



Overview of Shanghai MHEWS and the role of NMHS

Dr. Xu TANG

Mr. Yongjie ZOU

- 1. Shanghai Regional Meteorological Center,
China Meteorological Administration*
- 2. Emergency Response Management Office,
Shanghai Municipal Government*

Second Experts' Symposium on MHEWSs with focus on the Role of NMHSs

5-7 May 2009, Toulouse, France

Outline

1. Government and Institutional legislative Arrangements
2. The Threat, Risk Information Utilization, and Warning Standard Development
3. The Role of SMB in ERMS and the Cooperation and Coordination in MHEWS in Shanghai
4. Technical Support for EWS: 4 + 1 Platforms Development , and Future Steps
5. Lessons, Practices, and Experiences Summary

Multi-Hazard Early Warning in Chinese History



A signal fire on the Great Wall was used in the 7th century BC. The earliest form of an Early Warning System in Chinese history.



The weather signal tower at the Bund was established in 1908, issued weather warnings to ships and boats.



To transmit emergency warning from Great Wall in ancient China by releasing a signal fire. burning dried dejecta of wolf at the tower of the Great

Wall



The Chinese government pays great attention to MHEW through multi-agency cooperation



*“It is important to perfect through **multi-agency participation**, a (1)disaster prevention mechanism which covers **multi-hazard early warnings, multi-agency coordination and cooperation**, as well as regional joint defense. It is also necessary to perfect a (2)**multi-hazard detection warning mechanism** and a (3)decision-making coordination mechanism (4) an action mechanism on replying climate change through extensive public participation.”*

Chinese president Hu Jintao, 27 June, 2008

*“It is necessary to strengthen cooperation between related departments, such as **weather, water, civil administration, land resources, agriculture, forest and transportation, etc.** furthermore, a new weather disaster prevention and mitigation pattern needs to be established under the leadership of government, implemented by **multi-agency coordination and cooperation**, and participated by the whole society”.*

The Deputy Premier of State Council Hui Liangyu Speech at the China Weather Disaster Prevention and Mitigation Meeting in 2007



The Chinese government pays great attention to MHEW through multi-agency cooperation



*Under the guidance of WMO a cooperation agreement has been signed by the Shanghai municipal government and the CMA to implement **a demonstration project for a multi hazard early warning system** to fully promote the capabilities of a DPM and emergency response in Megacities.*

*“Weather departments should play their role as **the first link in the chain of DPM in disaster detection and warning** and should continue to play a supporting role in prevention and mitigation, as well as rescue.”*

Shanghai Mayor, Han Zheng

*It is important to establish multi-agency cooperation at all levels to perfect mechanisms for **multi-hazard detection and warning** as well as regional joint-defense prevention to actively push forward the development of **the Shanghai Multi-hazard EWS**.*

*Quoted from the 2009 Annual Report,
Administrator of CMA, Dr. Zheng Guoguang*



Multi-agency Coordination and Cooperation Legislative Arrangements in China

Chinese law has identified the responsibilities of government administrative departments in response to disaster emergency and multi-agency coordination and cooperation activities. For instance,

'The Public Emergency Response Law of China' regulates: Under the unified leadership of the country, the emergency response management system should be established through comprehensive coordination, classified management, responsibilities according to different levels and local management.

'The Flood Control Law' regulates: Weather, hydrology, maritime and other related departments are responsible for providing the flood control command agency with real-time information of hydro-meteorology, storm surge forecasts should be delivered in a timely fashion. Furthermore, departments such as telecommunications, transportation, electric power and material supply should prioritize supporting flood control efforts.

'Meteorological Law' regulates: Weather departments at all levels should organize joint detection efforts in forecasting serious disastrous weather with other departments in different regions across the country. They must also provide disaster prevention measures, assessments and analysis on the impact of the weather disaster, in order to provide local governments with information which could be helpful in the decision-making process.

Shanghai Congressional Directives Concerning Multi Agency Coordination in Weather DPM

---- Weather departments should provide special services through multi agency cooperation involving government departments such as:

- *Agriculture*
- *Flood Control*
- *Fire Control*
- *Environmental Protection*
- *Public Health*
- *Harbor and Maritime management*
- *Fisheries*
- *Traffic and Transportation*
- *Police*
- *Civil Administration*
- *Tourism*

---- **Communications departments** such as Radio, Television and the official government website for the city of Shanghai as well as **Transportation operators** such as airports, railways stations, harbors, tourist attractions and traffic control must follow the directives of the weather department and provide resources to facilitate the distribution of **early warning information in a timely fashion.**

---- In terms of lightning disaster prevention **all enterprises, social groups or organizations** (such as schools and community centers), should also follow the advice of the weather department.

Structure of The National Emergency Management Organization and The Emergency Preparedness and Planning System

Multi-agency joint efforts in warning and prevention

Technical Support

Natural Disaster
Emergency Response

Accidental Disaster
Emergency Response

Public Health
Emergency Response

Actions

- Civil Defense
- Flood Control
- Public Security
- Fire Control
- Public Health
- Environmental protection
- Safe Production
- Supervision
- Meteorology
-

Guidelines

Provincial General Emergency
Preparedness and Planning

Special Emergency Preparedness
and Planning through multi agency
cooperation

Emergency Preparedness
and Planning by National Ministries

Management
Support

Multi-agency
Response
Mechanism

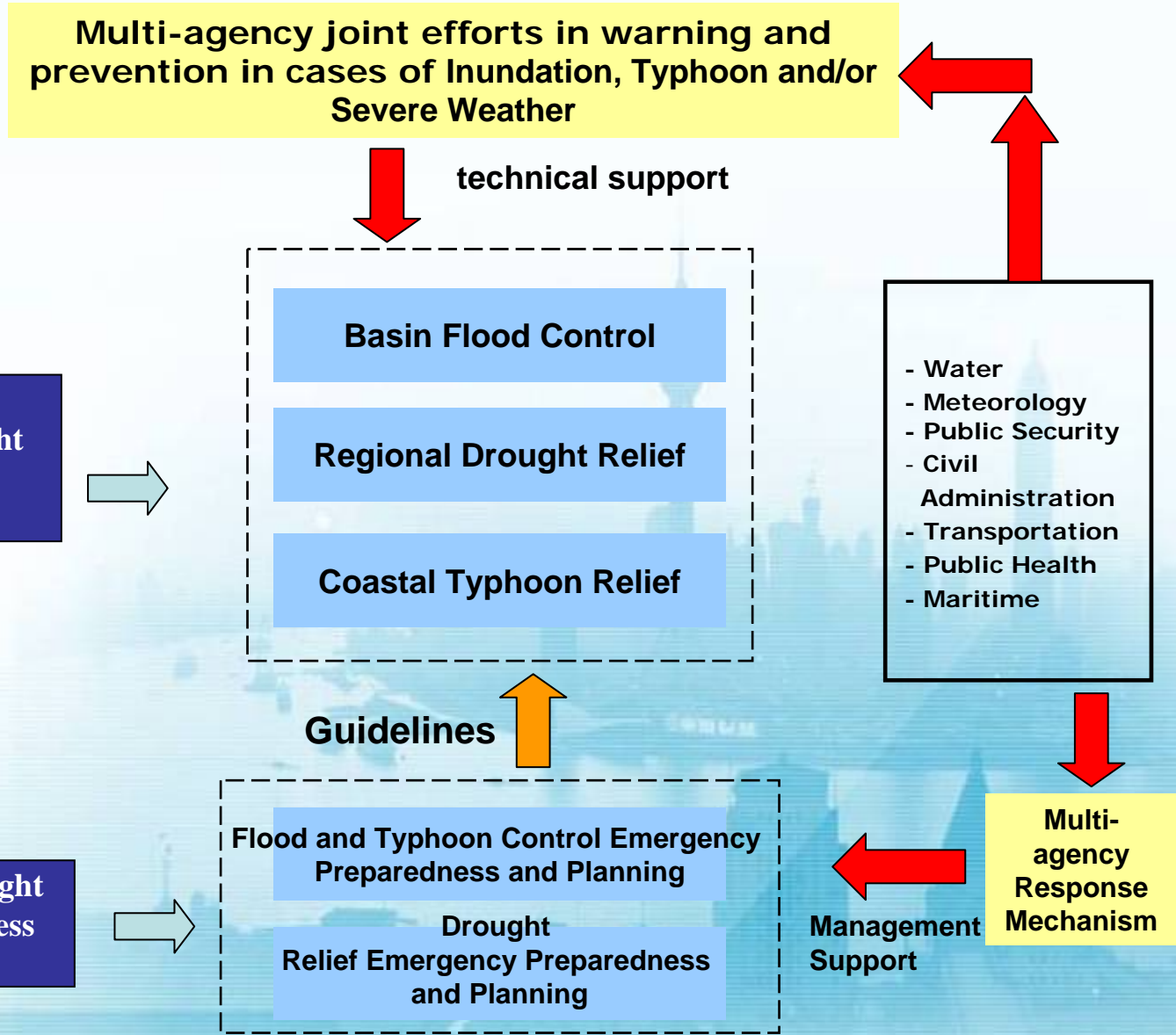
State Emergency
Response
Management System

State Council
Emergency
Response Office

State General Emergency
Preparedness and Planning

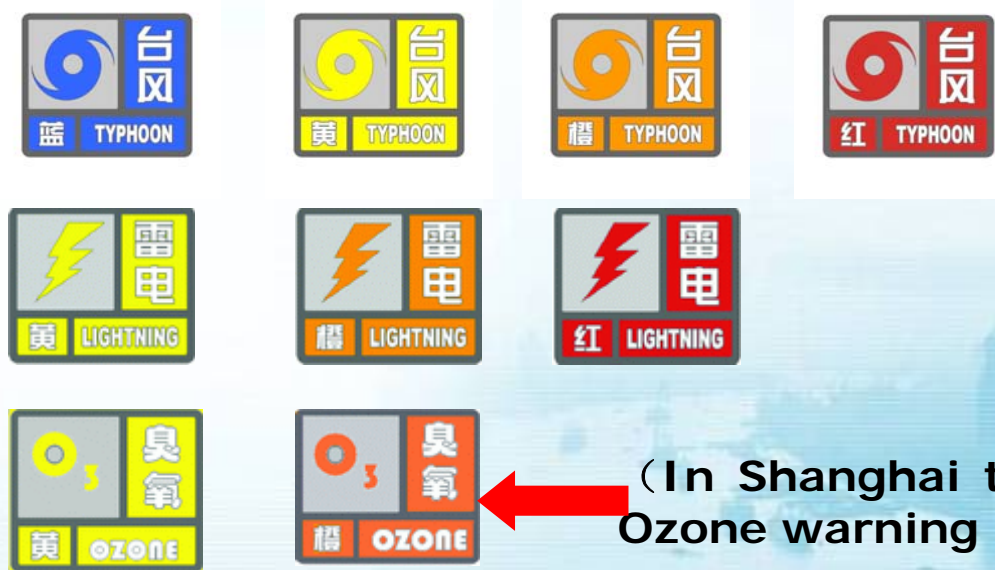
Example of Natural Disaster Emergency Response at National Level:

Flood Control and Drought Relief



The role of CMA in the EWS in association with Multi-agency Response for the DPM

The CMA issues 14 categories of warning signals: Tropical Cyclones, heavy rain, heavy snow, cold surges, strong wind, dust, heat waves, droughts, thunder and lightening, hail, frost, heavy fog, haze, icy roads.



(In Shanghai there is also an additional Ozone warning bringing the total to 15)

The CMA plays a vital role in the planning of *regional development by providing natural disaster risk assessment information* to industries and organizations. The CMA is required by the Central Government to create *weather disaster prevention planning for Multi-agency implementation*.

The role of CMA in the EWS in association with Multi-agency Response for the DPM

The CMA has signed over 15 agreements with several other ministries to prevent and mitigate the impact of severe weather and related disasters.



Outline

1. Government and Institutional legislative Arrangements
2. The Threats, Risk Information Utilization, and Warning Standard Development
3. The Role of SMB in ERMS and the Cooperation and Coordination in MHEWS in Shanghai
4. Technical Support for EWS: 4 + 1 Platforms Development , and Future Steps
5. Lessons, Practices, and Experiences Summary

Threat of Multi-Hazard to Shanghai

Shanghai is a mega-city situated on the shores of the East China Sea and the Yangtze River Mouth:

a) dense population——

population: 20million

area: 6,340 square kilometers

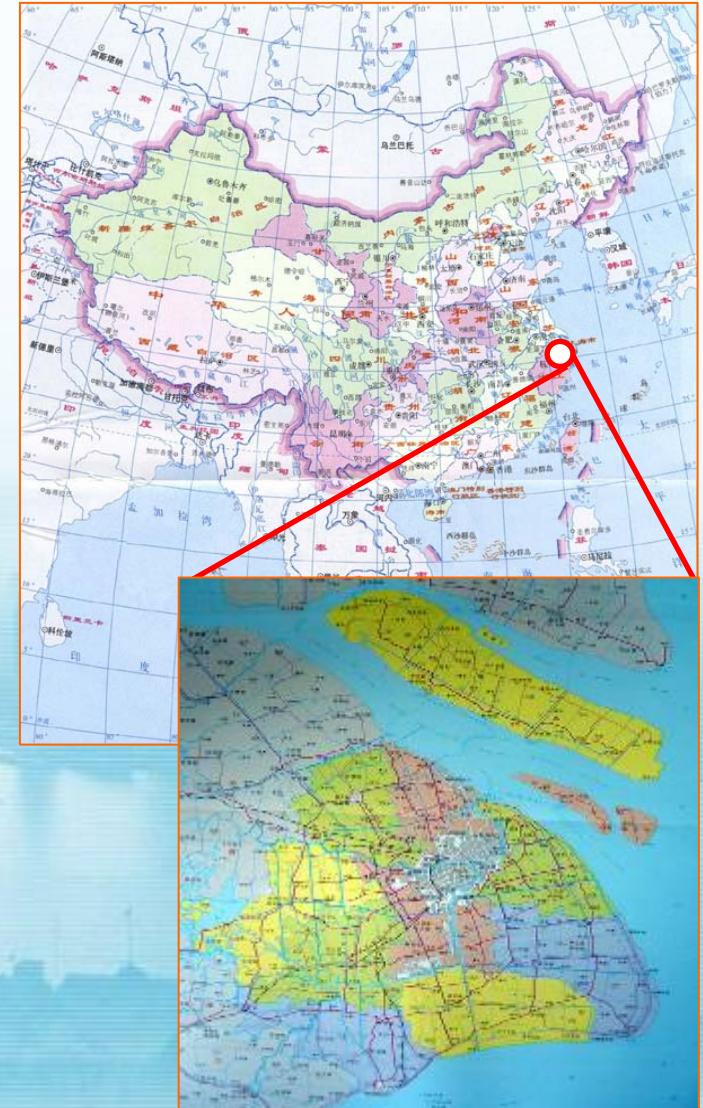
b) built-up structures——

20-plus-story buildings: >1600

30-plus-story buildings: >200

c) rapid economic development——

double-digit GDP growth for 14 consecutive years, before 2007.





**The National Financial,
and Transportation
Centers**



**International Financial Centre
of China**



Threat of Multi-Hazard to Shanghai

Shanghai is frequently affected by natural hazards such as **typhoon**, **severe convection**, **heavy fog**, **heat-wave**. Severe weather hazards may bring many other disasters, which further threaten city safety. Weather factor resembles the first piece of domino, and will impact other aspects of social activities.

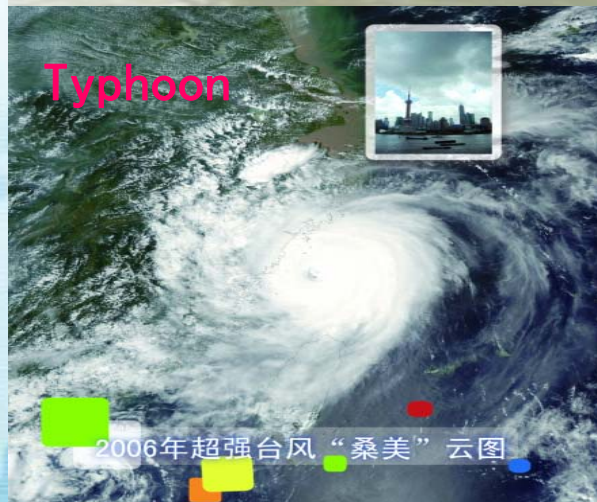
Rainstorm



Lightning



Typhoon



Fog



Threat of Multi-Hazard to Shanghai

Hazards	Introduction	Climate Average (Yearly)
Typhoon	Almost every year Shanghai suffered the Pacific tropical cyclone attacks, during 1949-2002 186 tropical cyclones affected shanghai with strong winds, heavy rains, storm surges and other disasters.	2 to 3 times.
Severe Convection Weather	Severe Convection Weather mainly occurs in the outskirts (county), sudden and destructive with a lot damages.	18 times .
Heavy Fog	Mainly occurs in spring and winter, have great impact on the air quality and traffic.	39 days
Heat wave	The high temperature days (higher than 35) is about 9 in normal years with 20-30 days in abnormal, may affect the city water and electricity supply, agricultural production and livelihood of the people.	9 days.

Comprehensive Characters of the Hazards in Shanghai

Regional Cross Effect :

- Due to severe weather exerts its impact from one place to another successively , inter- and intra-regional response is required.

Catenation Effect:

- Original and Derivative hazards.

Magnification Effect: (Reduction effect through enhancing the capacity of MHEWS)

- A normal climate event can trigger high impacts or even heavy losses in a mega-city.

Social Domino Effect:

- Natural hazards can cause accidents, abnormal public sensation and social security problems.

Social Demands in Safety Support for Big Events in Mega cities

Time: May 1 to Oct 31, 2010 World Expo (the main period of high impact weather)

Theme: Better City, Better Life

Objective: To attract more than **200** official participants and **70** million visitors



城市,让生活更美好



Better City, Better Life

Multi-Hazard Classification

According to the latest statistics, about 90% of the natural disasters in Shanghai were of meteorological and its associated hazards.

