

Desertification and Land Degradation: Monitoring Status, Trend and Impact Using Space Data

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Desertification, Land degradation & Climate
Change in North East Asia: Sub Regional
Approaches & Activities
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DLD: Major Causes and Drivers in North East Asia

Proximate Causes :

- **Deforestation**
- **Overgrazing**
- **Expansion of Agriculture (LU Change)**
- **Wrong Agricultural Management Practices**
- **Unsustainable Land use practices,**
- **Cultivation on Marginal Land**

- **Drivers or Driving Force:**
- **Population Pressure**
- **Aspiration to Lead better Quality of life**
- **Poverty**
- **Migration**

- **Climate Change**

Impact of DLD

- **Decrease in Biological Productivity of land, thus, impact Food Security**
- **Decline in Ecosystem Goods & Services**
(Food, Fodder, Clean water, Fibre, Timber, - -)
- **Socio-Economic Condition of People**
(Poverty, Migration, etc)
- **Increase in Sand & Dust Storms frequency, DLD acts as Source**
- **Human Well-being**
- **Surface Physical Properties (Albedo,Temp, Energy Balance)**
- **Climate Change**
- **Economic Loss: Globally, estimated to be ~ 10-17 % of Annual GDP**
- **DLD has led to Collapse of Some of the Ancient Civilization : Akkadian Civilization, in 4200 BC**

Major Processes of DLD in North East Asia:

- **Soil Erosion (Wind, Water)**
 - **Vegetal Degradation (in Forest, Rangeland, Pastureland)**
 - **Mining, Quarrying, Brick Kiln, - -**
 - **Soil Sealing and Urbanization**
 - **Mass Movement**
 - **Nutrient Depletion**
 - **Salinization/Alkalization**
- **Soil Erosion & Vegetal Degradation are Dominant LD processes, found all across the world including North East Asia**
 - **1094 & 549 Mha land is affected by Water & Wind Erosion Globally**

Combating DLD: What We Need To do

- **Prioritization of Degraded Land**
- **Preparation & Execution of DLD Combating /Land Restoration Plan**

Information Needs:

1. **Where are the Land degradation Areas Located**
2. **What is their spatial extent**
3. **What is the land degradation process
(Combating Plans are Specific to LD Type)**
4. **What is the severity of land degradation**

Answer: Map depicting above at appropriate scale

Mapping methods: Field Survey/EO Satellite

Mapping and Monitoring L D Using Space Data

1. Indirect Method: Based on Indicators
2. Directly Mapping LD Processes (Field & EO)

Indicators of DLD:

- LU - LC Change[@]
- NPP or Land Productivity Dynamics [@]
- Soil Organic Carbon Stock [@]
- Change in Vegetation Cover & Biomass
- Vegetation Species Composition

([@] UNCCD Indicators)

Indicator based methods do not provide LD process

Various Land Features as Seen on Space Imagery



IRS Liss IV image 20 October 2011

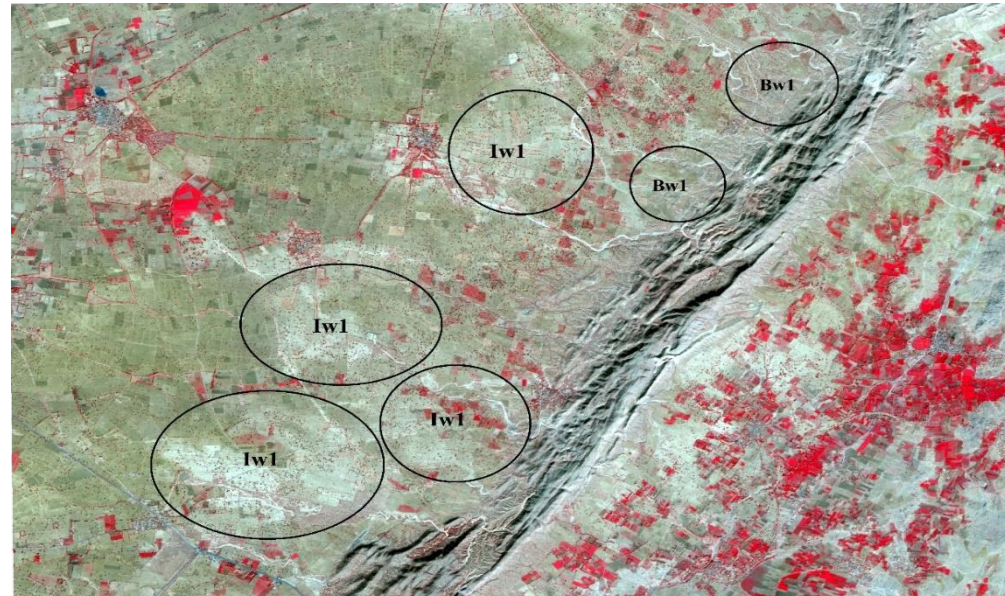
LD Processes as Captured on Satellite Images- Signatures

