Satellite Systems in Disaster Situations

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Context and Objective

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Nowadays, natural as well as climate-change catastrophes has represented an important decrease factor in the development programs for every society across the globe, **causing structural damages and,** in the worst cases, **human losses**

A crucial aspect in such events is the attenuation of the destructive effects. As **preventive culture** growths in any civilization, it constitutes an **essential element in the risk reduction strategy**

The earth itself is becoming instrumented to help predict disasters, **communication systems are needed to convey the data** to scientists, government agencies, emergency responders, and ultimately, **the public**

ITU, United Nations organisms, Government entities, Public and Private Telecomm sectors must take the lead to promote pre and post disaster plans in each of our countries

It is a matter of global priority to have early warning systems to prevent or minimize loss of life
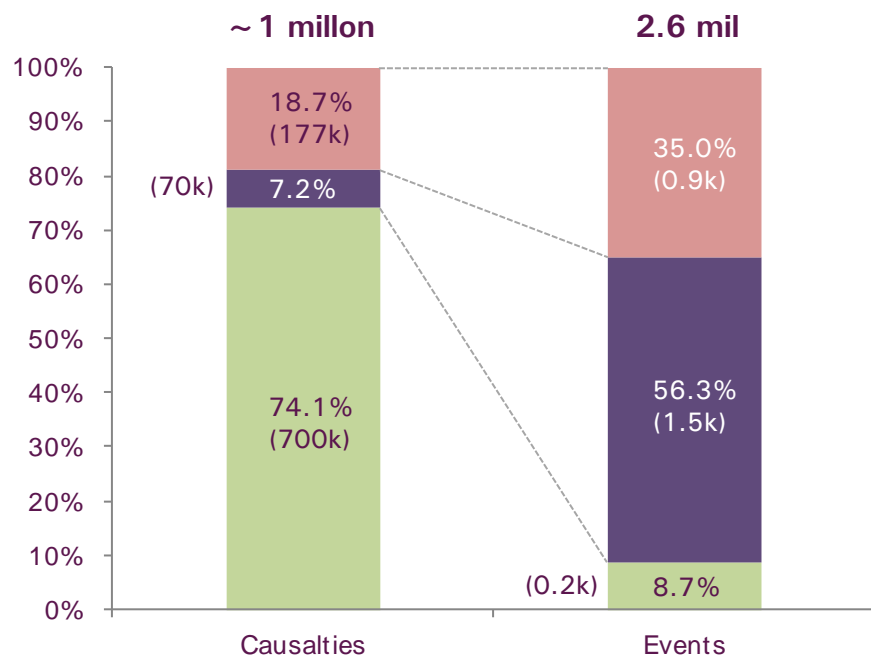
Weather-related phenomena, earthquakes, tsunamis, volcanic activity, etc. are examples of disasters
Brief Statistics – From 2000 to 2012

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From the last twelve years, almost three thousand events caused practically one million casualties… bottom line is that **several of theses disasters could have been reduced** by using **alerts or warnings…**

Earthquake

Floods

Storms

~ 1 millon

2.6 mil

Casualties	Events
18.7% (177k)	35.0% (0.9k)
(70k) 7.2%	
74.1% (700k)	56.3% (1.5k)
(0.2k)	8.7%

Storms
- Storms represents the event with less casualties per event
- 78% of the total casualties occurred in the tropical cyclone in Myanmar
- Excluding Myanmar event, only 31 average casualties occur during an storm event

Floods
- Average of 331 casualties in deadly flood events

Earthquakes
- 1/3 of the total earthquake casualties occurred during the 2010 Haiti event
- 23% of the earthquake events have more than 100 casualties
- Asia is the region with more earthquakes