Three Categories of Hazards in Shanghai

I

Weather and Climate Hazards

Typhoon,
Severe Convective Weather,
Heavy Rainfall,
Heavy Fog,
Snow and Icing Weather

II

Weather- and Climate-related Hazards

Storm Surge,
Urban Inundation,
Heat Wave and Human Health,
Epidemic Diseases,
Bacterial Food Poisoning, Strong Haze and Air Pollution,
Transportation, Energy Consumption,,
Aeronautic Hazard

III

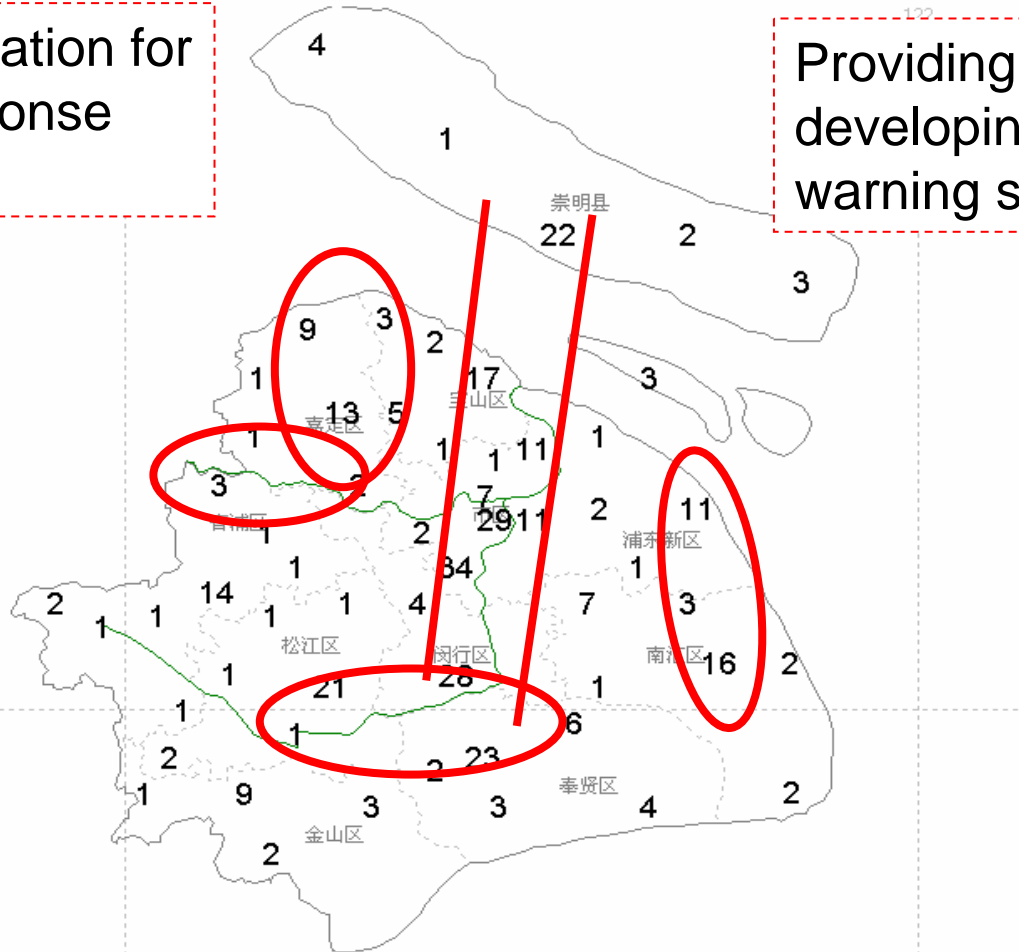
Other Hazards

e.g. Earthquake,
Accidental Disasters
Chemical Gas Leak

Risk Information Utilization: Severe Convective Weather (1)

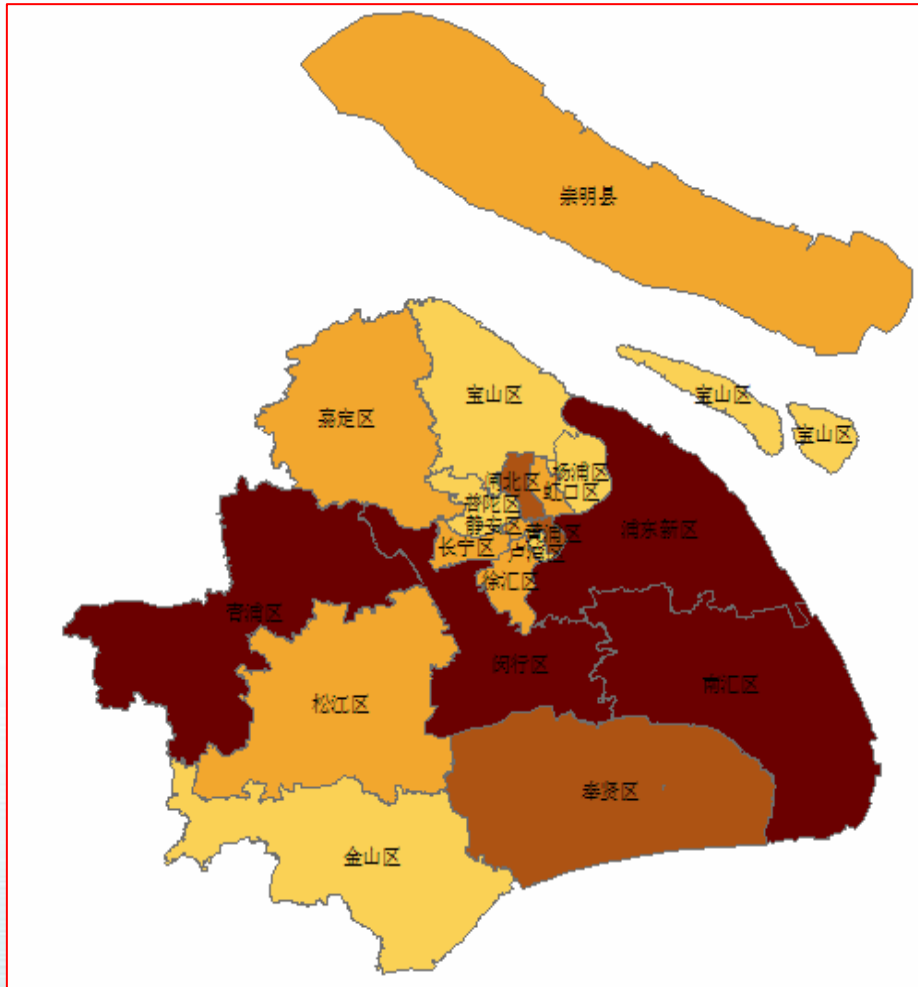
Providing information for emergency response planning.

Providing information for developing spatial warning standard.



Distribution of severe convective weather in Shanghai (1994-2004)

Risk Information Utilization: Lightning Threats (2)

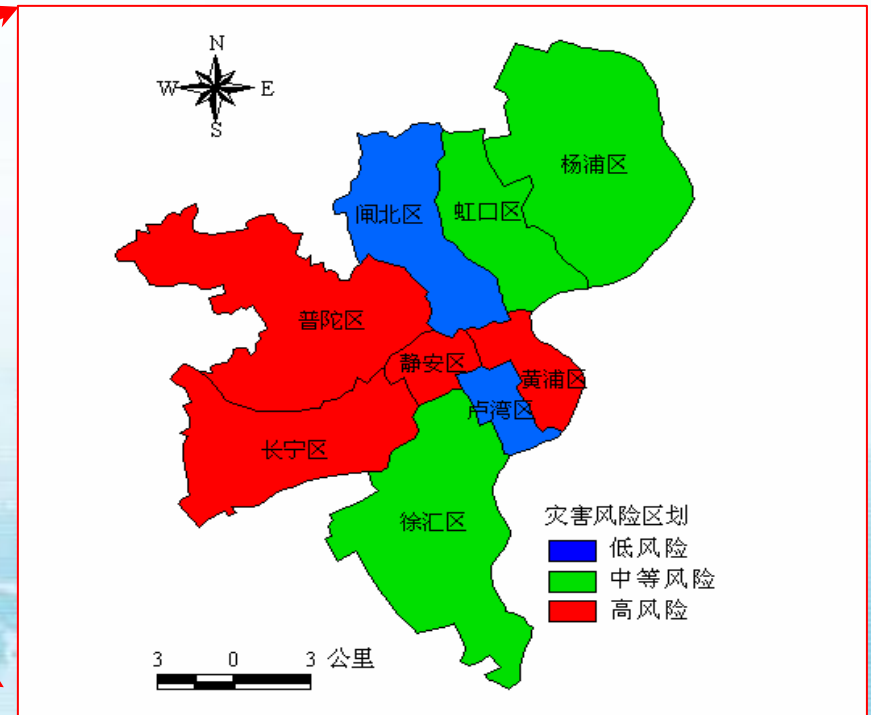
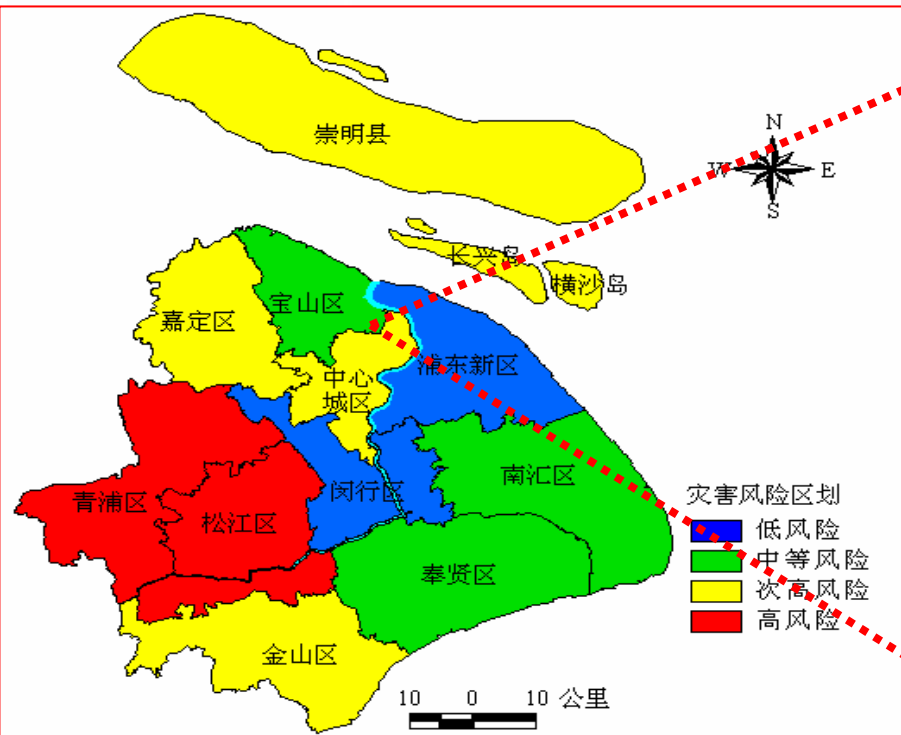


Lightning Risk Map

- **Factors:**
 - Historical lightning disasters;
 - Historical lightning and thunderstorm data
 - Exposure Information

Risk Information Utilization: Torrential Rain and Flood (3)

Factors such as regional total rainfall, drainage capacity, vulnerabilities were integrated to get the comprehensive risk map.



Flood risk map (Shanghai)

Flood risk map (City Centre)

The flood risk map contributes to:




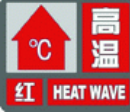



- Guidelines for land use planning and strengthening the capacity buildings for special regions.
- Directions for multi-agency cooperation and coordination in DPM for special regions.

Risk Information Utilization: Potential Risk Identifications Provided by Different Agencies (4)

- **The Safety Administration:** The distribution of information related to dangerous chemical sources (For example: in Jingshan District) .
- **The Real Estate Department:** Data on buildings and houses which are vulnerable to disasters.
- **Shanghai Meteorological Bureau:** A risk identification project for weather disasters
- ...



Risk Information Utilization: *warning standard development and warning improvement in Shanghai (5)*

Hazards	Symbol
Typhoon	
Rainstorm	
Snowstorm	
Heat wave	
Drought	
Cold wave	
Gale	

Hazards	Symbol
Lightning	
Hail	
Frost	
Heavy fog	
Haze	
Road icing	
Sand storm	
Ozone	

Risk Information Utilization: Contributions to EWS (6)

- **Risk information providing:**
 - Basic information for disasters impact model development;
 - warning standard development and warning improvement
 - Information for emergency planning;
 - Directions on multi-agency cooperation and coordination in special zones;
 - Basic information for land use planning.

Outline

1. Government and Institutional legislative Arrangements
2. The Threat, Risk Information Utilization, and Warning Standard Development
3. The Role of SMB in ERMS and the Cooperation and Coordination in MHEWS in Shanghai
4. Technical Support for EWS: 4 + 1 Platforms Development , and Future Steps
5. Lessons, Practices, and Experiences Summary

Role of Shanghai MHEWS in the Structure of the EMS



MHEWS

Role of Shanghai MHEWS in the Structure of the EMS



➤ **MHEWS**, as one of the 4 technical centers, provides technical support to the SERMP and guidance to decision-makers for Emergency events in Shanghai.

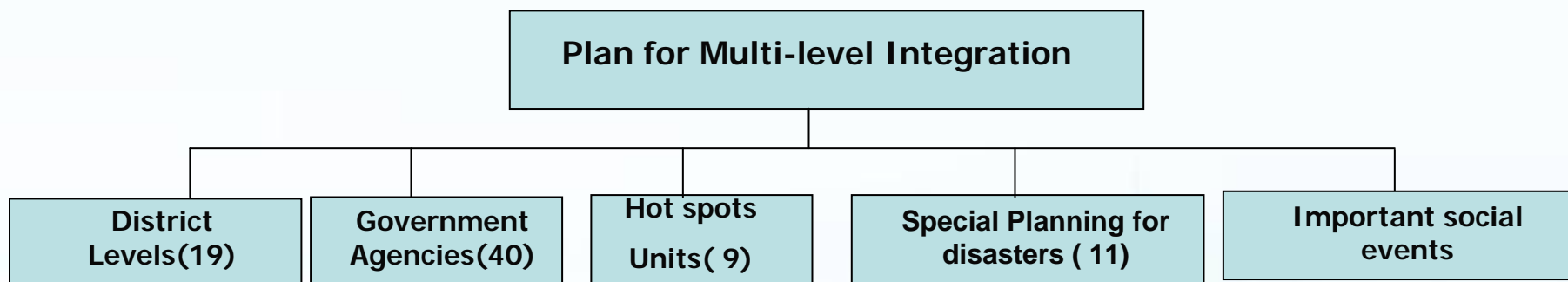
➤ The MHEWS warning dissemination platform also acts as the municipal-level platform for disseminating emergency response information.

Technical support

Management support

MHEWS

Preparedness plans for emergency response management



- *Shanghai has developed working plans for emergency preparedness and response.*
- ***Special working plan** for Emergency Preparedness and Response on Meteorological Hazards, such as **Heavy Fog, Snowstorm**, have been developed and issued at the end of last year. **Hot spots**, refer to the extremely important emergency management areas in the city, such as Yangshan harbor, Chemical Industry Complex, Subway stations, Airports, Railway Stations, Transportation Hubs, and Key Industries.*
- ***EMS** provide **management support** to multi-agency cooperation and coordination, Special working plans provide **detailed instructions** on multi-agency response.*
- *The most important role for **meteorological departments in DPM** are **monitoring and warning**.*

Organizational Structure for Implementing Plans

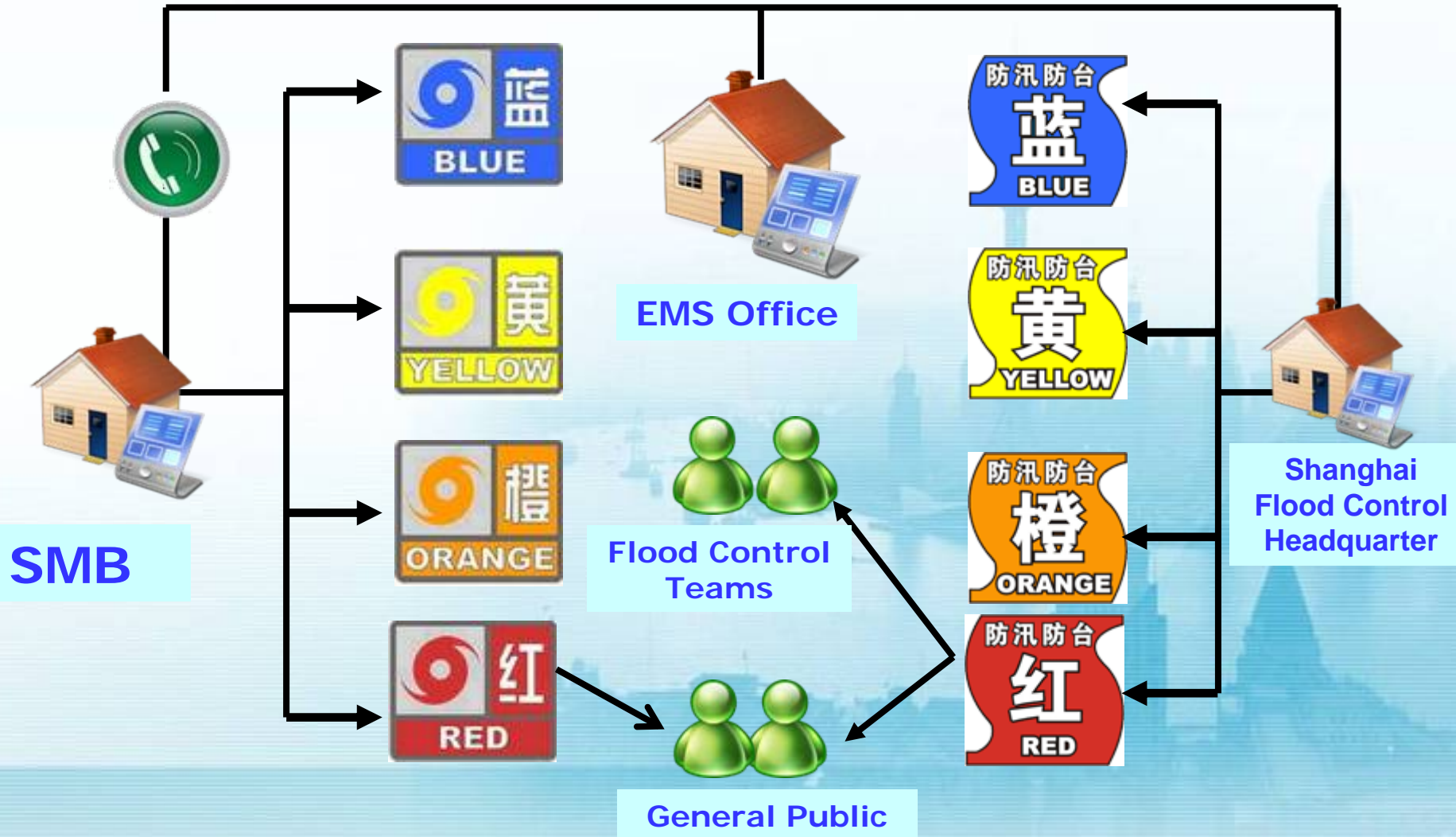


SMB is member of Emergency Management Committee, and responsible for:

- Lightning hazard emergency response*
- MHEWS construction*
- MHEWS daily operation*

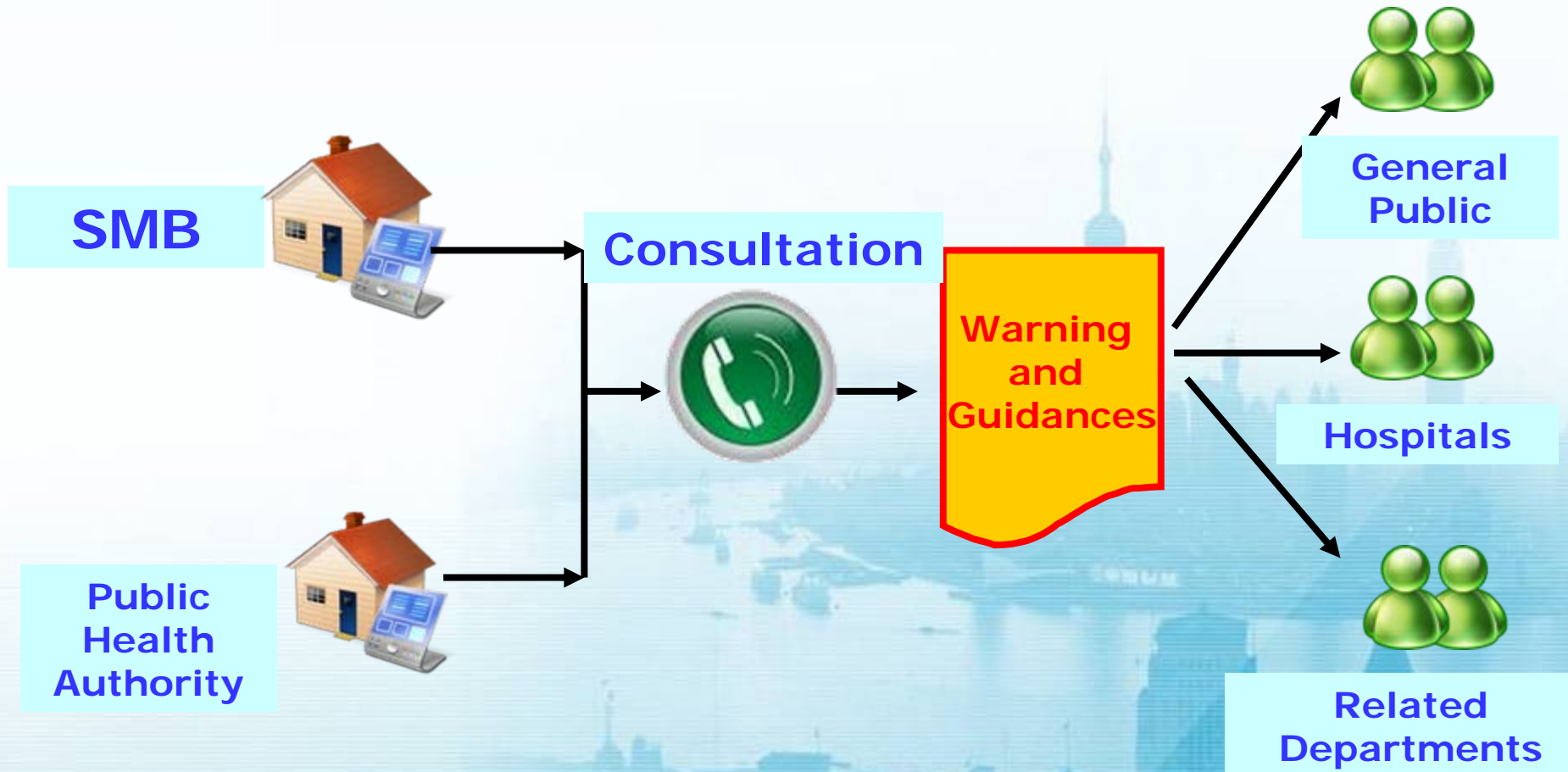
Coordination Mechanism (1): Joint Response Warnings and Standard Respond Actions

By now, 57 Effective joint actions on flood control has been implemented .



