**US/China Transportation Forum**

**Fifth Annual Workshop**
**Safety and Disaster Preparedness Disaster Assistance Working Group**
**October 26-29, 2013**

**FINAL REPORT**

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## BACKGROUND:

The U.S./China Transportation Forum, which was established in 2008 by the Secretary of the U.S. Department Transportation (USDOT) and the Minister of Transportation (MOT) for the People's Republic of China, provides an opportunity for both countries to share information for mutual benefit. The forum meets once annually, alternating between the two countries. Five working groups support the Transportation Forum, one of which is the Safety and Disaster Assistance Working Group (DAWG). The U.S. co-chair of the DAWG is Michael Lowder, the Director of Intelligence, Security and Emergency Response for the Secretary's Office of the U.S. Department of Transportation. The Chinese co-chair is Mr. WANG Jinfu or Mr. WENG Lei, Director General Safety and Supervision, Ministry of Transport, People's Republic of China. The DAWG conducts email exchanges, site visits, trade missions, seminars, expos, video-conferences, and an annual workshop to further its objectives. In June 2013, the Co-Chairs of the DAWG met in China to determine the agenda for the 2013 Workshop, and agreed upon an overarching theme of "Overcoming the Impacts to Transportation of Hurricanes and Typhoons".

The three-day workshop on disaster preparedness was held October 26-28, 2013at Rutgers, The State University of New Jersey, and key experts from the U.S. and China discussed disaster prevention and response, focused on transportation systems. Presentations were given by both U.S. and China

transportation officials and scholars, highlighting lessons learned from natural disaster events, as well as possible solutions for disaster preparedness and assistance. The damages and other impacts of Hurricane Sandy on New Jersey and New York transportation systems was a primary focus of discussion by USDOT representatives, with China MOT counterparts presenting information about the impact of similar events in China. On the third day, workshop participants visited key locations in New York City to learn about Hurricane damage and reconstruction, with an emphasis on improving the resilience of transportation systems. The slide below shows the similar environmental threats of hurricanes/typhoons that both countries have faced.


Mr. Michael LOWDER and Mr. WENG Lei gave opening statements for the workshop and Ms. Janet BENINI, DOT Associate Director for International Preparedness Programs, did a short presentation on the overview of the workshop and compared the similarities of two countries in terms of their size, population density on the east coast, transportation systems, and response to natural disasters. The slide below shows how citizens in both countries react to flooding.


## PRESENTATIONS:

Summaries of each presentation made over the two day Workshop at Rutgers are provided below.

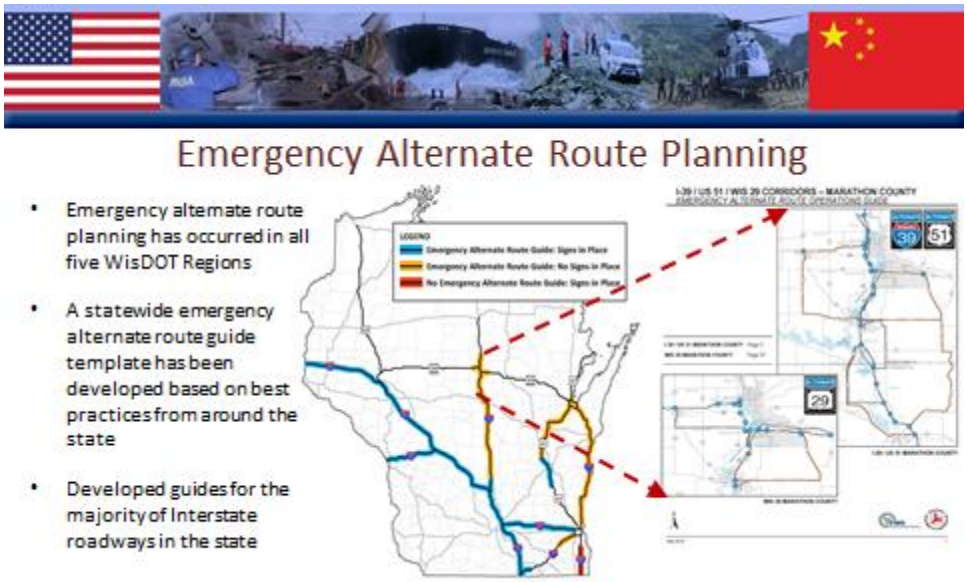
### CASE STUDIES: TRAFFIC INCIDENT MANAGEMENT AND QUICK CLEARANCE

***Traffic incident management and emergency transportation operations***

***Presenter: John CORBIN***

This presentation provided an overview of traffic incident management development history in the United States, and used Wisconsin's traffic incident management enhancement program as an example to illustrate how to respond to traffic incidents quickly. Before 1980s, there was no single national program to clear traffic accidents in the United States. The Federal Highway Administration (FHWA) created the initial national guidance and used cameras to monitor traffic incidents on interstate highways in 1980s. However, more active response to quickly clearing accident sites in dense urban areas was needed, which led to efforts to build local response systems based on cooperation among agencies (police, USDOT, hospitals, and etc.) during 1990s. In 2007, a nationwide Traffic Incident Management (TIM) initiative was established in order to build respond systems to provide quick and safe incident sites clean up, as well as enhancing communication among different agencies. Today, the TIM network connects professionals across the country via internet (by emails and website).

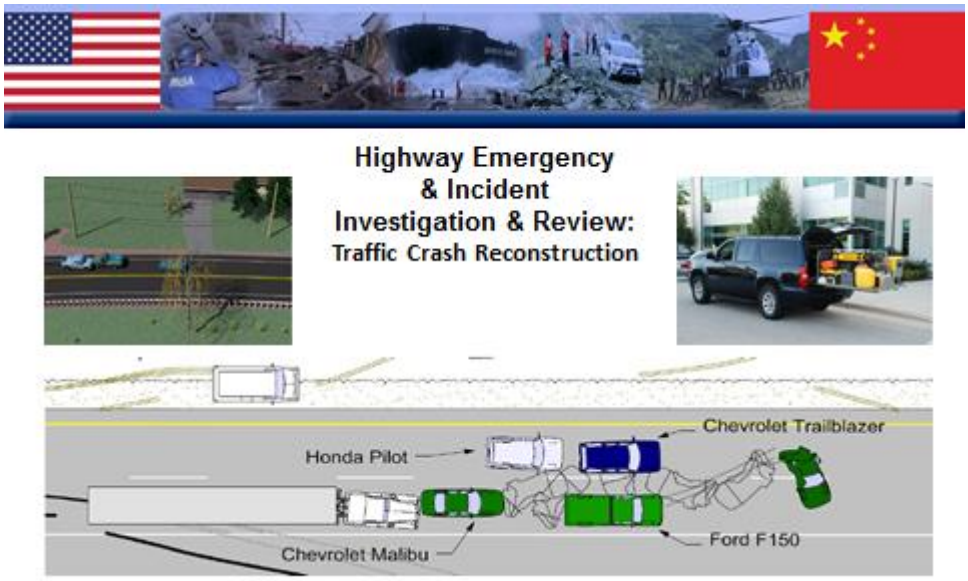
As Wisconsin has a population of more than five million and a dense highway network, an active program for quick traffic incident response is essential. The TIM program in Wisconsin contains five elements: the strategic program planning structure; the operations and response plans; the partnership agreements; guidelines and laws; and service, tools, technologies and systems. These elements not only describe the structures of the response system, but also clarify responsibilities by different agencies. The following slide shows how emergency alternate route planning was carried out in Wisconsin.




The TIM program has two committees: the oversight committee, which organizes regional partnership meetings and commands staff peer exchange; and the technical committee, which provides technical expertise in TIM projects. For instance, the Emergency alternate route planning is a statewide emergency alternate route guide template developed under the TIM structure. Wisconsin also published the WisDOT emergency traffic control and scene management guidelines, which provides instructions and on-going multi-disciplines response training on how to coordinate varies agencies on traffic incident sites.

The traffic laws and driver education guidelines is another important component of the TIM Network program. These laws and guidelines train drivers how to respond correctly if involved in minor accidents, in addition to providing guidelines for responders to work effectively and safely to prevent

secondary accidents on traffic incident scenes. In terms of traffic incident response operations, there are three important components. The first one is the freeway service teams and the cooperation with towing services companies as quickly removing heavy trucks and other obstacles is important to avoid traffic congestion on highways. Secondly, Wisconsin also has a statewide traffic operations center and incident notification systems which provide more reliable statewide incidents monitoring and recording services. The third is the emergency transportation operations (ETO). This evacuation plan provides interagency training and exercises around interstate highways based on national incident management system and incident command system's "coordination rules". In addition to traffic incident prevention planning and site cleanups, post incident investigation and review are also important. Thus, Wisconsin conducts road investigations on specific incidents to reconstruct traffic crash scenes to find out incident reasons and trace response procedures (see slide below). Professionals also organize regular after-action reviews and debriefings for better understanding of traffic incidents and potential improvements.




***Rapid Disposal and Rescue of Traffic Accidents on Chongqing Expressways***

***Presenter: ZHANG Wei (Prepared by: KONG Xiangzhi)***

Chongqing, with a population of over 30 million it is the largest city and a major transit hub in southwest China. The first highway in Chongqing was constructed in 1995, and the total mileage of

highways already reached 2,300km by 2012 and the average daily traffic flow exceeds 320,000 vehicles. Because Chongqing is a mountain city with many water areas across its landscape, the highways in Chongqing have some distinct characteristics which make traffic incidents management more difficult than in other cities. For example, various long longitudinal slopes on highways lead to higher traffic accident rates in certain areas; the high percentage of bridges and tunnels among highways (over 1/3 of all highways) and frequent extreme weather year round(foggy days, heavy rains and snows) made quick and safe response more difficult. The following slide shows pictures of some of Chongqing's transportation infrastructure.

In addition, as Chongqing is the transit hub for southwest China and the large traffic volume also increases the potential of traffic incidents. However, because of the unified management system and comprehensive law enforcement in Chongqing, the average time for disposing to a traffic accident scene is no more than 20 minutes and there have been no traffic accidents with above 10 causalities or serious traffic congestion on the highways so far.

