3rd ASIAN WATER CYCLE SYMPOSIUM
Beppu, Japan, 2-4th December 2007

DISASTER MANAGEMENT

WATER FOR DEVELOPMENT AND ECOSYSTEM

WATER FINANCING

CAPACITY BUILDING PROGRAMME OF ISRO, INDIA

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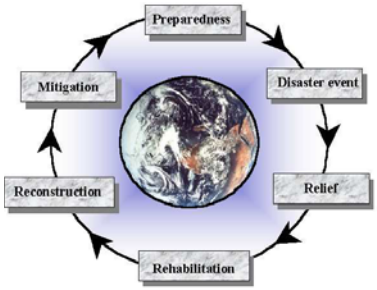
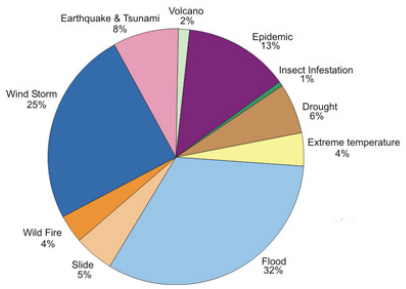
Dr. V. JAYARAMAN

REGIONAL REMOTE SENSING SERVICE CENTRE
Indian Space Research Organization, Department of Space
INDIA

➢Disaster Management





GAPS

- **Functionaries**
  - Administrators & Policy/Decision makers
  - Organizations & Academia
  - NGOs & Self help groups
- **Technological**
  - 'Last Mile' Outreach
  - New Tools & Methods
  - Seamless Integration
- **Operational**
  - Real Time Issues
  - Database Constraints
  - Institutional Constraints
- **Policies**
  - Regulation
  - Restriction
  - Accountability
- **International Cooperation**

CAPACITY BUILDING

CAPACITY BUILDING : ROLE OF ISRO / DEPT. OF SPACE

Space inputs for Disaster Management and Water for development & ecosystem

- **Functionaries**
  - Central/State/District/local administrators, policy & decision makers, planners, executives, academia, scientists, NGOs, community etc.
- **Technological**
  - Continued support of space inputs through IRS and INSAT series of satellites
  - Operational methodology for National missions & Newer applications
  - User need analysis and end-to-end value added solutions
  - Technological Development Projects and Application Validation Projects
  - Development of Decision Support Systems & Application Software
  - Consultancy for Infrastructure development & opearationalization of technology
- **Operational**
  - Database standards & Generation of digital database at different levels and scales.
  - National / Regional repository of database on natural resources.
  - Technology Transfer to partner institutions (SRSACs,academia etc.) and industry
- **Training**
  - Workshops / seminars / training programmes for end-users, beneficiaries / stakeholders.
- **International Cooperation / international charter**

CAPACITY BUILDING

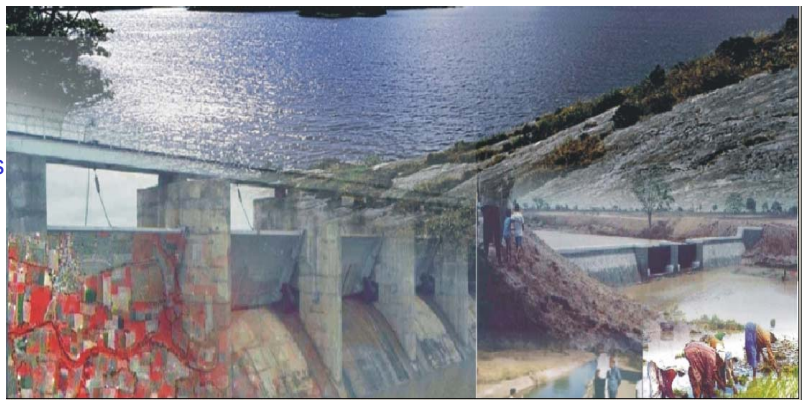
Functionaries

NNRMS-Standing Committee on Water Resources (SC-W)

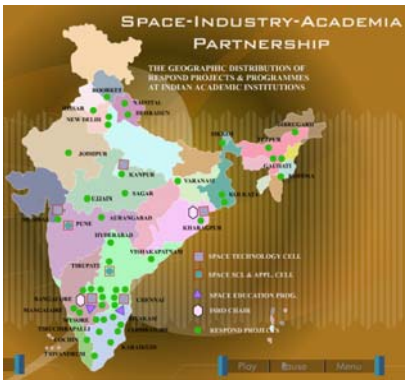
- Deals with the issues related to water resources and advise on the methods of using the Remote Sensing technology for operational water resources management in the country.
- Evaluate the information requirements for the water resources management and assess how much of it can be catered to by present and future RS System,
- Identify improved methods of water resources management by adopting newer techniques of data analysis, integration and modelling,
- Design the framework of a water resources information system for decision-making at different levels - input parameters, modeling and transformations
- Generate national programs / projects with identified sources of funding for achieving the above in the framework of the NNRMS.

• Major activities: *Capacity building in the area of water resources*

- Snow melt run-off in Himalayan river basins
- Flood risk zone delineation
- Command area development
- Ground water targeting
- Water resources assessment
- Environment impact of water resources projects
- Water quality mapping and monitoring
- Inter river basin water management
- Assessment of Reservoir Sedimentation
- Accelerated Irrigation Benefit Project
- Soil Moisture Assessment



NNRMS-Standing Committee on Training & Education (SC-T)



- Deals with the technological and training issues related to RS, GIS and GPS.
- Coordination with the other Standing Committees for evolving continuum of technology and training services
- Advanced areas for research, value-added services, developing modeling technologies, technology transfer issues, equipments and facilities.
- Establishment of an operational mechanism for manpower training at different levels in the field of Remote Sensing, Resource Management, GIS and integrated modeling.
- Plan for incorporation of RS and allied fields in School & University curricula.

• Major activities: *Capacity building in the area of Remote Sensing and GIS*

- Support to conduct specific training programmes in different application themes.
- Long-term collaborative training programmes to generate trained manpower
- Support to Universities/academic institutes to enable them to set up centralized remote sensing & GIS infrastructure for conducting educational programmes.
- Development of application tools in the area of image processing, GIS and photogrammetry for operationalisation.
- Enhancing Incorporation of RS & GIS in the school course curricula
- Initiate new training/education programme in the area of Satellite Oceanography, Meteorology and Atmospheric studies
- Pilot project on Edusat Utilization - virtual campus at IIRS, Dehradun for RS training programme.
- Initiate activities towards "Curricula Development" to update and develop curricula in different disciplines
- Project on e-learning - speeding up of e-learning project of IIRS, Dehradun.

Indian Institute of Remote Sensing
National Remote Sensing Agency
Dehra Dun

-On mission for transferring technology through education and training

•Objectives

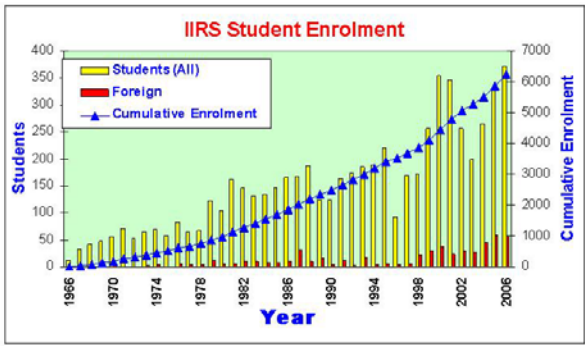
- Capacity building through technology transfer among the user community
- Education at Post Graduate level in the field of Remote Sensing
- Promote research in Remote Sensing and Geoinformatics.
- Value addition and services.

•Training / Educational Programmes & Courses

- REMOTE SENSING AND GIS : MAPPING AND MONITORING OF NATURAL RESOURCES
- GEOINFORMATICS TECHNOLOGY AND APPLICATIONS
- GEOINFORMATICS FOR GEOHAZARDS
- NNRMS-ISRO SPONSORED COURSES FOR UNIVERSITY FACULTY
- SPECIAL SHORT COURSES ON USERS DEMAND
- DECISION MAKERS' COURSE
- INTERNATIONAL PROGRAMMES

•International Collaborations

•ITC ; IHE ; Wageningen University, The Netherlands ; ADPC, Thailand ; WMO, Geneva ; Switzerland, GDTA ; CNES, France ; ITTO/JOFCA, Japan



Centre for Space Science & Technology Education in Asia and the Pacific (CSSTEAP)

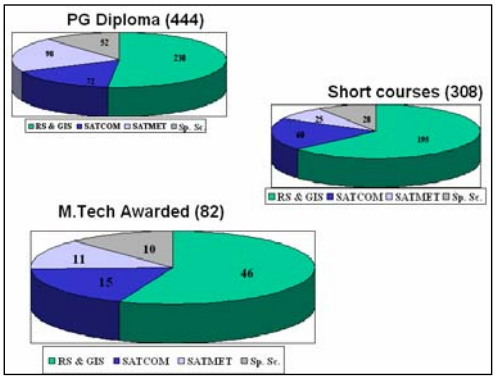
" Human resource development in the Asia-Pacific region in applying space science and technology for sustainable development of the region, achieved through academic excellence thereby enabling all learners to reach their individual potential."

"By giving to others knowledge increases"

- Established in India on November 1, 1995
- CSSTEAP is administered by an international Governing Board consisting of representatives of 15 member countries(as of today) in the Asia-Pacific Region and representative of the United Nations (UN-OOSA) and the International Institute of Geo-information Science and Earth Observation (ITC) in Enschede, The Netherlands as observers.

Educational Programme Records

- RS & GIS course is conducted every year
- SATCOM and SATMET/Space Science courses are done in alternate years.
- Post-graduate level courses - 9-month duration
- M.Tech degree
- workshops and short-term courses in the four disciplines.



