

Economizing Water Resources Using Geospatial Technologies Based Solutions In Pakistan

By

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- ❖ Case Studies
- ❖ Concluding Remarks

Introduction

- Agriculture economy
- Variability of water demand
 - Irrigation information system
 - River course monitoring
 - Flood vulnerability assessment
 - Thematic maps development

Aim of Presentation

To apprise participants on geospatial technology based solutions in water management including;

- Geospatial technology based solutions to address hindrances in management practices
- Time efficient means of information collection
- Accurate information to stakeholders
- Thematic solutions
- Capacity building of relevant departments

Water Management – Geospatial Perspective

- Efficient management and planning demand on-time accurate information
- Spatial tools like GIS, remote sensing, GPS etc. drastically improve data collection time and minimize long delays involved in surveys
- Spatial database
- Data interoperability

CASE STUDIES

Development of GIS for National Program for Improvement of Watercourses (NPIW)

Objective:

To develop GIS system for monitoring improvement work of watercourses using geospatial technologies

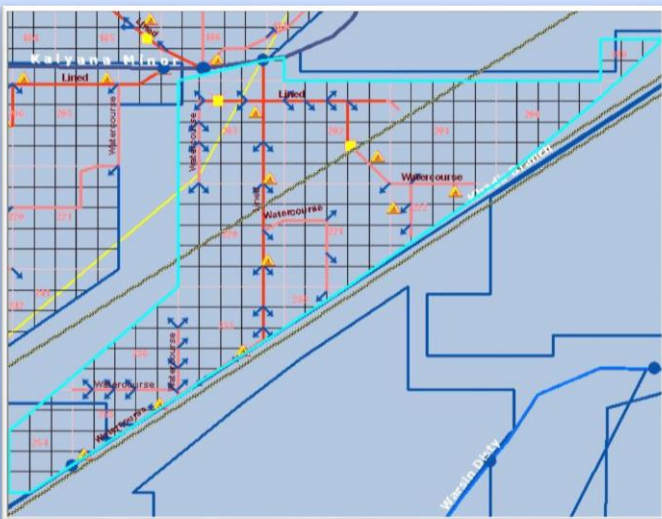
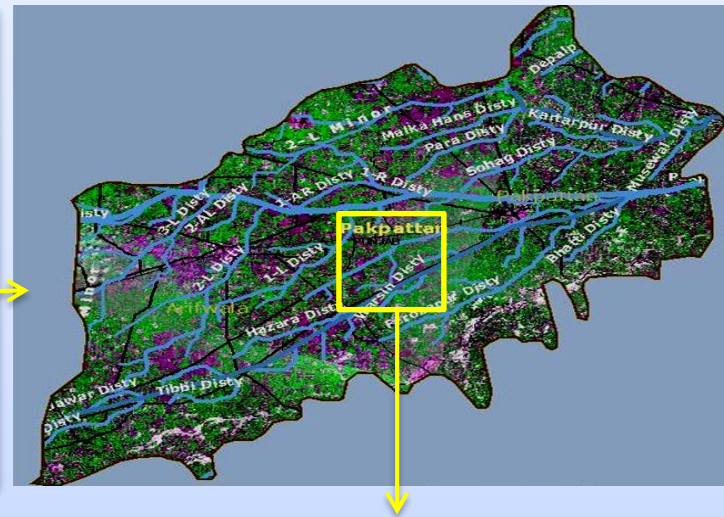
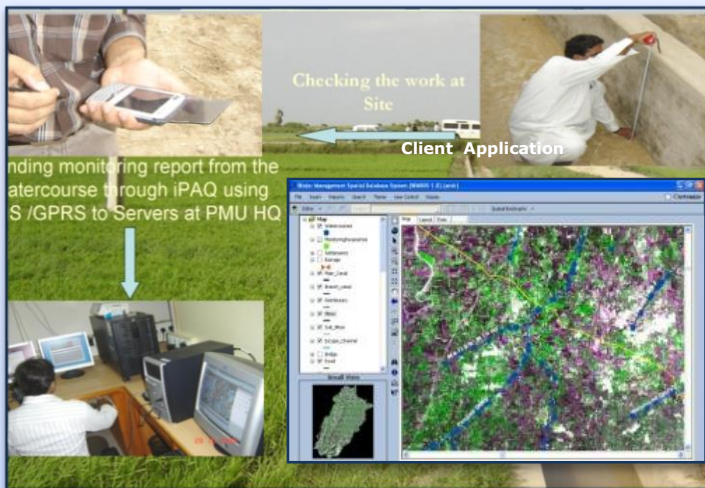
Scope:

- GIS development of 45,000 watercourses in **Sindh**, 15,000 WCs in **Khyber Pakhtunkhwa** and 58,000 WCs in **Punjab**
- Satellite image based extraction of irrigation network (rivers, canals, branches, distributaries, minors and watercourses)
- Development of client/server GIS customized applications
- Development of LAN based GIS Control (centralized) Lab at PMU offices
- Real-time data dissemination from field and integration with database

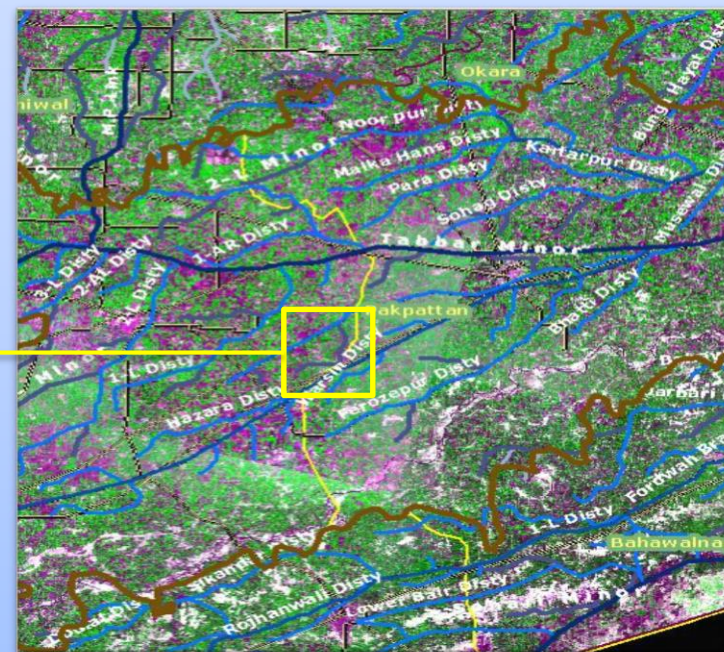
User:

- Directorate General (Agriculture), Water Management, Govt of Punjab
- Program Monitoring Unit, NPIW, Govt of Sindh
- Program Monitoring Unit, NPIW, Govt of KP

Development of GIS for National Program for Improvement of Watercourses (NPIW)



Information Works Involved OFWM Interventions/Land Distribution Designed Data Reconciled Data			
Watercourse No.	47400-R	Source	2-L Disty
Village/Chak No.	79/EB	Tahsil	Arifwala
Type of Mogha	APM	District	Pakpattan
Design Discharge (lps)	100		