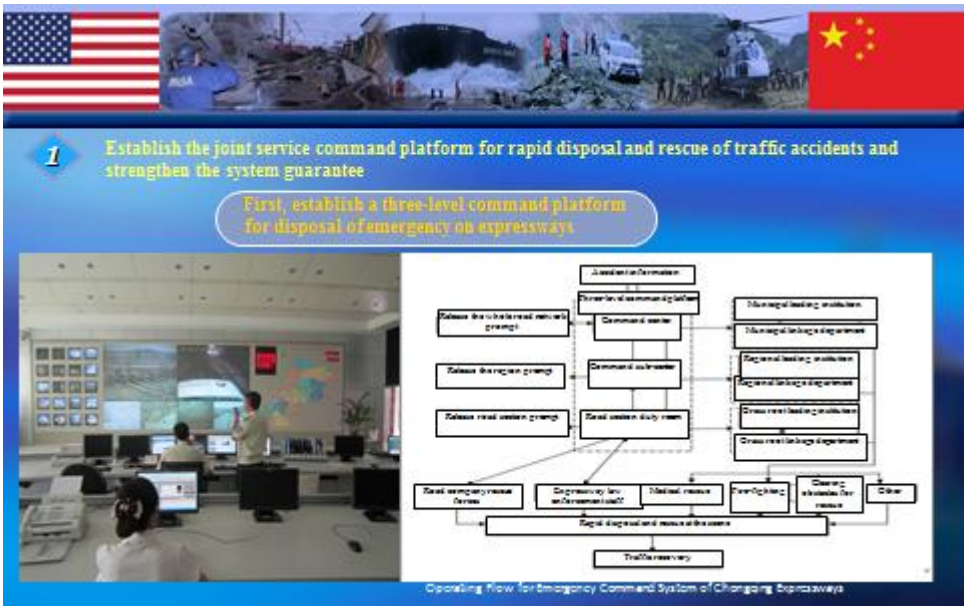
Chongqing has concluded five principles for quick response to traffic accidents based on its traffic incidents management experiences: coordinated action, accident disposal as per degree of urgency, safety first to smooth traffic flow, rescue prior to investigation, and smooth traffic prior to

obstacles clearing. In all traffic accident scenes, coordinating action is the most important principle and the first responders to the incident scene should begin organizing the rescue, site clean-up and maintain traffic based on the degree of urgency. And in all accidents scenes, not only the rescuing of people involved in the accident should be the first priority, but also the safety for responders, as secondary accidents may lead to more serious problems. The reopening of traffic lanes is not permitted until safety is confirmed.

Chongqing City also employs “Five Rapids” for rapid disposal and rescue of traffic accidents: rapid response, rapid traffic and scene control, rapid rescue of the injured, rapid investigation, and rapid obstacle removal. Under the cooperation arrangements among different agencies (police, hospitals, and etc.), responders should be dispatched within 5 minutes and arrive at the scene within 15 minutes. Once they arrive at the scene, police should control the scene or take traffic control to avoid secondary accidents. If an accident happens in tunnels or on a bridge, the entrances should be closed partially to ensure safe and quick rescue and site cleanup. By using cameras, GPSs and other high-tech equipment, quick investigations can be conducted to clarify responsibilities among agencies, and rapid obstacles removal accomplished through the collaboration among service providers and agencies.

In order to ensure quick response for traffic incidents, Chongqing found there are five critical guarantees: system guarantee, mechanism guarantee, information guarantee, science and technology guarantee, and ability guarantee. The following slide shows how agencies cooperate to maintain the accident scene.

Chongqing has established a three-level command platform for emergency disposal on highways. All sites, districts and citywide traffic scenes are linked to the control center for more efficient rescue management. In addition, police (110), hospital (120)[1], environmental agency, and etc. have established joint service command platform for quick traffic accidents response (The slide below shows how the three-level command platform is constructed).




The mechanism guarantee contains three major components: laws, emergency plans, and supporting systems. For example, Chongqing published guidelines for quick response to minor accidents (with no injury), which guides vehicle owners to identify and negotiate legal obligations without the present of a police officer. In addition to joint command system and mechanism guarantee, strengthening early warning and monitoring service is also important. Thus, Chongqing established a public alarm system which operates 24/7 in order to respond quickly to traffic accidents by monitoring

[1] Quick dial numbers for police and emergency medical services in China.

traffic flows, highway conditions and broadcasting live traffic information. The Chongqing police department also enhances road patrol and supervision on peak hours and holidays. Last but not least, Chongqing also strengthens responders' abilities by organizing regular multi-disciplinary training, review meetings, and emergency drills.

## CASE STUDIES: SAFETY OF LONG DISTANCE PASSENGER BUSES

***Lay Solid Foundations Comprehensively for Safety and Make the Greatest Efforts To Ensure Scientific Development***
***Presenter: LIBin (Prepared by: SONG Jian)***

This presentation illustrates the safety management of long distance passenger buses in China by using an example of one the country's largest transportation corporations. Suzhou Passenger Transportation Group Co., Ltd (SPTG) was established in 1949 and was privatized in 2004. It has over six hundred service lines and 14 long distance bus service stations, with average daily transport of 660,000 passengers. After decades of development, SPTG became a large corporation which provides not only long distance bus service, but also logistics, tourism, vehicle repairing, station operation and finance services. For decades, the company has promoted the policy of "safety first and prevention as the main body for comprehensive governance" in its passenger transport service; and developed four safety management mechanisms (access, exit, training, award and penalty) for its driver and management teams. In SPTG, all employees shall keep alert all the time and make preparations with frequent discussions of hazards. SPTG also values its organization and leadership of safe production, safety management supervision mechanism; and it subdivides responsibilities for workers and distributes safety indices for positions to share risks of safety for every employee.

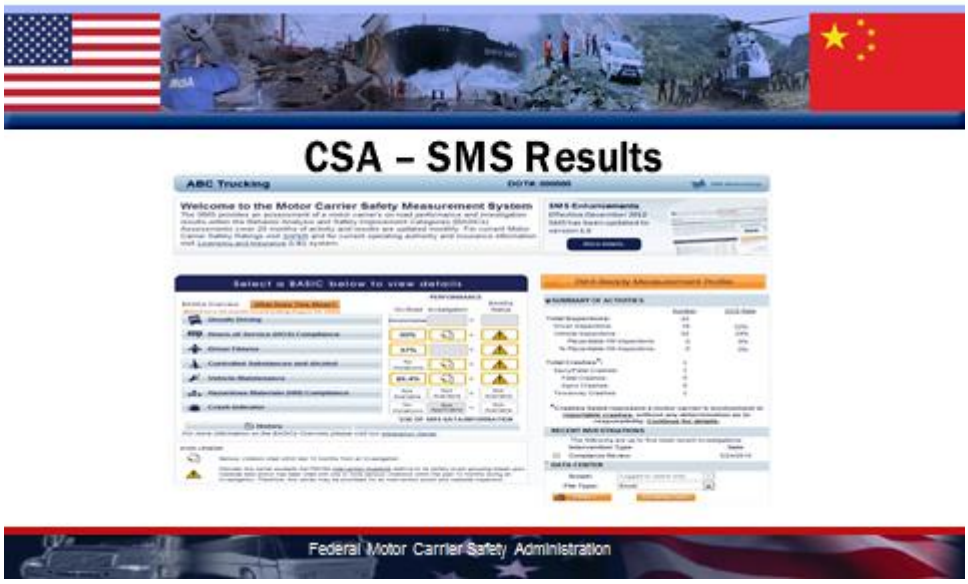

It 苏汽集团 Suzhou Passenger Transportation Group Co., Ltd focuses on building a team of safety management which performs their duties with great efforts. In terms of building the drivers team, SPTG standardizes uniform access requirements and procedures for different types of drivers. Moreover, SPTG continuously improves basic normative management; sticks to effective traditional management and focuses on practical innovation management (like full responsibility system, work inspection system, safety supervisor system and so on). In terms of monitoring employees' performance and on-the-job training, the company has input over 12 million yuan (about 2 million U.S. dollars) to establish a GPS platform and monitoring network for internal service. In addition, SPTG also organizes safety trainings and monitors driving behaviors (for example, set up strict time limits per day for drivers), as well as developing emergency response plans for safety management. Some of the safety management practices are shown in the slide below. For example, the activity system with a good wife program was designed to encourage family support toward ensuring drivers are well rested and prepared to work. The company also organizes various recreation activities for drivers' families regularly.


***Federal Motor Carrier Safety Administration (FMCSA): Passenger Vehicle Safety***

***Presenter: Wes BARBER***

Federal Motor Carrier Safety Administration (FMCSA) is the federal agency which regulates multi-passengers vehicles (bus, taxi, and etc.) and heavy trucks in the United States. FMCSA has about 500 investigators and works with state partners across the country to regulate over 60,000 carriers. Given the fact that FMCSA has limited capacities to regulate the large amount of companies, the key safety regulation is the Federal Motor Carrier Safety Regulations: Motorcoach/Bus Version. Under this regulation, a driver must pass a medical exam and obtain a commercial driver license before entering the industry. The regulation also limits drivers' maximum driving hours per day and requires drivers to keep vehicle maintenance logs. In addition, a department-wide initiative, the Motorcoach Safety Action Plan was established in order to unify responsibilities of the various agencies under DOT. This plan was last updated in 2012 and consists with three phases: quick strike; national safety assessment and outreach; and one safety standard for passenger travel.

