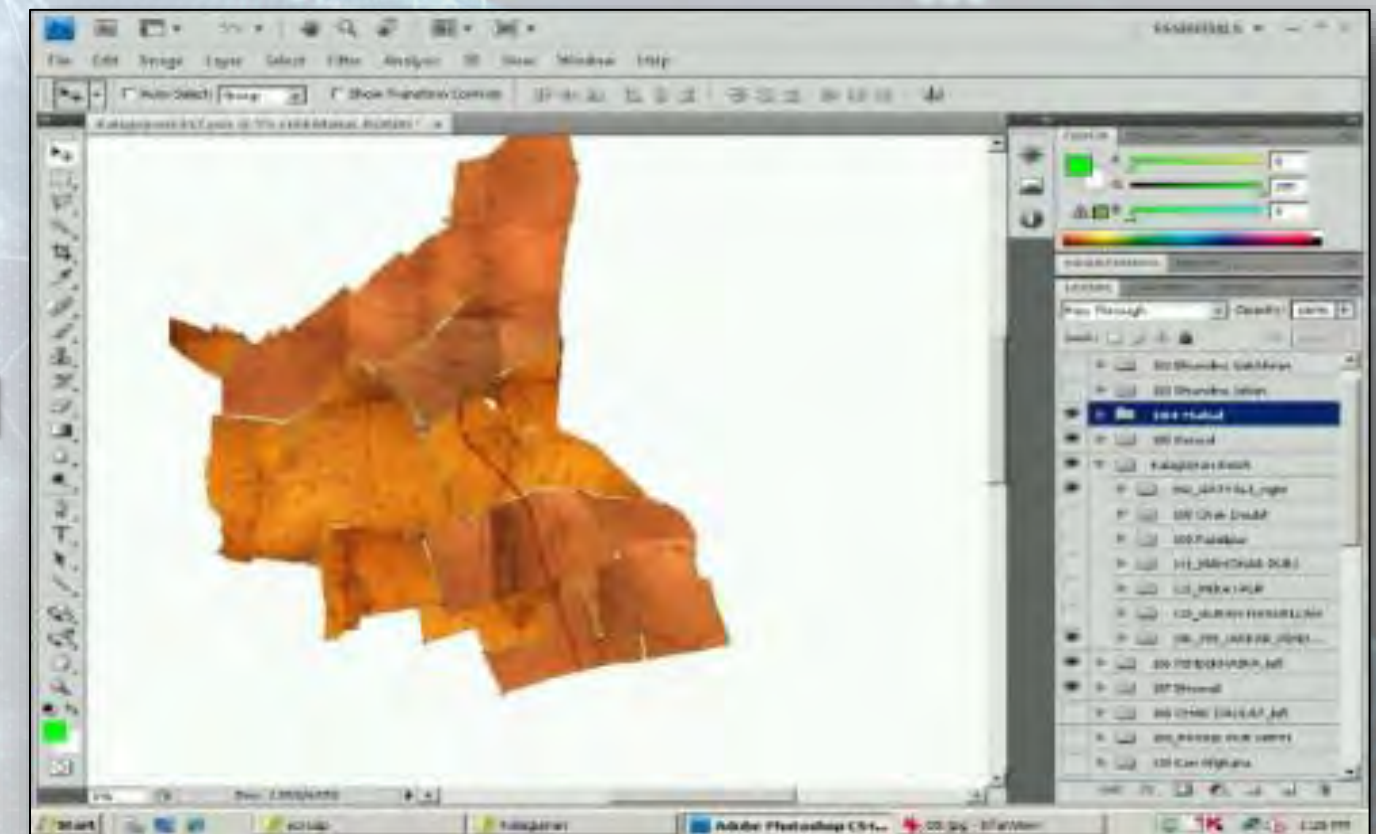
Step -6  
Land Parcel Mapping



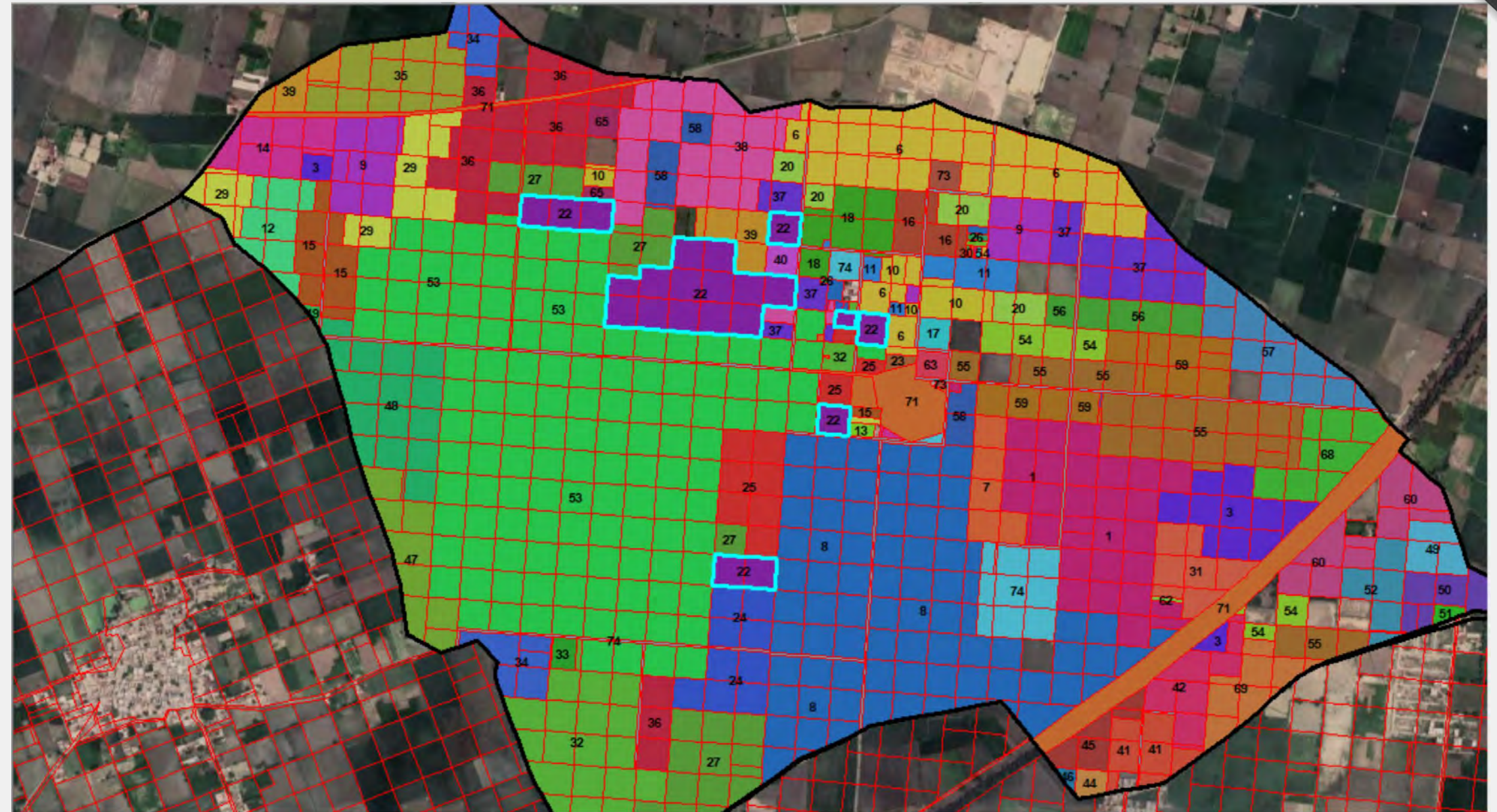
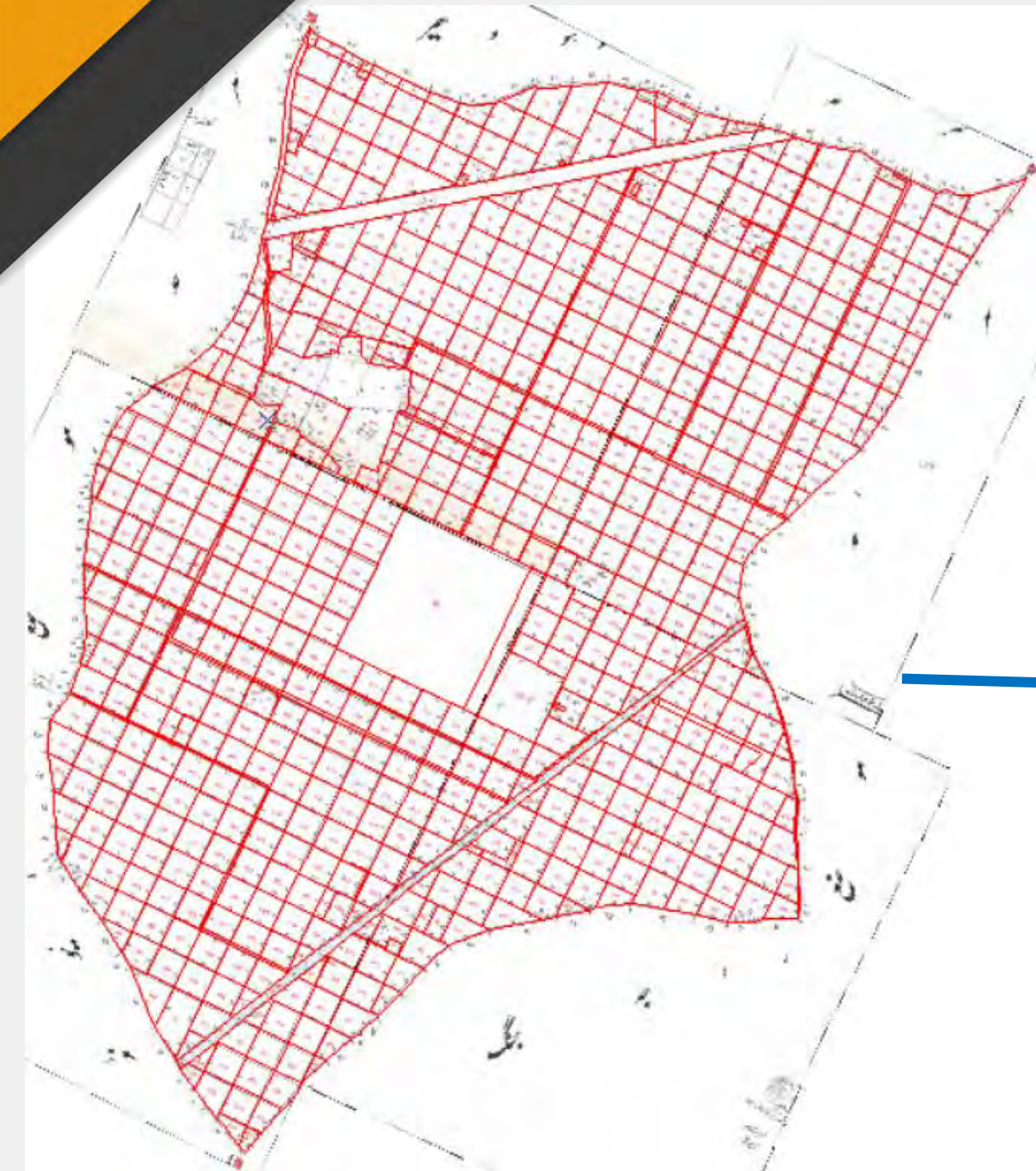
Step -5  
Village Boundary Delineation