Coordination Mechanism (2): Joint Issue

Heat Waves: Heat stroke and Bacterial food poisoning subsystem



Coordination Mechanism (3):

Supporting Efforts ---Special Plan for Accident Disasters

- **Disastrous accidents often have an unexpected impact on other fields, thus multi-agency coordination and cooperation activities are very important in response to these emergencies.**
- **In the process of creating Special Preparedness and Planning, the characteristics of disasters must be considered, and all related departments' responsibilities must be identified. Once this is done, multi-agency coordination and cooperation activities can be standardized.**

Emergency Preparedness and Planning on Accidental Disposition of Hazardous Chemicals (Shanghai)

Emergency Responders: Shanghai Emergency Response Center, Shanghai Municipal Safe Production Supervision Administration, local government and related agencies

Communication Support: Shanghai Municipal Urban Communication Administration

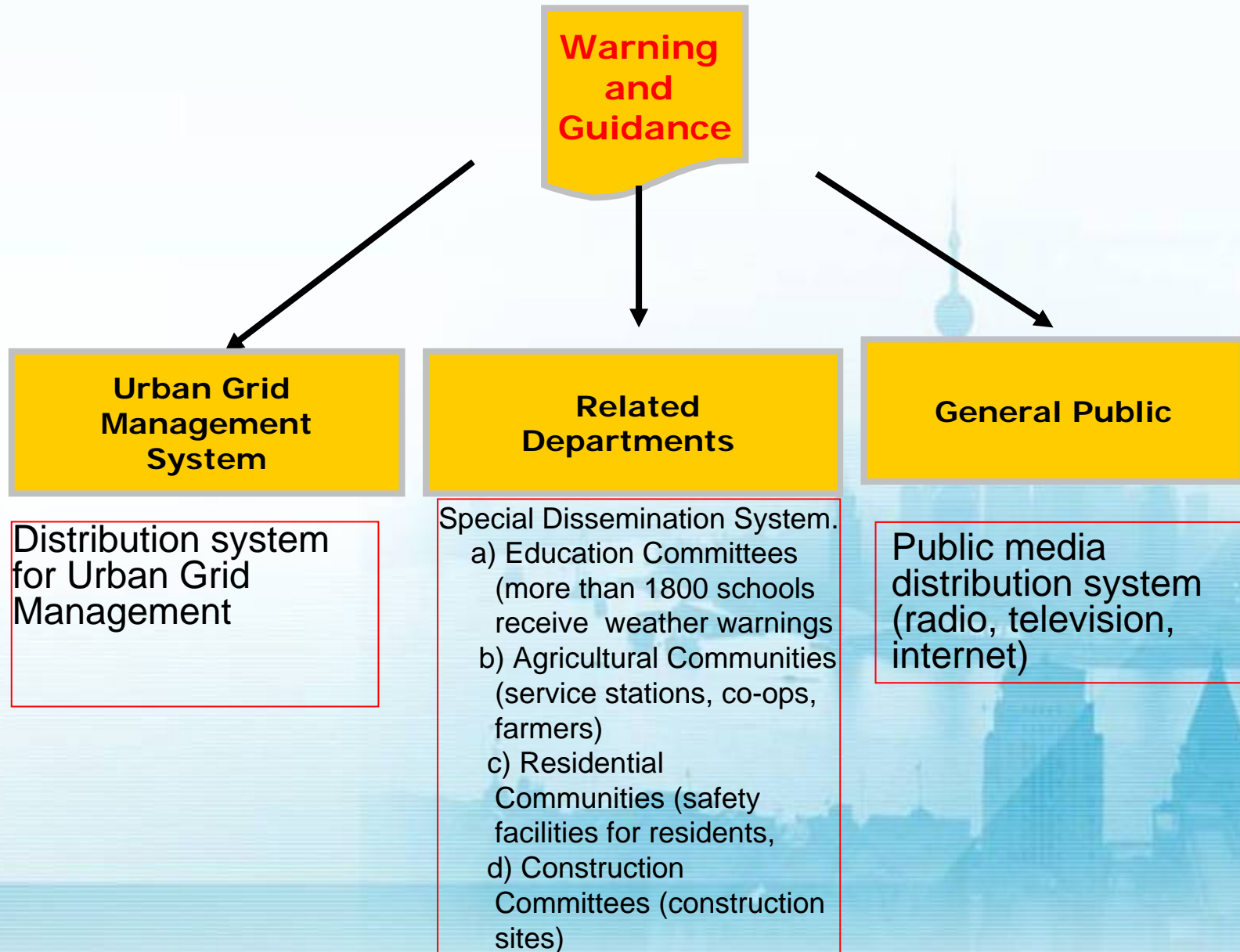
Specialized Support: Public security, fire control, rescue teams, environment protection, medical treatment, meteorology

Traffic Support: Shanghai Municipal Bureau of Public Security, Shanghai Municipal Transport and Port

Medical Support : Shanghai Municipal Public Health Bureau

Public Security Support: Shanghai Municipal Bureau of Public Security,

Coordination Mechanism (4) : Joint Dissemination



Collaboration and coordination in the EWS

Coordination actions between different agencies in the fields of:

- Information sharing;
- Joint generation of early warning information
- Joint dissemination of early warning information
- Coordination and cooperation of emergency response deployment
- Joint research and training

Collaboration and Coordination Master List in the EWS (SMB' roles)

Data and Information Sharing	Emergency Response Management Office, Emergency Response Center, Urban Grid Management Center, Marine Board, Traffic Bureau, Water Affairs Bureau, airports, Civil Affairs Bureau, Electric power company, Food and Drug Supervision Administration, Fire-risk Prevention Bureau Administration.....
Joint development of technology	Public Health Bureau, Food and Drug Supervision Administration, Agriculture Commission, Construction & Transportation Committee, Environmental Protection Administration , Electric power company
Joint Dissemination of Emergency Information	Emergency Response Management Office (early communication before warning), Daily of Air Quality (Environmental Protection Administration), Bacterial food poisoning warning (Food and Drug Supervision Administration).....
Joint Response	Flood control departments, Education Commission, Construction & Transportation Committee, Communications Authority, Marine Board , Electric power company

Example 1: EWS Multi-agency coordination and cooperation mechanism (Flood Control Headquarters)

Early Warning Grades	Response Levels (Implemented by Shanghai Flood Control Headquarters)
BLUE	Organize a consultation meeting to strengthen flood monitoring and flood control supervision, report the situation to Municipal Flood Control Headquarters and notify the Emergency Response Center of Shanghai Municipal Government.
YELLOW	organize a consultation meeting to strengthen flood monitoring and flood control supervision, propose specific preparation requirements, report the situation to the Shanghai Municipal Government and notify the Emergency Response Center.

Example 1: EWS Multi-agency coordination and cooperation mechanism (Flood Control Headquarters)



Early Warning Grades	Response Levels (Implemented by Shanghai Flood Control Headquarters)
ORANGE	Deputy commander-in-chief for Municipal Flood Control Headquarters will chair the consultation meeting to strengthen flood monitoring and flood control supervision, to direct counter-measures, and report the situation to the leaders of the Shanghai Municipal Government. If necessary, an emergency response meeting will be held to plan flood and typhoon control more efficiently.
RED	Commander-in-chief of the Municipal Flood Control Headquarters will chair the consultation meeting, participating in planning flood and typhoon control guidelines. If necessary, the leaders of the Shanghai Municipal Government will deliver a speech on Television or radio to encourage all the military and civilians to devote themselves to disaster resistance and rescue. Report the situation to the State Council and related state-level departments according to National General Emergency Response Readiness and other related regulations.

Example 2: EWS Multi-agency coordination and cooperation mechanism (Bacteria Food Poisoning Early Warning)

Coordinated activity between SMB and SFDA

Information Sharing	Joint Research on Early Warning Technology	Joint Dissemination of Early Warning Information
a) Meteorological data of recent 20 years (temperature, rainfalls and relative humidity). b) cases of group bacteria food poisoning.	a) To develop the research on relationships between bacterial food poisoning and meteorological conditions. b) To jointly set up the bacteria food poisoning warning models, and standardize the warning levels and joint prevention measures.	According to the output of the warning model, both sides will jointly disseminate the warning information after bilateral consultation

Example 2: EWS Multi-agency coordination and cooperation mechanism (Bacteria Food Poisoning Early Warning)

Signal	Meanings	Measures	Proprietor	The Public
RED 	High-risk weather conditions can easily cause bacterial food poisoning.	1) Strengthen the supervision and the examination of high-risk food business units 2) Disseminate the early warnings to high-risk food business units and demand them to focus on food safety management	On the basis of yellow, it adds: Not to provide high-risk food such as raw food, uncooked fish and sea food.	On the basis of yellow, it adds: No eating of high-risk food such as raw food, uncooked fish and sea food.
YELLOW 	Mid-risk weather conditions, bacterial food poisoning is possible	3) Strengthen the education of consumers, particularly the health in food processing operations .	Strictly limit the time between cooking and eating to 2 hours. Separate raw food from cooked food. Only touch cooked food with disinfected hands.	Determine if food stored in the refrigerator has gone bad; If not, re-cook the food completely. Before processing raw food, disinfect your hands first. Separate raw and cooked food in the refrigerator. Dishes for raw food should be disinfected before processing. Fast food should be consumed in time.

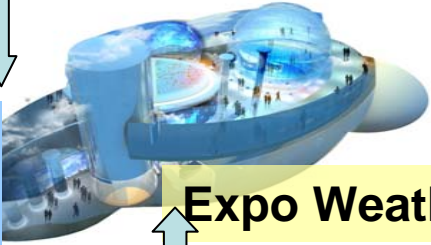
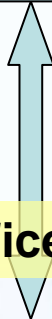
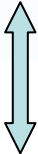
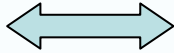
Example 3: EWS Multi-agency coordination and cooperation mechanism : Community Safety Programs

Warning dissemination by different methods

No.	Issuing methods	Receivers
1	File Transmission Protocol (FTP)	the public
2	BGU transmitting system	community supervisors
3	Cell-Phone Dissemination System	municipal decision makers, various government agencies, residential community managers, basic response units managers (i.e. school, hospital, park, construction sites), the public
4	FM Subsidiary Communication Authorization (SCA)	special users
5	Radio Broadcasting	the public
6	Public Electronic Billboards	the public
7	Mobile Media TV	passengers in taxi, bus, and subway
8	Warning Calls	basic response units office
9	Dedicated Lines	municipal decision makers, city affairs management departments, and special users
10	Other Public Media (i.e. newspaper, TV)	the public

Shanghai MHEWS

Shanghai Emergency Response Management Platform



**Coordination Mechanism
(Big Events)**

Expo Weather Office

**MHEWS
Information
Distribution
Flow in the
Safety Expo
Plan**

**Example 4:
EWS Multi-
agency
coordination and
cooperation
mechanism**



**Expo2010 Operation
Command Center**

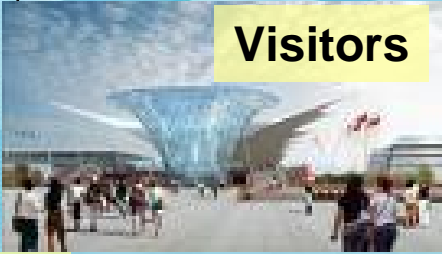
Through electronic screen
and broadcast system in
Expo site, cell-phone short
message and other
measures.



Participants Service Center



Organization Department



Visitors

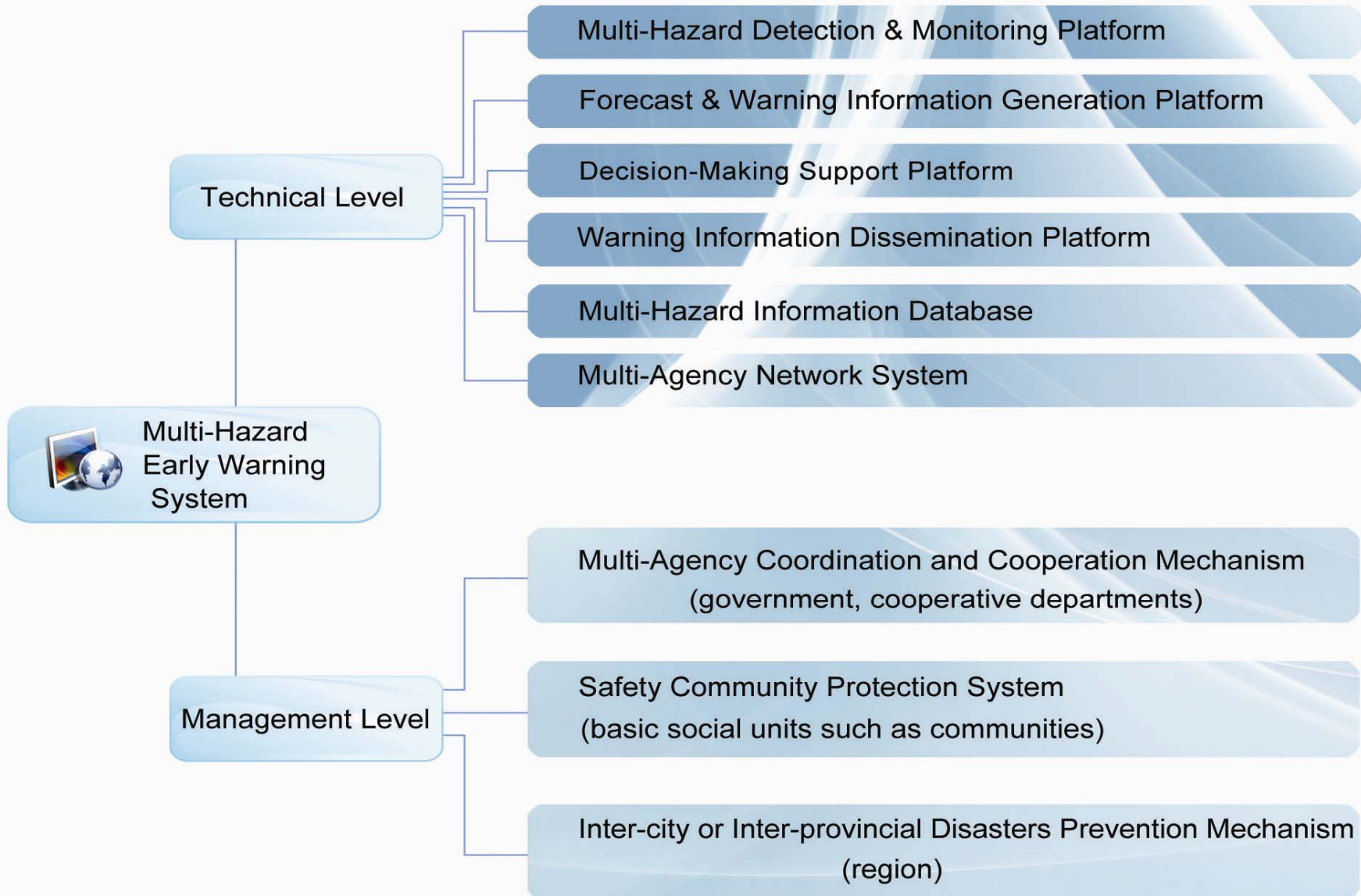
More than 230 participants



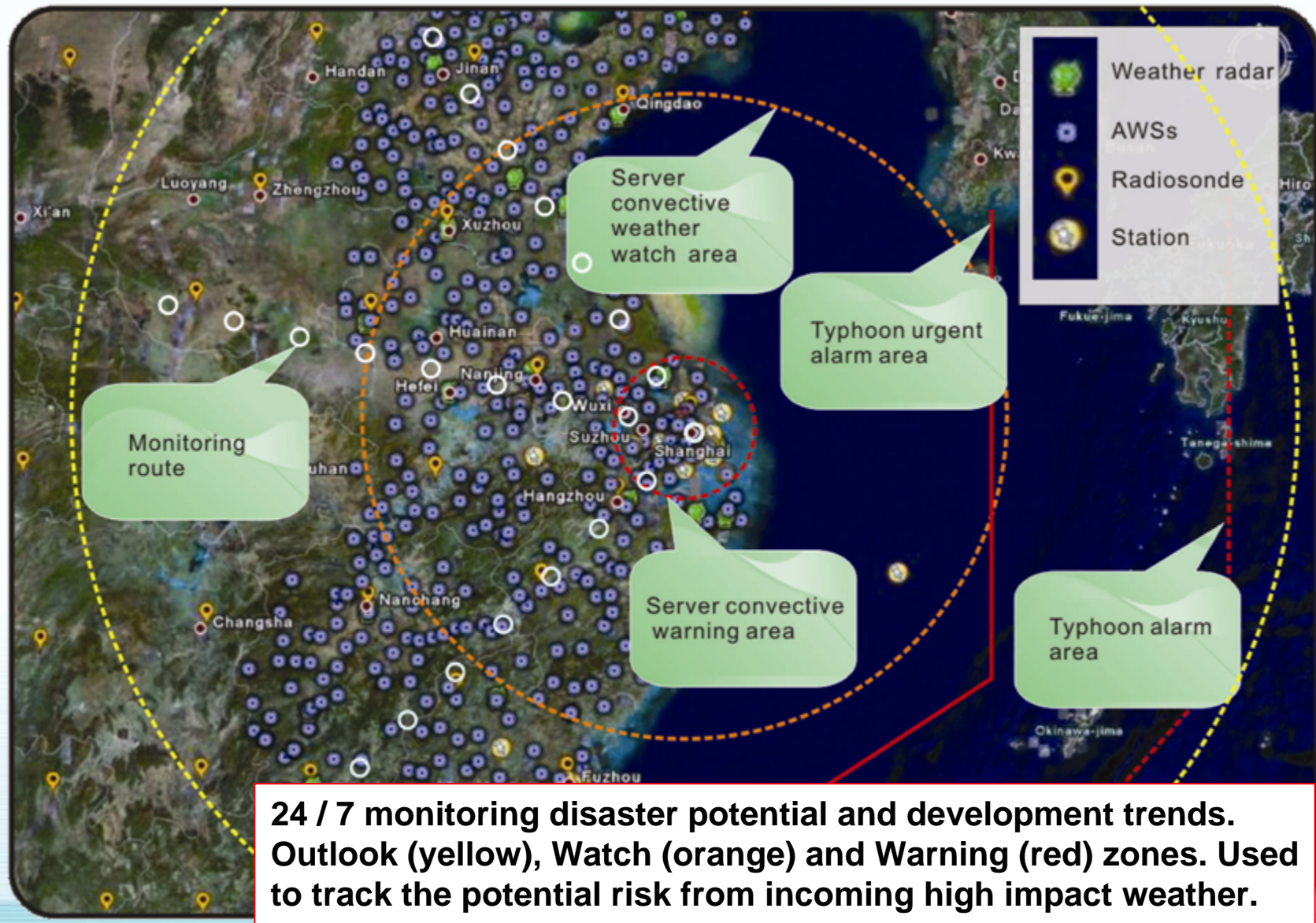
Outline

1. Government and Institutional legislative Arrangements
2. The Threat, Risk Information Utilization, and Warning Standard Development
3. The Role of SMB in ERMS and the Cooperation and Coordination in MHEWS in Shanghai
4. Technical Support for EWS: 4 + 1 Platforms Development , and Future Steps
5. Lessons, Practices, and Experiences Summary