FMCSA also developed compliance, safety, accountability (CSA) system to regulate the industry. A major part of CSA is the safety measurement system (SMS), which FMCSA uses to collect operational data from different carriers to evaluate and intervene in their performances. The behavior analysis safety improvement category (BASICs) under SMS is a comprehensive review procedure based on data collected from sampled carriers to investigate driver behaviors. All CSA-SMS evaluation results can be obtained on FMCSA's website, and a carrier will be put out of business if its safety fitness is below a standard score. The following slide shows the web interface of the CSA-SMS results. In summary, CSA guides agencies to ensure transportation safety of multi-passengers vehicles and commercial trucks. Thus, the training of specialties to monitor unsafe companies is important, as well as outreach and education to the industry and consumers



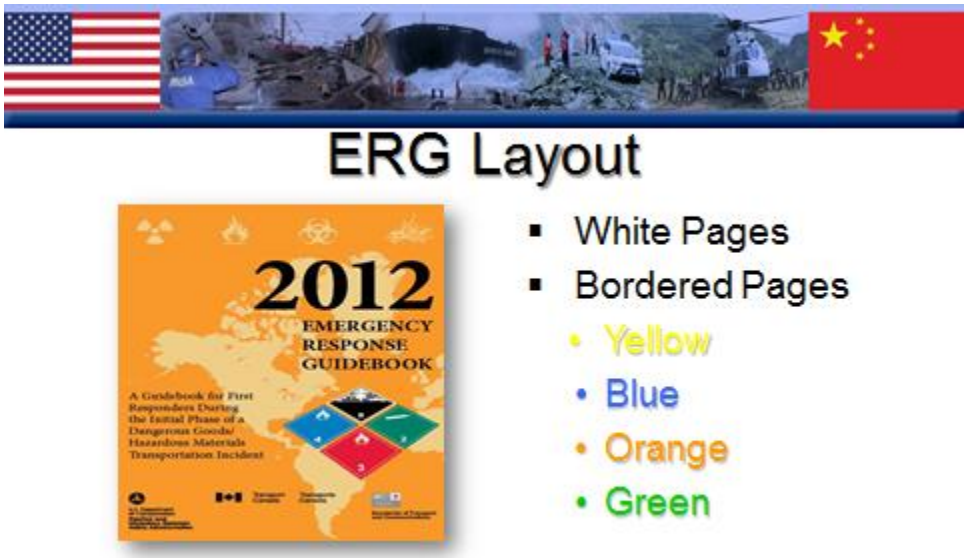

**CASE STUDIES: TRANSPORTATION SAFETY OF HAZARDOUS MATERIALS**

***United States Department of Transportation Pipeline and Hazardous Material Safety Administration: Emergency Response Guidebook (ERG)***

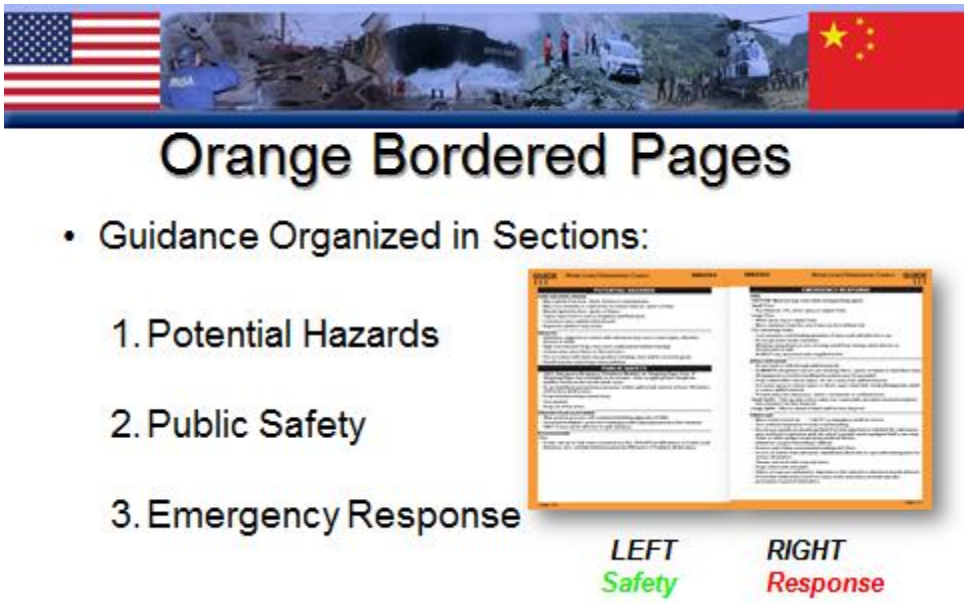
***Presenter: Anthony MURRAY***

United States Department of Transportation Pipeline and Hazardous Material Safety Administration publishes the emergency response guidebook (ERG) (see slide below) every four years with the joint collaboration with Canada and Mexico, and the latest version of ERG was published in 2012. The 2012 ERG aids emergency responders to identify hazardous material quickly and help them protect themselves and the general public. For instance, 911[2] phone operators need the ERG for efficient and effective response.

[2] US Emergency phone number




The guidebook layout can be categorized as white pages and color bordered pages. The white pages provide instructions on how to identify hazardous materials, and guidelines to evaluate how serious the accident is. The color pages of the guidebook are useful for identifying the hazardous materials and procedures to pack and ship the materials properly. For example, in the yellow bordered pages, there will be 4-digit UN ID number of hazardous materials listed in numerical order, which guide to the page number of proper shipping name in green bordered pages. And in the blue bordered pages, hazardous materials are listed in alphabetical order with their proper shipping name with related UN ID number. The orange bordered pages provide guidance organized in sections: potential hazards of a given material and proper emergency response; for example, how far to keep public back from toxic materials. And the last section of the guidebook contains green bordered pages, which provide protection actions guidance based on the type of hazardous materials listed in yellow or blue bordered pages. The following slide shows a sample page of the orange bordered pages:



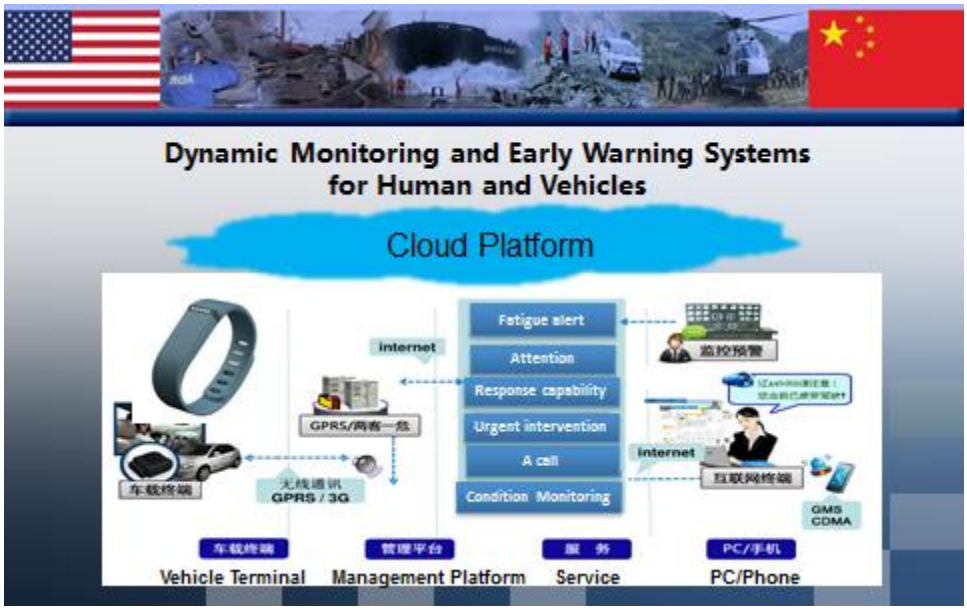

ERG is provided to emergency responders, for example, police, fire fighters and hospitals, for free and has been translated into 17 different languages. In addition, digital version of the 2012 ERG can be ordered from agency's website and there is also a hotline which provides guidelines for shipping hazardous materials.

***Briefing of Chinese Road Transportation Safety Management of Hazardous Chemicals***

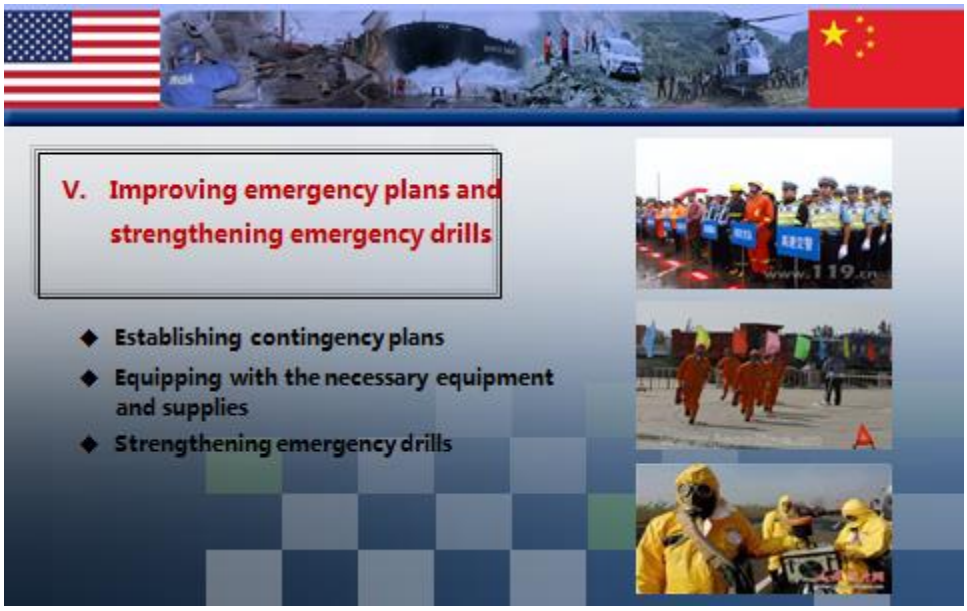
***Presenter: YIN Juntao***

Transportation safety management of hazardous materials in China is difficult as there are more than seven thousands companies in the industry. More than two billion tons of hazardous materials are shipped by more than 130,000 dangerous goods transport vehicles via the highway system every year. Thus, in order to ensure the transportation safety of hazardous chemicals, the Ministry of Transport issued *the Administrative Provisions on Road Transportation of Dangerous Goods* to regulate hazardous material transportation in China. The Ministry of Transport also guides companies to improve their safety systems, and carriers must be licensed before entering the industry. In terms of regulating drivers in the industry, the ministry implemented a vocational qualification system and provided continuing education training. For example, all drivers are required to take the driving aptitude test before entering

the industry. Moreover, for the dynamic monitoring and early warning systems for human and vehicles, a national monitoring network was established in 2008 (see slide below).




This network links the monitoring system with vehicles via satellite positioning devices, collecting real time data of drivers' behaviors for monitoring and early warning purposes. By tracking the routes and speeds of vehicles, this cloud platform can be used to monitor drivers' behaviors for safety purpose and provide early warning once a driver works over time limit or deviates from the scheduled route. It is also important to form a joint safety regulatory mechanism by improving cooperation among different agencies at national, provincial and local scales in addition to the construction of monitoring systems. Finally, emergency responders (police, fire fighters, etc.) are required to develop emergency response plans and strengthen their abilities by conducting emergency drills, as well as equipping with necessary equipment and supplies (see slide below).