Most of the disasters previously mentioned, impact directly the Asian countries
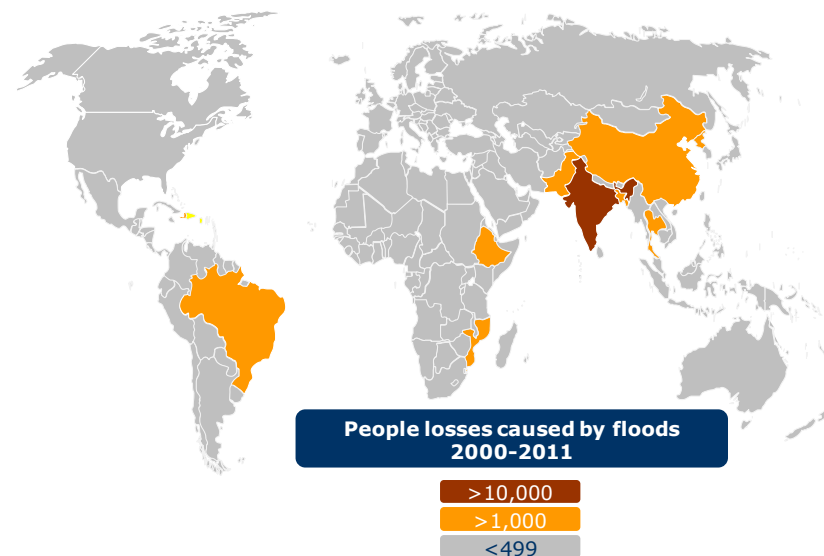## Brief status in numbers

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Earthquakes

Most of the people died in large earthquakes in Asia

People losses caused by earthquake 2000-2011

- >50,000
- >10,000
- >1,000
- <499
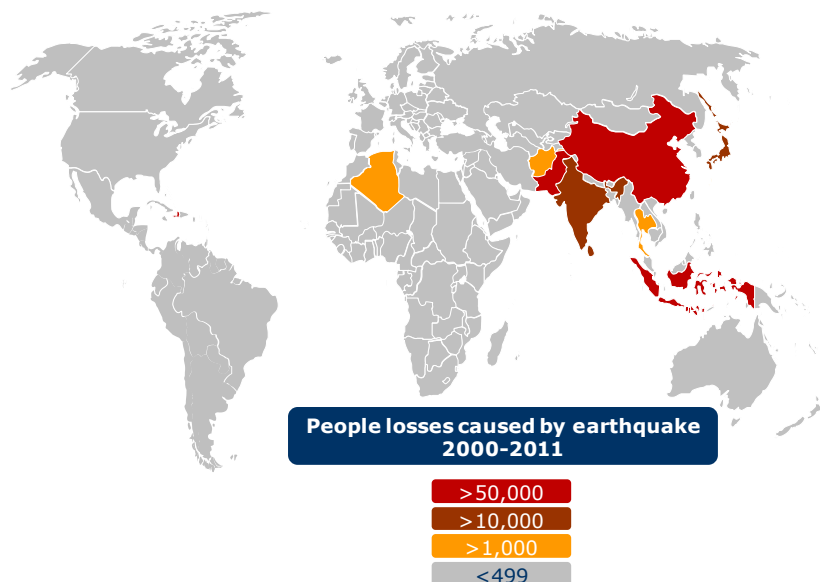
Previous alerts can decrease the number of casualties dramatically

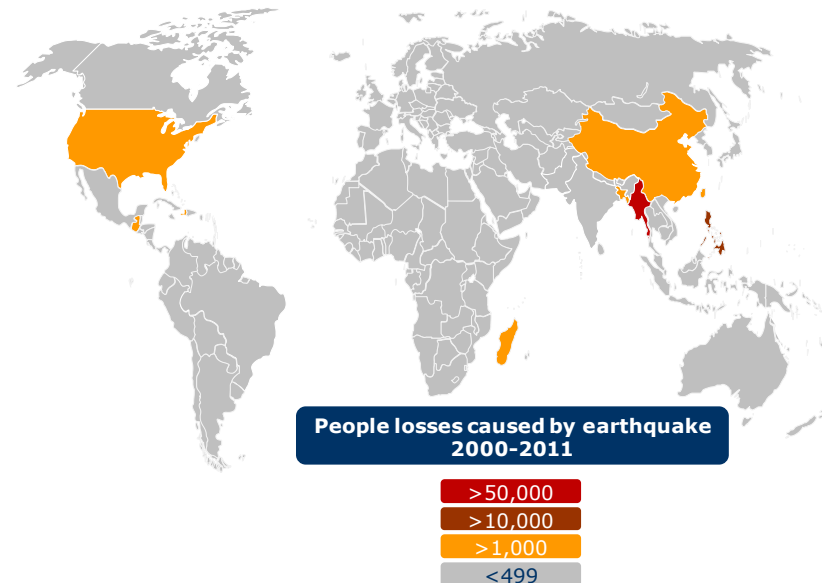## Floods

People losses caused by floods 2000-2011

- >10,000
- >1,000
- <499

38% of the casualties were in medium and minor floods in which lives could have been saved with timely information

