

# Continuously Operating Reference Stations (CORS) Network for Disaster Management and Emergency Response

Muhammad Muneeb Shaikh

Assistant Manager

Syed Zahid Jamal

Manager

Pakistan Space & Upper Atmosphere Research Commission (SUPARCO)

Presented at:

United Nations /Croatia Workshop on the  
Applications of Global Navigation Satellite Systems

Baska, Krk Island, Croatia

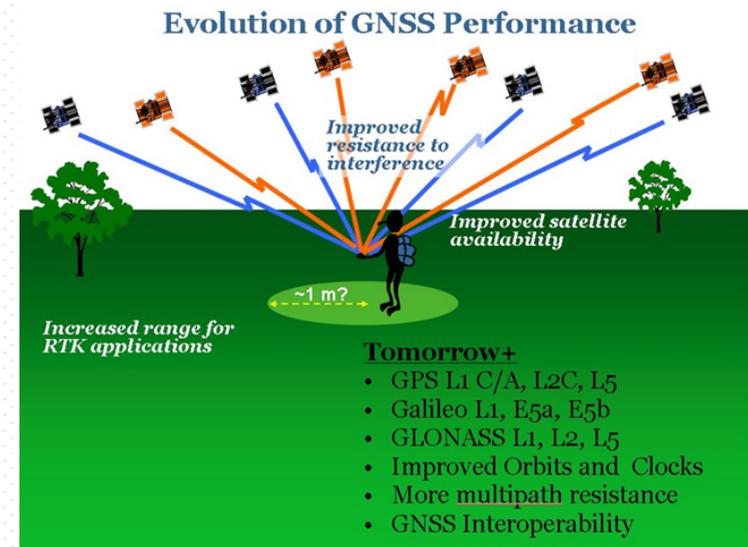
21 - 25 April 2013

# Outline

- CORS network for Pakistan
- Pakistan Hazards Vulnerability
- Early Warning System
- Tsunami Warning System
- Hazard Management
- Current Trends in Disaster Management
- Summary

# Global Navigation Satellite System (GNSS)

- GNSS is the standard generic term used for **satellite navigation systems**.
  - It provide autonomous geo-spatial positioning with global coverage.
  - GNSS based receivers can provide the location (latitude, longitude and attitude) within few meters.
- With the advancements in GNSS technology, surveying grade accuracy can be achieved by establishing CORS network as a national positioning service.
  - It will provide high accuracy, precision and integrity.
  - It can fulfill the requirements of geodesy and geosciences
  - It can serve the needs of surveying, mapping and navigation users.



# CORS Network for Pakistan

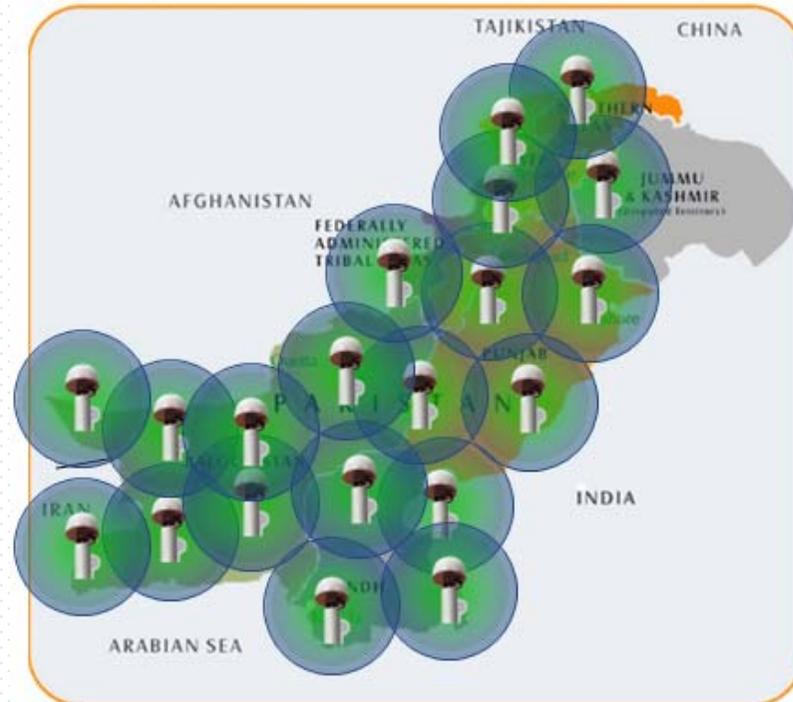
- At present no standardized framework is available
- Government and Private sectors are mainly using RTK technique for Surveying, GIS, and Construction.
- Uncoordinated and Ad-hoc approach, therefore not meeting the long term demand of government and private sector

