Emergency Management in China, Research and Solutions

Submitted by: Tsinghua University
The increasing risks to mankind
- Along with the social/economic development, risks on: high-rise buildings, oil/gas/water/electricity lifeline system, important infrastructures, key facilities etc.
- Natural disasters and their secondary disasters cause great potential risk to lives and properties
- New challenges brought forth by high-tech and information security
- Nuclear and radiological threat
- Increasing possibility of foreign biological threat and disease with international trades
- The complexity and difficulties in emergency response are rising with the economic development and people's expectation for safety

Our Major Research Projects
- We have conducted numerous major projects from government:
  - Framework Design of National Emergency Response Platform System (National, Province, City, and County)
  - Software and Database System Development for National ERP
  - Integrated Prediction and Pre-warning System for National Emergency Response Platform (ERP)
  - Emergency Response System for Sichuan Earthquake-Relief Commanding Center
  - Digital Emergency Response Plan Management System for Beijing City Emergency Response Commander Center
  - Digital Fire Safety Emergency Response Plans for All 2008 Beijing Olympic Stadiums and Training Centers

Emergency Response Related Research
- Fundamental mechanism and dynamics on the causes of disasters and evaluation of crisis
- Multi-scale modeling and visualization on disaster evolution
- Risk analysis and pre-warning of disasters
- Inspection and detection systems using multiple sensors
- Human behaviors under disasters and during evacuation
- Human protection technology and equipment
- GIS-based prediction and intelligent decision support system
- Technologies for digitized emergency response plans
- Emergency platform design, hardware and software integration
- City's comprehensive disaster mitigation and prevention

Mobile Emergency Products
Hardware: Mobile systems for near-field command

What make us UNIQUE

Hardware: design & integration
Software: design & development
- The concept of “model integration”
- The concept of “incident chain”
- The concept of “digital response plan”
- The concept of “data overlay”
- The concept of “data exchange”
- The best use of GIS
- Flexible interfaces with hardware/software

Flood Modeling and Simulation

GIS-based Air Pollution

The concept of “incident chain”

- A disaster is not an isolated occurrence, but interaction, showing a complex derivatives and secondary relationship. One disaster may trigger more disasters at certain circumstances, constructing a chain-like form. (Domino effect)
  - Songhua River pollution (2005): chain of explosion, fire, water pollution, social panic and diplomatic affair.
  - Ice storm (2008): chain of ice storm, traffic jam, interruption of power transmission, halt of railway transportation and even shortage of necessaries.
  - Earthquake (2008): chain of earthquake, landslides, quake lakes, road broken, etc.

Typical incident chain of earthquake, stored in DB

- Earthquake
- Landslides
- Dike burst
- Dam burst
- Building collapsed
- Bridges collapsed
- Ground subsidence
- Earthquake destruction

A simple diagram

- Flood
- Fire
- Explosion
- Epidemic disease
- Chemical release
- Polluting
- Social security problem
- Power failure
Secondary Disaster Prediction

- Typhoon and heavy rain may cause landslide, water dam broken, and other secondary disasters.

The concept of “digital response plan”

- Turn paper works into electronic tables via the deconstruction of response plans:
  - Basic plans: objectives, commander, basic procedures, related agencies, basic functions, etc.
  - Specific plans: assumed situation and resource dispatch table, procedures, maps and diagrams, etc.
- Easy to use/refer to
- Use digital response plan to assist the compile of IAP

Beijing 2008 Olympic Games

- Truly exceptional Olympics - Jacques Rogge
  - Including 31 competition venues, and 45 training venues and related hotels etc.
- Hazard analysis in venues
- Structure, facilities, disaster scenario awareness
- Develop comprehensive and detailed digital response plan via High-tech solutions
- Virtual training

Risk Evaluation, Action Plan

- Hazard zone change with time
- Incident Action plan

The concept of “data overlay”

- It's a method for comprehensive impact analysis, and for better situation awareness.
  - If typhoon is coming, data we may concern: population, hazmat, river bank, landslides, etc; other analysis based on “incident chain”
- Data overlay: to integrate multiple layers of data and analysis results on a map for comprehensive analysis.
- If we have more data, we can do more analysis by ourselves. If we don’t, we can get analysis results from different agencies via “data exchange”.

The concept of “data exchange”

- To share data between agencies
Our Contribution in Sichuan Earthquake

CPSR and Beijing Global Safety Tech. Co. Ltd. were working in the situation room making situation maps on May 17, 2008.

CPSR and Beijing Global Safety Tech. Co. Ltd. were working in Sichuan Emergency Rescue Commander Center.

Thank you!