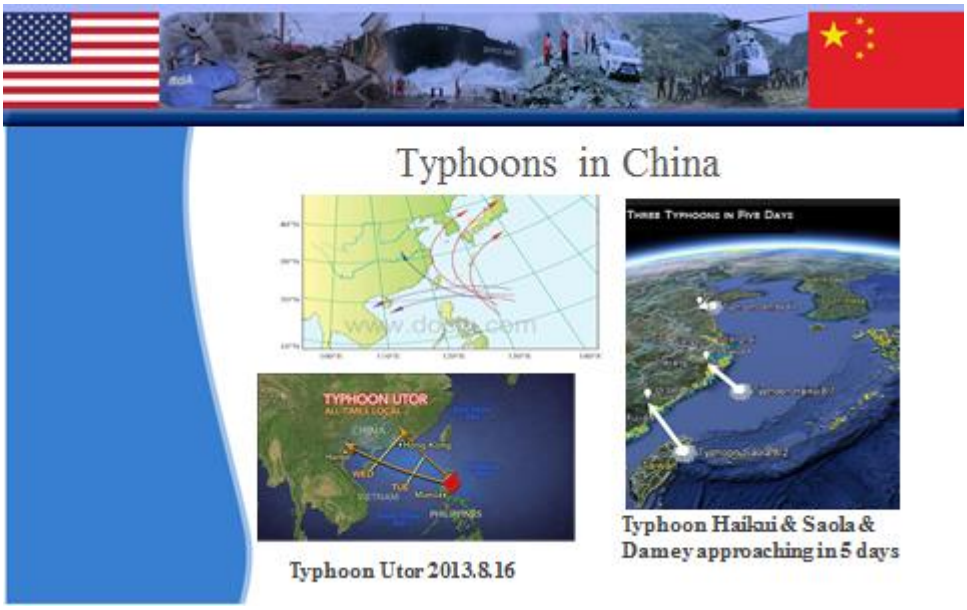



**CASE STUDIES: HURRICANES/TYPHOONS: PORTS AND SHIPPING**

***Making Proactive Prevention Effective Measures Against Typhoons***

***Presenter: HUANG Peng***

This presentation provided a brief review of proactive prevention practices against typhoons that might impact coastal ports and communities in China. For instance, three typhoons, Haikui, Saola and Damey approached southeast China within five days in 2012, resulting in a large quantity of cargo losses. Therefore, it is important to make rational and science-based judgment of the potential impacts by studying and analyzing typhoon data. Emergency response to typhoons should be planned ahead and proactive prevention is an effective method to limit the impacts of typhoons port areas. Proactive typhoon prevention on ports can be categorized into two parts: typhoon prevention for vessels and typhoon prevention for ports. For vessels, it is critical to make timely weather forecasts for appropriate strategies implementation: either mooring vessels in ports (or anchorage grounds), or navigating vessels away from the typhoon center at sea. For ports, typhoon-proof facilities should be included in all port design, and it is necessary to continuously improve the marine rescue network for typhoon damage prevention.




Additionally, the establishment of a typhoon monitoring agency is important. In order to limit their damages, agencies should work together on typhoon damage prevention preparation and take rapid response to rescue ships that are impacted. Agencies should cooperate with each other under the leadership of the Maritime Safety Administration (China MSA) in organizing typhoon prevention activities and post-typhoon rescue and recovery work. For example, Hainan Province established Hainan Marine Rescue Center (Hainan MRC) under the leadership of the provincial government in 1997. The Hainan MRC makes rapid response for five ports in the province by involving professionals, military and civil groups, and the general public. Hainan MRC also established a mechanism for regular typhoon-damage prevention and rescue drills and daily inspection of facilities and equipment, in addition to the organizations for typhoon damage prevention and safety responsibility. The following slide shows pictures of proactive prevention practices against typhoons.

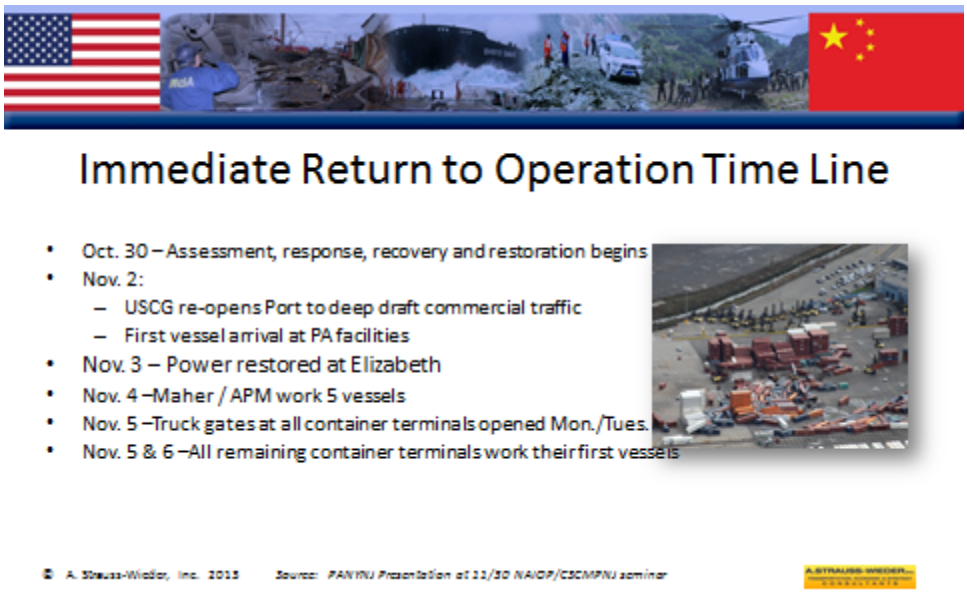

Each port administration, under the leadership of Hainan MRC, would organize and deploy typhoon-proof measurement in port region, docks, passenger terminals and township ferries after receiving typhoon forecast; and keep 24-hours supervision duty during the typhoon season. The port administration should also organize rescue and disaster relief to limit the losses when a typhoon strikes, and sum up the experience on a timely basis after the typhoon passes. Port enterprises also play a key role in the proactive typhoon damage prevention plan. They should focus on inspecting, repairing and consolidating major storage yards, oil tank region, large machinery vessels, and other facilities and equipment to secure the safety, as well as keeping inspection logs.

***Super Storm Sandy: Framing the Discussion of a Supply Chain Disruption and Transportation Outlooks***

***Presenter: Anne STRAUSS-WEIDER***

This presentation discussed both the short-term and long-term supply chain disruption impacts on Hurricane Sandy at the Port of New York-New Jersey, by reviewing how organizations worked together before and after the super storm. The disruption of the shipping supply chain in New York-New Jersey region affects both the industry and a larger geographic area, as the ports of New York and New Jersey are the third largest port facilities nationwide. On October25$^{th}$ 2012, the Port notified tenants

about the storm and the Port Authority (PA) Emergency Operations Center was activated in Oct. 28th. All tenant personnel and PA contract security were ordered off the port 24 hours before the storm hit New Jersey. The early warning of the storm helped tenants to get prepared for the impact. Because of the cooperation among agencies, damage assessment, response, recovery and restoration began the day after the super storm; and within five days after the storm, power was restored at the Elizabeth port and all terminals were back to operation by November 6th (the time line of immediate recovery is shown in the slide below). Diverting vessels to alternative ports helped to limit the impacts of supply chain disruption. A total of 57 vessels were diverted to alternative ports during the time period when ports were not in function because of extensive infrastructure damages.



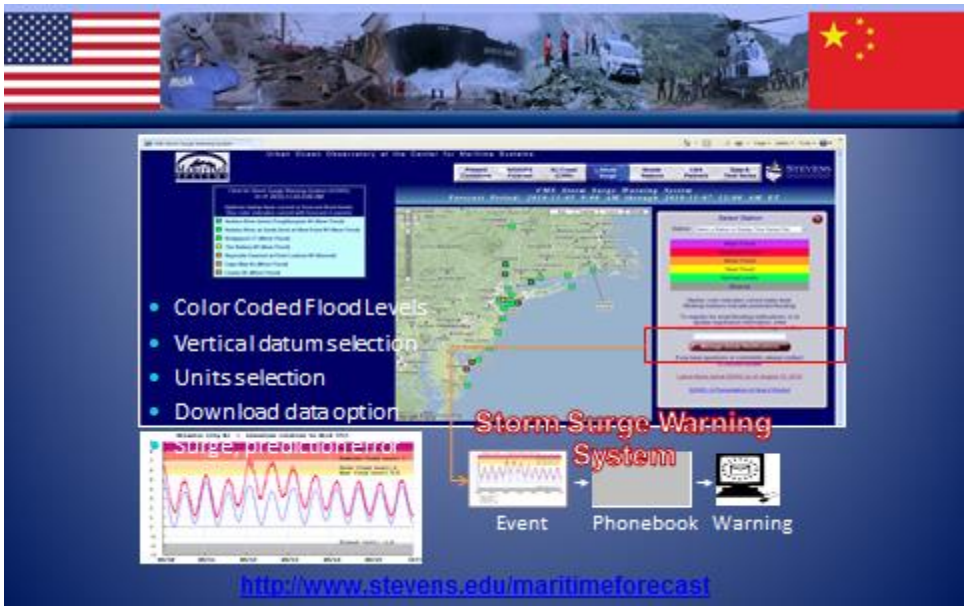

For example, the Greenville yard was totally broken in the storm and was not in function until January, 2013. Damage to cargos was another problem which disrupted the supply chain: many cargo containers collapsed in various ports because of the storm. What is worse, Sandy not only resulted in port infrastructure damage, but also road, rail track, and building damages, which made transport of cargos to alternative ports somewhat difficult and lengthened the recovery time. Thus, it is necessary to identify and make longer term capital investments and operational changes for continued recovery and reconstruction efforts while maintaining the supply chain.


