Connecting Physical Damage to Social and Economic Impacts

Steven P. French, Ph.D., FAICP
Dean and John Portman Chair
College of Design
Georgia Institute of Technology
Atlanta, GA 30332-0695
Earthquake Damage Impacts

We have made great progress in modeling physical damage to buildings and infrastructure.

Planning emergency response, recovery and mitigation requires translation of physical damage to **social and economic impacts**.
Earthquake Intensity determines Physical Damage

Physical Damage determines Social and Economic Impacts
Earthquake Event

Physical Damage

Building Stock

Transportation Systems

Infrastructure Systems

Critical Facilities

Social and Economic Impacts

Short Term

Housing

Economic Loss

Health

Social Disruption

Long Term

Relocation, Displacement

Fiscal Impacts, Business Failure, Job Loss, Reconstruction

Psychological Distress, Chronic Injury

Family Stress, Neighborhood Disruption

Emergency Shelter

Direct Damage, Price Increases, Business Interruption, Supply Disruption

Casualties, Fatalities, Health Care Disruption

Emergency Supplies Family Separation
Social and Economic Linking Factors

Building Occupancy or Land Use

Demographic Characteristics of population

Detailed Employment Characteristics (NAICS)
Linking by Spatial Location

Social and economic data can be linked with physical damage by spatial location using GIS.
Housing Impacts

**Short Term**
- Emergency Shelter
- Food, Water, Sanitation

Housing usually accounts for the largest number of units and the most economic loss because housing makes up 80-90% of the building stock.

**Long Term**
- Loss of Rental Housing
- Relocation
- Increased Debt Loads for Repair
Economic Loss

Short Term
- Repair and replacement costs
- Business Interruption
- Supply Disruption
- Price Increases

Long Term
- Fiscal Impacts
- Business Failure
- Job Loss
Health Impacts

**Short Term**
- Casualties
- Fatalities
- Service delivery disruption

**Long Term**
- Chronic injuries
- Psychological distress
Social Disruption

Short Term
  Family Separation

Long Term
  Neighborhood disruption
Key Data Sources

Traditional Sources
Tax Assessor Records
Population Census
Economic Census

Urban Big Data
Cell phone location Data
Transit boarding records
Infrastructure sensors
Video surveillance logs
Drone imagery
The Lens of Social Vulnerability

Vulnerable populations (children, senior citizens, disabled, low income) suffer a disproportionate share of social and economic impacts.
Conclusions

Social and economic impacts drive response and mitigation effort

Can now model social and economic impacts

Land use, demographics and detailed employment

New data sources provide better insights on social and economic activities