Step -4  
Mosaicking and Geo-referencing



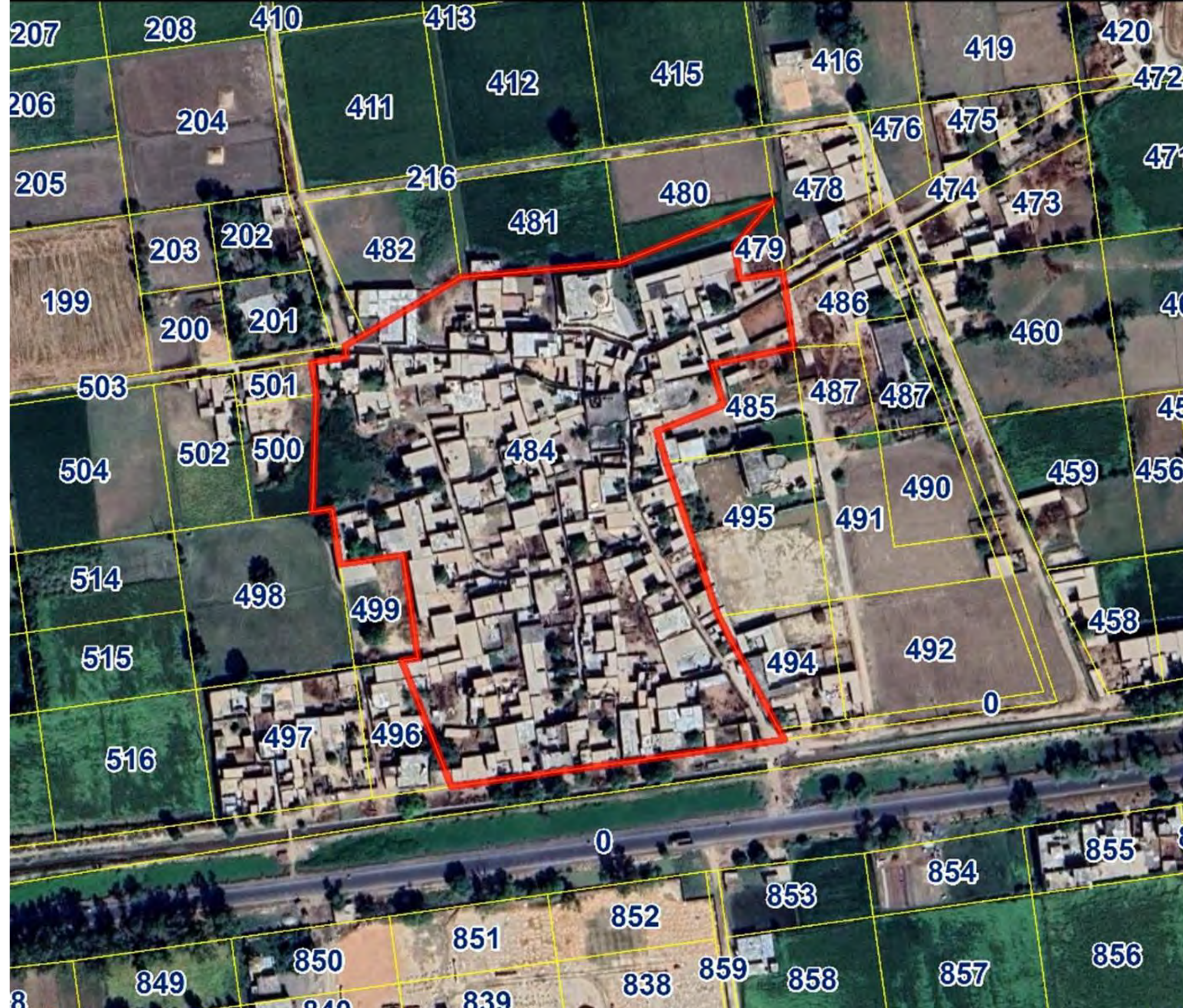
# Post Digital Mapping Challenges



- ***Khewat* (sum of parcels) based/land landowners-based system**
- **Every owner in the *khewat* is proportionate owner in each parcel**
- **No confirmation of possession of land**
- **Absent landowners**

# Cadastral Mapping

- Provides precise mapping of complete land parcels
- Facilitates land ownership verification, transfers, and legal clarity.
- Essential for disaster response, property taxation, and urban planning.
- GIS and satellite imagery offer precise boundary demarcations.
- Enables data overlay with historical and environmental datasets for advanced analysis.





