Next-Generation Disaster-Related Debris-Estimation Models

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Presentation Outline

Motivation

Conventional Debris-Estimation Models
Advantages & Disadvantages

Next-Generation Debris-Estimation Models
Accounting for Debris-Clearance Capacity

Estimating Debris Generation and Capacity
A San Francisco Bay Area Case-Study

Future Directions
Motivation

Large quantities of disaster-related debris **delays post-disaster recovery, hinders immediate emergency response activities**, and **prompts secondary hazards** (e.g., health issues, fires, floods).
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Effective Debris Management:

(a) **quantify** disaster-debris

(b) identify debris staging areas, storage, & **disposal sites**

(c) clear debris from major lifelines

(d) debris sorting, hauling, **recycling**, and discarding
Conventional Debris-Estimation Models

Move from **Empirical Quantification** → **Predictive Modeling**

1. Aggregation of Building Stock
2. Damage Modeling
3. Waste Quantity Estimation (Demand)
Next-Generation Debris-Estimation Models

**Conventional Approach**

1. Aggregation of Building Stock
2. Damage Modeling
3. Waste Quantity Estimation (Demand)

**Proposed Modeling Extension**

4. Clearance and Recycling (Capacity)
5. Informed Policy- and Decision-Making

- Facilities
- Personnel
- Financing
- Transportation
Estimating Debris Generation and Capacity: A Case Study

Debris Demand Analysis

San Francisco Building Stock:
- Wood
- Masonry
- Steel
- Concrete

Earthquake Return-Period Range: 25-1000 year events

Concrete by Building Type:
- Wood (15 tons/1000 ft²)
- Masonry (40 tons/1000 ft²)
- Steel (50 tons/1000 ft²)
- Concrete (100 tons/1000 ft²)
Debris Demand Analysis

Estimating Debris Generation and Capacity: A Case Study
Estimating Debris Generation and Capacity: A Case Study

Preliminary Demand Results

Graph showing the annual exceedance probability of concrete debris generation.
Estimating Debris Generation and Capacity: A Case Study

Debris Capacity Analysis

Processing Facility Capacity:
- Number of Facilities (1)
- Hourly Plant Capacities (300 tons)
- Hourly Transport Capacity (40 tons/truck x 2 trucks/hour)
Estimating Debris Generation and Capacity: A Case Study

Preliminary Capacity Results

The graph illustrates the annual exceedance probability for different materials (WOOD, MASONRY, CONCRETE, STEEL) and total debris generation against tons of concrete debris. The x-axis represents the tons of concrete debris, while the y-axis shows the annual exceedance probability. The graph indicates the capacity for debris handling under various time frames (1-day, 1-week, 1-month) for different material types and total debris.
Estimating Debris Capacity: Additional Uncertainty

Personnel

Sorting

Storage

Equipment

Transportation
Future Directions

1. Extension to **Other Material Waste Streams**
2. Quantifying **Cost/Benefit** of Recycling
3. Improving **Capacity Estimations** to Account for:
   - Financing
   - Personnel
   - Transportation
   - Other (e.g., permitting, mobilization, sorting)
4. Clearance and Recycling (Capacity)
5. Informed Policy- and Decision-Making

Questions?