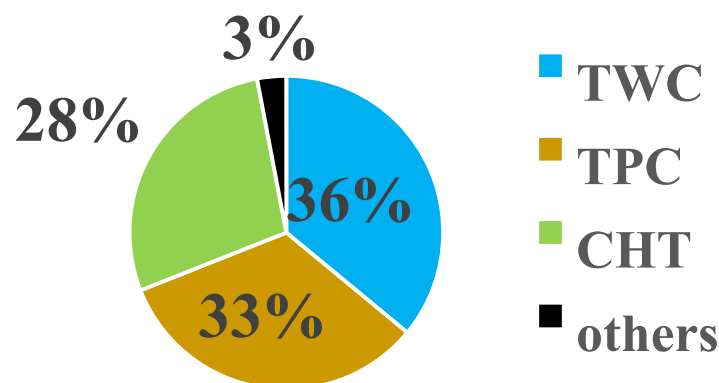
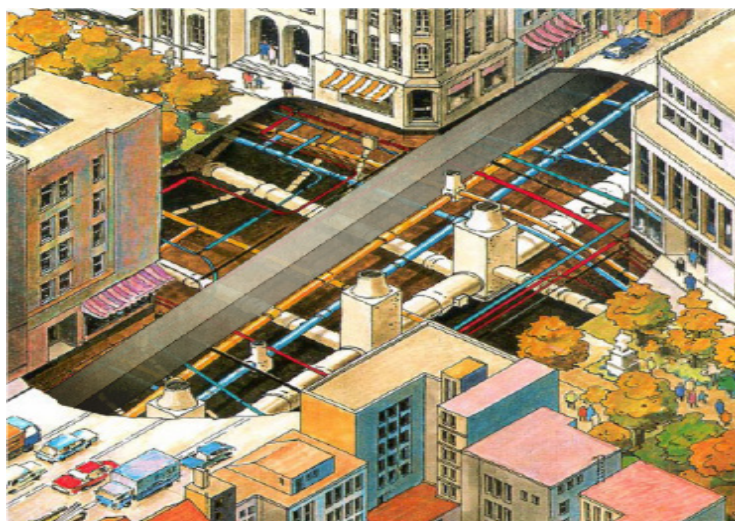




Introduction(1/2)

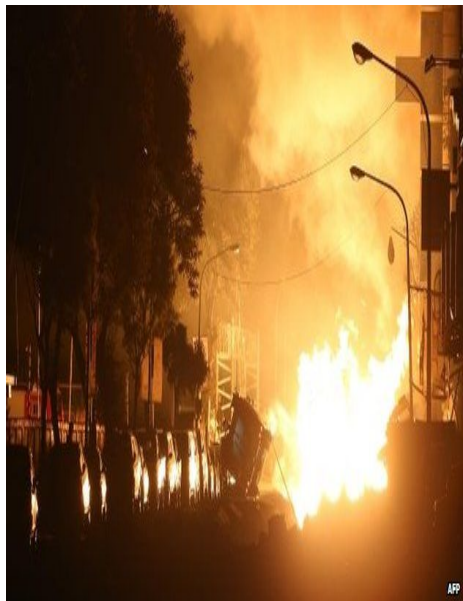
- ❑ Tainan City has 2,192 km², including 750,000 manholes , 49 pipeline authorities and total length of pipeline is 36,000 km that include high voltage power lines, natural gas, and petroleum pipelines.
- ❑ Maps and data for these pipelines were independently established and maintained by the respective agencies.
- ❑ Yearly road excavation are approx. 9,100 cases.