Development of GIS for National Program for Improvement of Watercourses (NPIW)

Project Data Entry

Select: WC Under Improvement | WC Improved Entry | Targets & Funds

Entry Date: 02/2013 10:20:57 AM | Region: Muzkan | Division: SWP | District: Bahawalpur | Tehsil: Ahmadpur East

Watercourse: WC No: 23750/WC | Latitude: 3244532.04 | Longitude: 146590.24 | Disty/Minor: 1/R/6/L/Minor | Vill/Chak: Mubarak Pur | UC: | PP: | NA: | Chairman: | Share Holder: 0

Works Executed: Lining Type: Brick Lining | Earthen: 3908 | Lining: 1510 | Lining % age: 28 | Nakkas Installed: 44 | Culverts Const: 4 | Drop Structure: 0 | B. Wallow: 0 | Other Structure: 0

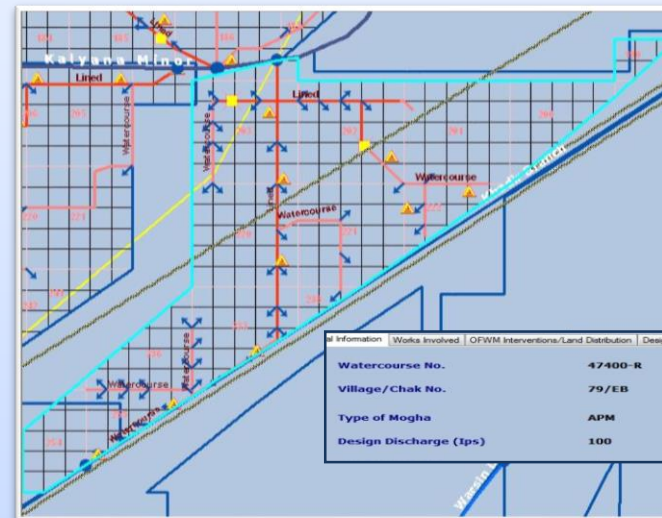
Component (Regular/Add./S): Regular | Project: NPIW | Year Improved (YYYYYY): 2009-10 | Status: Improved

Cost Sharing: Material Cost: 1300829 | Govt. Share: 1300829 | Farmer Share: Labour for Masonary Work: 325232 | Earthen (Rs): 406540 | Contribution for Const. Material: 0 | Total: 731772 | Total Scheme Cost: 2032701

Outlet Information: Type of Mogha: | Ground Water Quality: | Sanctioned Discharge (lps): 0 | Designed Discharge (lps): 0

Area watercourses: GCA (Acres): 0 | CCA (Acres): 0 | Total Length (m): 5418

Buttons: Add New (Imp) | Add New (UC) | Save Edit Improved | Cancel | Close



Watercourse No.	Source	2-L Disty
47400-R		
Village/Chak No.	Tahsil	Arifwala
79/EB		
Type of Mogha	District	Pakpattan
APM		
Design Discharge (lps)		
100		

Watercourses Report

Main Report

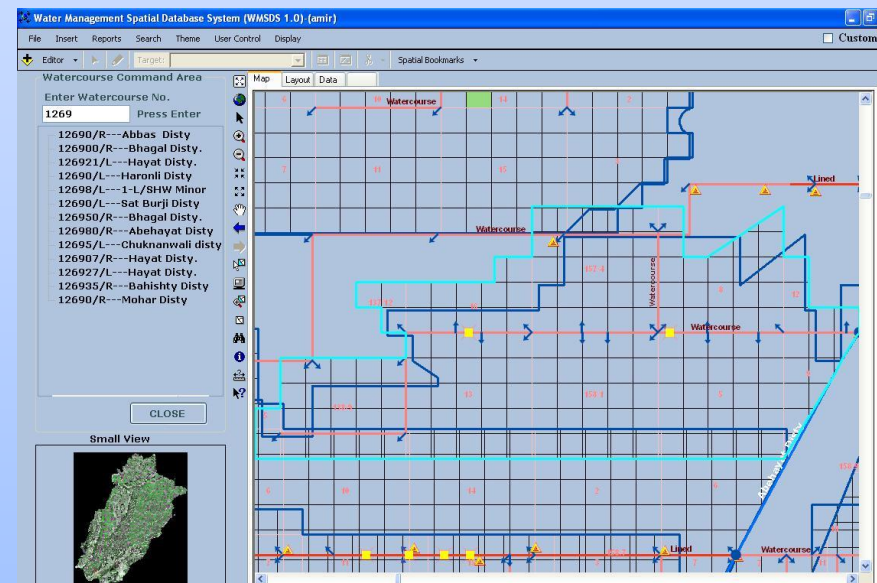
Watercourse Inventory 31-Mar-2014

Watercourse No.	10200/R	Village/Chak No.	2271/L	Tahsil	Chichawani	District	Sahiwal
Disty/Minor	2/L/1/L/Minor	Union Council (UC)	90	Division	Sahiwal	Command Area (Acres)	650
Type of Mogha	AD/RA	Design Discharge (lps)	80	Total Length (R)	5.770	Total Number of Share Holders	42
Ground Water Quality	Fresh	PP	224	NA	162		

B. Works Involved

Sr. No.	Name of Project	Year of Implementation	Name of Public Chairman	Type of Lining (Paved/CPW/PP)	Barthen Length (km)	Lined Length (km)	Lining Height	House Feet (No.)	Culverts Const. (No.)	ISW (No.)	Other (No.)	Verified amount (system cost) (Rs.)	Government Share (Rs.)	Farmer Share (Rs.)	Total Cost of Project (Rs.)	Component Regularity			
1	NPIW	2009-10	M. Sahran	1/10/L/L/Imp	4.190/0	1400/0	22.76	88	2	0	0	800,000	800,000	212,700	200,000	0	470,000	1,200,414	Regular
					4.190	1400	22.76	88	2	0	0	800,000	800,000	212,700	200,000	0	470,000	1,200,414	1

Total Page No.: 1 | Zoom Factor: 75%



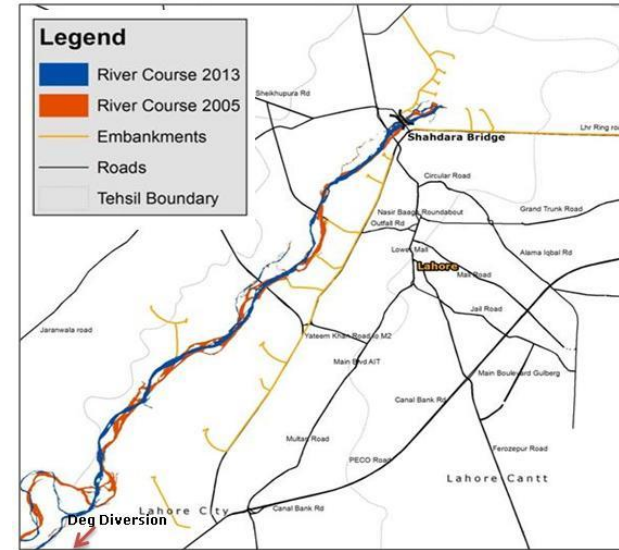
GIS for River Management (Case Study of Ravi River, Punjab, Pakistan)