CAPACITY BUILDING

Technological

Four Decades of Indian Space Programme

Applications driven programme
Self reliance in building & launching satellites

November 21, 1963

SLV-3 ASLV

PSLV GSLV

8 2

ONE AMONG THE SIX NATIONS

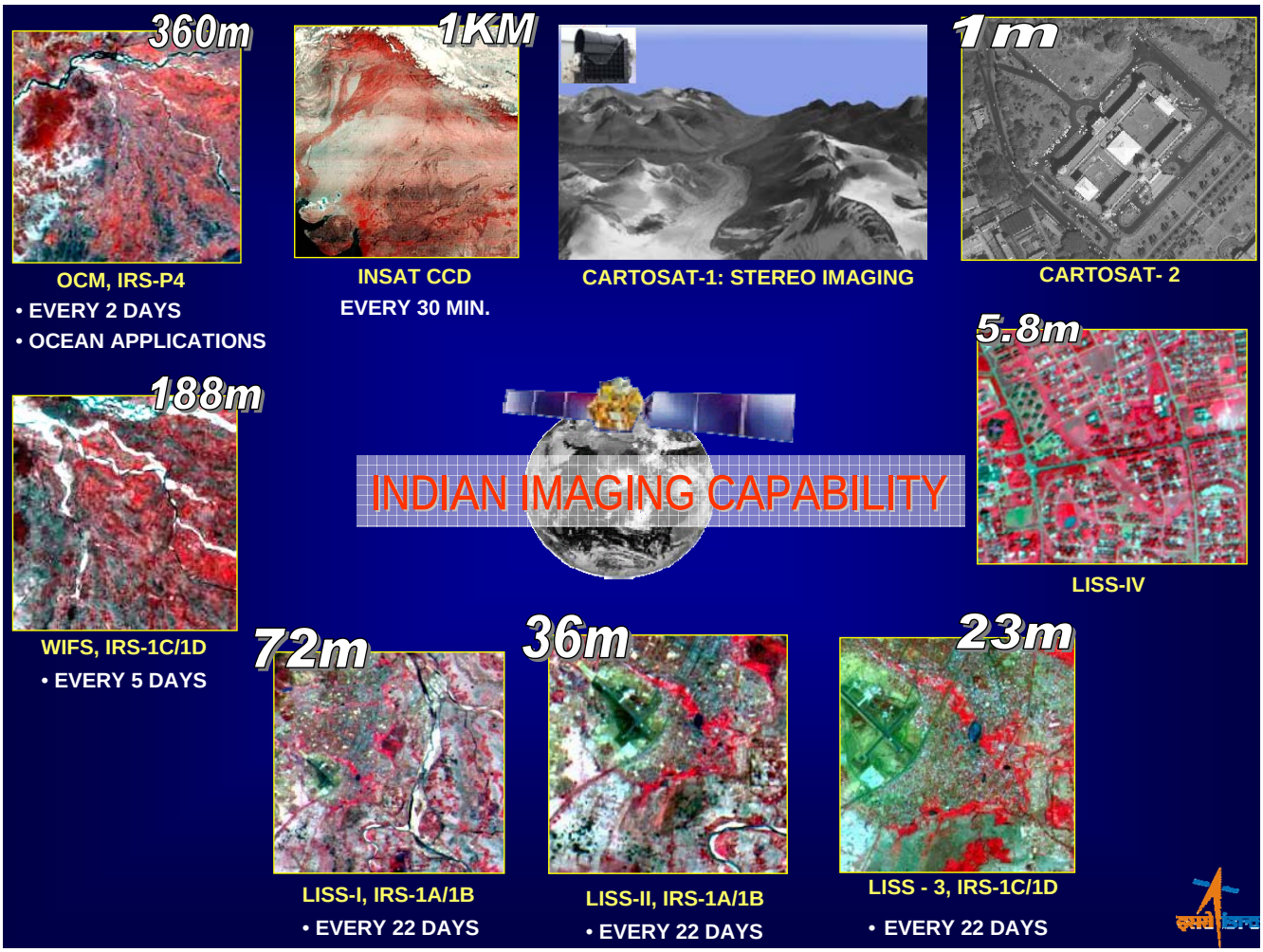
LAUNCH VEHICLE

SATELLITE

APPLICATIONS

47 + 4 Missions

ARYABHATA 19.04.75
INSAT-3E 28.09.03
KALPANA-1 12.09.02
INSAT-2E 03.04.99
INSAT-3C 24.01.02
INSAT-3B 22.03.00
INSAT-3A 10.04.03
GSAT-2 08.05.03
IRS-1C 28.12.95
IRS-P3 21.03.96
IRS-1D 29.09.97
IRS-P4 26.05.99
TES 22.10.01
IRS-P6 17.10.03
IRS-P5 05.05.05



OCM, IRS-P4
• EVERY 2 DAYS
• OCEAN APPLICATIONS

INSAT CCD
EVERY 30 MIN.

CARTOSAT-1: STEREO IMAGING

CARTOSAT- 2

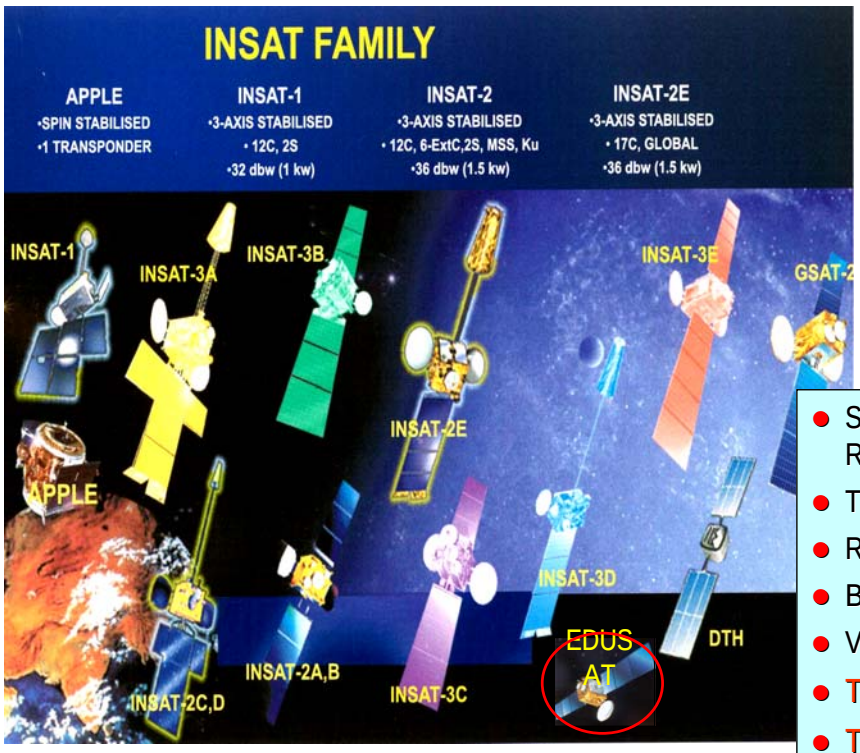
LISS-IV

WIFS, IRS-1C/1D
• EVERY 5 DAYS

LISS-I, IRS-1A/1B
• EVERY 22 DAYS

LISS-II, IRS-1A/1B
• EVERY 22 DAYS

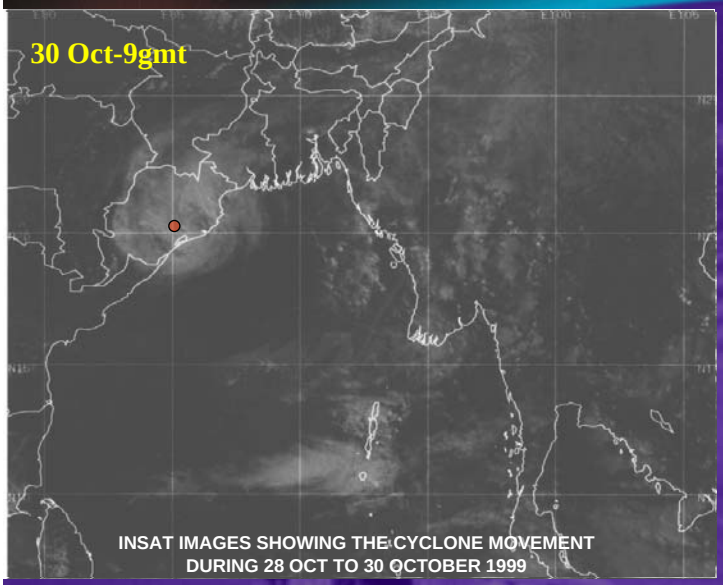
LISS - 3, IRS-1C/1D
• EVERY 22 DAYS



- About 1000 Earth Stations of DOT
- About 22,000 VSAT's of private VSAT network
- 33 TV Channels and 1200 TV Transmitters
- 300 AIR Radio Networking Stations

- SPEECH CIRCUITS ON TRUNK ROUTES
- TV BROADCASTING
- RADIO NETWORKING
- BUSINESS COMMUNICATIONS
- VSAT CONNECTIVITY
- TELE-EDUCATION/TRAINING
- TELE-MEDICINE
- SEARCH AND RESCUE SERVICES
- METEOROLOGY IMAGING
- DISASTER WARNING SYSTEM
- DATA COLLECTION PLATFORMS

CYCLONE WARNING DETECTION SYSTEM



INSAT IMAGES SHOWING THE CYCLONE MOVEMENT DURING 28 OCT TO 30 OCTOBER 1999

- MONITORING & TRACKING OF CYCLONE WITH INSAT VHRR
- SATELLITE BASED CYCLONE WARNING DISSEMINATION
- PROVISION OF INSAT MOBILE TELEPHONE TERMINALS

Issuing of Warnings:

