Adjusting the Emergency Management Planning Process for Urban Land Use in Taiwan

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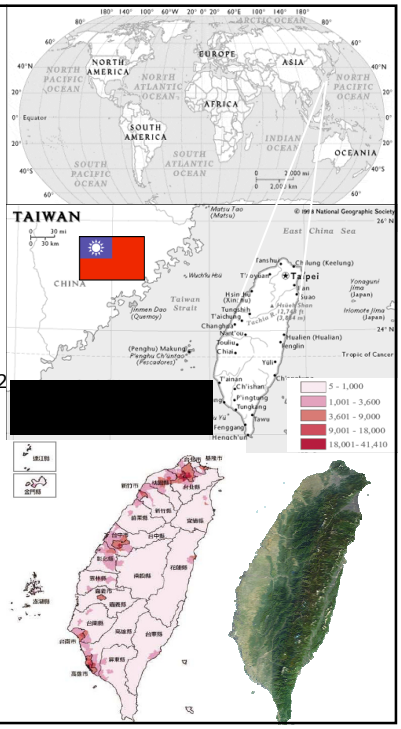
Introduction

- Taiwan
  - 36,184 km^2
  - 23 million inhabitants
  - Urban planned districts: 4,670 km^2
  - Density in Urban planned districts: 3,908 persons / km^2 (up to the end of 2008)
- > 70% of the inhabitants living in < 20% of the total area



Urban Development

Taipei- dense development

Introduction

- 73% of the population lives in more than 3 natural disaster impact zones (World Bank, 2005)
- Besieged by 3.6 typhoons per year
- Urban development concentrated in western plain with high density of populations

Top 10 natural disasters

Disaster	Date	Killed	Disaster	Date	Affected
Earthquake	17-Mar-1906	6,000	Earthquake	21-Sep-1999	108,664
Earthquake	20-Apr-1935	3,410	Earthquake	18-Jan-1964	62,485
Earthquake	21-Sep-1999	2,264	Wind storm	25-Sep-1969	40,408
Wind storm	Aug-1959	1,046	Flood	10-Jun-1977	20,000
Wind storm	Aug-1924	1,000	Wind storm	23-Jun-1990	20,000
Wind storm	Aug-1911	1,000	Wind storm	25-Jul-1977	11,528
Wind storm	29-Jul-2001	218	Flood	Sep-1977	6,000
Wind storm	Aug-1960	199	Wind storm	30-May-1966	5,021
Wind storm	25-Sep-1969	194	Wind storm	18-Sep-2001	3,608
Wind storm	Aug-1962	107	Wind storm	24-Oct-1987	2,200

Source: "EM-DAT: The OFDA/CRED International Disaster Database, Université catholique de Louvain, Brussels, Belgium" http://www.cred.be/emdat/intro.htm Access time: 05/01/2003

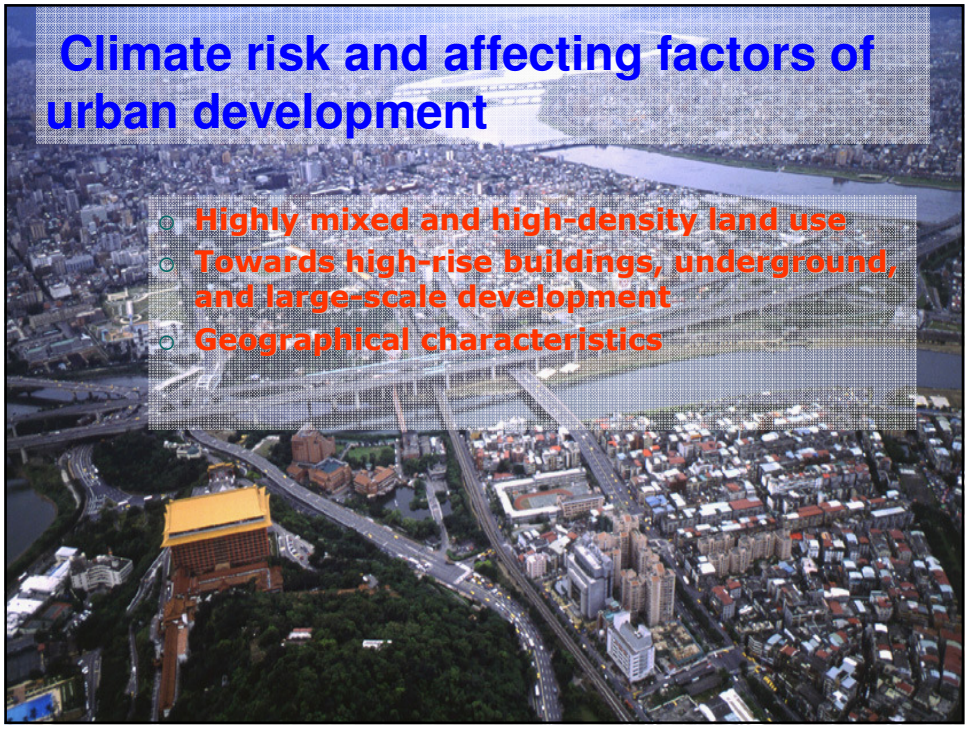
Climate change and extremely climatic phenomena in Taiwan