Source: EM-DAT: The OFDA/CRED International Disaster Database – www.emdat.be, Universite Catholique de Louvain, Brussels (Belgium)

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Storms

Current mechanisms works fine for
Storm prevention…

**People losses caused by earthquake
2000-2011**

| >50,000 |
| >10,000 |
| >1,000 |
| <499 |

**However, with better technologies,
numbers could be dropped down**

Society must be familiarized in the reduction risk practices, mainly based in the technological advanced applications properly integrated in a cultural context
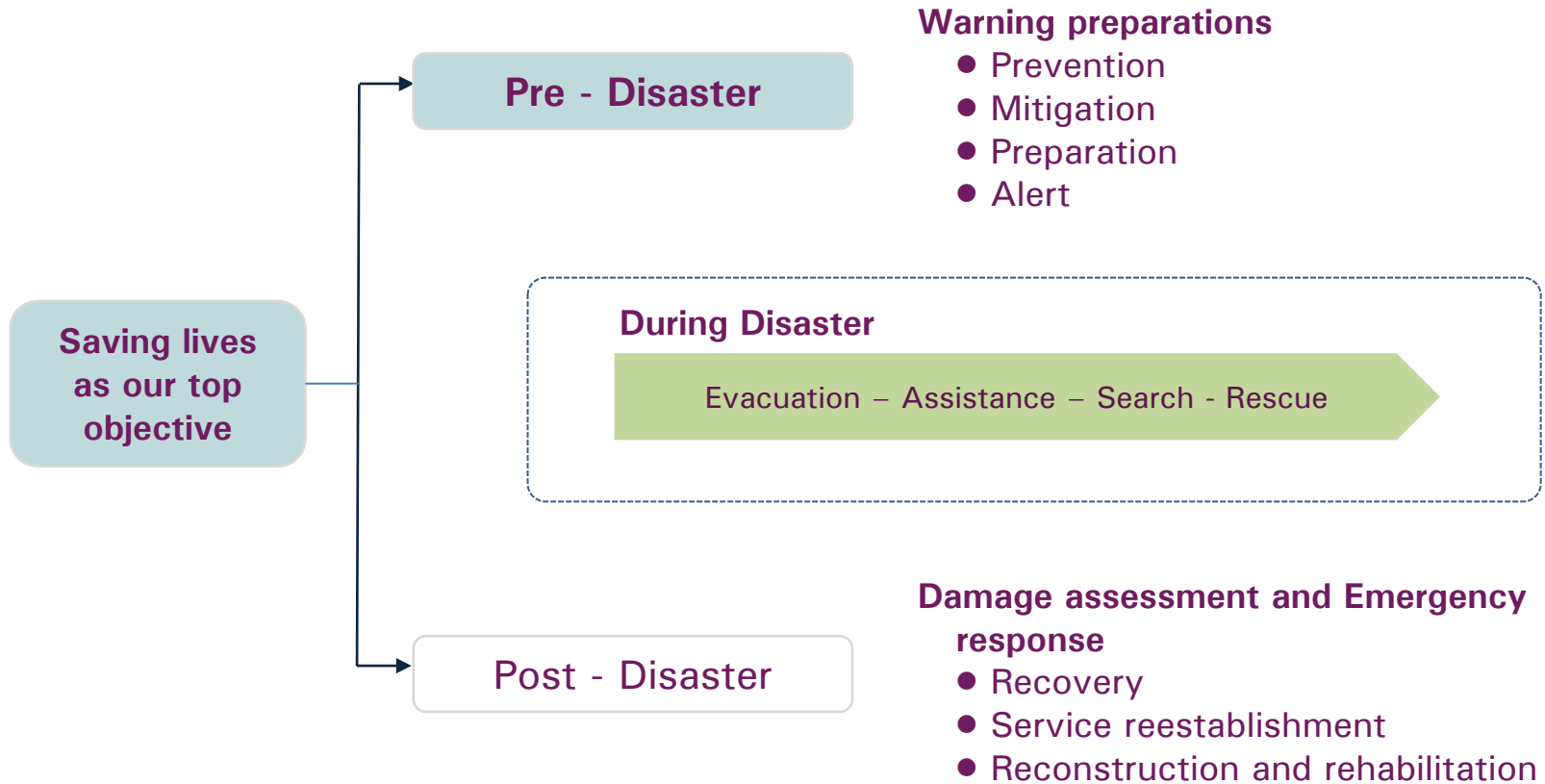
The "Millennium Declaration" in year 2000 recognizes the importance of creating all kind of procedures and politics for the prevention and attention of disasters