Pre-cyclone watch : 72 hrs in advance

Cyclone Alert : 48 hrs in advance

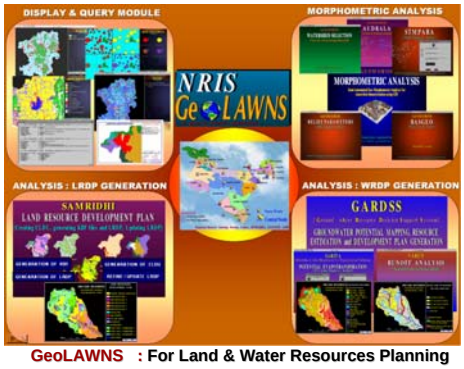
Cyclone Warning : 24 hrs in advance

Tropical cyclones

April to June
September to December

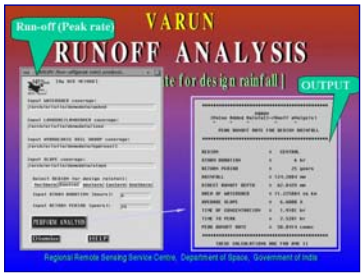
Formation of about 5 to 6 cyclones

Very strong wind > 200 kmph
Torrential rainfall ~ 50 cm in 24 hrs
High storm surges ~ 10 m high



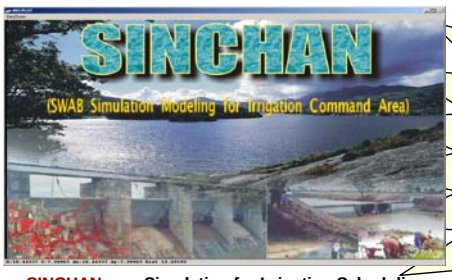
GeoLAWNS : For Land & Water Resources Planning

SARITA : Irrigation Scheduling



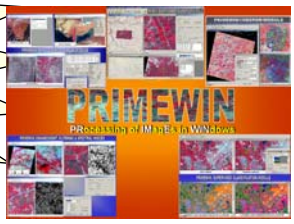
VARUN : Run-off modeling

GeoLIMIS : Locust Control & Surveillance



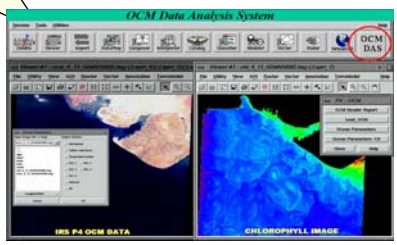
SINCHAN : Simulation for Irrigation Scheduling

DECISION SUPPORT SYSTEMS & APPLICATION SOFTWARE PACKAGES



KSHAMTA : Reservoir Capacity Estimation

DMSDQ: For Flood damage assessment



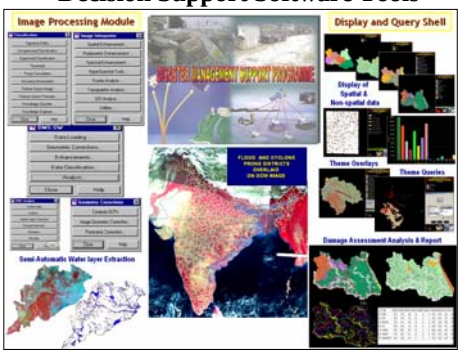
CAPACITY BUILDING

Operational

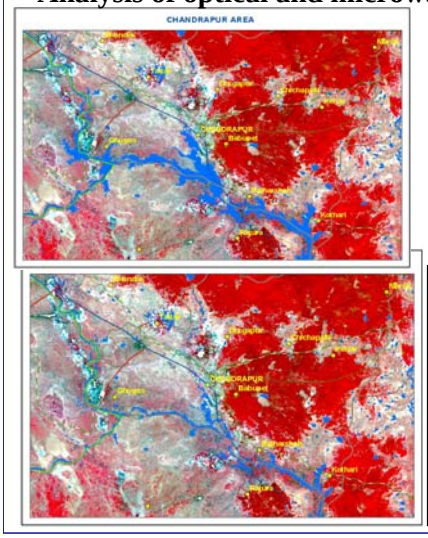
Operational services for flood & related disaster management

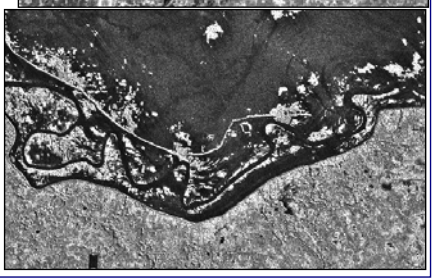
- Database generation at 1:50,000 scale & periodic updation.
- Hazard zonation for capturing the vulnerability (Preparedness)
- Near real time flood inundation mapping (Response)
- Scientific assessment of flood damages (Mitigation)
- Mapping of river configuration, flood control works
- River bank erosion & chronic flood prone area
- Improved forecasting and warning models
- Decision Support Software Tools

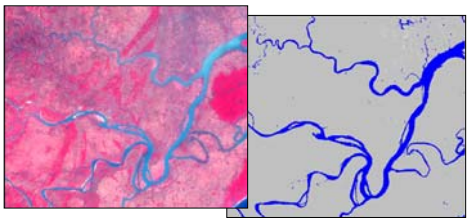
Decision Support Software Tools



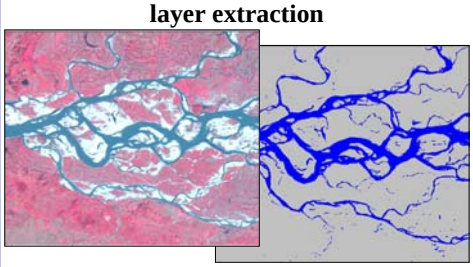
Analysis of optical and microwave data for inundation mapping







Semi-automated tools for water layer extraction

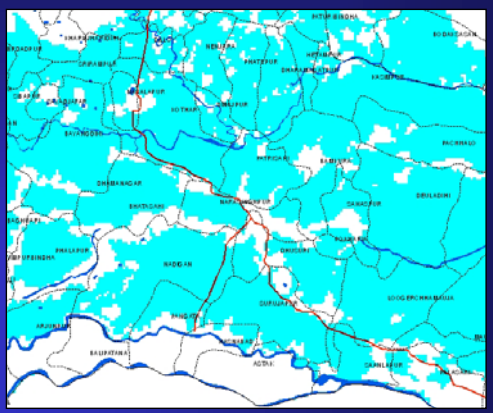


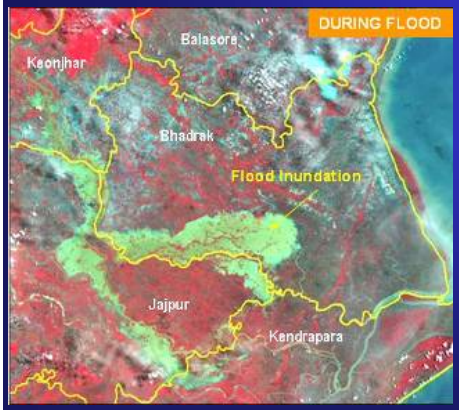
Orissa Floods - 2007

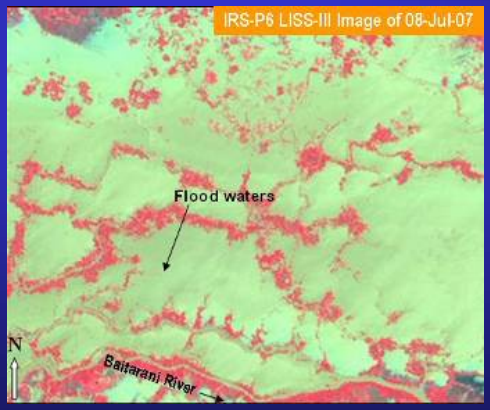
Floods hit Orissa due to heavy rains in Orissa state during first week of July 2007 due to depression in Bay of Bengal. Major rivers crossed its previous HFL