# Geodetic Control Network

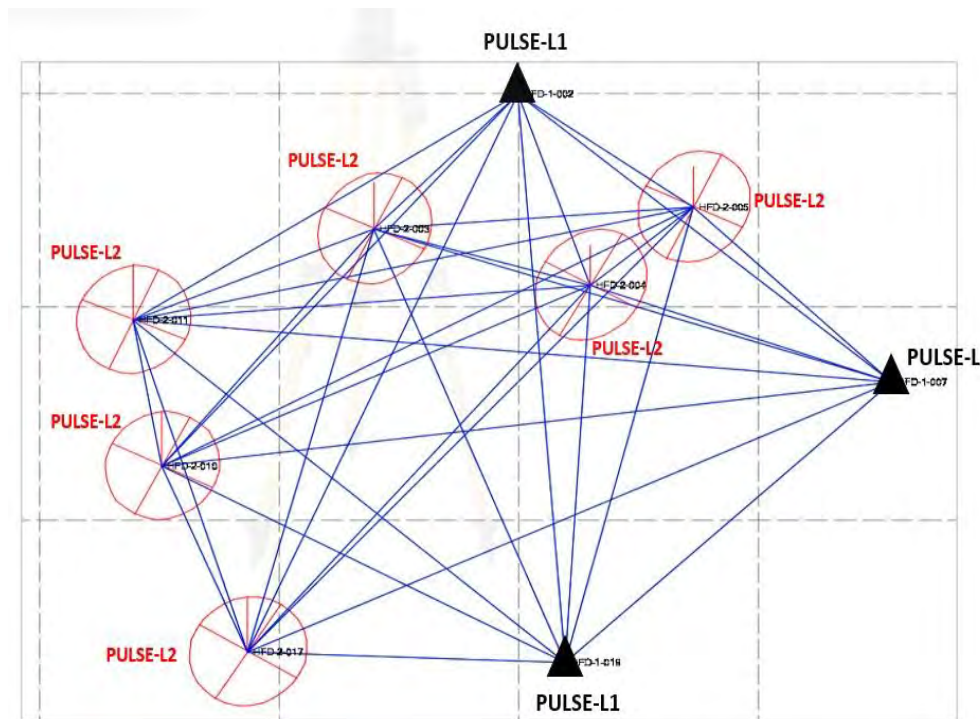
## Brief

Total Area of the Punjab	205,344 km <sup>2</sup>
Total Monuments	1994
No. of Monuments Installed	1994
No. of Level-1 Monuments	142 @ 20 to 25 Kms
No. of Level-2 Monuments	1852 @ 10 to 12 Kms

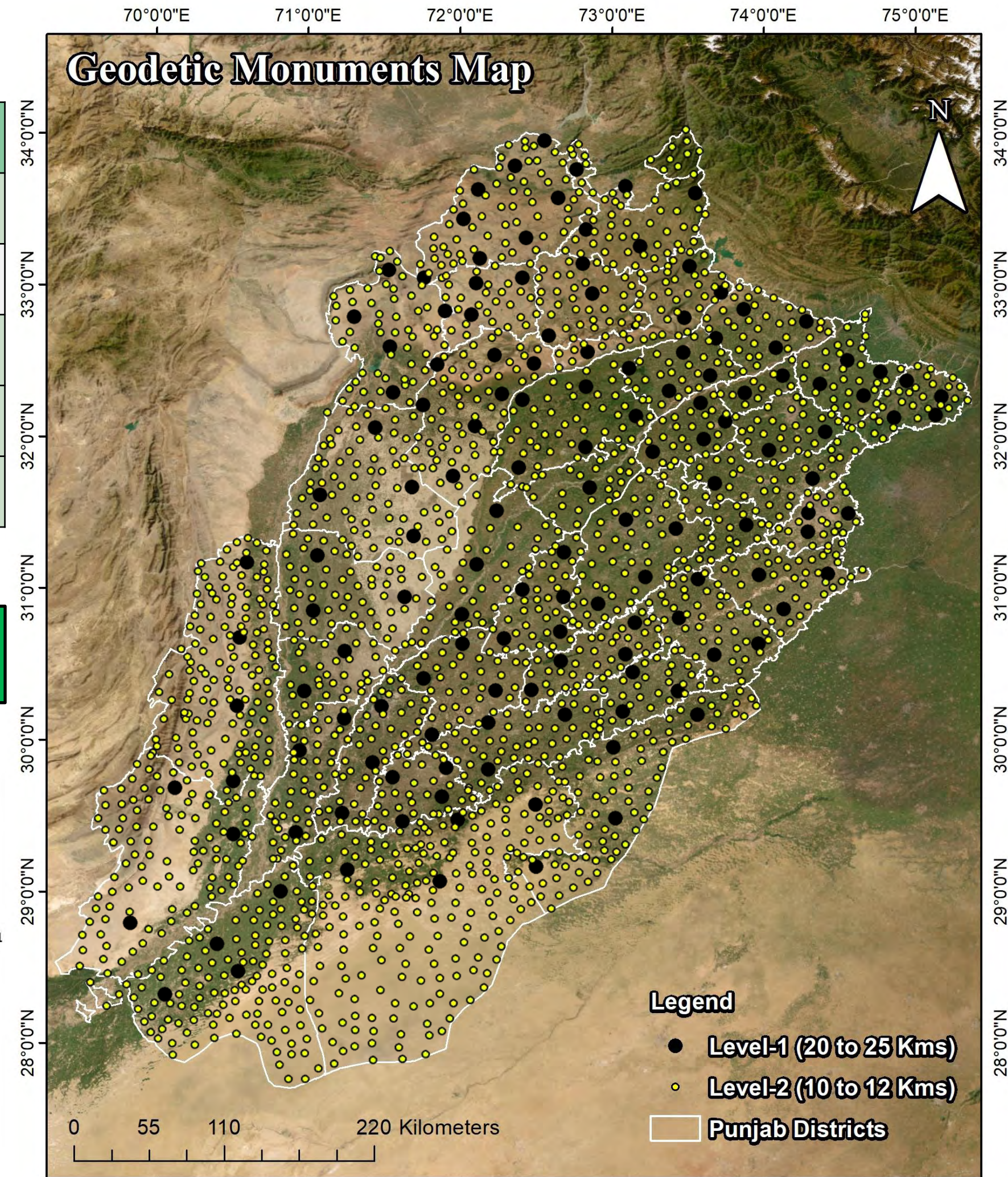
## Observation Scheme



Level-1 Monument




Observation scheme



# The Ultimate Goal

- Parcel Based system
- Digitally Verifiable
- Linked with Cadastral map
- Unified ownership document
- One stop shop
- Universal software application



## Parcel Document

MDT-JHT-0CC-001-0012-0000  
PARCEL ID



Property Address: 12, CivicCenter, Phase-I, M.A JOHAR TOWN

Parcel Area: 1 Kanal 0 Marla 0 Feet  
Covered area: \_\_\_\_\_

North side: No Data Available  
East side: No Data Available

South side: No Data Available  
West side: No Data Available

Nature of use: Commercial  
Department/Agency: Board of Revenue Punjab

Occupant Name: Zahid  
Occupant CNIC: 3420258793841

Transfer Date: 2024-03-25  
Status: Clear



<https://lda.pulse.gop.pk>  
Scan QR code to verify document authenticity

### Owner's Information

(Total Number of Owners: 1) مالک کی معلومات

Sr.	Name	Father/Husband Name	CNIC	Area as per share (K-M-Ft)	Picture
1	Zahid	Rashid	3420258793841	1 - 0 - 0	

