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Some activities relating to Space Data Applications for Land Use Planning, Food Security and Sustainable Environment Management in Nepal

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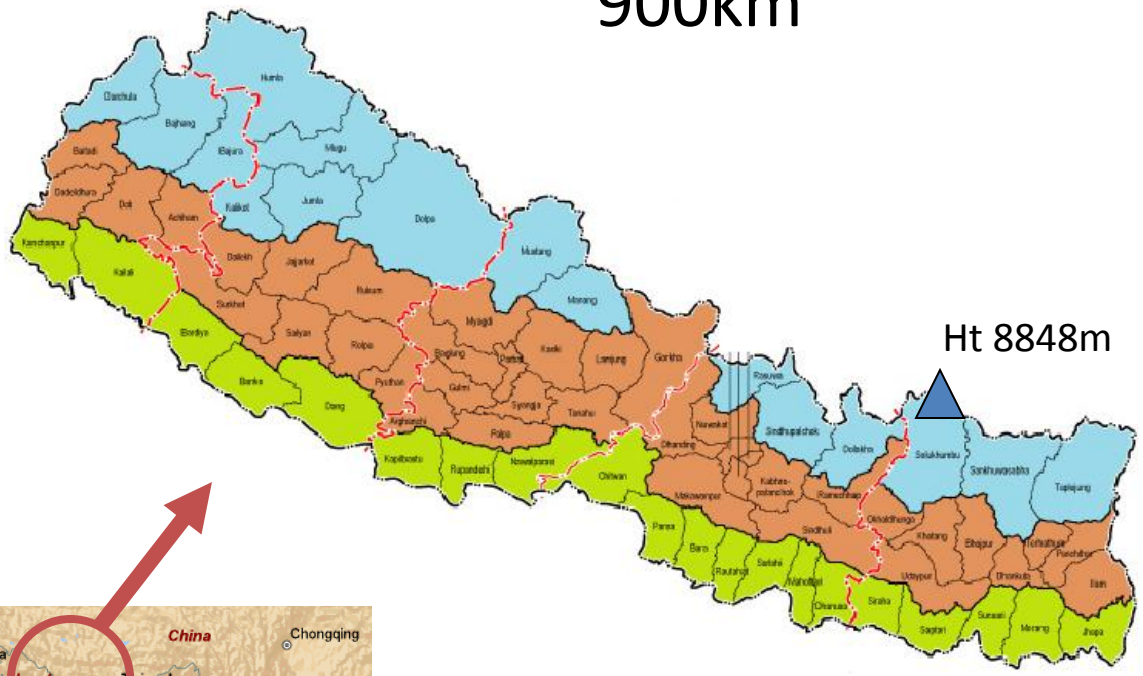
Dinesh Kaphle, Ministry of Land Reform and Management,, Nepal

Hem Raj, Ministry of Agriculture and Cooperatives, Nepal

Nepal – Geographically diverse

900km

200km



Ht 8848m

Ht 68m

- Diverse Geography
- Steep mountains
- Prone to natural disasters

Country Profile

- Situated in South Asia
- Area 147181 sqkm
- Population 26.8 Million
- Altitutude 68m to 8848m
- 80% High Himalayas and mountains areas
- 20% terai plains area
- Total forest cover continuously declining: current estimate less than 40%
- Himalayan region of Nepal one of the world's top 20 global biodiversity hot-spots

GDP (PPP) per capita USD 1,328 (IMF 2011)

1/3rd of GDP based on Agriculture Sector

2/3rd of the population engaged in Agriculture

Percentage of population below poverty line

1995-96 (WB/CBS Living Standard Survey): 41.2%

2003-04 (WB/CBS Living Standard Survey): 30.9%

2010-11 (WB/CBS Living Standard Survey): 25.2%

The Millennium Development Goals

1 Eradicate extreme poverty and hunger

2 Achieve universal primary education

3 Promote gender equality and empower women

4 Reduce child mortality

5 Improve maternal health

6 Combat HIV/AIDS, malaria and other diseases

7 Ensure environmental sustainability

8 Develop a global partnership for development

Space data application for poverty reduction and food security; and Sustainable Environment

- Land Use Planning (MOLRM)
- NEKSAP (Nepal *Khadya Surakshya Anugaman Pranali* or Nepal Food Security Monitoring System (MOAC)
- Forest Resource Assessment Programme (MOF/DoFRS)
- Conclusion: MOST What ??

