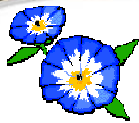


## Thematic Session A1 : Earthquake







## Thematic Session A2 Landslide

Papers = 42 + 28 = 70



## Thematic Session A1 : Earthquake

-  Hazard Zoning & Prediction
-  Vulnerability and Risk assessment
-  Disaster Mitigation
-  Coping Mechanisms & Reconstruction

## Thematic Session A2 Landslide



The two subjects lose their individual identities when we discussed

## Earthquake-Induced Landslides

Known to hamper relief operation

Without its knowledge,

Earthquake Hazard Assessment is incomplete

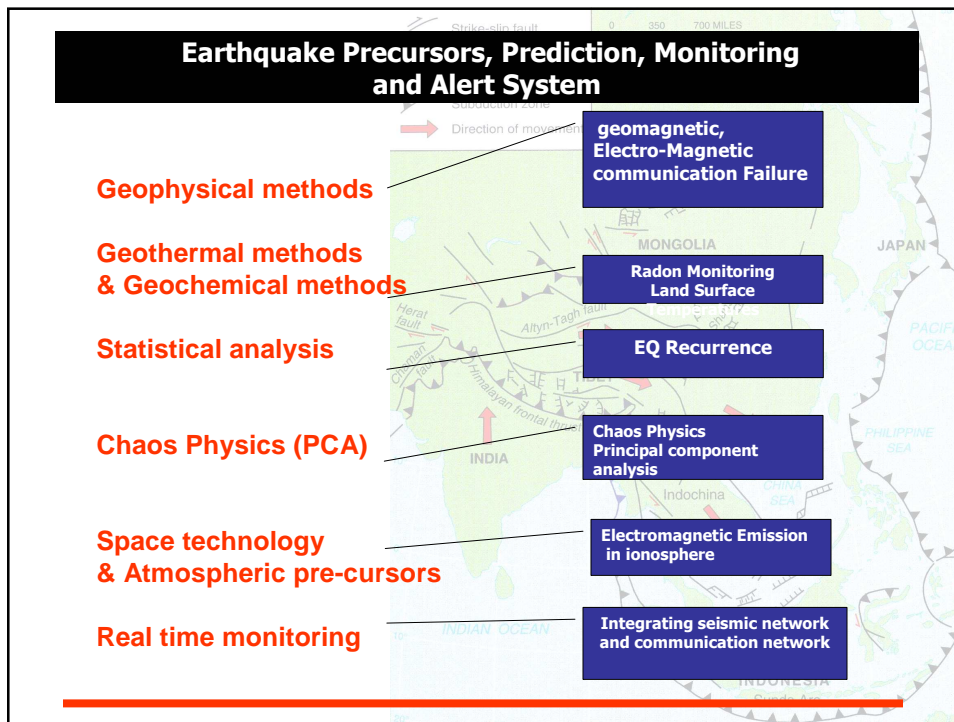
Landslide Hazard Assessment is not possible

Landslide and Earthquake Hazard Mitigation Strategy can backfire if EIL are ignored



Earthquakes cannot be predicted at the present level of Science. But several types of landslides can be predicted by recourse to scientific investigation, careful analysis, instrumentation and real time monitoring

Early warning against landslides is possible and deserves priority  
One Paper discussed feasibility of seismic alert system in India



## Others have reported success in Earthquake Prediction

- Space Technology

Zhonghao Shou et. al  
(1994-2001)  
50 predictions  
68% correct

- Radio waves

UYEDA Seiya et.al (2004)  
92 prediction  
-Error date<one day = 20%  
-Error date<10 days = 40%

- Statistical method

Kafka, et. al (2005)  
4km radius 13/15 = 87%  
7km radius 14/15 = 97%

We need to encourage research alongside mitigation activities



## Seismic Hazard Assessment

Problems of our cities even in Stable Shield Region-landfills-poor construction.-  
The case of Bangalore City

Problems of our schools- Unsafe School Buildings-  
The case of schools in old Delhi area.

Problems of non-engineered construction even by engineers and architects -Violation of Town Planning Guidelines, Codes & Byelaws-Review

Problems of unexpected failures due to site effects-  
Delhi, Bangalore, Chennai- Microzonation of Delhi and Jabalpur



## Earthquake Risk Mitigation

Housing Units ( 2001 Census)-245 Million  
73.8 million have earthen wall  
25.5 million have stone wall

40 % of them can suffer  
Total Collapse in Zone V  
Destruction in Zone IV  
Severe Cracking in Zone III

Earthquake Hazard Mitigation Strategies were discussed



## India Meteorological Department

Seismological observatories = 47

Real time seismic monitoring network  
as part of Tsunami early warning  
system= 17

Station telemetry system = 20

Regional seismological network = 40



## Proverbial Shadow between Success and Failure in Post Disaster Reconstruction

### *Good Example*

Latur earthquake (M 6.4, 1993)  
Bhuj earthquake (M 6.9, 2001)

### *Weak Community Participation*

Kashmir earthquake (M 7.4, 2005)



