Building loss ratio comparison based on physical vulnerability and event-based data in Taiwan

Chih-Hao Hsu, Ting-Chi Tsao and Chuan-Yi Huang

Disaster Prevention Technology Research Center,
Sinotech Engineering Consultants, Inc., Taipei, Taiwan

STUDY SITE

Taoyuan DF034 potential debris flow torrent：

- Event: Typhoon Soudelor in 2015
- Rainfall: 384 mm
- Debris: 13,000 m^3
- Damage: 15 houses

Video：
https://www.youtube.com/watch?v=kGkStNCauvk&feature=youtu.be

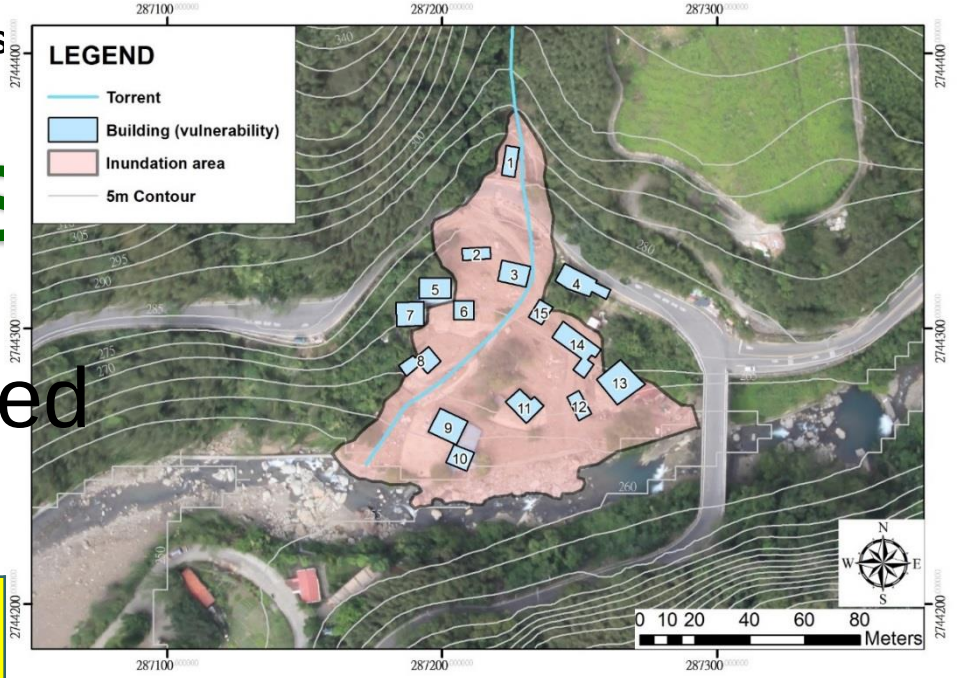
Pre-event

Post-event

FIELD INVES

Loss ratio was determined by experts in the field.

