

# Synergized Warning and Response Actions for Coastal Multi-hazards in Hong Kong

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9<sup>th</sup> Integrated Workshop

Bangkok, Thailand  
20 – 24 October 2014


# Elements Of Effective Weather Warnings


- meet public need
- timely
- effective transmission
- trigger public actions, in stages
- dynamic, in line with society change
- trust





# Major Severe Weather Warnings

## Tropical Cyclone Warning Signals

 **Standby Signal No.1**


 **Strong Wind Signal No.3**

 **8**  **8**  
NW 西北 SW 西南

 **8**  **8**  
NE 東北 SE 東南

 **Gale or Storm Signal No. 8**

 **9** **Increasing Gale or Storm Signal No. 9**

 **10** **Hurricane Signal No. 10**

## Rainstorm Warning Signals

 **Amber Rainstorm Signal**  
Amber 黃

 **Red Rainstorm Signal**  
Red 紅

 **Black Rainstorm Signal**  
Black 黑

# Other Weather Warnings



○ Thunderstorm Warning



○ Special Announcement on Flooding in the Northern New Territories



○ Landslip Warning



○ Strong Monsoon Signal



○ Yellow Fire Danger Warning



○ Red Fire Danger Warning



○ Cold Weather Warning



○ Very Hot Weather Warning



○ Frost Warning



○ Tsunami Warning



# TC warning system in Hong Kong

- Warning Purpose: **High wind and related impact**
- Average no. of TC affecting Hong Kong: **6.0 / year (1961-2010)**
- No. of days with warning effective: **17.8 / year (1961-2010)**



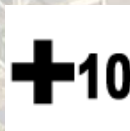
- Standby Signal No. 1
- Strong Wind Signal No. 3



- No. 8 Gale or Storm Signal



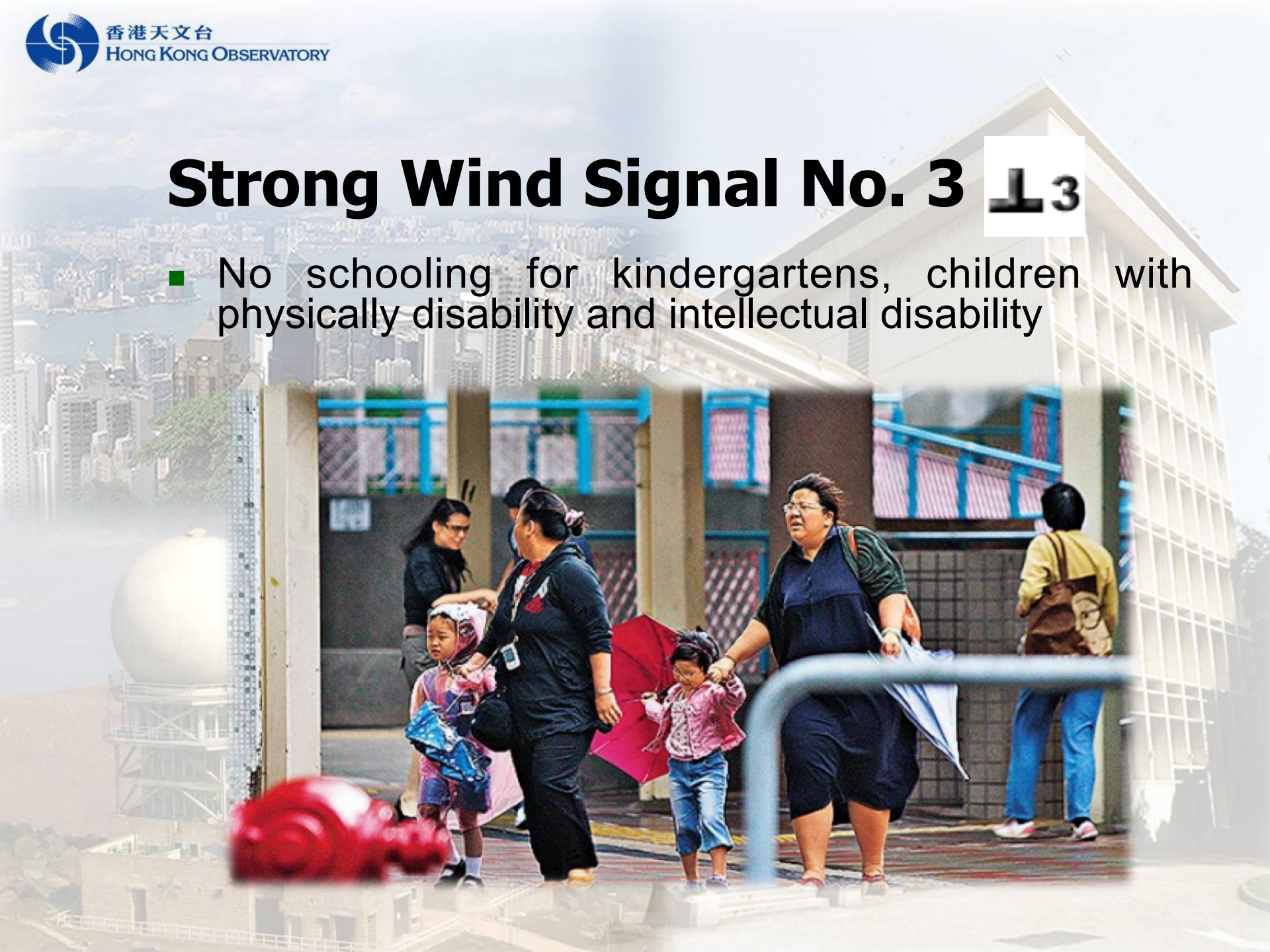
- Increasing Gale or Storm Signal No. 9



- Hurricane Signal No. 10

# Strong Wind Signal No. 3

- No schooling for kindergartens, children with physically disability and intellectual disability





# Education Bureau: TC & Heavy Persistent Rain Arrangements

Ref : EDB(IPR)ADM 90/1/9

Government of the HKSAR  
Education Bureau

5 July 2013

## EDUCATION BUREAU CIRCULAR NO. 12/2013

### **Tropical Cyclones and Heavy Persistent Rain Arrangements for Kindergartens and Day Schools**

[Note: This circular should be read by -

- (a) Supervisors and heads of all kindergartens  
and day schools - for action
- (b) Heads of all Sections - for information]

#### **SUMMARY**

The purpose of this circular is to inform schools of the arrangements under the inclement weather conditions. This circular supersedes the Education Bureau (EDB) Circular No. 3/2007 dated 10 April 2007 on the same subject.

#### **DETAILS**

2. The content of this circular relates to the safety of students and staff. All schools are required to comply with all the arrangements and act accordingly.
3. These arrangements apply:
  - (a) in the event of tropical cyclones and heavy persistent rain; and
  - (b) upon change of weather conditions at the time of public examinations.
4. Special attention is drawn to the different arrangements in the event of tropical cyclones and heavy persistent rain. The development of tropical cyclones is progressive and the effects are more lasting. With the announcement of suspension of classes in case of tropical cyclones, schools should arrange

Ref : EDB(IPR)ADM 90/1/9

Government of the HKSAR  
Education Bureau

5 July 2013

## EDUCATION BUREAU CIRCULAR NO. 13/2013

### **Tropical Cyclones and Heavy Persistent Rain Arrangements for Evening Schools**

[Note: This circular should be read by -

- (a) Supervisors and heads of all evening  
schools - for action
- (b) Heads of all sections - for information]

#### **SUMMARY**

The purpose of this circular is to inform evening schools of the arrangements under the inclement weather conditions. This circular supersedes the Education Bureau (EDB) Circular No. 4/2007 dated 10 April 2007 on the same subject.