- Due to its geographic characteristics, Taiwan is very sensitive to the changing climate

Change (2080-2099 relative to 1980-1999)	Taiwan	Northern region	Central region	Southern region	Easter Region
Temperature	2.3℃	2.3℃	2.1℃	2.2℃	2.4℃
Precipitation	- Decrease in spring and summer - Increase in fall and winter - Increase 7% yearly	- Decrease in spring and winter - Increase in summer and fall - Increase 21% yearly	- Decrease in spring and summer - Increase in fall and winter - Dncrease 5% yearly	- Decrease in spring and summer - Increase in fall and winter - Decrease 7% yearly	- Decrease in summer - Increase in spring, fall and winter - Increase 23% yearly
Extreme climate variability	More hot days in summer with temperature above 32 ℃; more cold days in winter with temperature below 10℃ / Increase in droughty days (very likely in Central and Southern regions) / Increase in the incidence of heavy rainfall				
Sea level rise	2.51mm/year~5.91mm/year 5.38mm/year				

Observations of CC in Taiwan

- **Increasing 1.4℃ in the past decade**
- **Increasing frequency of heat waves and longer duration**
- **Significant change in northern area**
- **Decreasing in freguency of rainy days(daily precipitation less than 1 mm)**
- **Significantly decreasing in # of rainy days (hourly precipitation less than 2 mm)**
- **Significant change of precipitation pattern in the past decade**
- **Significant drought change in central, southern Taiwan and Taitung**
- **Increasing frequency of typhoons in the recent 40 years, and increasing magnitude**
- **Sea level rising 2.51 mm/per year, about 1.4 times of the world average**