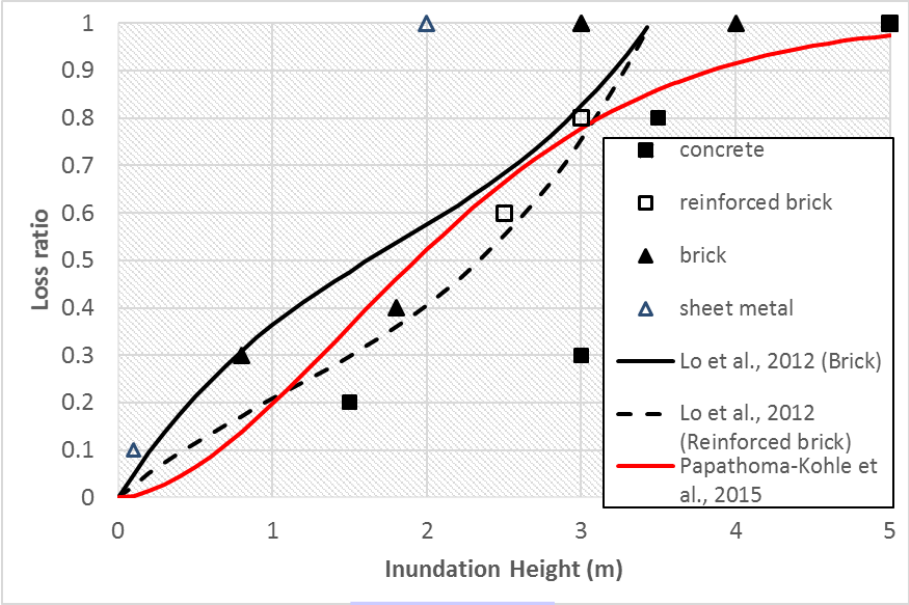
ID	Structure Type	Floor	Loss ratio
1	Concrete	2	1
2	Reinforced Brick	1	1
3	Reinforced Brick	1	1
4	Sheet Metal	1	0.1
5	Concrete	2	0.3
6	Reinforced Brick	1	0.8
7	Concrete	2	0.2
8	Brick	1	0.3
9	Reinforced Brick	1	0.6
10	Sheet Metal	1	1
11	Brick	1	0.4
12	Brick	1	1
13	Concrete	1	0.8
14	Brick	1	1
15	Brick	1	1



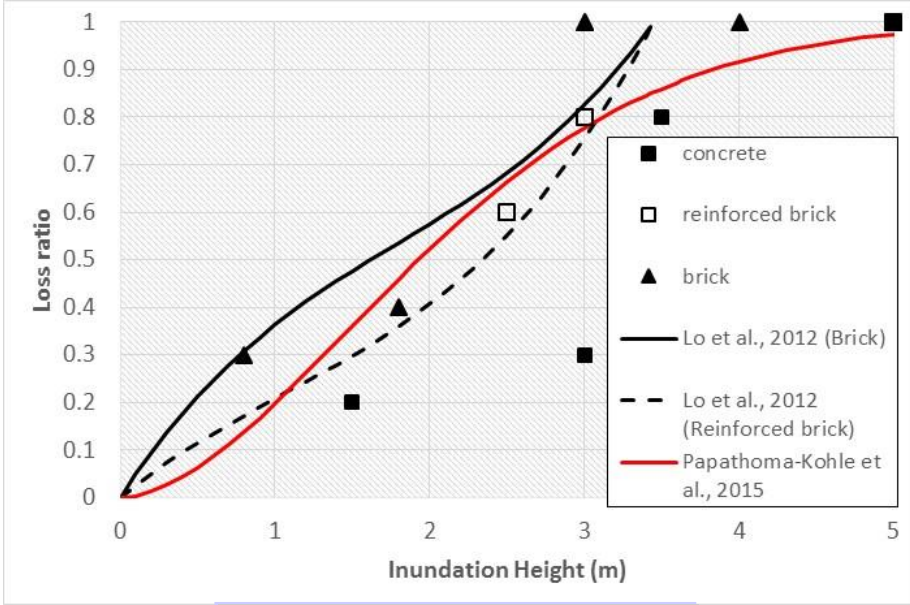
- Professor
- SWCB representative
- Experienced researcher

Vulnerability- based on inundation height

Plot the field data on the previous vulnerability curves based on inundation height.