Land Use Planning

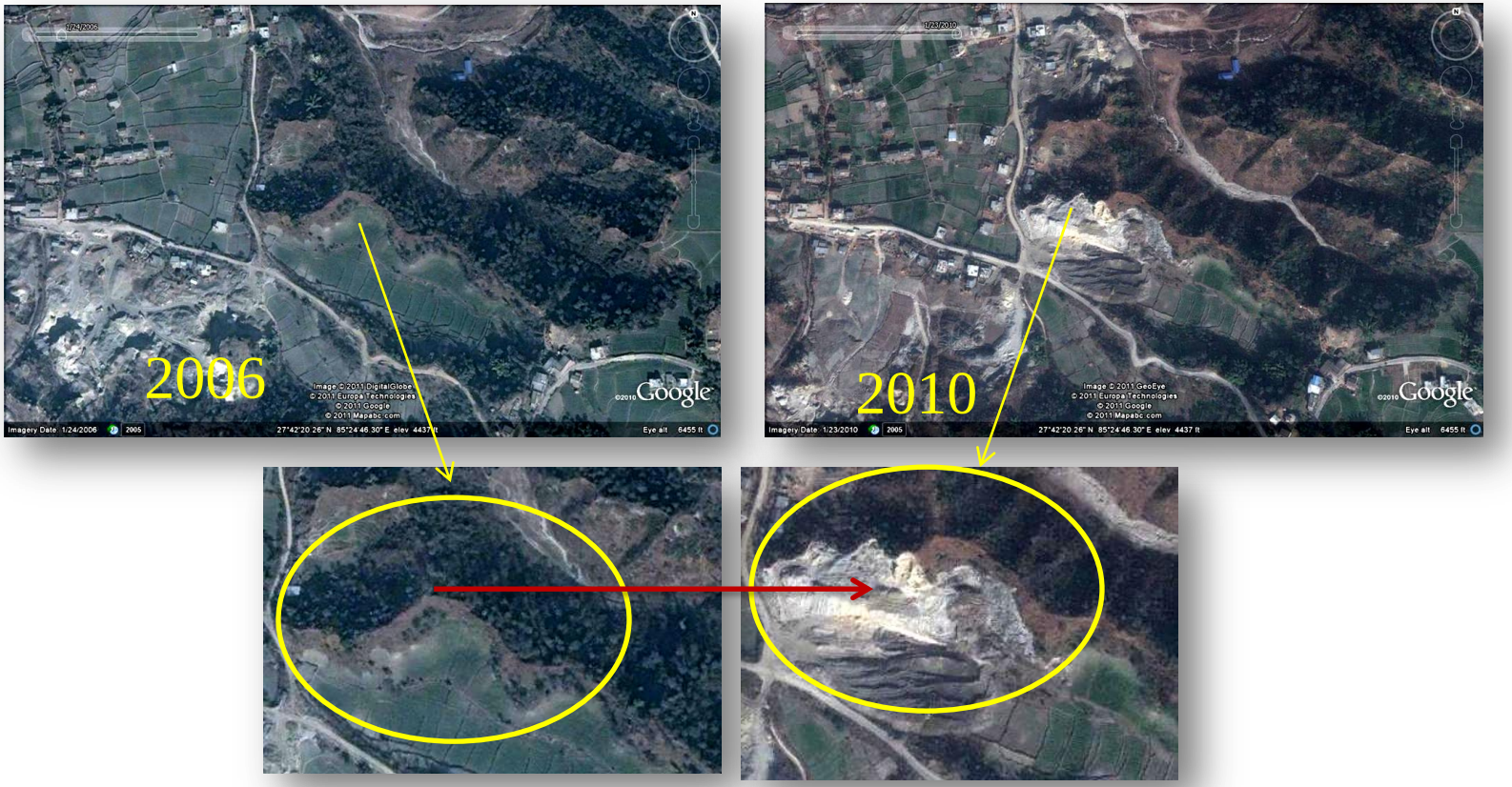
National Land Use Policy

Land use Data Acquisition

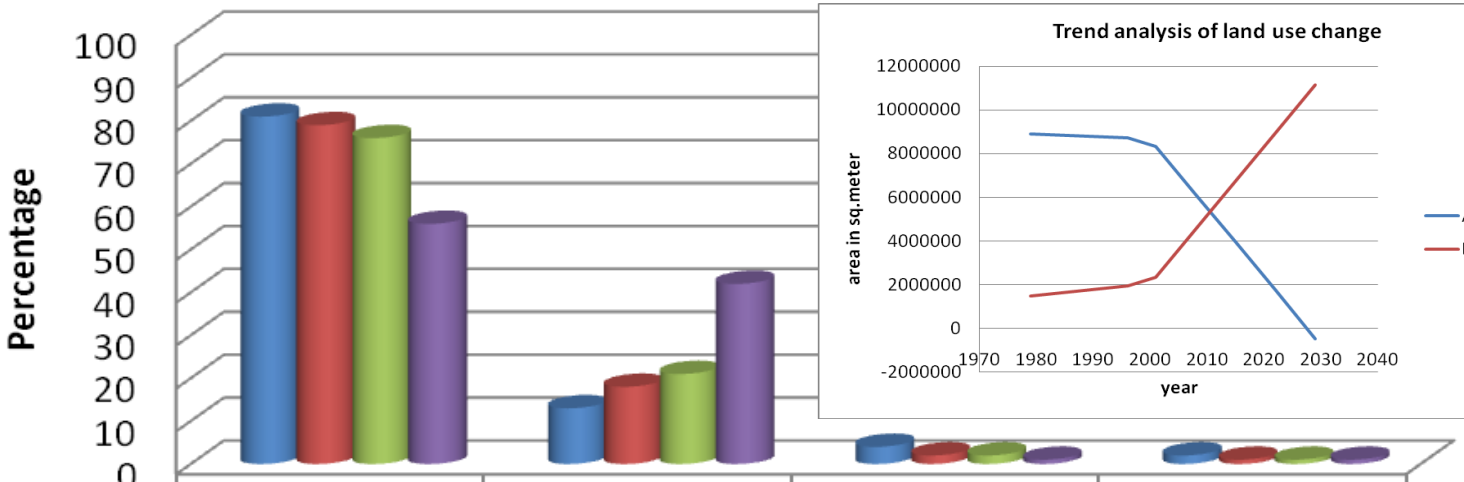
Land Use Zoning

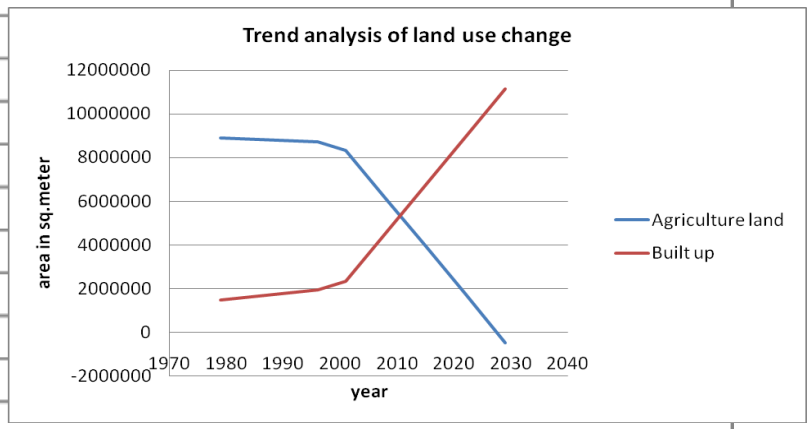
Regularization (niyaman)

Haphazard Land development and Encroachment on Public Land



Example of land Use Change in Thimi

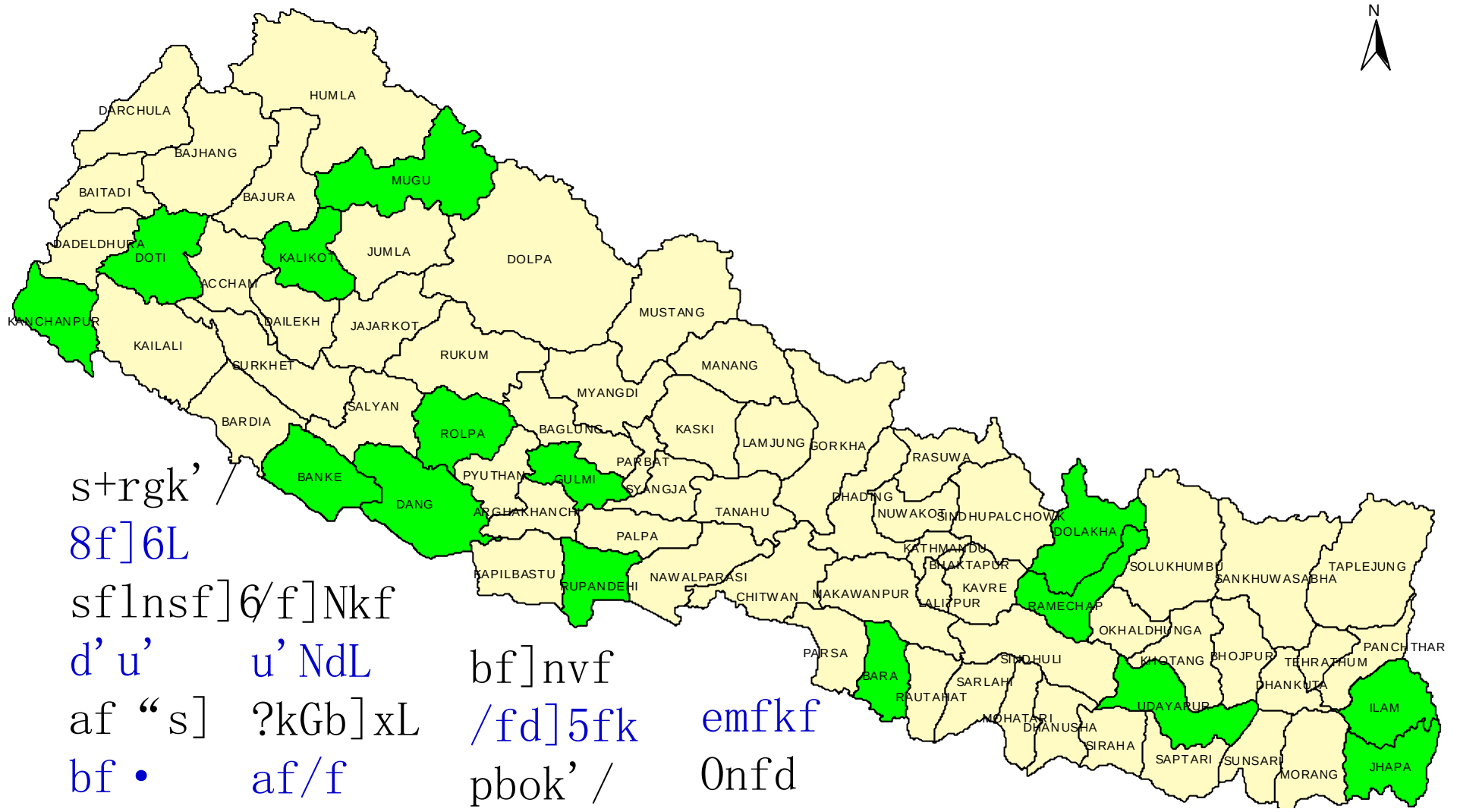




	Agricultural	Built up	River	Road
1979	81	13	4	2
1996	79	18	2	1
2001	76	21	2	1
2008	56	42	1	1

Source: Janak Raj Joshi

Stake holders consultations



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Stakeholders Consultation Meetings