**CASE STUDIES: USING WEATHER FORECASTS FOR OPERATIONAL DECISIONS**

***Lost in Translation: How Can Science Better Inform the Public about Natural Hazards***

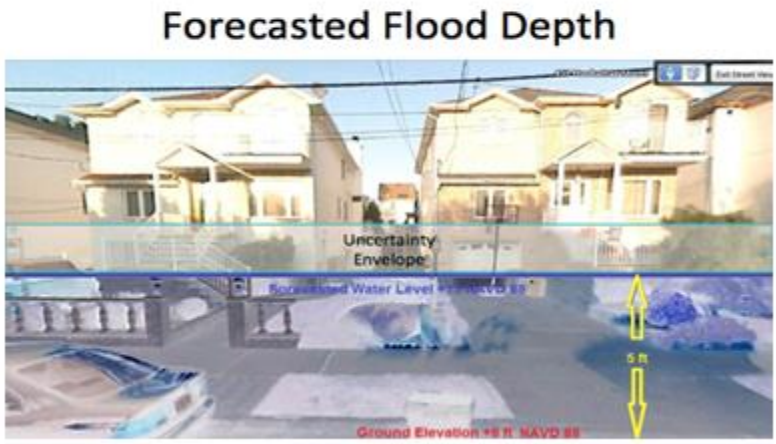
***Presenter: Michael BRUNO***

This presentation discussed possible methods to better deliver natural hazards information to the general public by using super storm Sandy as an example. The New York Harbor Observing and Prediction System (NYHOPS) is an integrated system of observing sensor and forecast models used to observe, predict and communicate ocean changes in New York, New Jersey, Maryland, and Massachusetts. There is also a website developed for ocean and storm monitoring, providing storm surge predictions based on the NYHOPS for up to 48 hours in advance. In addition, other agencies collect and deliver live tide data for storms like Sandy. The following slide shows the interface of one of the storm surge warning systems.




Yet, posting tide data or storm surge information does not seem effective to help the general public better prepare natural disasters: Sandy still resulted in tremendous damages across the New York and New Jersey region. For example, the owner of a boat in Hoboken did nothing for storm prevention as he/she did not know or care whether the water level or storm surge was going to be 14 feet or so as the information released was not relatively compared to dry land surface where the boat located (see slide below). It implies the general public needs information that is easy to understand for better disaster prevention.

Although scientific hazard forecasts are available, the public may not care if they cannot understand. In addition, some agencies were not well prepared either, as they also need to be better informed before natural hazards happened. Thus, reporting water level for storms may be misleading as numbers do not represent how serious the disaster may be effectively. Hence, visualization of natural disaster forecasting and fine scale forecasting might help general public better understand the potential threats of natural hazards like super storm Sandy.




For example, visualizing flood depth on Google Street View can be useful to help people better understand the potential threats of a storm and they can react accordingly (see slide above). Therefore, the scientific community should work together to develop more effective ways to translate scientific information, risks and vulnerability into terms that the public can understand easily and act on.

***Shanghai's Experience on Transportation Safety Management for Extreme Weather***

***Presenter: ZHANG Wei***

This presentation reviewed how Shanghai utilized weather forecast techniques for better preparation against potential risks of extreme weather. The major weather hazards for Shanghai are typhoons, heavy rains, and snows; therefore, governmental agencies collaborate to develop a

comprehensive plan under the leadership of the city government for extreme weather prevention. First of all, the meteorological department established a four-level warning system based on how serious the weather threats could be. Once the weather related emergency warning is broadcast to the public, agencies should prepare for the potential impacts of the hazardous weather accordingly. Weather warnings can be divided into blue, yellow, orange, and red warning, and the red warning represents the most serious situation. For example, during the super typhoon "Sea Anemone" in 2012, agencies in Shanghai cooperated to limit the damages of the typhoon. Right after receiving the warning of the typhoon, inspections and preparation were conducted by individual companies, ports and related agencies. In addition, a command center was established to supervise "Sea Anemone" prevention activities across the city under the leadership of city government.

In terms of road transportation safety, related agencies responsible for monitoring the operation of public transit and highway system worked together. For instance, some bus lines were detoured once road conditions became unsafe for passing due to flooding; and some infrastructures, like tunnels and highways, were closed for safety reasons; and special personnel were sent out to ensure the safe operation of rail transit. For water transportation, ports were closed during "Sea Anemone" and passenger vessels stopped services for safety reason. In brief, with the collaborations among agencies, Shanghai has developed a relatively comprehensive mechanism for transportation safety management against extreme weather.

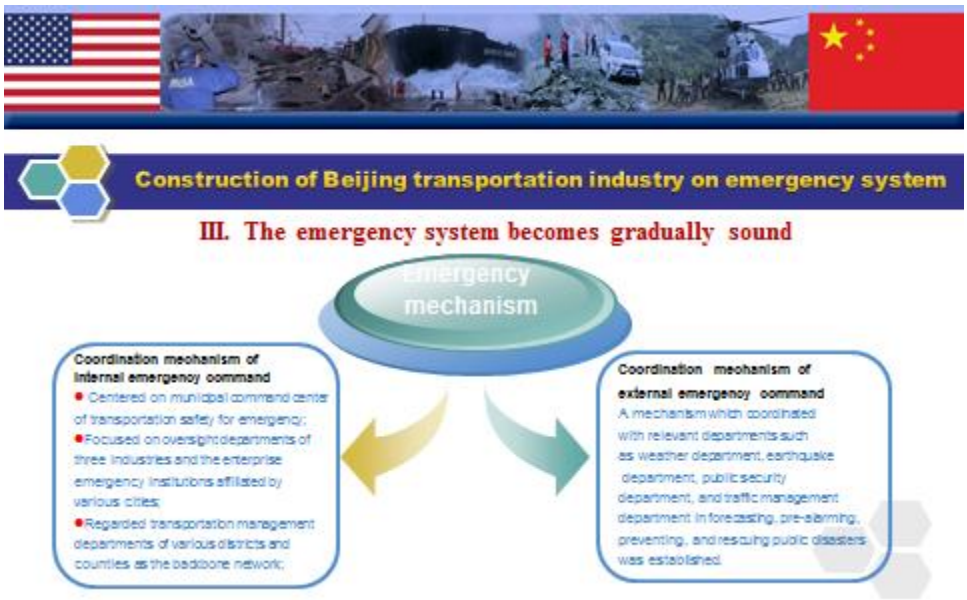
## CASE STUDIES: TORRENTIAL RAINS

### Work of Beijing Transportation Industry on Preventing and Responding to Torrential Rain

**Presenter: LI Bin**

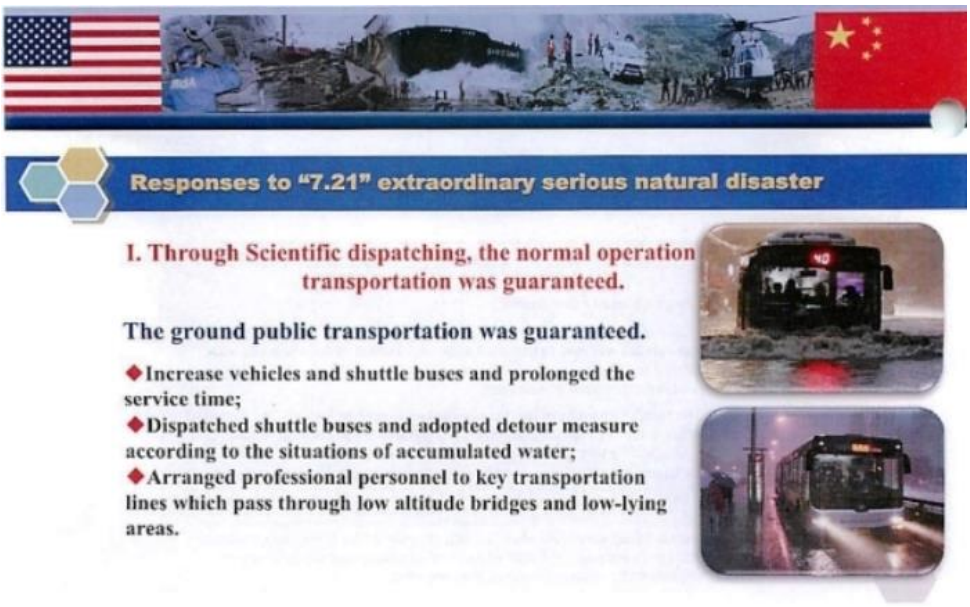
This presentation reviewed how the Beijing Municipal Commission of Transport (Beijing MCT) operated its emergency system in response to the "7.21" torrential rain in 2012. The emergency system of Beijing transportation industry is a three-level contingency plan system: under the supervision of

government agencies, and oversight by the industry, the individual company leads the responsibility. Beijing MCT established the command center of transportation safety in 2006; and by the end of 2012, there were six comprehensive contingency plans at citywide level, 50 contingency plans at industrial level and 125 contingency plans at enterprise level. The transportation emergency system can be divided into two parts: the coordination mechanism of internal emergency command, which focuses on oversight the transportation industries and enterprises; and the coordination mechanism of external emergency command which coordinates with relevant governmental agencies (public security department, meteorological department, etc.) for emergency response. The center also organized more than 100 emergency rescue teams and integrated about 6,000 video monitoring cameras for buses, metro, civil aviation and other related units. The structure of the emergency system for Beijing transportation industry is shown in the following slide:




The “7.21” torrential rain in 2012 was an extraordinary serious natural disaster in Beijing which led to average rainfall of 215mm in one day across the city (detailed characteristics of the disaster have been shown in the slide below). Thus, how to guarantee the normal operation of public transportation became an urgent issue for Beijing MCT.


During"7.21", increased vehicles and shuttle busses were dispatched over a longer service time period; and professional personnel were all on duty to ensure the operation of key transportation lines. For example, taxis and 60 coach buses were allocated to support Beijing Capital International Airport to dispatch thousands of people who were delayed because of the natural hazard. In addition, pumps, sandbags, and rain baffles were provided at metro stations, transit hubs and other facilities. In terms of disaster relief, equipment and people were allocated to the districts with emergency situations. After the "7.21" torrential rain disaster, Beijing MCT improved its emergency response system based on the experiences gained from this natural disaster. First of all, a commitment was made to improve the function of dewatering around roads and bridges to assure safety on roads. For example, adjusting valves and water fenders have been installed on all major roads and bridges to ensure the normal operation of vehicles by detouring vehicles once the water depth reached the warning sign on adjusting valves. Secondly, strengthen the security for public transportation to ensure residents' safety to move around. Beijing MTC, airport, and the railway station established an information communication mechanism to evacuate stranded passengers in airport or train stations.




