A Viable Approach to Establish Conclusive Land Title in India

G-Triangulation
Digital India Land Record Modernization
District Gurugram, Haryana

Satyaprakash Lakshmanappa & Dr. Sultan Singh
satyaprakashias@gmail.com; sultan_harsac@yahoo.co.in
District Administration, Gurugram, Haryana, India

Paper prepared for presentation at the
“2017 World Bank Conference on Land & Poverty”
The World Bank - Washington DC, March 20-24, 201
HARYANA LAND RECORD SYSTEM

Increasing Land Dispute
Nala Encroachment Case Study

Several demarcation exercises conducted by administration, failed to accurately locate a seasonal rivulet, to determine the encroachment dispute between two prominent developers.

NGT directed the DC, Gurugram to create a ‘Fool-proof Land Record Document’.

satyaprakashias@gmail.com; sultan_harsac@yahoo.co.in
LAND RECORDS

Gaps in Indian System

Revenue Records are Presumptive
Title awarded only through adjudication based on circumstantial evidence

Urban Land Records & Registration are separate systems

Old and outdated, incomplete and inaccurate cadastral records – graphical + textual
Multiple handling agencies – lack of coordination

satyaprakashias@gmail.com; sultan_harsac@yahoo.co.in
CURRENT LAND RECORD SYSTEM

Impact on Indian Economy

1.3% loss in India’s GDP growth rate due to insecure & unclear land titles

Title & Boundary Disputes leading to Costly Litigation
5% of land in urban areas, 28% of land in peri-urban areas

Land Records become the primary bottleneck for ensuring ‘Ease of Doing Business’
HARYANA LAND RECORD SYSTEM

Historical Scenario

First Survey and Settlement 1907-13

Re-Survey for Consolidation 1957-61

Land Area 44,212 sq. km.
No. of Villages 7,085
No. of Musavies 65,000

No. of Parcels 1,05,00,000+

Fairly evolved Land Record System for that time

satyaprakashias@gmail.com; sultan_harsac@yahoo.co.in
HARYANA LAND RECORD SYSTEM

Progress in Recent Years

2007: Experiments in Digitization & Modernisation of Land Records

District Sirsa
Digitisation of Cadastral Map

District Bhiwani
Digitisation of Urban Land Records & Habitats

District Rohtak
Digitisation of Urban & Rural Areas

satyaprakashias@gmail.com; sultan_harsac@yahoo.co.in
The digitisation of land parcels without a geo-reference can have a cascading effect / overlaps / lead to litigations.

The Land Record Management System without Correction of Historical Errors, Linkages between GIS & Textual Data at best can be a “Garbage In - Garbage Out” system
CHALLENGE FACED BY ADMINISTRATION FOR
Creating Accurate Revenue Records

MUSAVI
Revenue Maps

JAMABANDI
Revenue Records

satyaprakashias@gmail.com; sultan_harsac@yahoo.co.in
CHALLENGE FACED BY ADMINISTRATION FOR Creating Accurate Revenue Records

MUSAVI Revenue Maps

DIGITISATION Scanning & Vectorisation

JAMABANDI Revenue Records

DIGITAL ROR

satyaprakashias@gmail.com; sultan_harsac@yahoo.co.in
CHALLENGE FACED BY ADMINISTRATION FOR Creating Accurate Revenue Records

MUSAVI Revenue Maps → DIGITISATION Scanning & Vectorisation → GIS Basemap with Revenue Information → GEO REFERENCE Basemap linked to GPS → PUBLIC DOMAIN Accurate Revenue Records

JAMABANDI Revenue Records → DIGITAL ROR → GIS Basemap with Revenue Information

satyaprakashias@gmail.com; sultan_harsac@yahoo.co.in
CHALLENGE FACED BY ADMINISTRATION FOR Creating Accurate Revenue Records

MUSAVI Revenue Maps → DIGITISATION Scanning & Vectorisation → GIS Basemap with Revenue Information → GEO REFERENCE Basemap linked to GPS → PUBLIC DOMAIN Accurate Revenue Records

JAMABANDI Revenue Records → DIGITAL ROR

Maps - Referencing = Image (not usable)
Image + Referencing = Usable Maps

Need for Geodetic Triangulation

satyaprakashias@gmail.com; sultan_harsac@yahoo.co.in
NEED FOR
G-Triangulation

Presently, the 35 Precision Coordinates from Survey of India “Benchmark” are the only available means to locate Government Assets within the State.