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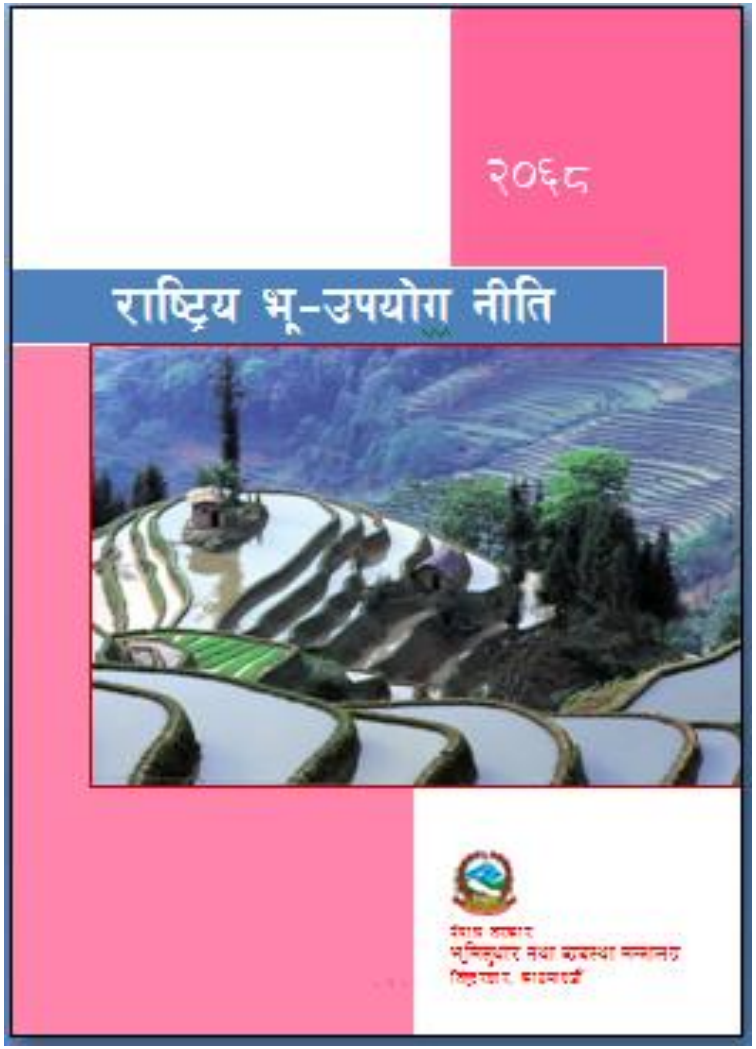
Land Use Policy Document prepared



Local level land resources data acquisition and land use zoning

- Present Land Use Maps
- Land System and Soil Maps
- Land Capability Maps
- VDC Profiles
- Land Use Zoning and Cadastral Layer Superimposition

Land Use Mapping

Image Orthorectific

- GCP Planning
- DGPS Survey & Post Processing
- DEM Creation from 1:25000 contours
- Ortho-rectification using Rigorous Mathematical Model (in PCI Geomatica)

- Review of existing land use reports/maps (National & International)
- Development of **Dichotomous, Modular-Hierarchical Approach based LU classification scheme**
- **LRMP land use classes – Level 2 Hierarchy**

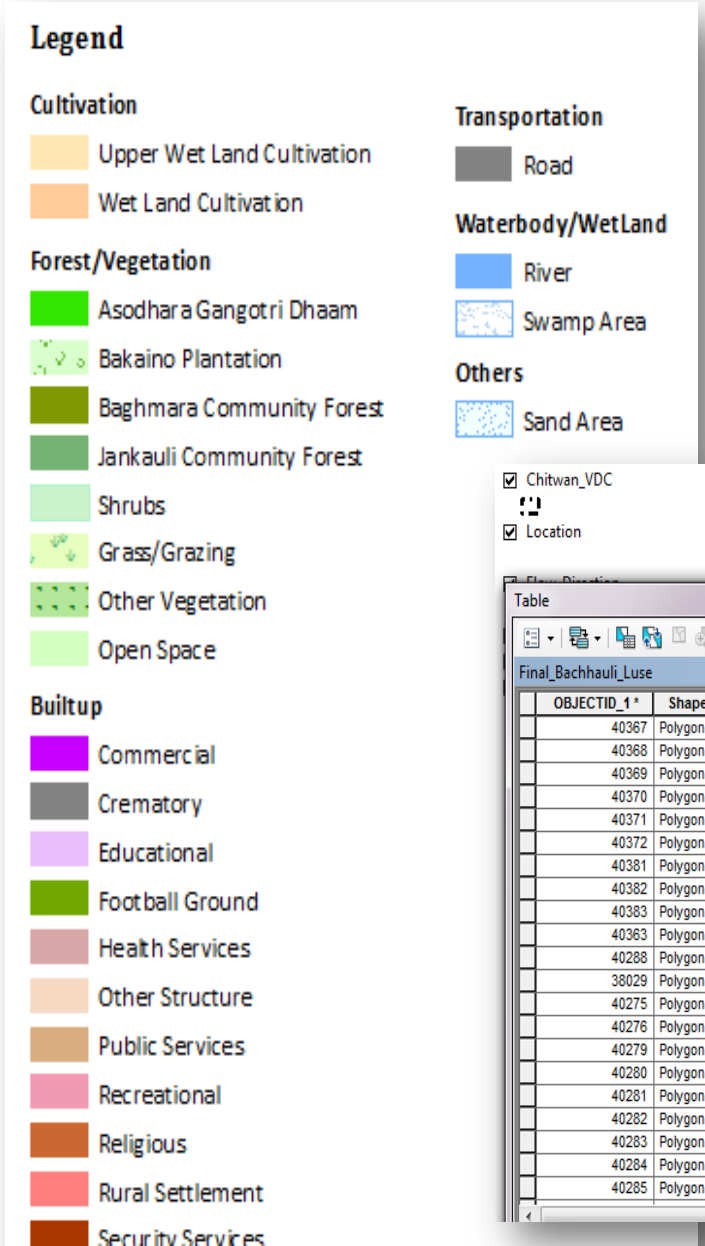
Land Use

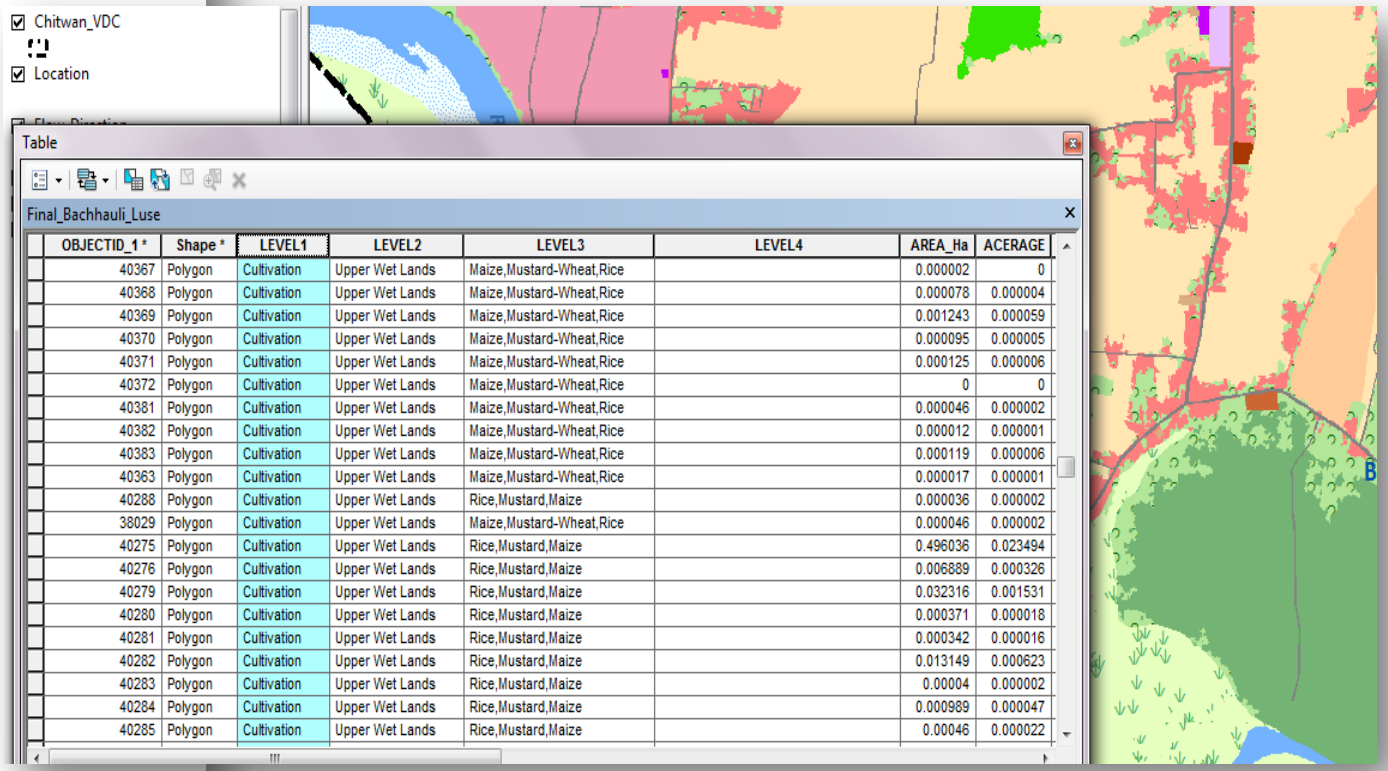
- Field observation and data collection
- **Segmentation based object-oriented classification**
  - Multi-Level Segmentation (3 levels)
- **Object relation based on**
  - Image object color, NDVI
  - Texture entropy
  - Shape
  - Neighborhood objects relationship

