An Urban Damage Scale based on Satellite and Airborne Imagery

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Topics to be Covered

- **Need for Standardized Scale**
- **Breakdown of Various Damage Detection Schemes**
- **Basic Requirements of Standardized Scale**
- **Proposed plan for Development**
- **Longer-term Needs for Remote Sensing**

Need for Standardized Scale

- The world has seen unprecedented losses in the last several years
  - *1999 Marmara, Turkey earthquake – over 30,000 killed*
  - *2004 Indian Ocean earthquake and tsunami – over 300,000 killed*
  - *2005 Hurricane Katrina – over $150 billion in losses and 10,000 (?) killed*

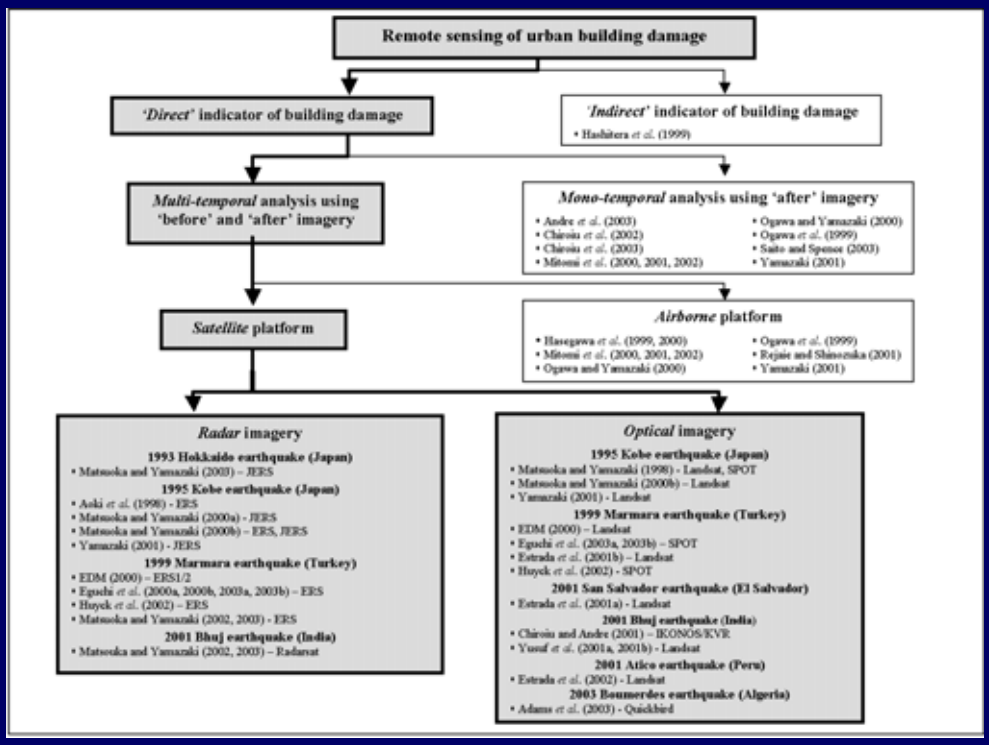
Need for Standardized Scale (continued)

- In almost all cases, effects of these large disasters are exacerbated by slow or delayed response.
- Major issue that impedes immediate response is not knowing the extent of the disaster.
- Especially important when it comes to responding to social needs and disruption

Need for Standardized Scale (continued)

- Remote sensing can change this situation
- Remote sensing offers the following benefits:
  - *Global access*
  - *Multi-sensor response*
  - *Relatively quick response, i.e., several days*

Damage Detection Schemes



Basic Requirements for Standardized Scale

- Identification of areas of significant damage and disruption,
- Number of collapsed buildings or structures,
- Number of people killed or injured (based on the building damage assessments),
- Areas of inundation (caused by dam failures, tsunamis, or levee breaks), and
- Areas of utility outage (as measured by lack of power or nighttime lights)

Specific Requirements

- At a minimum, the damage scale must distinguish between collapsed and non-collapsed structures.
- The scale must distinguish between image changes caused by building damage and those that reflect normal ambient effects, e.g., seasonal changes.
- Ideally, the scale will identify the following structural damage states: tilting of buildings, and soft-story collapses or failures.
- The scale should be employed using a variety of sensors, including optical (high-resolution), radar, and LIDAR.

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Specific Requirements

- The scale should distinguish damage to buildings and other infrastructure, such as roadways, bridges, utility equipment.
- The scale should distinguish damage to residential, commercial and industrial facilities.
- The scale should be updatable as new and better sensors emerge

Proposed Plan for Development

- Create a formal working group with sponsorship; also form a “blue ribbon” multi-national advisory committee
- Prepare a series of papers (peer-reviewed) that present the various approaches to damage detection using remote sensing technologies
- Working group prepares draft paper that recommends a standardized damage scale

Proposed Plan for Development

- Convene advisory committee to comment on draft paper and provide recommendations for improvement
- Publish final paper in peer-reviewed journal
- Development longer-range plan to continually update and revise scale based on new information and data
- Duration of project: 2 years

Longer-term Needs

- Improve hazard data and models, e.g., terrain models for flooding
- Efficient models for developing building inventories for large cities
- More formal procedures for integrating remote sensing technologies in response and recovery
- Meaningful interaction with first-responder community