Changes of three phases

Version 2000 | Version 2003 | Version 2007

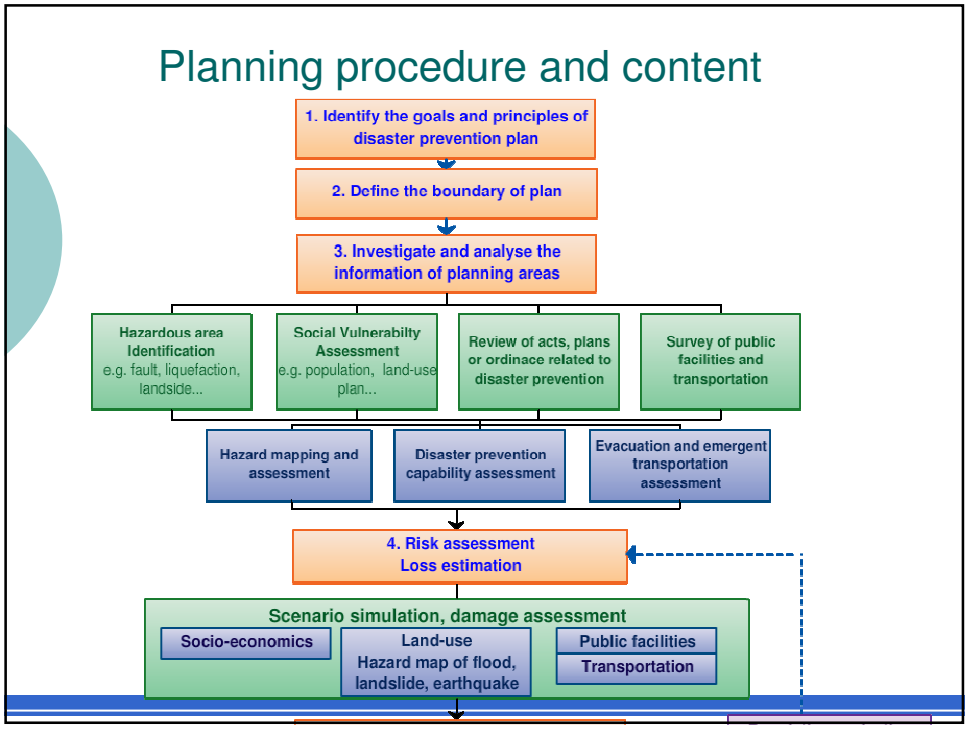
From

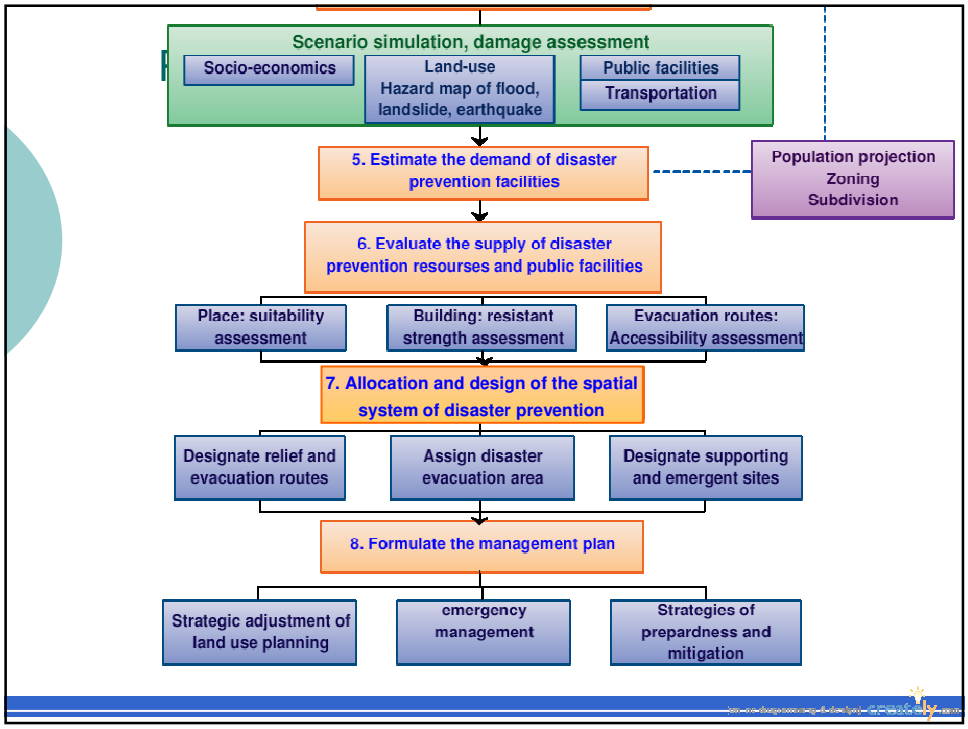
- Specific-hazard management system
- Supply-driven analysis
- Mitigation
- Land use adjustment

Earthquake disaster preparedness and response

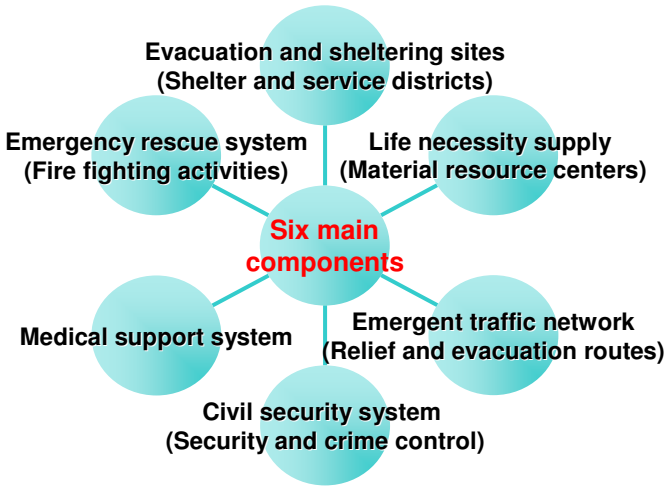
To

- All-hazards management system
- Supply-demand analysis
- Risk Analysis
- Emergency management

