



Evacuation Decision-making and Implementation

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 2010/5/12

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A story from Typhoon Morakot

- Typhoon Morakot caused severe damages in **Shinsan Village**, Nantou County last August
- The Chen-yu-lan River overflowed, severed the **main road** and caused **land loss**
- **20 buildings** fell into the river
- However, **no people dead or injured**
- **Why ?**



Photographs provided by Lin Yin-bin Photographs provided: Chinese (Changhua) Daily News

A story from Typhoon Morakot

- The village leader, **Miss Lin** has debris flow evacuation experience
- She asked ambulances to **move 3 severely brain-damaged people** in the village to the hospital when she heard a heavy rain warning in a weather forecast
- In the midnight August 8, 2009, she observed the river overflowing rapidly. She asked **her husband and police** to inform the residents to evacuate
- 20 minutes after completing evacuation, 20 buildings fell down into the river

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Types of Evacuation

Evacuate to different place

- This means, in the limited time available, moving residents from a place where they are in danger, to one where there is less danger or to a shelter along a route that isn't highly dangerous.
- When facing **debris flow** danger residents must be evacuated to a different place.



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Types of Evacuation

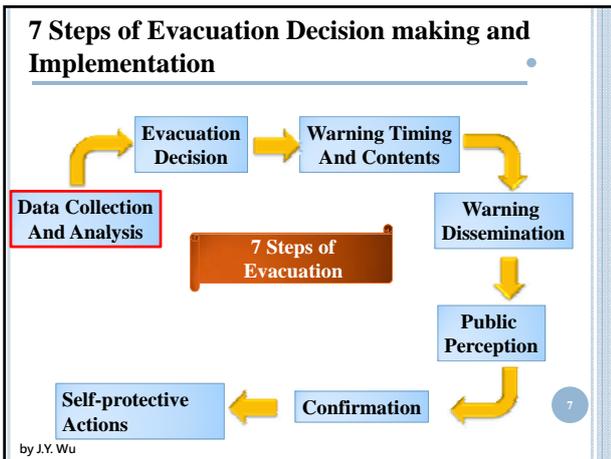
Shelter in place

- When the disasters **occur suddenly** and do not have enough time to move, shelter in place is another choice.
- Usually, shelter in place happens when
 - **flash floods (vertical evacuation)**
 - nuclear plant accidents



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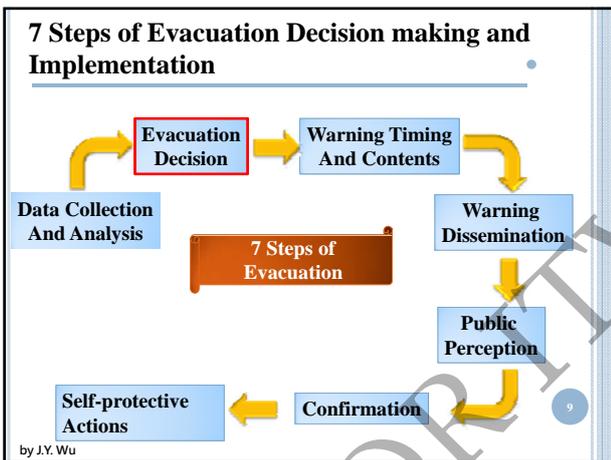


7 Steps of Evacuation Decision making and Implementation

Data collection and analysis

- What do weather forecasts tell us?
 - Rainfall over **50mm/hour** or over **300mm in a day** will cause **flooding**
 - Over 300mm/day may cause **debris flow**

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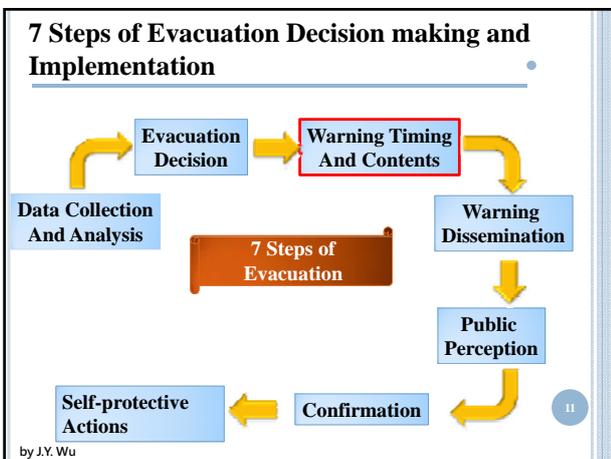