All data



Without sheet metal

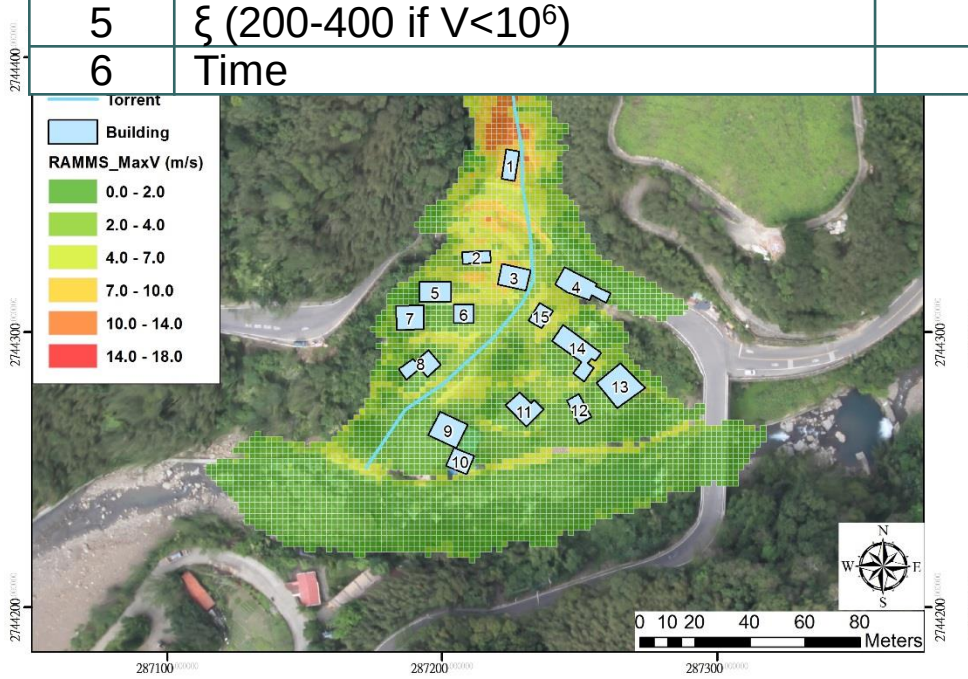
Vulnerability- based on impact force

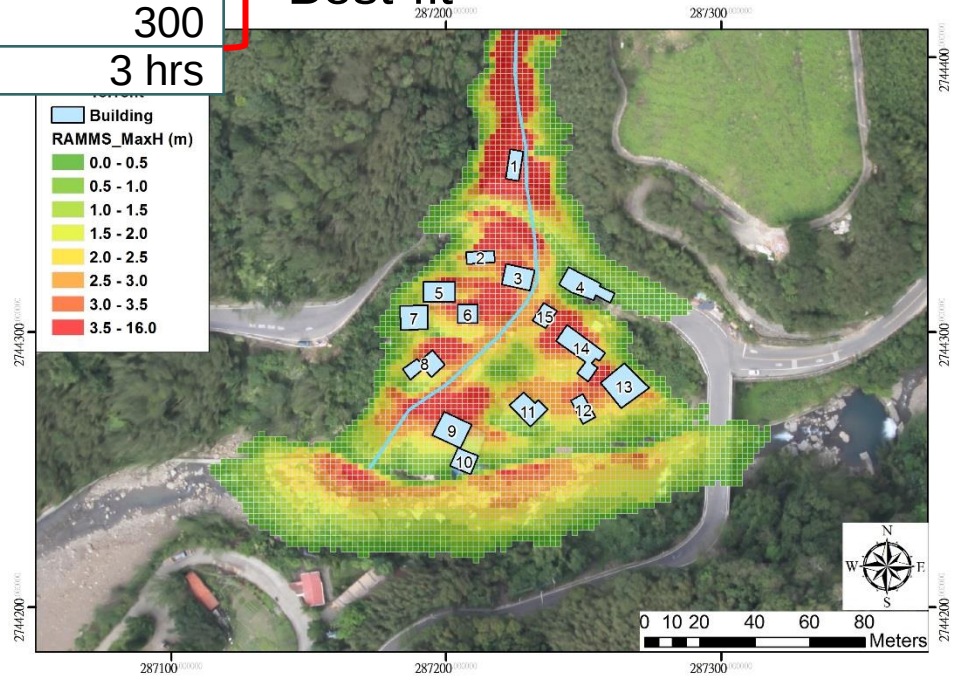
Using RAMMS simulation to get the data for impact force calculating.