The access to Information Technologies and Communications (TIC's) is fundamental in order to broadcast the relevant data that allows to create preventive actions

Intensify the cooperation across the globe in order **to diminish the number of effects** in natural disasters as well as the ones caused by us such as climate change

Prevention as well as Re-action are essential in a disaster situation
Two time regime for disasters

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Saving lives as our top objective

Pre - Disaster

Warning preparations
- Prevention
- Mitigation
- Preparation
- Alert

During Disaster

Evacuation – Assistance – Search - Rescue

Post - Disaster

Damage assessment and Emergency response
- Recovery
- Service reestablishment
- Reconstruction and rehabilitation

During a disaster, it is crucial to keep active the communication lines
Emergency Communications and Monitoring Systems

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While a disaster occurs, tactical communication, health, formal messaging and inter institutional traffic must be assured

Ideally, if any additional communication channel exists, the population could:
- Support in the evacuation
- Operate in hostels
- Assist government entities
- Ask for medical assistance

One of the most reliable communications systems up to this moments, has been the satellite systems

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Ground and Space-based **science data** must be delivered from remote locations **inexpensively and reliably** to distributed analysis centers

Monitoring systems are / will be developed to detect all types of natural disasters
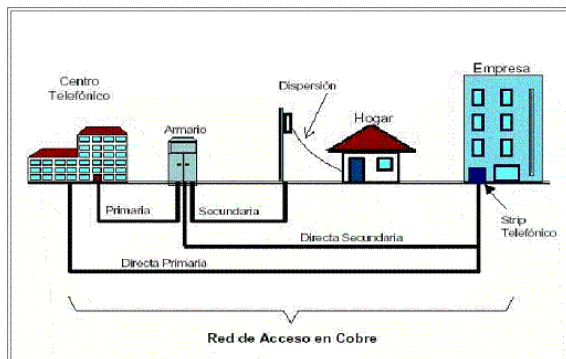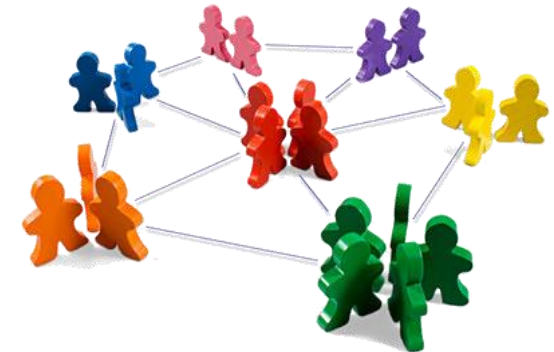
| **Terrestrial Infrastructure** | + | **Space Infrastructure** | + | **Social Networks** |