#### **DETAILS**

2. The content of this circular relates to the safety of students and staff. All schools are required to comply with all the arrangements and act accordingly.
3. These arrangements apply:
  - (a) in the event of tropical cyclones or heavy persistent rain; and
  - (b) upon change of weather conditions at the time of public examinations.

# Gale or Storm Signal No. 8

## Gale or Storm Signal No. 8



- Citizen should not require to report for work except the staff with special duty
- All schools are to close

## Pre-No. 8 Special Announcement

- Reduce the load of the public transports
- Content of the Special Announcement
  - Announce the issue time of the No. 8 typhoon signal
  - Government to begin a staggered release of staff, giving priority to those with long journeys home
  - Included the announcement of the Education Bureau for school suspension from 4 a.m. to 10 p.m





# Pre - No. 8 Special Announcement (Sample)

## Pre - No. 8 Special Announcement

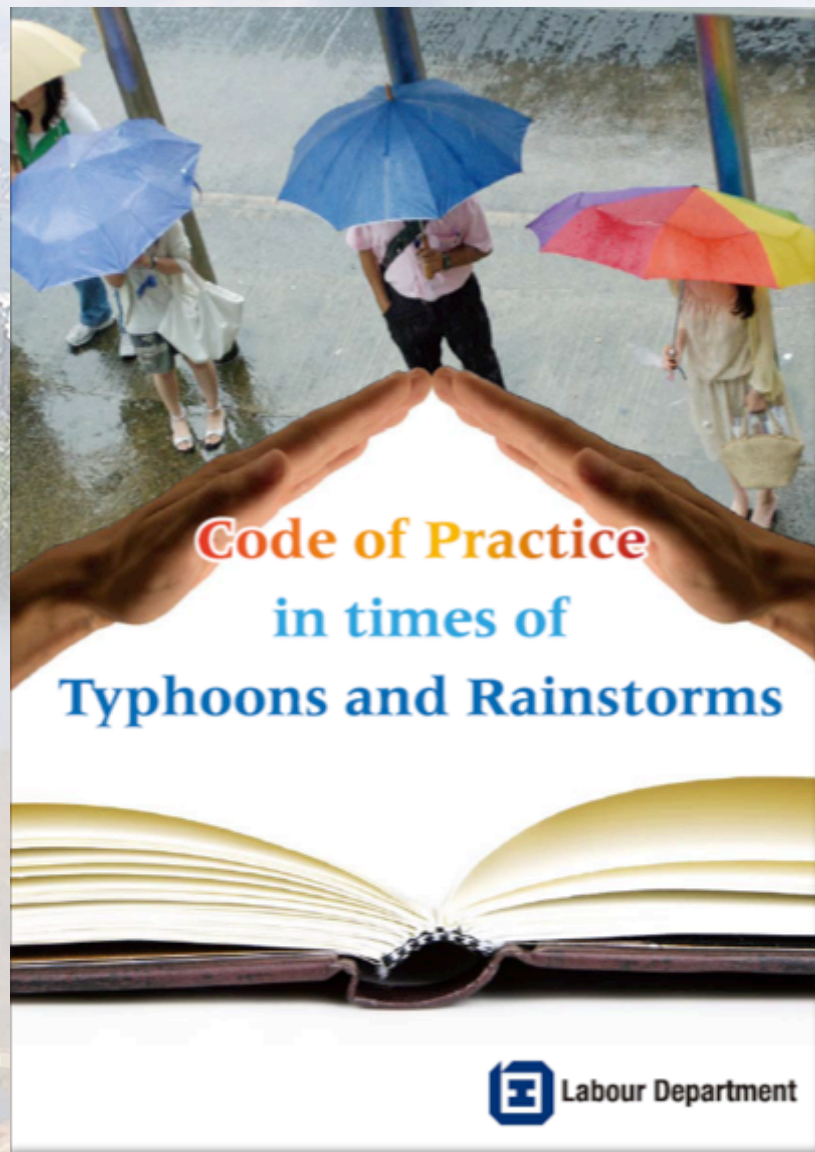
The Hong Kong Observatory announces that the Tropical Cyclone Warning Signal Number 8 is expected to be issued at or before 6 p.m. today (23 Jul 2012). Winds locally will strengthen further.

**The Government advises members of the public with long or difficult home journeys or having to return to outlying islands to begin their journeys now.** The Government is now making arrangements to release its employees accordingly.

Announcement by the Education Bureau (EDB): **The EDB announces that classes of all schools are suspended today.** Schools should implement contingency measures to ensure the safety of students. They should ensure that conditions are safe before allowing students to return home.

