



# **DISASTER MANAGEMENT: CHALLENGES OF COORDINATION AND ACCOUNTABILITY**

## *A Technology Perspective*

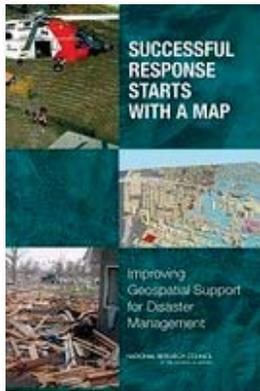
**SOHAIB KHAN**

Associate Professor of Computer Science  
LUMS School of Science and Engineering

22 September, 2010, IGC Growth Week

# THE TECHNOLOGY OF DISASTER MANAGEMENT

What Are the Expectations?



Successful Response Starts with a Map <sup>1</sup>

WHY?

Maps enable **Spatial Visualization** and hence **Coordination**

## DISASTER MANAGEMENT GIS

- **Base Layers:** Villages, Roads, Infrastructure, Population Spread...
- **Thematic Layers:** Hospitals, Shelters, Hydrology, Fault lines...
- **Event Related Data:** Disaster footprint, Locations of response resources, Data on casualties, damage assessment...



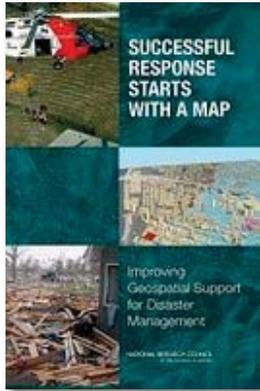
Doug Page, "GIS: Bringing Disaster Management Down to Earth", Homeland Protection Professional, [www.homeland1.com](http://www.homeland1.com)

<sup>1</sup> "Successful Response Starts with a Map: Improving Geospatial Support for Disaster Management", National Academies Press, 2007



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} **Pre-Disaster Preparedness**  
} **Post-Disaster Response**

<sup>1</sup> "Successful Response Starts with a Map: Improving Geospatial Support for Disaster Management", National Academies Press, 2007



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What Are the Expectations?

Successful  
Response Starts  
with a Map <sup>1</sup>

That is how it **should be...**

But this is not the case in most developing countries

**Effective Maps are Mostly Unavailable When Needed**

<sup>1</sup> "Successful Response Starts with a Map: Improving Geospatial Support for Disaster Management", National Academies Press, 2007



# THE BOTTLENECKS

What Impedes the Successful Deployment of Technology?