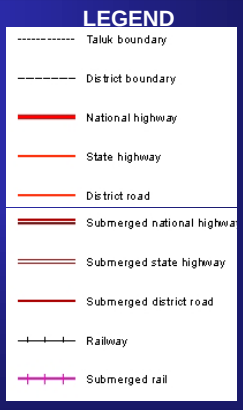
Normal river

Flood Inundation

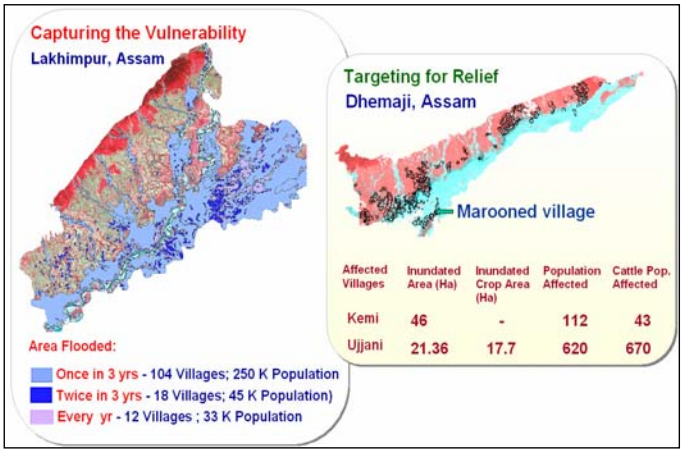




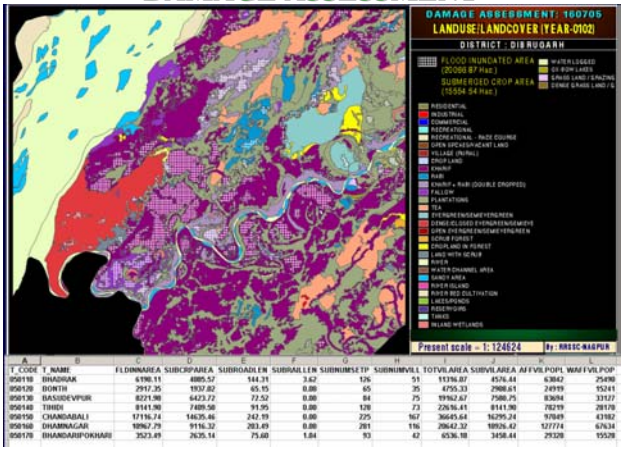




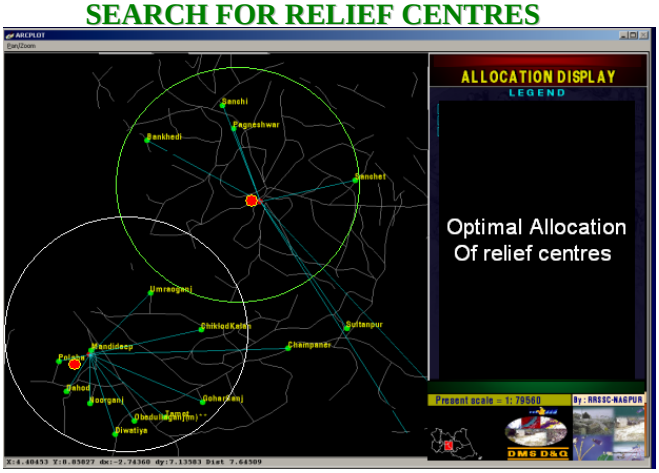
FLOOD HAZARD ZONATION



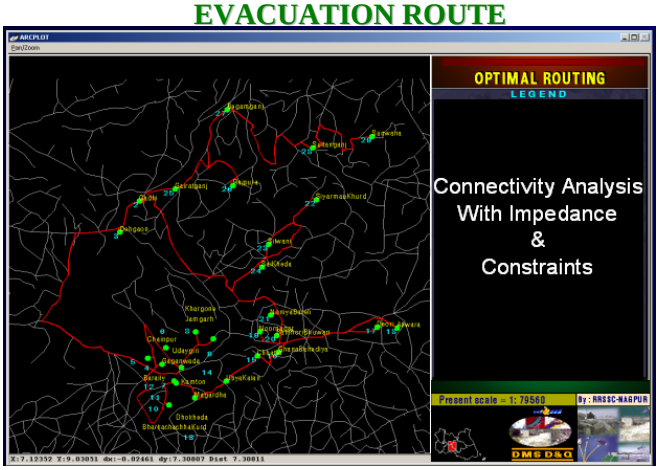
DAMAGE ASSESSMENT



SEARCH FOR RELIEF CENTRES



EVACUATION ROUTE



Drought : the silent threat to Indian rural economy

Agriculture – the immediate victim of Drought

- Geographical Area : 328.7 M ha
- Net Sown Area : 142.2 M ha
- Net Irrigated Area : 55 .1 M ha
- 70% of population (900 millions) depend on Agril.
- 68% of net sown area(142.2 M ha) is drought prone
- 50% of drought prone is severe in nature

Consequences

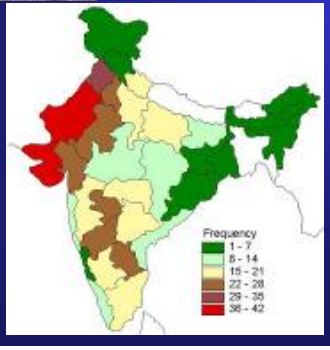
Unemployment

Cattle - Starvation

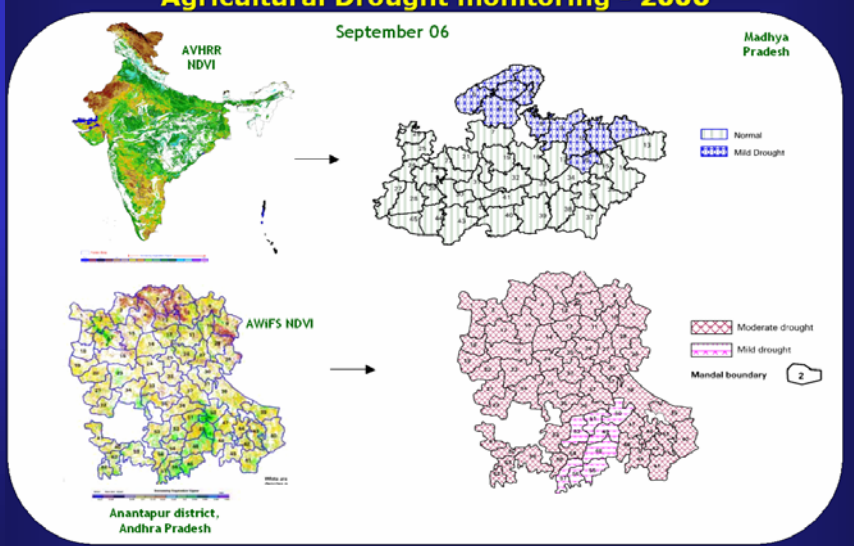
Fodder Shortage

Drinking Water Shortage

Frequency of droughts in India- 1871-1999



Agricultural Drought monitoring - 2006



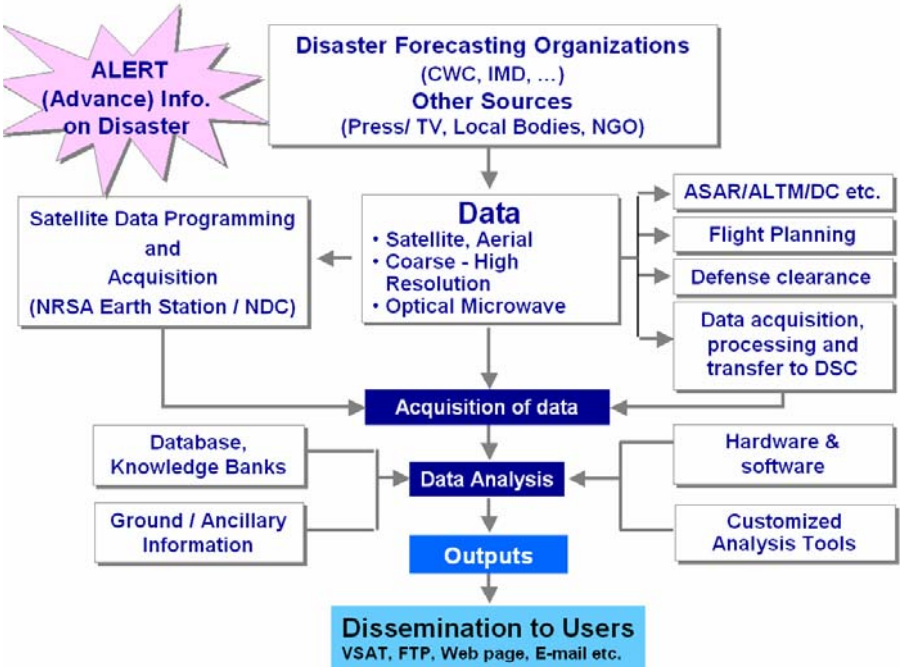
Decision Support Centre

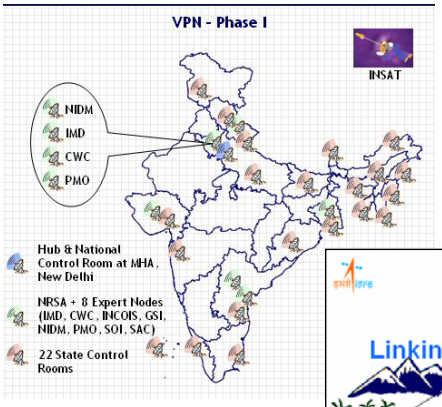
Disaster Watch, Satellite data planning & Acquisition, Information Dissemination,
Video conferencing facility

Servers for database, Web & floating licenses management networked storage systems

