University Capacity Building to help local government setup Resilience Community

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five broad threat classes:
- Natural Catastrophe & Climate
  - earthquake and windstorms
- Financial, Trade & Business
  - market crashes, and commodity price shocks
- Politics, Crime & Security
  - political instability, conflicts and terrorism
- Technology & Space
  - cyber catastrophe
- Health & Environment
  - pandemics and famines

The metric index
- GDP@Risk
- ranking of 300 World Cities
<table>
<thead>
<tr>
<th>Rank</th>
<th>City Name</th>
<th>Country</th>
<th>GDP@Risk ($US Bn)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Taipei</td>
<td>Taiwan</td>
<td>202</td>
</tr>
<tr>
<td>2</td>
<td>Tokyo</td>
<td>Japan</td>
<td>183</td>
</tr>
<tr>
<td>3</td>
<td>Seoul</td>
<td>Republic of Korea</td>
<td>137</td>
</tr>
<tr>
<td>4</td>
<td>Manila</td>
<td>Philippines</td>
<td>114</td>
</tr>
<tr>
<td>5</td>
<td>Tehran</td>
<td>Iran</td>
<td>109</td>
</tr>
<tr>
<td>6</td>
<td>Istanbul</td>
<td>Turkey</td>
<td>106</td>
</tr>
<tr>
<td>7</td>
<td>New York</td>
<td>United States</td>
<td>91</td>
</tr>
<tr>
<td>8</td>
<td>Osaka</td>
<td>Japan</td>
<td>91</td>
</tr>
<tr>
<td>9</td>
<td>Los Angeles</td>
<td>United States</td>
<td>91</td>
</tr>
<tr>
<td>10</td>
<td>Shanghai</td>
<td>China</td>
<td>88</td>
</tr>
</tbody>
</table>
• The local government is concerning more for damages caused by disasters in Taiwan.

• The capacity and manpower of local government is not enough to implement full disaster prevention in the community level without the help from outside resources.

• Universities in Taiwan have the capability of delivering non-structural methods and can help local government develop community resilience.
### Goals of Resilience community

<table>
<thead>
<tr>
<th>Goals</th>
<th>Actions and Responsibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>【Identify Disaster Potential】</strong></td>
<td>• Define types of disaster? • Find Locations? Extents? Impact?</td>
</tr>
<tr>
<td><strong>【Reduce Disaster Occurrence】</strong></td>
<td>• Solve Problems? • strategies?</td>
</tr>
<tr>
<td><strong>【Enhance Response Capacity】</strong></td>
<td>• Skill training • Evacuation timing and routes • Necessary equipment</td>
</tr>
<tr>
<td><strong>【Organize Response Team】</strong></td>
<td>• Members recruitment • Tasks assignment</td>
</tr>
<tr>
<td><strong>【Raise Public Awareness】</strong></td>
<td>• Education • Knowledge instruction</td>
</tr>
</tbody>
</table>
Step 1 Preliminary Study of the community

Identify and visit the **key man** who could help promote the resilience community.

Identify where disasters could happen and where people could hide when disasters do happen.
1. Raise public awareness through disaster cases in Taiwan or worldwide, such as
   - Typhoon Morakot triggered landslide in Siaolin Village, Taiwan.
   - 311 earthquake in Japan

2. Successful cases of resilience community in Taiwan
Step 2 Initiation and Activation

Introduction of local environment and disaster potential

Location of the community

DF214 Debris flow

Potential flooding area
In order to let the local residents know more about their risks from disasters, we plan the survey routes and lead them to study the environment with the company of experts and professionals.
Step 3 Site Survey and Strategy Development

Strategy Development

1. Sorting photos
2. Mapping photos
3. Strategy discussion
4. Experience sharing
Step 4 Education and Training

- Wound dressing demonstration
- Operating fire extinguisher
- Self operation
- Lecture of debris flow
Step 4  Education and Training

Organize Response Team

Commander

Deputy Commander

Executive Secretary

Patrol  evacuation  Preparedness  Caring  logistics

Chief:
鄭進友
李健章
黃良達
林秀貞
鄭足

Crew:
簡素丹
李金和
黃鎗成
蔡賴麗雲
黃美玉

黃正俊
李潘葉
嚴春生
黃棟卿
鍾亮風

李明星
黃賴花
黃體生
徐文讓
楊李清香

許添坤
黃棟卿
沈江瑞
謝秀蘭
高陳玉琴

秦錦雲
黃正俊
黃棟卿
高詹世嬌

李蜜
黃賴花
黃金花
黃棟卿
黃體生

陳孟佳
黃昌成
徐文讓
謝秀蘭
丁文琇

Step 4 Education and Training

Disaster Prevention Map

Evacuation Direction
Step 5 Drill of Disaster Prevention

Patrol

Caring

Evacuation

Refuge
Tracks and Intensity of All Tropical Storms

~ 2006

Saffir-Simpson Hurricane Intensity Scale
The frequency of the extreme rainfall induced by typhoons

Before 2000: once per 3~4 years
After 2000: once per year

Collect the extreme rainfall induced by typhoons (the top 20 of the rainfall index between 1970 and 2009)