Item	Parameter	Value
1	DEM	5 m* 5 m
2	Volume (derived from landslide)	26,966.7 m^3
3	Density of debris flow	2,100 kg/m^3
4	M	0.24
5	ξ (200-400 if $V<10^6$)	300
6	Time	3 hrs

(Lee et al., 2016)

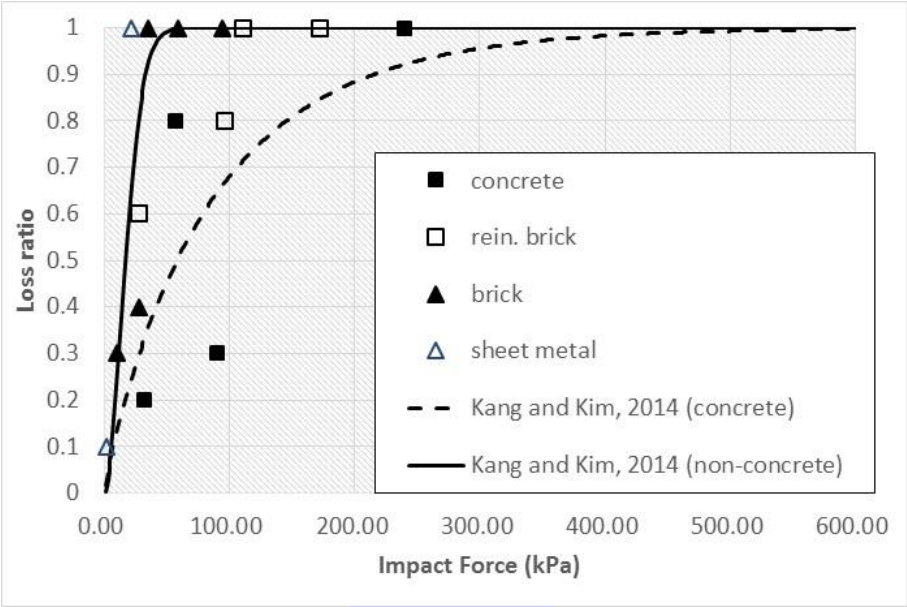
Best-fit



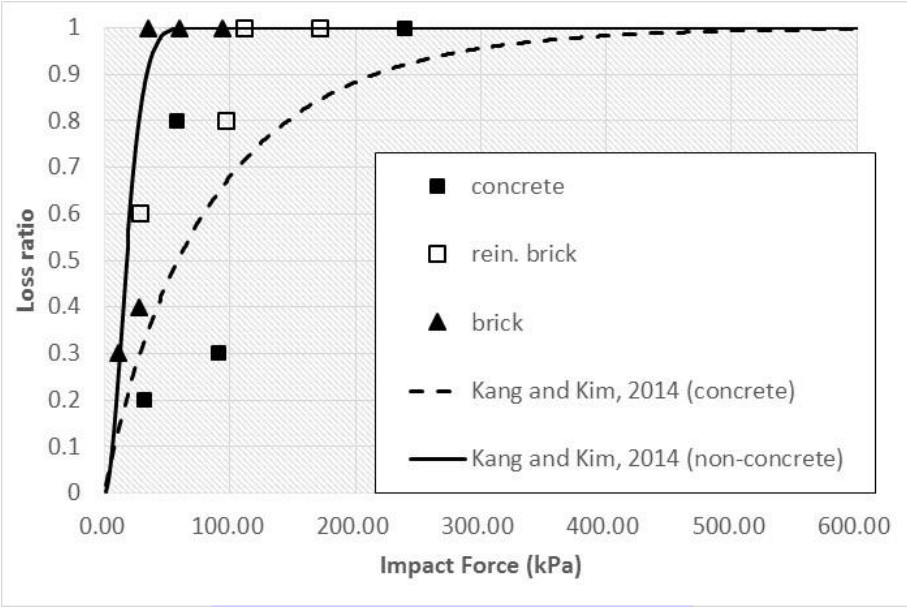


Vulnerability- based on impact force

Plot the field data on the previous vulnerability curves based on impact force.