Government, Public and Private entities

Electromagnetic Monitoring

- Magnetic disturbances
- Air conductivity changes
- Infrared signals
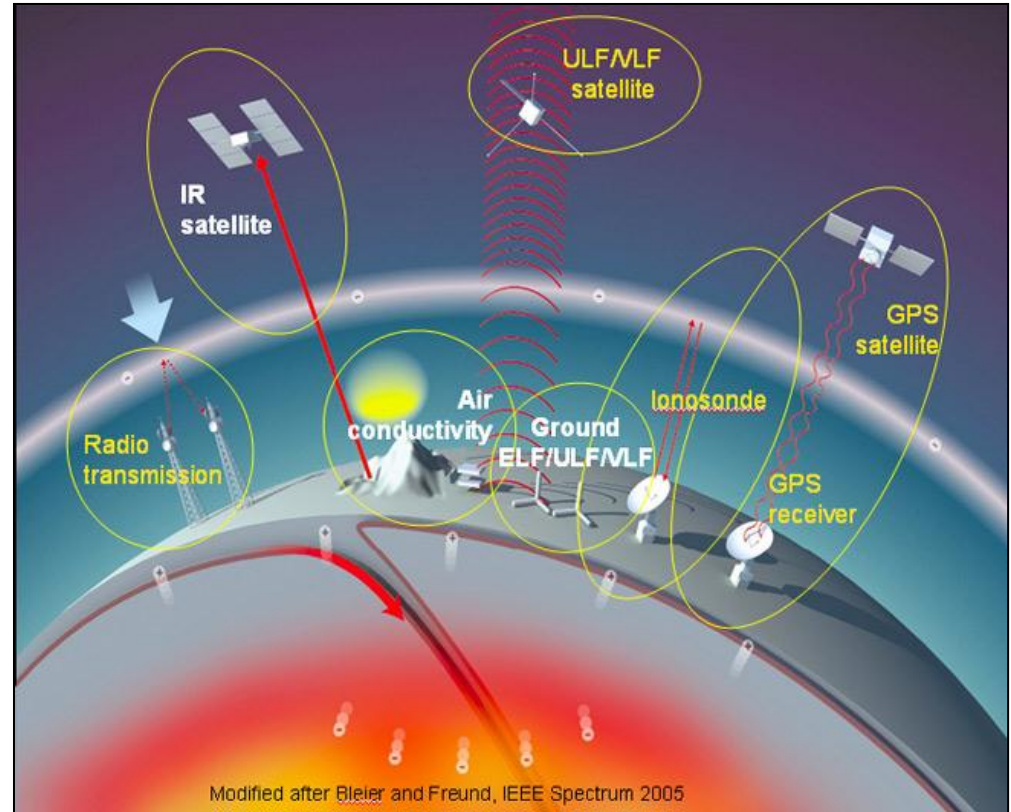- Ionospheres' disturbances
- Radio propagation changes

Seismic Monitoring

- Quake patterns (over the years)
- Seismic events (in months)

Data Fusion

- Multiple / simultaneous signals
- Pattern Recognition
- Data analysis

- Emergency broadcast

ULF/VLF satellite
IR satellite
GPS satellite
Radio transmission
Air conductivity
Ground ELF/ULF/VLF
Ionosonde
GPS receiver

Modified after Bleier and Freund, IEEE Spectrum 2005

Research Stage

Future Warning Systems

Effective Communications

Satellite systems exceed natural and physical barriers reaching wider geographic distances
Emergency Communications and Monitoring Systems

Satellites as an ideal solution when:

- Terrestrial infrastructure is insufficient

- Large geographic distances

- Continuous climate affectations

- Spot / multi spot communications

- Implementation velocity / flexibility

- Last mile connectivity

- Occasional / permanent service

- Redundancy

Current / Future Supply:

- Global coverage, immediate access to large distances

- Independent to terrestrial technologies

- Large bandwidth available

- Faster data rates

- Larger variety of data, voice and video applications

- Mobil equipment utilization

Satellite technology is fundamental in the reestablishment of communications post-disaster

- Natural disasters do occur, without a timely warning

- Climate change, as a product of our own excessive industrial activity have created un-balances in the global ecosystems

- As long as we do not revert the effects of the climate change, we must be prepare to engage the inevitable throughout conjunct actions and a proper prevention culture

- The size of the challenges and the reaction speed will push us to unite efforts throughout the entire world in order to establish action plans that could attend, in a formal / integral way, the emergency situation in any country

- Plans must consider prevention stages, intervention and reestablishment by using the most state-of-the-art technologies both terrestrial and in space, without leaving aside the financing required

- Without a doubt this forum with the ITU, through the BDT Office as well as the "Superintendencia de Telecomunicaciones de Guatemala" represents one of the best places to elaborate an integral Action Plan that could allow us to unite efforts to be better prepared in any disaster

Thank you

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