For instance, once the passenger flow increased because of heavy rain, buses and metro operation time was extended with higher frequency to meet the demand. On the other hand, professional personnel will be sent out along transit lines to inspect facilities and road conditions to ensure the passing safety. Additionally, agencies made emergency drills and public announcements to ensure residents' safety to move around. For example, with the help of the emergency information release system "Beijing serves you", Beijing MTC broadcasts warning messages to residents before and during extreme weather events. In summary, it is necessary for agencies to cooperate to ensure residents' transportation safety in extreme weather events, and keep on improving services based on previous experiences.

## CASE STUDIES: HUMAN FACTORS IN TRANSPORTATION SAFETY

***Human Factors in Transportation Safety***

***Presenter: Greg FITCH***

This presentation illustrated how human factors play a key role in transportation safety. The transportation system is design based on the interactions among drivers, vehicles and infrastructure/environment. However, it is remained unclear that how drivers may affect transportation

safety. Therefore, scholars use cameras to trace drivers' behaviors to see how human impacts transportation safety. Based on video records, about 78 percent of crashes involve the inattentive behaviors of drivers and 15 percent of the drivers were found to account for about half of the mistakes in all videos. Cell phone use was found to be a major distraction that leads to traffic accidents: reaching for the phone, texting, etc. are the most risky. On the other hand, talking/listening on phone does not relate to distraction. The following slide showed a truck driver who texted when driving and got into an accident a few seconds later:

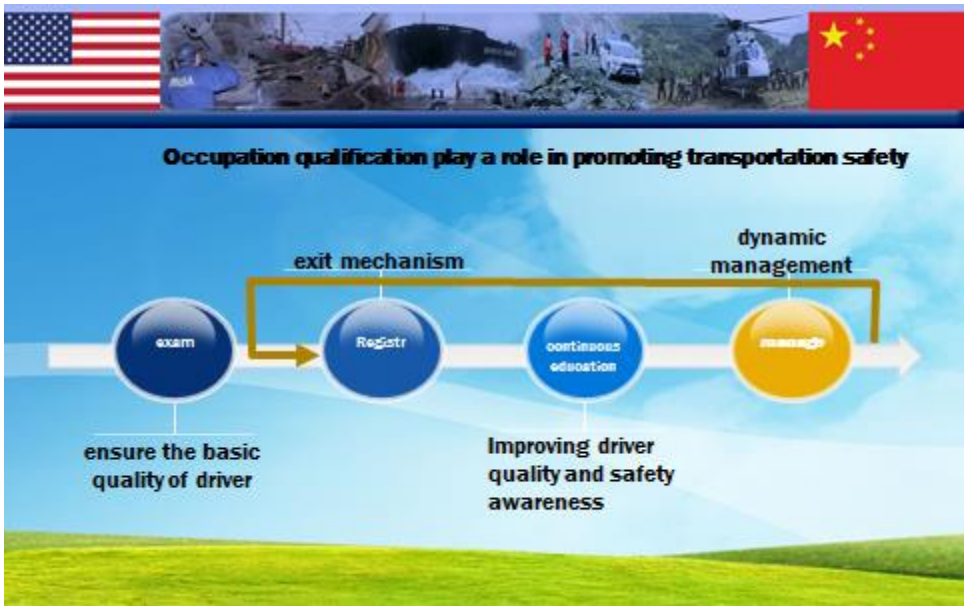

Collision avoidance systems have been developed to help drivers identify potential threats on the road. For example, the system can automatically stop the truck once it detects threats, like being too close to vehicle in front. In addition to collision avoidance systems, automated vehicles can be another potential solution to improve transportation safety. For example, the Google car can provide short range communications among cars in a certain range and perceive nearby vehicles at 360 degree view (see slide below). However, as existing collision avoidance systems and automated vehicles tend to be less interactive with drivers, it implies that they might not be as useful as designed if drivers do not respond to system's warning correctly. Thus, further research on how to transfer control from vehicles to drivers, how to meet driver expectations, how to identify and prevent misuse and so on is essential and urgent.


***Human Factors in Transportation Safety: Road Passenger and Freight Transport Driver as an Example***

***Presenter: YIN Juntao***

The Professional Qualification Authority of Ministry of Transport of China (PQA) is the national agency which manages road passenger and freight transport drivers in China. There are millions of road passenger and freight transport drivers in China and how to regulate their behaviors to ensure transportation safety is critical, as about one third of all traffic accidents are related to commercial vehicles. Based on PQA's analysis, drivers' basic qualities, professional skills and physical and psychological status play a key role in traffic accidents. They must be able to identify dangerous sources in a timely manner and take effective measures in time of emergency. For example, a bus driver made a wrong reaction in a traffic accident, resulting in the deaths of 12 people and 23 injuries. Thus, it is necessary to improve commercial drivers' professional skills and basic qualities.

PQA established an occupation qualification system to ensure commercial drivers' qualities and professional skills. The system can be divided into three parts: the examination standard system, the operation system and the exam quality assurance system. The following slide shows how the dynamic occupation qualification system can help promote transportation safety.




PQA updates the qualification examination syllabus and guide books for exam preparation according to law and regulation changes, as well as organizing computer based examination for all drivers. In addition to the basic qualification exam, road passenger and freight transport drivers also need to take defensive driving training and pass a 3D virtual scene based risk source recognition test. The defensive driving training and examination is designed to enhance the drivers' ability to react correctly in various emergency conditions. Recently, PQA developed continuous education mechanisms for road transport drivers by publishing textbooks, online continuous education information system, guidelines, and other materials (see slide below).

PQA also explored and carried out the registration management system to prevent unsafe behaviors of registered drivers by tracking behaviors of road transport drivers with GPSs, working logs, and so on. A driver's license would be suspended if he/she became "unqualified" based on PQA's evaluation. In brief, the occupation qualification system plays a key role in promoting transportation safety, and the qualification examination and a dynamic management system are both useful to improve drivers' quality and safety awareness.


**CASE STUDIES: HURRICANES/TYPHOONS: BRIDGES AND TUNNELS**

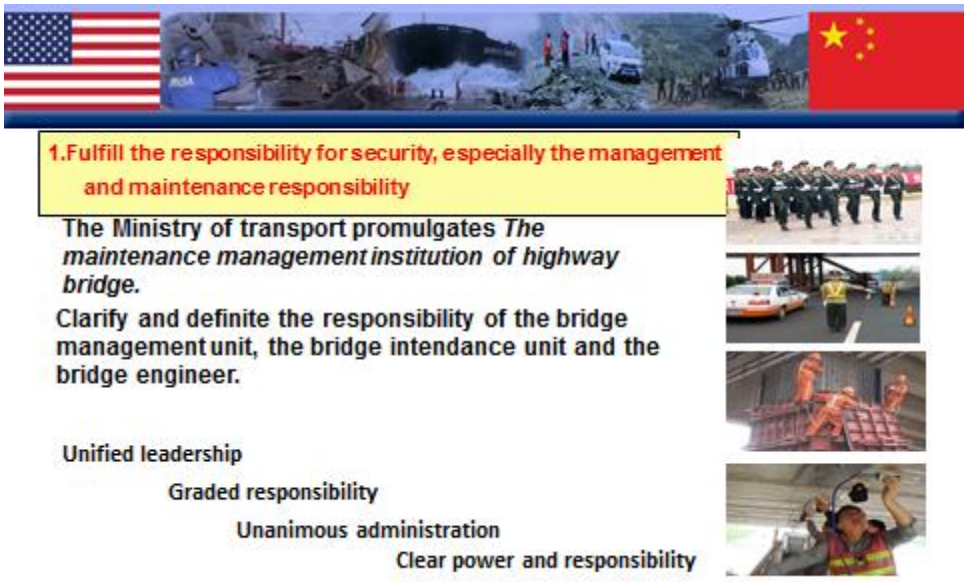
***The Main Measures of Typhoon Prevention and Control for***

***the Long Span Highway Bridge-and-Tunnels***

***Presenter: WENG Lei***

China is significantly affected by typhoons every year as it faces the Pacific Ocean on the east. With the rapid development of China's transportation system, long span highway bridges and tunnels in the east coast regions are increasing, and the task of typhoon damage prevention becomes more important for these infrastructures. Therefore, the Ministry of Transport promulgates *the maintenance management institution of highway bridges*, which clarifies and defines the responsibility of the bridge management unit, the bridge intendance unit and the bridge engineers (see slide below). In addition, proactive hazard investigations and management are critical to eliminate hidden danger in advance.

All long span bridges and tunnels, under construction or not, should be inspected regularly; and inspections should focus on sections with high risks, for instance, bridge and tunnel sections which are close to rivers, mountains or subjected to washout.




The cooperation among agencies is necessary for typhoon early warning and prevention as well. Hence, bridge-and-tunnel management units work with the meteorological department, the marine department and so on to establish information sharing mechanism for timely information distribution (the slide below shows how different agencies collaborate to strengthen early warning for typhoons).


Establishing contingency plans and preparing adequately are also critical for typhoon damage prevention. Around the striking areas of typhoons, for instance, it is important to reinforce important facilities, using engineers and equipment and implementing traffic controls expeditiously. Thus, in addition to regular inspections, real-time monitoring of important bridges and tunnels is a must.

Moreover, emergency rescue teams and emergency supplies are essential to ensure the operational safety on long span bridges and tunnels during the typhoon.