Dispatched by Hong Kong Observatory at 15:45 HKT on 23.07.2012

# Labour Department



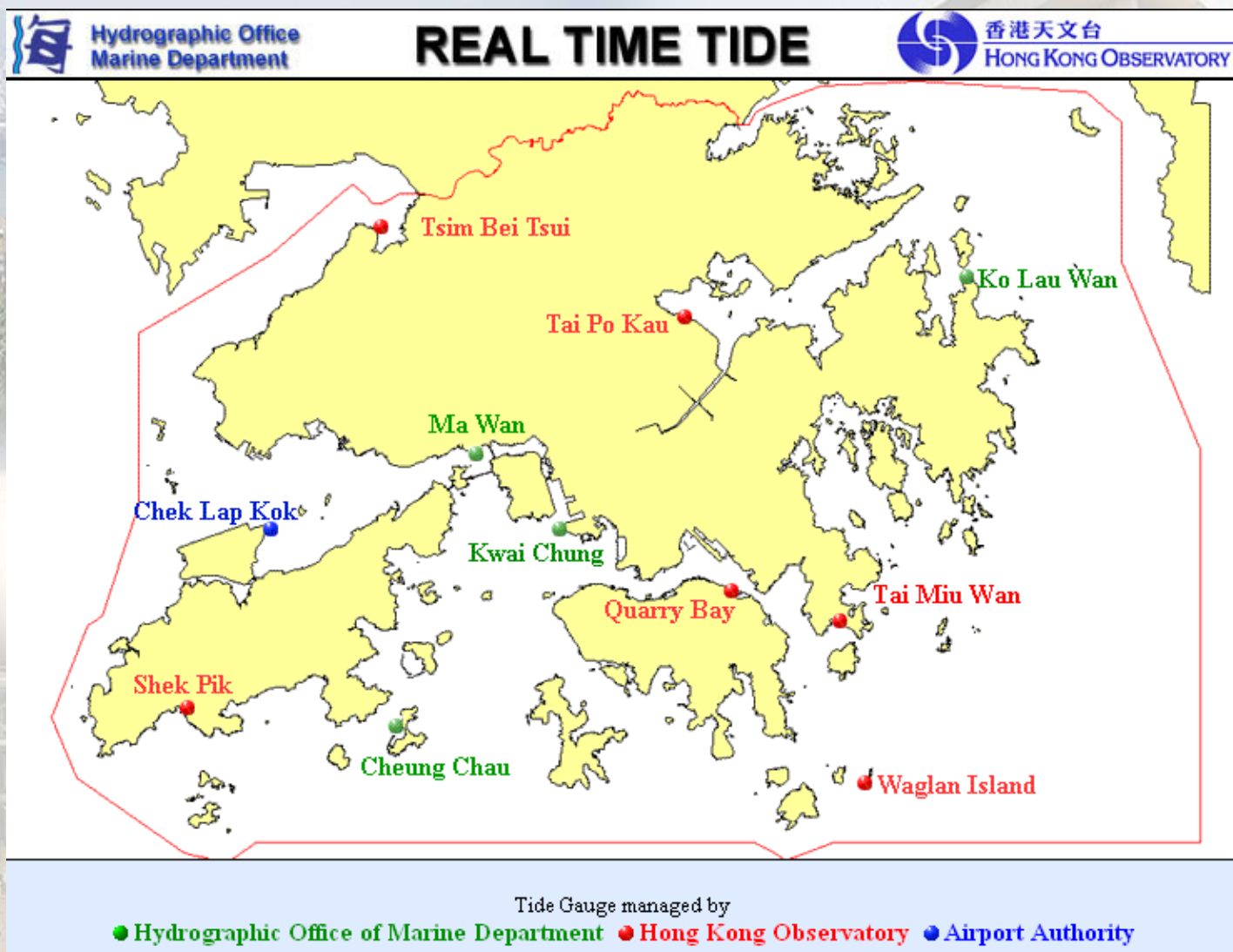




## Tsunami Warning

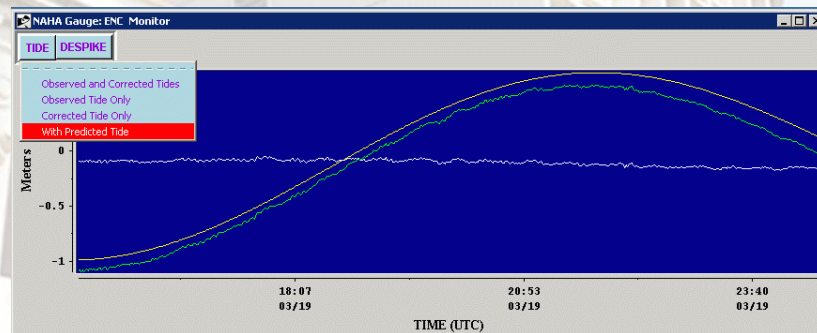
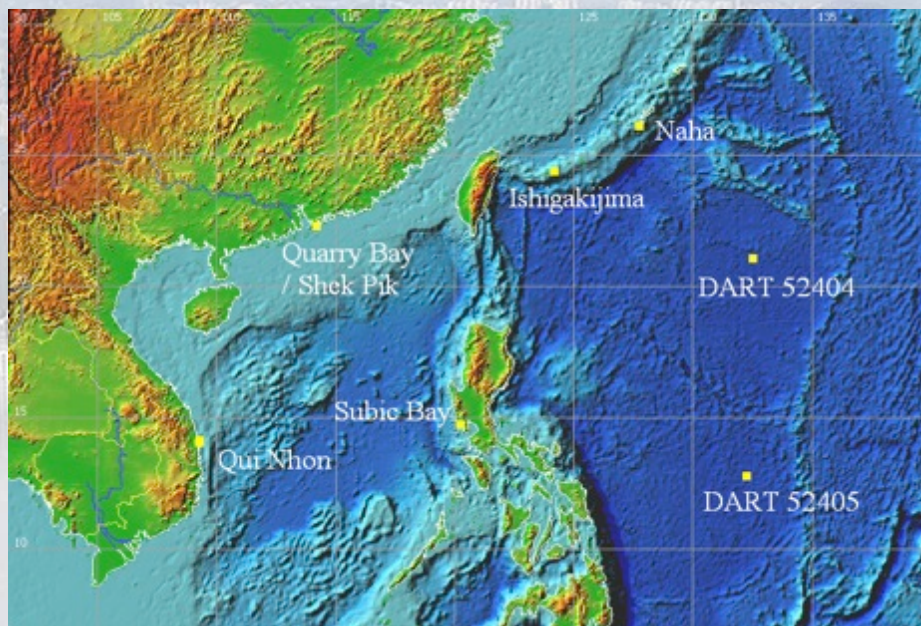
A severe earthquake is expected to generate or has generated a tsunami. If the tsunami persists, it would reach Hong Kong within 3 hours, and the height of the tsunami may exceed 0.5 metre above the normal tide level.