Land Use &

- Merging of segments (<1 ha.)
- Aggregation and generalization
- Development of GIS database

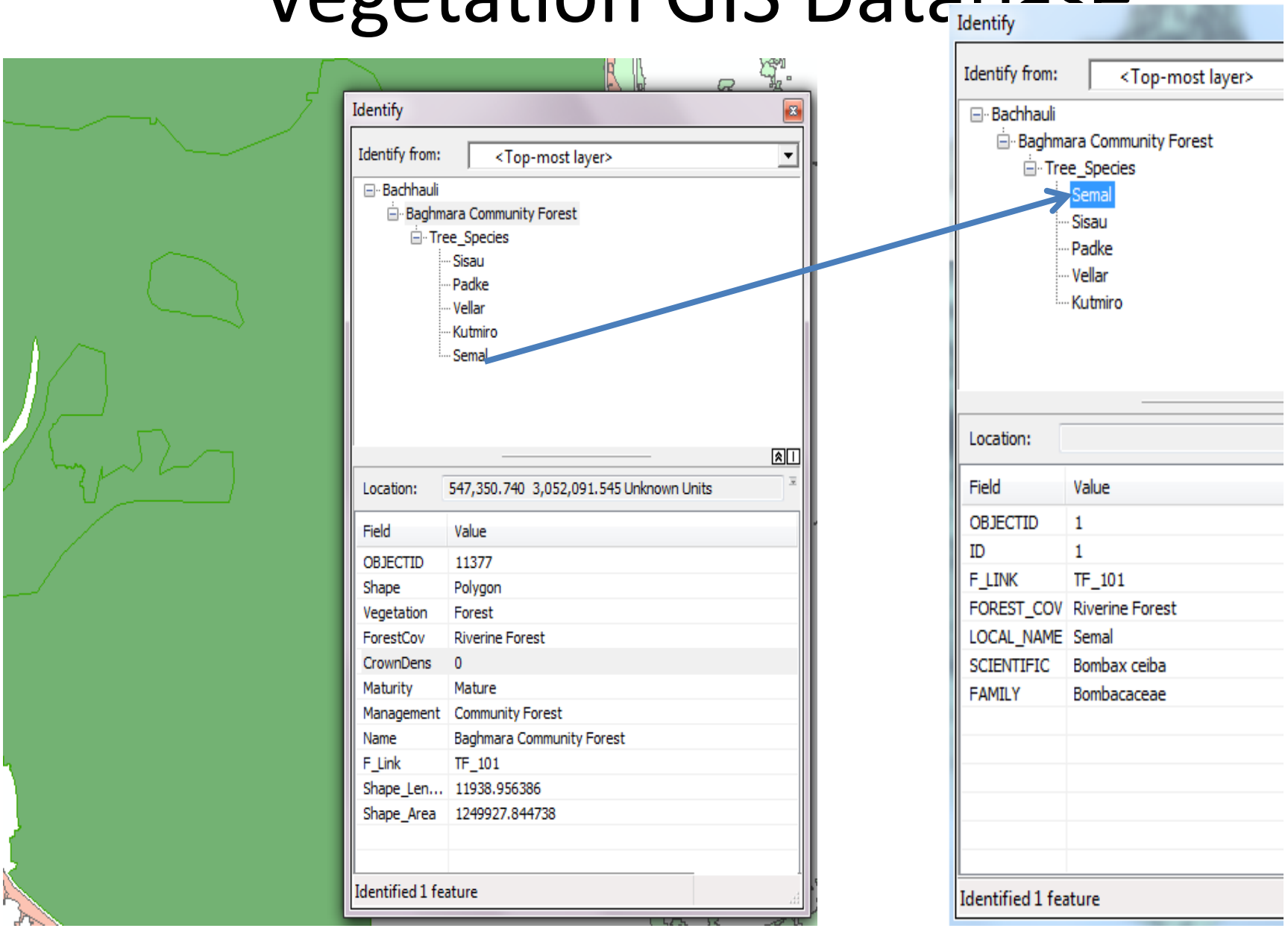
Land Use Mapping Legend & GIS Database



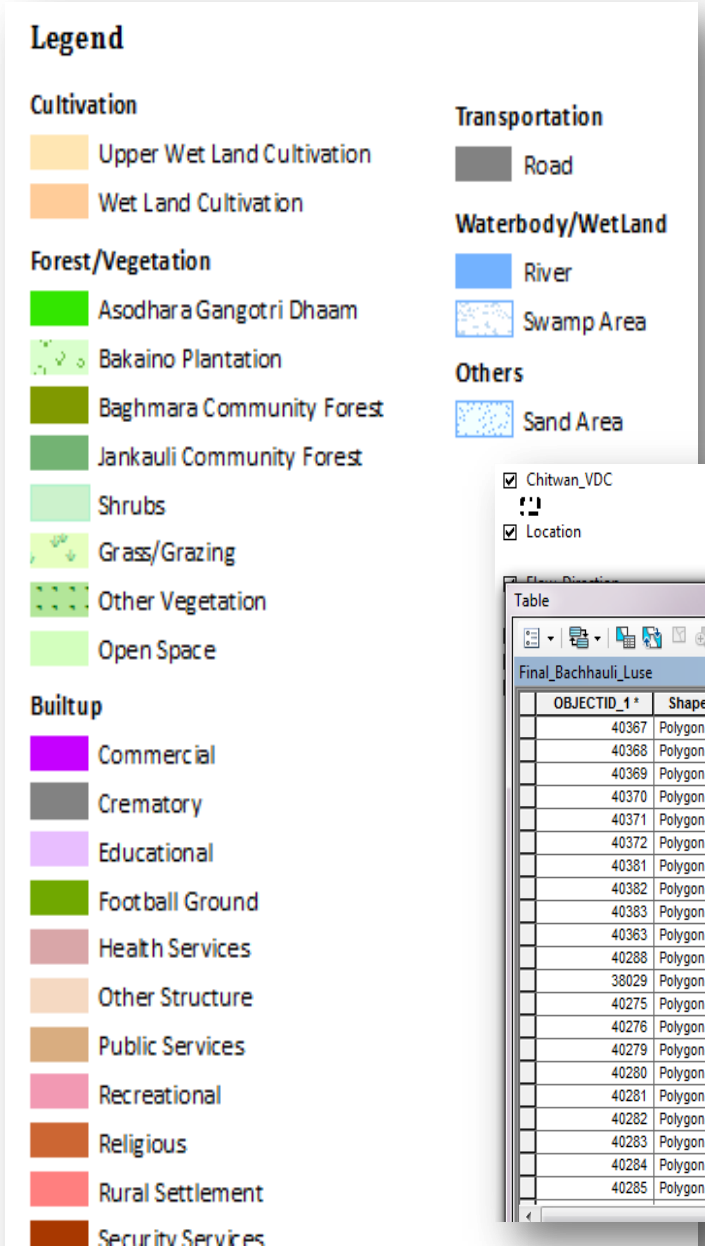


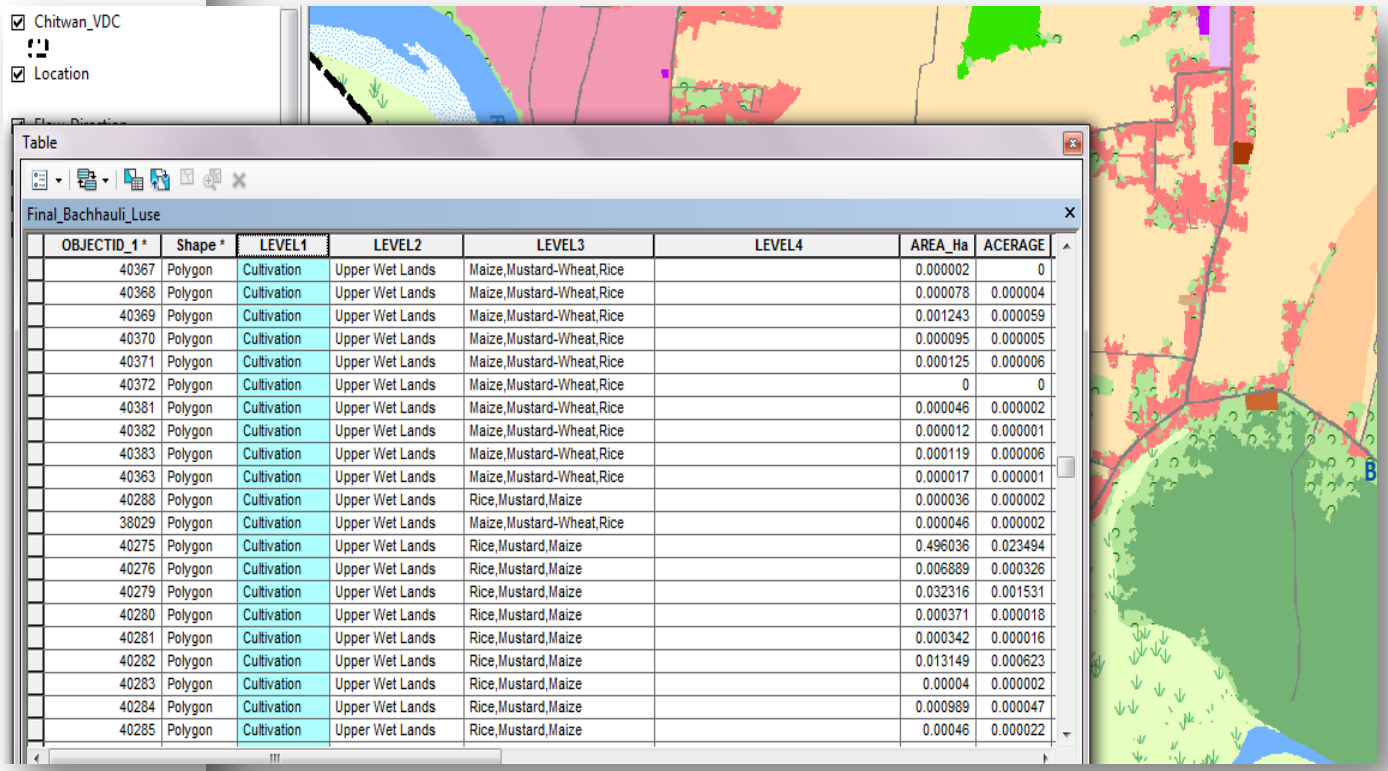
OBJECTID_1 *	Shape *	LEVEL1	LEVEL2	LEVEL3	LEVEL4	AREA_Ha	ACERAGE
40367	Polygon	Cultivation	Upper Wet Lands	Maize,Mustard-Wheat,Rice		0.000002	0
40368	Polygon	Cultivation	Upper Wet Lands	Maize,Mustard-Wheat,Rice		0.000078	0.000004
40369	Polygon	Cultivation	Upper Wet Lands	Maize,Mustard-Wheat,Rice		0.001243	0.000059
40370	Polygon	Cultivation	Upper Wet Lands	Maize,Mustard-Wheat,Rice		0.000095	0.000005
40371	Polygon	Cultivation	Upper Wet Lands	Maize,Mustard-Wheat,Rice		0.000125	0.000006
40372	Polygon	Cultivation	Upper Wet Lands	Maize,Mustard-Wheat,Rice		0	0
40381	Polygon	Cultivation	Upper Wet Lands	Maize,Mustard-Wheat,Rice		0.000046	0.000002
40382	Polygon	Cultivation	Upper Wet Lands	Maize,Mustard-Wheat,Rice		0.000012	0.000001