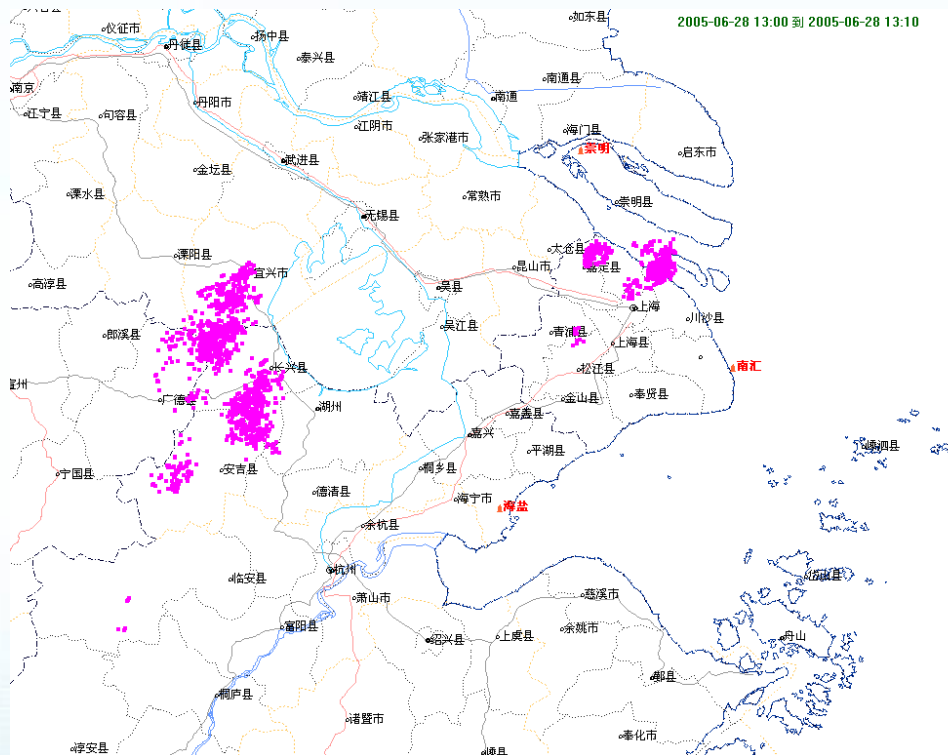
Contents of MHEWS



Monitoring & Detection Platform



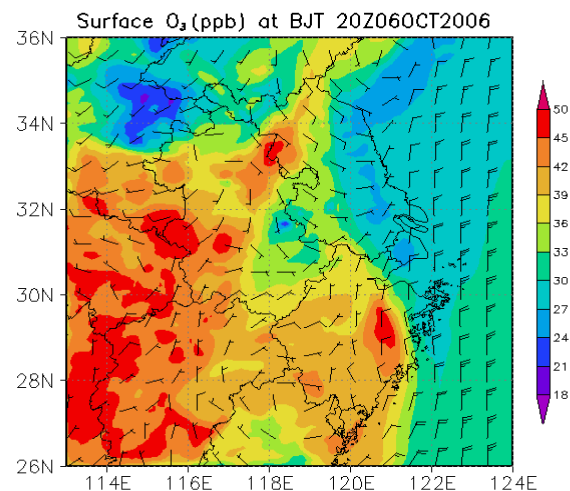
Early Detection & Monitoring Platform



Lightning early detection and monitoring system in the Yangtze River Delta



AWS in the Yangtze River Delta



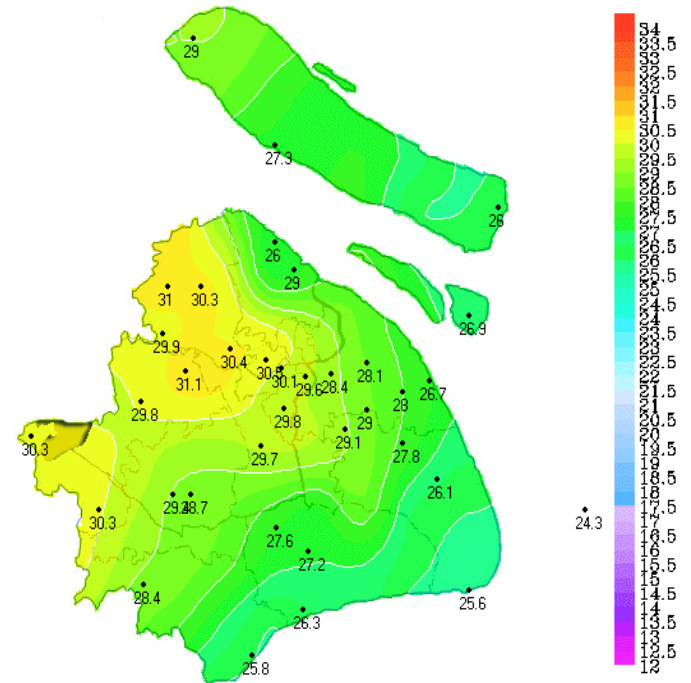
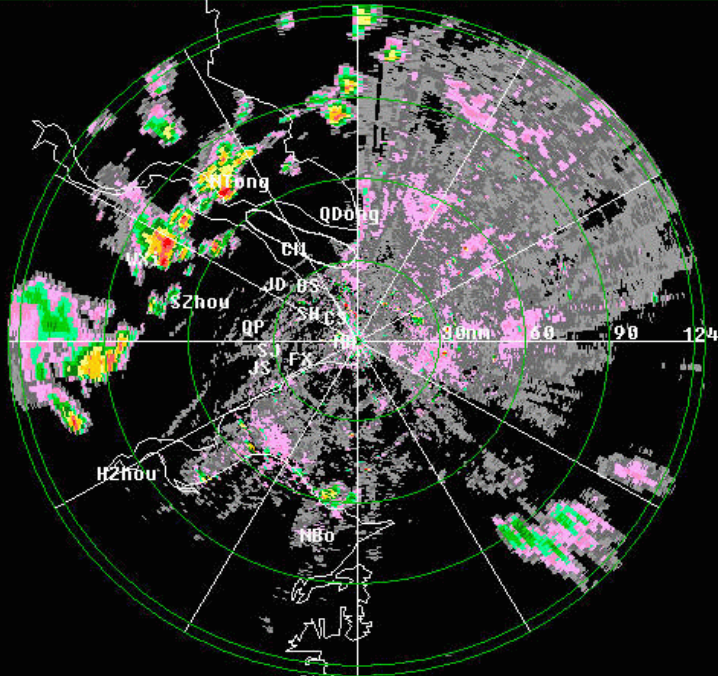
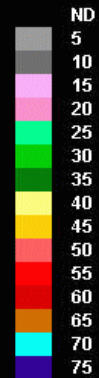
AQ prediction in the Yangtze River Delta by WRF-Chem

Early Detection & Monitoring Platform

Marta Systems RSHI CRPS 07/12/2004 08:38 Z

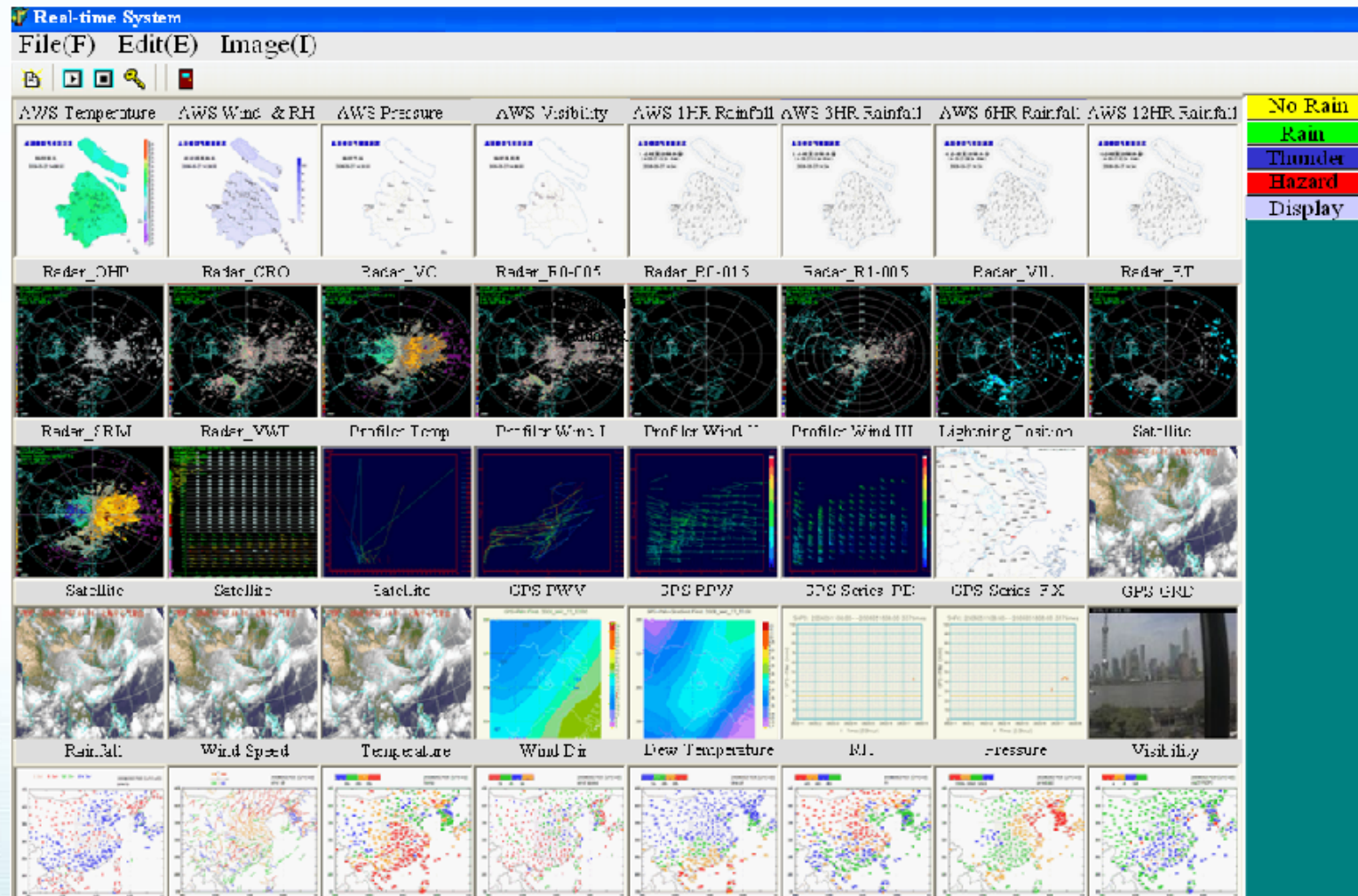
Mon Jul 12 16:27:18 2004
SHANGHAI
Comp Refl Precip 124nm (37)
AR 145 FT MSL
124 NM Range, 0.54 NM Res
Lat: 31.001 N
Lon: -121.885 W
Mode: Precip

Max Refle



Early detection and monitoring system in Shanghai

Early Detection & Monitoring Platform

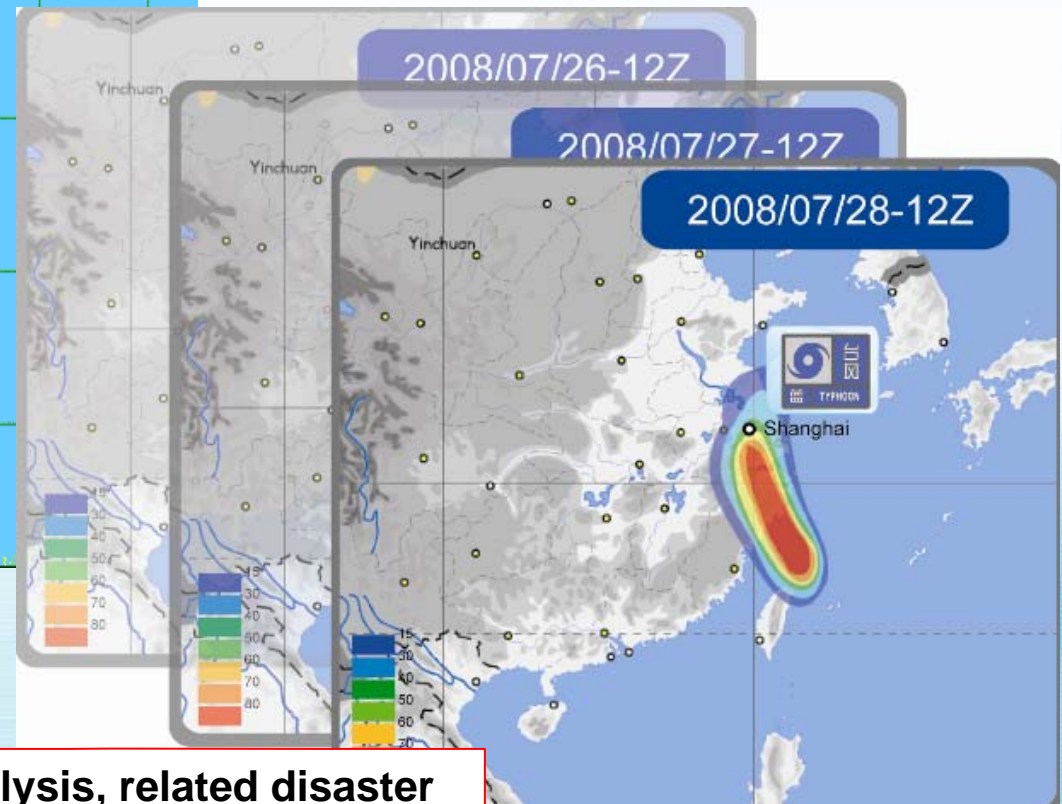
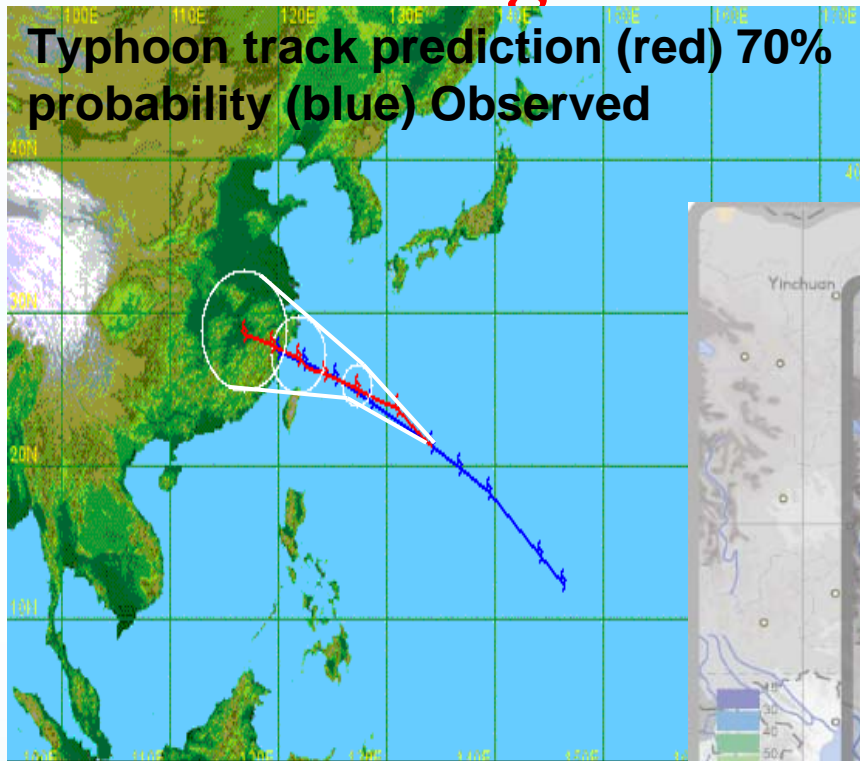


Multi-product monitoring and early warning interface

The EWS Forecast and warning information generation platform

The traditional weather forecast has extended to weather-related disaster prediction and warning based on the 3 categories of the threats' hazards with the partnership. The service provided by SMB has become **the start-up and a critical** support to the whole procedure of MHEWS and the city emergency management system.

The EWS Forecast and warning information generation platform



Providing weather analysis, related disaster forecasts and warning products to many fields, such as transportation, power, chemical, agriculture, public health.

The EWS Forecast and warning information generation platform: Subsystems

➤ Extreme weather Early Warning

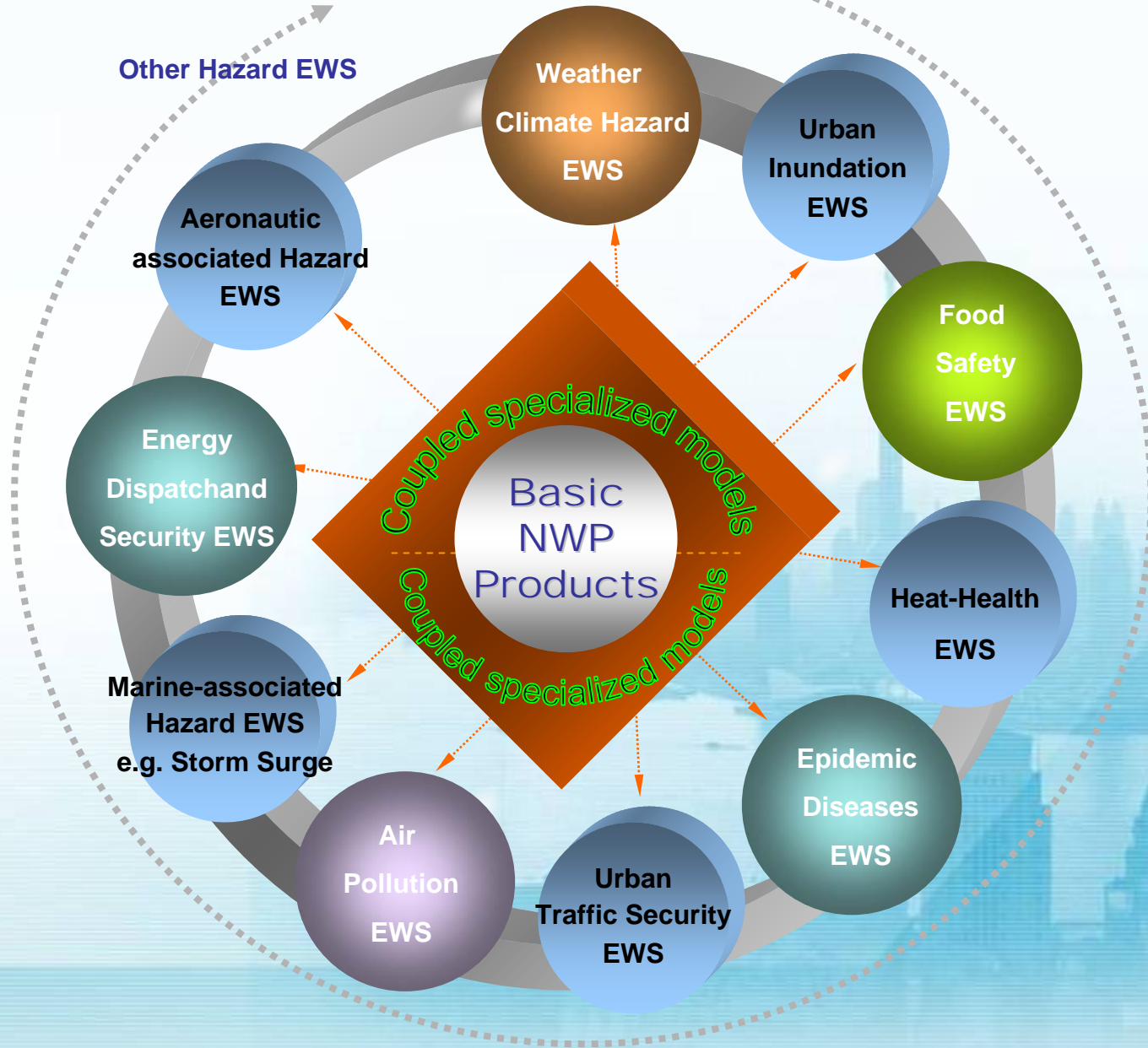
- Severe convective weather
- Tropical cyclones
- Heavy fog
- Snow and freezing rain

➤ Weather-related Hazards Early Warning

- | | |
|--------------------------|--|
| ---- Heavy Haze | ---- Static stability and Potential Fire hazards |
| --- -Windstorms | ---- Bacterial Food Poisoning |
| ----Lightning Strikes | ---- Heat waves and human health |
| ----Marine hazards | ----- Infectious Diseases |
| ----Agricultural hazards | ----- Dangerous Gas Diffusion |
| ----Urban Traffic | ---- Urban Inundation |
| ----Aeronautical Risks | ----- Energy Security |