**CORS Network for Pakistan addresses the establishment of CORS all over the Pakistan streaming GNSS correction to authorized users and consequently achieving centimeter to millimeter accuracy nationwide on a common datum.**



# Scope of CORS in Pakistan

- Network RTK approach
- Reliable, Accurate, Robust and Economical (RARE) Positioning Service
- 80 to 100 base station across the country
- Backbone for providing common datum



# Disaster Management & Emergency Response

Why Pakistan?

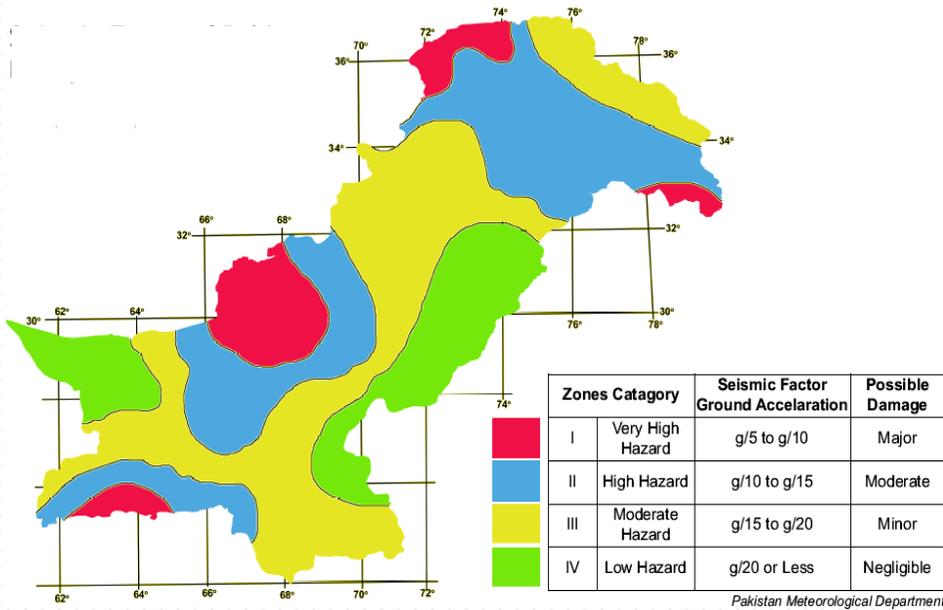
# Pakistan Hazard's Vulnerabilities



- Flood
- Earthquake
- Tsunami
- Land Slides
- Diseases Breakout

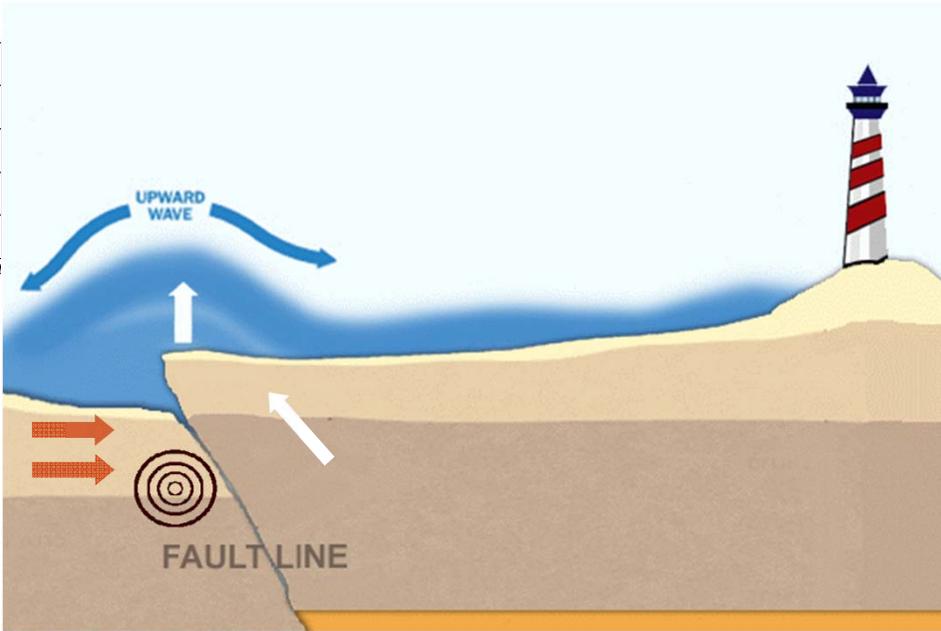


# Pakistan Hazard's Vulnerabilities



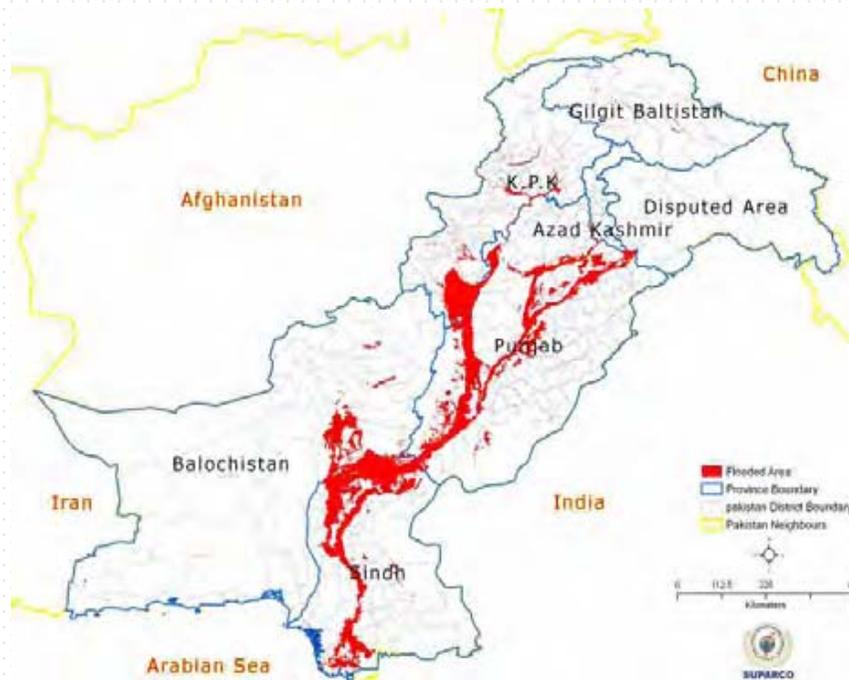
