Introduction of Taiwan Earthquake Impact Research and Information Application (TERIA) Platform

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Outline

1. Background
2. Objectives of TERIA
3. Application Examples
4. Conclusions
On the Pacific Ring of Fire
Since 1900, total 96 fatal quakes occurred
Every 10 year could have one destructive quake
High Earthquake Threats

- M>6
- M>6.7
- M>7

50年: 98 44 10
30年: 92 29 6
10年: 56 12

50年: 99 91 62
30年: 99 76 44
10年: 93 38 18

每25公顷平均人口数
- 7,400 to 20,100
- 4,000 to 7,400
- 2,200 to 4,000
- 1,200 to 2,200
- 600 to 1,200
- 300 to 600
- 100 to 300
- 0 to 100
1999.9.21 Chi-Chi Earthquake

http://www.921emt.edu.tw/
Earthquake Disaster Management

- Hazard Identification
- Inventory Collection
- Direct Impact Assessment
- Evaluation and Revising
- Restoration and Mitigation
- Indirect Impact Assessment
Earthquake Impact Assessment Items

A. Ground Motion and Hazard Simulation
   - A1.1 Ground Motion Characters Simulation
   - A2 Liquid-faction
   - A3 Landfall
   - A4 Ground deformation

B. Direct Impact Assessment
   - B1 Buildings
   - B2 Transportation
   - B3 Lifelines
   - B4 Special Structures

C. Indirect Impact Assessment
   - C1 Casualty
   - C2 Shelter s and Goods
   - C3 Building Fires and Debris
   - C4 Critical Infrastructures
Objectives of TERIA Platform

- Incorporating state-of-the-art assessment models
- Creating a trustworthy environment for information integration and data collection
- Assessing and reviewing earthquake impact scenarios
- Supporting earthquake impact simulation research and assessment model development
- Supporting compound-disaster studies, preparedness and recovery studies, government policy and strategy enactment
Application Example 1:

Shanjiao fault earthquake impact assessment

**Shanjiao fault (all)**
- M7.1
- Li 34km
- Ls 16km

**Shanjiao fault (N)**
- M 6.9
- Li 21km
- Ls 16km

**Shanjiao fault (S)**
- M 6.3
- Li 13公里

(Hsu et al., 2011)
Geospatial Meshed Data

Mesh size: 500x500 m

Advantages:
1. more detailed solutions
2. an exchange interface for model assessment and data inventory
3. easy to transfer to administrative areas
Impact Scenario Assessment

- Ground Motion Sim.
- Casualties
- Building Damage
- Road and Traffic
- Liquefaction
- Landfall Analysis
- Lifeline System
- Critical Infrastructure
Ground Motion Assessment

1. Shanjiao fault (all)
   - ArcGIS (shp)
   - MapInfo (mif)
   - Google (kml, kmz)
Impact Scenario Assessments

Building Damage

Fatalities
Building Damage Distribution Assessment

Building Damage Distribution

- Built before the design code
- Built after the design code

Pie chart: 36% built before, 64% built after
Building Damage Distribution Assessment

■ Building Damage Status

Map showing building damage distribution. The color-coded legend indicates different damage rates, with corresponding numbers of buildings.

- 1.04 - 10%: 36,106 buildings
- 10 - 25%: 9,179 buildings
- 25 - 50%: 1,095 buildings
- 50 - 100%: 65 buildings

Total number of buildings assessed: 46,445

区域
建物毁損機率(%) 數量(棟數)
- 1.04 - 10: 36,106
- 10 - 25: 9,179
- 25 - 50: 1,095
- 50 - 100: 65

總數: 46,445
Power System Damage Status

The image shows a map with various nodal points indicating different damage statuses across the network. The map includes symbols for different types of damage percentages, with specific areas highlighted in different colors and symbols to denote the extent of damage. The legend on the left side of the map explains the color codes and symbols used for various categories of damage, such as PS_PGA_FC, DS_PGA_FC, SS_PGA_FC, and 345KV, 161KV, 69KV, and 35KV levels.
Water System Damage Status
Scenario Illustration on Google Earth

Location

Results

Information

146.00

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0 20 40 60 80 100 120 140 160 180 200

25°00'56.87"N 121°17'22.65"E 海拔高度 14 公尺 角度海拔高度 871 公尺
2014 Taiwan National Drill Day Application
2014 Taiwan National Drill Day Application

Building Damage Scenario

- Sever 2,579 houses
- Complete 2,122 houses

![Building Damage Map with Sever and Complete categories](chart)
Conclusions

TERIA Platform Partners

- Research Institutes
- Central Government
- Private Sectors
- Local Governments

TERIA is designed and developed to be an open platform, emphasizing interdisciplinary cooperation, information integration and sharing, and to satisfy the needs for practical earthquake disaster management.

Future Work:

- Build up platform partnership
- Develop user interface
- Enhance data completeness
- Incorporate state-of-the-art assessment models
- Assess the effects of system interdependency
Thank you very much!
Building Type Statistics

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<td>SRC1</td>
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