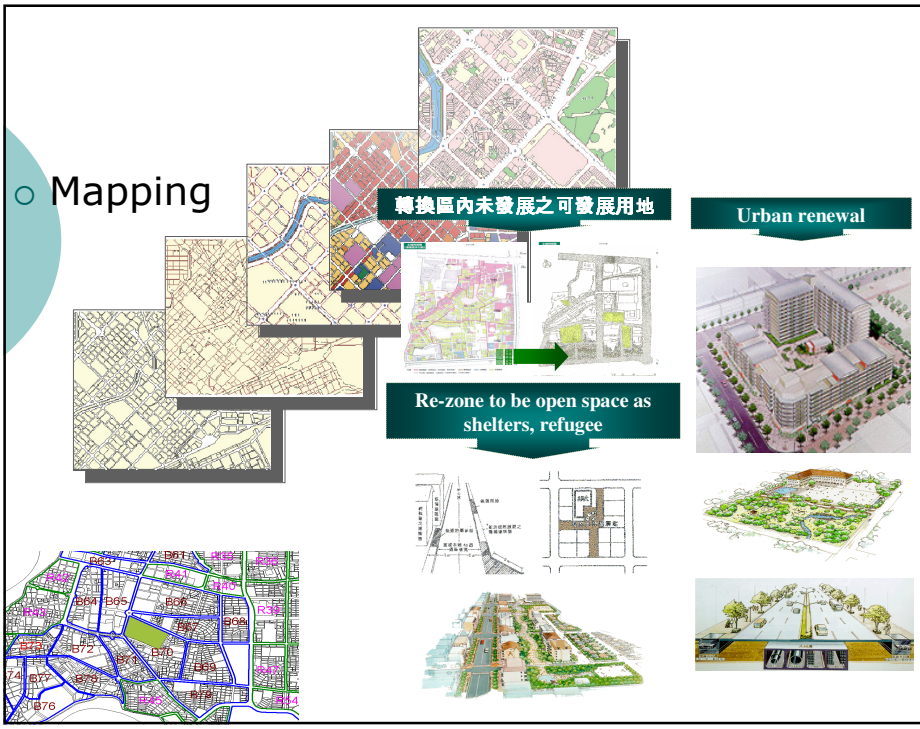

Planning procedure and content
1. Identify the goals and principles of disaster prevention plan
2. Define the boundary of plan
3. Investigate and analyse the information of planning areas
Hazardous area Identification
e.g. fault, liquefaction, landside...
Social Vulnerabilty Assessment
e.g. population, land-use plan...
Review of acts, plans or ordinace related to disaster prevention
Survey of public facilities and transportation
Hazard mapping and assessment
Disaster prevention capability assessment
Evacuation and emergent transportation assessment
4. Risk assessment
Loss estimation
Scenario simulation, damage assessment
Socio-economics
Land-use
Hazard map of flood, landslide, earthquake
Public facilities
Transportation


Scenario simulation, damage assessment
Socio-economics
Land-use
Hazard map of flood, landslide, earthquake
Public facilities
Transportation
5. Estimate the demand of disaster prevention facilities
Population projection
Zoning
Subdivision
6. Evaluate the supply of disaster prevention resourses and public facilities
Place: suitability assessment
Building: resistant strength assessment
Evacuation routes: Accessibility assessment
7. Allocation and design of the spatial system of disaster prevention
Designate relief and evacuation routes
Assign disaster evacuation area
Designate supporting and emergent sites
8. Formulate the management plan
Strategic adjustment of land use planning
emergency management
Strategies of prepardness and mitigation