40383	Polygon	Cultivation	Upper Wet Lands	Maize,Mustard-Wheat,Rice		0.000119	0.000006
40363	Polygon	Cultivation	Upper Wet Lands	Maize,Mustard-Wheat,Rice		0.000017	0.000001
40288	Polygon	Cultivation	Upper Wet Lands	Rice,Mustard,Maize		0.000036	0.000002
38029	Polygon	Cultivation	Upper Wet Lands	Maize,Mustard-Wheat,Rice		0.000046	0.000002
40275	Polygon	Cultivation	Upper Wet Lands	Rice,Mustard,Maize		0.496036	0.023494
40276	Polygon	Cultivation	Upper Wet Lands	Rice,Mustard,Maize		0.006889	0.000326
40279	Polygon	Cultivation	Upper Wet Lands	Rice,Mustard,Maize		0.032316	0.001531
40280	Polygon	Cultivation	Upper Wet Lands	Rice,Mustard,Maize		0.000371	0.000018
40281	Polygon	Cultivation	Upper Wet Lands	Rice,Mustard,Maize		0.000342	0.000016
40282	Polygon	Cultivation	Upper Wet Lands	Rice,Mustard,Maize		0.013149	0.000623
40283	Polygon	Cultivation	Upper Wet Lands	Rice,Mustard,Maize		0.00004	0.000002
40284	Polygon	Cultivation	Upper Wet Lands	Rice,Mustard,Maize		0.000989	0.000047
40285	Polygon	Cultivation	Upper Wet Lands	Rice,Mustard,Maize		0.00046	0.000022