Seismic Zone of Pakistan

Tsunami Vulnerability

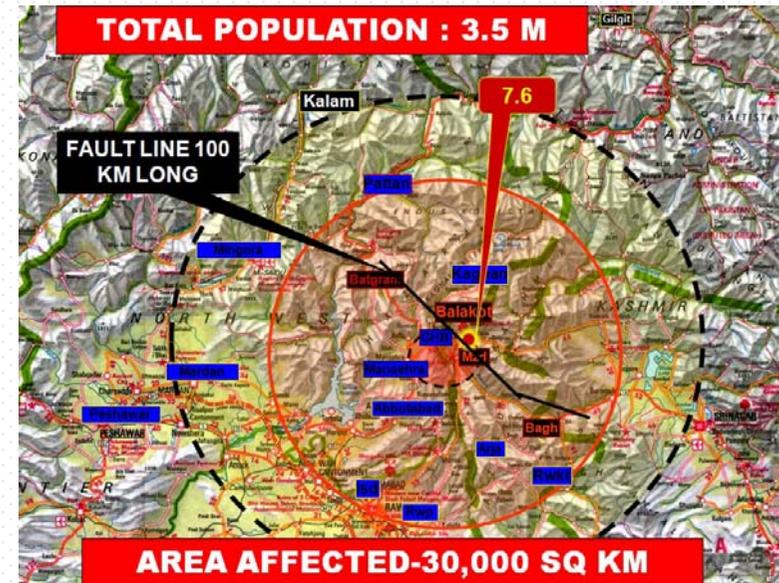


# Recent Disasters

- On 8th Oct 2005, a powerful earthquake struck the northern parts of Pakistan
- Destruction to infrastructure and housing.
- Severely affecting more than one millions of lives.
- 200 million tons debris to be managed



Source : [http://www.un-spider.org/sites/default/files/RSO\\_SUPARCO\\_Floods.pdf](http://www.un-spider.org/sites/default/files/RSO_SUPARCO_Floods.pdf)



Source: National Disaster Management Authority (NDMA)

- The floods during last three monsoon seasons from 2010 to 2012 caused extensive damages in Pakistan.
- At least 2000 people killed and over a million homes destroyed
- Floods ruined crops worth 281.6 billion rupees (\$3.27 billion)