Only 11 our of 35 SoI Benchmarks are physically existing as on 2015
G-TRIANGULATION
Re-Establish Existing SoI Benchmarks

Differential Global Position System

To Establish One Point
11 Satellites
72 Hours
3 Locations

satyaprakashias@gmail.com; sultan_harsac@yahoo.co.in
G-TRIANGULATION

Re-Establish Existing SoI Benchmarks

Differential Global Position System

To Establish One Point
11 Satellites
72 Hours
3 Locations

satyaprakashias@gmail.com; sultan_harsac@yahoo.co.in
Establish other SoI Benchmarks

Physically locate all the 35 Master Control Points

G-TRIANGULATION

Base Station

Rover

Transmission Antenna

GPS Receiver

10 to 30 km

satyaparakashias@gmail.com; sultan_harsac@yahoo.co.in
G-TRIANGULATION
Establishing Primary Control Points

Network of Primary Control Points

20 km Interval
121 Control points

satyaprakashias@gmail.com; sultan_harsac@yahoo.co.in
G-TRIANGULATION
Establishing Secondary Control Points

Network of Secondary Control Points
8 km Interval
589 Control points

satyaprakashias@gmail.com; sultan_harsac@yahoo.co.in
Establish Gurugram Boundary from Primary & Secondary Control Points
Establishment of Tertiary Control Points

The Monumentation and DGPS work has been carried out Tehsil wise and cover approximately 512 village tri-junctions covering 5200 musavi spread over 291 villages in 05 tehsils.

satyaprakashias@gmail.com; sultan_harsac@yahoo.co.in
G-TRIANGULATION

Village Tri Junction Monumentation

Village Tri Junction DGPS Survey – Established of geodetic coordinate using DGPS survey carried out in reference to the state network.

satyaprakashias@gmail.com; sultan_harsac@yahoo.co.in
G-TRAIANGULATION
Verify Tertiary Control Points

satyaprakashias@gmail.com; sultan_harsac@yahoo.co.in
G-TRAIANGULATION

Geo Referenced Cadastral Map

Satellite Data Processing & Village Cadastral map Geo-referencing

Post processing of DGPS Survey data, Geo-referencing of Satellite Image, DEM and Ortho Generation, Overlaying of revenue village map and analysis.

satyaprakhashias@gmail.com; sultan_harsac@yahoo.co.in
Manesar Tehsil

Legacy Data Validation

Move from “Presumed Titles” to “Conclusive Titles”

Link the conclusive titles to the economic process, disaster management, food security, land acquisition, rehabilitation & resettlement.

Decision making facilitated in determining location of roads, bridges & watersheds etc.

satyaprakshias@gmail.com; sultan_harsac@yahoo.co.in
MANESAR TEHSIL
Legacy Data Validation

satyaprakashias@gmail.com; sultan_harsac@yahoo.co.in
MANESAR TEHSIL
Legacy Data Validation

satyaprakashias@gmail.com; sultan_harsac@yahoo.co.in
VILLAGE HASSANPUR
Legacy Data Validation
Tri Junction Validation

Village Area
Vector = 271.9 acres
R.O.R = 269.4 acres
0.93% difference

satyaprakashias@gmail.com; sultan_harsac@yahoo.co.in
VILLAGE HASSANPUR
Legacy Data Validation

Identification of discrepancy in distance between Tri-Junction to Tri-Junction (Badi Burji)

As per Cadastral Map
As per R.O.R.
VILLAGE HASSANPUR

Legacy Data Validation

Identification of discrepancy in distance between Auxiliary Control Points (Choti Burji)

As per Cadastral Map
As per R.O.R.