Vegetation GIS Database



Land Use Mapping Legend & GIS Database





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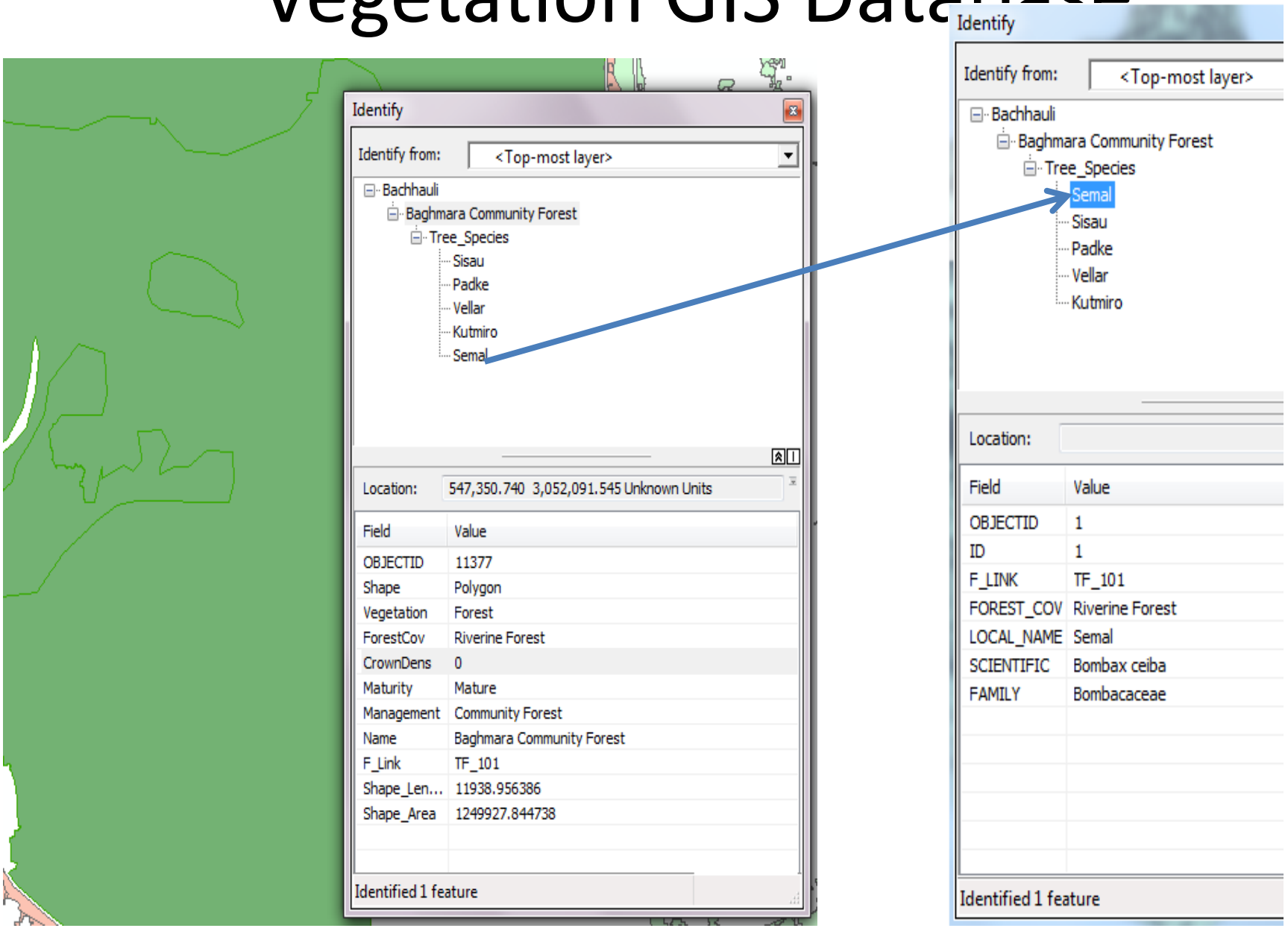
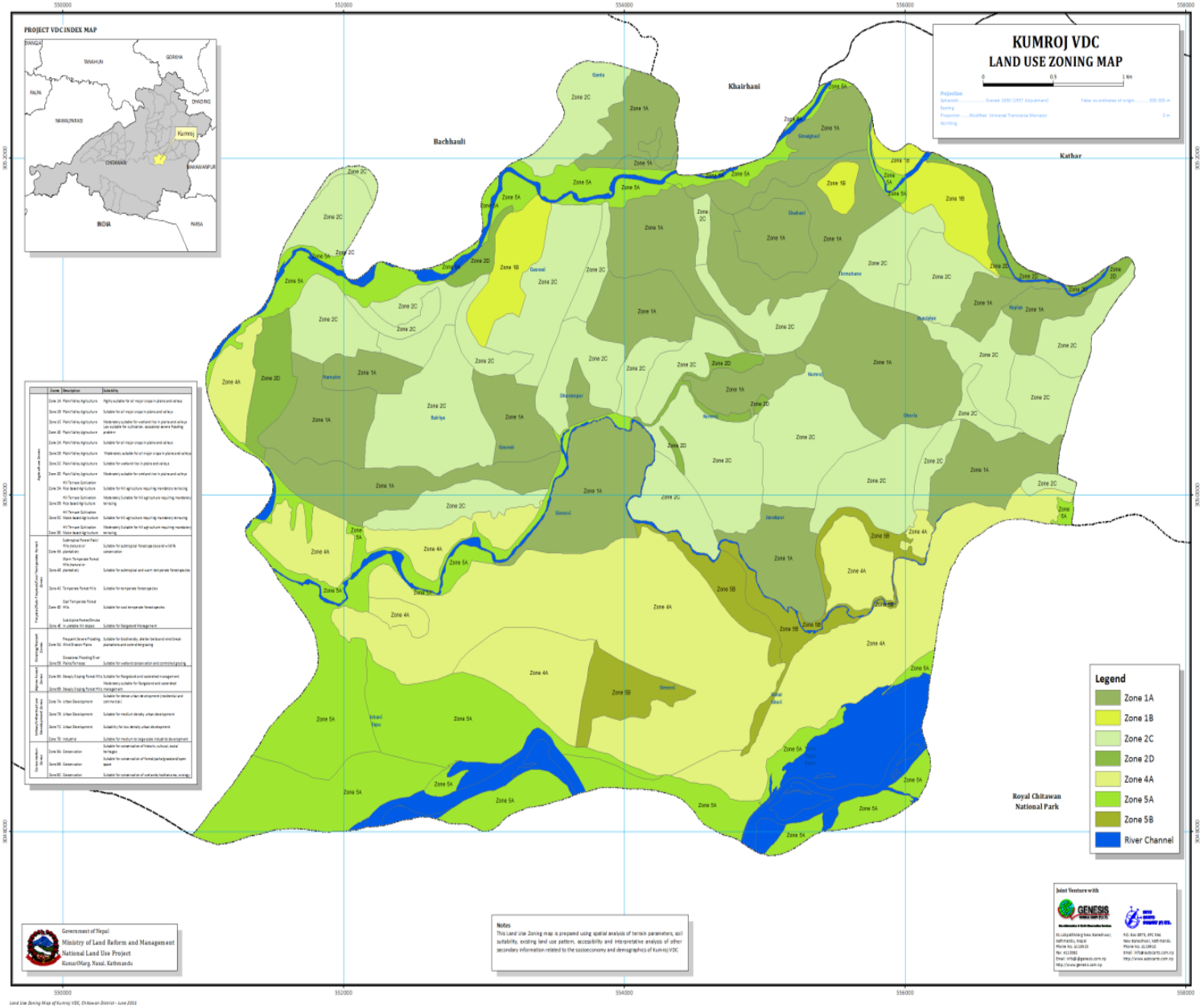
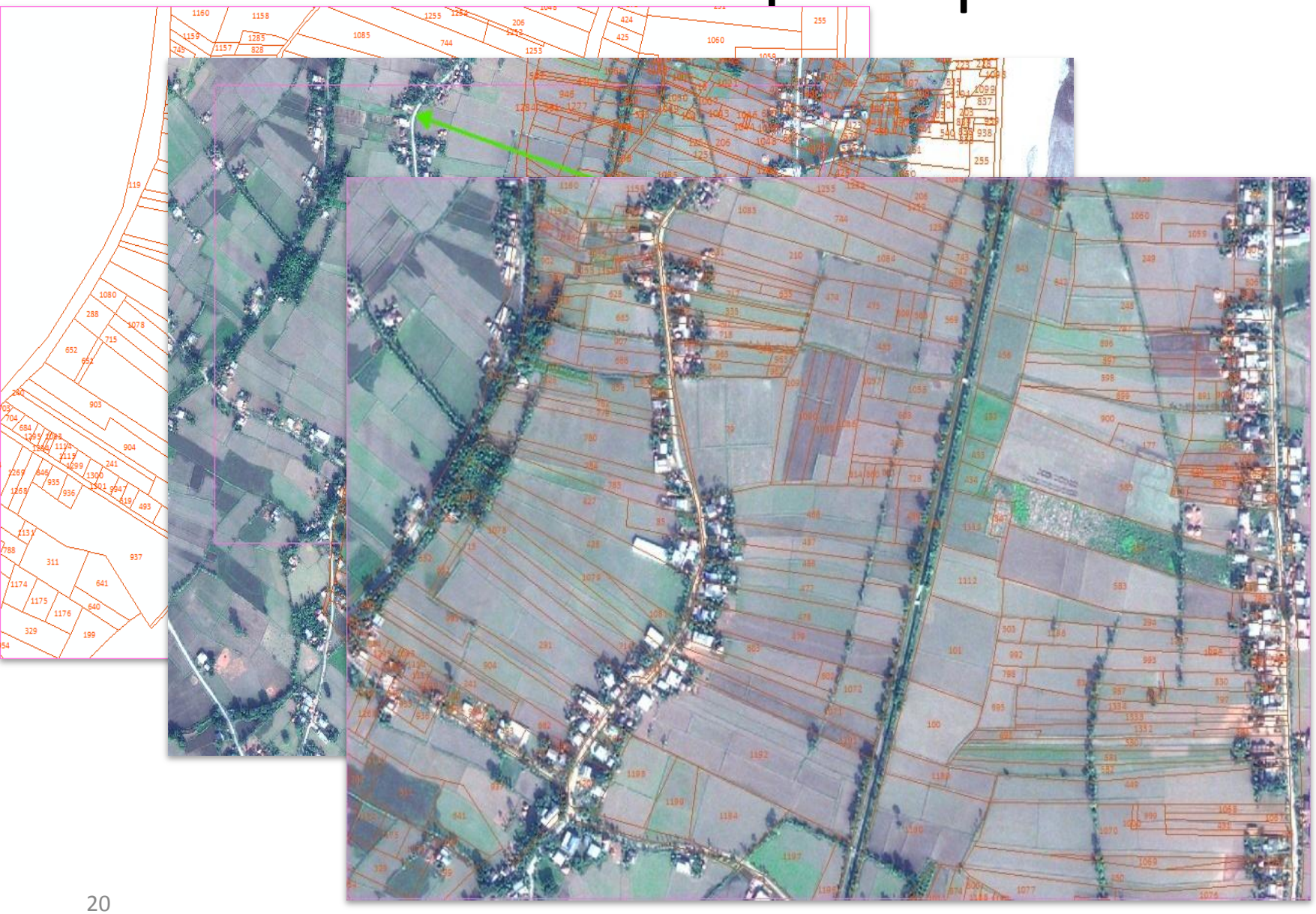