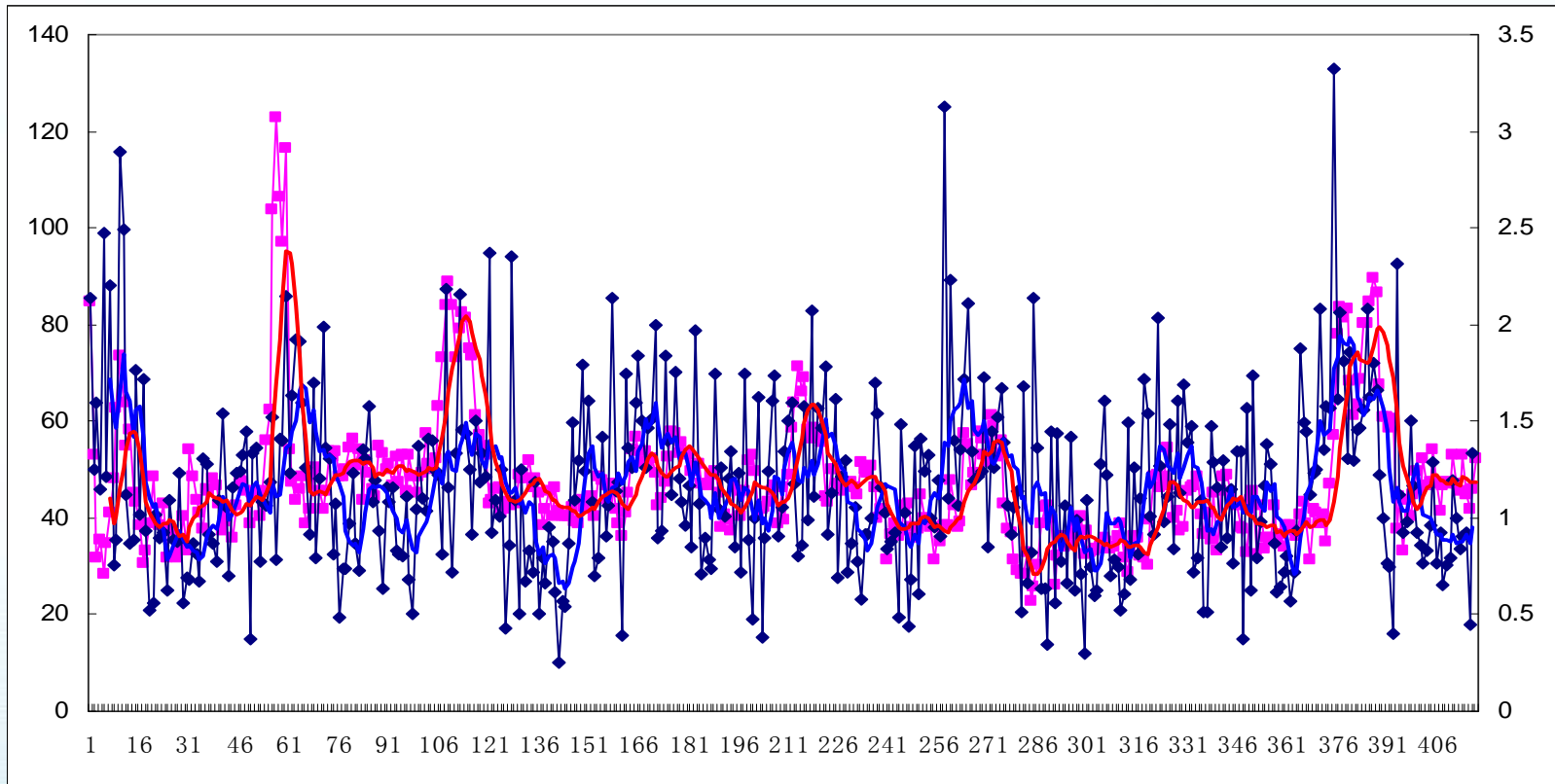
The EWS Forecast and warning information generation platform

Subsystems



Weather- and Climate-related Hazard Prediction and Warning Subsystems

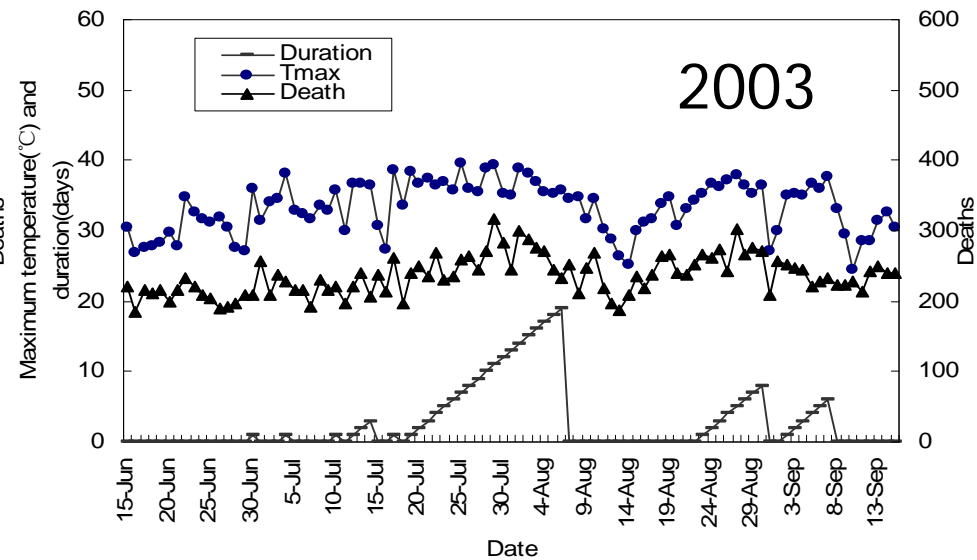
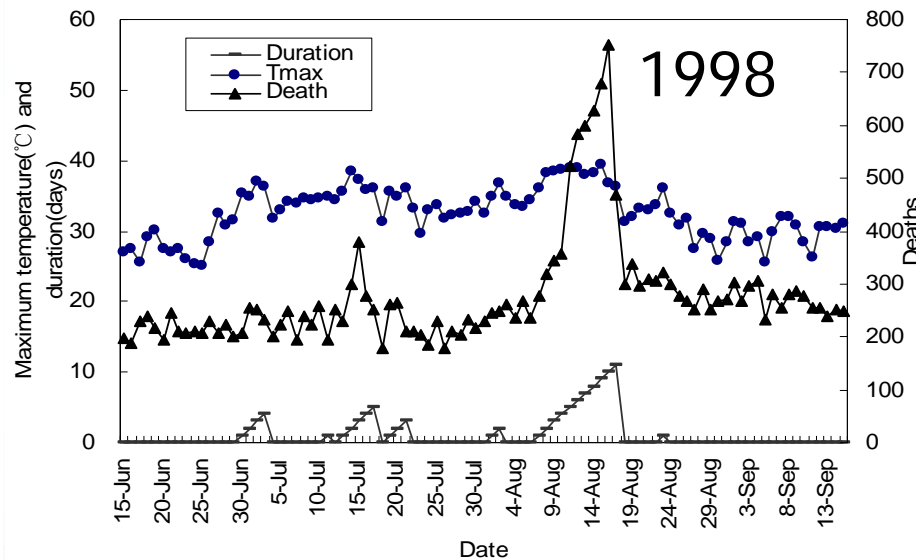
(4) Epidemic Diseases Early Warning Subsystem



Flu trend (red) is related to temperature variation (blue)

Weather- and Climate-related Hazard Prediction and Warning Subsystems

(3) Heat-Health Early Warning Subsystem



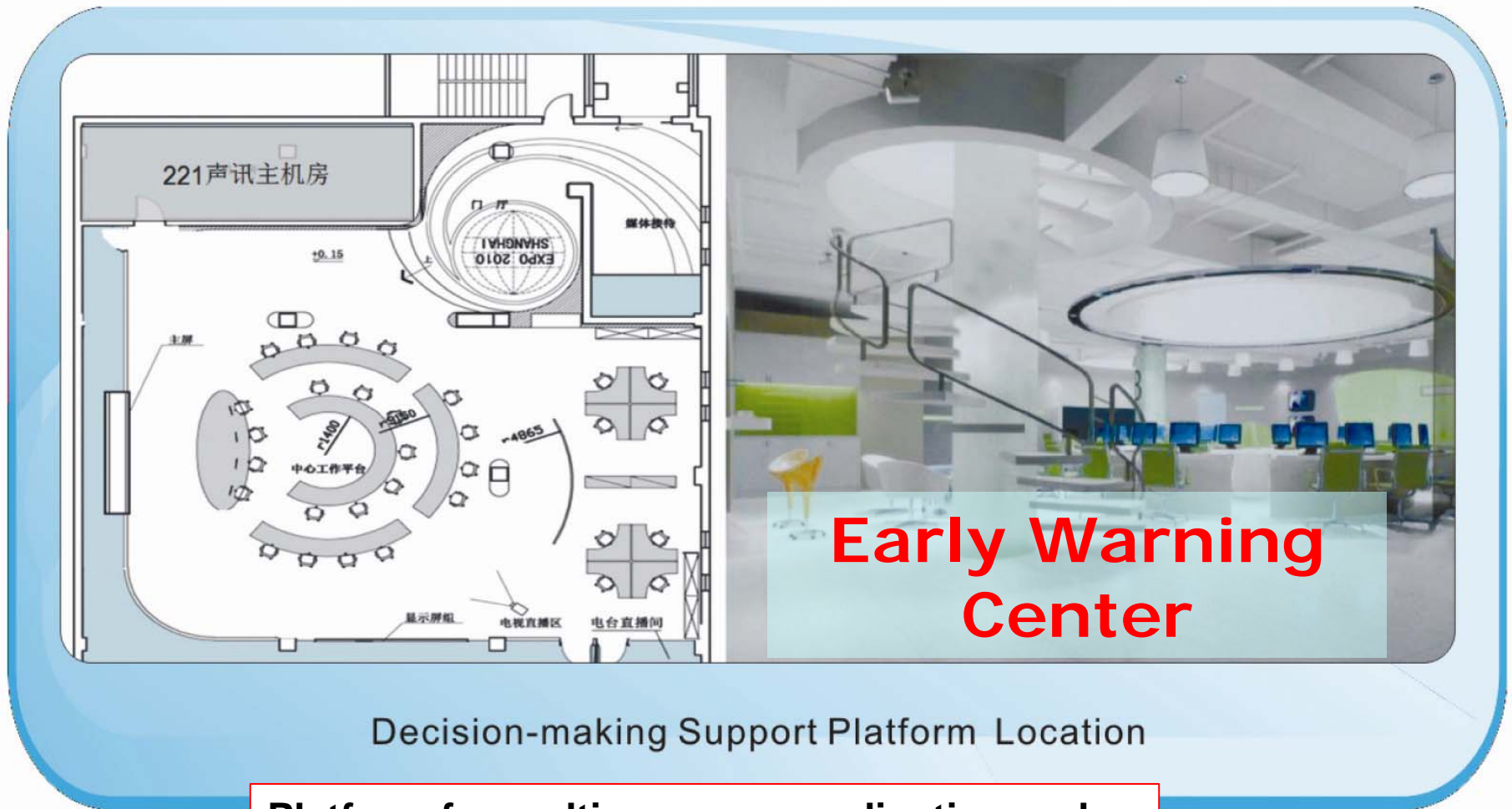
Maximum temperature and deaths caused by the heat wave of 1998

Maximum temperature and deaths caused by the heat wave of 2003

$$EM_i = -82.8 + 2.48 \times T_{max_i} + 0.326 \times CdT_{max_i}$$

Cooperated with Public Health Bureau, Heat-Health EWS has been built up, and operated this year.

EWS Decision-making support platform

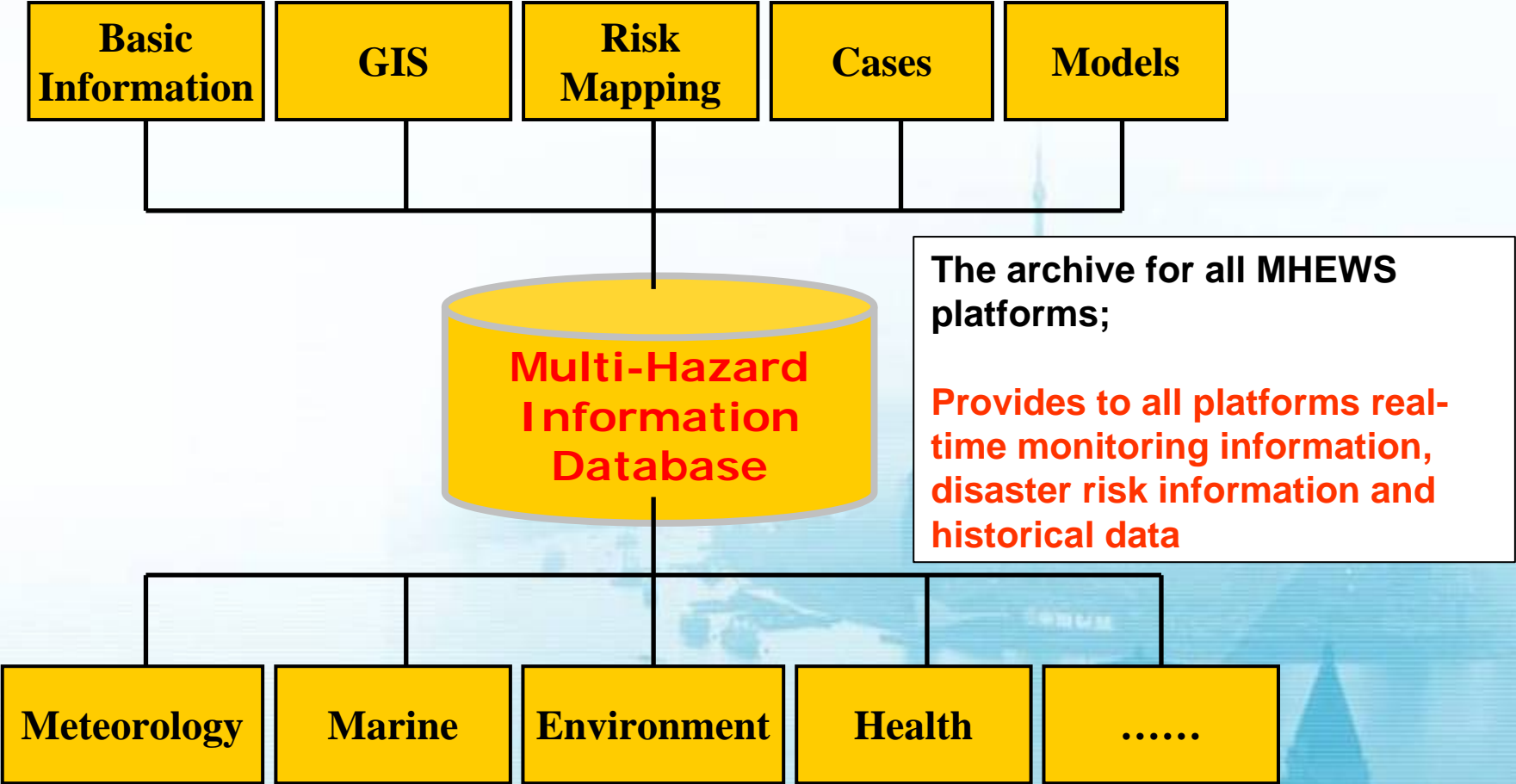


Early Warning Center

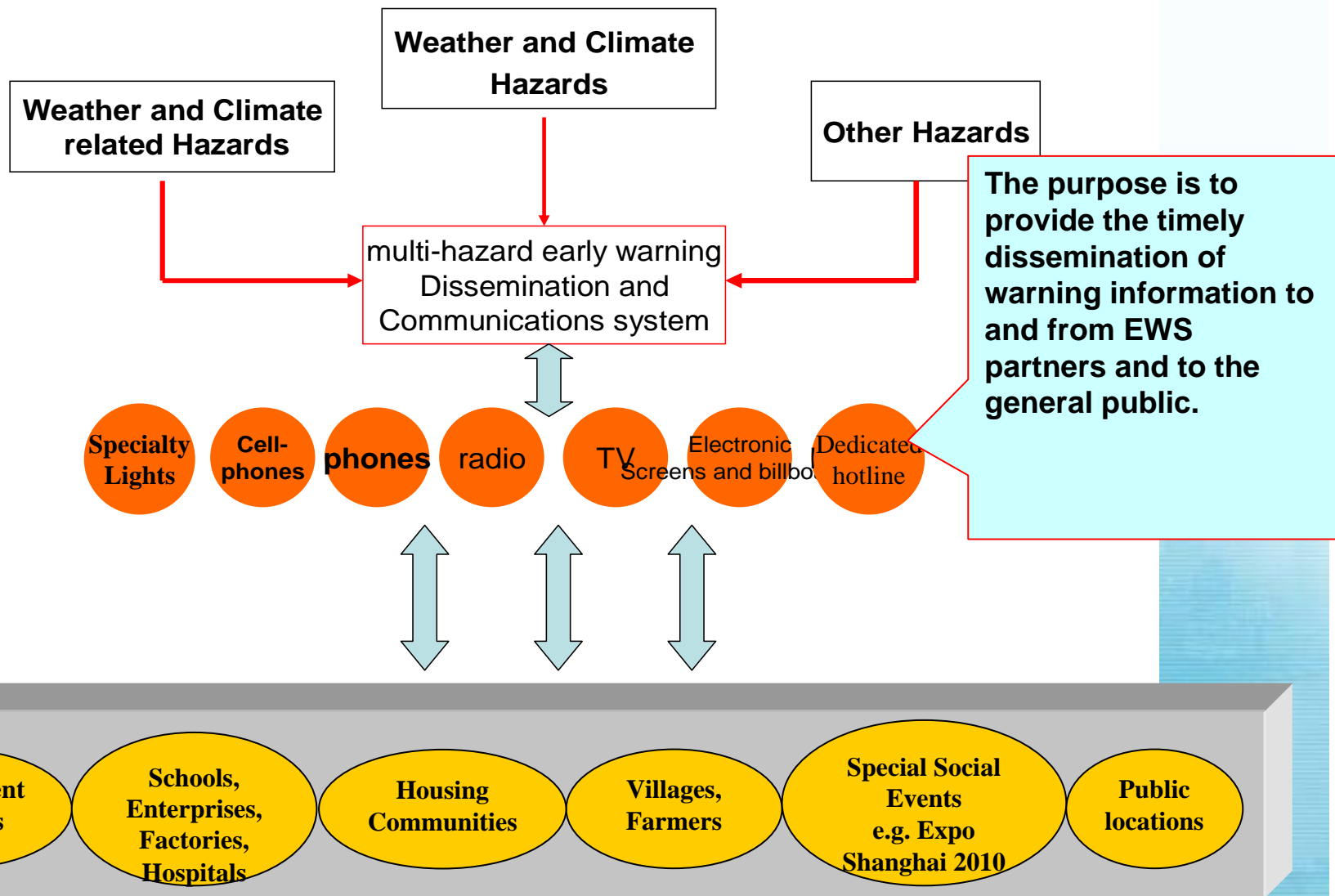
Decision-making Support Platform Location

Platform for multi-agency coordination and cooperation in determining the appropriate level of disaster response

EWS Multi-Hazard Information Database

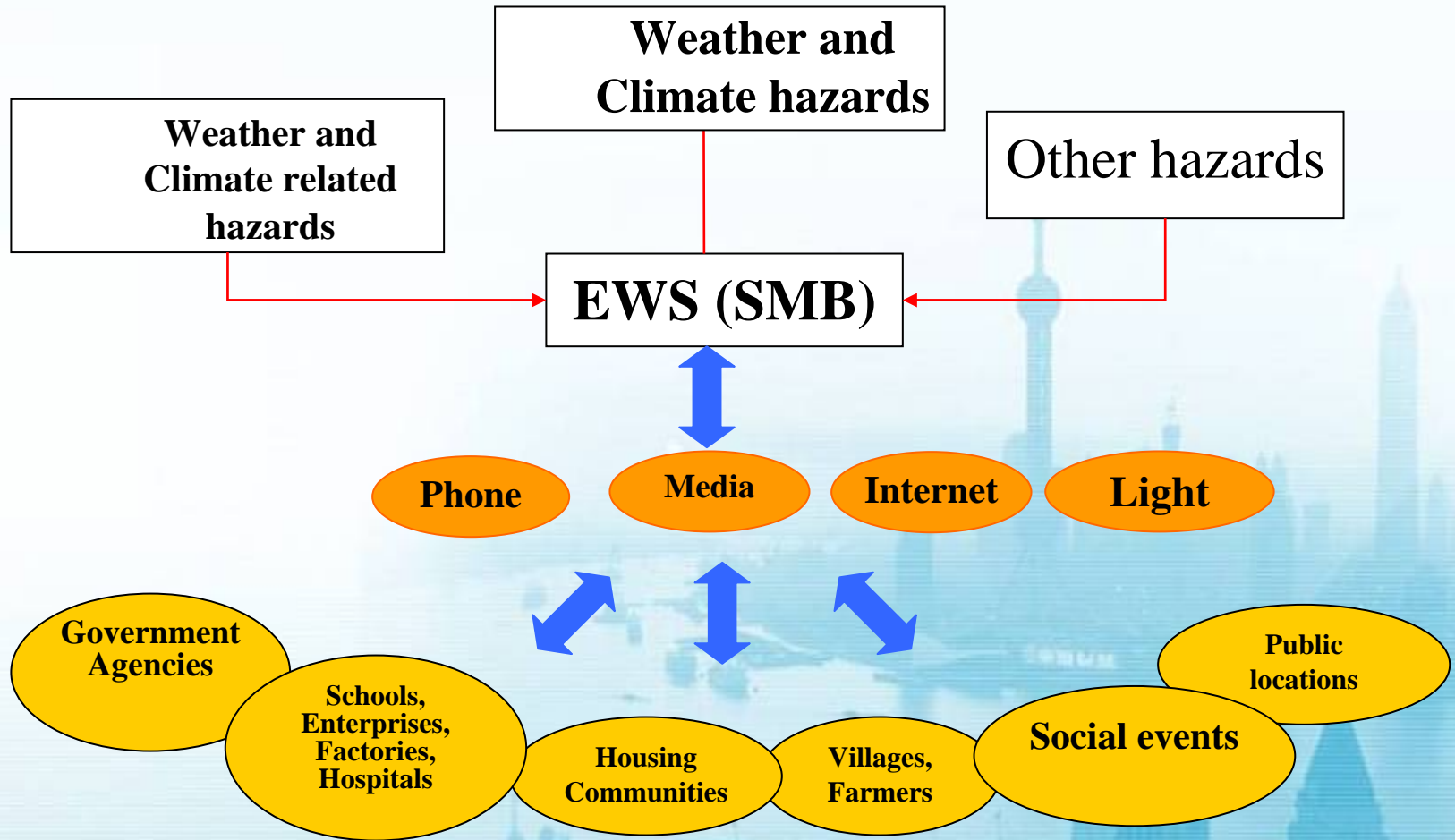


EWS Warning Information



Operation Flow

EWS Dissemination and User Application System



Dissemination and User Application System

1.City-level Dissemination Platform. Based on the weather information dissemination platform, the Municipal Emergency Office issues management information to **3000 staff in 76 different departments.**

2. Department-level Dissemination Platform (under operation). The cell phone message platform of SMB has already sent warnings concerning water affairs, flood prevention, sunstroke, food poisoning and community management. The Information dissemination system covers more than **8000 residential areas, 1780 junior and primary schools and 300 agricultural units.**

3. Public-level Dissemination Platform (effectively used).

—The first **community warning light system** of the nation has been constructed in Baoshan district, Shanghai. The system will be extended to the tallest buildings in each district.