Components of this approach

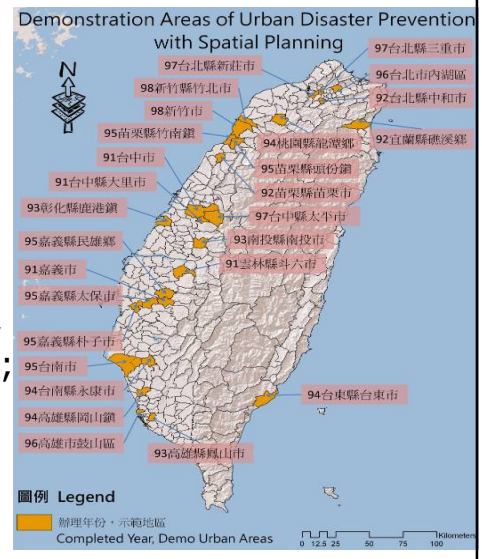


- Mapping



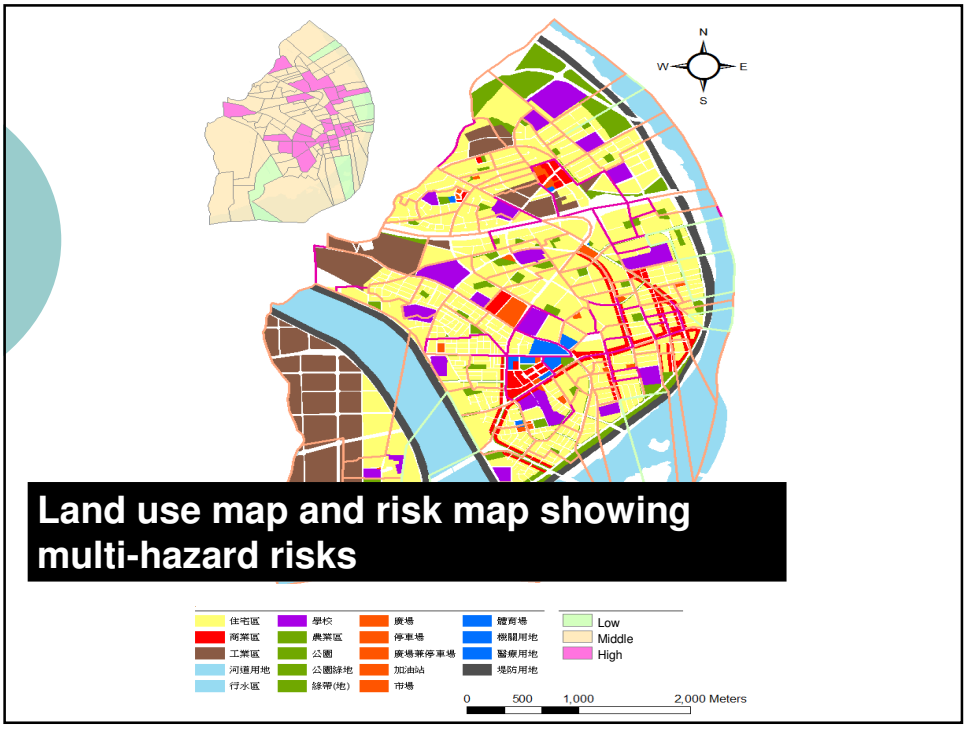
Demonstration

- Initially proposed in 1990s; take earthquakes to main account;
- Focus on urban areas;
- More than 20 projects;
- Most located in western plain

