Methods to Forecast Natural Hazard Occurrences and the Impacts on Societal Systems

Group 1
US-Taiwan Workshop on the Advancement of Societal Responses to Mega-Disasters Affecting Megacities

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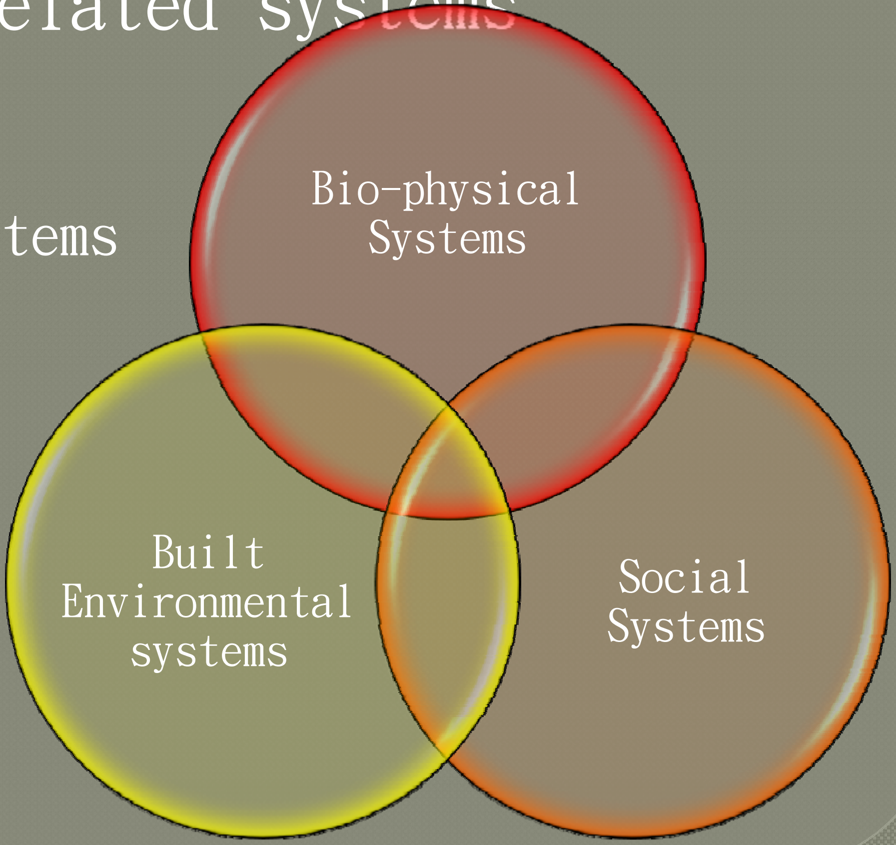
Basic Philosophical Premis

- Natural Disasters (whether mega or not) are a function of the interactions between three complex interrelated systems
  - Bio-physical Systems
  - Social Systems
  - Built Environmental Systems



Each sphere consists of complex interrelated systems that demand the development models for hazard forecasting and disaster impacts (physical and societal) that will often dependent on the coupling/linking of models within each sphere. Fundamentally disaster forecast and modeling must be conceived as an interdisciplinary problem.

Where we would like to be in 1-3 years

- Bio-Physical systems forecast and modeling
  - general goals: Reduce uncertainty & Increase stability and lead-time
  - Typhoon/ hurricane
    - intensity and size prediction and reduction of track error.
    - interaction with mountain ranges
    - Quantitative Precipitation Forecasts (QPF) for short term accumulated rainfall and dynamic model for 2 days or longer.
  - Coupled ocean, atmosphere, and terrestrial modeling for storm surge and flooding (basin and over-topping)

Where we would like to be in 1-3 years

- Bio-Physical systems forecast and modeling
  - Earthquake
    - Detection of incipient earthquake and early warning
  - Interaction between hazards and natural eco-systems. (ecosystems services, environmental degradation and habitat loss)

Where we would like to be in 1- 3 years

- Built environmental systems
  - Interactions between hazard agents (hurricane/earthquake) and built environmental systems
  - Coupled/linked modeling for infrastructure systems
  - Assessing and improving resiliency of infrastructure, housing, and engineered systems (i.e., underground mass-transit, etc.)

Where we would like to be in 1-3 years

- Social systems
  - Economic and social impacts of disasters
    - Fiscal impacts, business & employment disruption and losses
    - Demographic (composition, size, dislocation)
    - Health and psychological
  - Decision making and risk planning
    - Multiple levels of scale (households, businesses, government [local, state, national]) and the interaction among these levels of scale.
  - Enhancing public response
    - Roles of forecast and warning
      - ensuring forecast are communicated in an effective way and through effective channels
      - Interaction among multiple jurisdictions and agencies for effective decision making; increasing lead times for flooding
    - Making effective use of real time forecasts and information
    - Modeling public response (household, organizational, and community)

Where we would like to be in 1-3 years

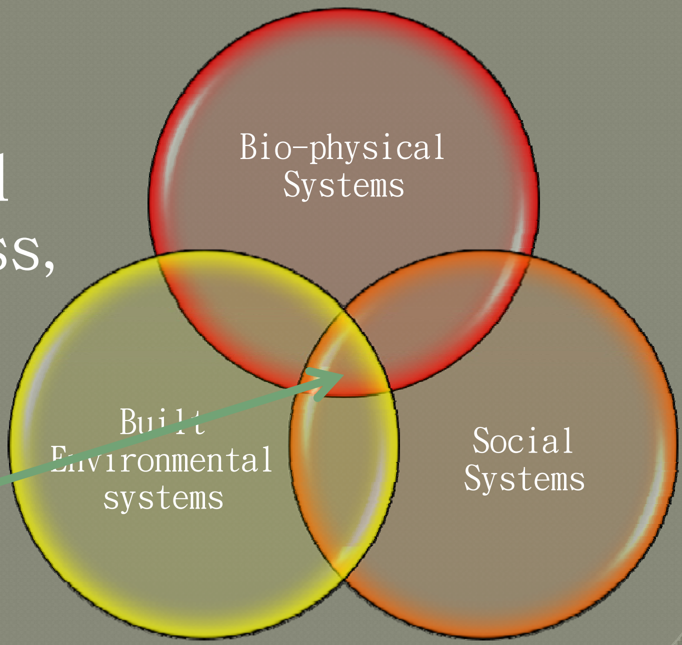
- Social systems
  - Disaster response and recovery
    - Focus on resiliency – adaptive change as a part of recovery
    - Multi-dimensional (housing, local government, businesses, civil society, etc.)

Cross cutting issues:

- Scale and resolution (focus on fine resolution [1 meter, neighborhood, building, etc.])
- Validation and data issues
- Longitudinal research
  - Social systems & soc-ecological couple system interaction (RAVON)
  - Built environment
- Social vulnerability issues
  - Developed/less developed world
  - Marginalized populations (ethnic/racial/economic)
  - Age, gender and language issues

Where we would like to be: 3-5 year

- Longer-run focus should be on the overlap areas:
  - Interdisciplinary approaches and models
    - Coupled or linked models
  - Decision support tools development for public use and input (GIS based, public access, Wikification…)



Focus should be here.

What are the next steps?

- Research and modeling exchange
  - International transfers of modeling technologies and research
    - Cross-national case study comparisons
    - Joint contributions to lessons learned database
  - Cross-national fertilization of research ideas through joint research projects