Water Erosion



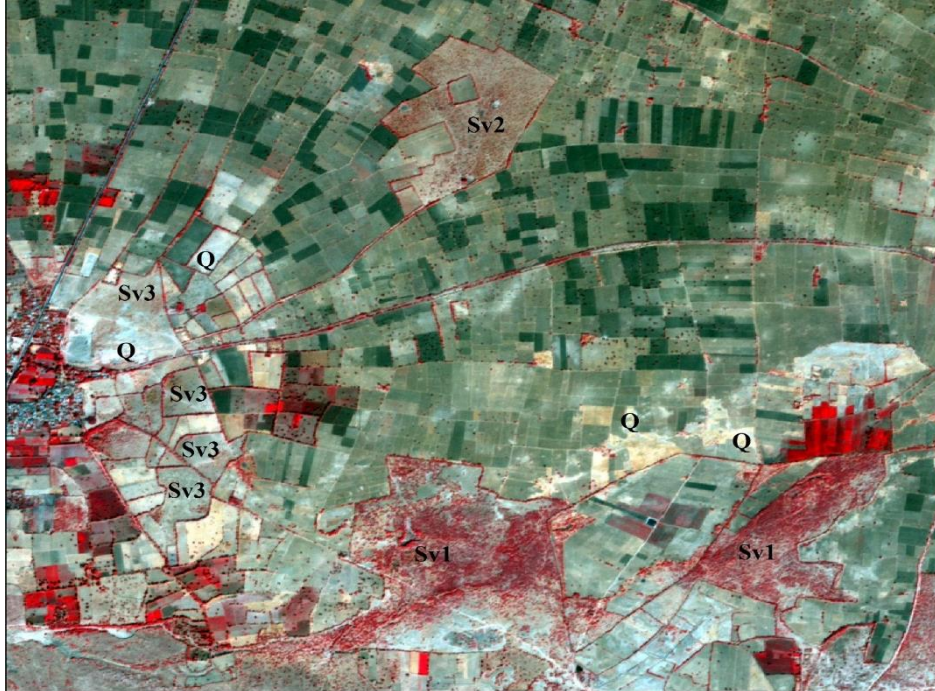
**Water Erosion, Arizona, USA
(Google, Image)**

Water Erosion, in Agriculture Fields, Rajasthan, India (LISS III)



LD Processes as Captured on Satellite Images

Vegetal Degradation



**Sv: Vegetal Degradation in
Grazing/Scrubland, India (LISS III)
(Overgrazing)**

Deforestation, Amazon Forest Brazil (Google Image)

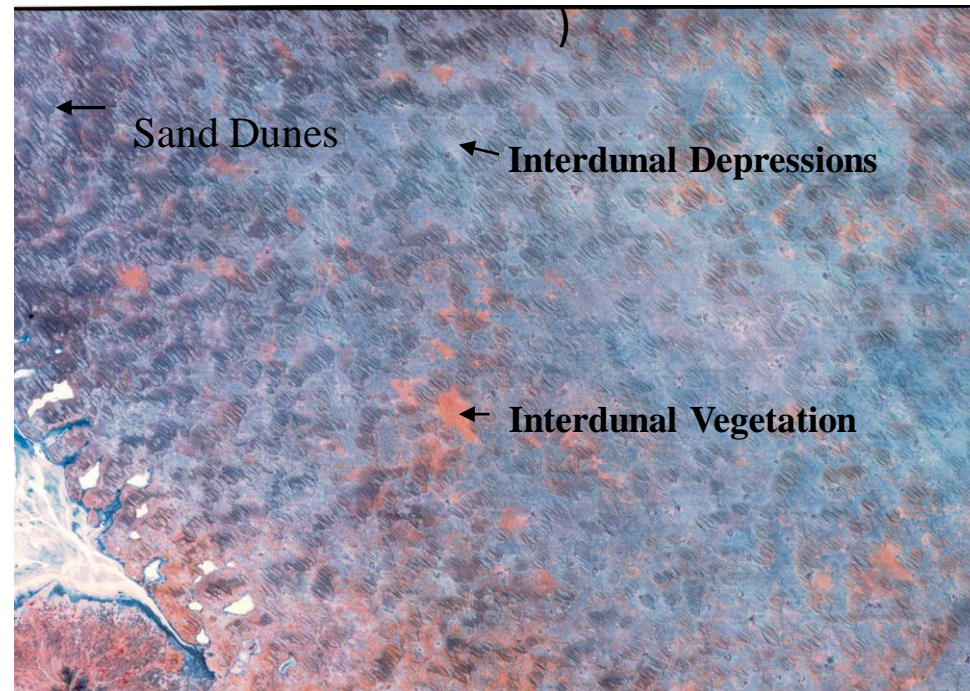


LD Processes as Captured on Satellite Images



Salinization, Nr Dumbleyung
Lake, Australia (Google Image)

Wind Erosion. India
AWiFS Image



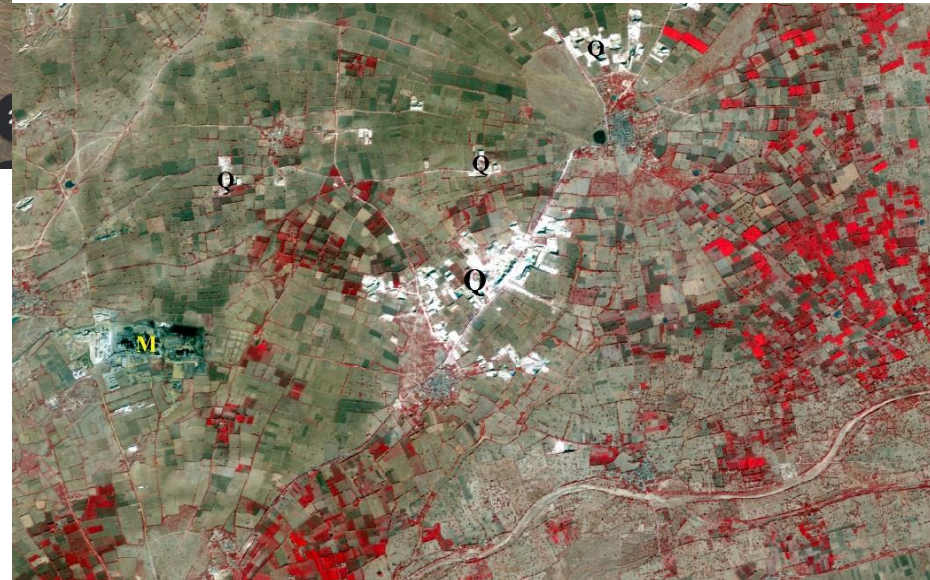
LD Processes as Captured on Satellite Images