Objectives Use of modern techniques for river management to enhance survey accuracy and efficiency

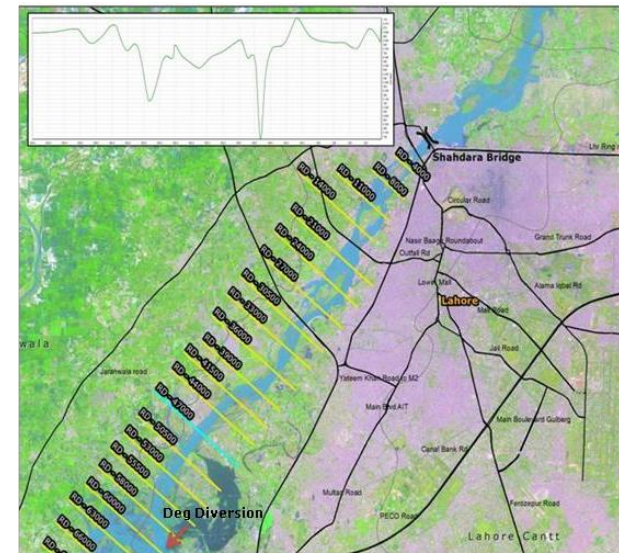
Scope Development of integrated database for plain table survey maps and satellite imagery

Synergy of ground data and GIS for preparation of engineering maps from field survey data

User Irrigation Department, Govt. of Punjab

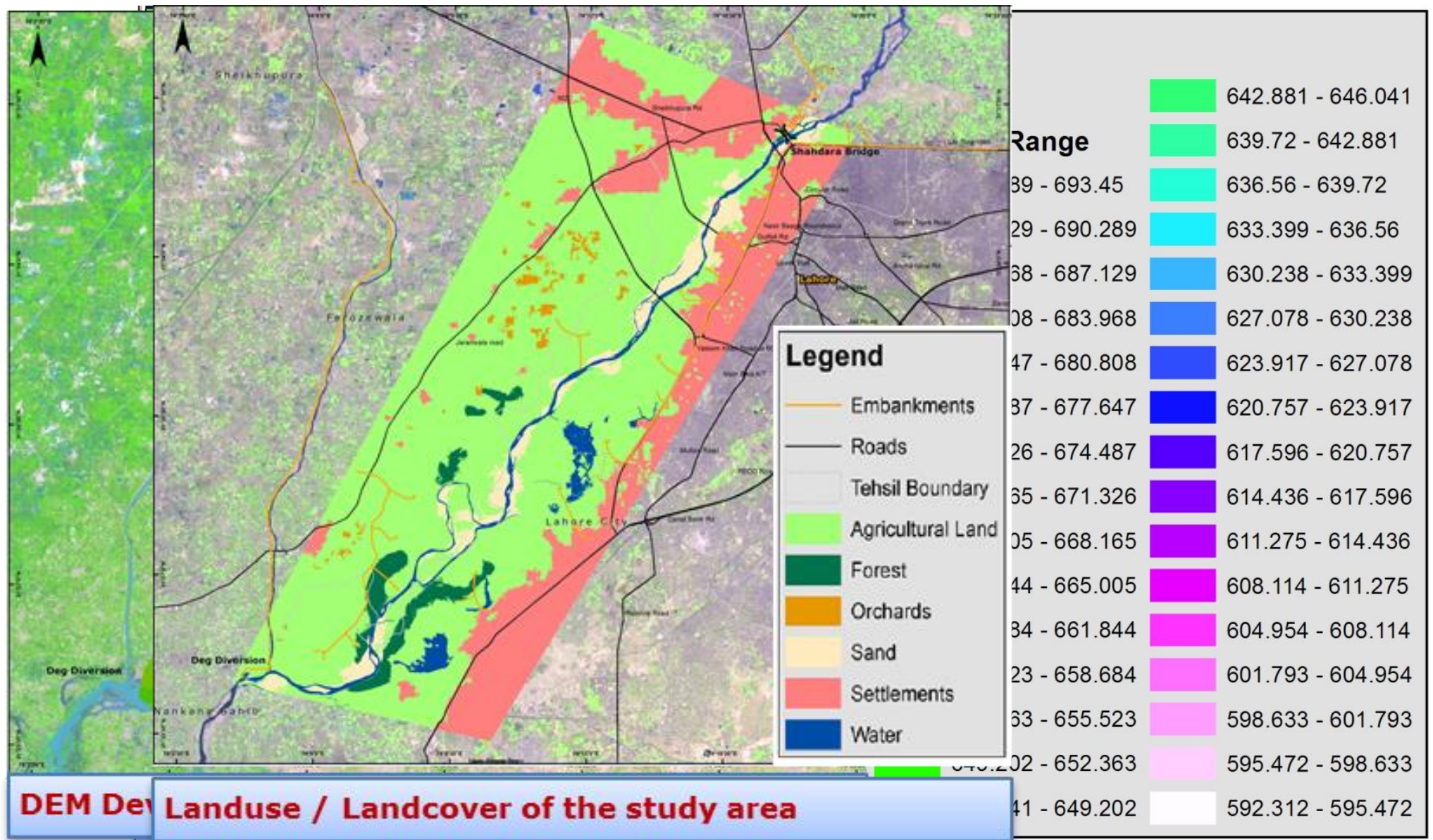


River Course Change



River cross sections on satellite image

GIS for River Management (Case Study of Ravi River, Punjab, Pakistan)



Flood Vulnerability Assessment Using Geospatial Techniques

Objectives: To determine flood vulnerability from Guddu to Sukkur Barrage using HEC-RAS and Geo-Spatial techniques