Difference

satyaprakashias@gmail.com; sultan_harsac@yahoo.co.in
VILLAGE HASSANPUR
Legacy Data Validation

Identification of discrepancy in distance between Auxiliary Control Points (Choti Burji)
As per Cadastral Map
As per R.O.R.
Difference

satyaprakashias@gmail.com; sultan_harsac@yahoo.co.in
VILLAGE HASSANPUR
Legacy Data Validation

Geo Referencing with Musavi

satyaprakashias@gmail.com; sultan_harsac@yahoo.co.in
VILLAGE HASSANPUR
Legacy Data Validation

Revenue Map
1957

satyaprakshias@gmail.com; sultan_harsac@yahoo.co.in
VILLAGE HASSANPUR
Legacy Data Validation

Revenue Map (updated)

2016
VILLAGE HASSANPUR
Legacy Data Validation
Parcel to Parcel Comparison
1957

Village Hassanpur

Legacy Data Validation
Parcel to Parcel Comparison
1957

satyaprakashias@gmail.com; sultan_harsac@yahoo.co.in
VILLAGE HASSANPUR

Legacy Data Validation

Parcel to Parcel Comparison

2016

After Updation
VILLAGE HASSANPUR
Legacy Data Validation

Area Comparison

1957

0-1 67.14%
1-2 3.29%
2-3 1.89%
3-4 0.94%
4-5 0.70%
5 and above 26.06%

satyaprakashias@gmail.com; sultan_harsac@yahoo.co.in
VILLAGE HASSANPUR
Legacy Data Validation

Area Comparison

2016

After Updation

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-1</td>
<td>85.71%</td>
</tr>
<tr>
<td>1-2</td>
<td>3.6%</td>
</tr>
<tr>
<td>2-3</td>
<td>1.12%</td>
</tr>
<tr>
<td>3-4</td>
<td>0.89%</td>
</tr>
<tr>
<td>4-5</td>
<td>1.56%</td>
</tr>
<tr>
<td>5 and above</td>
<td>7.14%</td>
</tr>
</tbody>
</table>

satyaprakashias@gmail.com; sultan_harsac@yahoo.co.in
VILLAGE HASSANPUR

Increased Accuracy of Revenue Records

- SATELLITE ORTHO IMAGE (50 CM) – 2011
- PANCHROMATIC IMAGE (75 CM) – MARCH 2016
- MULTISPECTRAL IMAGE (3 METER) – MARCH 2016
- UAV IMAGE (5 cm) – 23 JULY 2016

satyaprakashias@gmail.com; sultan_harsac@yahoo.co.in
G-Traingulation

BENEFITS

satyaprakashias@gmail.com; sultan_harsac@yahoo.co.in
G-TRIANGULATION

Benefits

Conclusive Titles

Linking UID

Document Access

Insurance

Land Lending

Judiciary

Forensic Audit

satyaprakshias@gmail.com; sultan_harsac@yahoo.co.in
**G-TRIANGULATION**

**Benefits**

![Stop Corruption]

Happy Farmer

Govt. Revenue

satyaprakashias@gmail.com; sultan_harsac@yahoo.co.in
G-TRIANGULATION: TEHSIL MANESAR

Legacy Data Validation

Area Resolved: 2,800 Acres

Ownership issues resolved: 1,500

Tehsil Manesar

TOTAL AREA

Difference between ROR and Actual
Reduced from 7.39% to 0.01%

satyaprakashias@gmail.com; sultan_harsac@yahoo.co.in
FUTURE
Revolutionise Revenue Record Management
G-TRIANGULATION

Team

**T L SATYAPRAKASH,**
Dy. Commissioner
Thought Leader

**DR. SULTAN SINGH,**
Sr. Scientist, NRDMS-HARSAC
Technical Lead

satyaparakashias@gmail.com; sultan_harsac@yahoo.co.in
Thank You!

Email: dcgrg@nic.in, sultan_harsac@yahoo.co.in
Mobile: +91-9999178178, +91-9416243824