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Evacuation decision making

- The consequences of failing to evacuate when evacuation should take place
 - Fatalities, many people trapped**
- Consequences of evacuating when it is not necessary
 - Residents complain** (and next time they might not take warnings seriously due to the "cry wolf" effect), **economic losses**

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Warning timing and contents

- When to give the order?**
 - Too early : Residents **unwilling to leave**, economic losses
 - Too late : No time to evacuate, **disaster happens** during the evacuation
- Contents of the announcement?**
 - Describe the **present situation and its seriousness**, say **when the evacuation** will take place and the **method**
 - Under no circumstances should the contents of the warning change
 - Consider the **language** used in the announcement carefully

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Warning timing and contents

- When carrying out an evacuation, the government has to take into account the needs of special types of organization, including
 - Hospitals
 - Nursing homes
 - prisons (and detention centers)



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Warning timing and contents

- Hospital and nursing home : Many of the patients will not be able to move on their own, so easily become victims disaster.
 - 14 old people drowned in a nursing home in Keelung, Taiwan when they were not evacuated in time in 2000.
 - During Hurricane Katrina, 44 patients drowned in a hospital in New Orleans.

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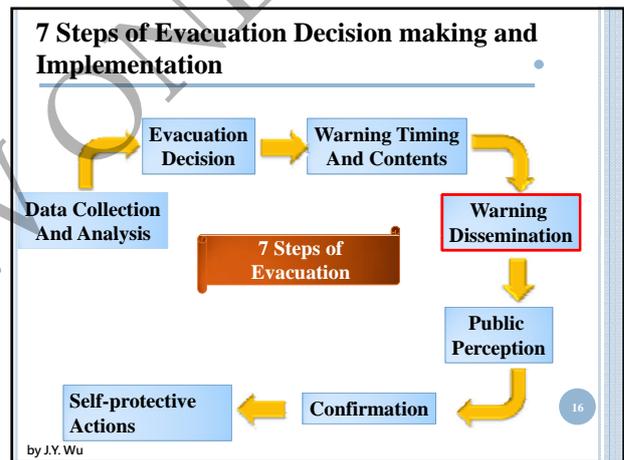
Warning timing and contents

- Prisons (detention centers) : The people inside these institutions can't move freely, so their evacuation ahead of a disaster is an important issue.



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Warning dissemination

- Information source
 - Government departments or news media, even ordinary people
- Delivery channels
 - face to face contact, telephone, alarms, loudspeaker, radios, TV and newspapers
- Believability
 - The public has more confidence in government information than that from other sources

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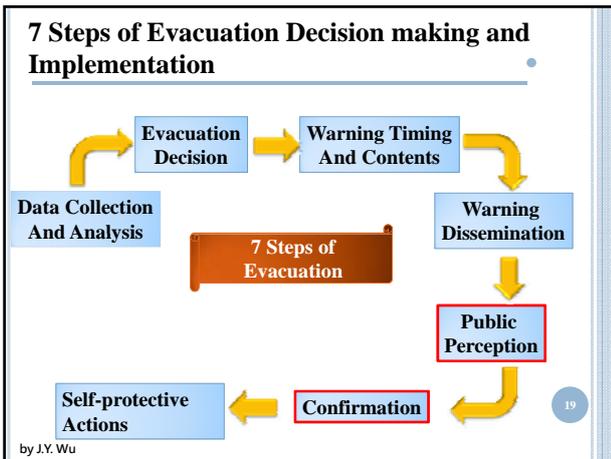
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Warning dissemination

- Order delivery channel should consider the following characteristics :
 - Accuracy of content
 - Penetration (permeates down to the everyday lives of the residents)

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7 Steps of Evacuation Decision making and Implementation

The public's perception of the warning and reconfirmation

Environmental advance warnings

- Before some disasters, there are warning signs around (eg. Heavy rainy) that can warn of an impending disaster and can persuade people to evacuate immediately
- However, **not all warning signs are obvious** so residents may refuse to evacuate.
 - In the summer of 1976, a flash flood in Big Thompson Canyon, Colorado, USA, **killed 145 people**

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The public's perception of the warning and reconfirmation

Environmental advance warnings

- Another type of advance warning is the response of other people
 - When people see others packing up and preparing to leave, they are likely to ask themselves if they should also leave and join the ranks of those being evacuated.