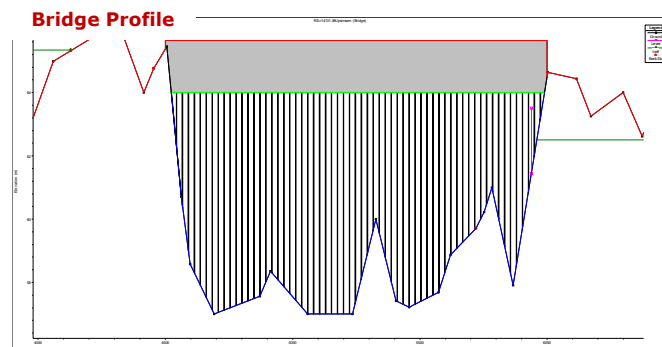
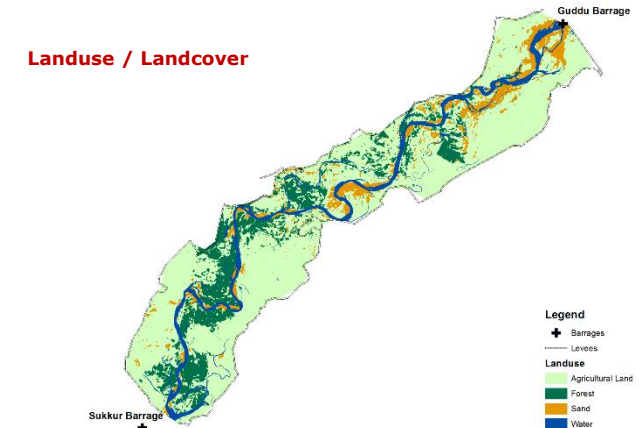
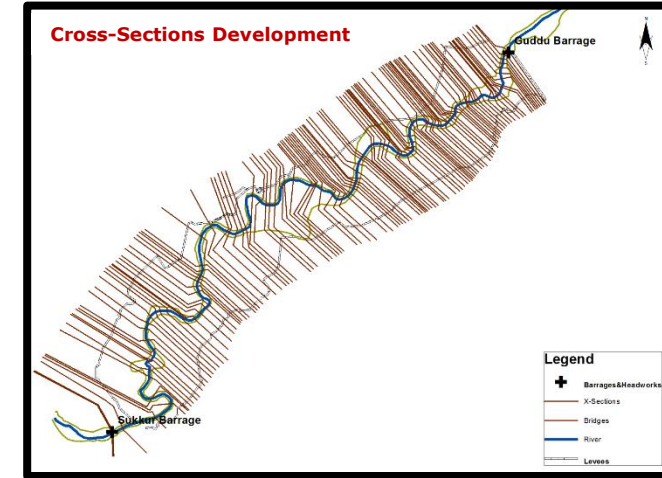
Scope: Geodatabase development of landuse / landcover, embankments, irrigation and road network, Cross sections, river banks and bridges etc.

Hydrological analysis using HEC-RAS model on SRTM DEM

Simulation of water level in Indus river for different discharge / stream flows

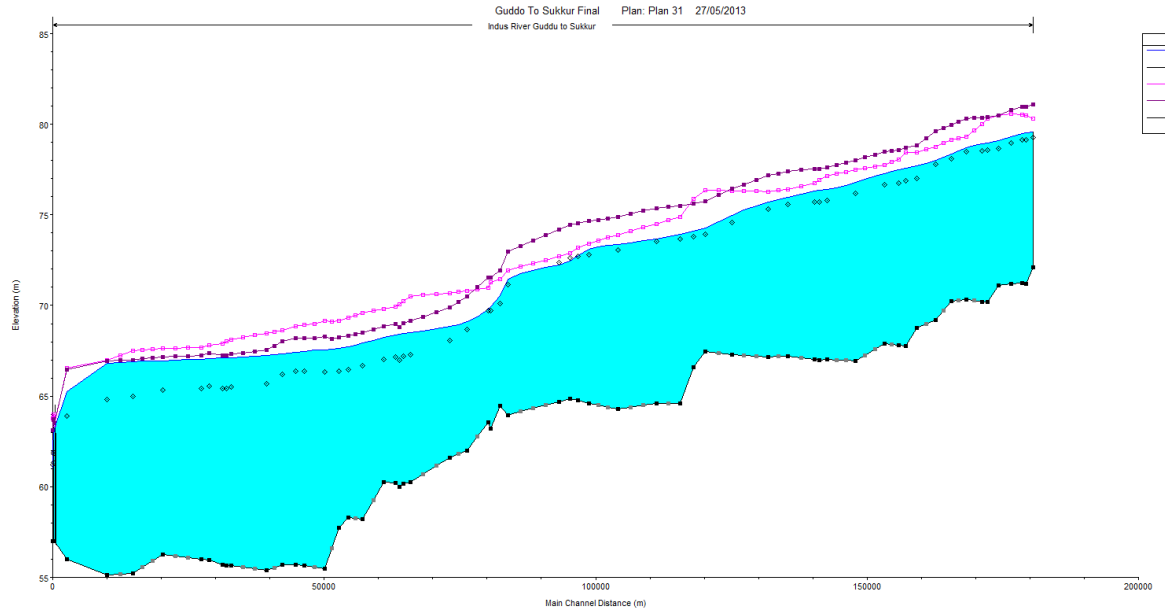
Identification of vulnerable embankments based on freeboard b/w water surface and top of the embankment

