BHU-NAKSHA
"CADASTRAL MAPPING"

LAND RECORDS INFORMATION SYSTEM DIVISION (LRISD)
NATIONAL INFORMATICS CENTRE (NIC)
INTRODUCTION

- Land plays a crucial role in our social and economic life, particularly in rural areas.

- The scheme of computerization of land records was started in 1988-89 with the aim of removing inherent flaws in the existing land records system. Basic work converting the Record of Rights (ROR) into digital form is complete in majority of States with computerized ROR being distributed to citizens from Tehsil computer centre.

- The scheme has been revamped and many new and related components have been included such as computerization of registration and its integration with Land Records, capacity building, survey, cadastral maps, modern record room. The new scheme is called National Land Records Modernization Programme (NLRMP) launched in 2008.

- The integrated programme would modernize management of land records, minimize scope of land/property disputes, enhance transparency in the land records maintenance system.
The major components of the programme are computerization of land records including mutations, digitization of cadastral maps and integration of textual and spatial data, survey/re-survey and updation of all survey and settlement records.

Information technology has brought transparency in land records and registration department by facilitating placing of property records on the public domain.

While Record Of Rights (ROR) data has been converted to electronic form by many states long back, the preservation and manipulation of cadastral maps on electronic media had been eluding due to cost and technology constraints till recent past.
NEED FOR COMPUTERISATION

- High volume of data being handled.
- Extensive public dealing.
- Requirement of regular maintenance of records.
- Information called for by different departments.
- Accuracy of the information extremely important.
- Importance of spatial (cadastral map) data.
OBJECTIVES OF LRIS

- The application will concentrate on the linking of both attribute (non-spatial) data with special reference to cadastral (spatial) data.

- Minimum duplication in land data maintenance.

- Data integrity, accuracy and timeliness in information processing is ensured.

- Automatic generation and issuance of Record of Rights.

- Helps to settle land disputes by providing accurate and effective information.

- Crop information maintained is useful for agricultural census work.
**ROLE OF NIC**

*As a Monitoring group... As an Enabler...*

- ..We keep track of the progress attained in every state.
- ..We operate online monitoring system.
- ..We conduct meetings through Video Conferencing with all stakeholders concerned to record performance and delays.
- ..we provide technical guidance and operational support towards offshoot requirements like Training on Computer, Awareness and Operational aspects of Land Records.
BHU-NAKSHA

- BHU-NAKSHA is a tool developed in-house by NIC using Open source JAVA library ‘GeoTools’ to facilitate management of Digitized Parcel maps.

- BHU-NAKSHA is suitable for the states where Cadastral maps are in use.

- With proper customization BHU-NAKSHA can be integrated with existing Land Records application of any such State.
It is a comprehensive tool to cater to all basic necessities of Patwari with regard to parcel map management.

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BHU-NAKSHA can be integrated with existing LR application of any such State.

National Informatics Centre is the nodal agency of Government Of India which is committed to provide state-of-art solutions for the Information Technology needs of the Government.
BHU-NAKSHA ARCHITECTURE

BHU-NAKSHA APPLICATION

BHU-NAKSHA FRAMEWORK

State ROR plugin
- State 1
- State 2
- State n

- Geotools
- Jasper Reports
- Postgis

- Map Database Postgresql
- ROR Database
- ROR Database
- ROR Database
FEATURES

- Developed using Open source software.
- **Works in Windows and Linux**
- **Integration of spatial and textual data**
- **Scale**: Map can be displayed and printed to any scale.
- **Distance between two points can be measured**
- **Area calculation is automatic**
- **Layers on Plot map**: can be displayed and printed
- **Plot division Size & shape can be adjusted**
- **Merging**: of two polygons at a time
- **Map based Queries** (As many as required)
- **Import from multiple format**: Supports importing data from multiple sources like shape file, .adf file and ETS data.
- **Display of all maps of Khasras** owned by a person by clicking on any one single Khasra map.
- **Grid to help in drawing segments**.
- **Print Khasra map along with adjoining Khasra maps and owner details**.
SYSTEM REQUIREMENT

Software and Hardware requirement for running the application

- **SOFTWARE :-**
  - Operating System : Windows/Linux etc
  - Database : SQL Server/postgres

- **HARDWARE :-**
  - RAM : 1 GB or Above
  - Processor : Pentium IV or above
  - Hard Disk : 160 GB Minimum
OPEN SOURCE SOFTWARE USED IN PROJECT

- NetBeans IDE
- Postgre SQL
- PostGIS
- Geotools
- iReport
PostgreSQL

- PostgreSQL, often simply Postgres, is an object-relational database management system (ORDBMS).
- It is released under an MIT-style license and is thus free and open source software.