## Non Availability of Base Layers in GIS Ready Format

Population Density

Infrastructure  
Mapping

Spelling variations  
in Roman Urdu

Mapping of Villages

Lack of  
Standardization

Security Concerns

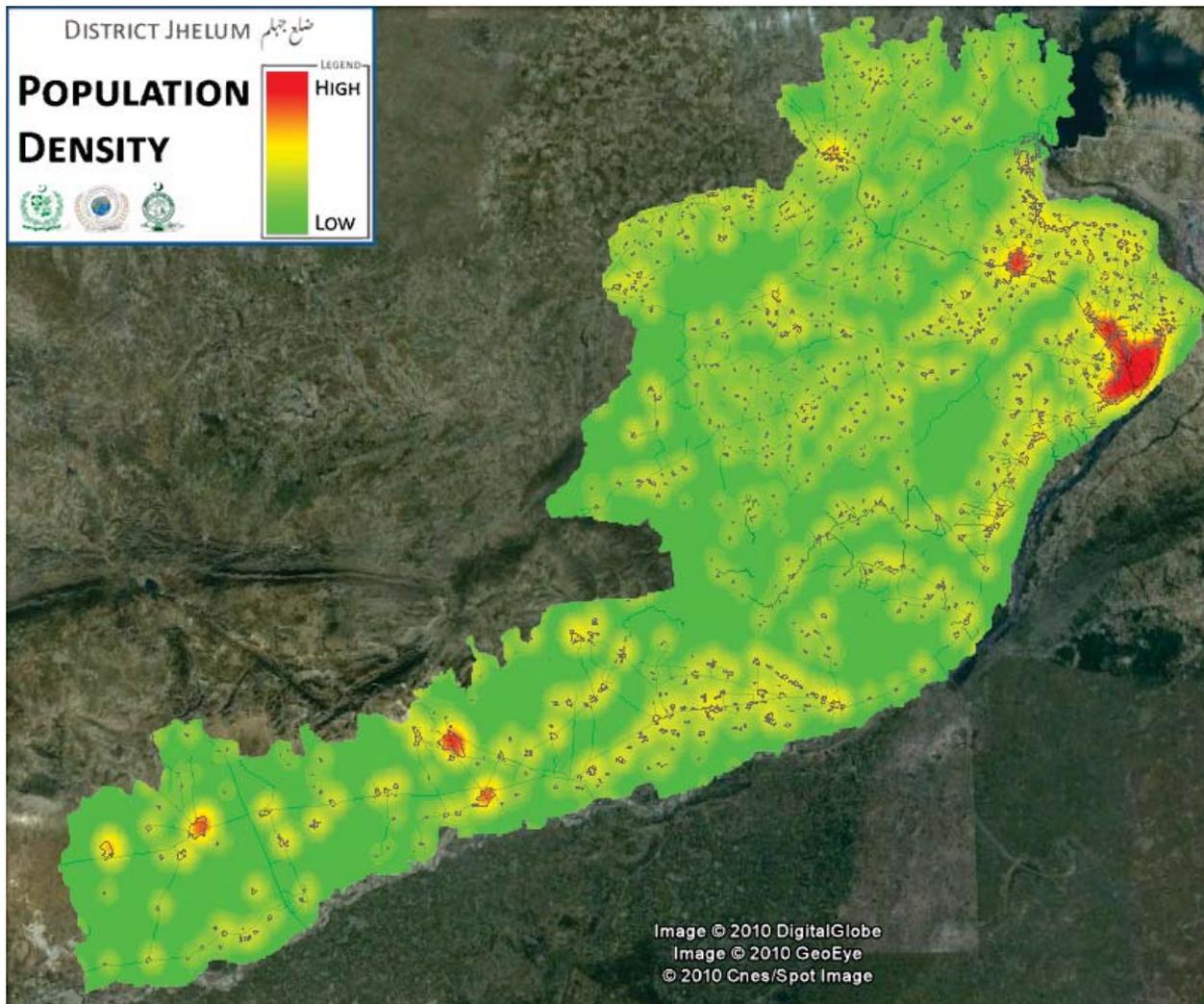


# REMOVING BOTTLENECKS

How to Jump Start Effective GIS Systems?

Need innovative ways to quickly jump-start the much needed base layers

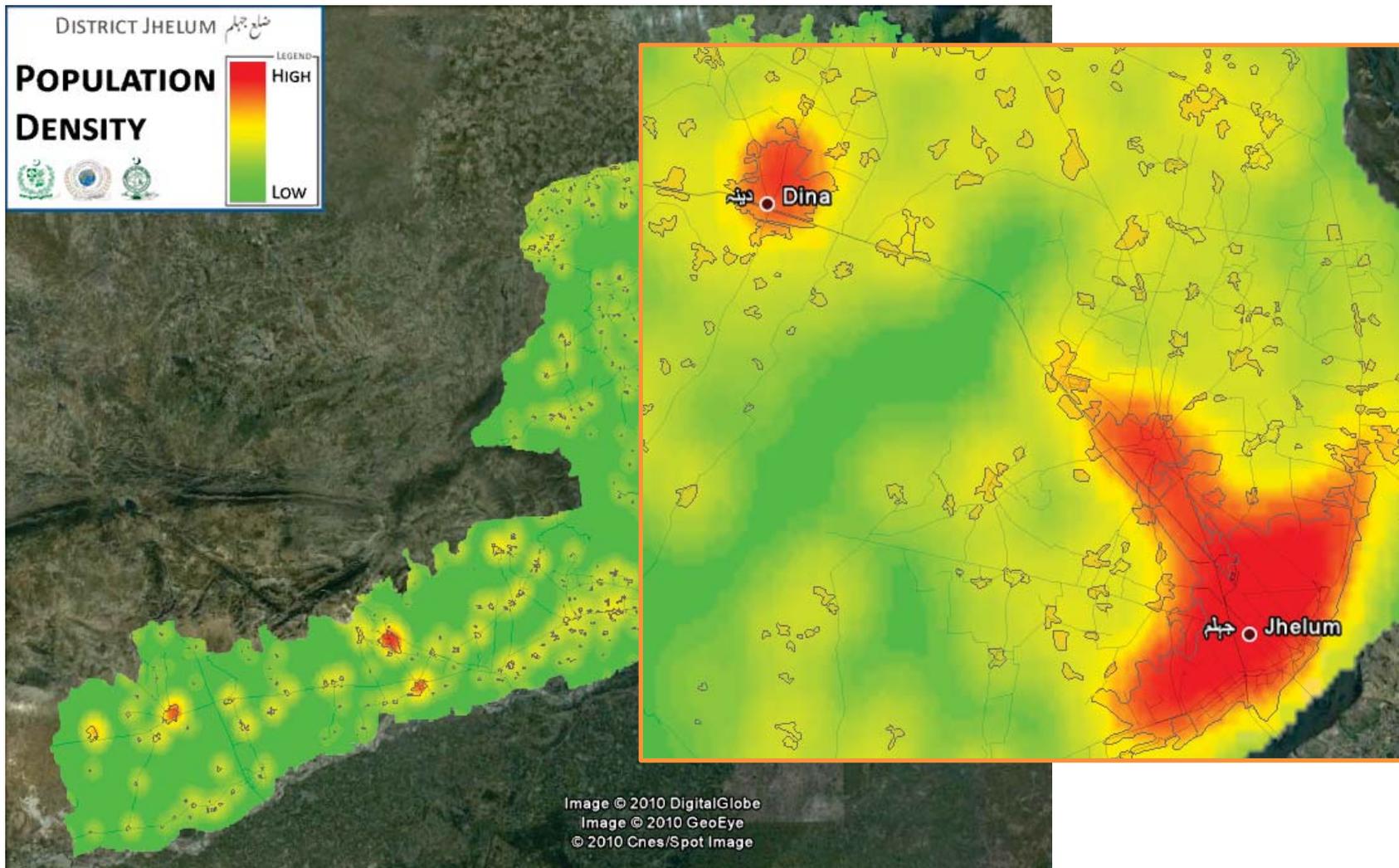




## Coarse Population Density Map Estimated from Satellite Imagery

SUPARCO-LUMS Collaboration 2010





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SUPARCO-LUMS Collaboration 2010



# INTEGRATING SCATTERED DATASETS

Attribute Data (e.g. Population Census)

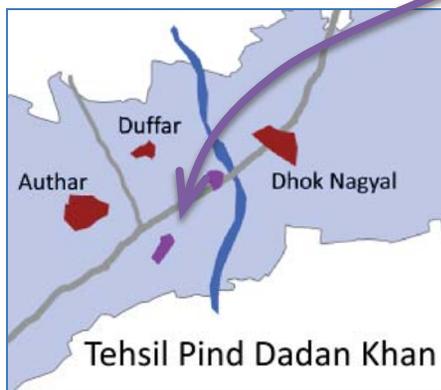
Village Name	Total Population	Literacy Ratio (10+)
Authar	3405	41.8
Dhok Nagyal	1675	50.2
Duffar	370	59.0
Watalian	1975	58.2

Step 1  
Phonetic Matching

Geo-referenced Village List  
(e.g. Survey of Pakistan maps)

Village Name	Latitude	Longitude
...	...	...
Athar	32.550N	72.833E
...	...	...
Dhok Naghial	32.716N	73.383E
Daffar	32.600N	73.083E
...	...	...

