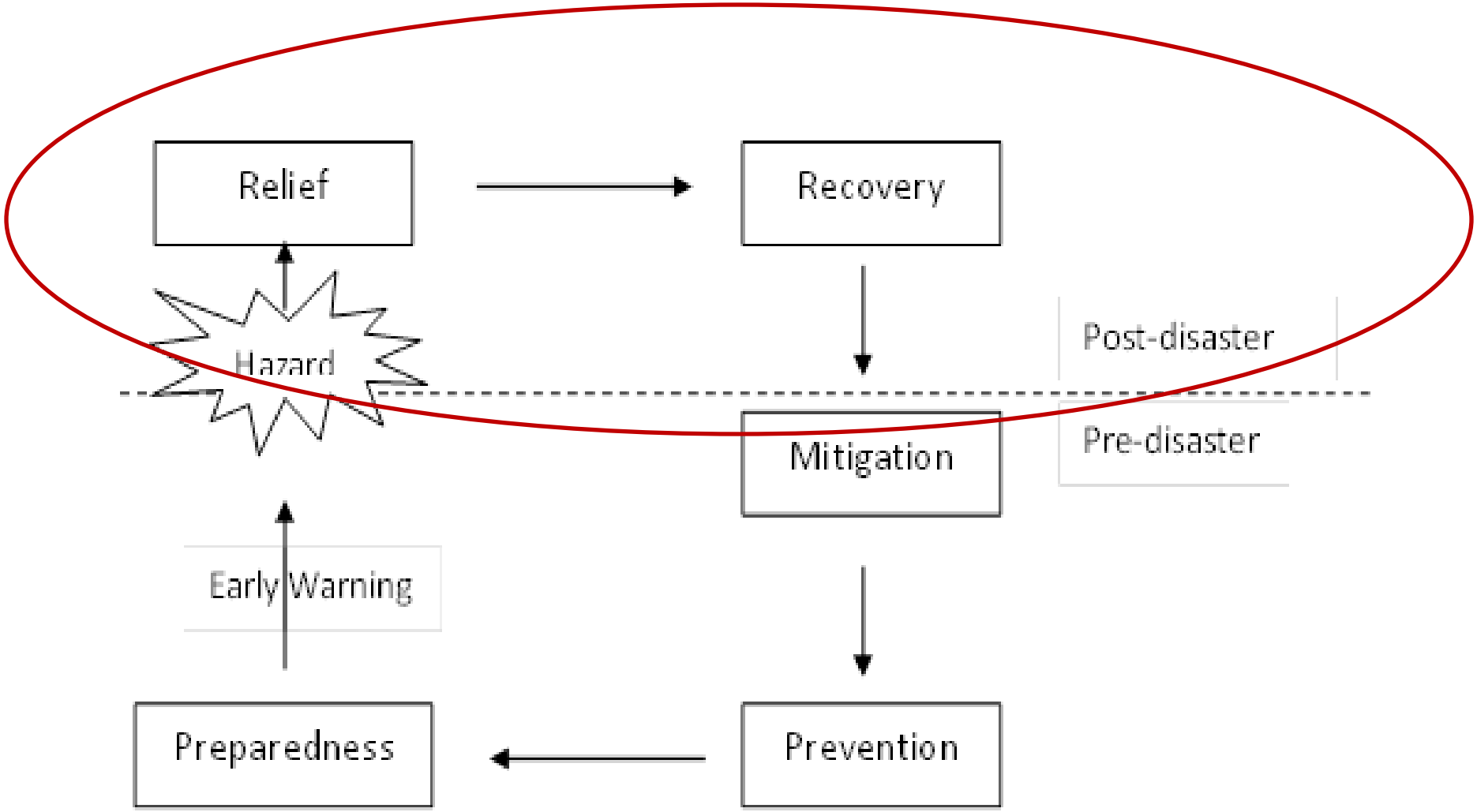
The resilience of ICT infrastructures and their role during disasters

Rohan Samarajiva & Shazna Zuhyle

Expert Consultation on Asian Information Superhighway and Regional Connectivity,
Manila, 24-25 September 2013

LIRNEasia
www.lirneasia.net

Scope of the paper: After the disaster



Role of information & communication after a disaster

- Natural disasters & humanitarian crises cause disorder and panic
- Communication services may not be considered a priority when basic needs such as food, clean water and shelter are lacking
  - But, access to accurate information is what calms societal turbulence
- For information to be communicated
  - Underlying network must function
  - Supporting soft infrastructure (e.g. institutions and policies) must exist