Showing 1 to 1 of 1 entries

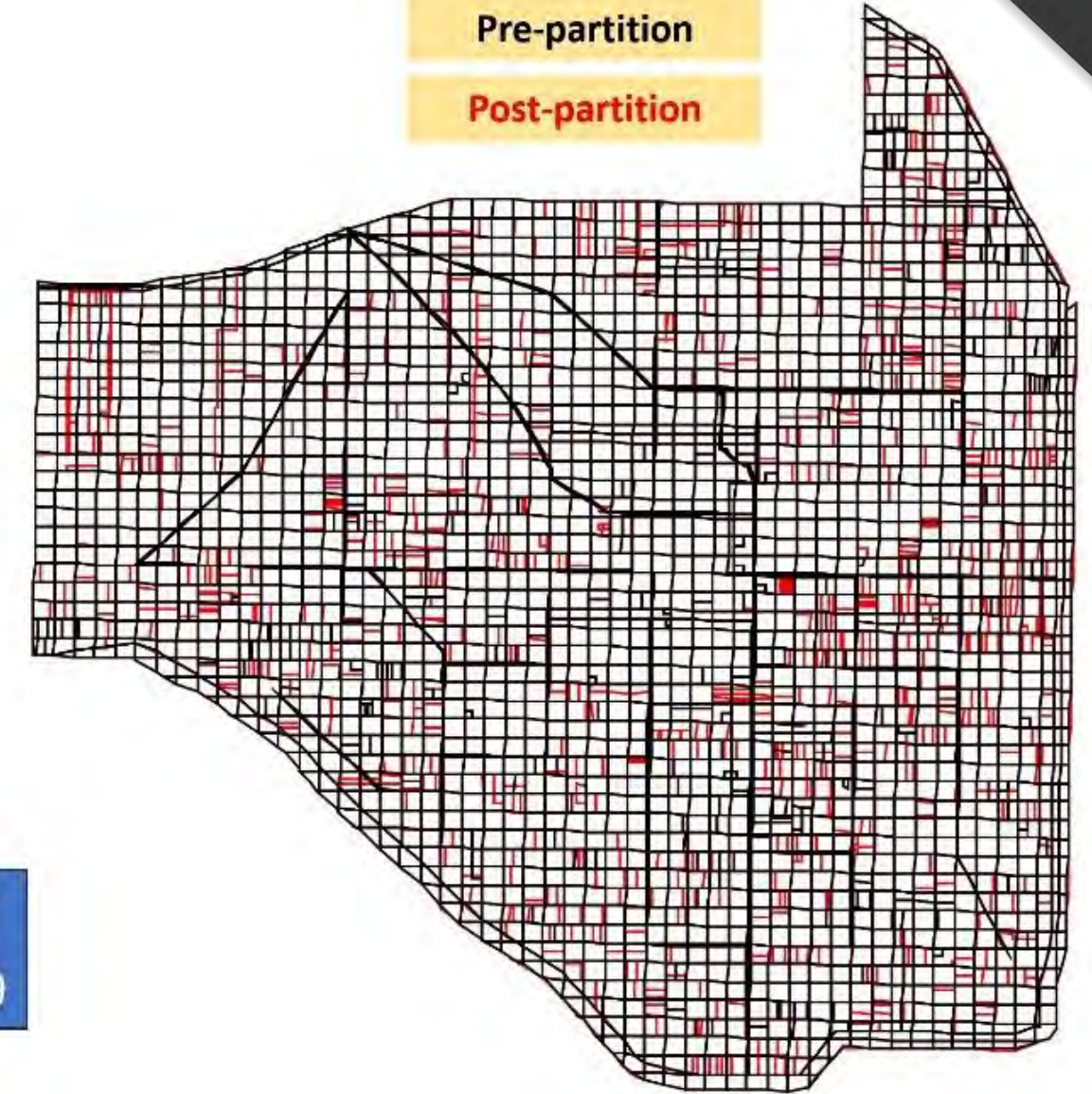
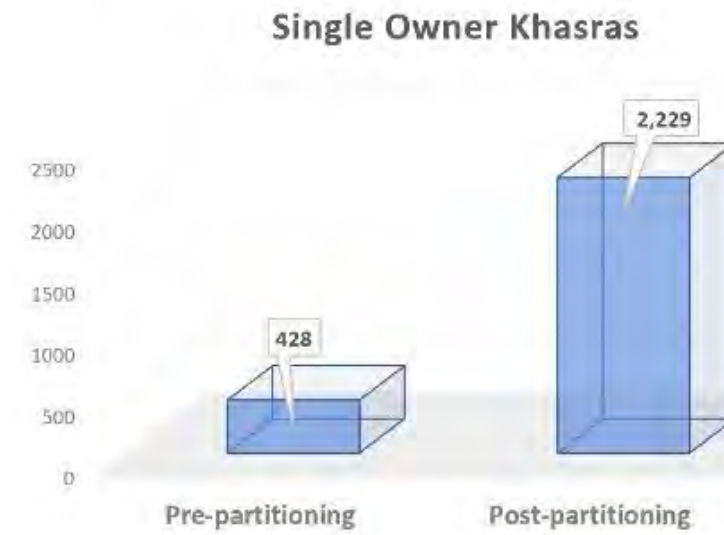
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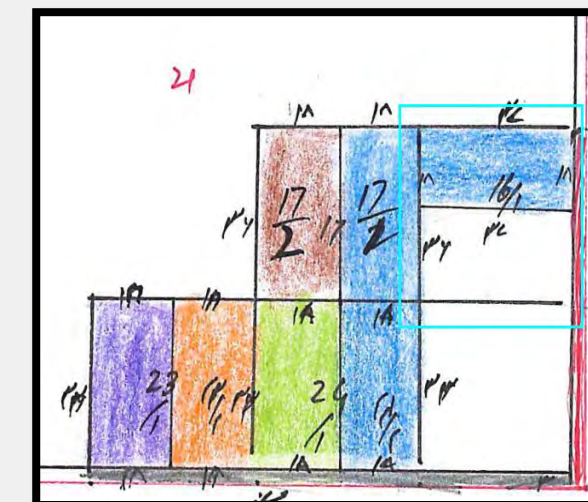
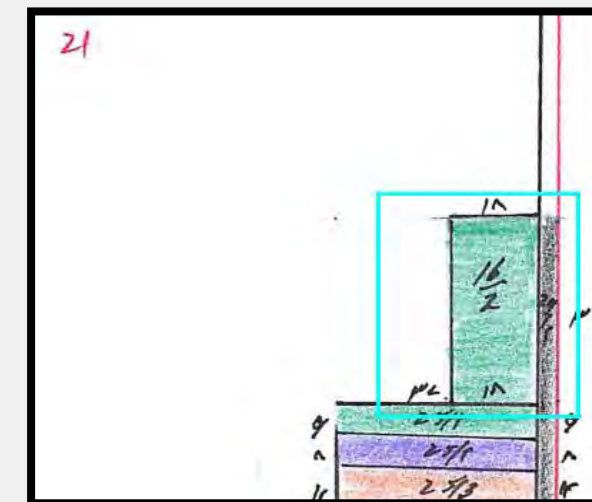
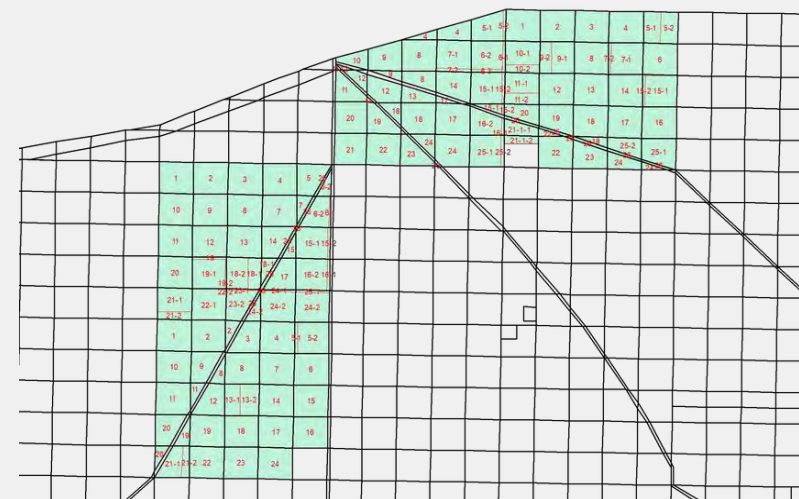
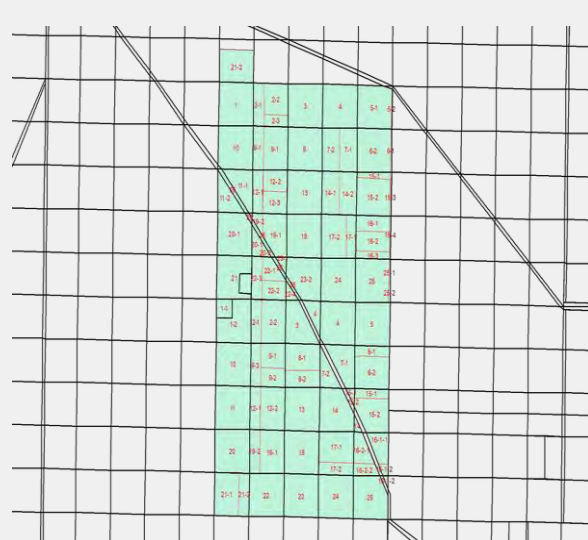
# Mass level partitioning activity

- Started across Punjab
- 50 million+ parcels to be targeted
- Special software and support
- Mutation fee waived off by Govt.
- Incentives for field formation

## Overview



- Total Khasra (Pre): 2,317
- Engaged Khasras (pre-partition): 1,559
- Engaged Khasras (post-partition): 2,639
- Total Khasra (Post): 3,397



# Major Disasters in Punjab



## Flooding

Recurrent and significant impact, with floods from rivers like Indus, Jhelum, and Chenab affecting communities and agricultural lands almost annually.