Users Govt of Sindh

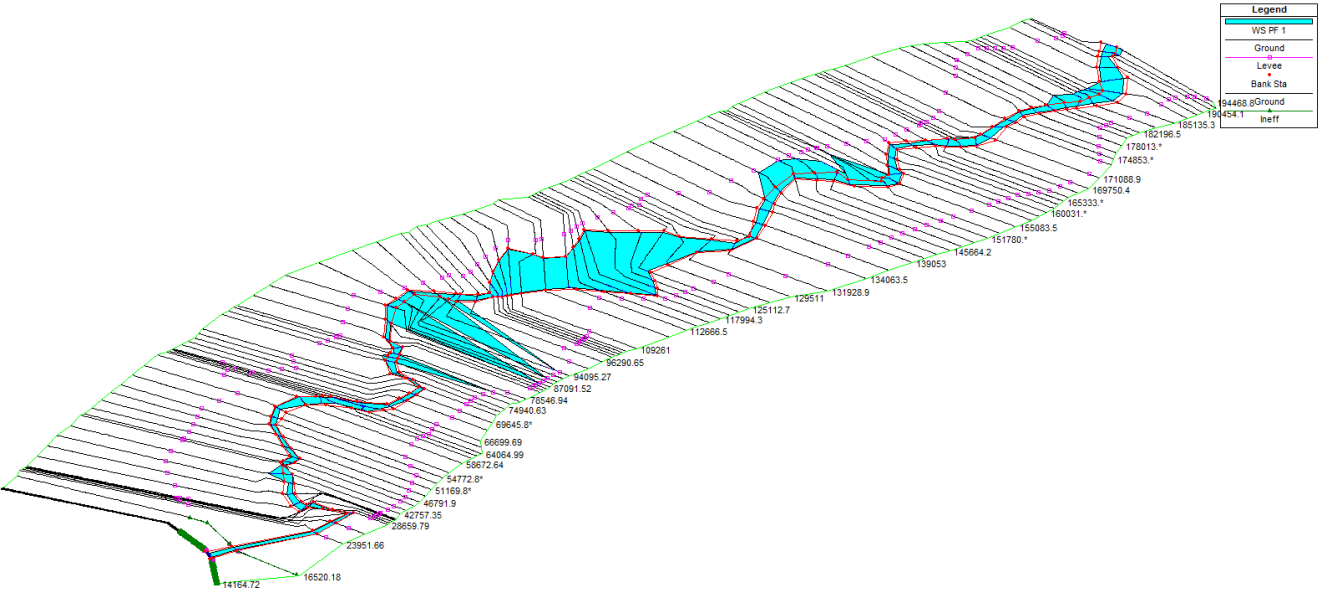


Stream Flow Simulation

LONGITUDINAL PROFILES



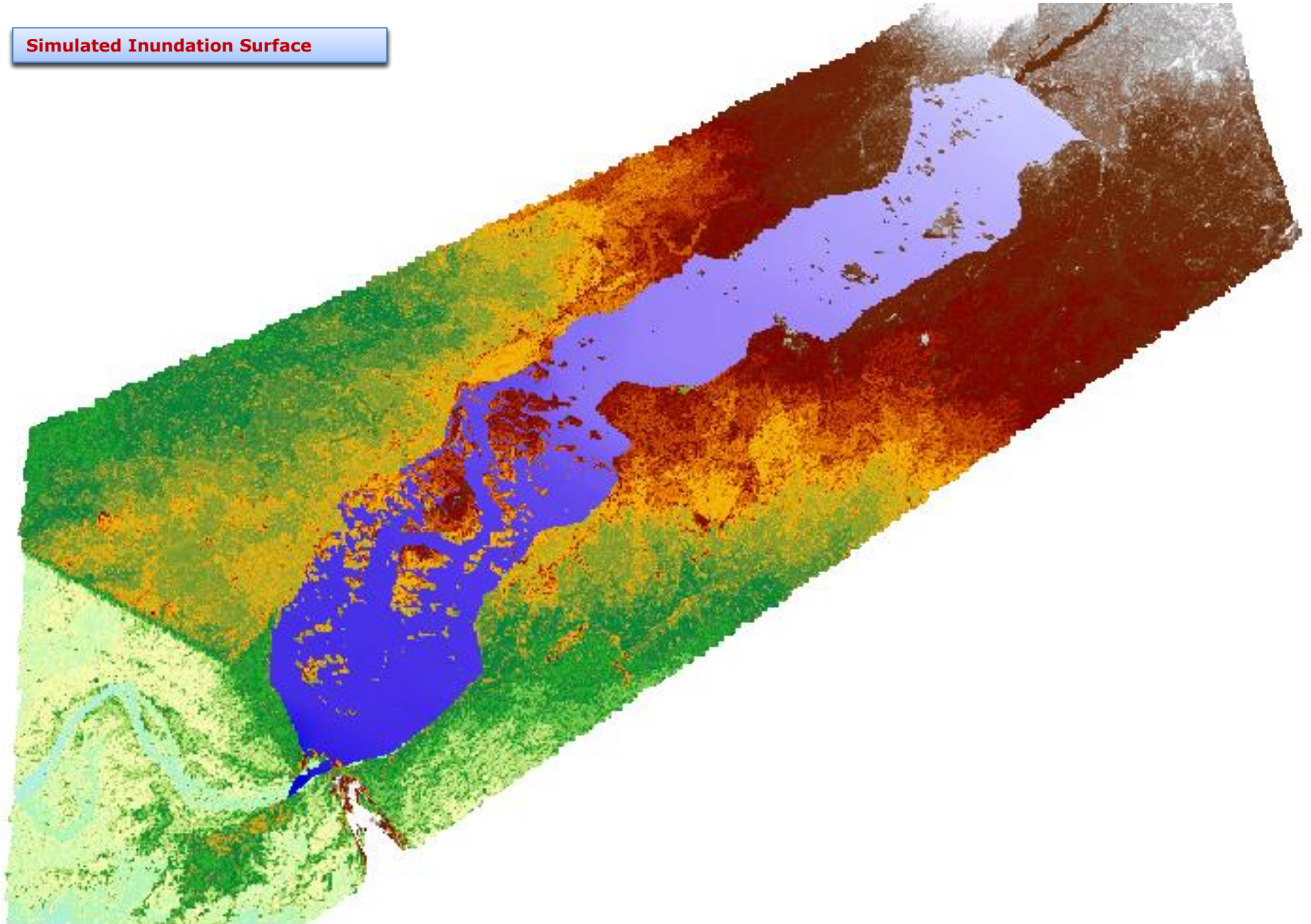
Guddo To Sukkur Final Plan: Plan 31 27/05/2013