- PostgreSQL evolved from the Ingres project at the University of California Berkeley.
- In 1996, the project was renamed to PostgreSQL to reflect its support for SQL.

- PostGIS adds support for geographic objects to the PostgreSQL object-relational database.
- In effect, PostGIS "spatially enables" the PostgreSQL server, allowing it to be used as a backend spatial database for geographic information systems (GIS), much like ESRI's SDE or Oracle's Spatial extension.
GeoTools is a free software (GPL) GIS toolkit for developing standards compliant solutions.

GeoTools is a contributor of the GeoAPI project: a vendor-neutral set of Java interfaces derived from OGC specifications - and implements a subset of those.

It is written in Java and currently is under active development.
GeoTools library supports the following core features:

- interfaces for spatial concepts and data structures.
- JTS Topology Suite Geometry: The JTS Topology Suite (JTS) is an open source java software library that provides an object model for Euclidean, planar, linear geometry together with a set of fundamental geometric functions.
- Attribute, Spatial and Temporal filters
- Data access for feature support (transaction based with optional locking).
- spatial referencing (with coordinate reference system and coordinate transformation).
- Rendering with full style layer descriptor support.
- set of swing components.
METHODOLOGY

- Analysis of the current system adopted in the country.
- Preparation of the **SRS specification** of the system.
- Preparation of **E-R Diagram** of the system.
- Preparation of the **Use case** of the system based on different actors and their goal to use the system.
- Preparation of the **Activity** of the system based on different activity performed by the personnel.
- Designing the system.
- Coding of the System.
- Testing of the system.
E-R DIAGRAM OF THE SYSTEM
USE CASE DIAGRAM
ACTIVITY DIAGRAM
RUNNING THE APPLICATION
RUNNING THE APPLICATION

Before running the application do the following:-

1) Install postgresql.
2) Install postgis
3) Create bhunaksha database in postgres. Please specify template as postgis when you create database (This can be done through Bhunaksha Settings -> Restore Database or PGAdmin3).
4) Restore the blank database provided on top of bhunaksha database (This can be done through Bhunaksha Settings -> Restore Database or PGAdmin3).

Open the Bhunaksha folder and double click on the bhunaksha.exe.
DOUBLE CLICK ON Bhunaksha.exe to run the application
DATABASE CONNECTION SETTINGS
### Vector Database Connection

<table>
<thead>
<tr>
<th>Port No. of Postgres database</th>
<th>Database name</th>
<th>User Name of Postgres</th>
<th>Password of the Postgres</th>
</tr>
</thead>
<tbody>
<tr>
<td>5432</td>
<td>bhnaksha_demo1</td>
<td>postgres</td>
<td>************</td>
</tr>
</tbody>
</table>
Non-Vector Database Connection

Jar Name (available in conf folder)

Host Name

Port no. of SQL Server

Database Name

Sql Server User Name

SQL Server password
Successfully connected with database.
Application will try to restart to apply new settings.
Some times you may get some message like the one given below. If so click the **close** button. This is because database connection is not yet saved.

Since database connection settings are not set it will automatically open the DB Settings window.
DIFFERENT OPERATION UNDER FILE TAB
DIFFERENT OPERATION UNDER REPORTS TAB
DIFFERENT OPERATION UNDER SETTINGS TAB
HELP TAB
BHU-NAKSHA

For editing the map in its digitized form NIC CG State Centre has developed a tool, named BHU-NAKSHA, with all features required so as to divide, join, print, zoom in & out, calculate area of map etc. The details of this module are presented in the subsequent paragraphs.

The tool for editing GIS Khasra maps has been developed using open source GIS tools. It comprise of a front-end application in JAVA and back-end spatial database in PostGIS.

Important features of the application are:
- Developed using open source software.
- This application can be used in LINUX as well as WINDOWS platforms.
- Import option to import spatial data from shape format to PostGIS.
- Display of all maps of Khasras owned by a person by clicking on any one single Khasra map.
- Single polygon can be split into multiple polygons in a single operation.
DISPLAYING THE MAP
SELECTION OF PLOT BY MOUSE CLICK
SELECTION OF PLOT BY ENTERING PLOT NO.