## Earthquakes

Less frequent than floods, seismic events have impacted, especially near fault lines in the northern regions.

## Drought

Parts of southern Punjab periodically experience drought, leading to water shortages and affecting crop yields.

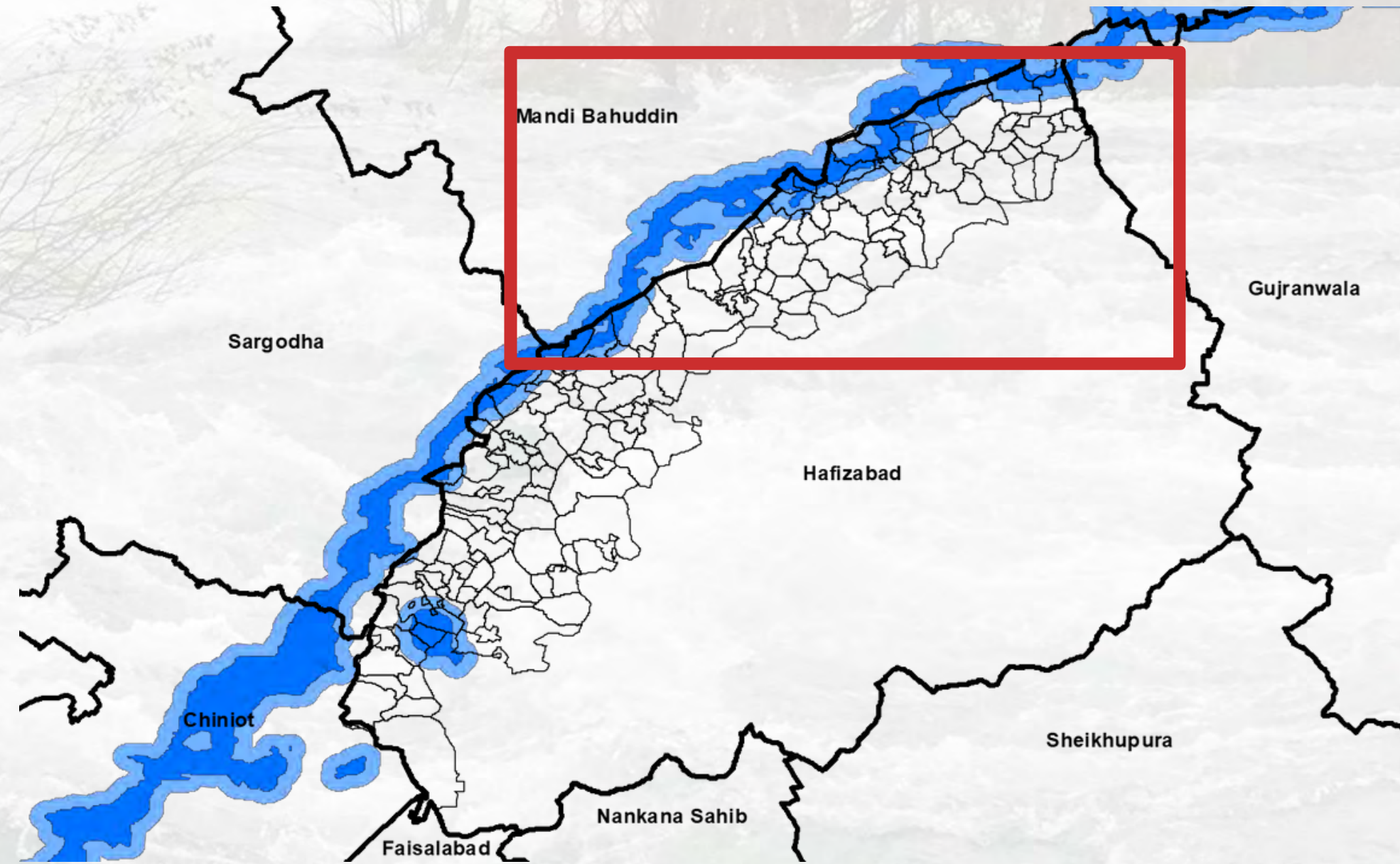
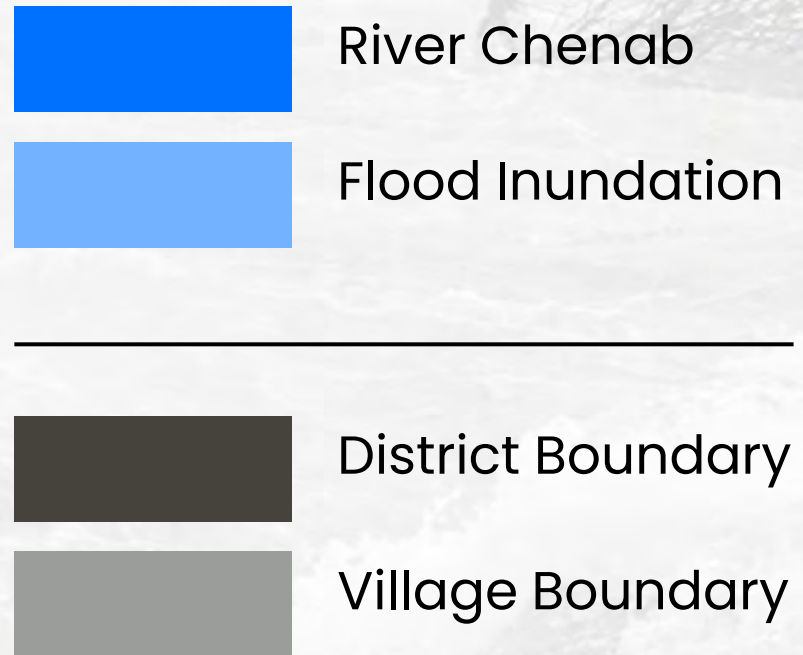
## Heat Waves

With rising temperatures, Punjab faces increasingly intense heat waves during summer.