# Disasters Devastations & Lessons Learned



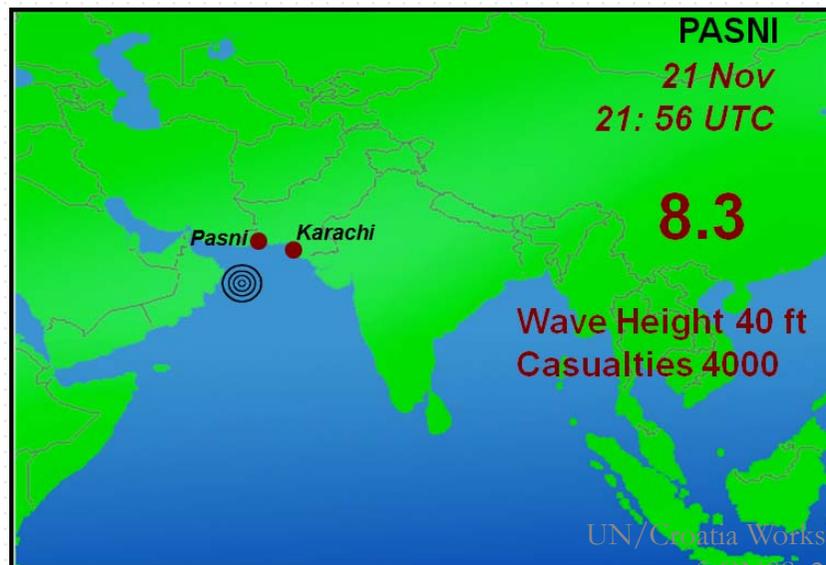
# Early Warning Systems

- GNSS based CORS network can be used to provide early warning in case of emergency.
- Studying the plate tectonic movement will help in providing notifications and warnings for earthquake, volcanic eruptions and landslides.
- Establishing seismic network support will assist in tsunami early warning systems.
- By monitoring the storm surge and streamgages can help in flood and severe weather warnings.
- Geomagnetic observations will help in storm forecast.
- Precise geospatial information obtained using CORS network will aid in carrying out response operations for wildfire and accidents.



# Tsunami Warning System

- In 1945, an earthquake of 8.3 Richter scale near Pasni (Baluchistan) has caused tsunami with wave height of 40ft.
- Improved understanding of the potential tsunami hazard from the Makran Fault in Iran and Pakistan.
- Need of community preparedness using scientifically developed hazard maps.
- Need of Tsunami monitoring system, for detecting and generating early warning.



# Hazard Management

In the aftermath of significant disaster event, GNSS serves as an essential enabling technology for:

- Re-Mapping
- Establishing a grid and geo-referenced incident data
- Precise Monitoring
- Immediate Response for Search & Rescue
- Organizing Debris Removal
- Planning for long term recovery



# Current Trends – Social Media For Disaster Management

## Top Social Media Tools



Reaching **500M**



Over **200M blogs**



Over **800M users**

Source: <http://www.slideshare.net/NatalieSisson/how-to-use-social-media-in-emergency-response-management-in-response-to-emergency>

# Current Trends – Social Media for Disaster Management

- Social media is a current phenomena that has revolutionized the people life.
- With the incorporation of navigation features in social networking applications, it can be effectually used for:
  - Social navigation, geo-social consuming.
  - Search and rescue efforts can get great benefit.
- The increase in use of social networking applications in Pakistan, can be effectively utilized for disaster management.



# Current Trends – Cellular & Smartphone Application

- Pakistan has been one of the fastest growing mobile markets among the emerging telecom markets
  - Currently there are more than 121 million cellphone users in Pakistan.
  - The usage of Smartphones in Pakistan is increasing significantly
- Utilization of SMS text messaging service in case of emergency.
  - It reaches effectiveness where ever they are without internet
  - Can easily accommodate multiple languages.
- Integration of GNSS in recent smart phones
  - Mobile apps
  - Emergency response apps



# Summary

- GNSS based technology can serve the needs to effectively manage disasters and provide early warnings.
- Establishment of advance GNSS technology such as CORS network increases the accuracy of GNSS based systems.
- Social Media can play important role in aftermath of disaster, especially in search and rescue operations.
- GNSS and mobile networks should be efficiently used for emergency response.
- Countries like Pakistan which are highly prone to disasters, needs to take necessary steps to effectively manage any such condition in future.