# Tsunami Monitoring in Hong Kong



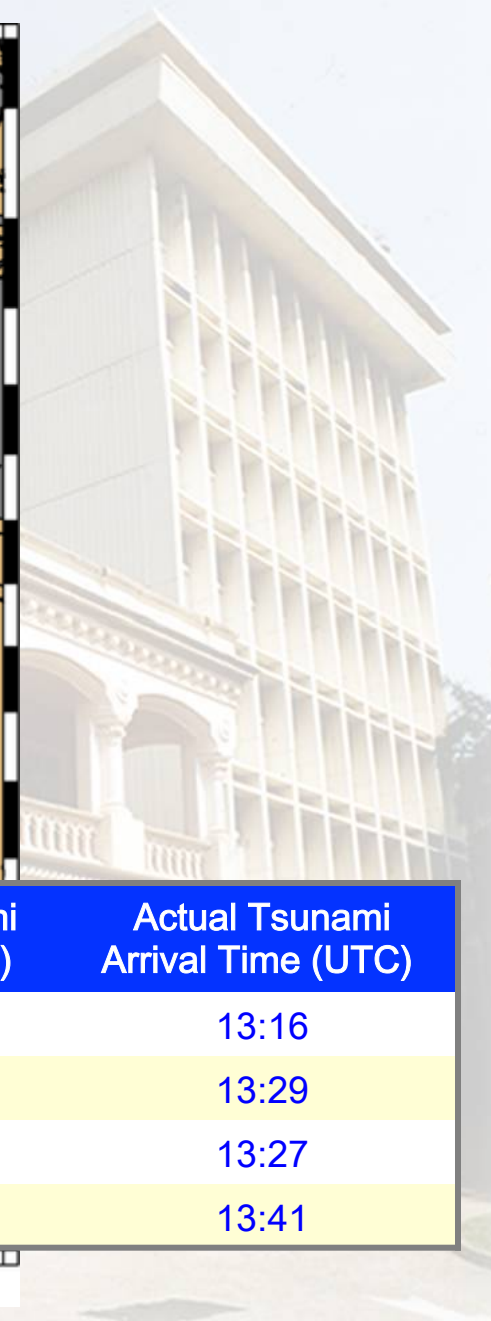
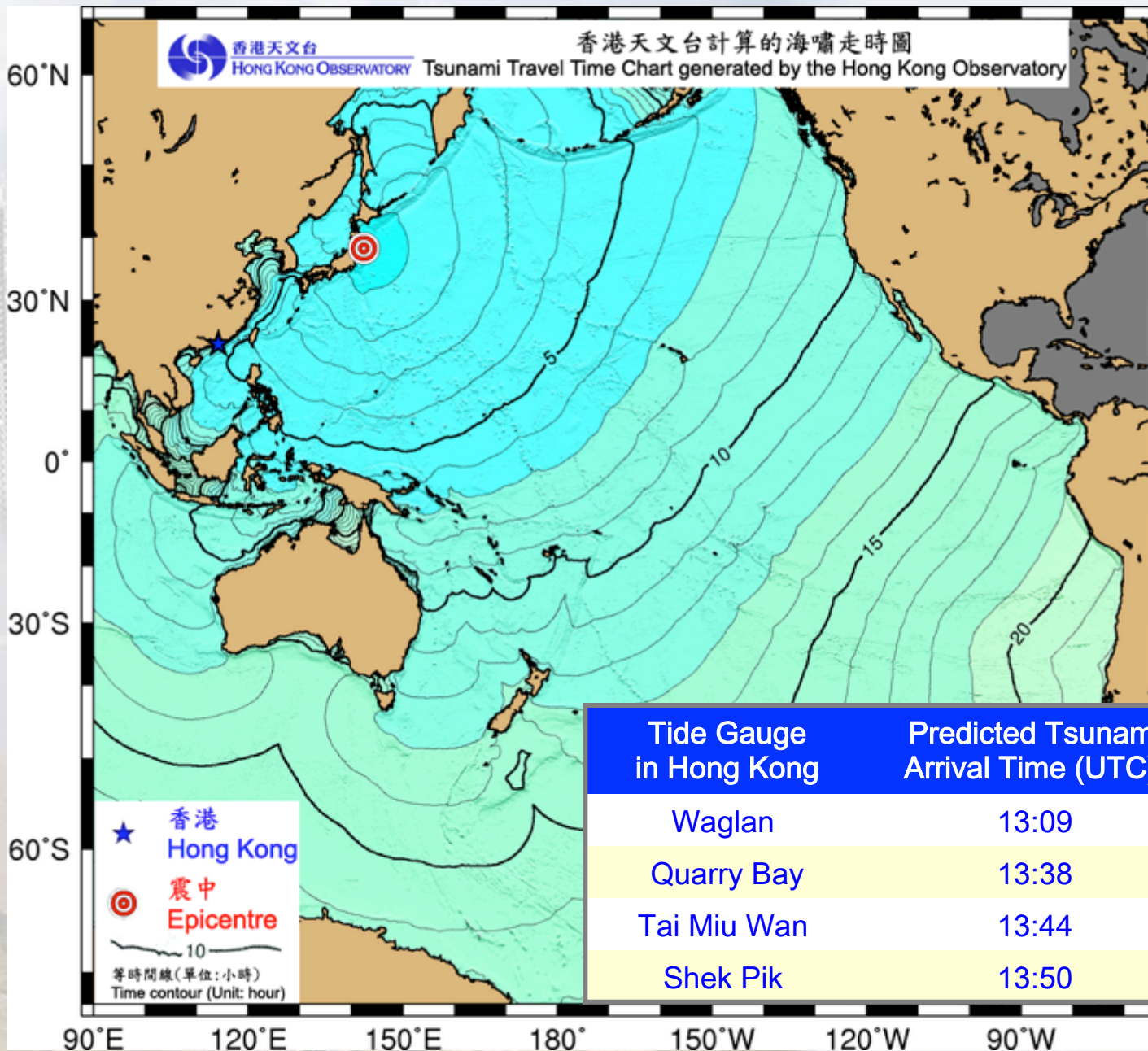


## Tsunami Monitoring in Hong Kong



Tsunami Monitoring Tool

# Tsunami Travel Time





# HKO Tsunami Warning

<u>Type of Warning</u>	<u>Tsunami height</u>	<u>ETA</u>	<u>Update</u>
Tsunami Warning	$\geq 0.5\text{m}$	$\leq 3$ hours	1 hour
Tsunami Information Bulletin	$\geq 0.5\text{m}$	$> 3$ hours	6 hours
	$< 0.5\text{m}$	$\leq 3$	1 hour
	$< 0.5\text{m}$	$> 3$ hours	6 hours

## Sample of Hong Kong Observatory Tsunami Information Bulletin

PRESS WEATHER NO. 170 - TSUNAMI INFORMATION BULLETIN

TSUNAMI INFORMATION BULLETIN

TSUNAMI INFORMATION BULLETIN



Tsunami Information Bulletin

TSUNAMI INFORMATION BULLETIN UPDATED BY THE HONG KONG OBSERVATORY AT 10:00 P.M. ON 11 MAR 2011.

A SEVERE EARTHQUAKE OF MAGNITUDE 8.9 OCCURRED NEAR THE EAST COAST OF HONSHU, JAPAN AT ABOUT 1:47 P.M. ON 11 MAR 2011.

THE TSUNAMI GENERATED BY THE EARTHQUAKE MAINLY AFFECTS THE PACIFIC. AFFECTED BY THE TSUNAMI, THE SEA LEVEL IN PARTS OF THE TERRITORY IN HONG KONG ROSE SLIGHTLY IN THE PAST HOUR.

THE LATEST TSUNAMI HEIGHTS RECORDED IN HONG KONG:

ABOUT 0.1 M AT WAGLAN

ABOUT 0.1 M AT QUARRY BAY

ABOUT 0.2 M AT TAI MIU WAN



Recorded Tsunami height

IT IS EXPECTED THAT THE SEA LEVEL RISE IN HONG KONG WOULD BE LESS THAN HALF A METRE, WHICH IS MUCH LOWER THAN THE NORMAL DAY-TO-DAY TIDAL VARIATION OF ABOUT ONE METRE.

PRECAUTIONARY ANNOUNCEMENT:



Precautionary announcement

1. PLEASE STAY TUNED TO THE RADIO OR TELEVISION FOR FURTHER INFORMATION.

DISPATCHED BY HONG KONG OBSERVATORY AT 22:07 HKT ON 11.03.2011



# Sample of Hong Kong Observatory Tsunami Warning

## Tsunami Warning

[Issuance or Update]

Tsunami Warning *\*issued/updated* by the Hong Kong Observatory at \_\_\_\_\_ *\*a.m./p.m.*  
on \_\_\_\_\_.

A severe earthquake of magnitude \_\_\_\_\_ occurred \_\_\_\_\_ at about \_\_\_\_\_  
*\*a.m./p.m.* on \_\_\_\_\_.

# It is not certain whether a tsunami has been generated but precautions should be taken for the sake of safety.

# The earthquake *\*is expected to generate / has generated* a tsunami that affects the South China Sea. *If the tsunami persists, it would reach Hong Kong around \_\_\_\_\_  
\*a.m./p.m. and recur at intervals of 5 to 60 minutes. In the \* couple of / few hours following the arrival of the tsunami, sea levels in Hong Kong would rise to about \_\_\_\_\_ - \_\_\_\_\_ metres above chart datum, or equivalently about \_\_\_\_\_ - \_\_\_\_\_ metres above normal tide level. Flooding may occur in low-lying coastal areas. Precautions should be taken for the sake of safety.*

# A tsunami generated by the earthquake is now affecting Hong Kong. Tsunami waves would recur at intervals of 5 to 60 minutes. In the next *\* couple of / few hours*, sea-levels in Hong Kong would be about \_\_\_\_\_ - \_\_\_\_\_ metres above chart datum, or equivalently about \_\_\_\_\_ - \_\_\_\_\_ metres above normal tide level. Flooding may occur in low-lying coastal areas. Precautions should be taken for the sake of safety.