Man Made: Mining & Quarrying

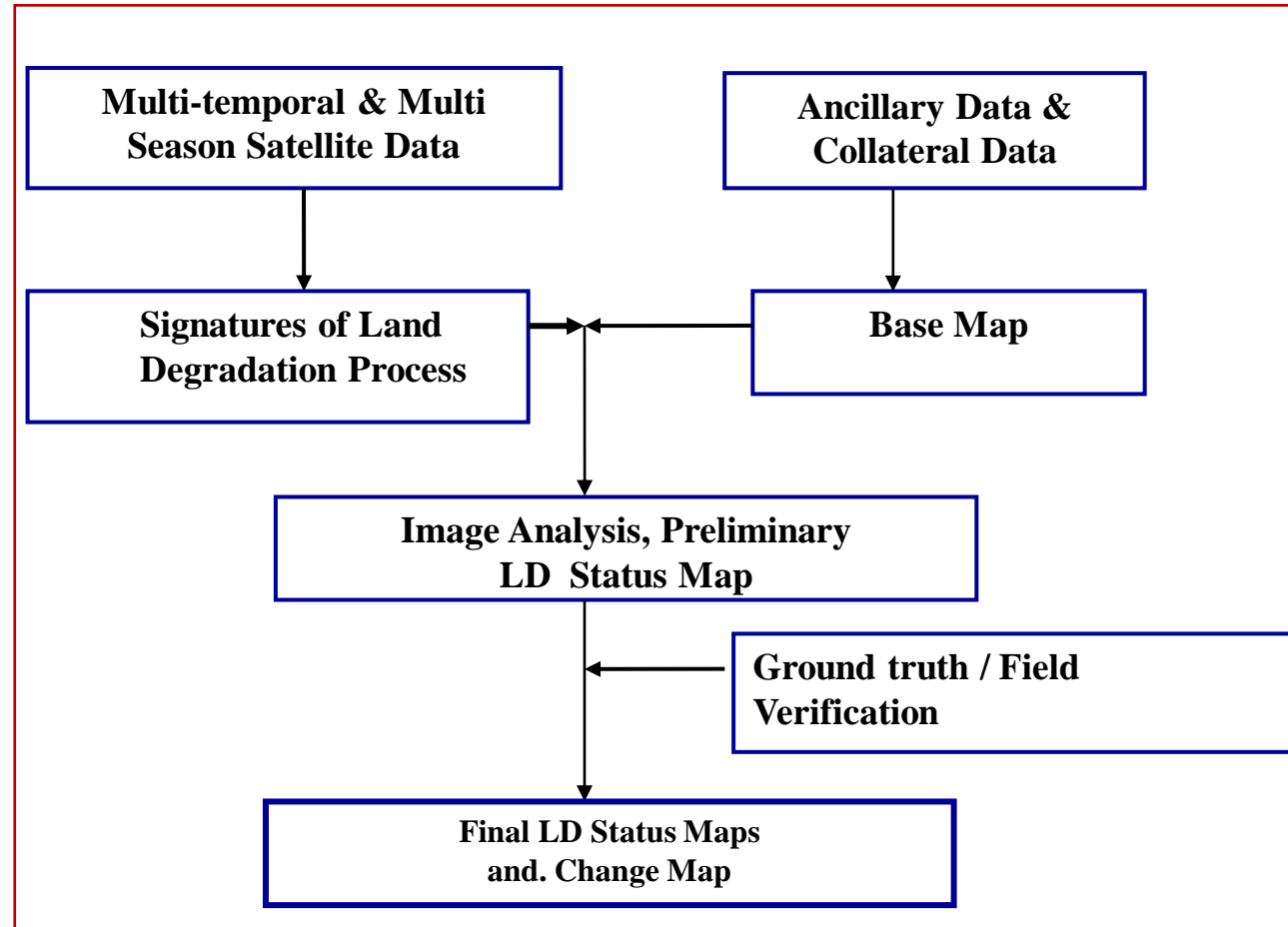


Copper Mining, Arizona, USA (Google Image)

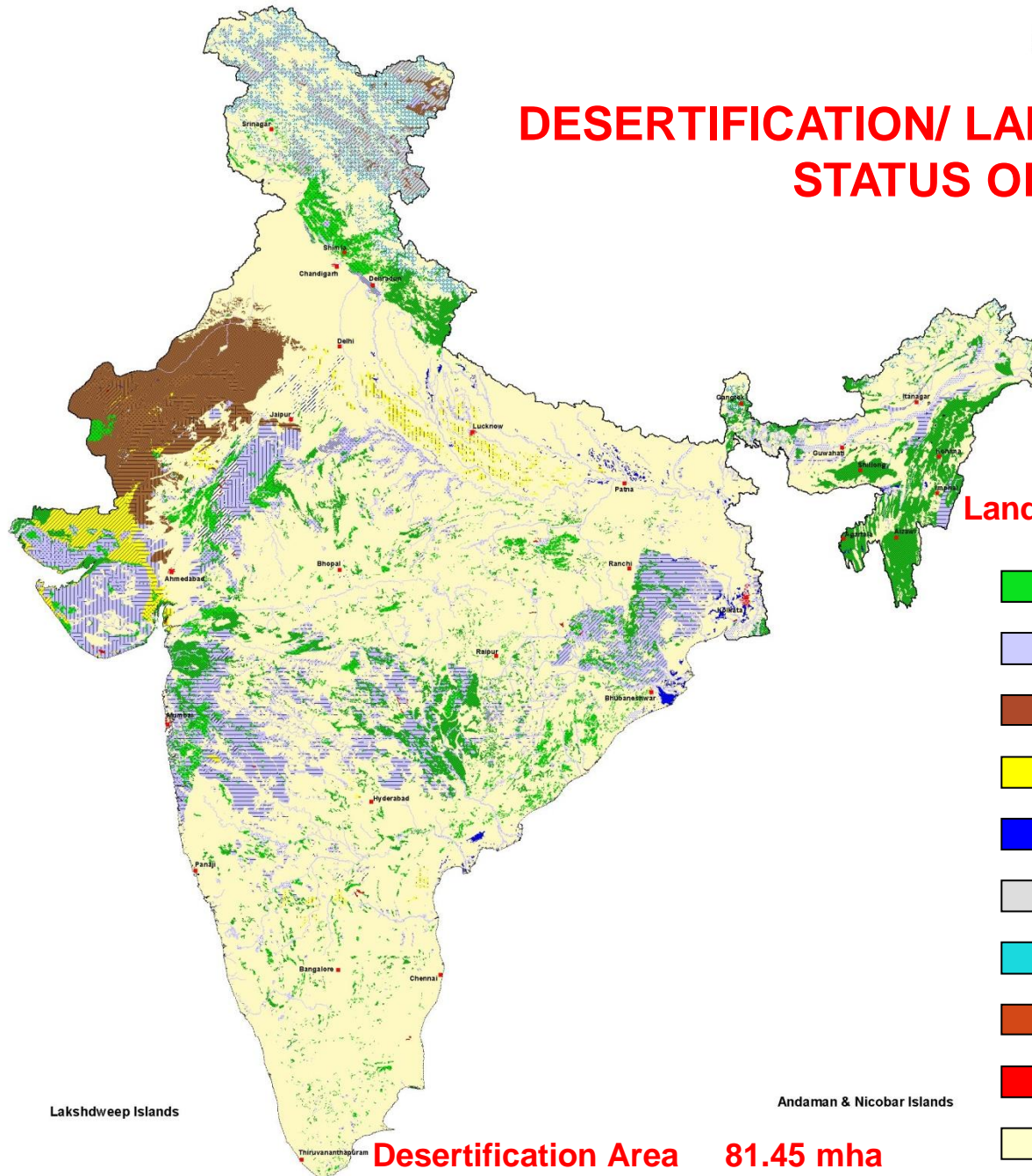
Quarrying, Rajasthan, India (LISS III)