Generally speaking, the warning in the form of the response of other people, is more persuasive when it comes to getting people to evacuate than a government order.

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The public's perception of the warning and reconfirmation

Background of the people

- The more people have been affected personally by recent disaster the easier they are to evacuate
- however, people's memories of fade with time and level of disaster preparedness decreases.
- People also interpret past disasters in different ways.
 - some people think that after a disaster there will be a period of time without another disaster.

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7 Steps of Evacuation Decision making and Implementation

The public's perception of the warning and reconfirmation

Background of the people (continue)

- If people believe that they can control their fate they are easier to evacuate. Those who believe in predestined fate are less easy to evacuate.
- Personal characteristics:
 - Women believe warnings more than men.
 - Old people and minorities believe warnings less.

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The public's perception of the warning and reconfirmation

Social network

- Person to person interaction plays an important role in delivering the order to evacuate
 - Ex : Family networks are usually the channel through which evacuees confirm the warnings. The larger a family is and the closer their relations the safer they are. Networks of friends and colleagues have a similar function.

「Notification from a friend」 is the warning they trust the most

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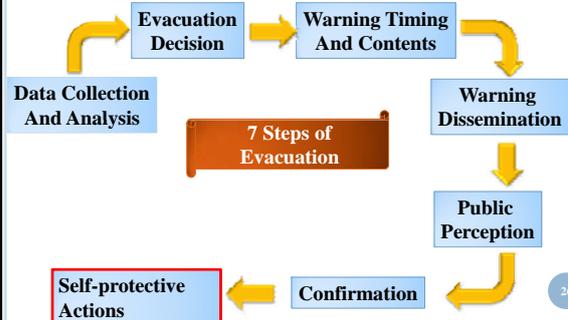
The public's perception of the warning and reconfirmation

- A **community network** is another kind of network. When disaster threatens the community operates like a relative or friend network and can be used to strengthen the individual's social links and information acquisition. When relatives' relations are weak warning delivery through community becomes more important.

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7 Steps of Evacuation Decision making and Implementation

Self protective actions

Subject	Evacuation	Execution of evacuation order	Time taken
Shuili Township, Nantou County		29% of residents obeyed evacuation order	2.62 hours
Jianshi Township, Xinzhu County		Only 15% of residents obeyed evacuation order	3.83 hours

- The above shows that there is a **big gap** between government planning and the actual behavior of people
- There is a need to **accumulate the experience** of each disaster and adjust evacuation planning.

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Experience from Hurricane Katrina



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New Orleans: The city below sea level



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source : Time magazine

Experience from Hurricane Katrina

The fail of evacuation

- In August 30, 2006. Hurricane Katrina caused **more than 700 deaths**
- Why?
 - Mayor Nagin announced **mandatory evacuation order** very late, more than 50, 000 residents fail to evacuate
 - Many African American **did not receive** mandatory evacuation order (because many of them had **criminal records** or **wanted men**. They escape from the polices while coming to inform them the evacuation order)

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Experience from Hurricane Katrina

The fail of evacuation (continue)

- The evacuation experience in New Orleans was **very different** from the other cities in the US
- In New Orleans, **68%** of the population are African American.
- $\frac{1}{4}$ of the African American are **low income household**. The do not have **own private vehicles**
- The government tried to mobilize **buses** to move them out of the city, but it is too late--

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Conclusion: Actions when back to home

- Applying the **7 steps** of evacuation decision making and implementation into your country's system
- Assist **government leaders** to clarify the factors that need to be considered in evacuation decision-making .
- Clear understanding by government departments of matters **they are responsible for**.

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Conclusion: Actions when back to home

- Assist **village leaders** formulate an evacuation mechanism/plan
- Assist village leaders **convert their familiarity with the community into systematic information** that can help with the execution of an evacuation .

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THE END

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