Space-based Information for Disaster Risk Reduction

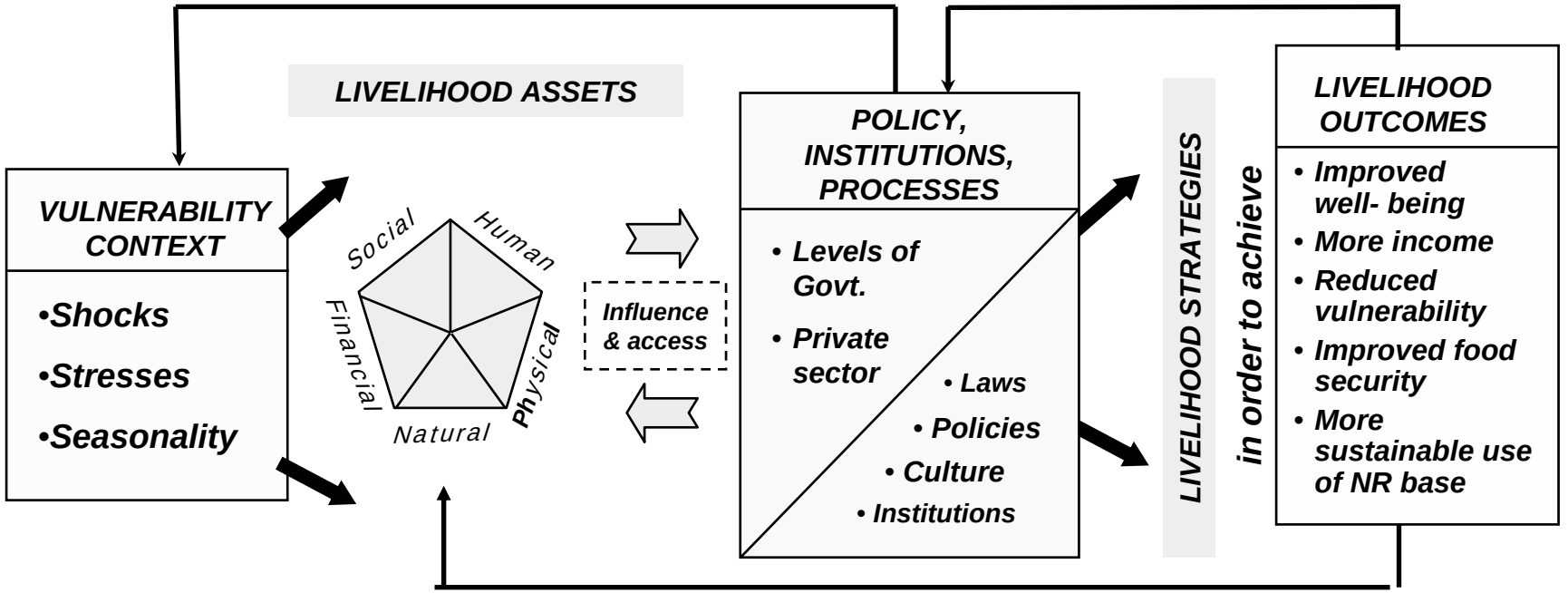
Expert Group Meeting on Building e-Resilience through ICT and Space Technology

Dr. V Jayaraman
Satish Dhawan Professor & Senior Advisor (Space Applications)

UN-ESCAP
Bangkok

Nov 20-21, 2012

Resilience building with Sustainable Livelihoods



Poverty

Vulnerability to Shocks

Vulnerability to Climate Change

Sustainable Livelihoods

Resilience to shocks & Stress

Adaptable to Climate Change

ICT could be yet another Livelihood Asset for the Poor. ICT have a role in Livelihood Outcomes too!