Step 2  
Interactive Tool for  
Expert Intervention



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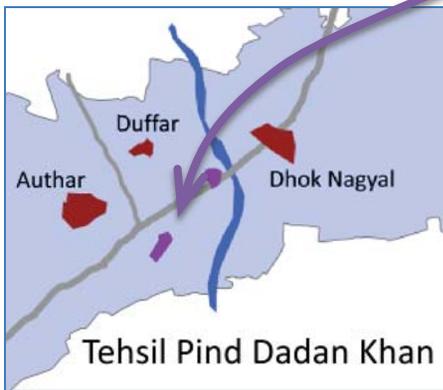
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**Step 1**  
Phonetic Matching

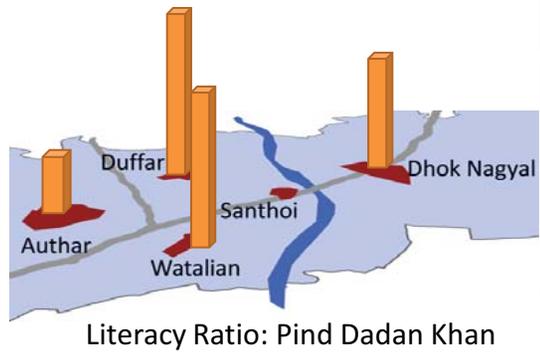
Geo-referenced Village List  
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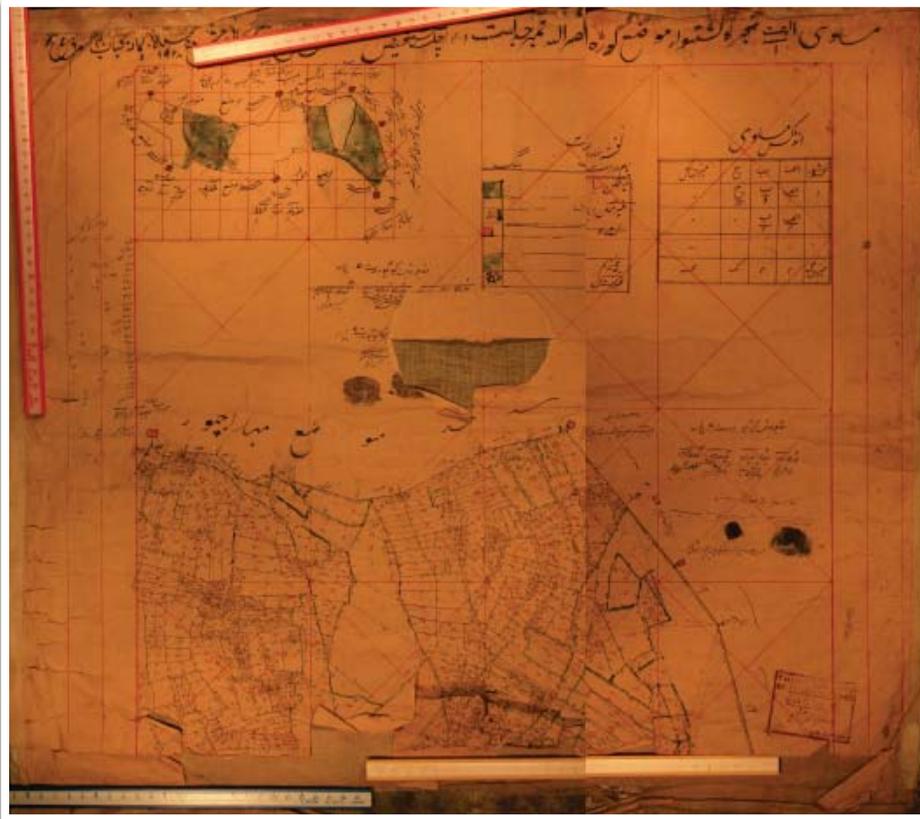
**Result 1**  
Geo-referenced  
Attribute Data



**Result 2**  
Updated Master  
List

Village Name Variants	Pop.	Lit. R	Lat.	Long.
Athar, Authar	3405	41.8	32.55N	72.83E
Dhok Naghial, Dhok Nagyal	1675	50.2	32.71N	73.38E
Daffar, Duffar	370	59.0	32.60N	73.08E
Watalian	1975	58.2	32.35N	73.10E