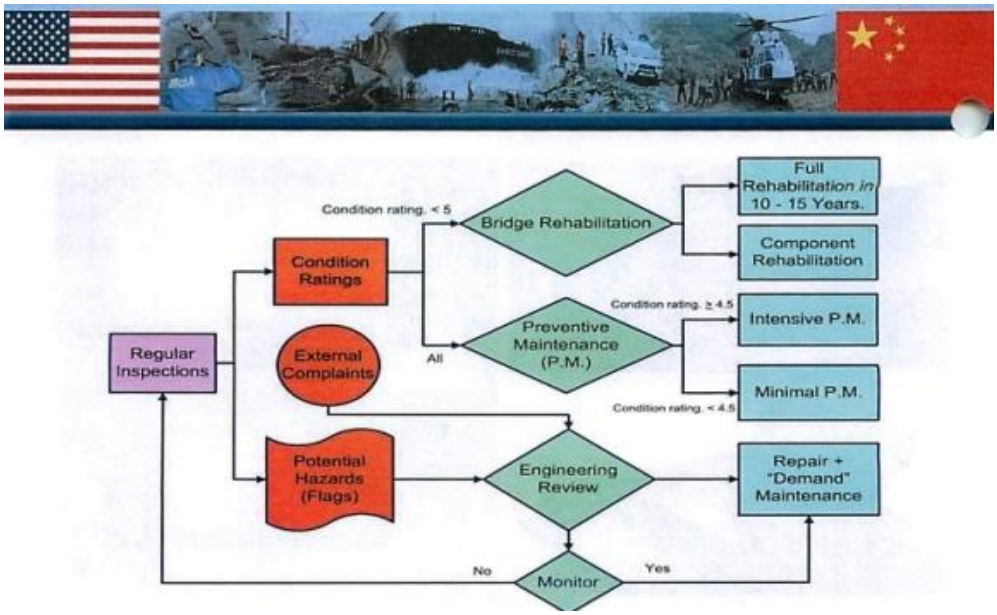
***New York City Department of Transportation***

***Presenter: Bojidar YANEV***

New York City established the Department of Transportation to provide safe and efficient movement of goods and people throughout New York City's roadways and bridges. The agency is responsible for the maintenance and repairs of 790 bridges across the five boroughs. For all bridges under the department, some require special attention and even 24 hour monitoring because of their structures and functions. For example, 25 movable bridges require 24/7 special monitoring to ensure the transport of goods.

The Federal government has required inspection on all bridges for at least every two years since 1979.Because of the large amount of bridges across the city and relatively limited staff within the department (total staff: 432), maintaining and managing all bridges has become a problem. The department has digitized all bridges' data since the 1980s to better track a bridge's historic records. In addition to digitized inspection records, the department also developed a logic model for bridge

maintenance and management based on the bridge's condition and previous inspection outcomes. The slide below shows the logical model for maintenance:




Bridges with low condition scores will get bridge rehabilitation within a given time phase, and preventive maintenance will be performed on bridges with high condition scores. The department also cooperates with other agencies for better bridge management practices. For example, the department works with US Coast Guard, NYS DEC[3] and NYPD and funded by federal government to conduct Manhattan Bridge's inspection and maintenance.

## CASE STUDIES: HURRICANES/TYPHOONS: STORM SURGE

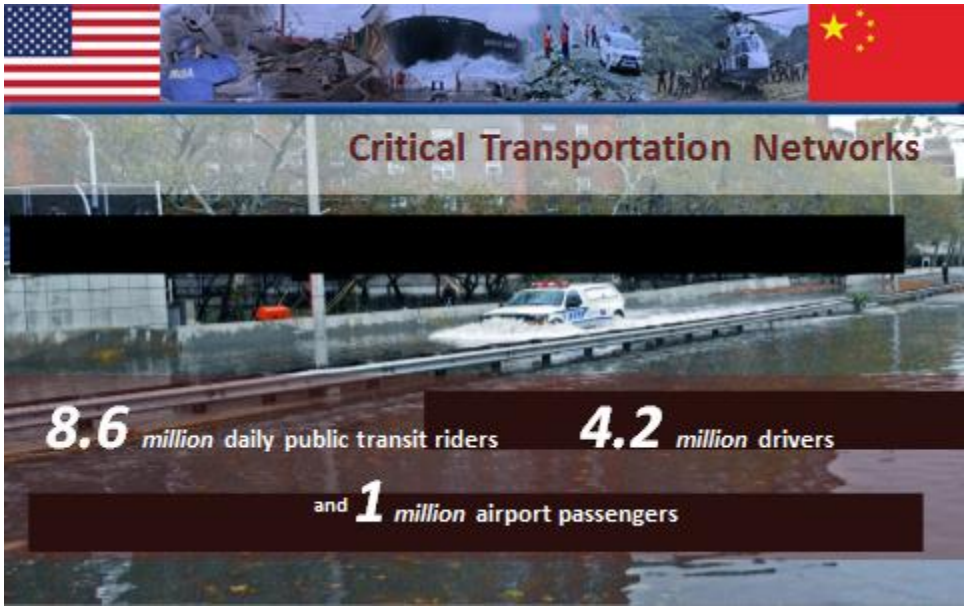
***Transportation in the Age of Climate Change***

***Presenter: Lacy SHELBY***

Extreme weather has become more frequent worldwide because of climate change and results in great damages to transportation facilities. For example, Hurricane Sandy damaged traffic signals at 700 intersections in New York City and the flooding impacted most areas at lower Manhattan. Sixty lane miles of roadways were severely damaged and 500 land miles of roadways sustained minor damage;

[3] New York State Department of Environmental Conservation

and millions' transportation were impacted. The following slide provided a snapshot of the damages of Hurricane Sandy on transportation infrastructure:



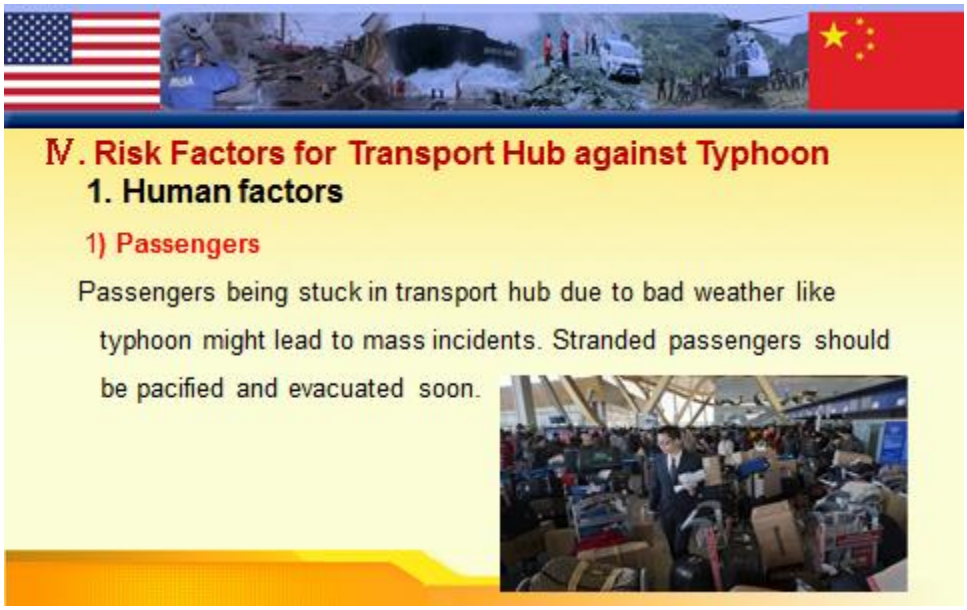

Therefore, it is critical for both governmental agencies and the general public to react to minimize losses. Additionally, proactive planning becomes more and more important as prevention for future extreme weather damages is necessary. First of all, coordination is important for emergency response. For example, mobilizing people and facilities in emergency situations can be very helpful. In addition, using data and research, like the flood zones map, to inform future development can help prevent potential natural hazard damages. Governmental agencies should also plan, program and report the impacts of extreme weather at local level. Moreover, building green infrastructures is useful for hazards prevention by mitigating storm water damage, cleaning the traffic exhaust, beautifying transportation infrastructures and so on (see slide below). However, it is important to clarify the purpose of building green infrastructures, and encourage general public to participate.


**CASE STUDIES: HURRICANES/TYPHOONS: MULTI-MODAL HUBS**

***Safety Management Measures and Experience of Preventing and Fighting Typhoon at Transport Hub***

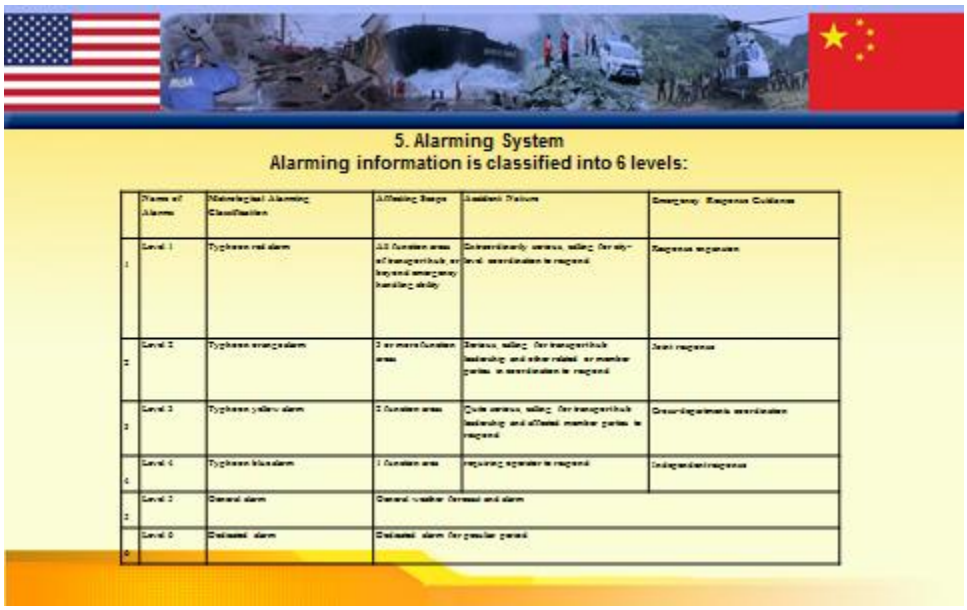
***Presenter: YANG Lixin***

By illustrating experience of Shanghai Hongqiao comprehensive transportation hub during Typhoon "Sea Anemone" in 2012, this presentation addressed the potential safety management strategy for transportation hubs against extreme weather. The Shanghai Hongqiao comprehensive transportation hub is China's largest transit hub with a planning area of 26.26km$^2$andembraces complex interchanges among high-speed train, bullet train, metro, buses, taxi and aviation. The most direct damage to the transport hub caused by typhoons is building destruction as major buildings in the hub are usually composed of long-span steel structure and large glass walls. Secondary disasters are also risky for the hub as the failure of key equipment may cause accidents or damages, especially when passengers stranded in the hub:




The overall goals for safety management of typhoon prevention at Hongqiao transport hub are: timely alarms, strong defense, efficient coordination, and effective solution. Therefore, Hongqiao transport hub established the Emergency Response Center (ERC) under the leadership of the municipal government to deal with information related to emergencies. The Hongqiao ERC monitors hazards, and performs routine inspection and maintenance for emergency prevention, especially at some key areas, like surface water-prone areas where facilities and equipment are located and so on, for typhoon damage prevention.