Land Use Zoning Map of Kumroj VDC, Chitawan District - June 2021

Cadastral data superimposition



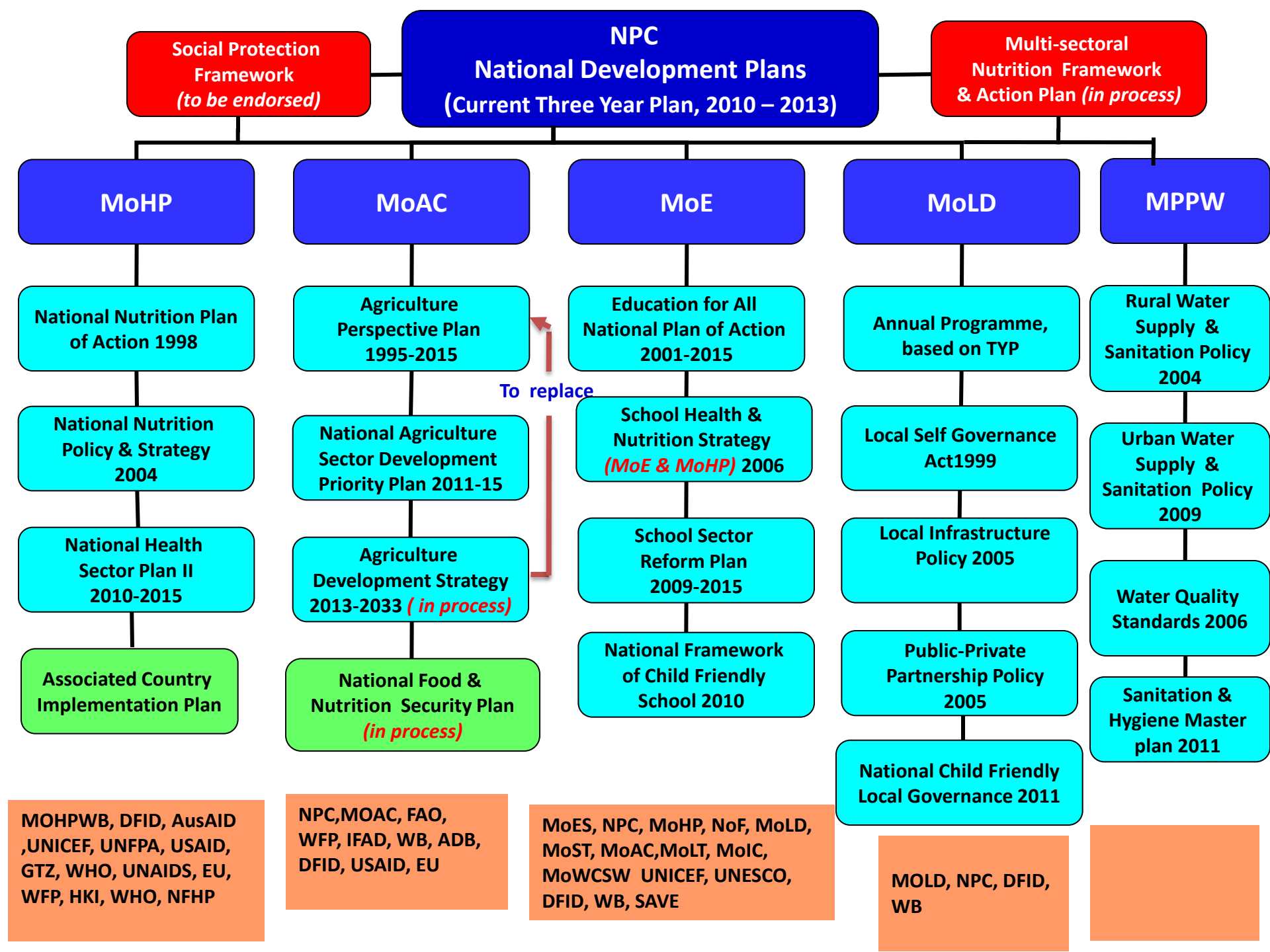
NEKSAP

Nepal Khadya Surakshya Anugaman Pranali

(Nepal Food Security Monitoring System)

Objectives of NEKSAP

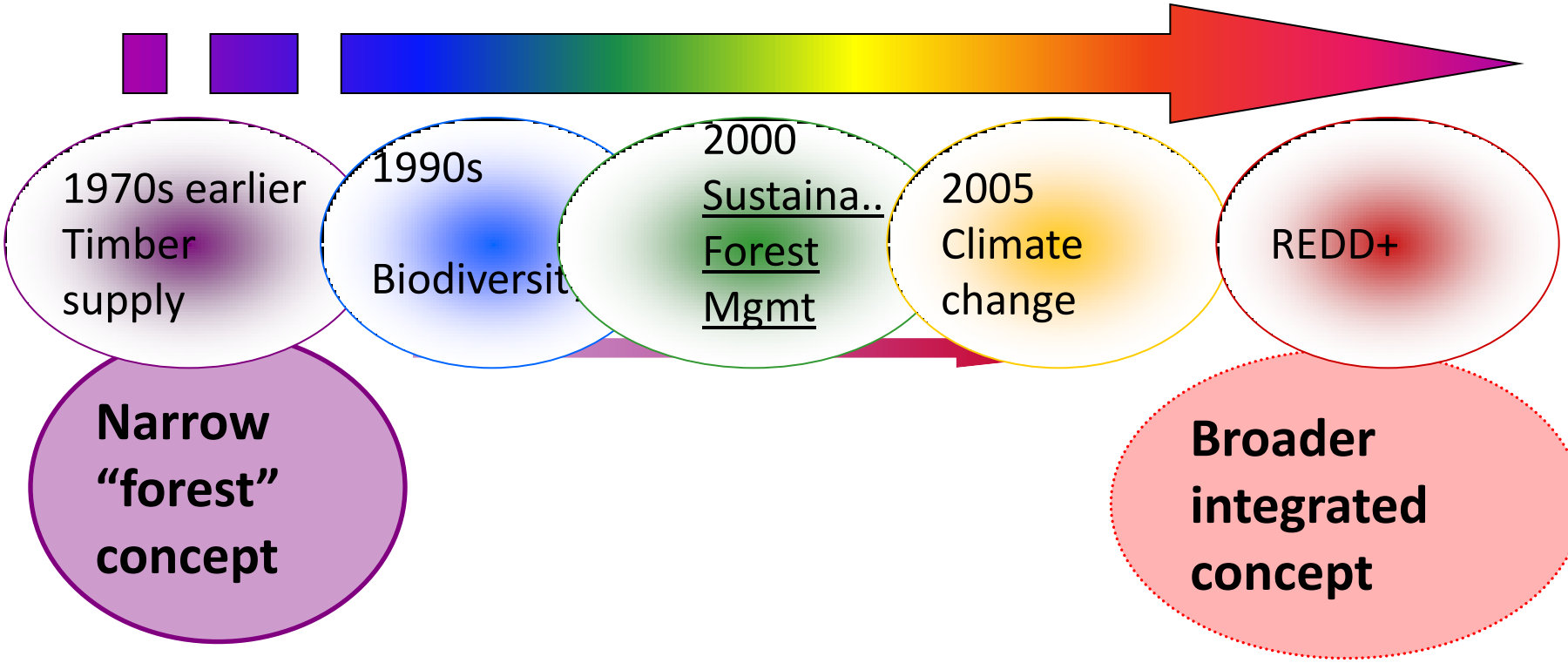
- **Strengthen capacity of Government Institutions to manage and operate an integrated Food Security Monitoring System**
- **Strengthen district based food security monitoring and response analysis**
- **Increased integration of NEKSAP within relevant national monitoring system**


Social Protection Framework (to be endorsed)
NPC
National Development Plans
(Current Three Year Plan, 2010 – 2013)
Multi-sectoral Nutrition Framework & Action Plan (in process)
MoHP
MoAC
MoE
MoLD
MPPW
National Nutrition Plan of Action 1998
National Nutrition Policy & Strategy 2004
National Health Sector Plan II 2010-2015
Associated Country Implementation Plan
Agriculture Perspective Plan 1995-2015
National Agriculture Sector Development Priority Plan 2011-15
Agriculture Development Strategy 2013-2033 (in process)
National Food & Nutrition Security Plan (in process)
To replace
Education for All National Plan of Action 2001-2015
School Health & Nutrition Strategy (MoE & MoHP) 2006
School Sector Reform Plan 2009-2015
National Framework of Child Friendly School 2010
Annual Programme, based on TYP
Local Self Governance Act1999
Local Infrastructure Policy 2005
Public-Private Partnership Policy 2005
National Child Friendly Local Governance 2011
Rural Water Supply & Sanitation Policy 2004
Urban Water Supply & Sanitation Policy 2009
Water Quality Standards 2006
Sanitation & Hygiene Master plan 2011
MOHPWB, DFID, AusAID ,UNICEF, UNFPA, USAID, GTZ, WHO, UNAIDS, EU, WFP, HKI, WHO, NFHP
NPC,MOAC, FAO, WFP, IFAD, WB, ADB, DFID, USAID, EU
MoES, NPC, MoHP, NoF, MoLD, MoST, MoAC,MoLT, MoIC, MoWCSW UNICEF, UNESCO, DFID, WB, SAVE
MOLD, NPC, DFID, WB

Forest Resource Information System

- Objectives of Forest Resource Assessment
  - Obtain reliable, accurate and updated forestry information required for forestry planning, and forestry and sustainable enviroment policy and management decisions
  - Obtain forestry data required for REDD+ and MRV.