Methodology for LD Mapping & Monitoring



DESERTIFICATION/ LAND DEGRADATION STATUS OF INDIA



Land Degradation Area 105.48(32.07%)

- Vegetal Degradation(31.66)**
- Water erosion(33.56)**
- Wind erosion(17.56)**
- Salinization/Alkalization(5.26)**
- Water logging(0.98)**
- Mass movement(4.45)**
- Frost heaving(0.14)**
- Frost shattering(10.21)**
- Man made(0.01)**
- No Apparent degradation**

Lakshdweep Islands

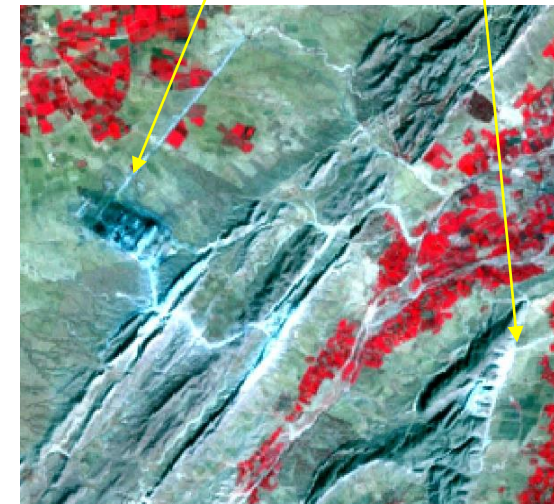
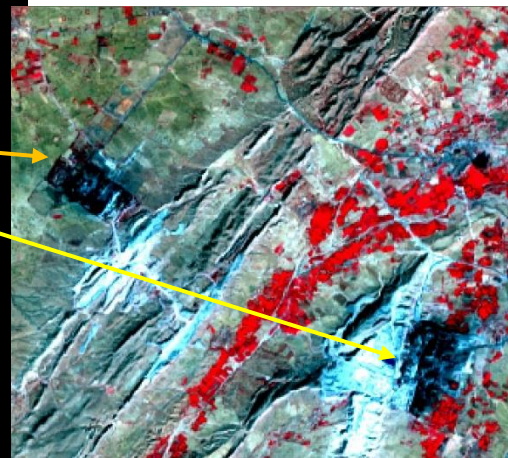
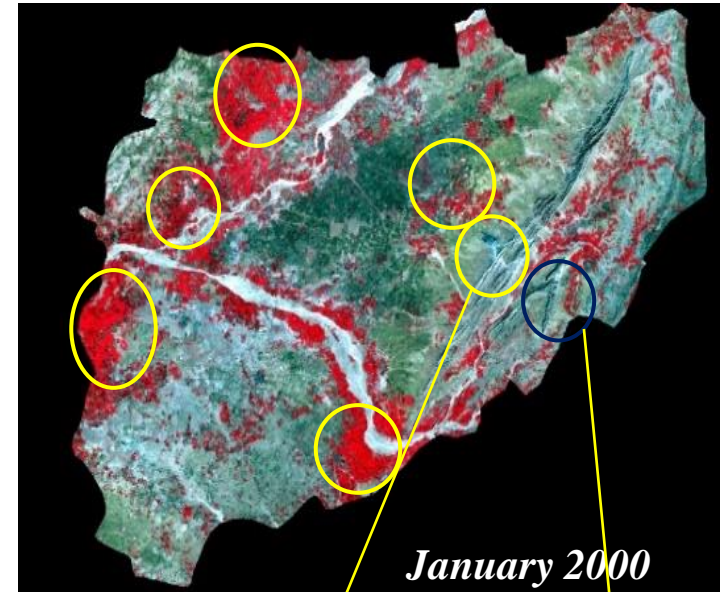
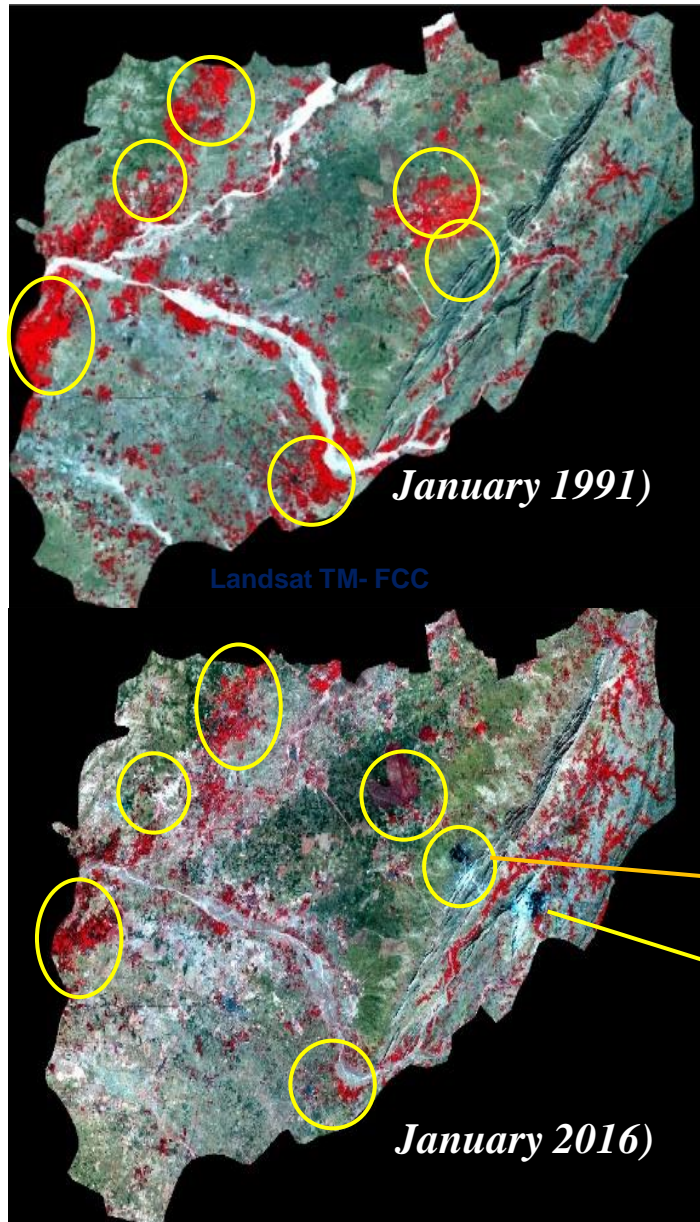
Andaman & Nicobar Islands