Introduction(2/2)

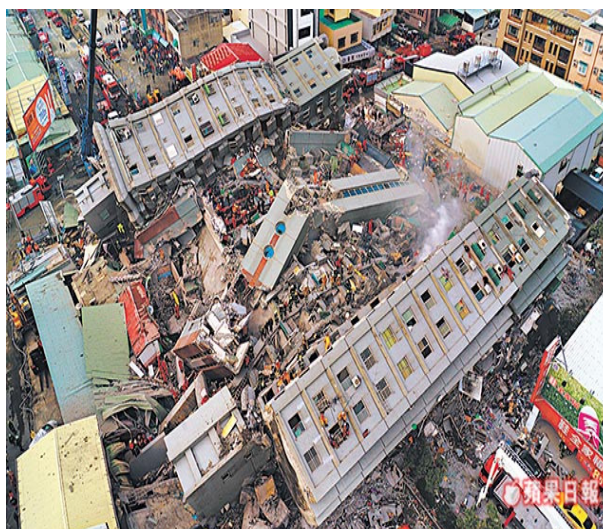
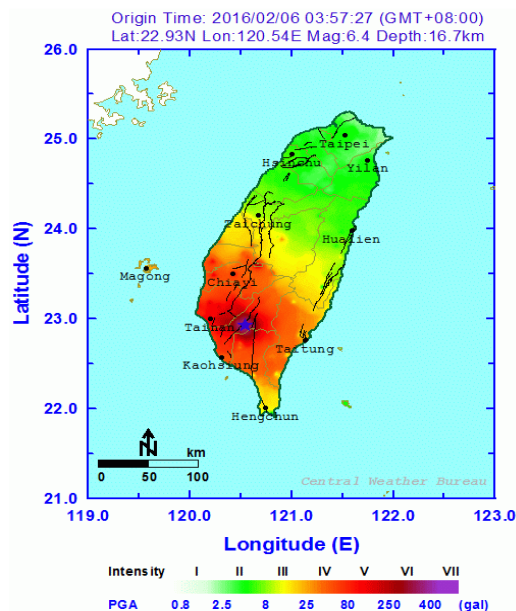
- ❑ The Kaohsiung gas line explosion in July 2014 brought the public's attention to the importance of underground utility pipelines management is a great part of urban development and disaster-prevention management.
- ❑ People desperately want the safety and relevant information of pipelines under roads to reduce anticipatory anxiety.





Expected emergencies in Tainan City

- ❑ Results of the Central Geological Survey indicated that there were 6 active faults in Tainan.
- ❑ Earthquakes would be the most damaging and unavoidable type of natural disaster for utility pipelines.
- ❑ Man-made errors may lead to toxic or chemical disasters (when petroleum and natural gas pipelines were damaged).





Disaster prevention functions for REMS

~ Pipeline maps accessible anywhere

- ❑ Mobile phone APP for REMS.
- ❑ For disaster prevention, frontline personnel could employ the APP to immediately acquire information of underground pipelines without flipping through printed maps or performing on-site excavation.