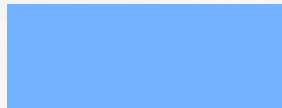


## Fog and Smog

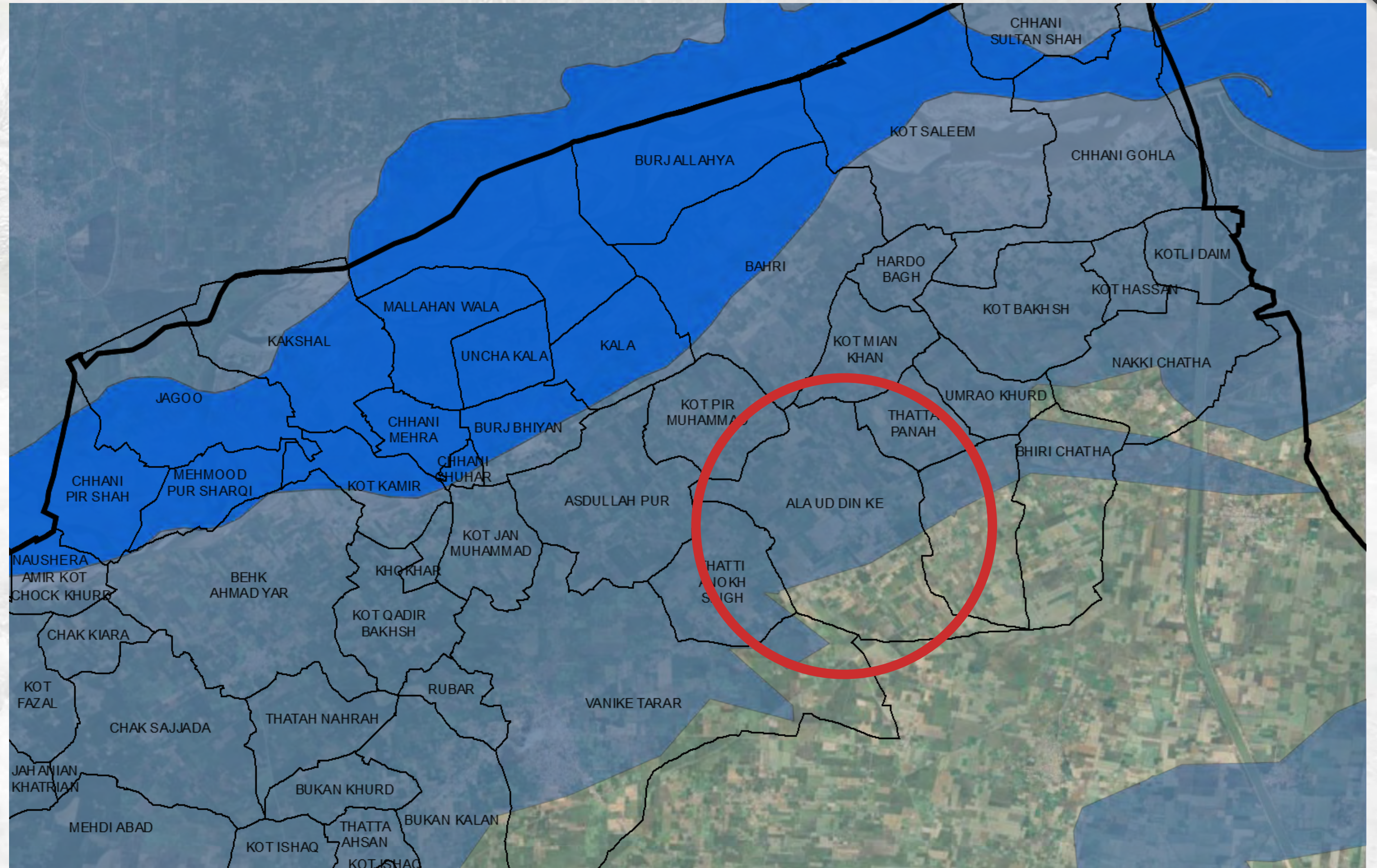
During the winter, dense fog and smog events disrupt transportation, health, and daily life.

