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

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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 provides autonomous geo-spatial positioning with global coverage.
  - GNSS-based receivers can provide the location (latitude, longitude, and attitude) within a 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

<table>
<thead>
<tr>
<th>Zones Category</th>
<th>Seismic Factor Ground Acceleration</th>
<th>Possible Damage</th>
</tr>
</thead>
<tbody>
<tr>
<td>I Very High Hazard</td>
<td>g15 to g10</td>
<td>Major</td>
</tr>
<tr>
<td>II High Hazard</td>
<td>g10 to g15</td>
<td>Moderate</td>
</tr>
<tr>
<td>II Moderate Hazard</td>
<td>g15 to g20</td>
<td>Minor</td>
</tr>
<tr>
<td>IV Low Hazard</td>
<td>g20 or Less</td>
<td>Negligible</td>
</tr>
</tbody>
</table>

Source: National Disaster Management Authority (NDMA)

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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 million lives.
- 200 million tons of debris to be managed.

- 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)

Source: National Disaster Management Authority (NDMA)

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Disasters Devastations & Lessons Learned

GNSS based technology will serve the needs in case of disaster and provision of early warning systems.
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.

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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

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 effectives 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.