FUNCTIONS THAT CAN BE DONE BETTER WITH ICTS

Documentation of needs and resources

- Enhanced information processing and visualization capabilities can, by themselves, enable better documentation of needs, e.g.,
  - Registries of the missing and injured
  - Medicines and food for the affected
  - Housing and infrastructure damage assessments
- Integration with Geographical Information Systems (GIS) can enhance further
- If coupled with communication technologies (essential in recovery phase), can enable
  - Superior field data collection (faster and with fewer errors) and
  - Effective dissemination to those who can address the needs
- If databases are organized and populated prior to the incident, efficacy is greater

software is currently deployed and used by a growing number of
ers:

New York (Office of Emergency Management): Since 2007, the
New York's Office of Emergency Management has used Sahana
e for managing its all-hazards sheltering plan, which involves over 500
capable of housing over 800,000 persons and staffed by over 60,000
ncy employees and volunteers.

storms, including "nor'easters", tropical storms and hurricanes, can and
t New York City. In fact, New York's densely populated and highly
ed coastline makes the city among the most vulnerable to hurricane-
damage. Due to regional geography, hurricanes in New York City –
nfrequent – can do far more damage than hurricanes of similar strength
outhern United States. With sustained winds of 74 miles per hour or
along with torrential rains, storm surge is among a hurricane's most
us features. A major (category 3 or 4 storm) could push more than 30
torm surge into some part of New York City.

of the NYC Coastal Storm Plan, a customized version of Sahana
e is used to plan for and manage the evacuation facility structure
ary to house the thousands of potential evacuees in the NYC

2013

Apply for the Sahana Internship Program No
2012

SSF supports Hurricane Sandy response in
October 30, 2012

SAHANA EDEN ESSENTIAL GUIDE

Spatial coordination

- ICTs allow for synchronous or asynchronous communication across space, enabling greater coordination of spatially separated actors
- Especially important when
  - A disaster has a geographically wide scope (a tsunami or a cyclone versus a localized landslide) and
  - Physical transportation systems may have been degraded or even destroyed
- Even with localized disasters, ICTs enable coordination of assistance from unaffected areas

Publication

- ICTs can give voice to affected people, especially in terms of empowering them in relation to the relevant authorities, be they government or non-government bodies

Facilitation of payments

- This particular function has not been implemented in a disaster situation because payment through mobile is a relatively new phenomenon
  - However, it has potential in the context of the payment functions of mobiles becoming relatively ubiquitous in several countries

RESILIENCE

Databases: Options for increased resilience

- Locate the databases in cloud (or at least, back up in the cloud)
- Can function even without communication capabilities, though sub-optimally
  - Databases can be outside the disaster area; or within, if power is available
  - Use robust packages such as Sahana where physical movement of database using USBs is feasible

Communication networks

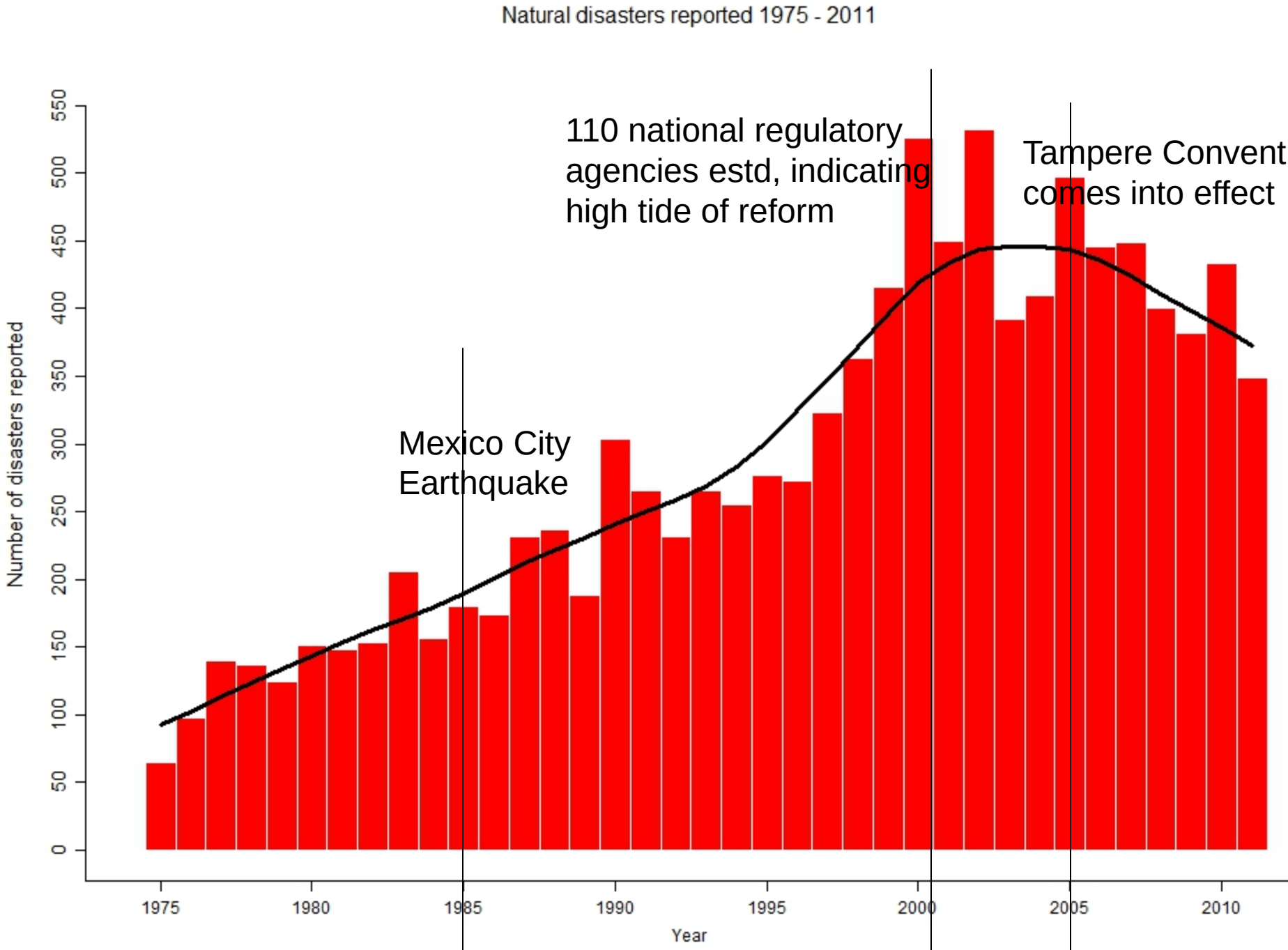
- Network itself is vulnerable
  - Cables can break
  - Towers can topple
  - Power sources (and the backups) can fail
  - People who operate the systems can die, be injured or be unable to get to their stations
- Degree of vulnerability depends on the technological platform