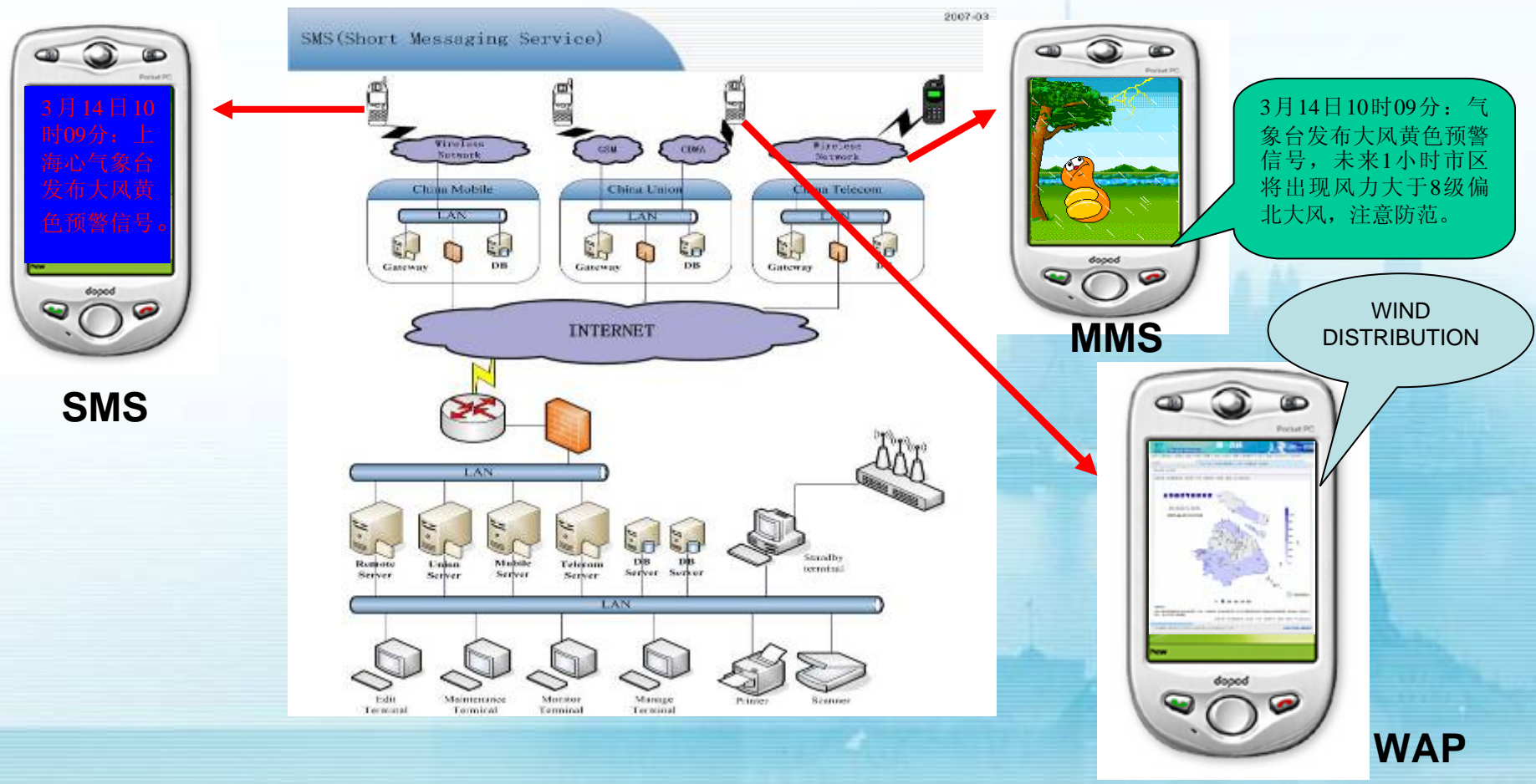
—Cell phone message dissemination mechanism for serious disasters has been implemented

—Public warning dissemination network includes **22 000 public electronic screens, 2000 billboard TV screens, and 1000 electronic road signs.** The number of the electronic screens increased to **50 000 during 2008.**



EWS Dissemination and User Application System

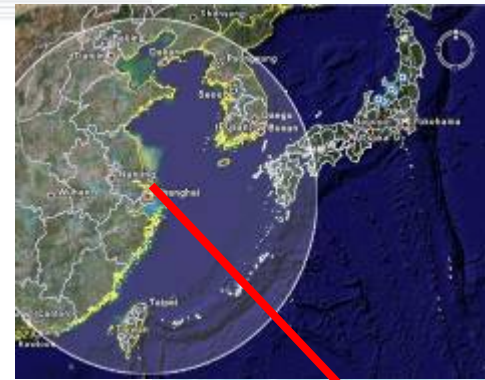
Cell-Phone dissemination (SMS, MMS, WAP)
Has been implemented, supported by a **layered user database**



EWS Dissemination and User Application System

Radio Broadcasting Dissemination

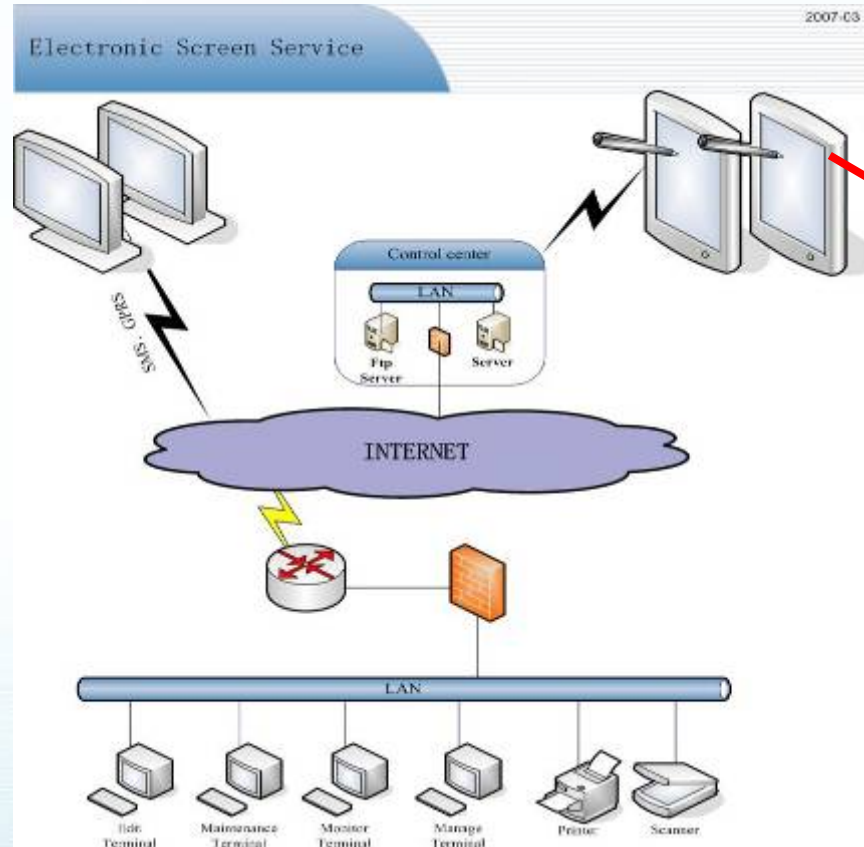
FM Subsidiary Communication Authorization (SCA) will be used to broadcast warning information.



The ocean radio broadcast can cover the coastal water area for a +1000 km radius surrounding Shanghai.

EWS Dissemination and User Application System

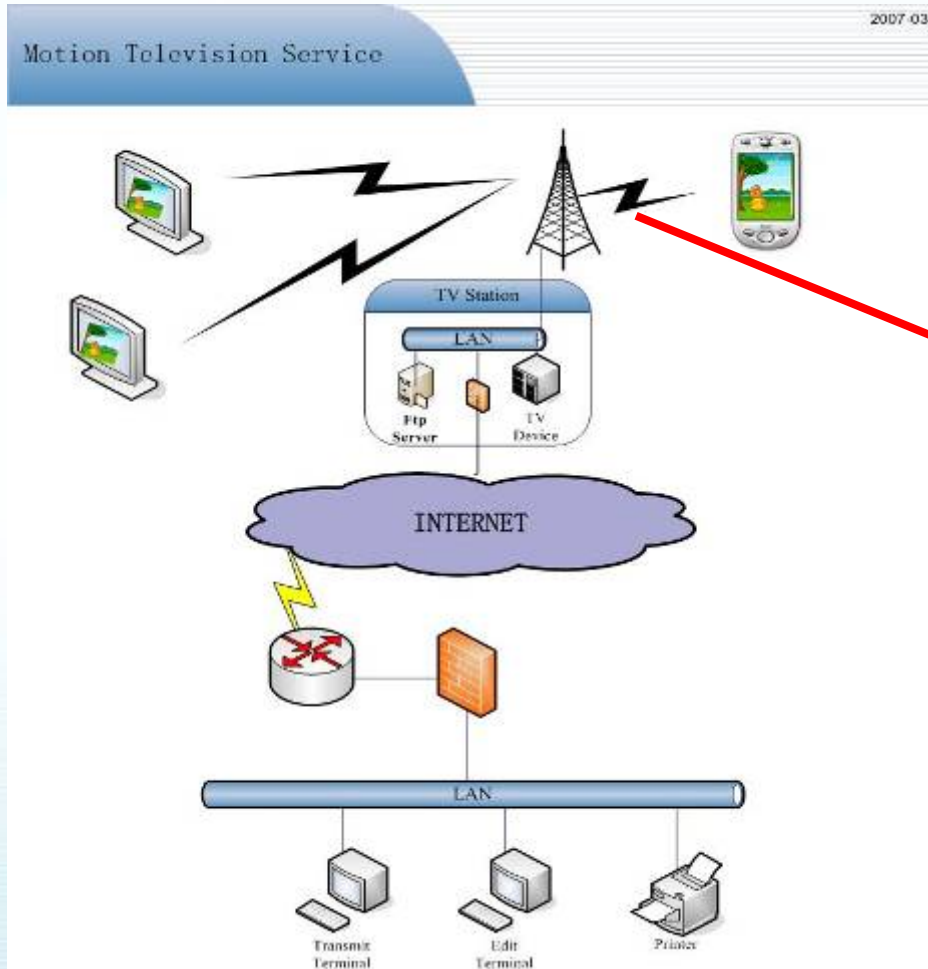
Public Electronic Screen Dissemination



Early warnings are issued with guidance for prevention and mitigation via display screens in streets and parks.

EWS Dissemination and User Application System

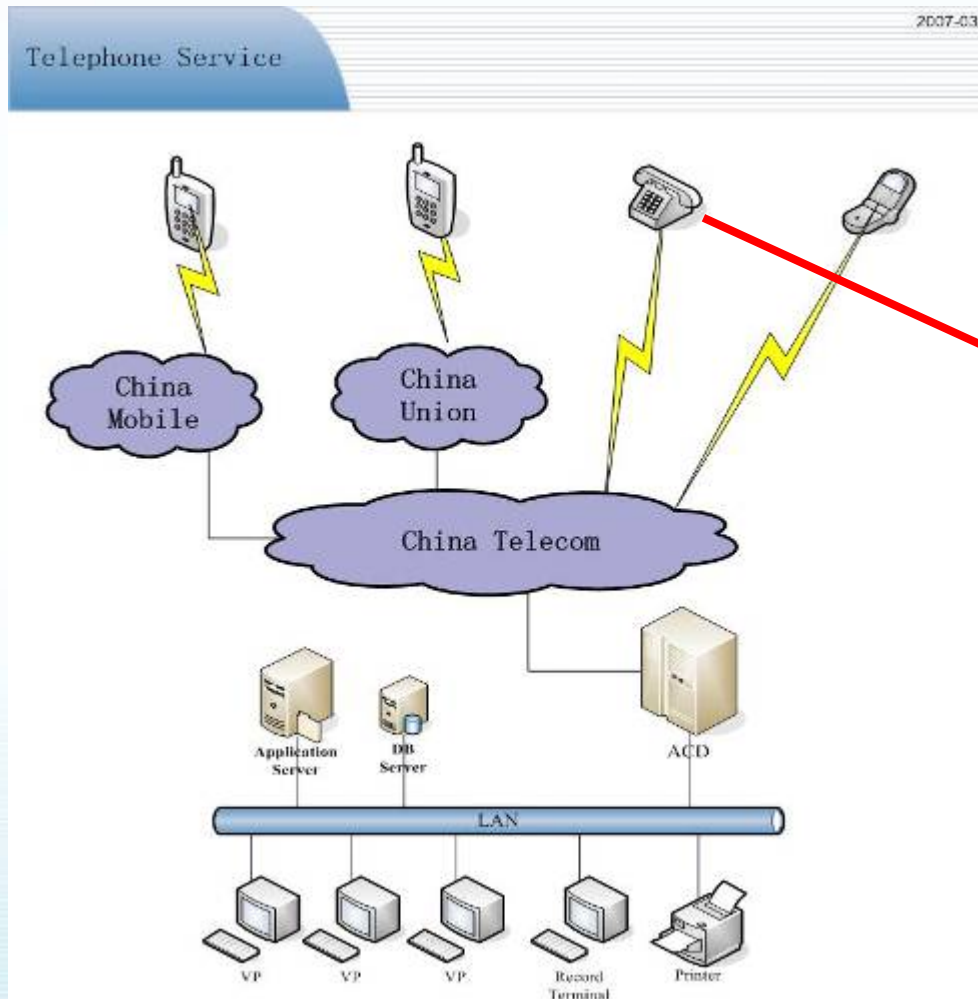
Mobile TV Dissemination



Early warnings via Mobile TV in public transportation vehicles such as taxis, buses, and subways.

EWS Dissemination and User Application System

Warning Call Dissemination



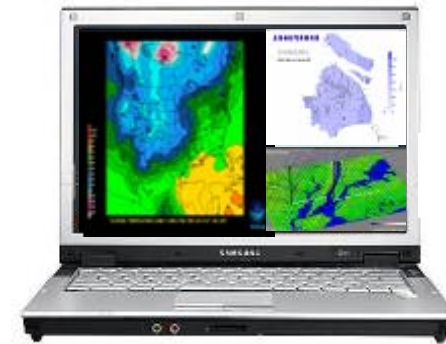
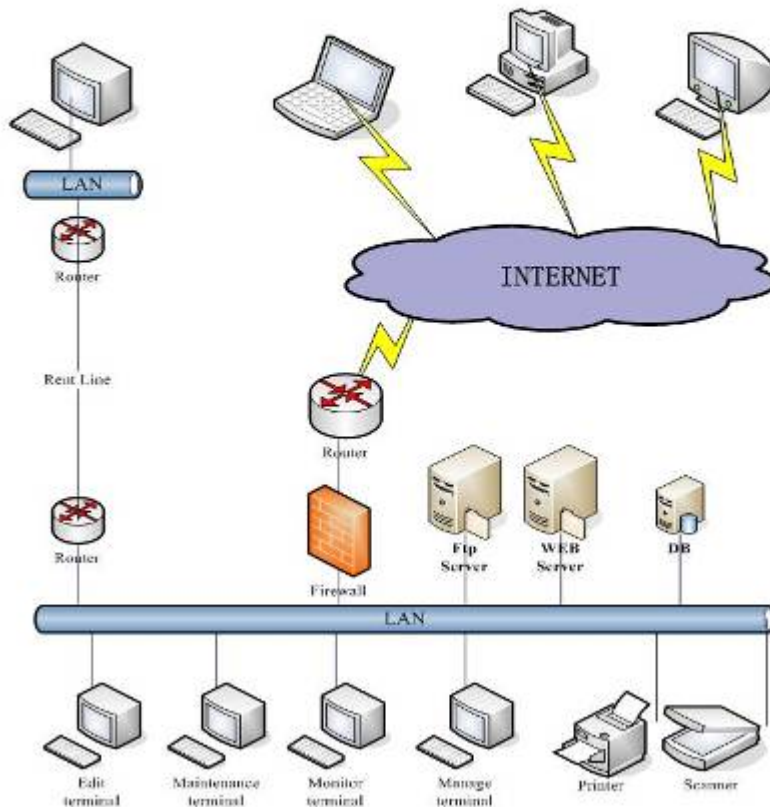
Based on weather hotlines, active outgoing call services to subscribers, Called “Warning Calls” (150 calls every minute)

EWS Dissemination and User Application System

Dedicated Line Dissemination

Rent Line Service

2007-03



Text and graphics are offered through a Dedicated Line. The terminal display software can display the simulation images of the disaster's impact, development, and evolution for government agencies.

Future Steps

- Supported technically by 4 platforms and information database, *MHEWS will be integrated into the comprehensive management platform* of city's safe operation, which will prefect the disasters prevention and mitigation system of Shanghai. In Addition, *MHEWS center* is scheduled to be established and be announced officially by the end of the year.
- *More special preparedness planning will put into operation*, so that the multi-agency action are to be more adapt to disasters with characteristics of linkage and diversities.

Future Steps

- Rehearse activities, such as multi-agency response actions, will be strengthened to verify the validity of special preparedness.
- Safe community capacity buildings will be promoted to raise the public's awareness and knowledge about disaster prevention.
- According to requirement of disasters warning and defense in Expo Park, the Platform construction for EWS in Expo Park will be strengthened and put into operation in early of 2010.

Outline

1. Government and Institutional legislative Arrangements
2. The Threat, Risk Information Utilization, and Warning Standard Development
3. The Role of SMB in ERMS and the Cooperation and Coordination in MHEWS in Shanghai
4. Technical Support for EWS: 4 + 1 Platforms Development , and Future Steps
5. Lessons, Practices, and Experiences Summary

Lessons

Case 1: Rainstorm on August 25, 2008

Observation:

More than 100mm rainfall in urban area in about 1-2 hr., which broken the record of 100 years of heavy rainstorm in Shanghai.

Impacts:

- More than 150 streets and 11000 houses were flooded,
- Some lower cross-section roads were shutdown.
- Significant increase of traffic accidents.
- More than one hundred flights were delayed in Pudong and Hongqiao airport.



Lessons

Case 1: Rainstorm on August 25, 2008

Lessons:

1. Early warning requires not just warning information release, but the earlier consultation and early notification.
2. The feedback information from multi-agency cooperation and coordination is extremely important for updating warning levels in the whole process of DPM.