# [customized]

\* The predicted normal tides today are:

High water \_\_\_\_\_ metres at \_\_\_\_\_ *\*a.m./p.m.*

Low water \_\_\_\_\_ metres at \_\_\_\_\_ *\*a.m./p.m.*

\* Tsunami heights recorded around the ^ the Pacific / South China Sea / Hong Kong:

Tsunami Warning

Arrival Time of Tsunami and expected tsunami height

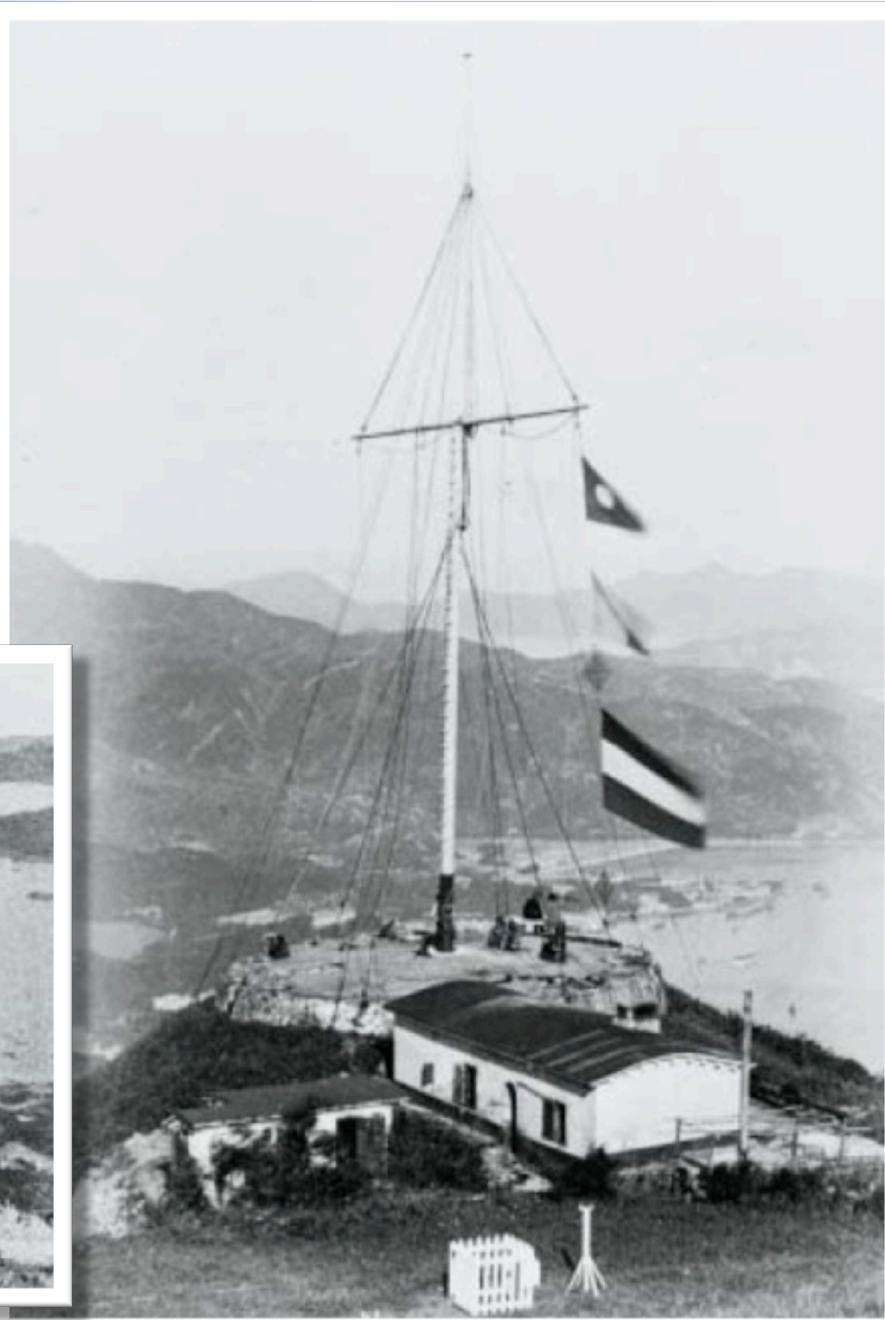
High / Low Tide level

Recorded tsunami height

# Precautionary Measures

- Stay away from shores, beaches and low-lying coastal areas. If you are there, move inland or to higher grounds. The upper floors of high, multi-storey, reinforced concrete building can provide safe refuge if there is no time to quickly move inland or to higher grounds.
- Do not engage in water sports.
- Vessels should stay away from the shore or shallow waters. If vessels remain moored in typhoon shelters, their moorings should be doubled and all personnel should leave the vessels and head for higher grounds.
- Please observe these precautions until the Observatory cancels the tsunami warning.
- Please stay tuned to the radio or television for further information.











# Deliver the warning message effectively

- Significance of warning = transmit + communicate
- Take care to the public
  - Disadvantaged groups
    - Simplify
    - Visualize (symbol, number/color), trigger public actions
  - Special clients
  - Smartphones, internet
  - Real time observation for the individual risk assessment and decision making



# Weather Information Dissemination to the General Public



Dial-a Weather (free)  
(1878200)



Internet  
(webpage, twitter, youtube)



General  
Public



TV, radio



Mobile phone  
(iPhone, Android, WAP, SMS)