Mexico City, 19 September 1985: The disaster that begat an international treaty

The equipment from the building (from that previous image) toppled, cutting off long-distance calls and significantly impacting local services in Mexico City in the 1985 earthquake.

Puzzle of Tampere

- Tampere Convention on the Provision of Telecommunication Resources for Disaster Mitigation and Relief Operations was negotiated in 1998 and came into effect in 2005, just after the 2004 Indian Ocean tsunami
- While it may have had good effects on contingency planning, not one country has invoked its provisions
- Conceived when integrated monopolies and undersupply of service was the norm, was Tampere made irrelevant by liberalization?


Natural disasters reported 1975 - 2011
110 national regulatory agencies estd, indicating high tide of reform
Tampere Convent comes into effect
Mexico City Earthquake
Number of disasters reported
0
50
100
150
200
250
300
350
400
450
500
550
1975
1980
1985
1990
1995
2000
2005
2010
Year

Pros & cons of liberalization

- In the old days, one integrated network with the strengths and weaknesses of monopoly
  - Resources to harden network
  - Single point of contact for emergency responders
  - If one big network fails, no alternative
- With multiple access networks independently managed, less likely to have total failure, but
  - Solutions such as “emergency roaming” feasible
  - Perhaps less incentive to invest in hardening networks
  - Tower sharing, essential facilities may reduce redundancy