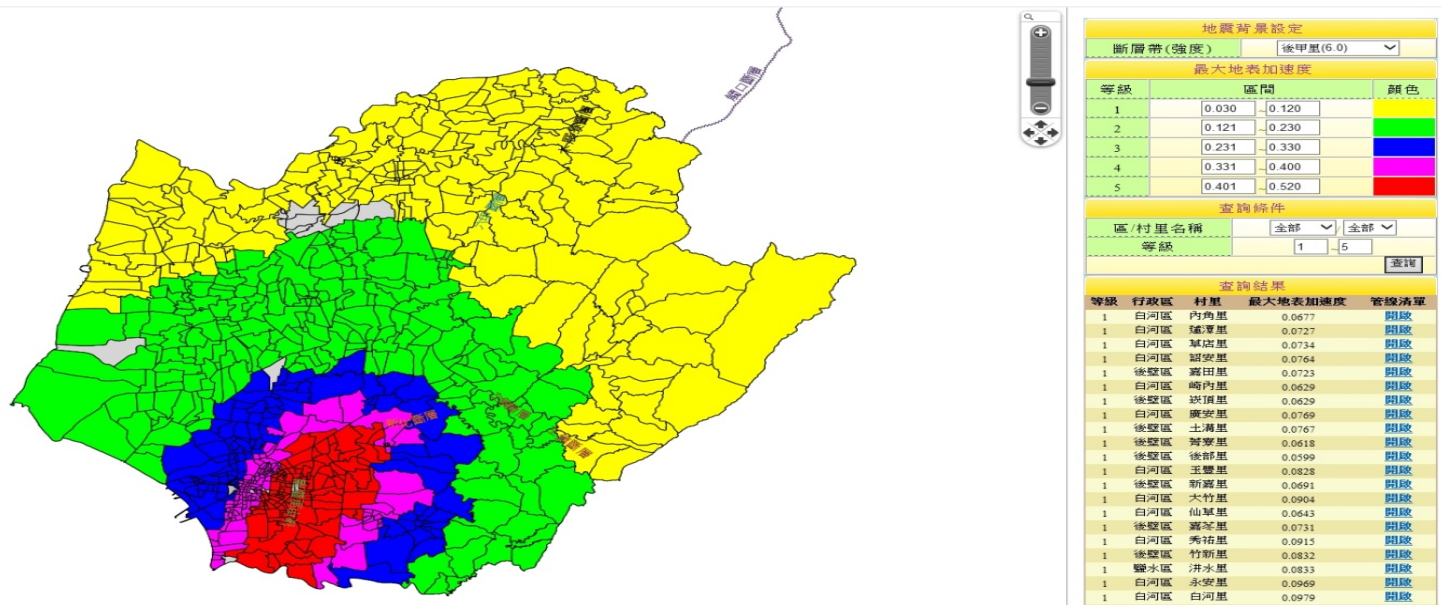




Disaster prevention functions for REMS

~Preliminary review of disaster potential

- Collaborated with the Disaster Prevention Research Center of National Cheng Kung University to develop the *Earthquake and Disaster Prevention Evaluation System* and established earthquake simulation data for the 6 fault zones in Tainan City.
- TWC would then be recommended to initiate preventive measures such as replacing aging pipelines to improve the safety of supply systems.



- Earthquake simulation of the Houjia Village Fault.

Disaster prevention functions for REMS

~ Exposing all hazardous pipelines

- ❑ The Road Excavation Management System was required to display the hazardous pipelines map layer so that these pipelines could prevent to be damaged during construction.