Disasters: Deaths, Miseries and Damages


Tsunami 2004


Cyclone, Bangladesh 2007

Japan Tsunami 2011


Bihar Floods , India 2008


Earthquake Sichuan 2008

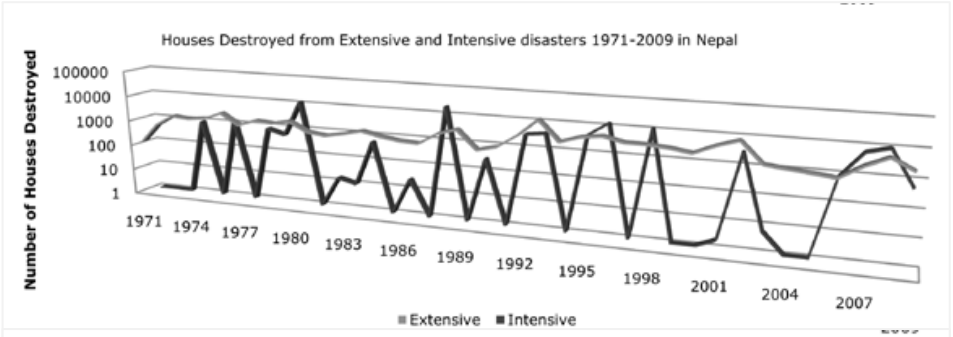

Earthquake Muzaffarabad 2005

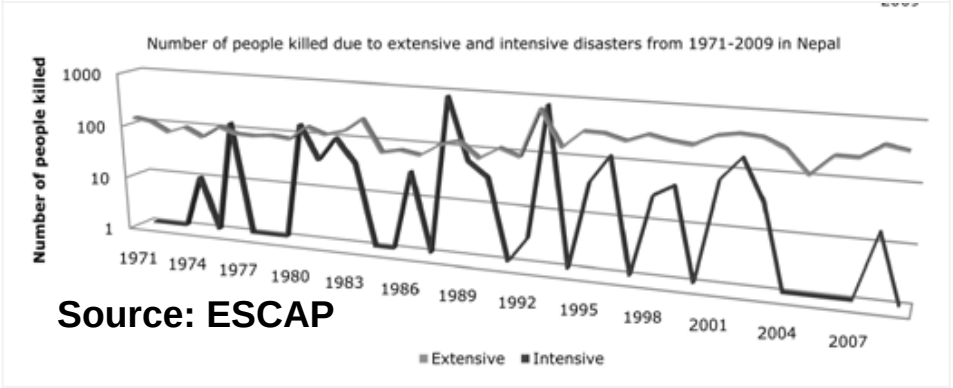

Kobe 1995


Pak Floods 2010


Pak Floods 2010


Thai Floods 2011





Source: ESCAP

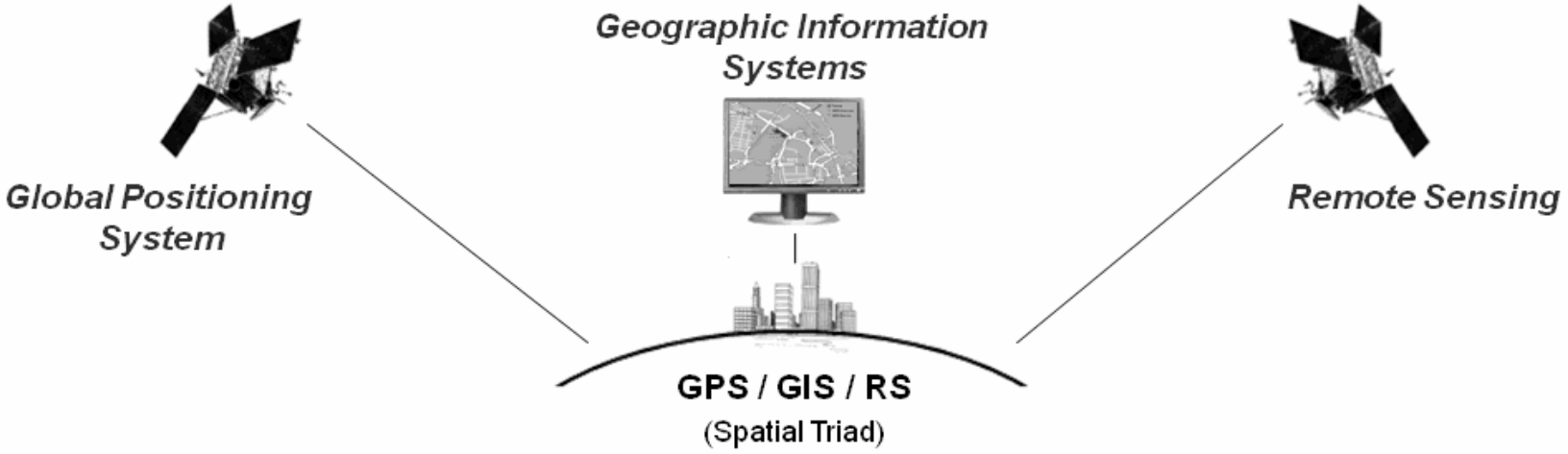
For low capacity countries, the cumulative effect of small scale disasters increases vulnerability

What ICT & Space Technology could do?