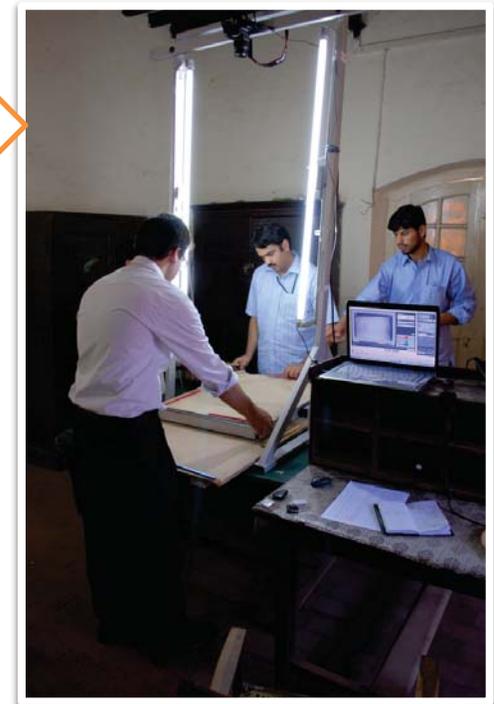
British Era Land-Revenue Map

Stored in



District Record Room (Jhelum)

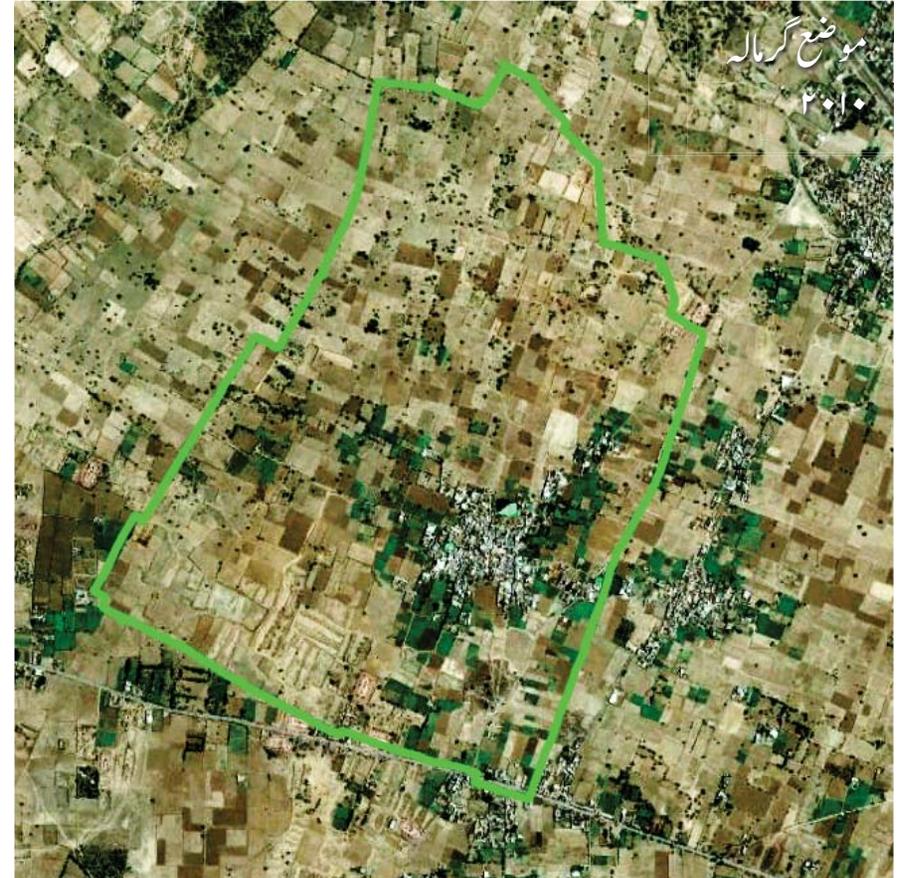
Scanning of  
5000+ sheets  
for District  
Jhelum



## Administrative Boundary Mapping to Mauza-Level

SUPARCO-LUMS Collaboration 2010





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SUPARCO-LUMS Collaboration 2010



تانوگونی جہلم



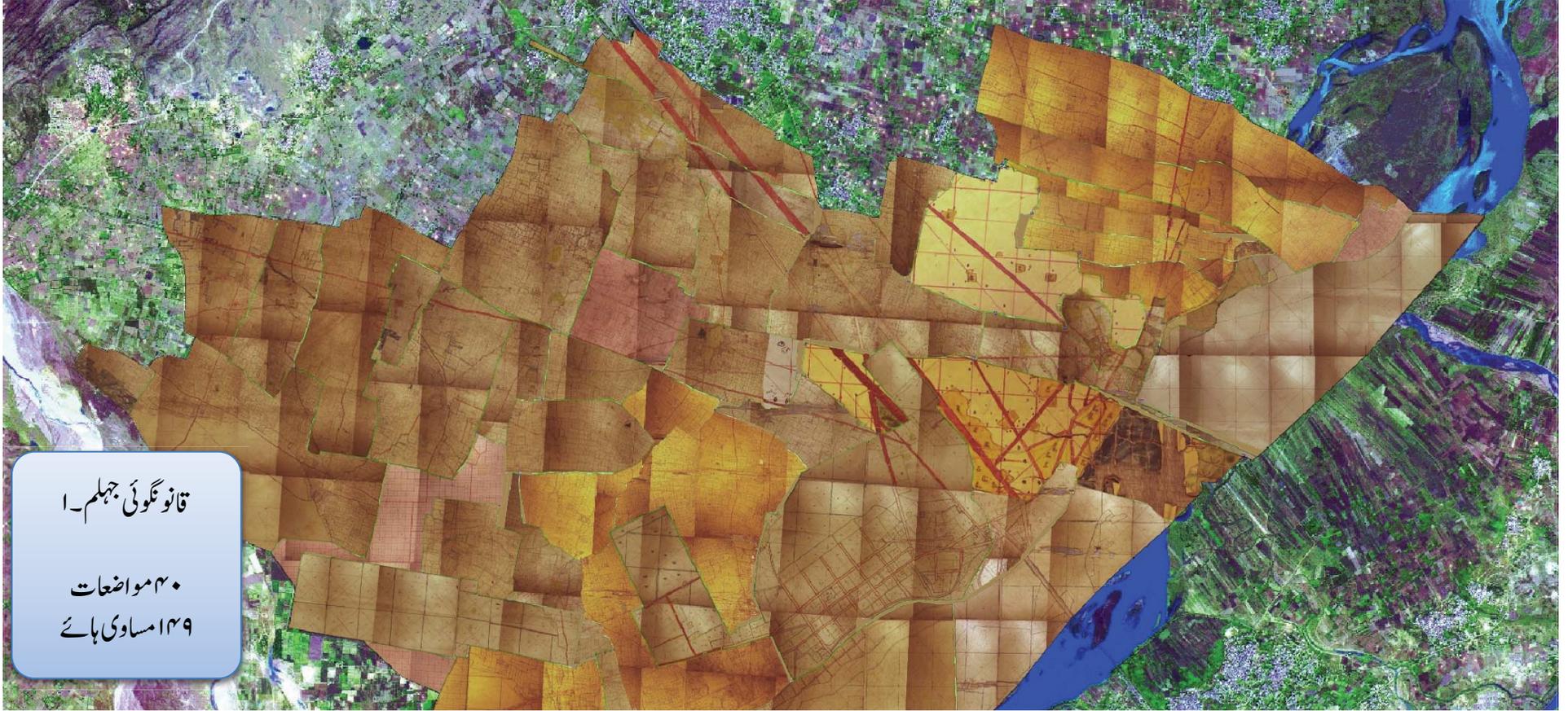
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SUPARCO-LUMS Collaboration 2010