Desertification Area 81.45 mha

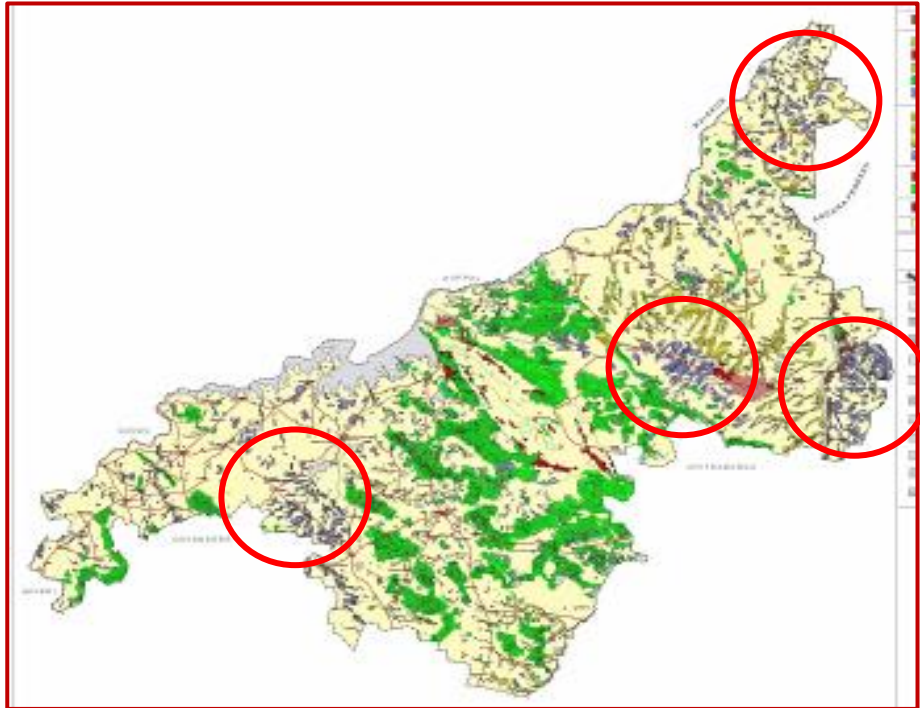
Areas in mha

Monitoring Land Degradation

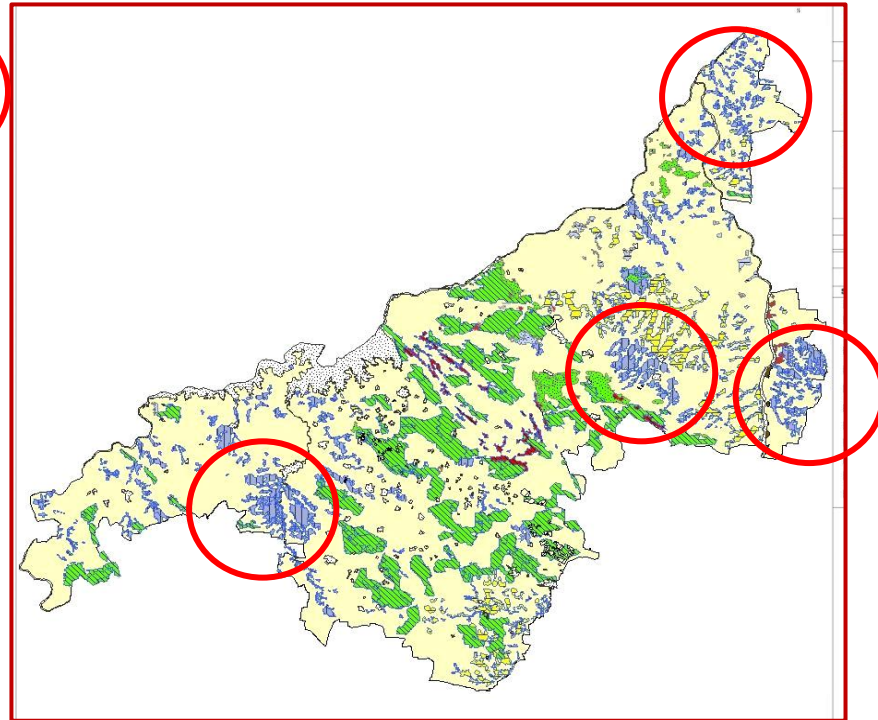
Jaitran, Pali, Thar Desert, India



LD Monitoring



Bellary, Karnataka, India



Year	2001	2011
Water Ero	370	498
Salinity/Alka	299	314
Vegetal Deg	1101	1132