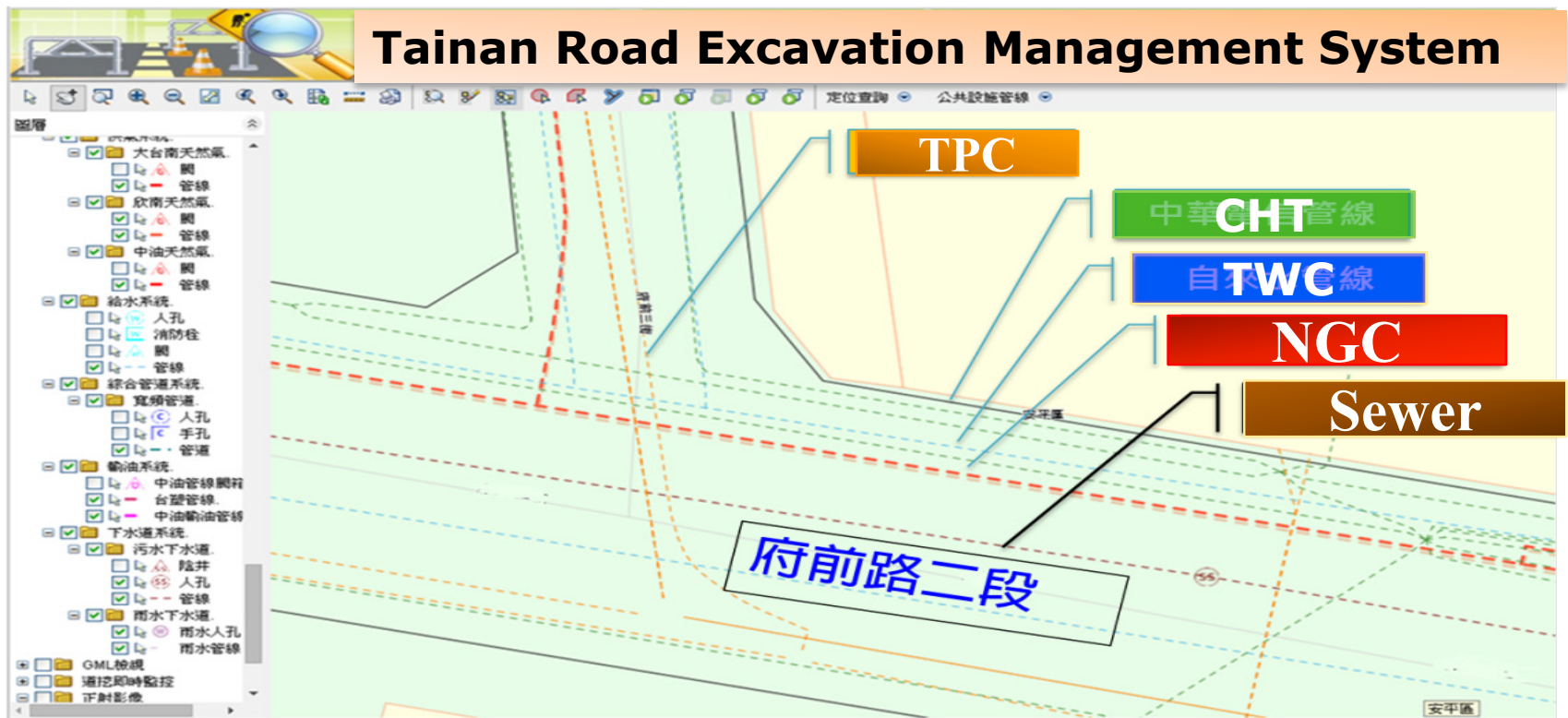
Once positioning and searches were completed, the system will be able to indicate potential hazardous pipelines in the area. Ex. the orange dotted line in the figure would be the **natural gas pipeline**.



Disaster prevention functions for REMS

~Proactive reminders to prevent damaging excavation

- ❑ Utilities can easily study their excavation site when overlapped with other utilities pipelines and remind them to take precautions during the excavation process.