Disaster Management: Challenges of Coordination and Accountability  
Sohaib Khan, Lahore University of Management Sciences, Pakistan

قانونگونی جہلم ۱



قانونگونی جہلم-۱

۲۰۰ مواضعات

۱۳۹ مساوی ہائے

## Administrative Boundary Mapping to Mauza-Level

SUPARCO-LUMS Collaboration 2010



Disaster Management: Challenges of Coordination and Accountability  
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### GARMALA

Total Population: 1271

Males	624
Females	647
Above 18 yrs	725
Above 21 yrs	645
Married Females	195
Non Muslims	7

Literacy Rate: 62.2%

	Male	Female
Above Matric	88	44
Below Matric	148	101

Total Houses: 213

Pacca	150
Semi Pacca	62
Katcha	1

Availability of Potable Water: 10 of 213

Availability of Electricity: 192 of 213

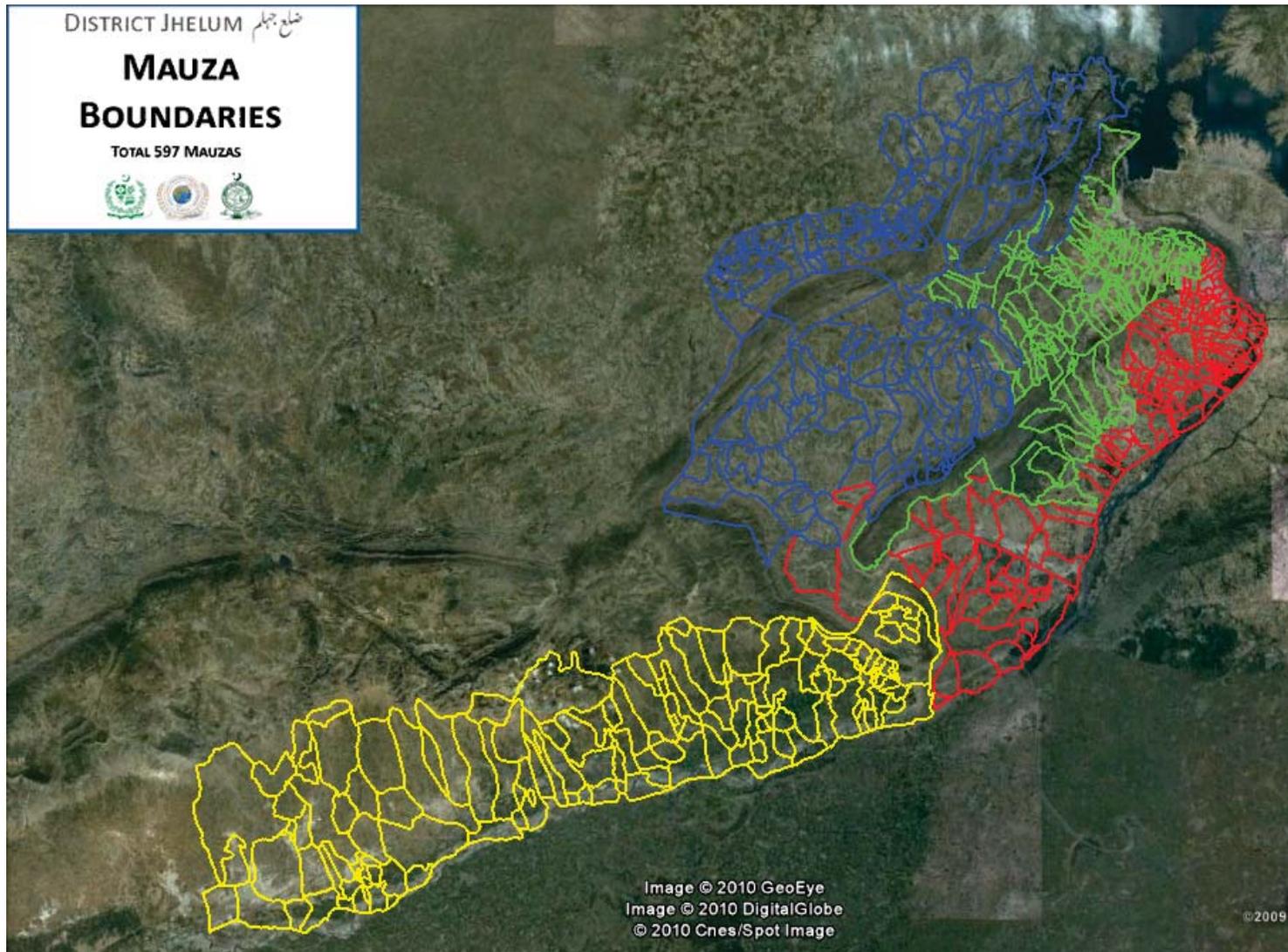
Average Household: 6 persons

Hadbast Number: 245



## Administrative Boundary Mapping to SUPARCO-LUMS Collaboration 2010

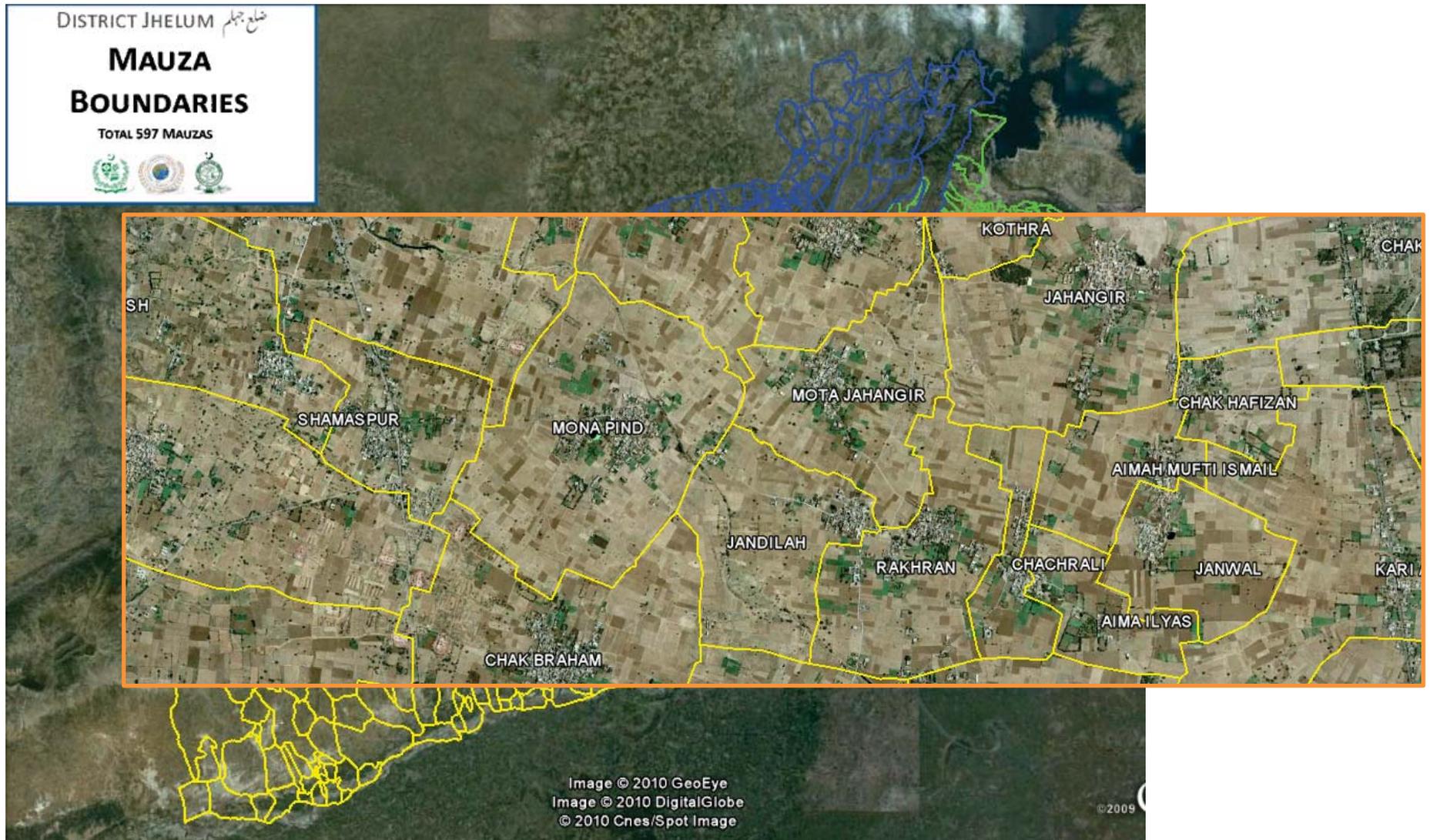




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SUPARCO-LUMS Collaboration 2010