Methods for Arresting LD & Restoring Degraded Land

Soil and Moisture Conservation Measure

Rain water harvesting

Sustainable Land Management

Afforestation/Plantation

Optimum Land use

Agroforestry/Silvi-Pasture

Wind Breakers & Shelterbelts

- - - - - specific to LD processes

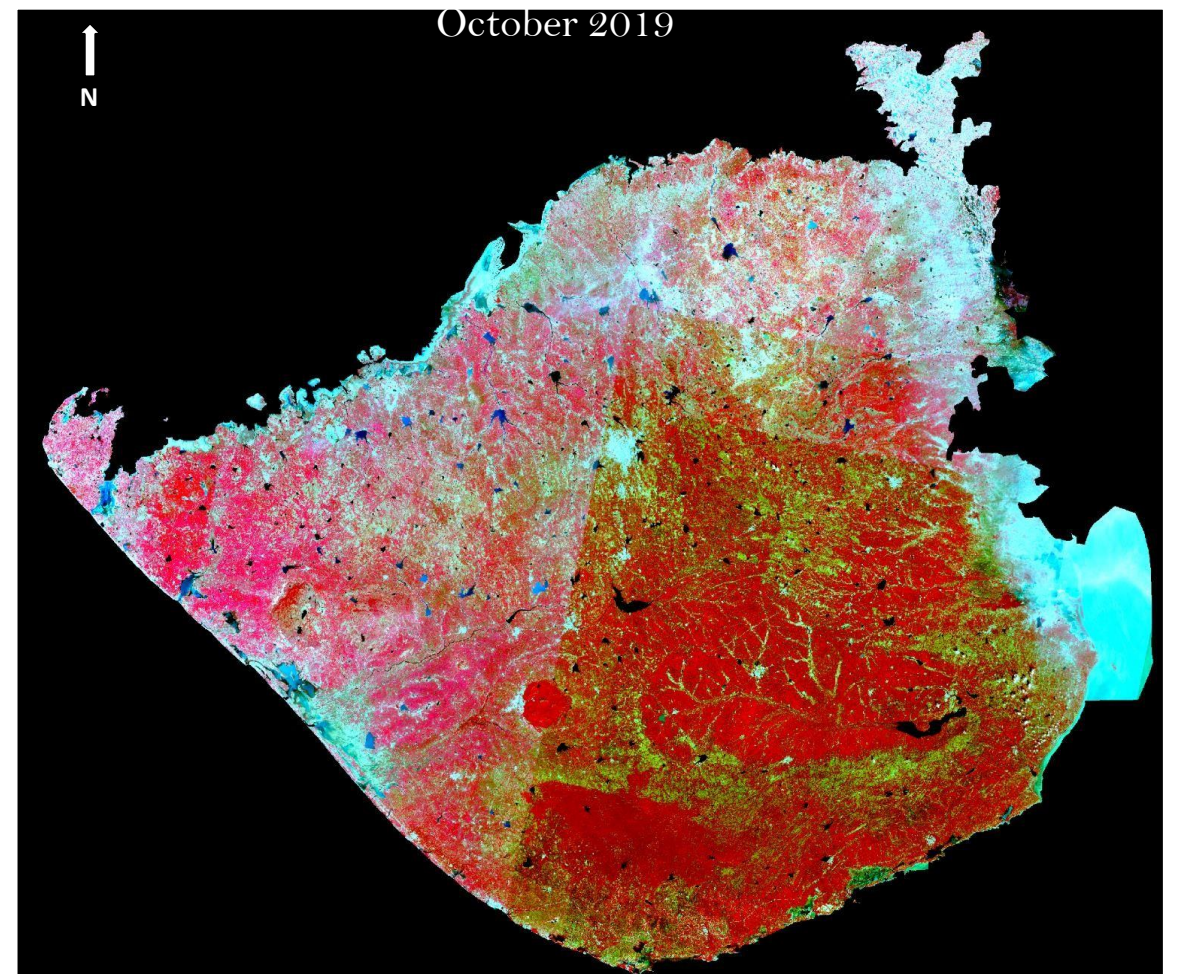
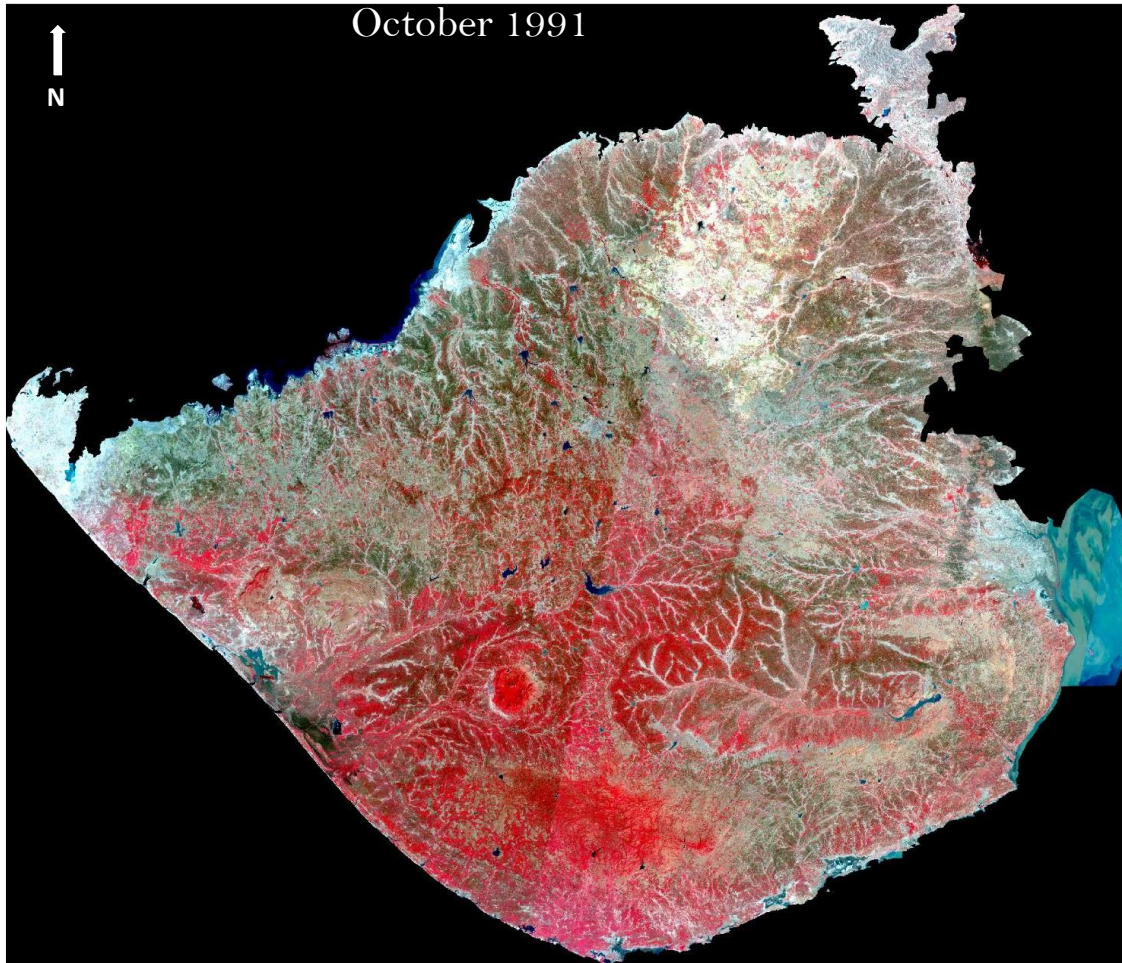