Enter Plot No. Here
Displaying Plot Information of Selected Plot
GETTING INFORMATION OF DUPLICATE KHASARA
Duplicate Khasara
BLANK PLOT IN MAP

Showing Blank Khasara in Map
Displaying different layers of the map
MANAGING LAYERS
IMPORTING PLOTS FROM .SHP FILE

Browse the shape file containing plots.
1) Select Bhucode (Village code) column from Shape File.
2) Select Plot No (Khasara) column from shape file.
3) Select the village to which the Shape File belongs.
4) Type sheet no or keep it blank if the sheets are mosaiced to one shapefile during digitization.
5) Type Scale factor if the measurements in shape file is different from that of ground.
   (In almost all states 1 unit in shape file corresponds to 1 meter (unit) on ground. In case of Uttar Pradesh 1 unit in shape file was equal to 1 unit on printed paper map which is in 1:4000 scale. So UP has to set scale factor 4000. In case of Himachal units on ground is in Karam and digitization is done in centimeters and map is printed by scaling each inch to some karam. HP has to set scale factor 22 because by multiplying each unit in shape file with 22 we will get 1 karam on ground)

Click Import to import plots from shape file to Postgres database and to attach it with the selected village.
IMPORTING PLOTS FROM .ADF FILE
IMPORT LAYER
Shape File: [Browse]

Layer: OUTER TOWER STATIONS

ID Column: OUTER TOWER STATIONS

Villages: KANWAR

District: 44 - राजस्थान

Tehsil: 07 - इंदौर

Rd: 03 - इंदौर - या

Village: 214 - रामगाँज

Sheet No: (keep it blank if there is only one shape file per village)

(Import operation will overwrite existing maps of the village)

Import  Close
MERGING THE PLOTS
PRINTING PLOT REPORT
नक्शा प्रिटआउट

District: रायपुर, Tehsil: रायपुर, RI: रायपुर - एक, Village: हवंद्र
### List of Imported Villages

**Date:** 23/02/2012 03:09:41 PM

<table>
<thead>
<tr>
<th>Village Code</th>
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<th>No. of plots</th>
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<td>1 440701.142</td>
<td></td>
<td>525</td>
</tr>
<tr>
<td>2 440701.143</td>
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<tr>
<td>3 440701.144</td>
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<td>4 440701.145</td>
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<td>8 440701.149</td>
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<td>11 440701.152</td>
<td></td>
<td>683</td>
</tr>
<tr>
<td>12 440701.153</td>
<td></td>
<td>1392</td>
</tr>
<tr>
<td>13 440703.214</td>
<td>District: रायपुर, Tehsil: रायपुर</td>
<td>Village: हैवट,</td>
</tr>
<tr>
<td>14 440703.215</td>
<td>District: रायपुर, Tehsil: रायपुर</td>
<td>Village: जलाय उर्फ,</td>
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<td>15 440703.216</td>
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<td>Village: अर्थी,</td>
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<td>Village: नंदन,</td>
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<td>17 440703.218</td>
<td>District: रायपुर, Tehsil: रायपुर</td>
<td>Village: दोबिशा,</td>
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<tr>
<td>18 440703.219</td>
<td>District: रायपुर, Tehsil: रायपुर</td>
<td>Village: कोलिया,</td>
</tr>
</tbody>
</table>
Khasra Information Report

Missing Khasras in Attribute Data

District: रामपुर, Tehsil: रामपुर, R:\ रामपुर - एक, Village: हृद्यांत

3, 7, 9, 16, 18, 19, 29, 38, 46, 48, 53, 55/1, 55/2, 56, 68/3, 69, 72, 74, 77, 78, 83, 91, 92, 99, Z1, Z2, Z3, Z4, Z5, Z6, Z7, Z8, Z9, 101, 105, 106, 117, 121, 123/3, 123/4, 124, 125, 136/1, 140/1, 140/2, 141, 142/3, 149, 151, 155, 161, 164, 169, 170, 171, 176, 178, 180, 186, 188, 190, 190/1-3, 190/6-7,
Khasra Information Report