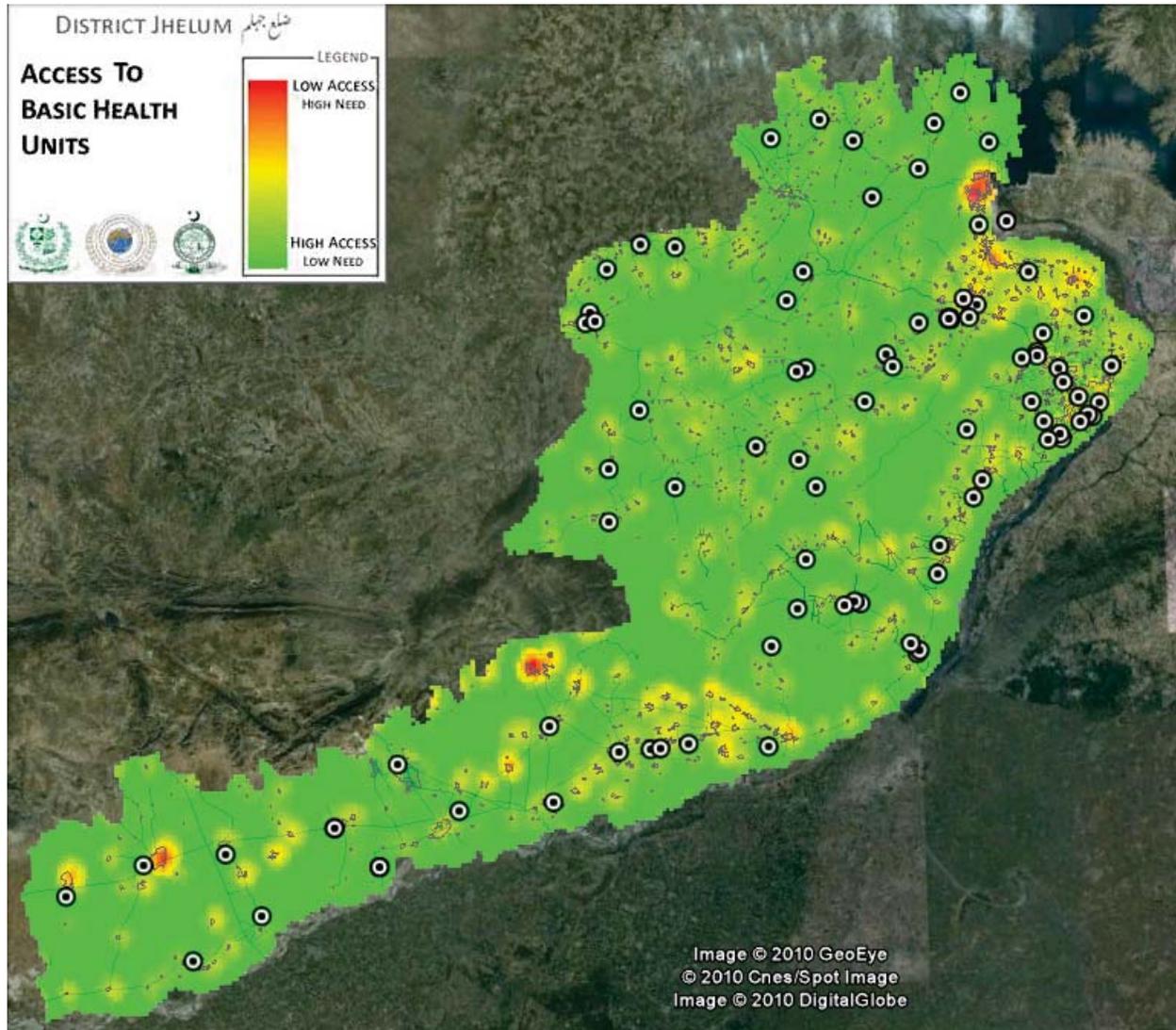




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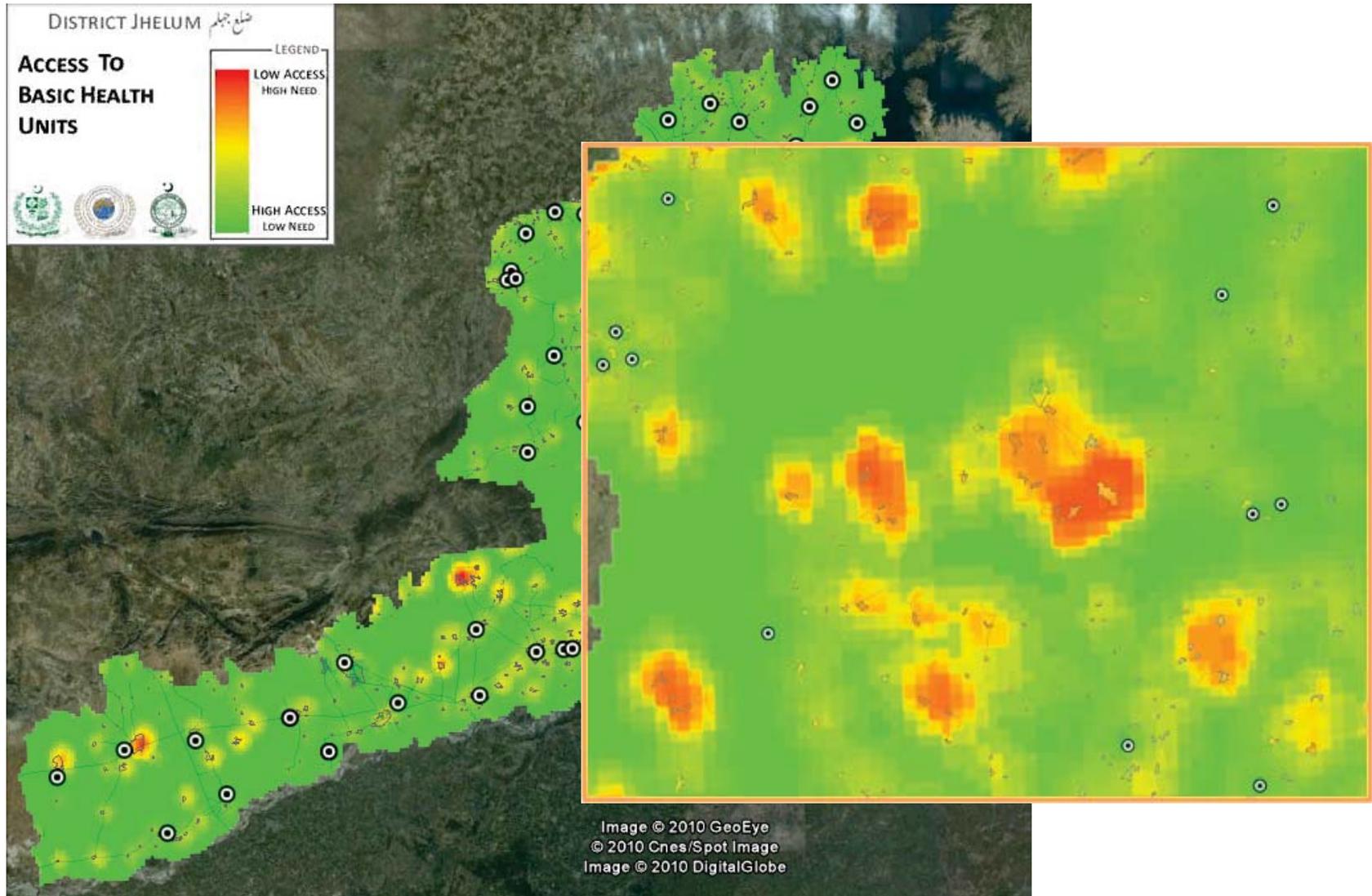