Data analysis and value addition

Data Acquisition, Analysis & Dissemination

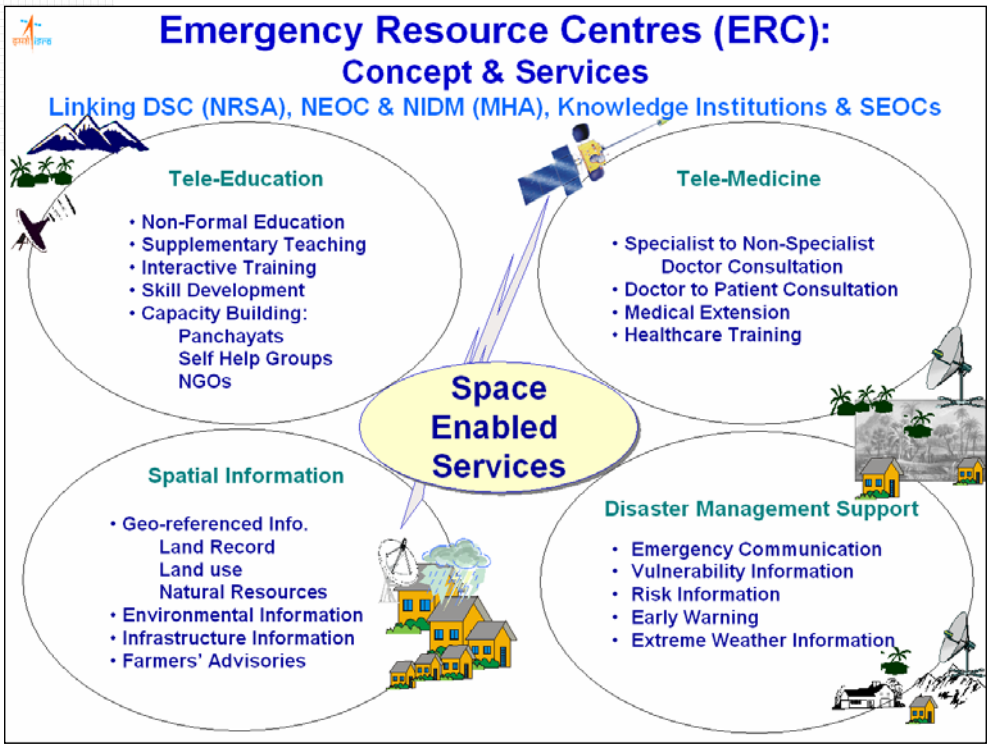




The Role of Space-based Systems & Services

Telemedicine Connectivity

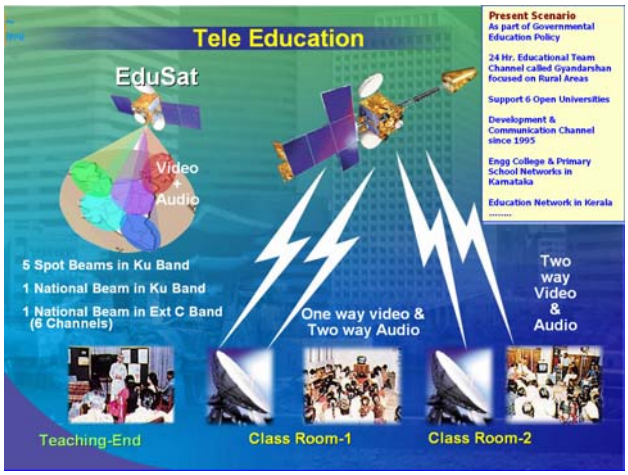
Doctors from Defence Services

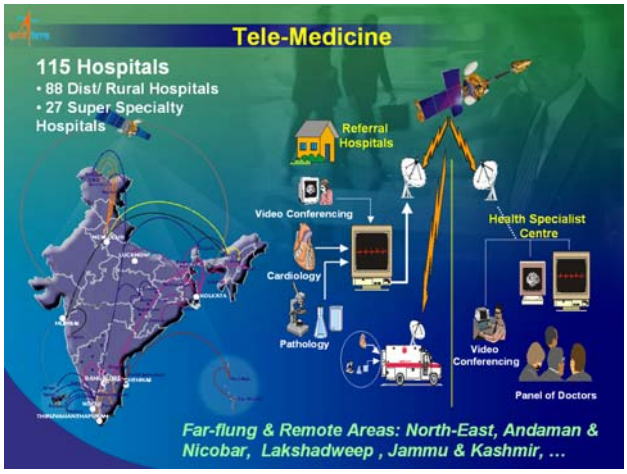


VILLAGE RESOURCE CENTRES

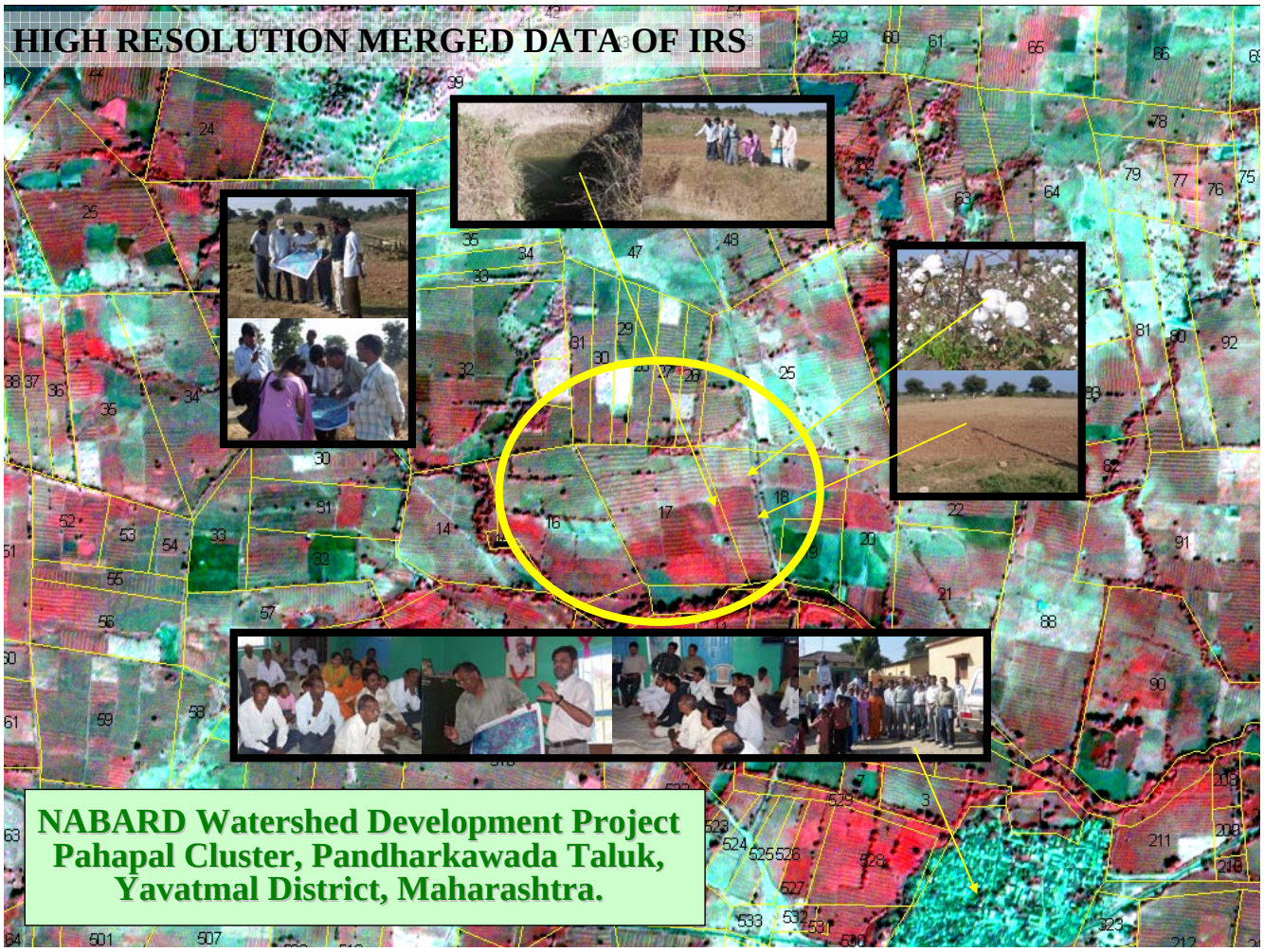
..more than 300 VRCs already operational

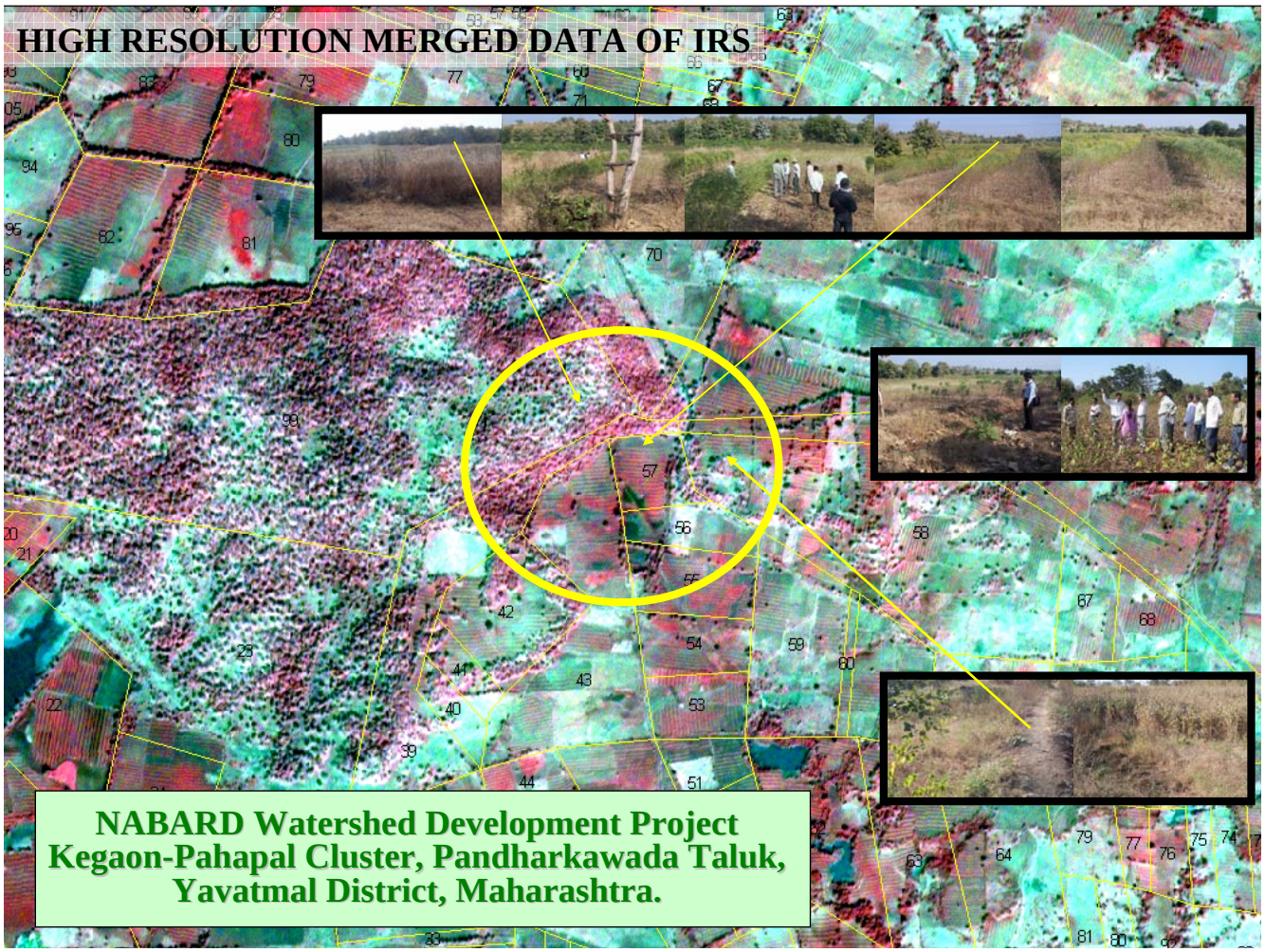
- **Tele-education**
  - **Dedicated satellite EDUSAT**
  - **more than 44,000 virtual class rooms**
- **Tele-medicine**
  - **250 nodes operational**