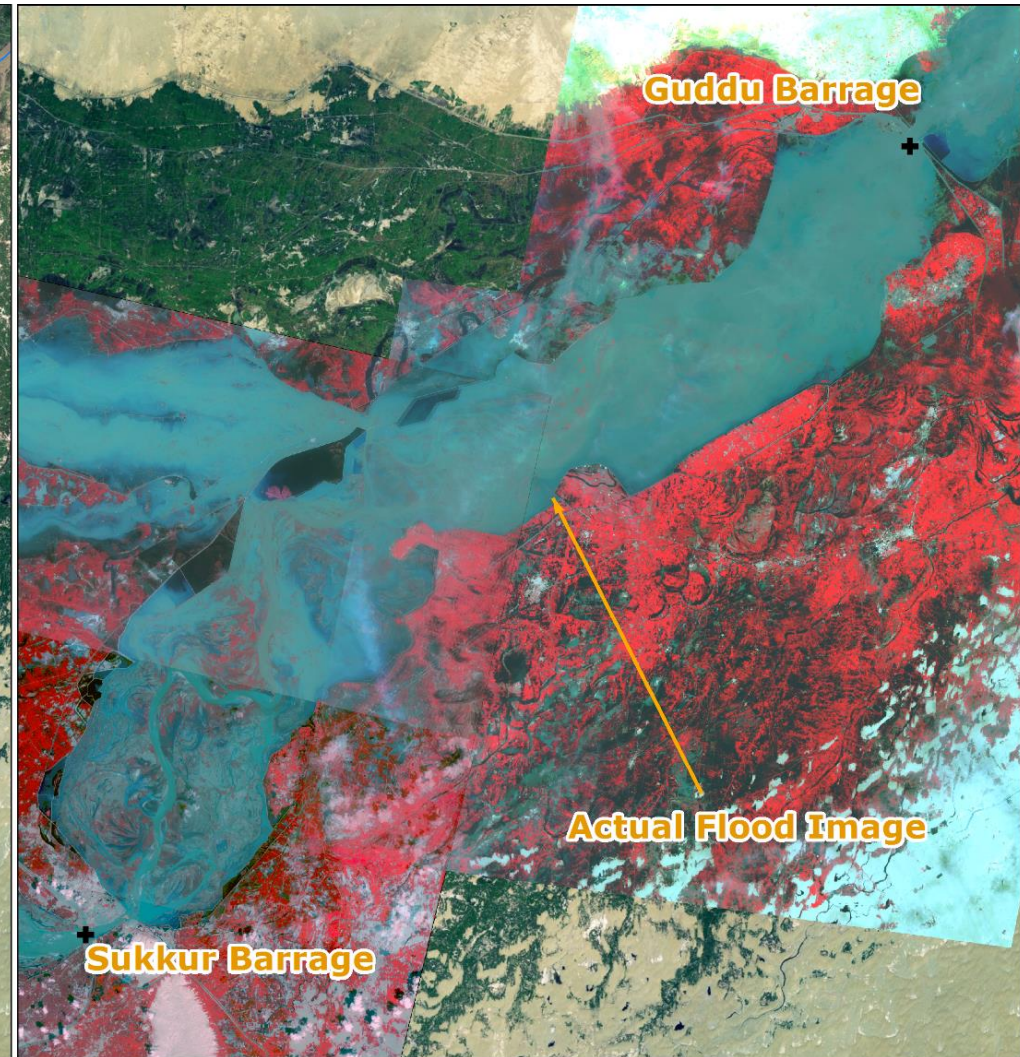
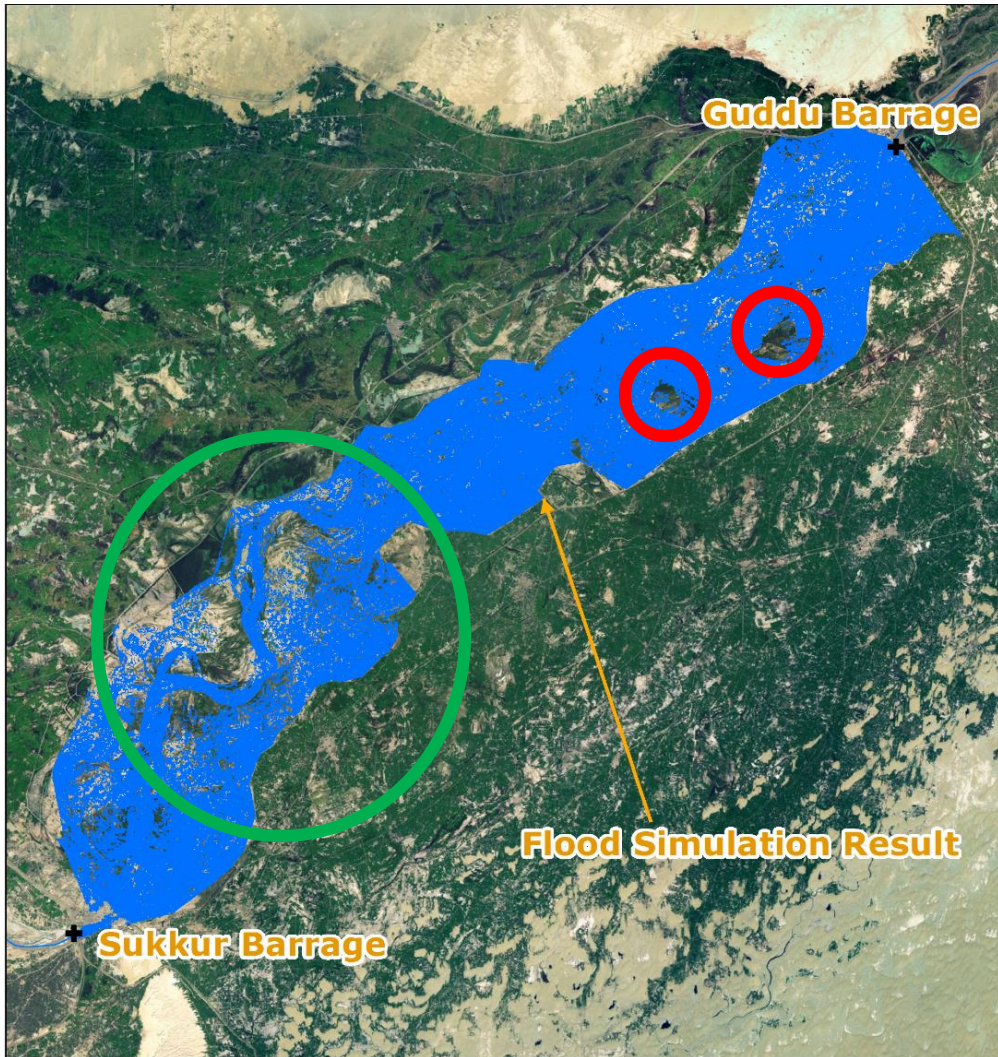
3D CROSS-SECTION PLOT

INUNDATION RESULTS

Simulated Inundation Surface



OBSERVED VS. SIMULATED



Pre (June) & Post (July) Monsoon Analysis

Flood Vulnerability Assessment and river course change monitoring

Objectives:

Pre & Post monsoon assessment of flood protective infrastructure to predict vulnerable bunds during high river flows in Sindh

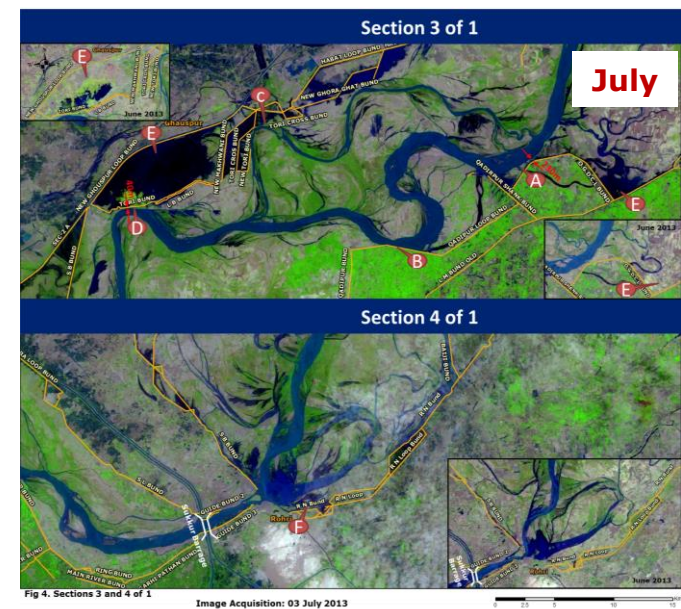
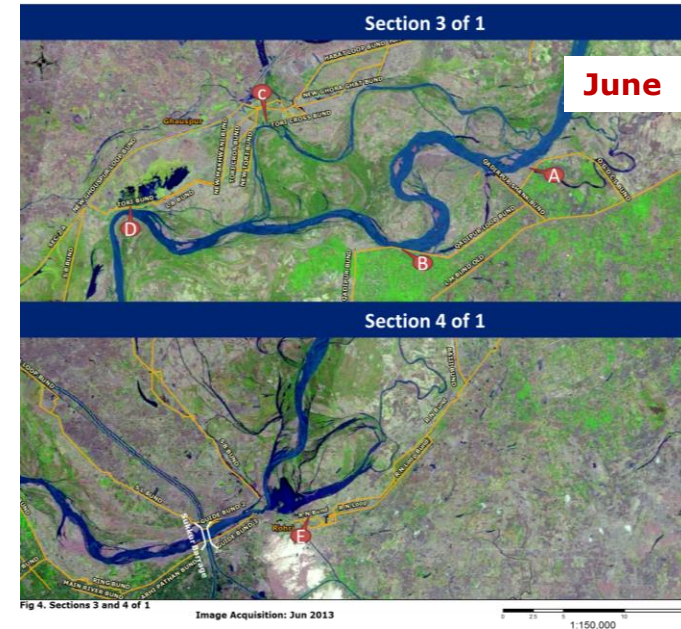
Scope:

Mapping of Indus River course and flood plain before & after monsoon and timely reporting to the concerned departments for timely remedial measures

Mapping of major obstructions using high resolution satellite imagery and proposal for artificial channelization in floodplain

Users

Govt of Sindh



Demarcation of Obstructions

Indus River Floodplain, Sindh

Objectives:

Identification of obstacles / Zamindari bunds in Indus floodplain for pre-monsoon preparedness in Province Sindh

Scope:

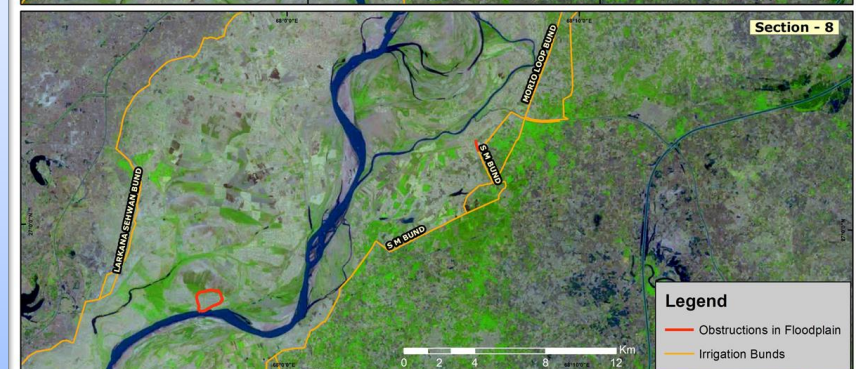
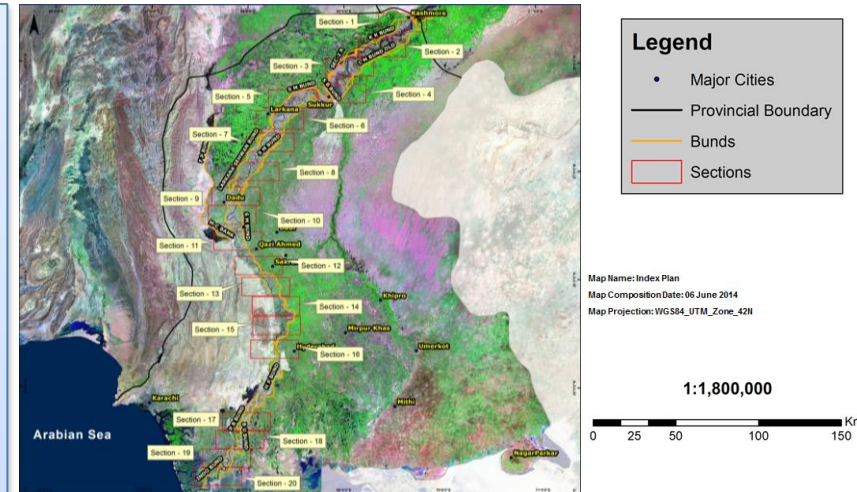
Satellite image based identification of obstacles in floodplain

Imint and visual interpretation

DEM to delineate natural and artificial channels and depressions in floodplain

Users

Govt of Sindh



Recommended for consideration by PDMA:

Minimize human interventions in floodplain

Restoration of floodplain in its natural form i.e. Depressions, channelization etc

During high flows through artificial channelization in order to avoid flooding beyond floodplain

Demarcation of Obstructions

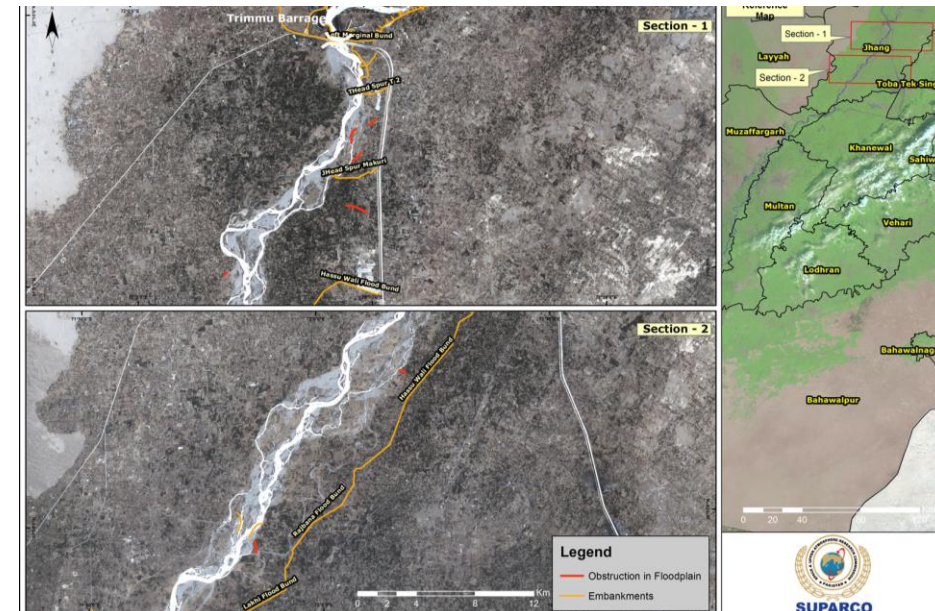
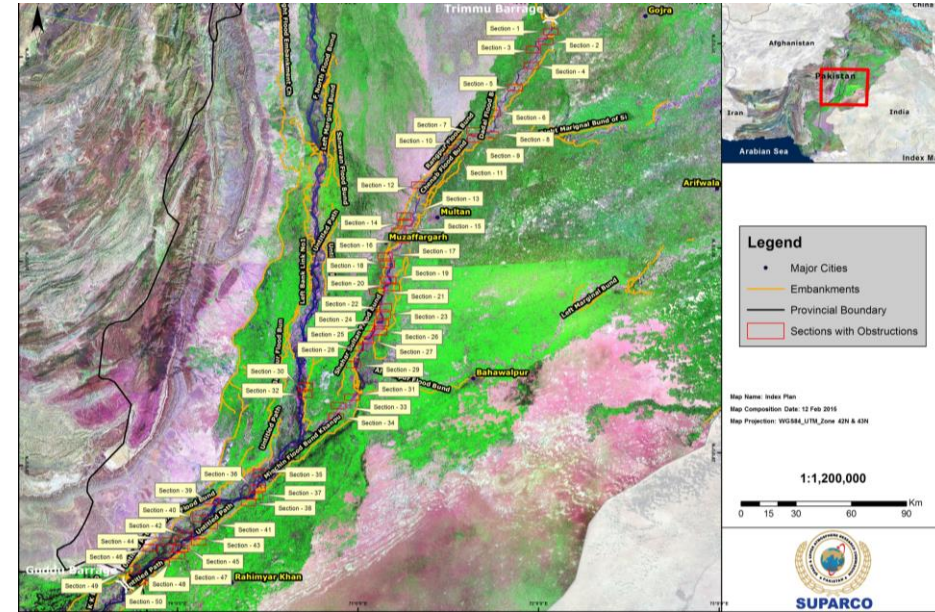
Chenab River Floodplain, Punjab