Domestic & international backhaul

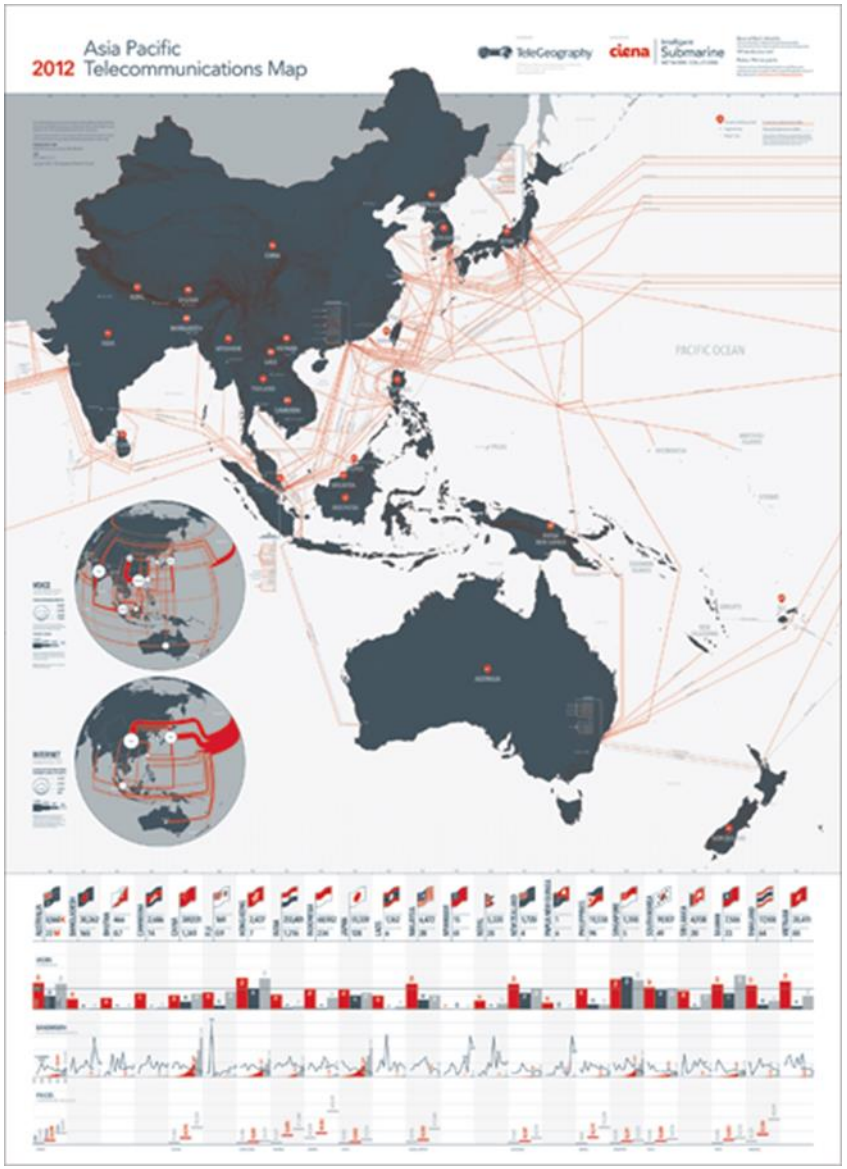
- More traffic; more “choke points”; greater effects from failure
- Greater attention must paid
  - Contingency planning
  - Need to move from ring architecture to mesh
- Identifying vulnerabilities is important
  - Hardening infrastructure is important
  - So is ensuring real redundancy (paths/technology)
- It’s not hardening OR redundancy; but hardening AND redundancy

Example: Post-2004 Tsunami changes in the Maldives

- Dhiraagu & Wataniya changed their network topologies from a series type to a ring
- Two VSATs installed for emergency communications in strategic locations (Vilimalé and South Gan)
- Interconnection of country's 2 submarine cables to reduce risk of losing international connectivity
- National roaming and priority calling will be activated with the official announcement of a disaster

Need to develop submarine-terrestrial mesh for Indian Ocean-Asia

- Now with Africa also building terrestrial cable, Asia may be the region with least terrestrial cables
- Terabit shows that existing bilateral terrestrial cables are used to bring traffic to Singapore and Hong Kong and then out on submarine cables
- Indian Ocean has three chokepoints: Suez/Red Sea; Malacca Strait and Taiwan Strait
- Fragmented efforts to work around by private actors; but as Terabit shows, there is a need for seamless terrestrial connectivity



To government entities

To operators

To UN ESCAP

RECOMMENDATIONS (SELECTED)

What UNESCAP can do

- Promote the concept of a Pan Asian terrestrial optical fiber network among member states since it is the first-best solution to improving international backhaul, including the lowering of costs and enhancing of reliability. Ideally the terrestrial network will utilize existing Asian Highway, Trans-Asian Railway and electrical grid rights of way.
- In the interim, promote the integration of existing and new bilateral terrestrial and undersea cable segments, into regional networks.
- Raise awareness of the possibilities of requesting help through the Tampere Convention among government decision makers, especially those from countries that are vulnerable to earthquakes and tsunamis and from small island nations.
- Assess the use of priority numbers within countries in Asia Pacific and the standardization of emergency numbers.

What UNESCAP can do

- Contribute to the standardization of channel allocations in cell broadcasting has been widely considered but not implemented. Given its importance and usefulness in post catastrophe situations actively engaging in setting standards for cell broadcasting regionally or internationally is important.
- Assess countries' vulnerability to natural hazards and thereafter assessing the feasibility of creating or extending the current catastrophe risk management initiatives (PCRAFI or similar) to include a sub region or more countries.
- Assist in implementing a disaster management software similar to that of the Sahana implementation in New York (please see Box 1) with long term recovery organizations.
- Disaster response responsibility is shifting to community-based organizations (a local empowerment/self-help model) rather than the more traditional government-led (top-down/charity) model of disaster relief. As such it is recommended to design and promote new initiatives that look to build relevant capacity with local organizations.