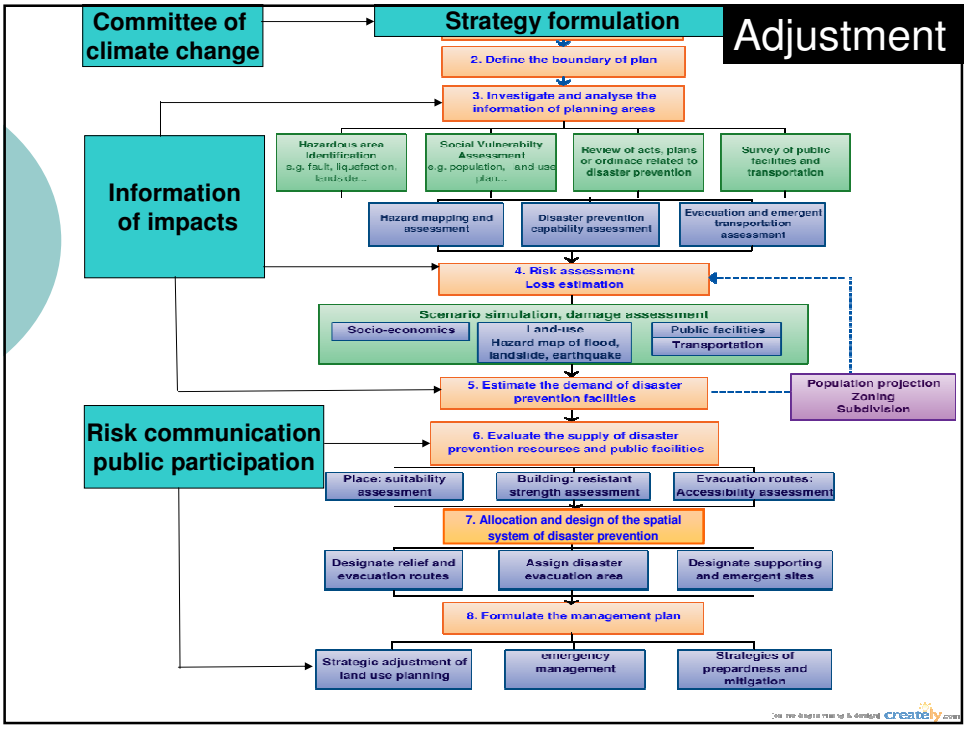


More than 20 demonstration projects with the system

Platform of the planning system



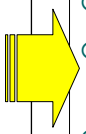
Land use map and risk map showing multi-hazard risks



Transition of disaster prevention planning philosophy

Past

- Passive
- Leading by governments
- Response
- Engineering tools

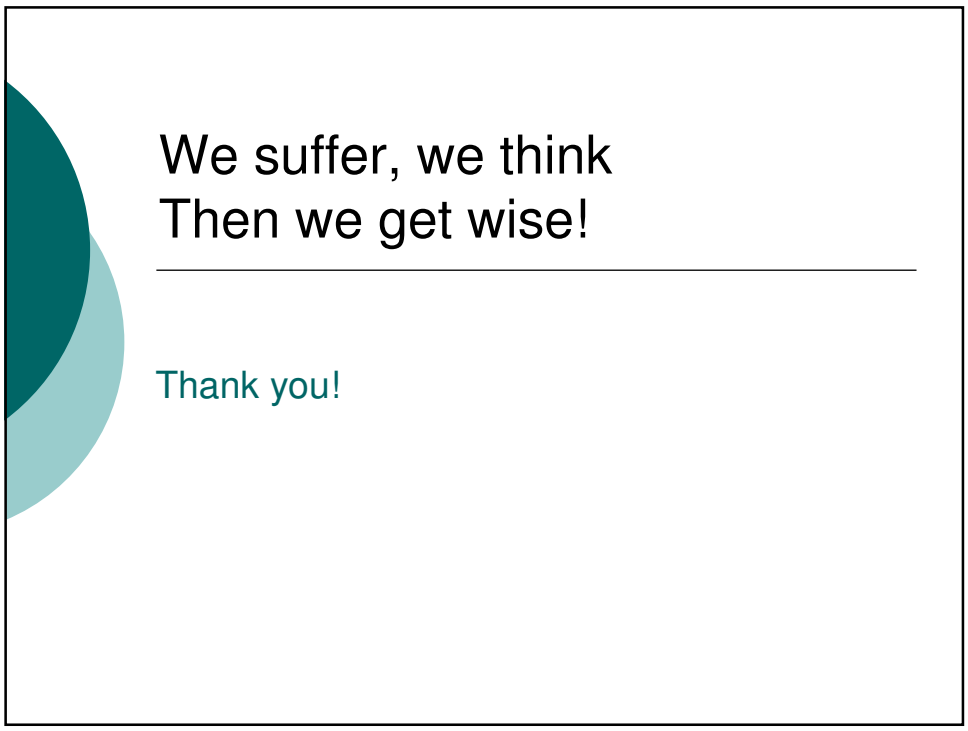


now and future

- Active
- Public participation
- Preparedness, mitigation, response, and recovery
- Integrating with structural and non-structural tools,
- Be part of sustainable development strategies

Direction of the future

- Amending land related regulation so as to combine this approach
- Enhance the involvement of trans-discipline, cross-sector to respond to the risk of multi-hazards
- Raise risk consensus through education the regulation land use


We suffer, we think
Then we get wise!
Thank you!