Fax



# Warnings in force : always shown on TV



# Re-definition of service models

Traditional

Internet website

Mobile platform

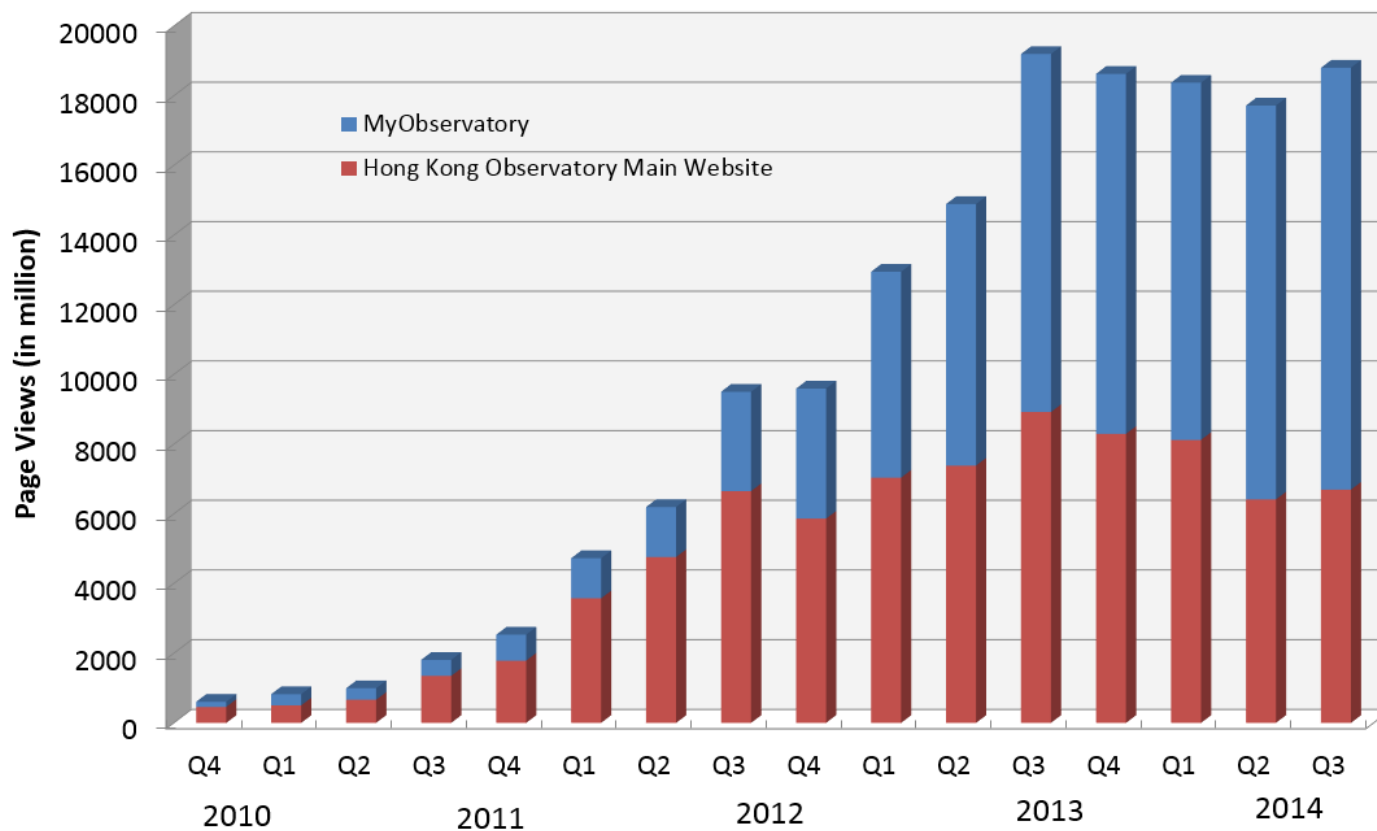


- Limited information
- Text/Audio format
- Spoon-fed with data

- Attractive and detailed
- Interactively “poll” the required information
- Multimedia
- Anytime and anywhere
- Personalized location service



## Statistics of MyObservatory and HKO Main Website



# Design of Warning System

Warnings with a heart

- Precautionary announcements
- The human touch



# “Graded” Warning System

- Enable the community to build up its response commensurate with the risk involved
  - Rainstorm warning



possibility of rainstorm of significant impact



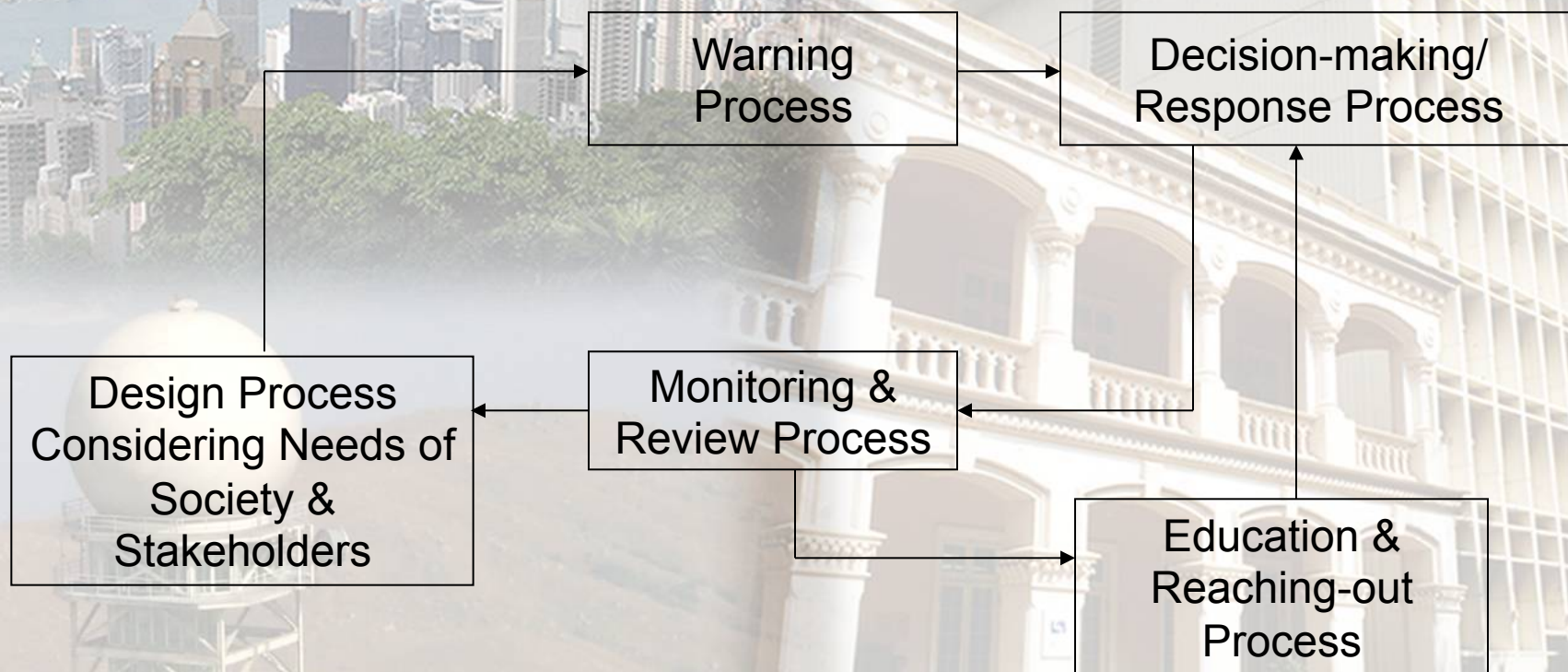
students should stay in safe places (home or school)



all should stay put and outdoor workers seek shelter indoors

Note: Beware the colours selected for a graded system

# Development of an Effective Warning System





# Contingency Plan for Natural Disasters for HK

## Emergency Support Unit, Security Bureau

- Manage the rainstorm, typhoon, tsunami etc. natural disasters
- Gather up and relate the duties and responsibilities to the government departments or other companies during natural disasters
  - *All departments already have the particular duties guideline*
- Flow of messages

Security Bureau Circular No. 3/2009

### CONTINGENCY PLAN FOR NATURAL DISASTERS

(INCLUDING THOSE ARISING FROM  
SEVERE WEATHER CONDITIONS)

