Information Needs and Flow for Disaster Management

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Hazards are not necessarily to become disasters

- **Disaster reduction measures need to be taken**
  - **Before disasters**
    - Risk assessment
    - Background information base
    - Disaster modeling
    - Mitigation and response planning
    - Preparedness at national to community levels
  - **Monitoring and early warning**
    - Collect and extract disaster signals
    - Disseminate alerts to the public
  - **Response to disasters**
    - Mitigation and damage estimation
    - Mobilizing and delivering resources
    - Rescue and relief
  - **Effectiveness depends on effective uses of information and knowledge**
Immediate response to the catastrophe
- Indian Ocean and SE Asia tsunami early warning system

Strategic objectives
- Multi-hazard disaster warning and management systems for knowledge based disaster management
  - Information and knowledge base
  - Information acquisition, analysis and early warning
  - Preparedness and response planning
  - Public mobilization and instruction
  - Mitigation, rescue and relief supporting tools
- At national, sub-regional to regional levels
- Communication networking relevant nodes and ensuring information flows among them

A digital divide indicated by the Indian Ocean Tsunami
Information and knowledge base

- **Background information base**
  - Geo-characters, maps, digital elevation models,…
  - Demographic, economic and social data
  - Remote sending images and related thematic maps
  - Material storage and other response resources

- **Knowledge base with decision supporting tools**
  - Vulnerability and historic disaster records
  - Disaster modeling and impact estimation
  - Mitigation and response planning, simulating and action supporting
    - Engineering measures
    - People evacuation
    - Mobilization of human and material resources
    - Rescue and relief action
Disaster management information system

- Disaster management information supporting system should be established at national level
  - As information and knowledge platform for integration and operation of relevant information and decision supporting tools
  - One of the most important technical bases for comprehensive, integrated Multi-hazard disaster warning and management
  - Subsystems distributed at and operated by relevant government and non-government organs as function nodes
  - Acceptance of external information and technical assistance

- Accessible to field action centers and action teams
  - In form of data, chart, images, flash, tele-conference,...
  - Through disaster communication systems
Information acquisition, analysis and early warning

- **Realtime**: observing stations to information processing centers
  - For earthquake, tsunami, storm-surge ...
  - Ground, seafloor and sea surface based
  - Rate rate: $10^{3-4}$ bps one way, minute/ hours to continuous

- **Semi-realtime**: observation sites to information processing center
  - Meteorological, hydrological & oceanographic parameters
  - Forest and grassland fire hotspots
  - Data rate: $10^{3-4}$ bps one way, minute/ hours

- **Realtime information from processing centre for early warning**
  - Analysed early warning signal
  - To disaster management authorities of national and relevant local governments
  - Data rate: $10^{3-4}$ bps two way, whenever needed
Semi-realtime space-/ air-borne remote sensing information products

- **Meteorological satellite data and thematic products**
  - Weather disasters, forest fire, ...
  - Data volume: $10^4$-$7$ Bytes, interval: 1 - 12 hours

- **Remote sensing satellite data and thematic products**
  - Disaster area and damage assessment
  - Data volume: $10^6$-$8$ Bytes, interval 6 hours to 2 days

- **Airborne survey: remote sensing image, photo, video, ...**
  - Detailed survey of disaster hit areas
    - **Realtime - special communication arrangement**
      - Data volume: $10^6$-$8$ bytes

- **Provided through disaster management information system**
  - Images or information extracted thematic products
  - Products provided by domestic and external sources
  - Accessible to field centres
Preparedness and response planning

- No specific communication requirement
- Emergency communication capability should be part of preparedness and response planning

Public mobilization and instruction

- Delivery of disaster warning
  - From government authorities
  - To the people in all possible affected areas
  - With clear instruction for their proper actions
- Possible communication means
  - Loudspeaker broadcast
  - Radio/TV broadcast
  - Group SMS and group e-mail
  - Remote communities: Community informing centres?
- Data rate may be quite low, caverge should be high
Emergency communication supporting field actions (1)

- Among national disaster management HQ, local centers, field centres and field teams
- Communication among national information centres and external information service providers
  - Remote sensing products and other globally observed information
- Among HQ and local/field centres
  - Two way multimedia communication
    - Overall disaster situation and field observation reports
    - Action instructions with supporting information and thematic maps
    - Information about related operations
  - Video/audio conference
  - Data rate: $10^{5-6}$ bps, continuous
Emergency communication supporting field actions (2)

- Between field centres and field action teams, and between local/field centres and material supply teams
  - Mitigation, rescue, relief, medical services, epidemic prevention, ...
  - Field report on situation and assistance needs, actions with relevant information and maps
  - Voice and low rate data $10^3$-$4$ bps, through cellular phone, VHF/UHF radio, satellite-mobile, ...
  - Multimedia information – WiMax at $10^5$-$6$ bps

- Between medical service teams (field centres) and remote hospitals
  - Transmission of medical files, images, ...
  - Tele-conference for consultation
  - Data rate $10^5$-$6$ bps, when needed
Bandwidth requirements of disaster communication systems (1)

- As part of disaster management infrastructure
- For information acquisition and early warning
  - Before disasters: daily normal operation
    - Monitoring data to information processing centres
      - Low bandwidth data transmission
    - For accessing satellite data products
      - Reception of broadcasted products
      - Access to on-line service: $10^{4-5}$
  - During disasters response
    - For early warning information acquisition, no extra bandwidth required
    - For access to satellite image: $10^{5-6}$ bps
    - For access remote sensing thematic products: $10^{4-5}$ bps
Bandwidth requirements of disaster communication systems (2)

- **For emergency response**
  - Before disasters: standby, testing and maintaining, training, ...
  - During emergency:
    - High bandwidth required in limited disaster hit areas
    - Support voice, video, data, conference, ...
    - Support cellular phone
  - For field centres, >10^5 bps
  - For field teams: voice communication is minimum
  - In some situation, terrestrial infrastructure may be destroyed, or not provide the bandwidth
    - Rapid deployable high bandwidth connections
      - Satellite, microwave, optical fibre, ...

A proposal for development and establishment of regional cooperative mechanisms on disaster communication support

For existed disaster communication system
- To work as a backup and complementary system

For countries or areas without existing systems, or bandwidth can not meet the requirement
- To form a workable operational system

Support broadband based VPNs for
- National disaster management information systems
  - To enhance such nodes where other connectivity could not provide sufficient bandwidth
  - Easier access to domestic and external information services
- National emergency response services
  - Linking local and field centres, and access to national HQs
  - Providing WiMax and/or mobile to field teams
Satellite broadband enabled sub-regional communication supporting systems (2)

- With one sub-regional standby emergency communication system be shared for serving many members countries
- Satellite advantages:
  - Broad coverage
  - Shared and re-locatable bandwidth
  - Movable terminals for rapid deployment and easy installation
- Satellite broadband services become available
  - Support connection at $10^6$ bps
  - Terminals and bandwidth have become quite affordable
  - Public-private partnership and big user community may make them further lowered
- Satellite resources could be provided through multi-stakeholder approach
- ... ...

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Thank you for your attention