Objectives: Identification of obstacles / Zamindari bunds in Indus floodplain for pre-monsoon preparedness in Punjab

Scope: Satellite image based identification of obstacles in floodplain

Imint and visual interpretation
DEM to delineate natural and artificial channels and depressions in floodplain

Users Govt of Punjab



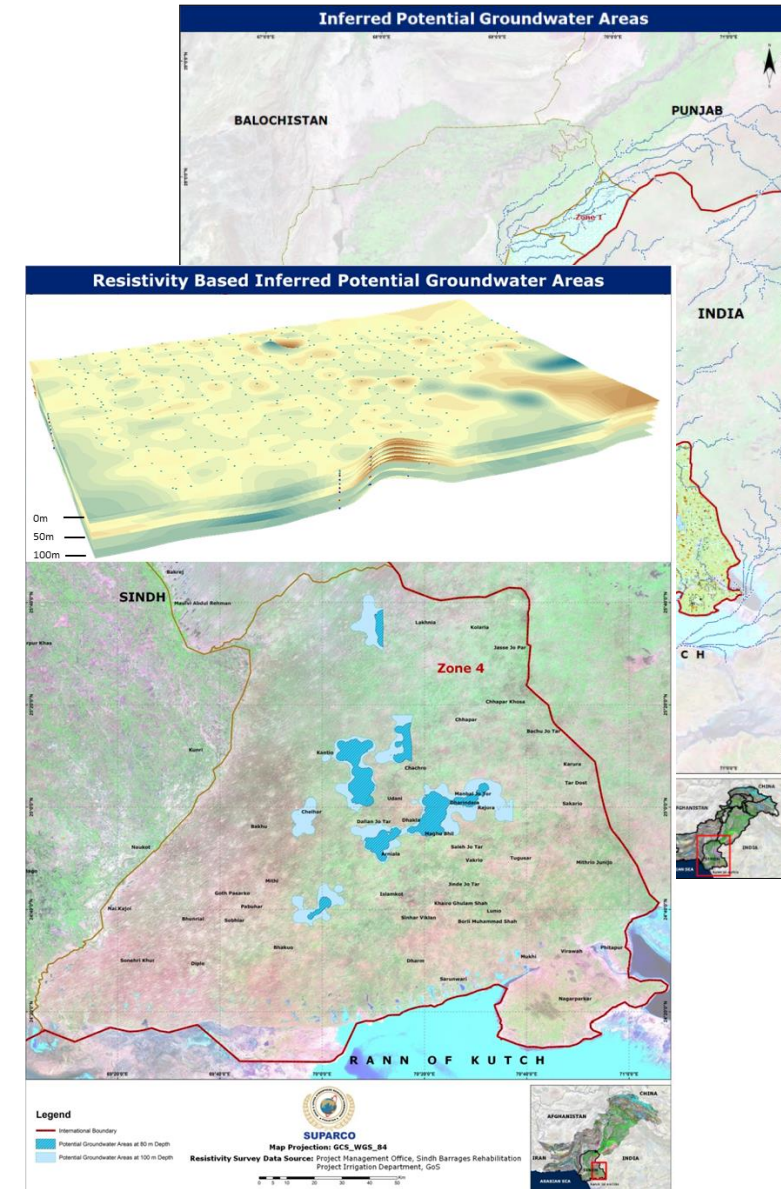
Development of GIS to Assist Groundwater Exploration in Thar Desert

Objectives: Identification of potential groundwater areas using geospatial techniques to assist in field investigations for delineation of subsurface aquifers

Scope: Integration of RS & GIS with geophysical field survey data

Inferring groundwater potential areas survey data for provision of clean sweet water for public and Thar Coal Power Project

User: Sindh Barrages Rehabilitation Project (SBRP), Irrigation Deptt, Govt of Sindh



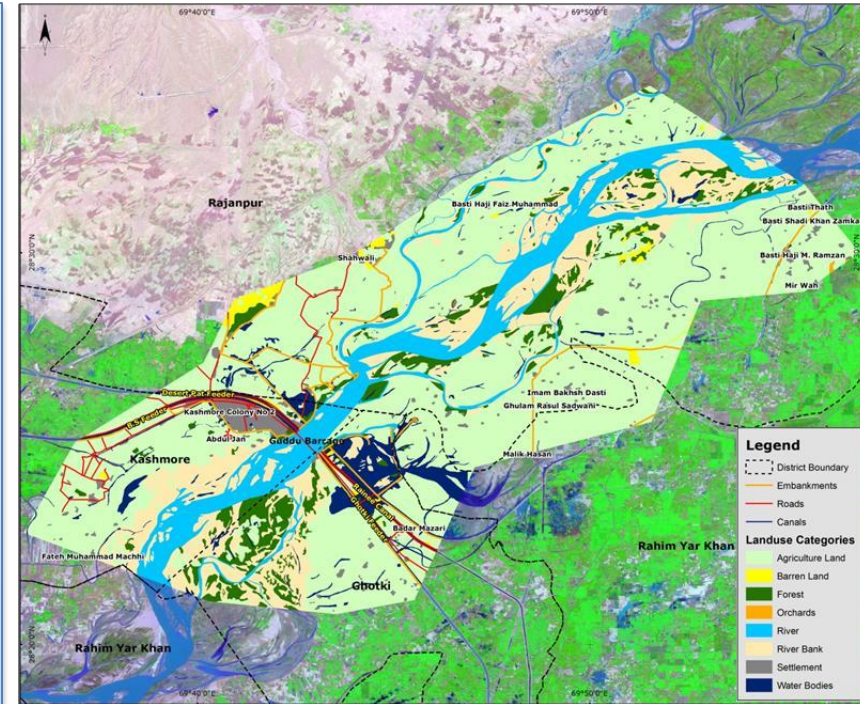
Landuse Mapping of Guddu Barrage Area

Objectives: Baseline mapping of Guddu Barrage area for environmental impact assessment

Scope: Preparation of detailed Landuse / landcover categories (infrastructure, forest, agriculture land, settlements and others) at 1:10,000 using very high resolution imagery

User Mott McDonalds (Pvt.) Ltd

Benefits: To help in Environment impact assessment of Guddu barrage rehabilitation project (World bank funded)



CONCLUDING REMARKS

- ❖ Time and cost efficient solutions
- ❖ Spatial database development
- ❖ Large scale mapping especially in distant areas
- ❖ Field scale measurements and data validation
- ❖ Capacity of building of concerned officials

THANK YOU