The top 20 rainfall indices (1970~2009):

- 2000XANGSANE
- 2001NARI
- 2001TORAJI
- 2002NAKRI
- 2004MINDULLE
- 2005HAITANG
- 2007KROSA
- 2008SINLAKU
- 2008JANGMI
- 2008KALMAEGI
- 2009MORAKOT

Yearly breakdown:

- 2000~2009
  - 2000XANGSANE
  - 2001NARI
  - 2001TORAJI
  - 2002NAKRI
  - 2004MINDULLE
  - 2005HAITANG
  - 2007KROSA
  - 2008SINLAKU
  - 2008JANGMI
  - 2008KALMAEGI
  - 2009MORAKOT

- 1990~1999
  - 1990YANCY
  - 1996HERB
  - 1998ZEB

- 1980~1989
  - 1987LYNN
  - 1989SARAH

- 1970~1979
  - 1973NORA
  - 1974BESS
  - 1978ORA

Frequency

NCDR(2010)
Typhoon Xangsane (Oct, 2000)

Flooding in Xizhi District, New Taipei City
The map of levee, pumping systems around Taipei city
Pumping Station
Sep, 2001 NARI Typhoon – Taipei Metro Subway
<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aware of formation of typhoons</td>
<td>24 hours before the forecasted typhoon’s Grade 7 wind affect area may hit the distance of 100 km measured from the coast of Taiwan</td>
</tr>
<tr>
<td>Birth of Typhoon</td>
<td>Typhoon Warning on the sea</td>
</tr>
<tr>
<td>Typhoon Warning on the sea</td>
<td>Two times a day of information providing</td>
</tr>
<tr>
<td>Typhoon Warning of land fall</td>
<td>Two times a day of information providing</td>
</tr>
<tr>
<td>The high possibility of typhoon hitting Taipei</td>
<td>Video conferencing</td>
</tr>
<tr>
<td>Daily weather watch</td>
<td>EOC launch</td>
</tr>
<tr>
<td>Flooding season weather watch</td>
<td>Dismiss of typhoon warning</td>
</tr>
<tr>
<td>Daily summary</td>
<td>Level 2</td>
</tr>
<tr>
<td>Two times a day of information providing</td>
<td>Level 1</td>
</tr>
</tbody>
</table>
We provide video conference during Typhoon season
Integrated heavy rainfall or Typhoon information

- 雷達回波
- 紅外線衛星雲圖
- 可見光衛星雲圖
- 水汽頻道衛星雲圖
- 500hPa高度場、渦度場及風場
- 700hPa高度、垂直速度、濕度
- 850hPa高度、溫度、溼度及風場
- 地面天氣圖
- 地面風速、流場
- 板橋探空圖

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地面天氣圖
地面風速、流場
板橋探空圖
Climate change scenario

Down scaling

Modified design hyetograph

Flood routing

Social and economical situation

land subsidence

Levee

Drainage systems

Inundation simulation

Sea wall

Storm surge analysis

V = F(I, A, E)
Ensemble Cluster Rainfall Forecasting (Typhoon Nalgae 2011)

Observed (10/01~10/03)

72hr-cluster- cumulative rainfall forecasting (mm)

Initial time  9/30 08:00 LT  9/30 20:00 LT

72hr-lead time-typhoon path prediction
Ensemble rainfall - Typhoon Saola

4 times/day, 22 members (16 finished)

Average of 16 members
Day 1  8/2 20:00-8/3 20:00

Start for simulation: 08/2 14:00
Day 1  8/2 20:00-8/3 08:00  Day 1  8/3 08:00-8/3
Day 2  8/3 20:00-8/4 20:00
Day 3  8/2 20:00-8/3 20:00
• 16 of 22 members of TTFRI finished
• Lead time 72 hrs (Total simulation time =78 hrs., but needs about 6 hrs. to run simulation)
• Rainfall used for flood simulation 8/1 20:00-8/2 20:00, duration=24hr, Average of Top 5 of 16 members

8/1 20:00 - 8/2 20:00
Average of Top 5: 350mm/24hr
Dynamic potential flood map during 24 hours with 600mm rainfall
Yuanshantze Flood Diversion

Flood Division Tunnel (Bypass Tunnel)

Site Description

East Sea
1. For the criterion of 200-yr return period flood protection, 1,620 cms is the design flood discharge, diverting discharge is 1,310 cms, and 310 cms is released to the downstream of the river.

2. Main structures:
   (1) Flood outlet
   (2) Sluice way
   (3) Fish way
Yuanshantze Flood Diversion

Intake works

- Side weir
- Still and sediment detention Basin (靜水池)
- Orgee weir

184m (L), EL. 62.5m
80m(L)×3m(H), EL. 63m
Diversion tunnel (L=2.48 km, D=∮12m, S=1%)
Conclusion

- By cooperation between the local government and universities to promote the resilience community,
  - The **local government** could strengthen its connection to districts and community;
  - The **university** could put its non-structural methods into practice;
  - The **community** could learn to deal with catastrophic disasters by helping themselves before the government can further assist them.

Community is the basic and the most important level for disaster management
Thanks for your attention

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