Geospatial : a mega technology

(Nanotechnology) **Geotechnology** *(Biotechnology)*

Geotechnology *is one of the three "mega technologies" for the 21st century and promises to forever change how we conceptualize, utilize and visualize spatial information in scientific research, commercial applications and general usage*

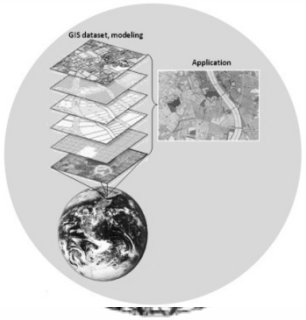


Where *is* **What**

Mapping involves ***precise placement*** *(delineation) of physical features*

(Graphical)

Descriptive
Mapping



Prescriptive
Modeling

Why *and* **So What**

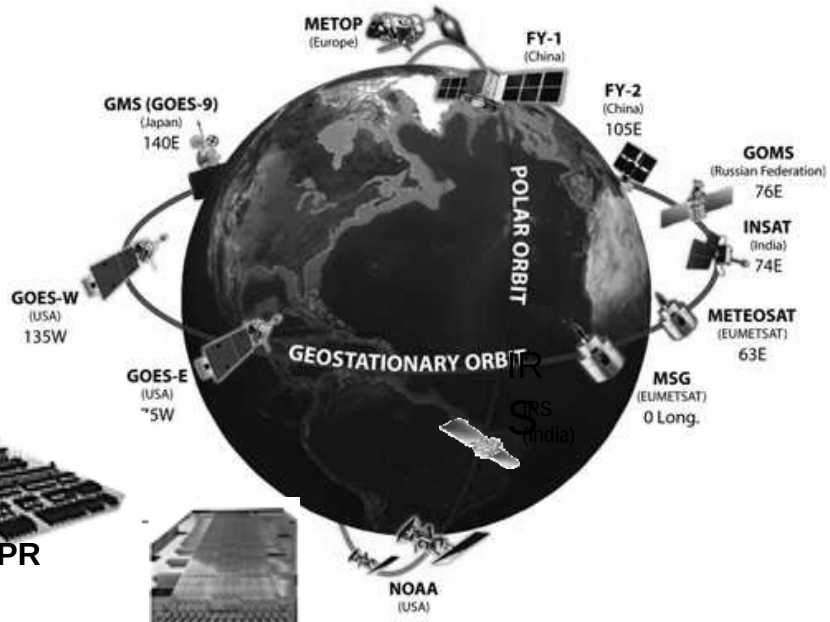
Analysis involves investigation of ***spatial relationships***

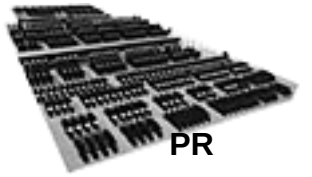
(Numerical)

Source: Joseph K Ber

Space observations
Spans across EM Spectrum

- Atmospheric chemistry instruments
- Atmospheric temperature & humidity sounders
- Cloud Profilers & Rain Radars
- Earth Radiation Budget Radiometers
- High resolution optical imagers
- Imaging multi-spectral radiometers (vis/IR)
- Imaging multi-spectral radiometers (passive microwave)
- Imaging microwave radars
- LIDARs (Backscatter; DIAL; Doppler)
- Multiple direction/ polarisation instruments
- Ocean colour instruments
- Radar altimeters
- Scatterometers
- Gravity, magnetic field & geodynamic instruments




PR

Dual Frequency PR


PALSAR


SGLI


OCTS


PRISM


ASTER


OCI

Transgressing from Qualitative to Quantitative

Emerging Capabilities

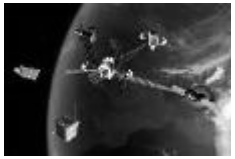
Technology reaching Individuals

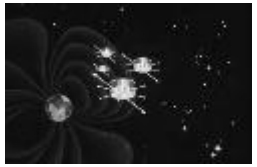
- **Next Generation FSS**
  - **Higher frequency – Ka band; On board processing; Greater pow… more flexible spot beams**
- **Next Generation MSS**
  - **Moving to "broader band"**
  - **Smaller lighter user terminals**
  - **Dynamic allocation of spot beams**
  - **Hybrid networks (Satellite plus cellula… e)**
- **Next Generation Earth Observa…**
  - **Ultra-high resolution (sub-m… -spectral and multi-parametric SAR**
  - **Thematic Constellatio… Satellites, Autonomous Missions**
  - **Precision Product… ized Services**
  - **Advanced atm… ounders, radiometers, profilers, Precipitatio…**
  - **Forma… and sensor-web**
- **Nex… tion Satellite Navigation**
  - **… based services**
  - **…mented Aviation services**