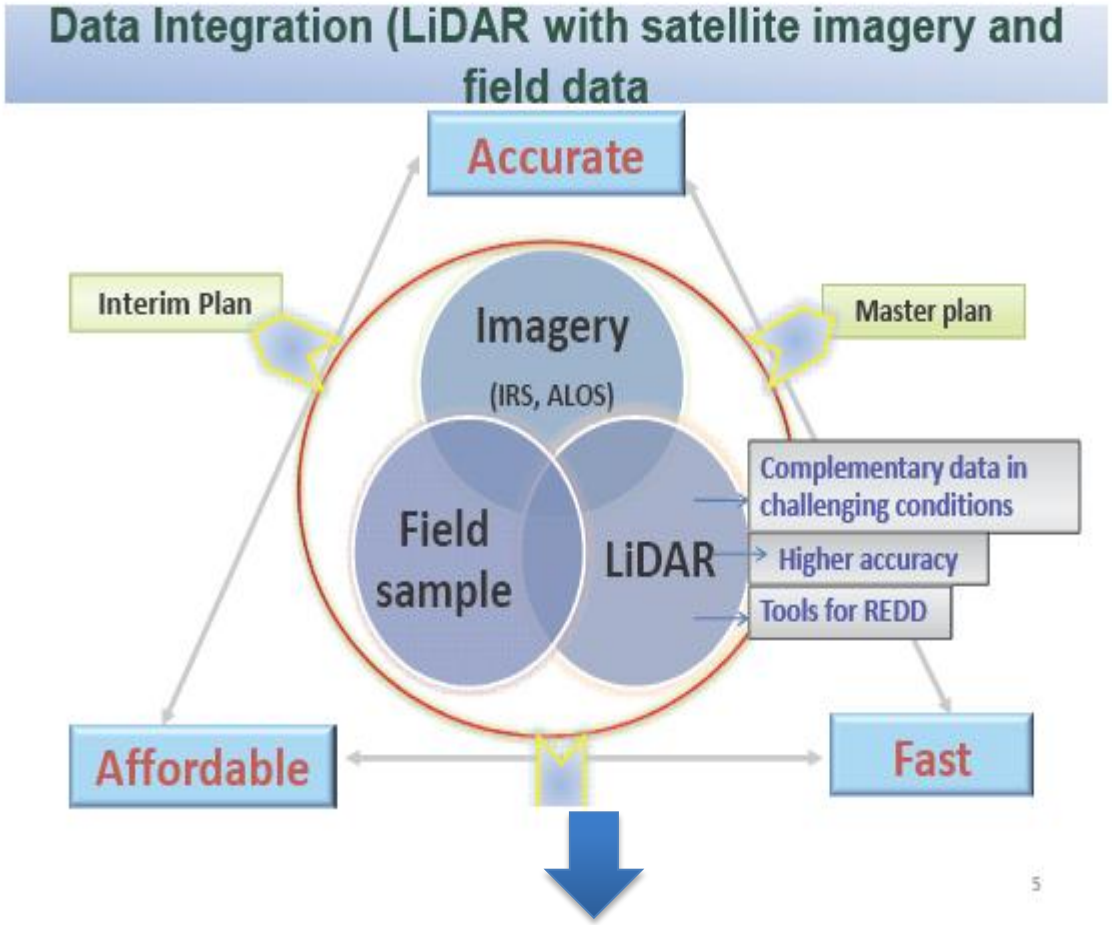
Data needs changing over time



Trend of forestry Evolution

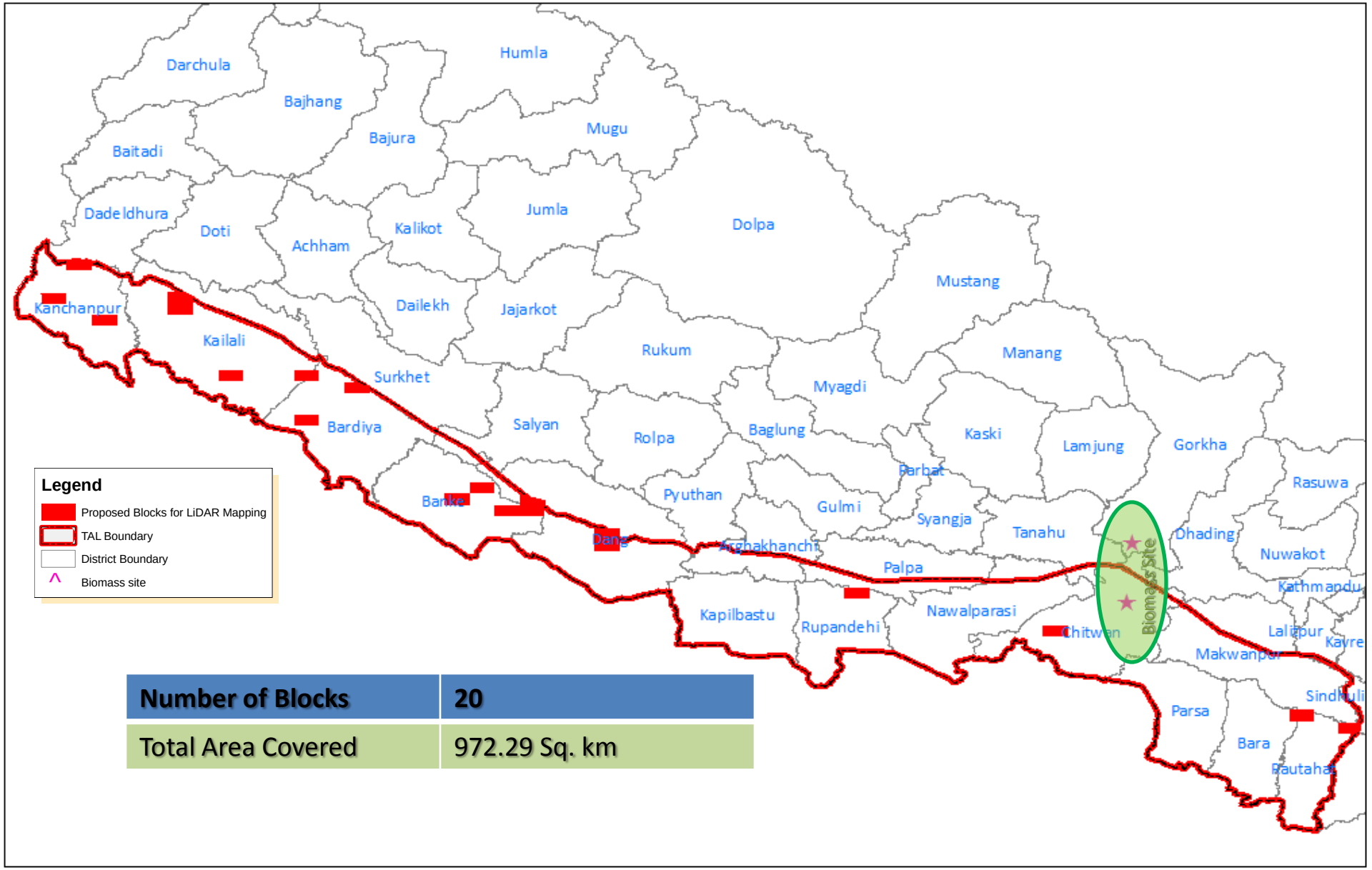
Courtesy: Pem Kadel

Forest Resource Assessment and Forest Carbon Monitoring



Forest Resource data

Application of LiDAR assisted Multi Source Program for forest Biomass estimation



Number of Blocks	20
Total Area Covered	972.29 Sq. km

Project Generating data for REDD+

- Nepal is a REDD country under FCPF of World bank.
- Nepal's REDD readiness preparation proposal (RPP 2010-2013) approved.
- World Bank is supporting for RPP implementation implementation.
- Developing Reference Scenario, MRV system and capacity building are the key issues.
- FRA to facilitate data required for REDD+.

Forest Carbon stock Assessments :

Considering all carbon pools

- Above-ground and below-ground biomass
- Dead organic matter (dead wood and litter)
- Soil Carbon (organic matter)
- Land use change (Forest to others and vise versa)

Conclusion

- Different organizations use space observation data for decision making related to food security and poverty reduction (MD1) and sustainable environment (MDG7)
- Coordinated action is needed
- Need for the establishment of a National Space Technology Application Centre is felt
- Ministry of Science and Technology has taken steps in that direction. A task force has been entrusted with making necessary study and suggest detailed plan

THANK YOU !!!