Case 2: Snow Storm on Feb. 2008

From the end of Jan. to the early of Feb. 2008, the Southern China and Shanghai suffered from cold waves and snowstorms.



Case 2: Snow Storm on Feb. 2008

- China hasn't experienced **weather this bad in decades**. **Millions of the country's migrant workers made their journeys home** for the Spring Festival. The Spring Festival is China's most important holiday when people journey home to be with their families. Some two billion journeys were made during the festival last year, making it the largest migration of people on the planet.
- Across China **around 19 airports have shut** because of the weather. **Around half the provinces in the country have had to start rationing power.**
- During the storms, **over 2,000 transmission towers [pylons] and a staggering 39,000 kilometers of power lines collapsed** under the weight of ice and snow. China's use of a high-tension power grid as opposed to more expensive underground cables, and its crushing dependence on coal – for 80 percent of its electrical power – left it **especially vulnerable to the storms.**



Hazard Domino Effect

Severe weather hazards may bring many other disasters, which further threaten city safety. Weather factor resembles the first piece of domino, and will impact other aspects of social activities.

Natural Events

Weather factor is the first collapsed plat of domino.



Case 2: Snow Storm on Feb. 2008

SMB issued **icing roads, cold wave, heavy fog, warnings** during that period. The Emergency Response Management Office demanded that 300 government agencies should take the warnings issued by SMB as the **start-up of multi-agency actions on the risk response and prevention**. The Shanghai MHEWS concept sufficiently embodies in the multi-agency teamwork against the snow storm.

.

Case 2: Snow Storm

The actions taken were as follows:

- **The Agricultural Department**---100 thousand farmers harvested their vegetables in advance.
- **The Government**---Issued snow removing notification and called on millions of citizens took the actions;
- **The Traffic Control Department** - took 'no road closed' decision to avoid too much vehicle waiting and road icing after SMB issued road icing warnings.
- **The Public Health Department** - took the secondary level of emergency response action to require all hospitals ready for medical treatments to help people who was injured from frostbite and tumble.

Lessons:

Case 2: Snow Storm

1. The process of multi-agency response action should be taken simultaneously by multi-hazard early warning process. So that the timely feedback information of the response actions is useful to each phase of DPM.

2. It is very important to have warning level update as reference to implement corresponding response actions, that is, response actions should be adjusted according to warning level information.

.

Practices

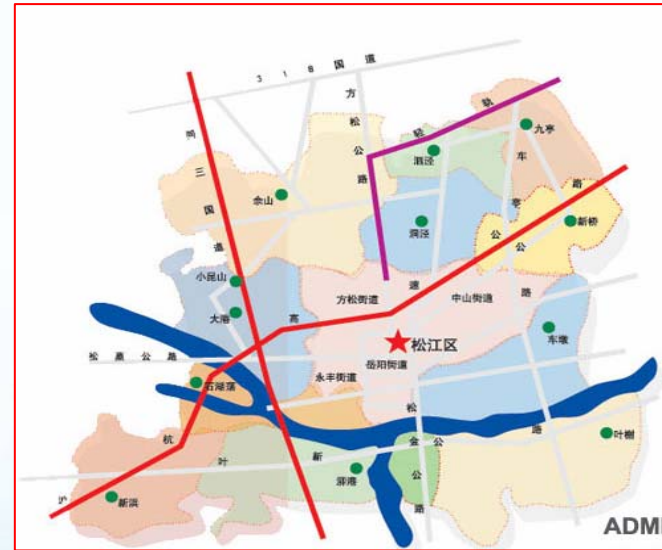
Example 1: The application in urban area and its suburb

---- taking *Songjiang* Town (suburb) and *Xuhui* District (downtown) as examples

Objective and characteristic:

- **As a part of Shanghai MHEWS**
- **Meet the local needs to prevent the high impact disaster and its special need for mitigation.**
- **Expand the application functions of MHEWS**

Songjiang (suburb area)



1. *one of the major satellite towns of Shanghai*, which have many high ranking tourism facilities, 7 famous universities, high-technology enterprises and agriculture farm land.

The area of Songjiang is 605.09 square kilometers. The population in the district is about 520,000, and therein 500,000 floating population, with a total population of more than 1,000,000. The GDP of the area is about 642.11 billion, with ranking the city's comprehensive total economic output in the third.



2. *It is a southwest Gateway of Shanghai*, facing to Zhejiang city-group of traffic throat. (Shanghai-Hangzhou railway, Shanghai-Hangzhou expressway, Jiajin highway, Huqingping expressway, Tongsan state highway and so on , forming a criss-crossing road traffic network). It's high-sensitive to typhoon, heavy rain, fog and accompanied suddenly traffic accidents, and it affects outbound traffic to the southwest of Shanghai as a whole.
3. *The topography of Songjiang is low-lying, and the river network is complex*, as one of the main city's water intake. (4 meters above sea level on average, with 2 meters above sea level to the minimum, and it's the bottom of the pot in Shanghai). *It's a place which is high-sensitive to typhoon, rainstorms and floods.*

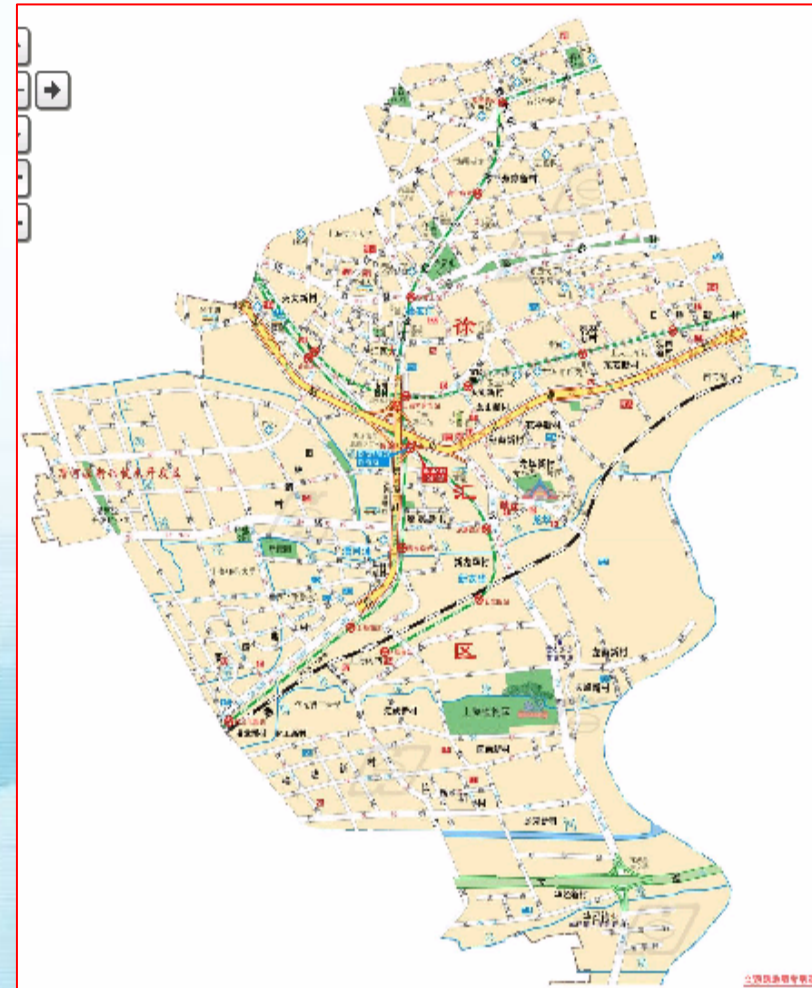
Xuhui (downtown area)

1. One of commercial centers in Shanghai. (54.8 square kilometers, with 891.8 thousand population and the density of 16286 people/square kilometer. GDP 65 billion RMB.) Thus it is a highly sensitive area to disaster, such as air pollution and public health.

2. Important Traffic hub in Shanghai (Shanghai South Railway Station and traffic hinge to suburban SW locates in Xuhui. There are 5 10000 dwt berths, and 12 thousands outdoor electronic displays in Xuhui.) Thus it is very sensitive to traffic accidents caused by typhoon, heavy rain, and heavy fog. At the same time, the safety of buildings are also threatened by strong wind.

3. Low-lying topography characters. (low natural gradient on earth-surface, which are all below high water level; Land subsides due to large-scale exploitation of underground water; The altitude is between 2.5-3 meters, with low-lying below 2.5 meters.)

Thus *it is also sensitive to typhoon and heavy rain, as well as related hazards, such as urban inundation.*



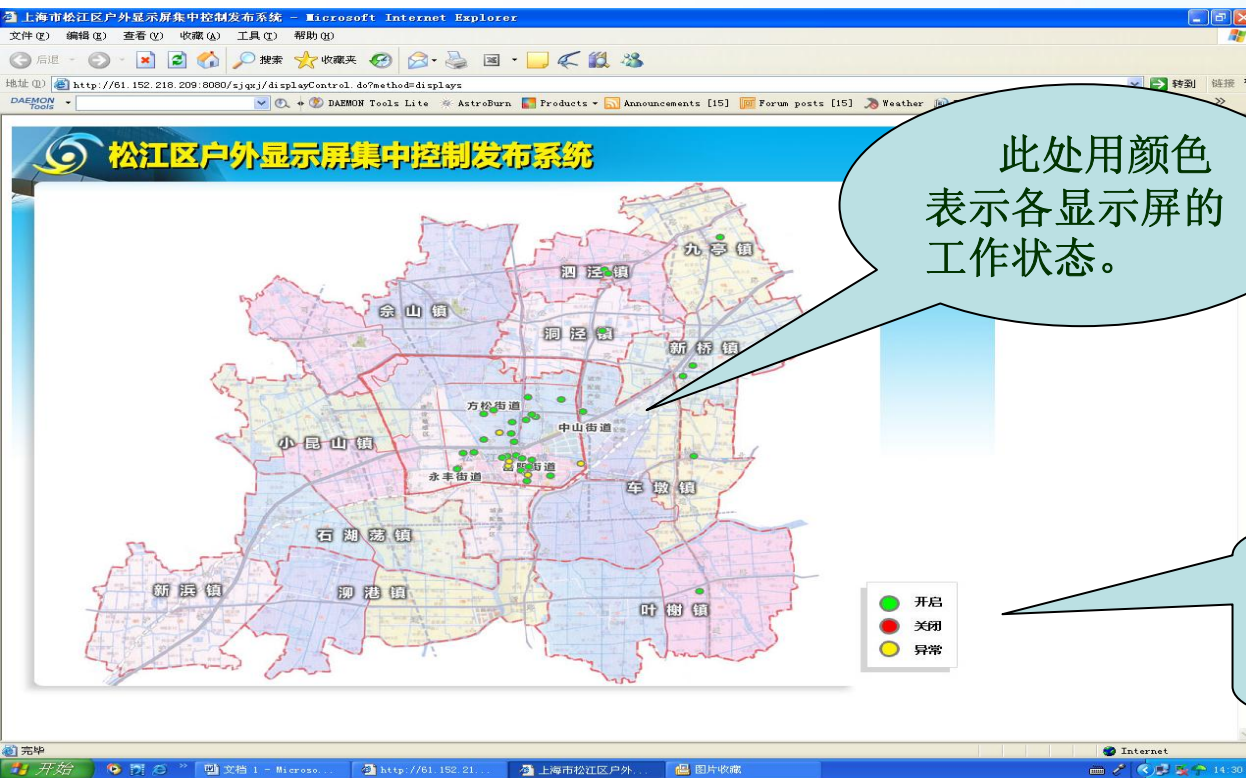


VIP 第一票务
TICKET

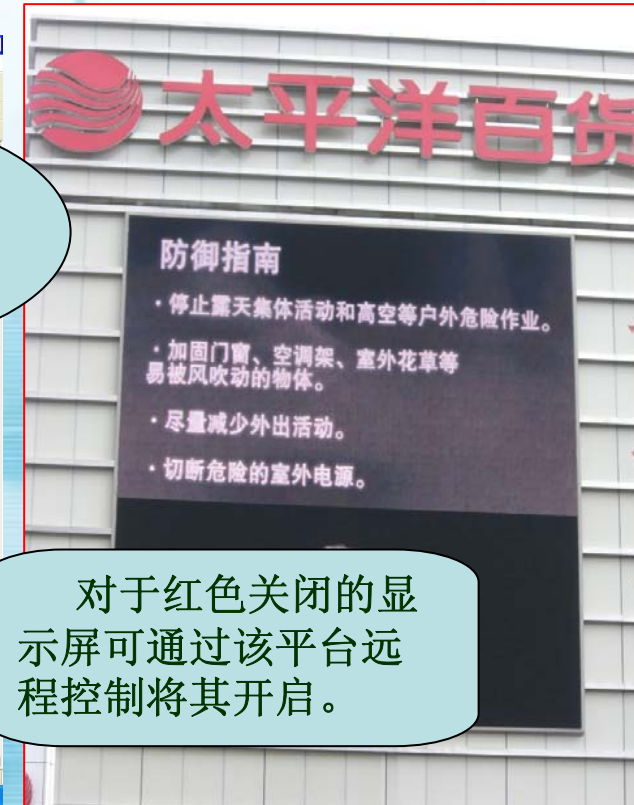


1. Outdoor Electronic Dissemination System

44 electronic displays will be set up in key areas of Songjiang, and there has been 9 large-scale ones located in center area of Xuhui District, disseminating weather warning, forecast, real-time weather information and action guidelines.



此处用颜色表示各显示屏的工作状态。



对于红色关闭的显示屏可通过该平台远程控制将其开启。

2. Urban Grid Management System of MHEWS has been set up.

—Grid response management mechanism (Grid supervisor)

—Urban Grid Weather Disaster Messenger Mechanism
(127 in Songjiang, 182 in Xuhui)

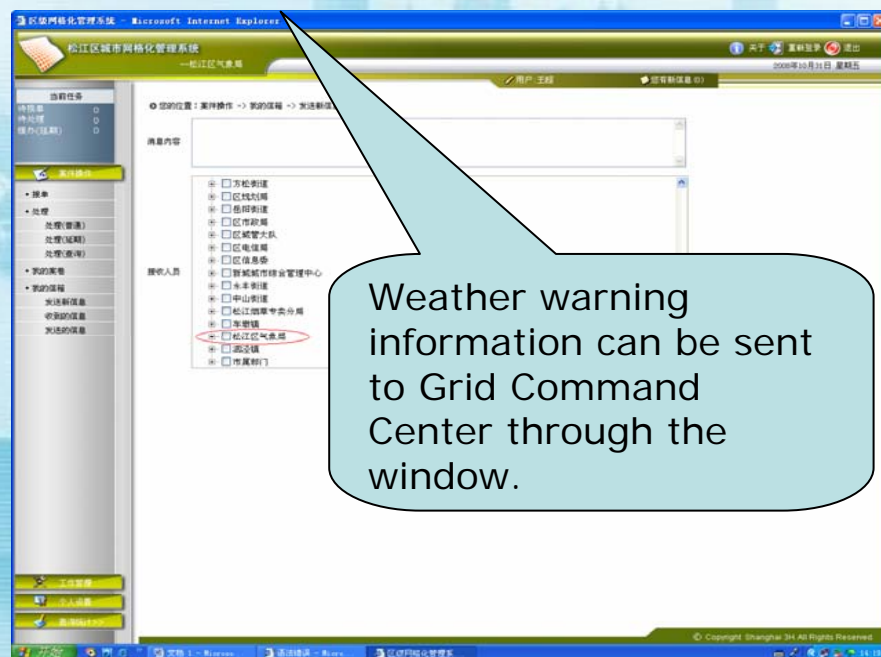
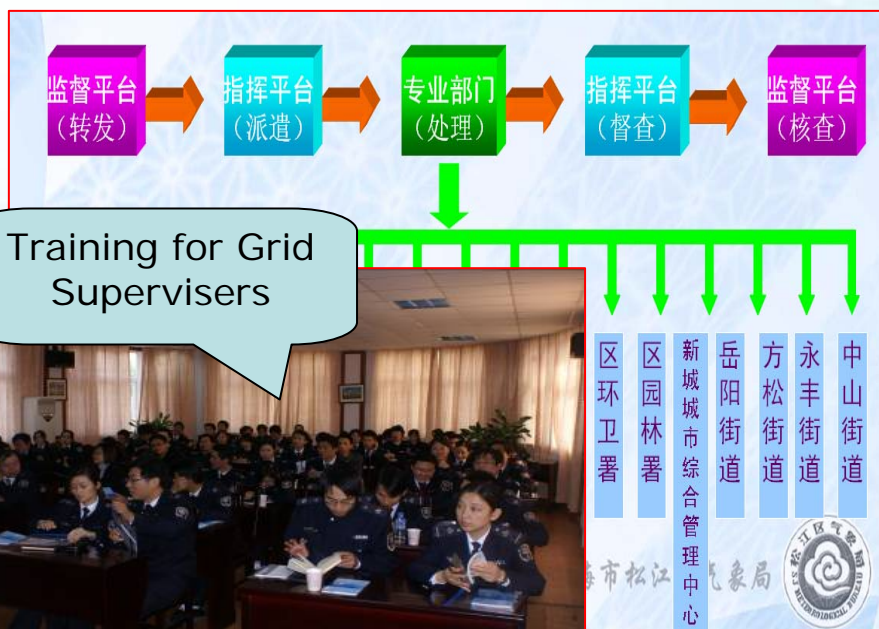
Grid supervisors act as urban weather messenger, responsible for inform disaster to SMB.

Grid supervisors are responsible for **receiving weather warning information**.

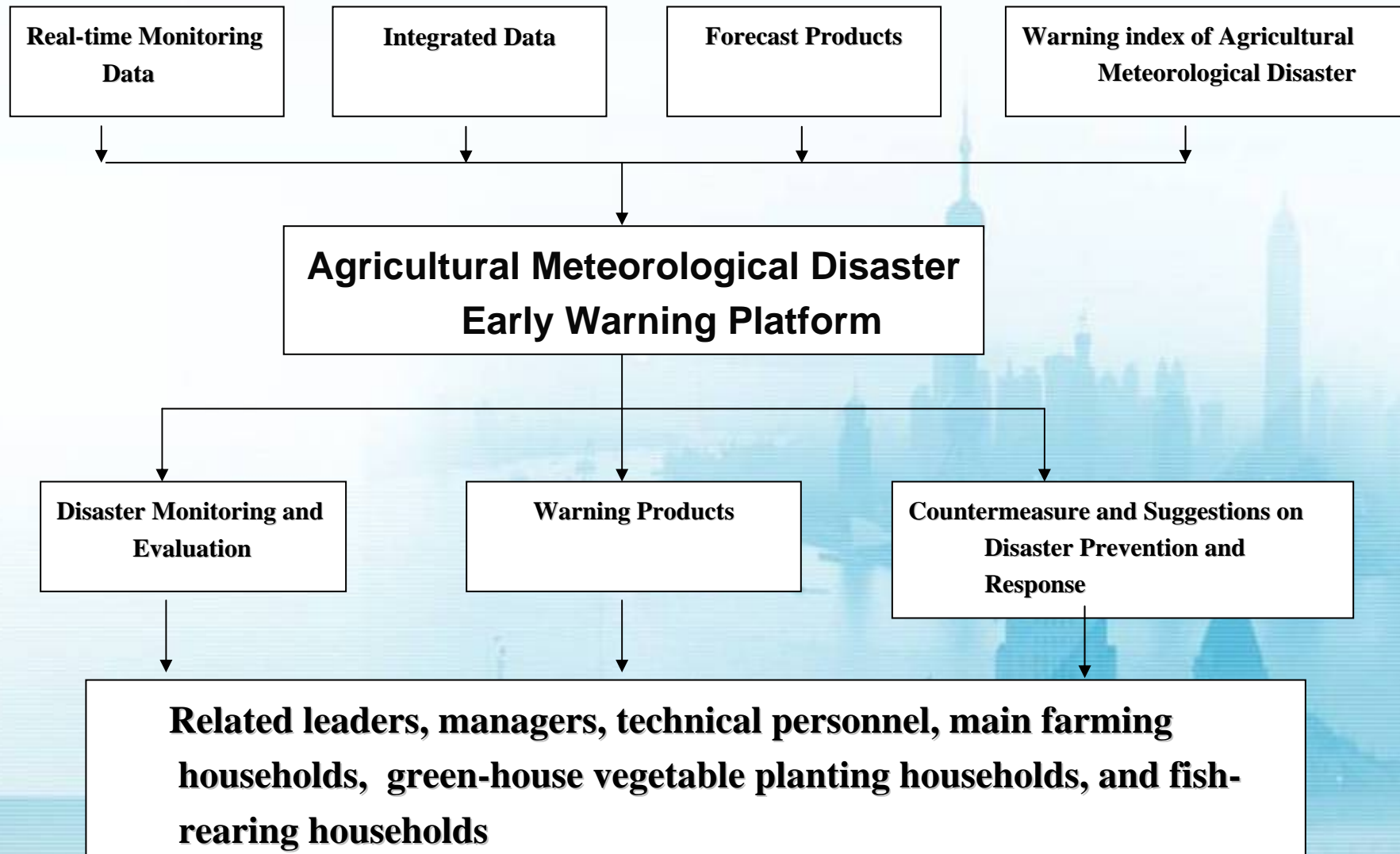
Grid supervisors are responsible for **disseminating warning information and action guideline**.