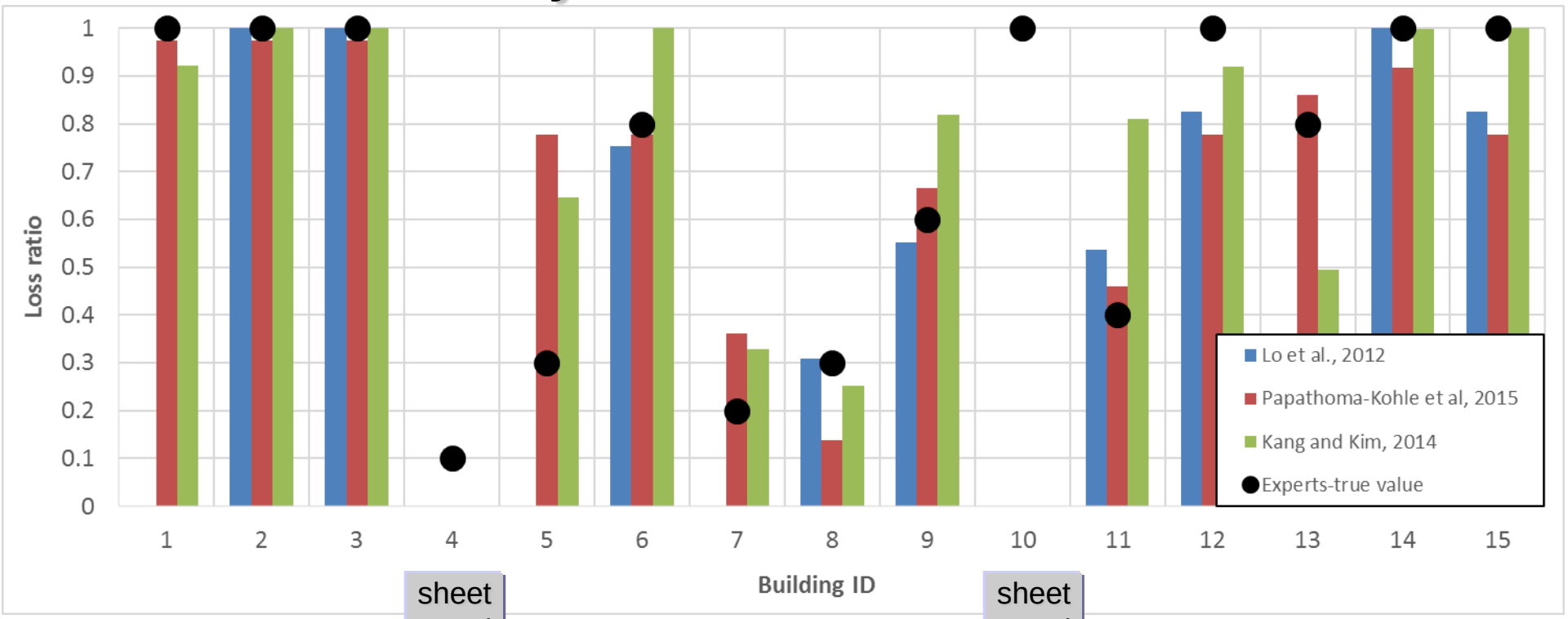
All data

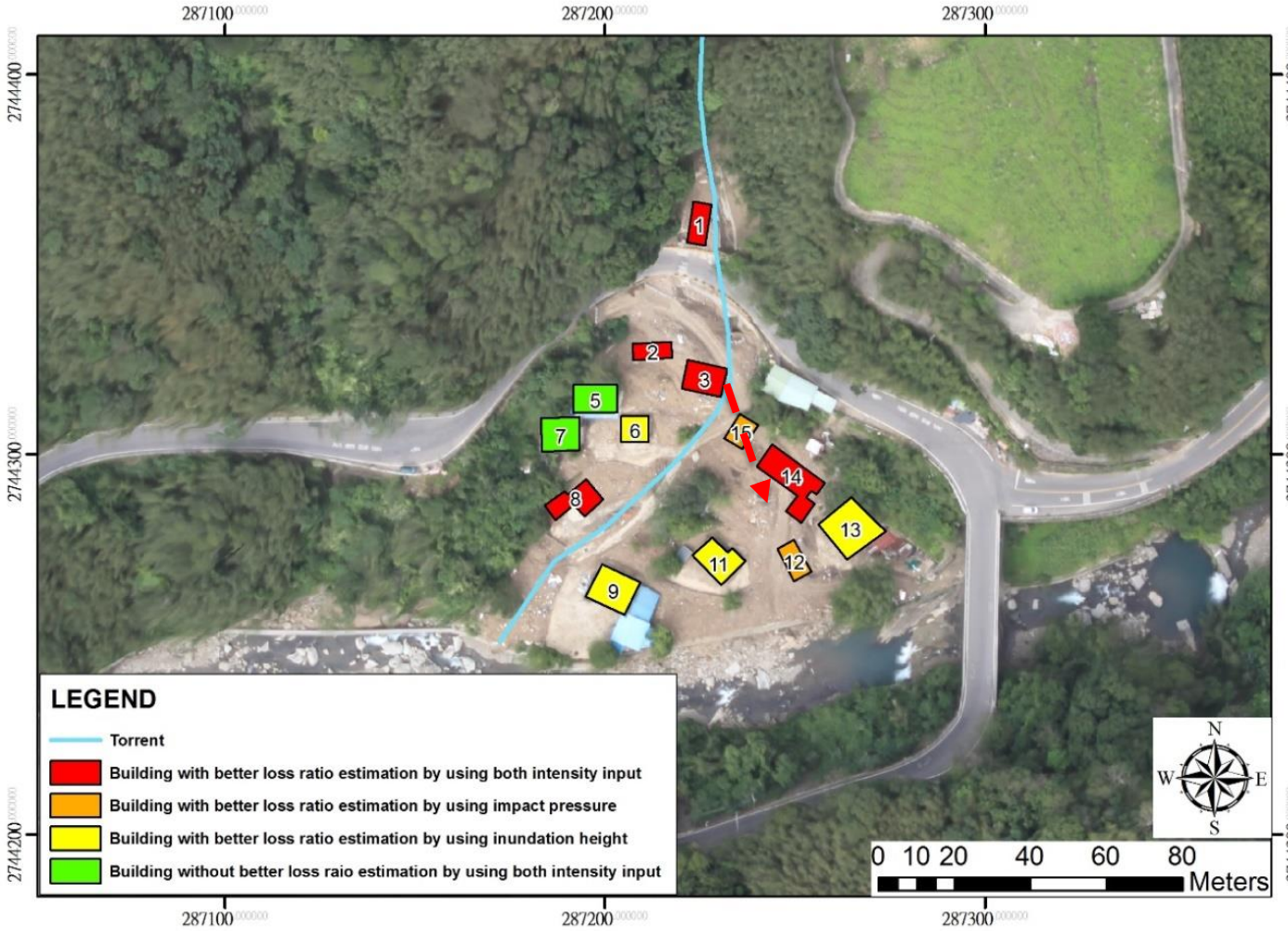


Without sheet metal

COMPARISON

By using different intensity input and vulnerability curve to estimate the loss ratio, it shows different accuracy.





- Overall, using inundation height as intensity input is reasonable.
- However, using impact pressure as intensity input is more suitable for buildings in the direction of flow.
- Besides, buildings 5 and 7 show higher deviation. we suppose the reason is that they are stronger concrete structure and on the edge of the inundation area.

Thanks for your attention

Chih-Hao Hsu
ansonhsu@sinotech.org.tw
https://dptrc.sinotech.org.tw/index_en.php