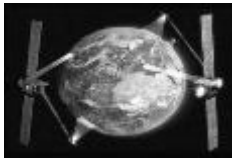
Last Mile to Last Foot Connectivity

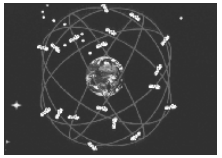
Augmented with

Web 2.0; Social Networking ; Smart phones ; Cloud Computing; and Crowd Sourcing…



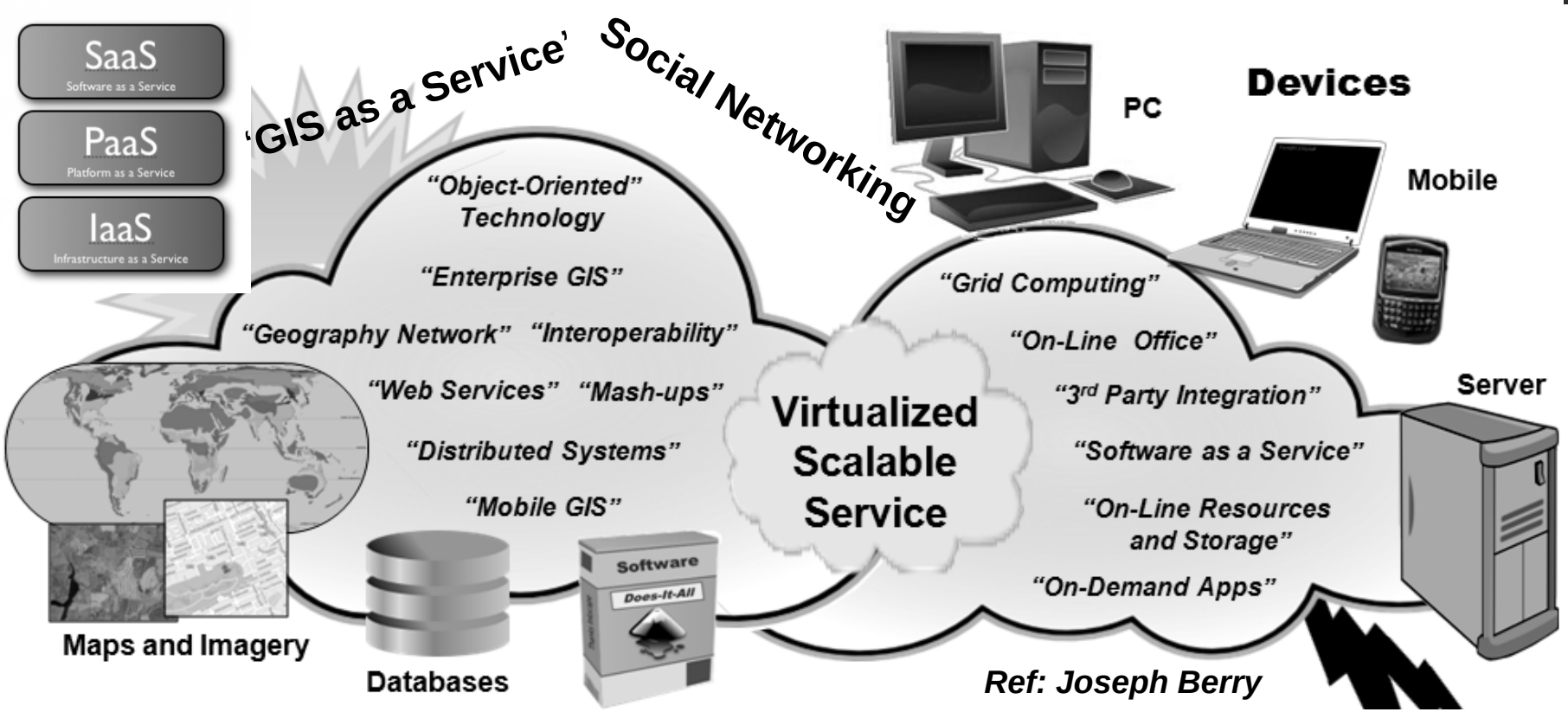


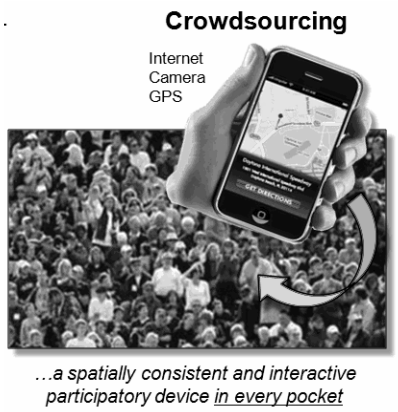




Cloud Computing & Crowd Sourcing

Neo-Geography and beyond!





Accuracy concerns pertaining to Crowd Sourcing and security concerns of Cloud Computing are largely disappearing !

'Big Data' and 'Liquid Data' and 'Data Mining ' and 'GIS as a Service' on the Cloud are current buzz words!

atial in Disaster Cycle

Vulnerability Map

Without RS/GIS; Static

With RS/GIS; Real Perspective Visualization

(Source: UNOSAT 2004)

g	Early detection of events/ related parameters; and dissemination
tion	Info. on terrain, hydrologic, climatic socio-economic and ecological aspects of community vulnerability
ssment	Pre and Post event change detection, identification of damages..
s	Creation of vulnerability info. for developmental planning, reconstruction
ion	Broadcasting, VSAT, WLL-VSAT, Sat-phone, DCP

Components of Space Applications