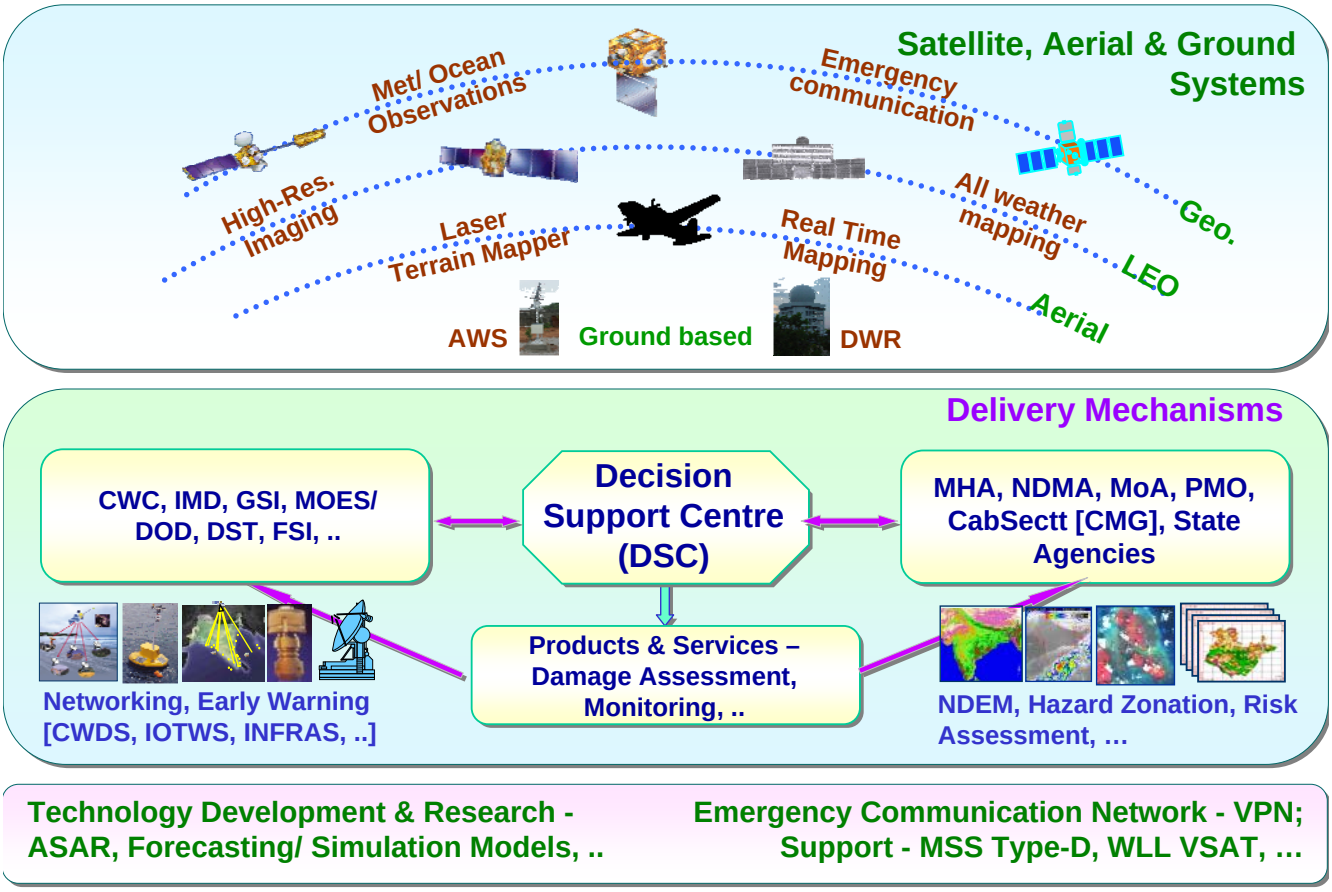


WORKSHOP ON WOMEN FARMERS EMPOWERMENT


HIGH RESOLUTION MERGED DATA OF IRS
NABARD Watershed Development Project
Pahapal Cluster, Pandharkawada Taluk,
Yavatmal District, Maharashtra.


HIGH RESOLUTION MERGED DATA OF IRS
NABARD Watershed Development Project
Kegaon-Pahapal Cluster, Pandharkawada Taluk,
Yavatmal District, Maharashtra.

Disaster Management Support (DMS) System



CAPACITY BUILDING

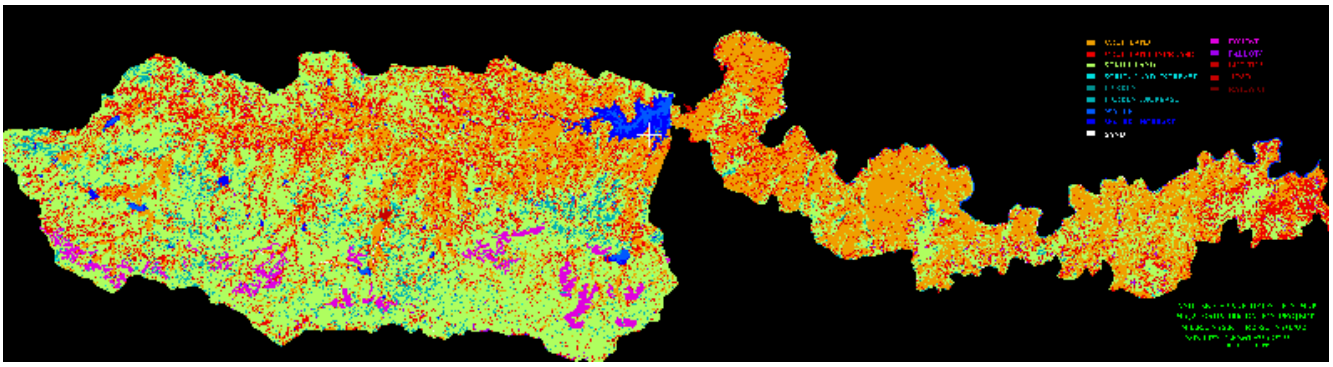
Policies

WATER FOR DEVELOPMENT AND ECOSYSTEM

Water Resources Project

Project Planning
Project Execution

Project Design
Project Operation



Catchment Area

- Runoff Analysis
- Erosion Studies
- Watershed Development
- Change Detection

Reservoir

- Water Spread & Capacities
- Sedimentation
- Optimisation Models

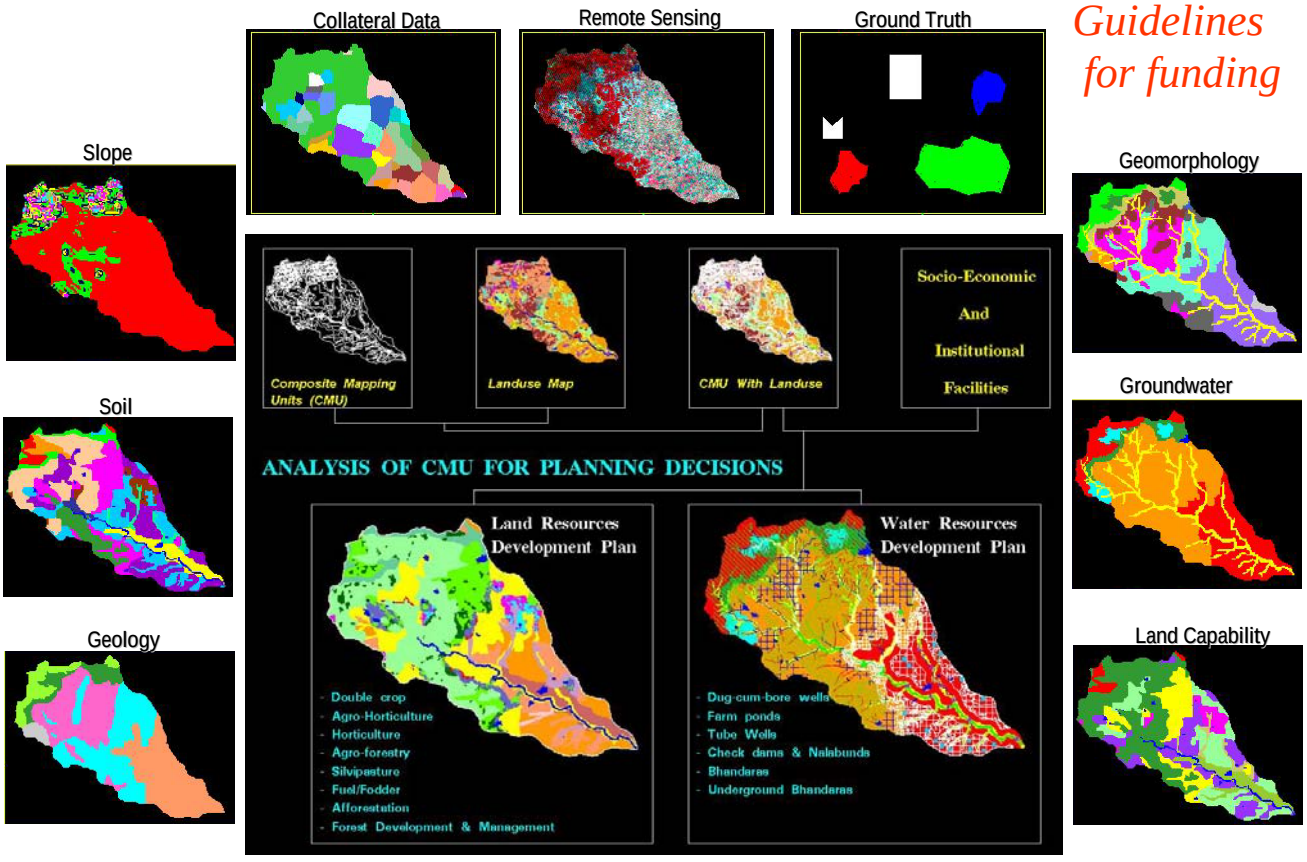
Command Area

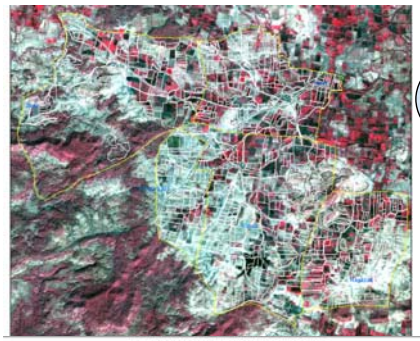
- Crop Inventory
- Water Demand
- Canal Network
- Water Logged & Salinity
- Change Detection
- Irrigation Scheduling
- Soil moisture assessment