Emergency Support Unit  
Security Bureau  
Government Secretariat  
July 2009

File Ref. SEC 8/2/12 Part 30

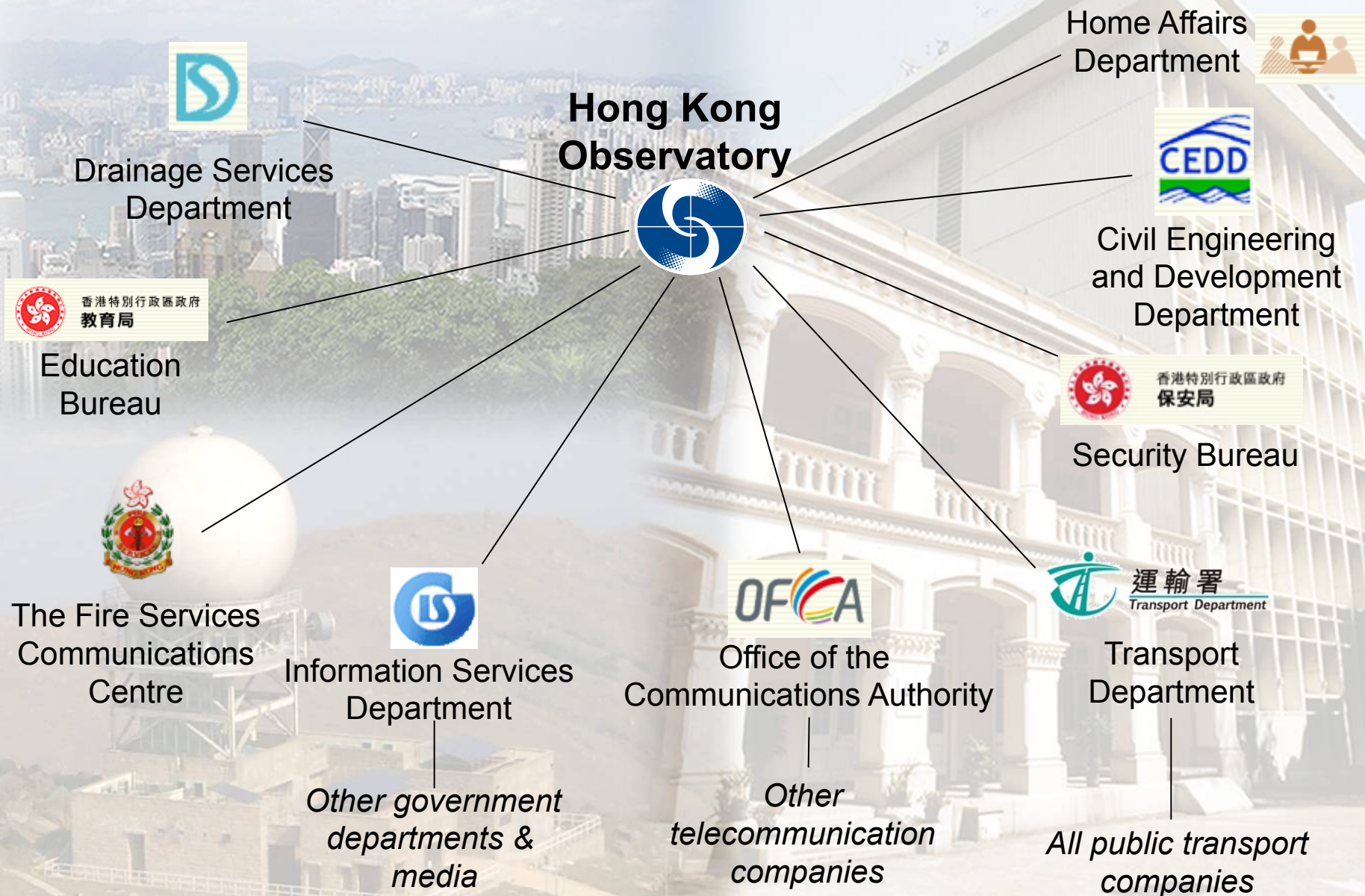
# Main Government Departments

- Security Bureau (Emergency Support Unit)
- Education Bureau (arrangement for the school suspension)
- Hong Kong Examinations and Assessment Authority (arrangement for Public Examinations cancellation)
- Transport Department (public transport arrangement)
- Civil Engineering and Development Department (landslip matters)
- Drainage Services Department (flooding management)
- Home Affairs Department (open up temporary shelters)
- The Fire Services (Rescue operations )
- Marine Department (Maritime Rescue)



# Dissemination System

## Relay of Warnings within the Emergency Response System



# Engaging Stakeholders

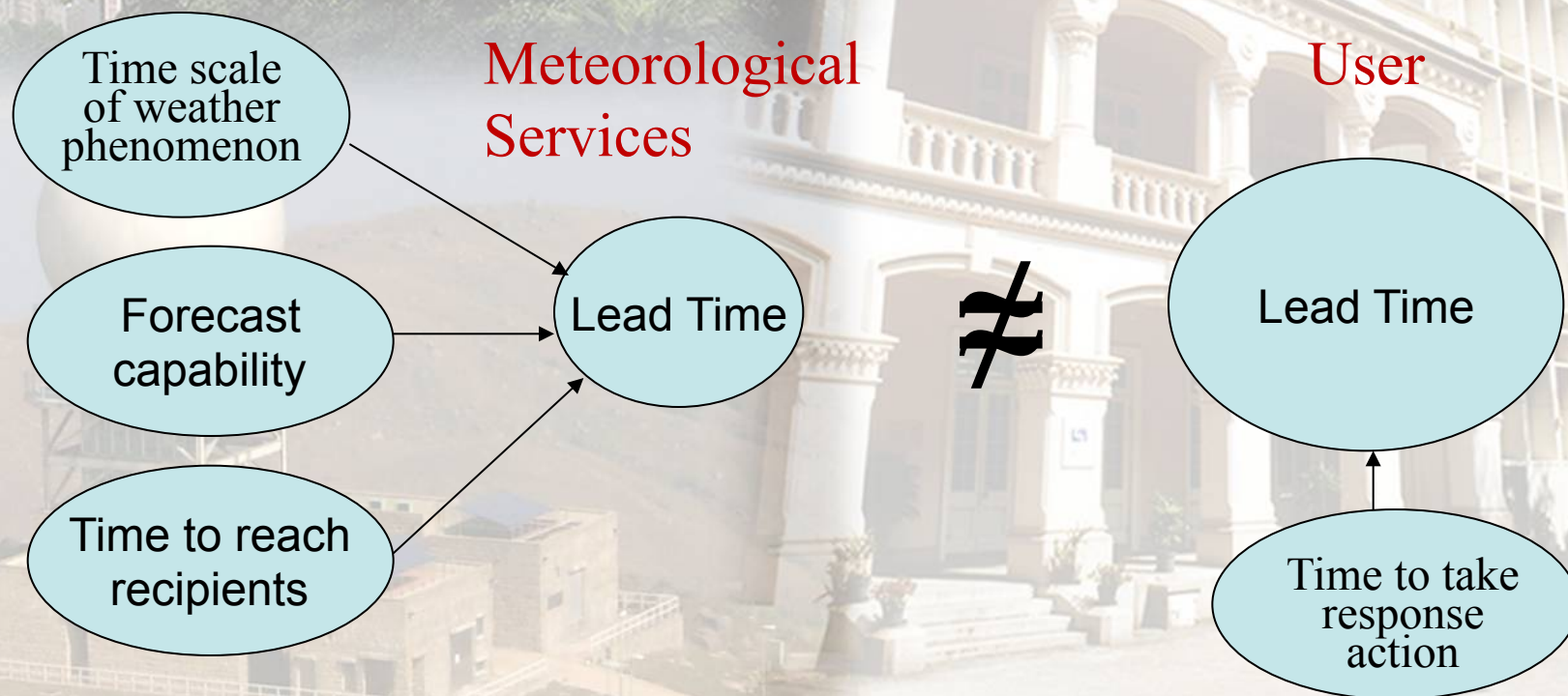
- Government Bureaux/Department
- Public utilities
- Media
- General publics