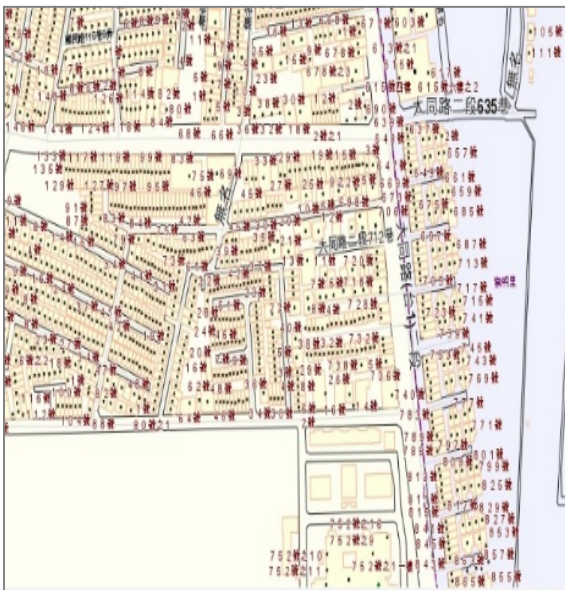




Disaster prevention functions for REMS

~Integration of city-wide pipelines

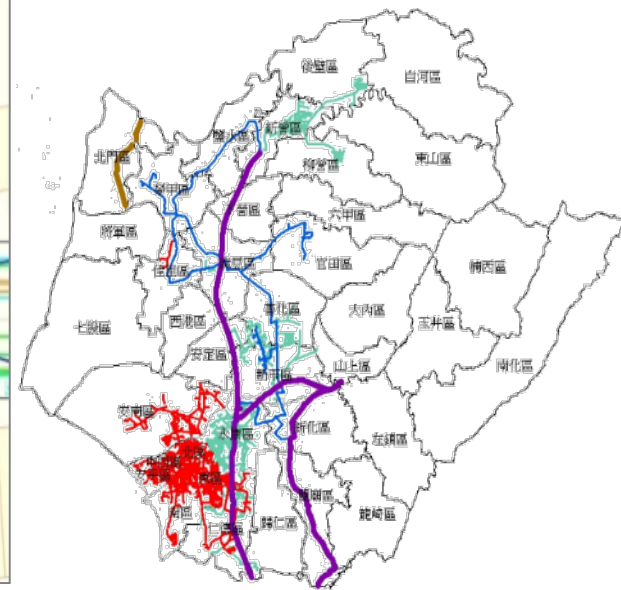
- ❑ Tainan City Government released the multi-departmental pipeline database and map integration system to combine all databases and maps from various public agencies and pipeline management units into a single consolidated public utility database.