Land and Water Resources Development Plan

- Incorporation of local-specific knowledge for watershed planning

Guidelines for funding





NABARD SUPPORTED HOLISTIC WATERSHED DEVELOPMENT PROGRAMME (NHWDP) For Distressed Districts of Vidarbha, Maharashtra

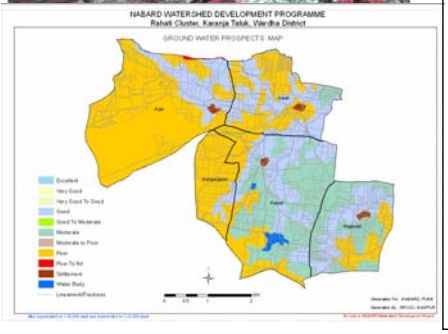
Guidelines for funding By Financial institutions

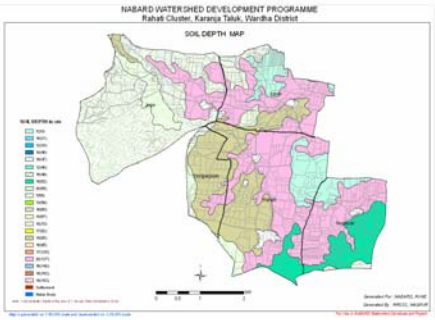
36 Village Clusters / 90,000 ha (Gat-level Planning – Net Planning Exercise)

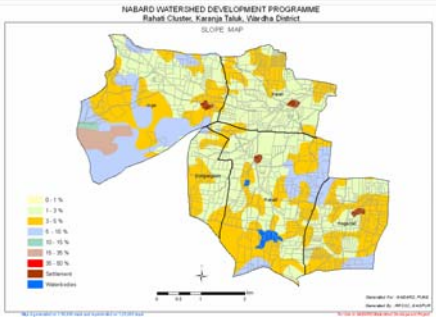
Holistic watershed interventions combined with livelihood support activities.

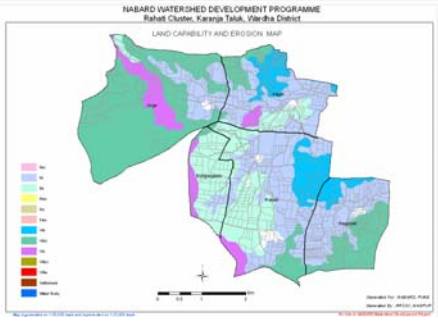
Four Resource Support Organisations (RSOs) will be supervising and guiding the 27 Project Implementing Agencies (PIAs)

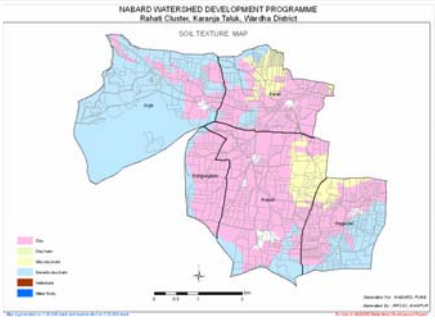
To enhance the capacity of RSOs/PIAs to utilize the satellite data and related information for watershed development projects & Livelihood sustenance.







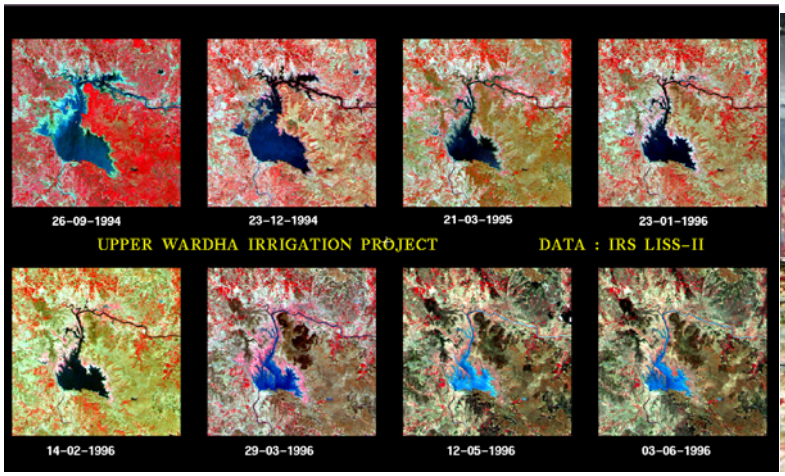


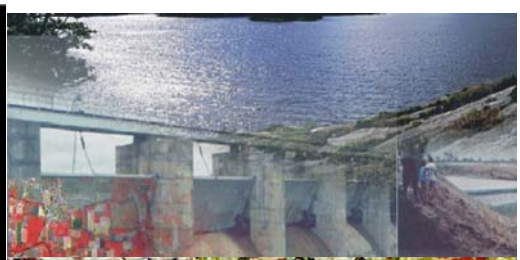


WATER FOR DEVELOPMENT AND ECOSYSTEM

ESTIMATION OF RESERVOIR CAPACITY AND SEDIMENTATION

Monitoring Mechanism





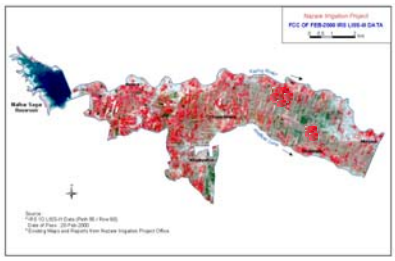
Multidate Remote Sensing data provides us actual water spread area of the reservoir on different dates, thus providing elevation contours in form of water spread. Incorporating water elevation contours into the contour map of the submergence area for better accuracy to generate Digital Elevation Model (DEM). The DEM is then used for capacity estimation of reservoir at given water level.

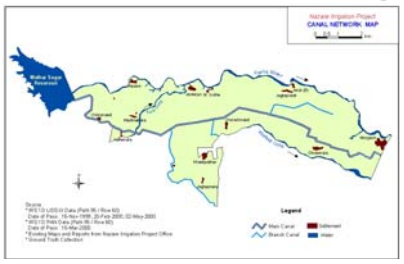
For estimating the peripheral sedimentation for assessing live storages of reservoirs, remote sensing technique is now widely being used. Due to peripheral sedimentation, the water spread area of reservoir for the particular water level decreases, thus reduces the storage capacity. The reduction in live storage capacities of reservoir between two time steps is attributed due to sedimentation.