Monitoring Impact of Actions Taken

Parameters used

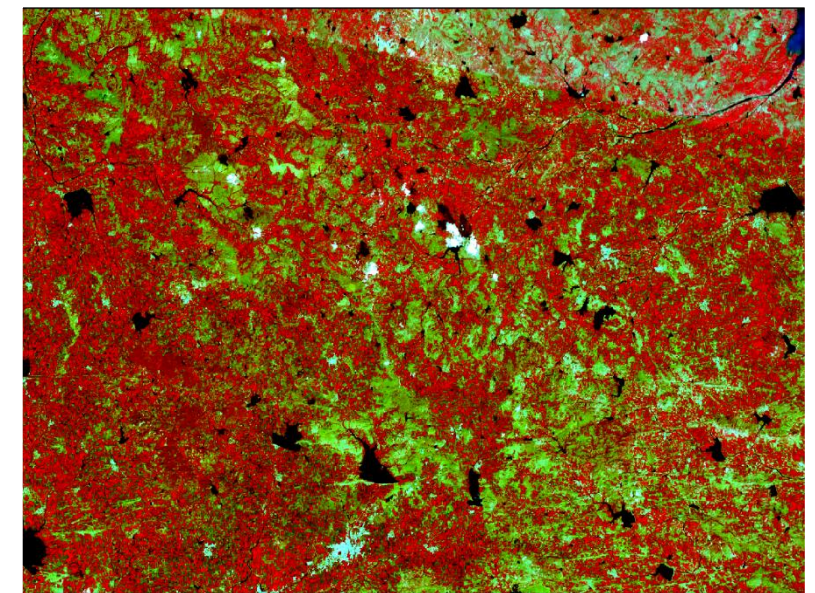
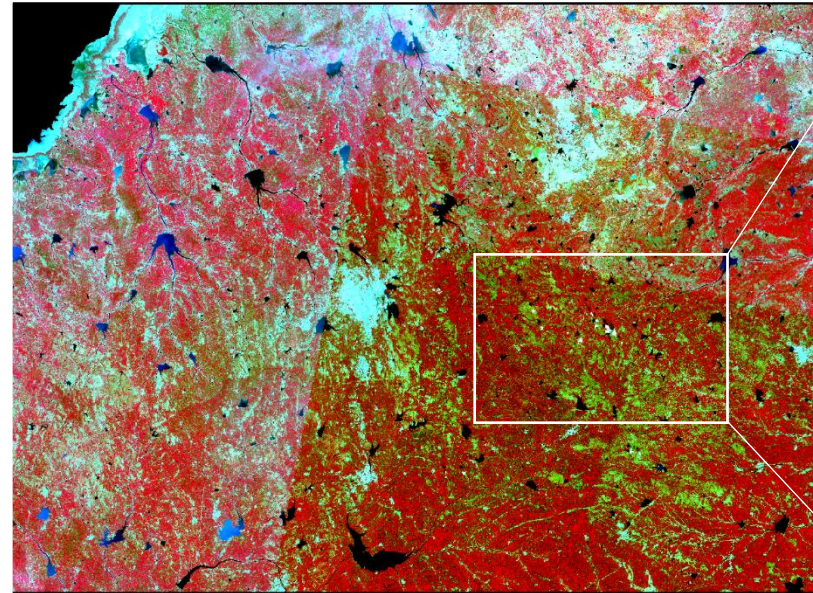
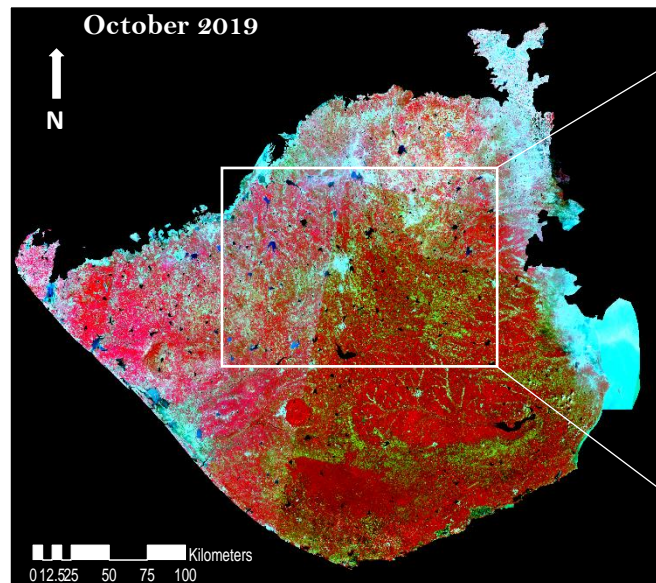
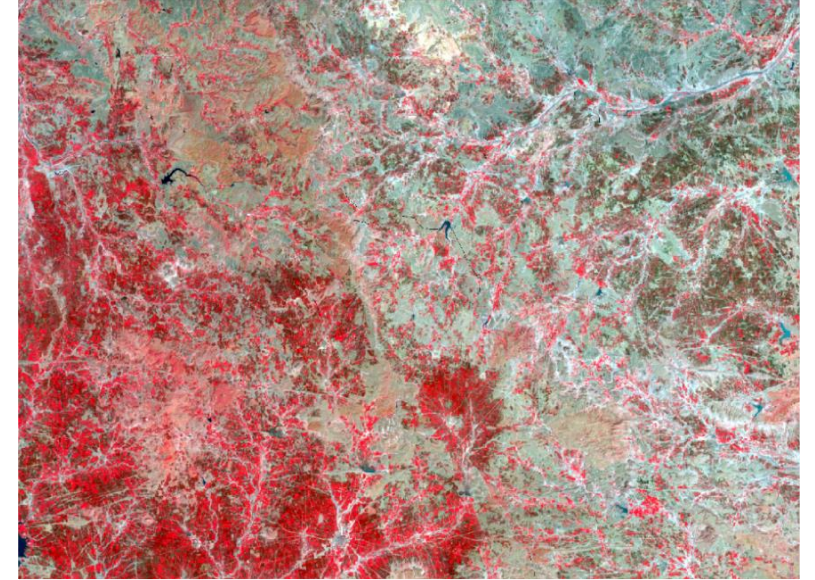
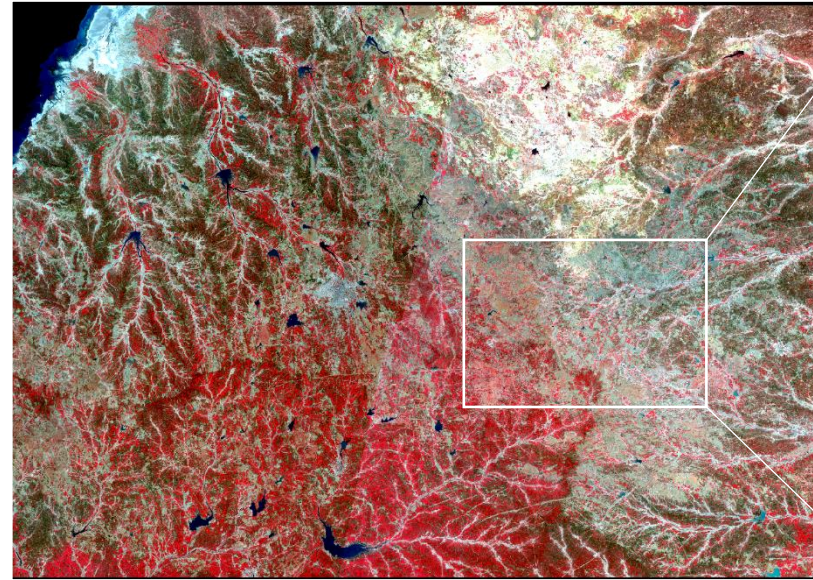
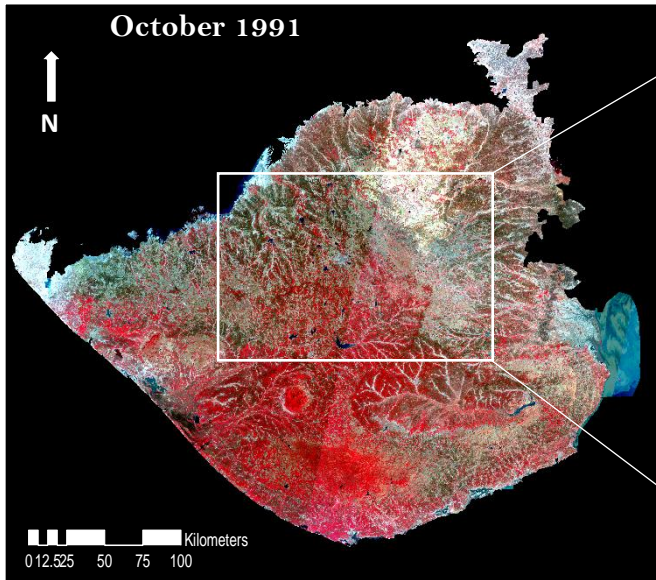
- **Socio-Economic Profile**
- **Vegetation Cover**
- **Land use /Land Cover**
- **Number and Area of Surface Water**
- **Recharge in ground water**
- **Soil Organic Carbon**
- **Productivity**
- **Biodiversity & Species Composition**
- **- - - - -**

Monitoring Restoration/Recovery



Saurashtra, Gujarat

Monitoring Restoration/Recovery



Sub Regional Cooperation:

- **DLD is a transboundary issue:**
eg. - SDS Source & Impacted Countries can be different
- **Technological Cooperation:**
Exchange of Technical Know How
Capacity Building
- **Involvement of Regional Experts**

Thanks