Database



Utilities Pipelines

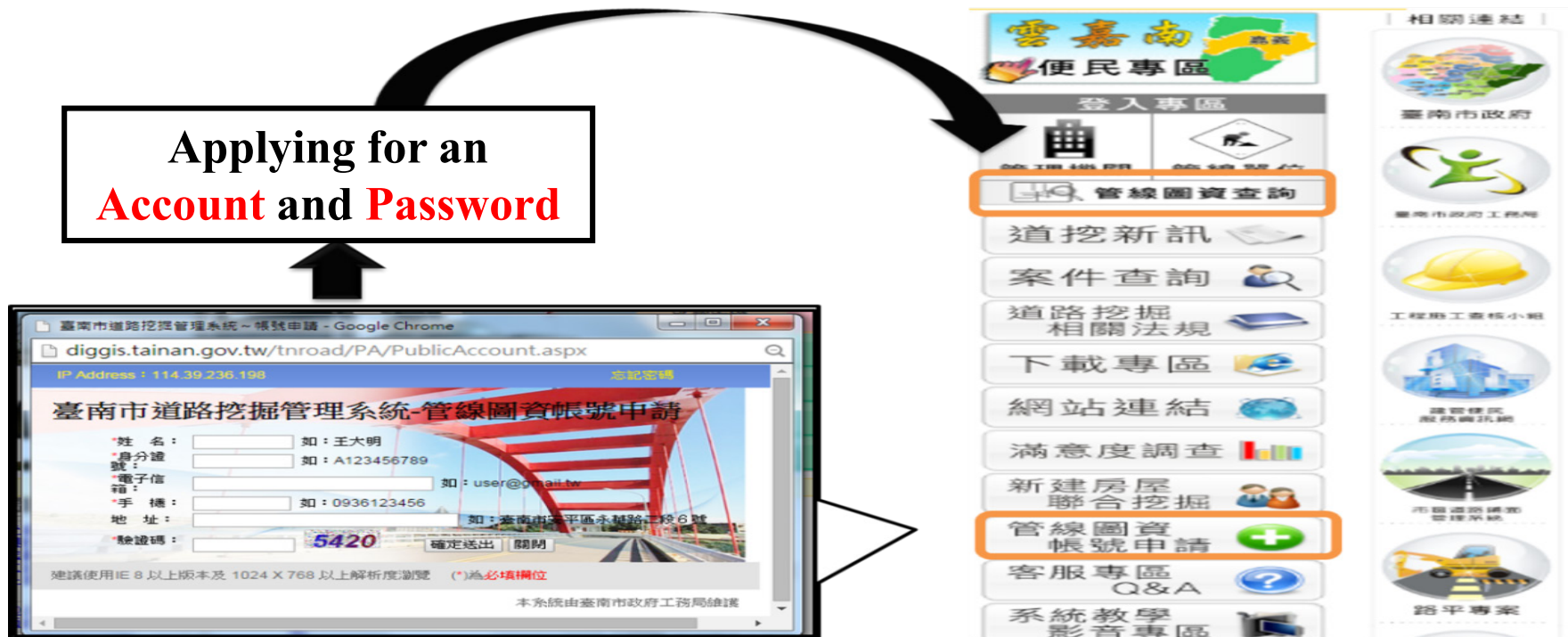




Disaster prevention functions for REMS

~ Open map data for queries

- ❑ The system allows people to go online and register an account to search and peruse pipeline database and maps to satisfy their right to know and alleviate public concerns.





Disaster prevention functions for REMS

~ SOPs for emergency rescue and repairs of damaged pipelines

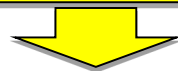
Verify actual disaster areas and status



Use mobile phone to retrieve information and maps from the public utility database.



Verify the distribution of hazardous pipelines



Convene coordination meeting on site



Mark the positions of pipelines on site



Prioritize emergency rescue of key areas



Repair pipelines in systematic sequence



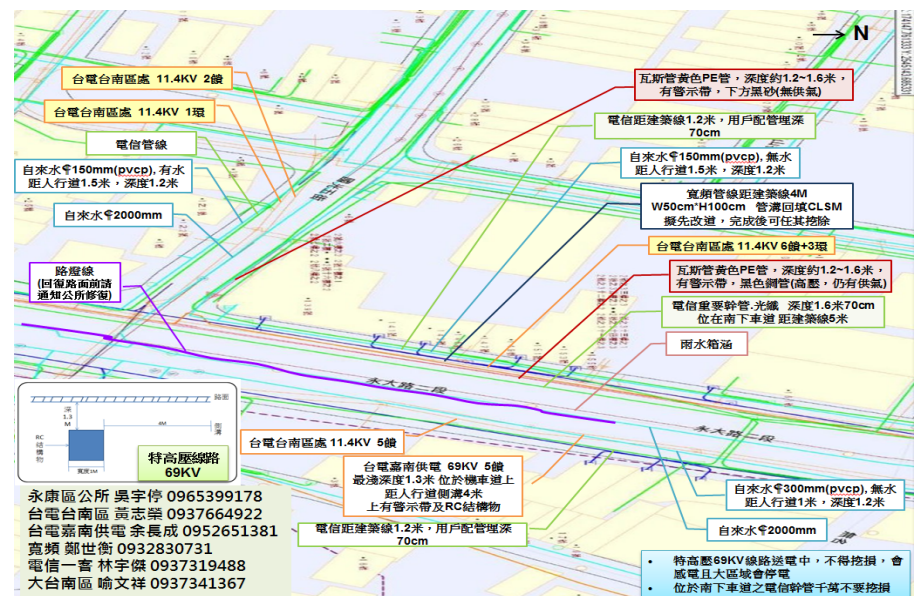


Practical application during Tainan Earthquake

- ❑ Tainan Earthquake led to the collapse of many buildings such as Weiguan Building as well significant damages of TWC's pipelines.
- ❑ Rescue teams arrived on site and used the mobile phone APP to retrieve pipeline information and maps, saved at least 2 hours of querying time and allowing subsequent rescue work to be initiated effectively.



The collapsed Weiguan building



Pipeline maps under Weiguan Building **13**



Features of Road Excavation Management System

- ❑ Reduce the time taken to search for maps and data
- ❑ Reduce repairs resulting from damages caused by improper excavation.
- ❑ Reducing misreading of map data during disaster rescue.
- ❑ Seizing the initiative in disaster rescue and avoid secondary disasters.



Thank you for your attention !