## Need for Basic Health Units

SUPARCO-LUMS Collaboration 2010





## Need for Basic Health Units

SUPARCO-LUMS Collaboration 2010



← → ↻ floodmaps.lums.edu.pk ☆

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## Pakistan Flood Maps

Providing Mapping of 9000+ Villages in Flood Affected Areas

Home Maps Submit an Update **NEW** Request a Widget About Us

f t g+ Y!

Flood Map Google Earth Version Google Maps Version

Layers

- Flood Extents (20th September, 2010)
- Settlements
- Roads
- Tehsils
- +  Selected District Details
- Layyah Mouza Boudaries

Map Navigation

Navigate to a settlement by name:

District:

Tehsil:

Settlement:

[Go to Location](#)

Navigation Help:

The settlements layer may take some time in loading. To view settlements names, please zoom in.

Zoom in/Out PageUp / PageDown

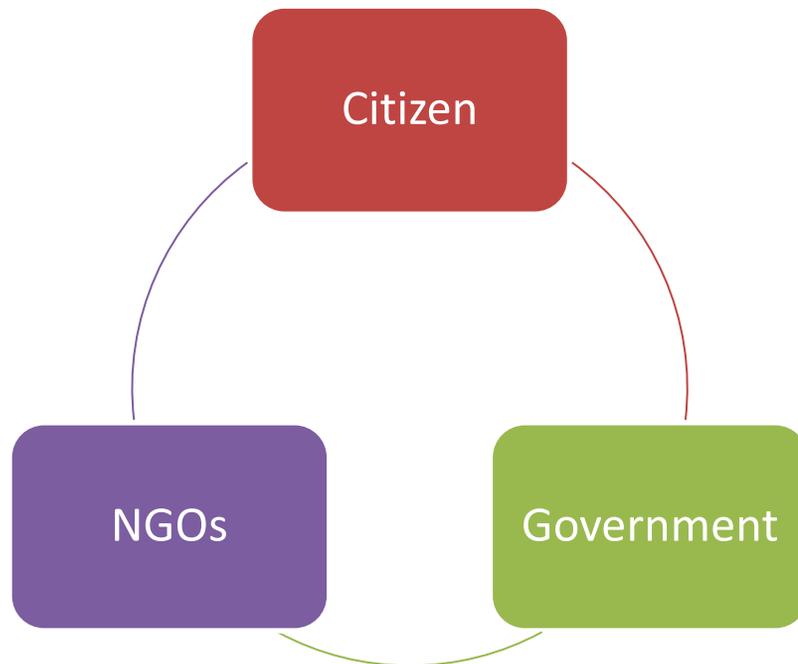
## Pakistan Flood Maps (<http://floodmaps.lums.edu.pk>)

LUMS, SUPARCO, PITB, Urban Unit, IGC

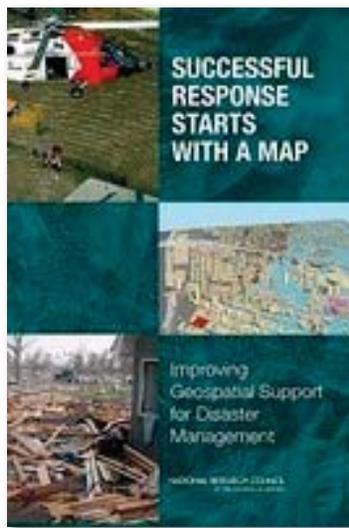


# THE VISION

**No Village Left Behind**



- Citizen Feedback
- Accountability
- Transparency
- Optimization of resources
- Tracking impact



“The effectiveness of any technology is as much about the **human systems in which it is embedded** as about the technology itself.”

*Successful Response Starts with a Map, National Academies Press, 2007*