# Flood Disaster-2014





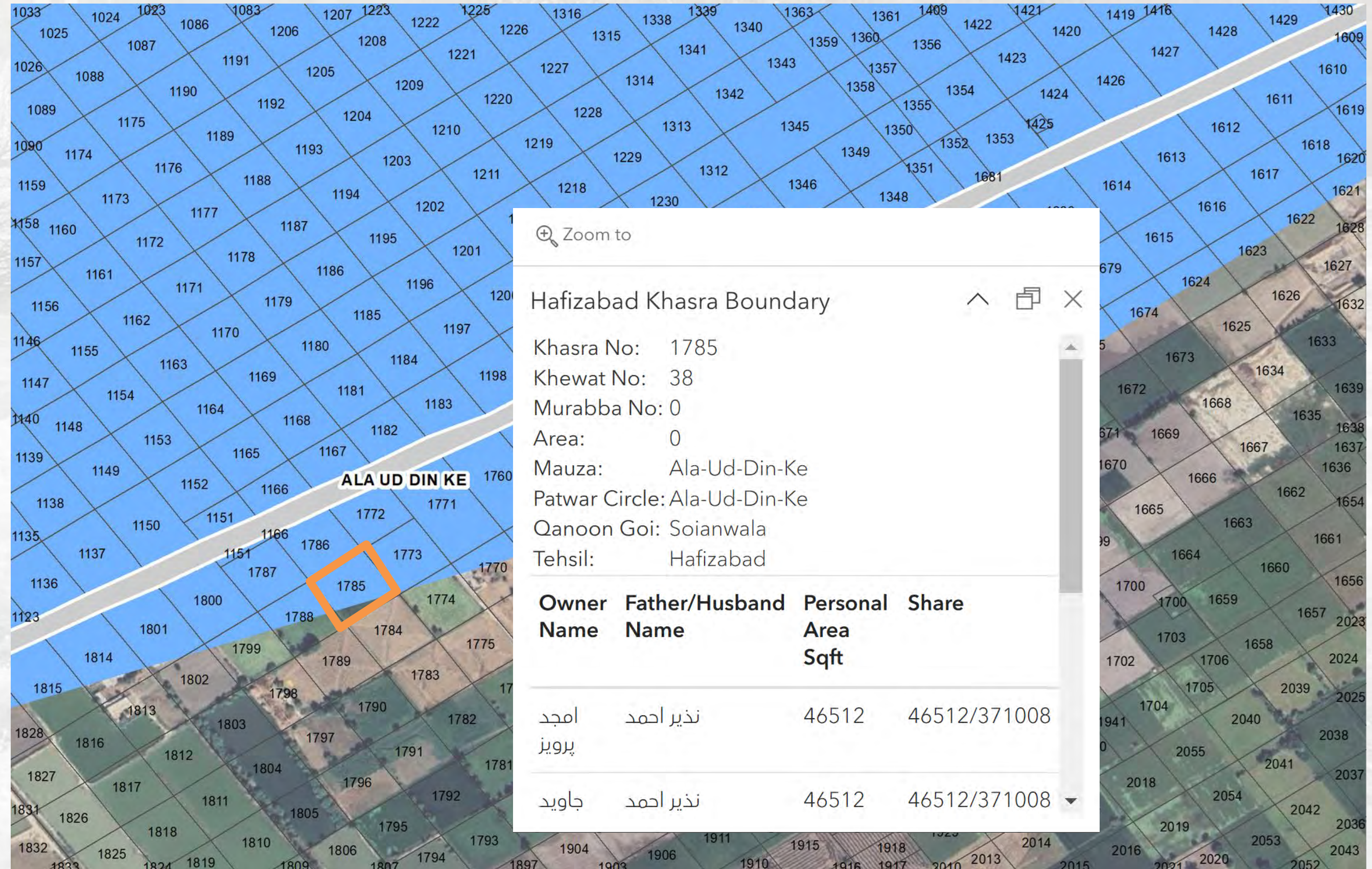
# Flood Imapcted Region

-  River Chenab
-  Flood Inundation
-  District Boundary
-  Village Boundary



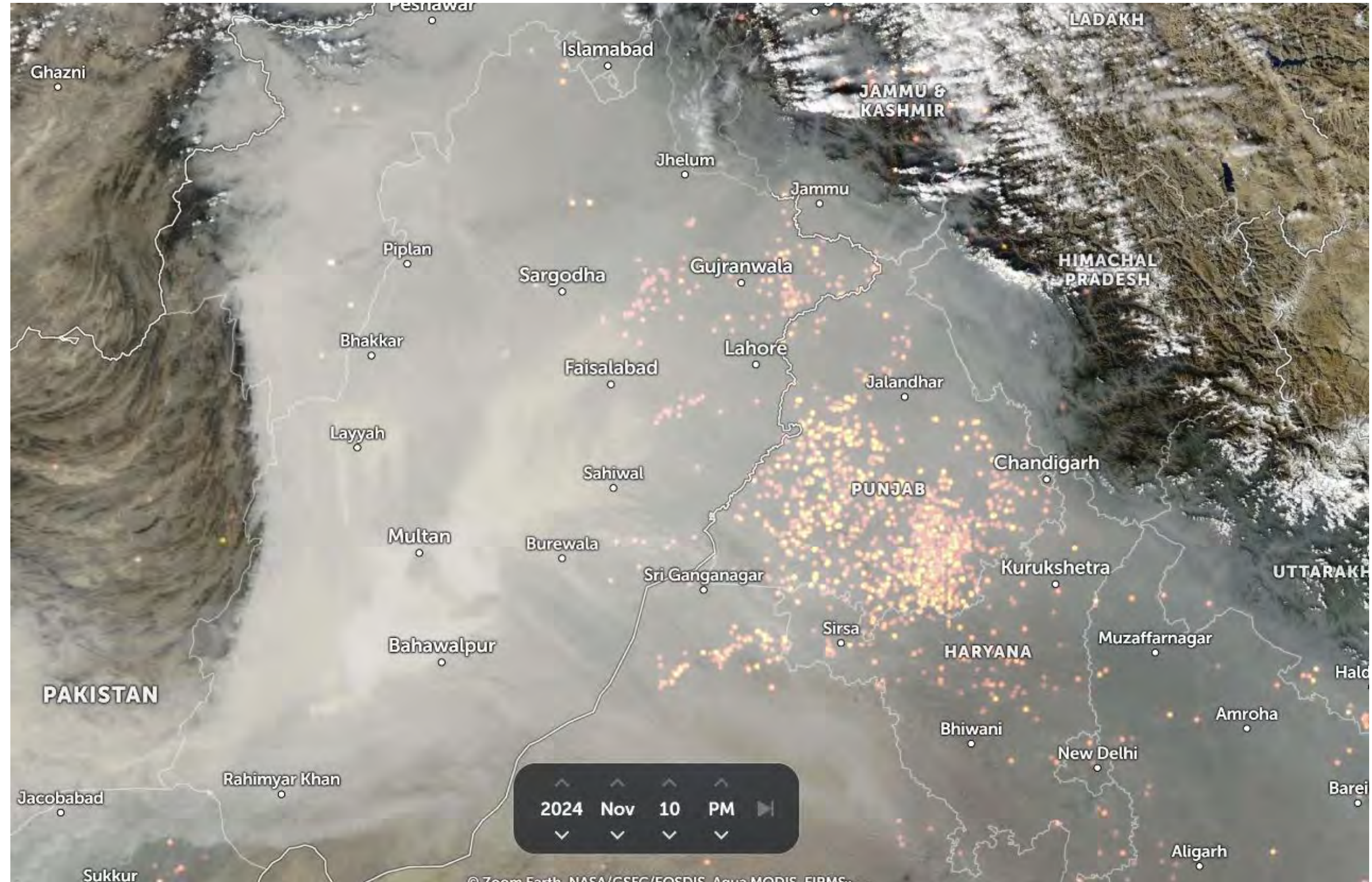
# Precise Identification

 Flood Inundation  
 Land Parcel



# Smog Condition-2024

- **Agriculture crop burning**
- **Industrial emissions**
- **Vehicular pollution**
- **Construction and dust pollution**
- **Climatic and geographic factors**

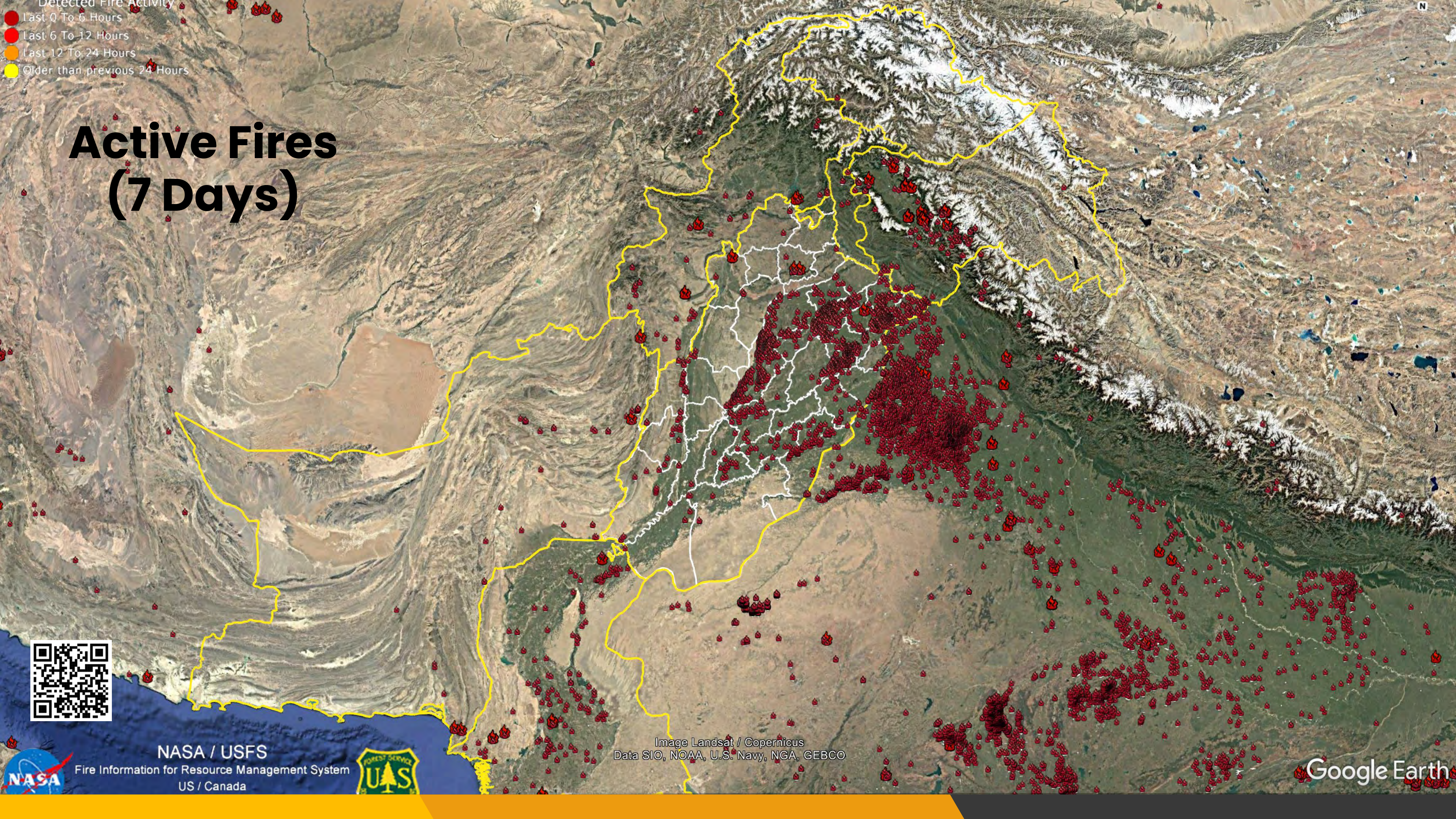


**Active Fires Mapping Source:** Zoom Earth  
(<https://zoom.earth/maps/satellite-hd/#view=31.904096,73.828403,9z/date=2024-11-10,pm/overlays=heat,fires>)



- Detected Fire Activity
- Last 0 To 6 Hours
  - Last 6 To 12 Hours
  - Last 12 To 24 Hours
  - Older than previous 24 Hours

# Active Fires (7 Days)



- Detected Fire Activity
- Last 0 To 6 Hours
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  - Older than previous 24 Hours