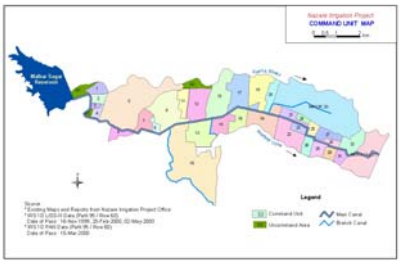
WATER FOR DEVELOPMENT AND ECOSYSTEM

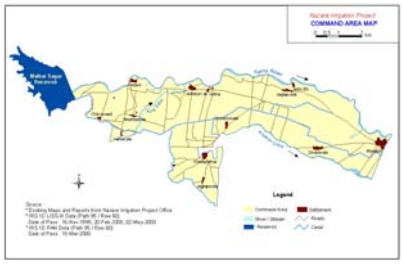
Irrigation Information System

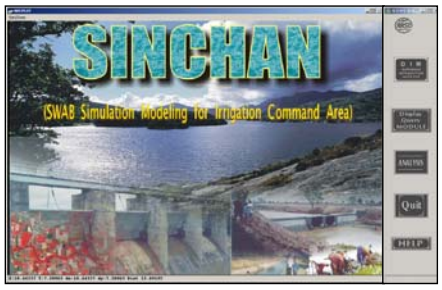
Water users associations

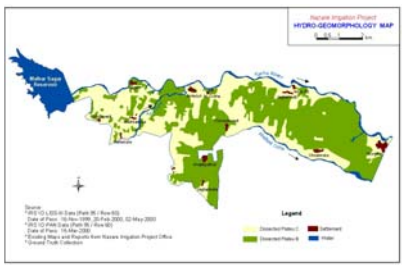


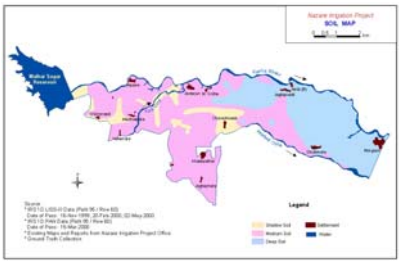


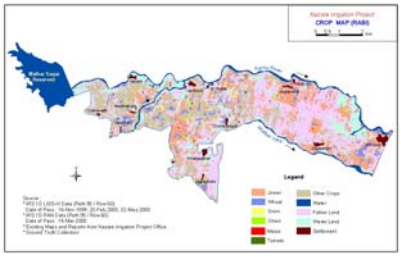


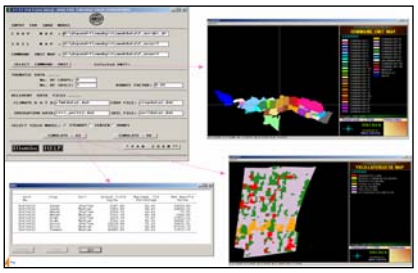






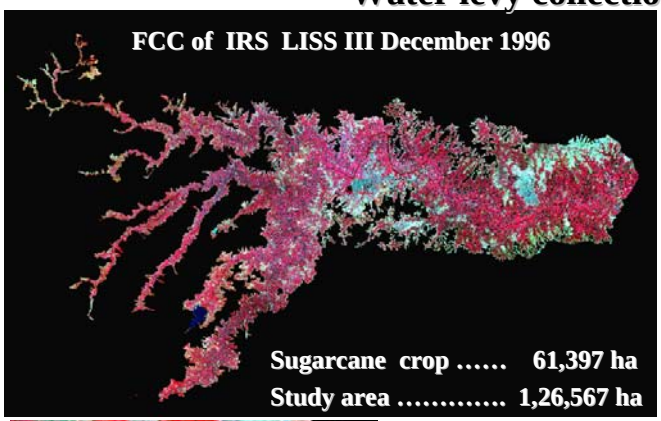


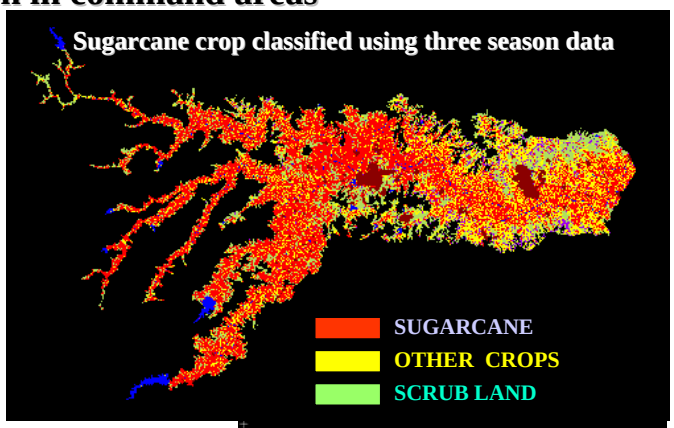




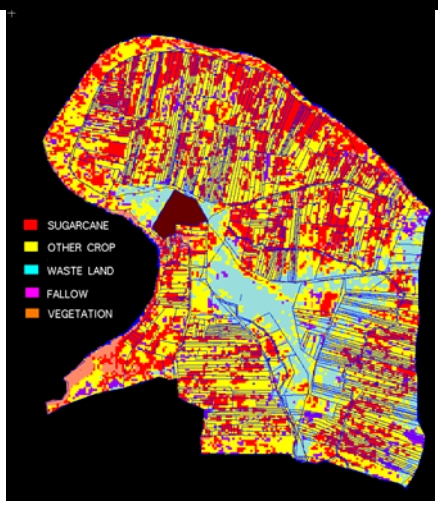
WATER FINANCING

Water levy collection in command areas



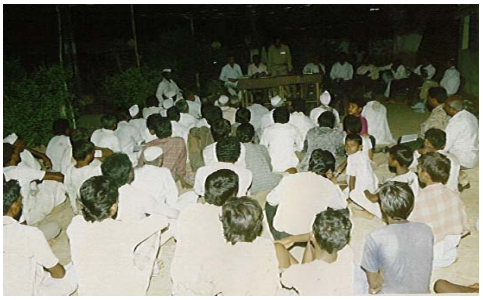


Water resources department, Govt. of Maharashtra, India is operationally mapping the crops using RS data in 22 command areas for water levy collection & water management.



VILLAGE MEETING TO DISCUSS PROBLEMS & SOLUTIONS

Local elected bodies
&
Water users associations



CAPACITY BUILDING

International Cooperation

INTERNATIONAL CHARTER – SPACE AND MAJOR DISASTERS

• Goals

- **To provide emergency authorities – Coordinated access to space means in case of disaster**
- **Mainly EO today but may cover telecom and telemedicine**

• Principle

- **No exchange of fund**
- **Each signatory commits resources**

• Agencies

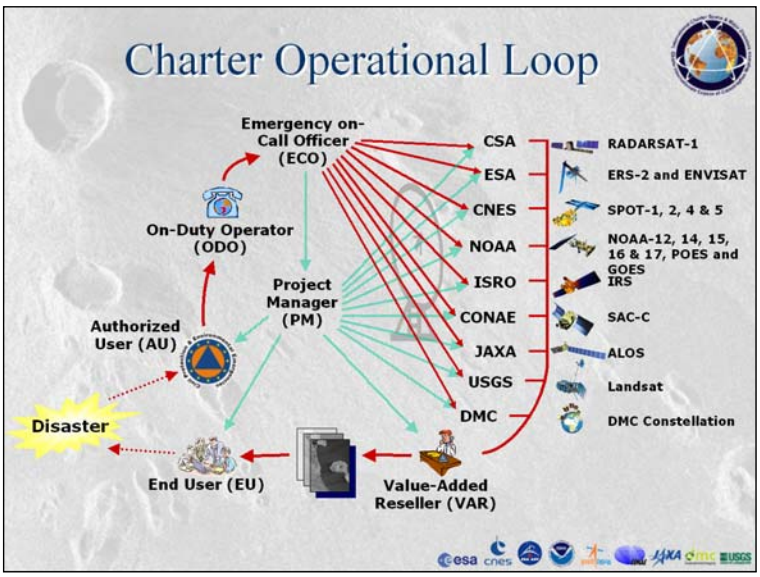
- **ISRO, CNES, CSA, ESA, NOAA,**
- **CONAE, JAXA, USGS, DMC**

• GROUND STATIONS TO BE USED

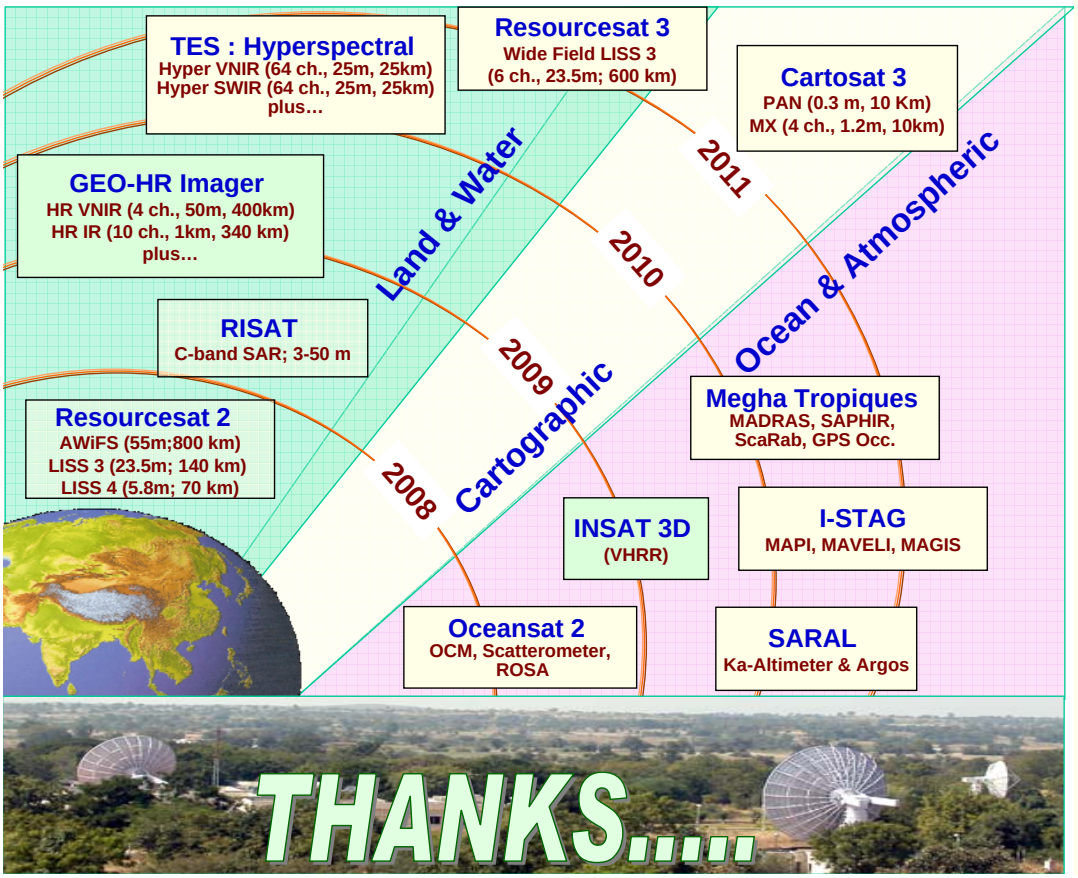
- **Hyderabad – South Asia**
- **South Korea – East Asia**
- **Thailand – South East Asia**

ISRO IS A PARTNER IN SENTINEL ASIA PROGRAMME

- Charter is a marvelous collaboration among space agencies and private entrepreneurs (PPP) to make space based resources available in time for disaster management
- The operational procedures are well Established and services are available for those in need.
- ISRO as an active partner in the charter providing these services for global community



Indian EO Missions - The Near Future



THANKS.....