Grid supervisors participate in **trainings** on weather-related knowledge as basic technique and qualification.

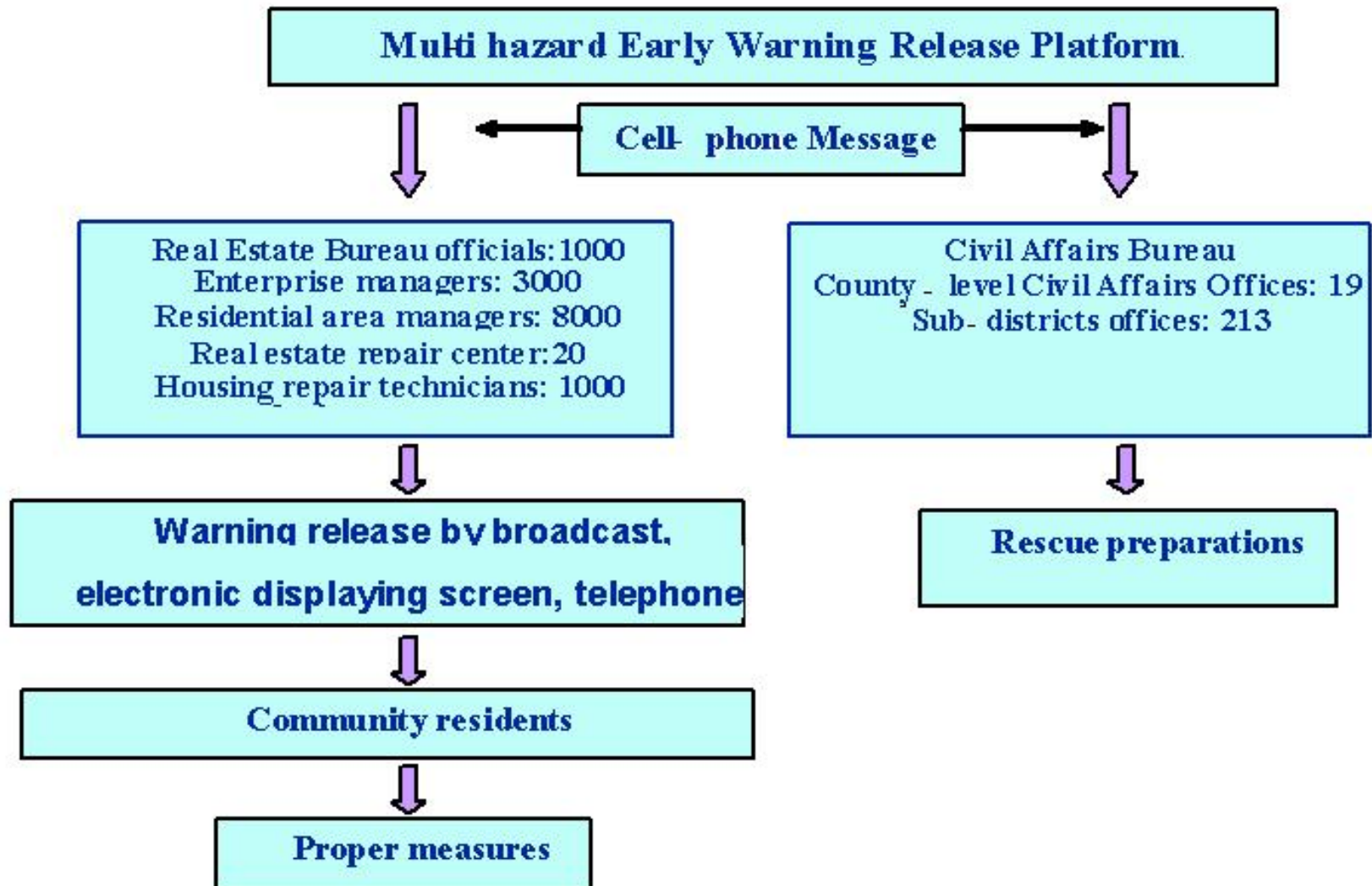
MHEWS Information Sharing Platform has been developed in the mechanism.



3. Early Warning dissemination platform for farmers' special use in Songjiang



3. Early Warning dissemination platform for residents' in residential communities in Xujiahui District



Experience : Characteristics

Key Technology

Integrated data utilization of disaster monitoring, warning, evaluation and dissemination.

Key Mechanism

Joint response mechanism of multi-agency during the whole disaster impact process.

Aim

Improve the response ability of government in disaster prevention and rescue.

System Description

MHEWS Plays a start-up role for multi-agency response for disasters prevention which covers emergency response for natural disaster, accident, public sanitation and social security events.

Multiple means:

**Multi-Hazards
Integration**

**Multi-Agency
Joint Response**

**Multi-Phase
Response**



The system covering 21 kinds of disasters that may happen in the fields of weather, marine, biology, hydrology, energy, agriculture, production security, communication, fire protection, public equipments malfunction, nuclear and radiation accidents, environment pollution accidents, public sanitation, food security, social security, earthquake etc.

Two steps of the system construction:

- 1 Cover 19 kinds of disasters which connect to weather hazards.**
- 2 Cover the rest 3 kinds of disasters.**

Multiple means:

**Multi-Hazards
Integration**

**Multi-Agency
Joint Response**

**Multi-Phase
Response**

Set up 36 different joint response mechanisms among 25 governmental departments of the city.

25 Governmental Departments: Municipal Emergency Management Office, Emergency Response Center, Education Commission, Development and Reform Commission, Bureau of Public Security, Commission of Construction and Administration, Water Affair Bureau, Harbor Administration, City Planning Administration, Food and Drug Supervision Administration, Environmental Protection Bureau, Public Health Bureau, Aviation Bureau of Eastern China, Air force, Disease Control Center, Agriculture Commission, Economic Commission, Taihu lake Administration, Electric Power Company, Culture, Radio Broadcasting, Film and Television Administration, Tourism Administrative Commission, Housing, Land and Resource Administration, Civil Defense Office, Safe Production Supervision Administration

36 Joint Response Mechanisms on governmental classified-command, smooth traffic, inspection of building construction, marine visa, ship supervision, the regulation and control of drain network, dispatching of fairway and airport, market security of coal, oil and electricity, price supervision of market necessities, food sales control, communication security, public health and disease control, fire safety of city, the transfer and reserve of disaster-relief materials, Insurance Relief, social rescue, evacuation and so on.

Through the system, the above departments can efficiently cooperate in emergency management.

Multiple means:

**Multi-Hazards
Integration**

**Multi-Agency
Joint Response**

**Multi-Phase
Response**



Early warning is the first step of emergency and penetrate the whole procedure of emergency management system. Through the multi-hazards early warning system, information can be shared effectively and be disseminated in time. Through the system, weather department will be able to do more in the public management of government disaster prevention and mitigation system.

Early means:

Early detection, early consultation, early distribution provide for early preparation and response needed for appropriate response activities to minimize the loss of life and property.

This can be achieved through two approaches:

(1) Technical approach:

- Utilizing an integrated interagency regional approach through the use of all monitoring capabilities to optimize data and information collection for early detection;
- Utilizing all available uncertainty information and to consult with the other agencies in advance of any warning. By utilizing the integrated distribution system to provide quick distribution of warning information.

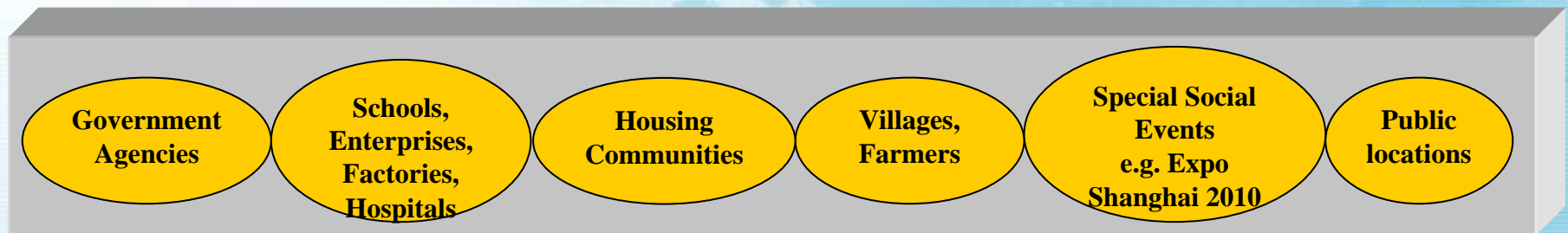
➤ (2) Management Approach:

Shorter response time resulting in early deployment can be achieved.

Experience: Characteristics

a) All-reaching strategy is important to meet needs of various users.

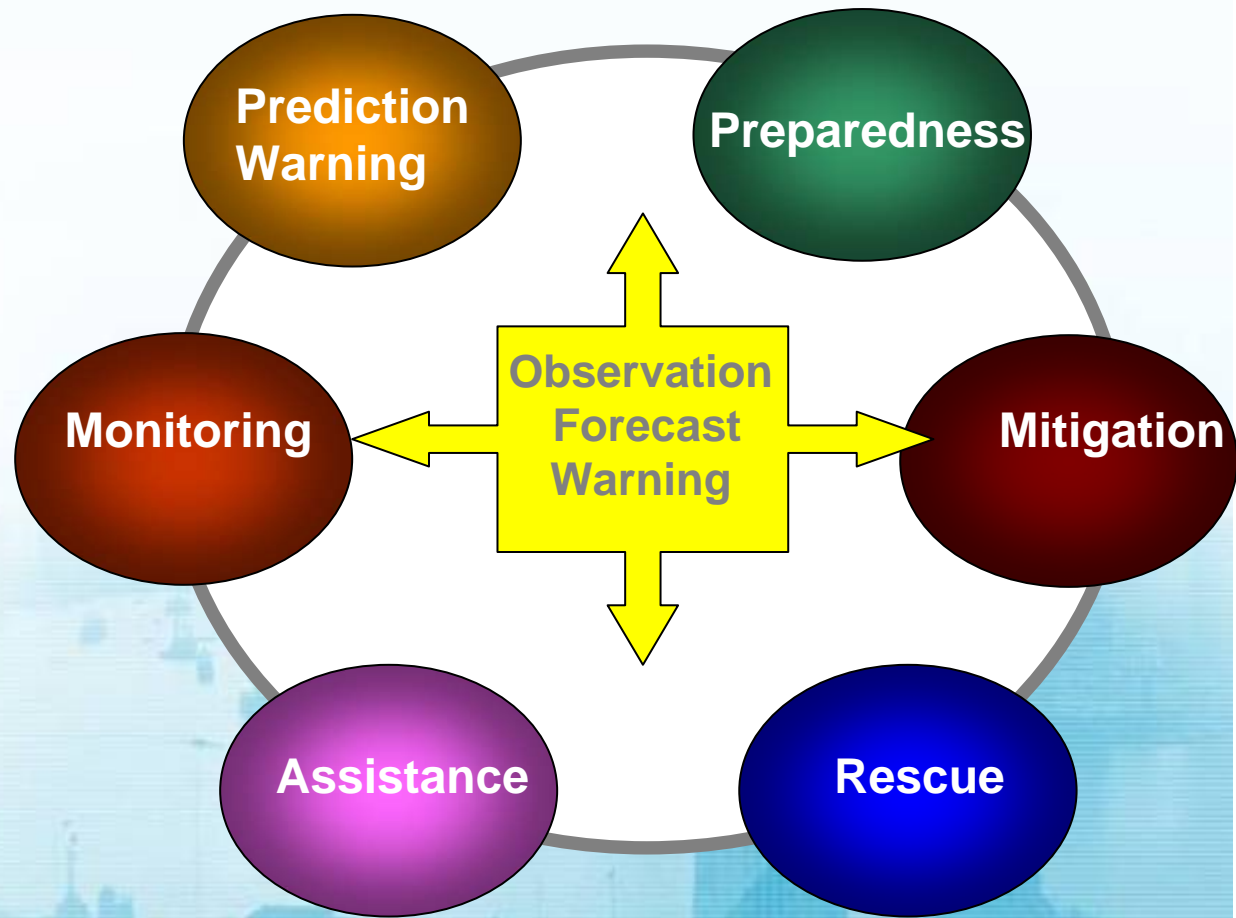
- Point-to-line services are provided for key social activities, where ‘line’ means that meteorological services should be provided throughout the entire sequence of activities.
- In point-to-area services, ‘area’ designates the general public. A point-to-area service is one in which public meteorological services should cover the whole of society.



Experience: Characteristics

b) "3M" strategy

- **Multi-Agency preparedness**
- **Multi-Hazard integration**
- **Multi-Phase response**



Multi-phase Response Framework for Multi-hazard

Experience: Characteristics

c) Grassroots Experience: *Community Participation*

□ In Shanghai, more than 10,000 residential communities actively take part in disaster mitigation exercises every year.

people-centered, for target audiences, i.e., disadvantaged people.

□ *supported by multi-agency backup* from SMB, residential communities, Civil Affairs Bureau, etc.



**Residential Community
Response Rehearsal**

- **Multi-agency response** for multi-hazard mitigation is needed for unique, simple, and clear information to the *grassroots organization*.
- **Seamless approach** in the whole procedure of implementation, which includes **monitoring, warning, preparedness, mitigation, rescue and assistant** might be an embodiment of “**End-to-end-to-end**” concept.
- The current infrastructure for prediction/warning in **NMHSs can play an important role** in the development and implement of multi-hazard **early warning system based on Science**.

Experiences:

MHEWS Approaches: point, line, area and people

- In terms of the Shanghai comprehensive disaster prevention and mitigation system, the Shanghai Multi-Hazard Early Warning System has fully implemented in the efforts to realize the four approaches, including **point**, **line**, **area** and **people**.

Point

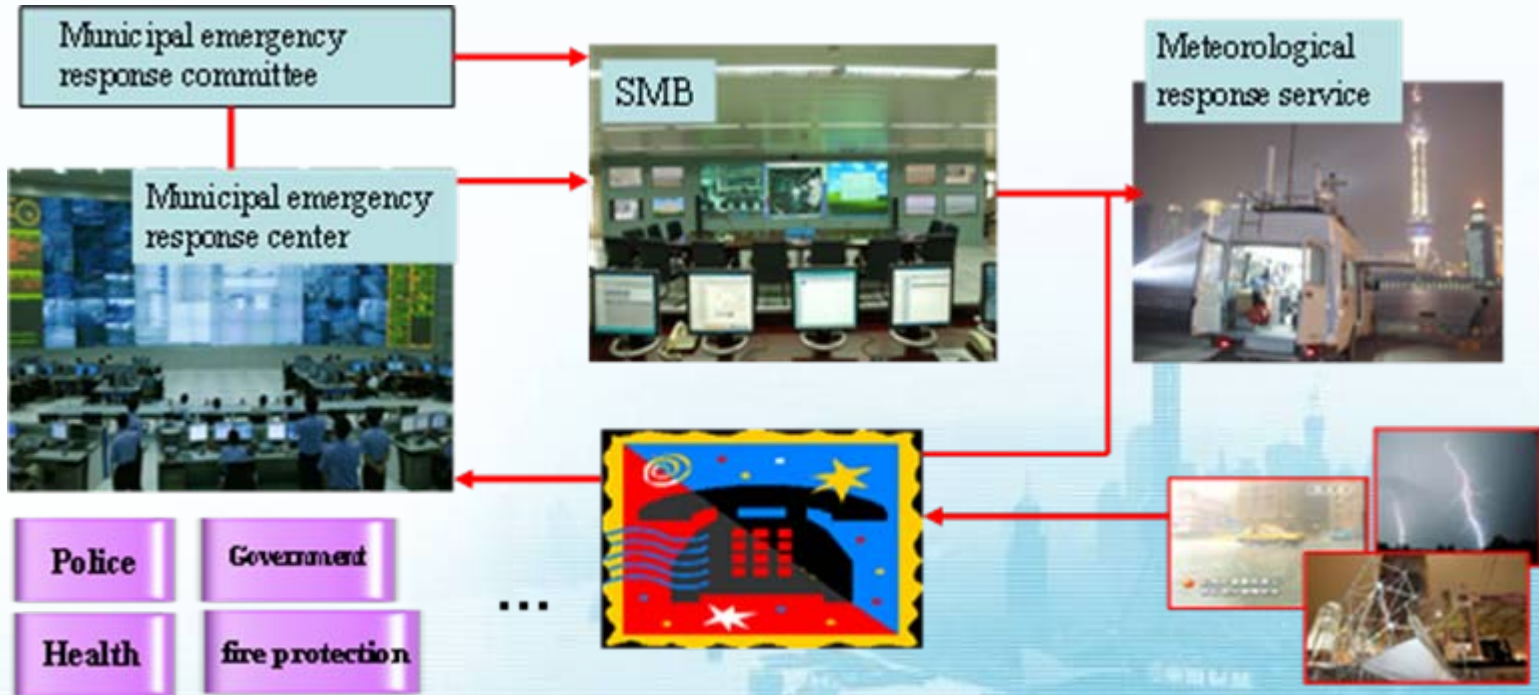
The so-called "point" means embedding the MHEWS into a number of safety-sensitive hot spots related to the safety of the city



special position for meteorological warning service has been set up in the Harbour of Yangshan, and the establishment of marine observatory will provide early warning service for the shipping, loading and unloading, logistics and timely evacuation.

Line

The capacity to standard the inter-agency and interdisciplinary coordination and cooperation is important to implement the MHEWS as one chain from early monitoring, early warning, prevention, and mitigation to rescue.



- **Flood Control Department and Meteorological Service has established standard joint emergency response mechanism concerning typhoons, rainstorms and other city disasters through the whole procedure of DPM.**
- **Food and Drug Supervision Administration and Meteorological Service has established joint mechanism for information-sharing, development of technology and dissemination of early warning for food poisoning.**

Area

Combination with urgent emergency response mechanism with the daily urban grid management mechanism is an important approach. The efforts to increase the rate of coverage of warning are important.



People

Effective application of MHEWS for decision-makers, social groups, individuals, and the general public is critical. However, implementation of the concept of people-centered is very important in the whole procedure of MHEWS to meet needs.

重要气象信息市领导专报
2008年第32期
上海市气象局
2008年6月15日10时15分 签发: 商 斌

“风神”今晨登陆广东深圳
--27-28日本市有较强降雨

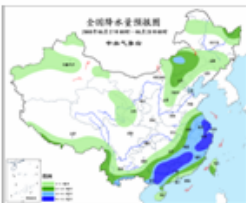
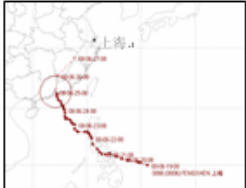
今年第6号强热带风暴“风神”今天早晨5时30分前后在广东省深圳市葵涌镇沿海登陆, 登陆时减弱为热带风暴, 中心附近最大风力有9级(23米/秒)。

目前热带风暴中心正以每小时10-15公里的速度向偏北方向移动, 强度继续减弱, 预计今天半夜前后进入江西境内, 并逐渐转向东北方移动。

受该热带风暴减弱后的低气压影响, 预计27-28日本市将出现一次较明显的降雨过程, 过程累积雨量50-80毫米, 部分地区100毫米以上, 华东中南部沿海海面将出现阵风8-10级的偏南大风。

我们将密切监视热带风暴“风神”强度和路径的变化以及对本市的风雨影响程度, 如有新的情况及时报告。

报: 市委办公厅、市政府办公厅、市政府机要局



• for social groups, disaster prevention capacity of social basic units will be enhanced through establishing the security system in communities.

• awareness and knowledge for disaster prevention and mitigation of individuals will be improved through the collaboration with the education departments and public training programs.

An aerial photograph of a large, white, spherical building with a rainbow on its side. The building is situated in a paved plaza area, and a road is visible in the background. The text "Thanks for your attention !" is overlaid in red on the building.

Thanks for your attention !

Welcome to Shanghai !