# Active Fires (7 Days)

Hemis National Park

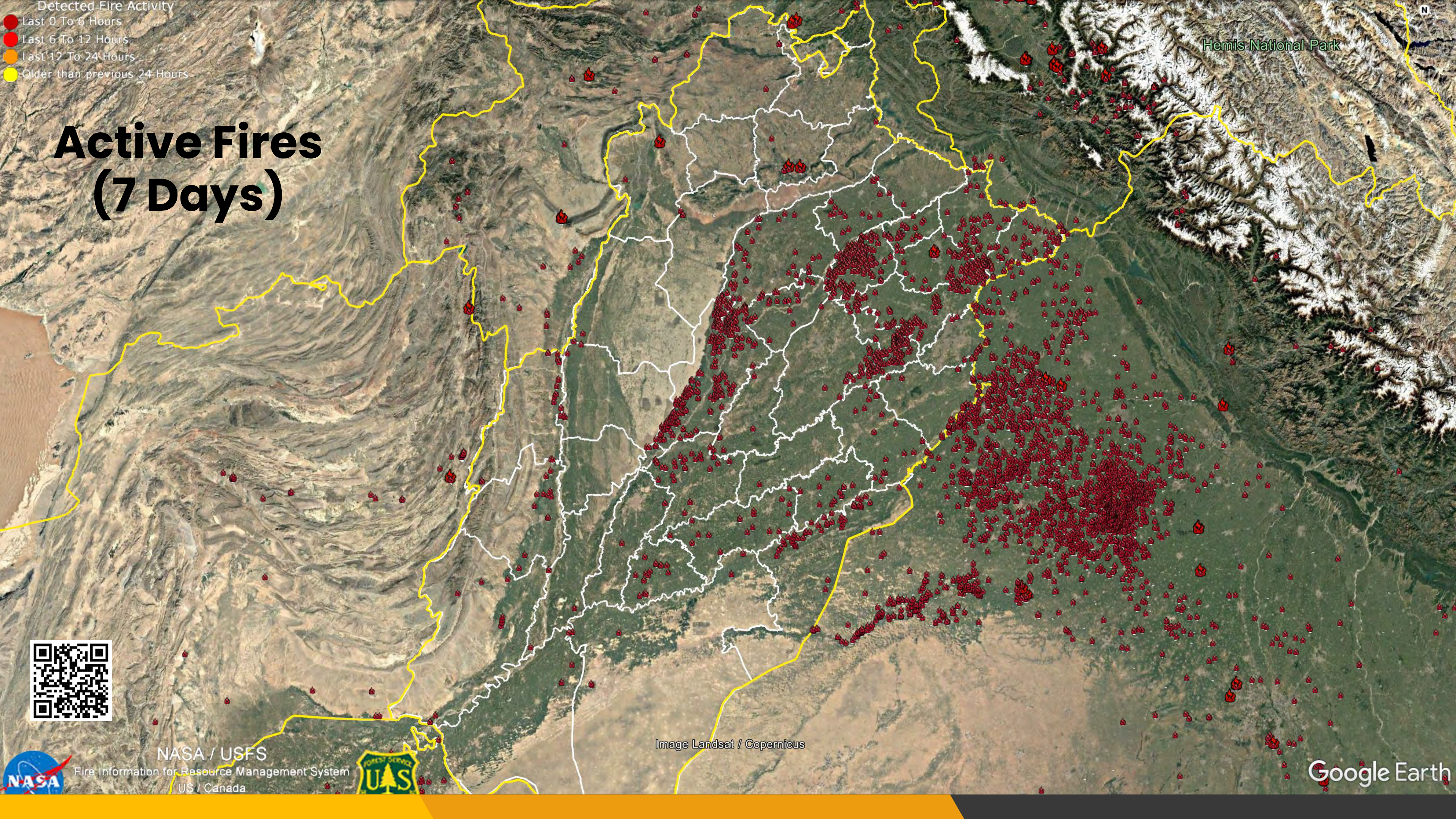


Image Landsat / Copernicus



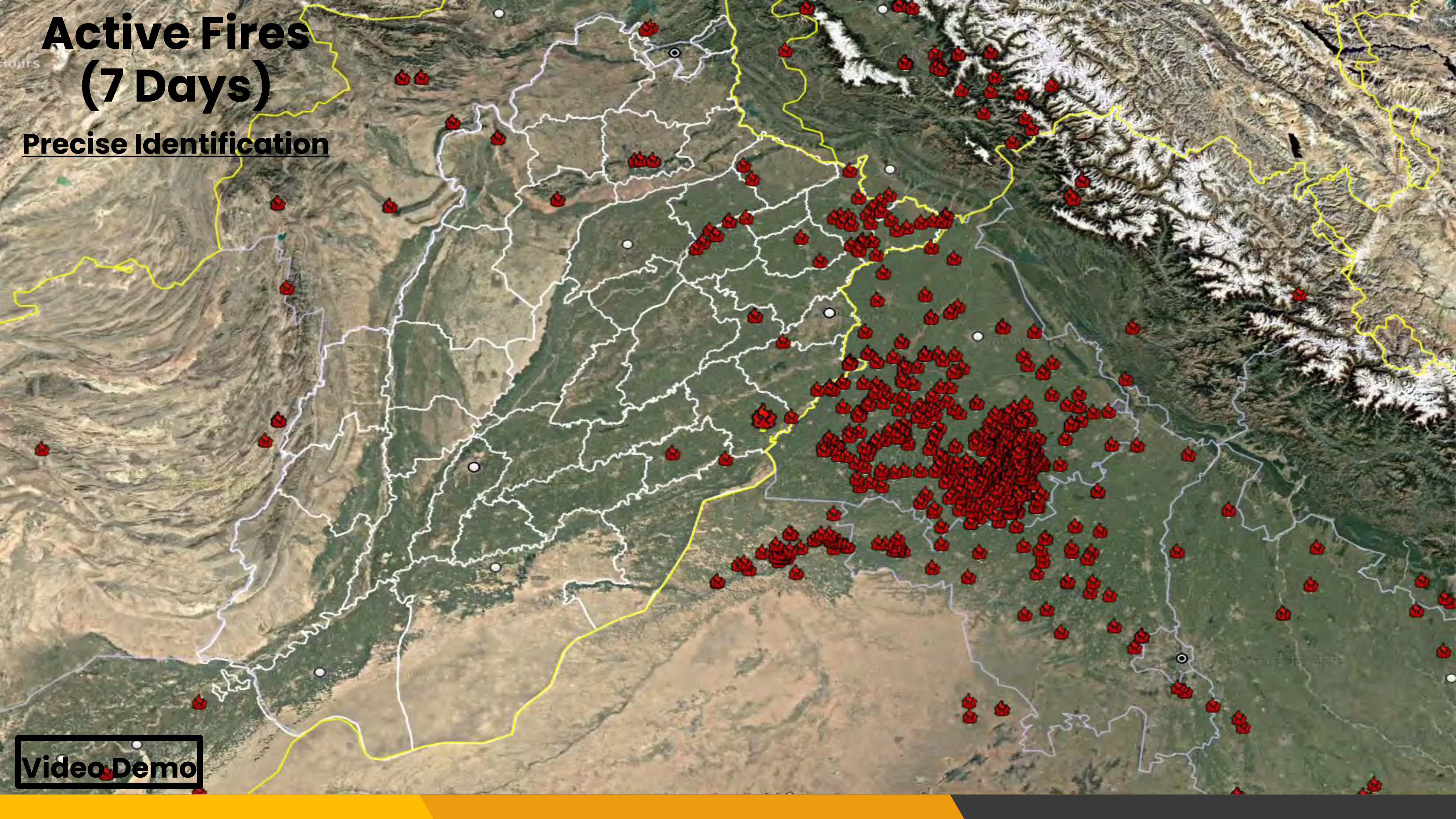
NASA / USFS  
Fire Information for Resource Management System  
US / Canada



Google Earth

# Active Fires (7 Days)

Precise Identification



**Video Demo**

# Conclusion

## Proactive Flood Preparedness

Uses precise land parcel data and historical flood patterns to identify high-risk areas before flooding occurs.



## Fair Compensation

Supports equitable distribution of relief funds by pinpointing exactly who is affected, down to the parcel level



## Vulnerability Mapping

Enables targeted support for communities most likely to be affected by floods.



## Enhanced Governance

Strengthens land resilience and governance in flood-prone areas, creating a sustainable model for future disaster management



## Data-Driven Relief Efforts

Helps accurately assess flood impacts on specific lands and agricultural zones, ensuring effective response and resource allocation.



## Emergency Preparedness

By continually updating floodplain data, PULSE offers critical insights for proactive risk management and emergency planning across Punjab



# Future Potential



## Risk Assessment

Leveraging PULSE's precise land data and GIS capabilities, the system could provide detailed hazard profiles, allowing for proactive risk mitigation tailored to specific areas



## Climate Adaptation

In the face of climate change, PULSE's adaptability allows it to inform infrastructure planning and resource management to minimize the long-term impact of various disasters



## Disaster Resilience

The PULSE system can be scaled to address other natural hazards such as earthquakes, landslides, and droughts, enhancing resilience across a wide range of disaster-prone regions



# Thank You

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