Missing khasaras in map

District: राजपुर, Tehsil: राजपुर, RI: राजपुर - एक, Village: हुबदाद

186/6, 78/2, 186/4, 9/3, 9/4, 19/13, 55/25, 56/2, 55/14, 24/2, 24/1, 38/3, 16/2, 18/5, 166/5, 83/1, 55/4,
18/7, 24/4, 25/1, 4394/2, 87/1, 130/10, 132/3, 12/3, 3/1, 72/2, 67/3, 55/23, 73/8, 91/8, 134/3, 3/2,
91/5, 29/2, 190/5, 4381/286, 29/1, 136/1/9501, 38/6, 38/7, 73/9, 71/4, 135/3, 16/1, 24/3, 130/20,
Khasra Information Report

List of Duplicate Khasara numbers In Map:

District: रायपुर, Tehsil: रायपुर, R/T: रायपुर - एक, Village: हवबर

43/1, 130/1, 99/3, 1.
MUTATION DETAILS
VILLAGE MAP PRINT
SPLITTING A PLOT

There are two ways to invoke Split Window.

1. From Menu File -> Split Plot.

If invoked from this option then you will have to Select a village and type plot number to load map of the plot for splitting.

2. From Village Map.
Select a plot and click Split Window menu from More..

There are two ways available to split a plot:-

1. Distance Angle Method
2. Arc Method (Adjacent Side)
### Village: इकबलपुर

#### Plot Info
- **Plot Number:** 143/2
- **Area in Hectare:** 0.809
- **Mutation No:**
- **Mutation Date:**
- **Scale:** 830.40

#### Dimensions

<table>
<thead>
<tr>
<th>No</th>
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<th>Distance</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>P1 → P2</td>
<td>100.577</td>
</tr>
<tr>
<td>2</td>
<td>P2 → P3</td>
<td>68.831</td>
</tr>
<tr>
<td>3</td>
<td>P3 → P4</td>
<td>77.779</td>
</tr>
<tr>
<td>4</td>
<td>P4 → P5</td>
<td>28.772</td>
</tr>
<tr>
<td>5</td>
<td>P5 → P6</td>
<td>46.831</td>
</tr>
<tr>
<td>6</td>
<td>P6 → P1</td>
<td>8.296</td>
</tr>
</tbody>
</table>

#### New Partitions of Plot No 143/2

<table>
<thead>
<tr>
<th>Name</th>
<th>Area</th>
<th>KD</th>
</tr>
</thead>
</table>

**Plot No: 143/2**
Creating a Division Line
Create Division Line using Distance Angle Method

creating division line by inputting distance and angle measurements

The window has three parts:-

- First and last terminal points of the division line should intersect an edge of the plot.
- Terminal points can be either an existing vertex point or a point between two vertex points.

For existing vertex point select the vertex from the combo box.
For point between two existing vertices select the set of two points and specify distance from the first point in the set. The total distance between the set of points will be displayed on screen.

The middle part is to place intermediate points of the division line.

- A series reference points and distance and angle from the reference point has to be typed in the middle table.

It will show the resulting division line when you feed the values. Click OK to accept the line created.
CREATE DIVISION LINE USING ARC METHOD (ADJACENT SIDE)

create division line using Arc method taking a corner point as initial reference.
In this approach define the following parameters:

1. Select the first corner point.
2. Define the distance towards second point.
3. Define the distance towards last point.
4. Define arc radius from first point.
5. Define arc radius from second point.
6. Since there are two intersecting points for the Arcs you have to select the actual point of interest.

It will show the division line being created when you enter the values.

Click OK to accept the line created.
CONCLUSION

- **Bhu-naksha** can serve as a design of a **national cadastral mapping system**.

- Presently BHU-NAKSHA application implemented in different tehsils of states like Chattishgarh, Madhya Pradesh, Himachal Pradesh, Assam, Sikkim, Uttar pradesh.

- Any changes in the ROR data can be displayed on the map this can **save the time of modification of the map** as it uses the updated ROR data.

- Map can be printed in **any scale as per user requirement**.

- **Multi-Lingual support** of Bhunaksha provides to print and display the owner’s information as per region.

- **ROR Data** is the main data for any type of Property claim.

- Bhunaksha can serve for Land information for those states which uses the **cadastre technique** for Land record management.
REFERENCES

Web Reference:-

ii. http://www.netbeans.org
iii. http://www.postgresql.org
vi. http://www.nic.in
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viii. http://www.nlrmp.nic.in
ix. http://www.nlrmppportal.nic.in

Literature:-


IV. Land Records Information System, Software Requirement Specifications document, NIC(Hqrs), New Delhi, 1996.

V. NLRMP Capacity building training courseware, 2009 and 2011.