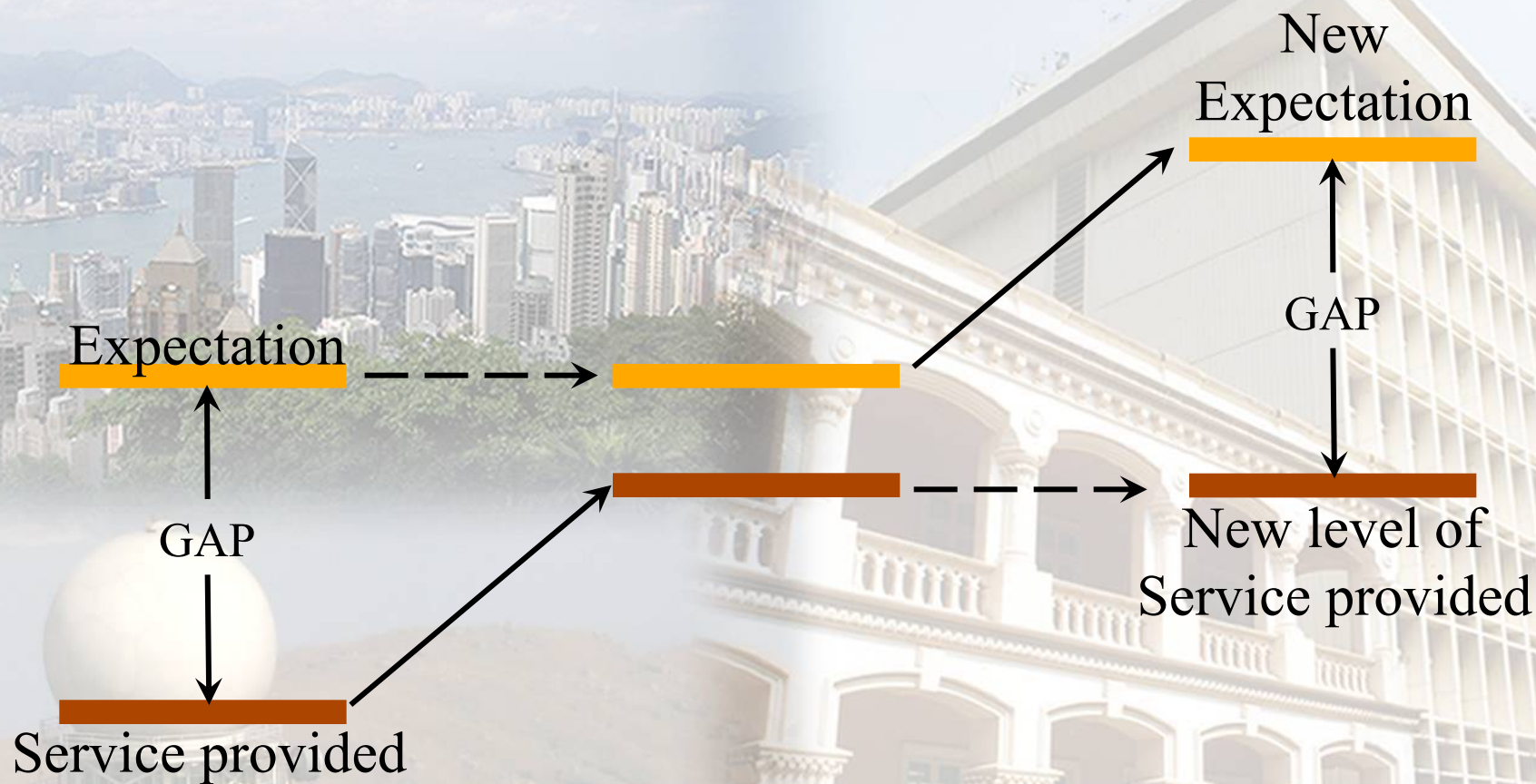




# Warnings should be Timely

- Depend on how the recipient evaluates the product
- User expectation managed through education and outreach





Rising expectation cancels the effect of a rising level of service, maintaining the gap









# Government Departments

- Liaison Meetings (usually annually)
- Communication Exercises
- Drills
- Pre-wet Season Seminars
- Interflow Visits

# Liaison Meetings between Government Departments Well before the TC & Rain Season

- Liaison meetings with essential departments
  - Understand requirements, build up rapport, establish communication mechanism & content
  - Review procedures and revise operation manuals
- Pre-wet season seminars for all government depts
  - Review the content of warnings and relevant precautionary measures
  - Introduce new services
  - Collect opinions





# Liaison Meetings between Government Departments

- Review existing procedures
- Propose new initiatives or requirements
- Update contact list
- Promote better working relationship
- Arranging Communication Exercise / Drill
- Outlook for the year: El Nino/La Nina, no. of TCs, annual rainfall





# Tai O Early Storm Surge Alert System





Storm Surge generated by Typhoon Utor lead to serious flooding at Tai O, Hong Kong in 6 July 2001 (right)



Storm Surge generated by Typhoon Hagupit lead to serious flooding at Tai O, Hong Kong in 24 Sep 2008 (above)



Join government departments rescue drill at Tai O, Hong Kong, 2011 (right)



# Arrangement for Tai O Storm Surge Alert

## Installation of demountable flood barriers (擋水板) on the river-wall at Tai O

- ❑ Relevant construction by Civil Engineering and Development Department (CEDD) completed
- ❑ Drainage Service Department(DSD) is responsible for the installation of the demountable flood barriers





# Early Storm Surge Alert System (5 locations)



# Early Storm Surge Alert

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- When water level at any sites is/are predicted to exceed the corresponding threshold **within 24 hours** at the time of running the storm surge model, **SMS alert** should be issue to **relevant DSD engineers & HAD DOs**



# Tai O Storm Surge Rescue Drill







渠務署外判承包商在其中一个易受风暴潮引起水浸的地区放置沙包



# Media / Journalists

- Liaison Meetings (usually annually)
- Luncheon - Informal gathering
- Training for Journalists

# Media

- Publicize **success stories**
- Create good **relationships with media** and develop media packages for media to publicize meteorological and hydrological knowledge







**Luncheon / Training Course for the journalists**



# Liaison Meetings with Special Communities

- Aviation Community
- Shipping Community
- Fishermen Community





# General Public

- Pamphlets on weather warnings
  - Meanings
  - Response actions
- Precautionary announcements included in warnings to advise response actions



# General Public

- Email / Letter / Phone Call
- Media
- Webpage for Collecting Suggestions
- Friends of the Observatory – Think Tank
- Open Day - Interview
- Public Opinion Survey (Apr/Oct twice a yr)
- Pamphlets
- Announcements of Public Interest



# Meteorological Services have to work on both science and human aspects



~ Thank you ~