## Landslides and other Mass movements

Investigations, studies and case records

Seismicity, rainfall and human interaction-  
The Triggering Factors

Phata & Sonapur : Seismicity +heavy rainfall

Serchhip, Mizoram:, severe scouring, barren slope, high hydrostatic pressure

Konkan Coast: rainfall induced landslide ; Space technology and 3D modeling

Chandmari, Sikkim: management and monitoring



## Retreat of Himalayan Glaciers

The sad story of 15 000 Glaciers- some of them are Receding faster than those elsewhere in the World  
Gangotri Glacier- 850m in 25 years;2000m in 200yrs

Ascending Snowline – Descending Timberline  
Heightened Environmental Stress and imbalance

**Bigger issue of Climate Change & Global Warming**

## • Landslide Hazard Mapping, Vulnerability and Risk Analyses

Satellite  
images  
GPS  
GIS

Advocacy for Large scale  
mapping- Patal Ganga

Zoning factors  
Urbanization  
geology and geomorphology

## Landslide Hazard Mapping Programmes

- Geological Survey of India Programme
  - National Highway 1A J&K
  - National Highway MANIPUR
  - Elsewhere
- Convert it into a Mega National Initiative with time bound action plan
- Insist on reliability check and user friendliness of all maps
- Link the maps with disaster management
- Sustain mapping activity as work in progress
- Liberalize Map Policy and Implementation

# Landslide Dams

**Gohana Landslide Dam- July 1970**  
**Reni Landslide Dam..... July 1970**  
**Belakuchi Landslide Dam July 1970**  
**Kanunauldia gad Dam Aug1978**  
**Parachu Landslide Dam Jan 1975**  
**Bhagirathi Blockade..... July 1992**  
**Jahakri Landslide Dam... Feb 1993**

**Alaknanda Tragedy of July 1970 was the mother of tragedies . Our landslide Hazard Zonation Programmes should take note of such possibilities**

## SOME OTHER RECOMMENDATIONS

Setting good examples of Landslide Investigation, Analyses and Remediation- attending to Landslide Hotspots

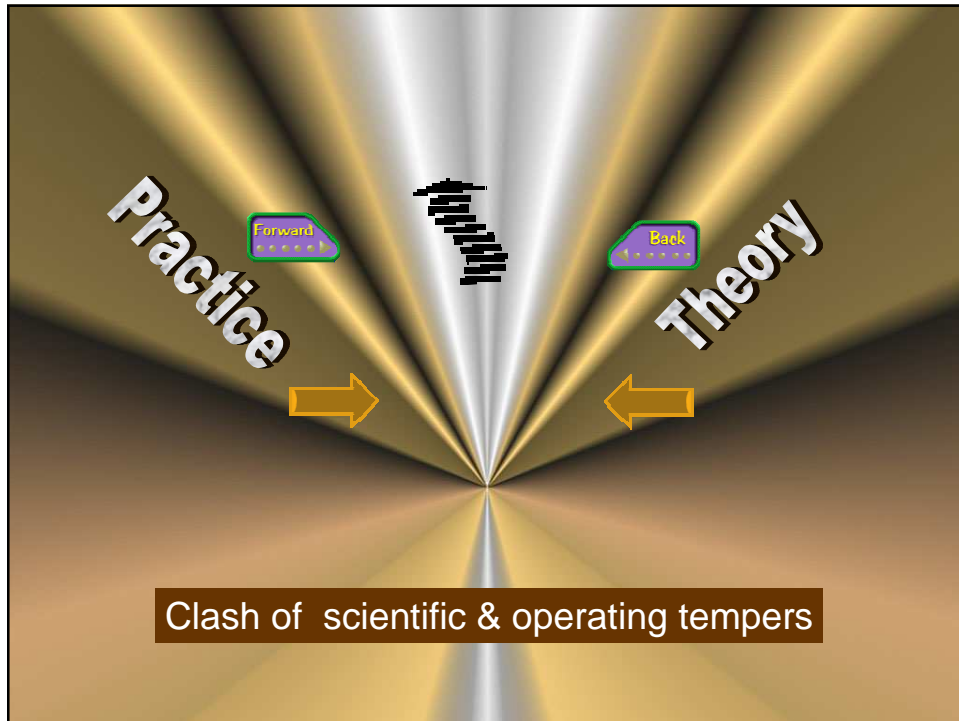
Protection of Heritage Buildings & Lifeline Structures

Need and Urgency for adoption of new appropriate tech.

Comprehensive Guidelines for Siting of Human Settlements

Techno-Legal and Techno-Financing Regime for Disaster Risk Mitigation

Review of Research Priorities and Coarse and Fine-tuning of the Programmes funded by the DST and the Ministry of Earth sciences – their perfect alignment with NDMA priorities



In Managing Earthquakes and Landslides as business as usual

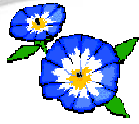
There is a crime here  
which goes beyond denunciation  
There is a sorrow here  
that weeping cannot symbolize  
There is a failure here  
that topples all our success

John Steinbeck

The great end of life is not knowledge but

**Action**

T.H.Huxley



**When Political Will is at its crescendo**

**Can action be far behind?**

**Thank You**