This presentation detailed how the Hongqiao transport hub dealt with super typhoon “Sea Anemone” in 2012. Hongqiao ERC cooperated with the metrological department to set up an alarming system to broadcast real-time warning information via TV, radio and website (see slide below).




The transport hub also conducted inspections on facilities and infrastructures for typhoon and flood prevention in advance. In addition, the transport hub coordinated with bus and taxi companies to rapidly deploy adequate vehicles to evacuate stranded passengers due to rail and flight cancellations. During the typhoon period, all personnel from the airport, rail system, and police were on duty to ensure the safety of the hub by monitoring the operation of flood and typhoon damage control facilities. Because of the collaboration of different agencies, damages were minimized: the operation and service were well controlled inside the hub during “Sea Anemone”. However, as information among different transport modes was not as well connected, passengers found transfer to other modes of transportation during the emergency period was a problem. Thus, improving connections among multi-modes of transportation in response to emergency situations should be conducted in the near future.

## CASE STUDIES: HURRICANES/TYPHOONS: FERRIES AND PASSENGER BOATS

***Brief Introduction of Typhoon Prevention Measures of the RO-RO Passenger Ships***

***Engaged in Qiongzhou Strait***

***Presenter: MA Yuqing***

Qiongzhou Strait is located on the typhoon corridor between Hainan Province (Hainan Island) and Gauangdong Province in southern China (see slide below). Therefore, typhoon prevention becomes a major task for RO-RO passenger ships as more than 20 typhoons pass the strait every year from June to November. There are 55 trips between Hainan Province and mainland China daily on different types of RO-RO passenger ships. A typical RO-RO passenger ship is about 20 meters long with 1,000 passenger capacity, and RO-RO ships vary from small vessels below 1,000GT to the largest one which is over 23,000GT. In order to minimize the impacts of typhoons on RO-RO passenger ship transportation, Hainan designed three different methods of response based on typhoon tracks.


Thus, identifying the track of a typhoon and its potential impact in advance is important for safety management of RO-RO passenger ships against typhoons, and emergency response should be implemented accordingly. When a typhoon lands at Hainan Island, vessels must be moved to Houshuiwan typhoon anchorage. When a typhoon passes by the southern part of Hainan with wind force[4] below 10, RO-RO ships will be allowed to be berthing at the terminal, but if the wind force is between 10-12, RO-RO passenger ships above 3000GT will be sheltered at other anchorages. Finally, when a typhoon lands or passes by the coastal area of Guangdong Province, RO-RO passenger ships can

[4] Wind force is categorized into 0~12, and the number increases with wind force increased.

be sheltered at Haikou Bay anchorage. The following slide shows how different typhoon tracks may impact Hainan Island.


In order to get timely typhoon information, Qiaongzhou Strait VTS established five radar stations and one command center to covers maritime area of 5,100 $km^2$ to provide accurate and timely monitoring information. In addition, a linkage mechanism with local governments, meteorological departments- and other agencies has been built to share real-time information, and special personnel are 24-hour on call for emergency during typhoon season.

***Staten Island Ferry: Hurricane Sandy Response***

***Presenter: James DESIMONE***

The Hurricane Sandy response of Staten Island ferry can be categorized into three phases: storm preparation, storm response and post storm recovery. Storm preparation is important to limit the damages of the hurricane. Hence, before Hurricane Sandy, all crews and staff secured vessels and facilities by relocating vessels to safer ports and putting sand bags around infrastructures. In addition, facilities were shut down for safety reasons. It was difficult to keep vessels safe as the storm was strong and electricity was out during the storm. During the storm, crews were on vessels for maneuvering to avoid ferries hitting each other:


The Staten Island ferry also provided food and water for staff that were on vessels during the storm to make sure they are well prepared for storm response and post storm recovery. The hurricane created great damages to facilities and infrastructures. Most damage was caused by flooding, as the electricity was off and pumping equipment failed to work (see slide below). Because staff was well settled during the hurricane, they were able to be back to work soon after the storm for recovery tasks.


**CASE STUDIES: HURRICANES/TYPHOONS: PREPAREDNESS FOR PEOPLE WITH DISABILITIES**

***Emergency Evacuation for People with Medical Needs***

***Presenter: Tom CHARLES***

Every emergency evacuation strategy must account for people with special needs, and how to identify and locate population with special needs is important. For example, during Hurricane Sandy, over six thousand people needed to be transferred because their facilities were in flood zones in New York City. They needed to be moved within a relatively short preparation time, and transferring people with special needs required utilization of public transportation resources. New York City Office of Emergency Management (NYCOEM) conducted homebound evacuation operation (HEO) for homebound individuals with disabilities with no other options for evacuation, and the 311 response system[5] was used for individuals to get information in times of emergency. NYCOEM cooperated with different agencies to dispatch vehicles to pick up and transfer people with special medical needs.

[5] US expedited non-emergency call system

**Evacuation Strategy: Homebound Evacuation Operation (HEO)**
**New York City Office of Emergency Management (NYCOEM)**

| Medical Issue | Description | Transportation Asset | Final Destination |
|---|---|---|---|
| 1. Stretcher | Unable to leave home on their own; unable to travel in a sitting position (require stretcher transport) | Ambulance | Hospital |
| 2. Wheelchair | Unable to leave home on their own; able to sit for an extended period of time (can travel on a bus) | Department of Education school bus with Firefighter Transport Team | Hurricane Evacuation Center |
| 3. Ambulatory | Able to leave home with assistance (can get to the curb); disabilities prevent use of public transportation for evacuation | Paratransit | Hurricane Evacuation Center |

For example, the Healthcare Evacuation Center (HEC) coordinated the Healthcare Facility Evacuation Plan for the evacuation of hospitals, nursing homes and other facilities. However, there are gaps between the time required to serve people with special needs (72-hours) and the time of emergency alarm usually issued by governments (24-hours), causing difficulties for emergency evacuation. Therefore, to maximize the number of evacuations of people with medial/special needs, the travel distance and time to evacuation centers must be optimally short. In addition, some residents are unwilling to be evacuated because of pets, belongings and other reasons. Therefore, policies must be established to allow pets and define limitations for carry-on items for efficient evacuation. Moreover, more focus should be put on post disaster response supports, which is more important than the operation of services and facilities during disaster period to protect facilities, employee and equipment.

Finally, conducting post-evacuation response assessment is important for better communication with other agencies and customers, as well as improving evacuation practices in the future. For example, after Hurricane Sandy, NYCOEM found that sending people back home is another issue need to be carefully planned:  as all evacuees were transported from different areas to evacuation centers, it is necessary to send people with special/medical needs back home properly. In addition, management of

emergency resources in advance and restoration of regular service are important as these resources will be reused for future evacuation services.

## STUDY TOUR

Following the formal workshop sessions, participants took part in a half-day study tour of several key transportation locations in New York City, learning from the experience of transportation experts and operators with super storm Sandy and the recovery of transportation systems.

**APPENDIX A: Workshop Agenda**

US/China Transportation Forum

Safety and Disaster Assistance Working Group

**Fifth Annual**

**Workshop on Disaster Preparedness**

# Agenda

| TIME | EVENT | PRESENTER(S)[6] |
|---|---|---|
| **Saturday, October 26** | | |
| 6:00 | Informal Buffet Dinner | |
| **Sunday, October 27** | | |
| 8:00 – 8:20 | Registration | |
| 8:20 – 8:30 | Convene and Administrative Remarks | Janet BENINI |
| 8:30 – 8:40 | Welcome from Rutgers University | Michael GREENBERG |
| 8:40 – 9:00 | Opening Statements | US: Michael LOWDER<br>China: WENG Lei |
| 9:00 – 9:30 | Orientation to Workshop & Self Introductions | Janet BENINI |
| 9:30 – 10:30 | Traffic Incident Management and Quick Clearance | US: John CORBIN<br>China: ZHANG Wei |
| 10:30 – 10:45 | Break | |
| 10:45 – 11:45 | Safety of Long Distance Passenger Busses | China: LI Bin<br>US: Wes BARBER |
| 11:45 – 12:30 | Lunch | |
| 12:30 – 1:30 | Transportation Safety of Hazardous Materials | US: Anthony MURRAY<br>China: YIN Juntao |
| 1:30 – 2:30 | Hurricanes/Typhoons: Ports and Shipping | China: HUANG Peng<br>US: Anne STRAUSS-WEIDER |
| 2:30 - 3:00 | Break | |
| 3:00 – 4:005 | Using Weather Forecasts for Operational Decisions | US: Michael BRUNO<br>China: ZHANG Wei |
| 4:00 – 4:45 | Case Study: Torrential Rains | China: LI Bin |
| 4:45 – 5:00 | Summary and Close for the Day | Janet BENINI |
| 6:00 | Official Dinner | |

[6] Note: Last names are shown in ALL CAPITALS

| Monday, October 28 | | |
|---|---|---|
| 8:30 | Reconvene and Update Announcements | Janet BENINI |
| 8:45 – 9:45 | Human Factors in Transportation Safety | US: Greg FITCH<br>China: YIN Juntao |
| 9:45 – 10:45 | Hurricanes/Typhoons: Bridges and Tunnels | China:WENG Lei<br>US: Bojidar YANEV |
| 10:45 – 11:00 | Break | |
| 11:00 – 11:30 | Hurricanes/Typhoons: Storm Surge | US: Lacy SHELBY |
| 11:30 – 12:00 | Hurricanes/Typhoons: Multi-Modal Hubs | China: YANG Lixin |
| 12:00 – 12:15 | Group Photo | |
| 12:15 – 1:15 | Lunch | |
| 1:15 – 2:15 | Hurricanes/Typhoons: Ferries and Passenger Boats | China:MAYuqing<br>US: James DESIMONE |
| 2:15 – 2:45 | Break | |
| 2:45 – 3:15 | Hurricanes/Typhoons: Preparedness for People with Disabilities | US: Tom CHARLES |
| 3:15 – 3:45 | Closing Remarks by Co-chairs | China: WENG Lei<br>US: Michael LOWDER |
| 5:00 | Lecture on Transportation Issues in China<br>for Rutgers Faculty and Students followed by Reception | China: WENG Lei |
| | **Tuesday, October 29** | |
| Morning | Study Tour: Hurricane Sandy Impact in New York | Gregory BROWN |