

Lessons learned in flood and tsunami disaster mitigation

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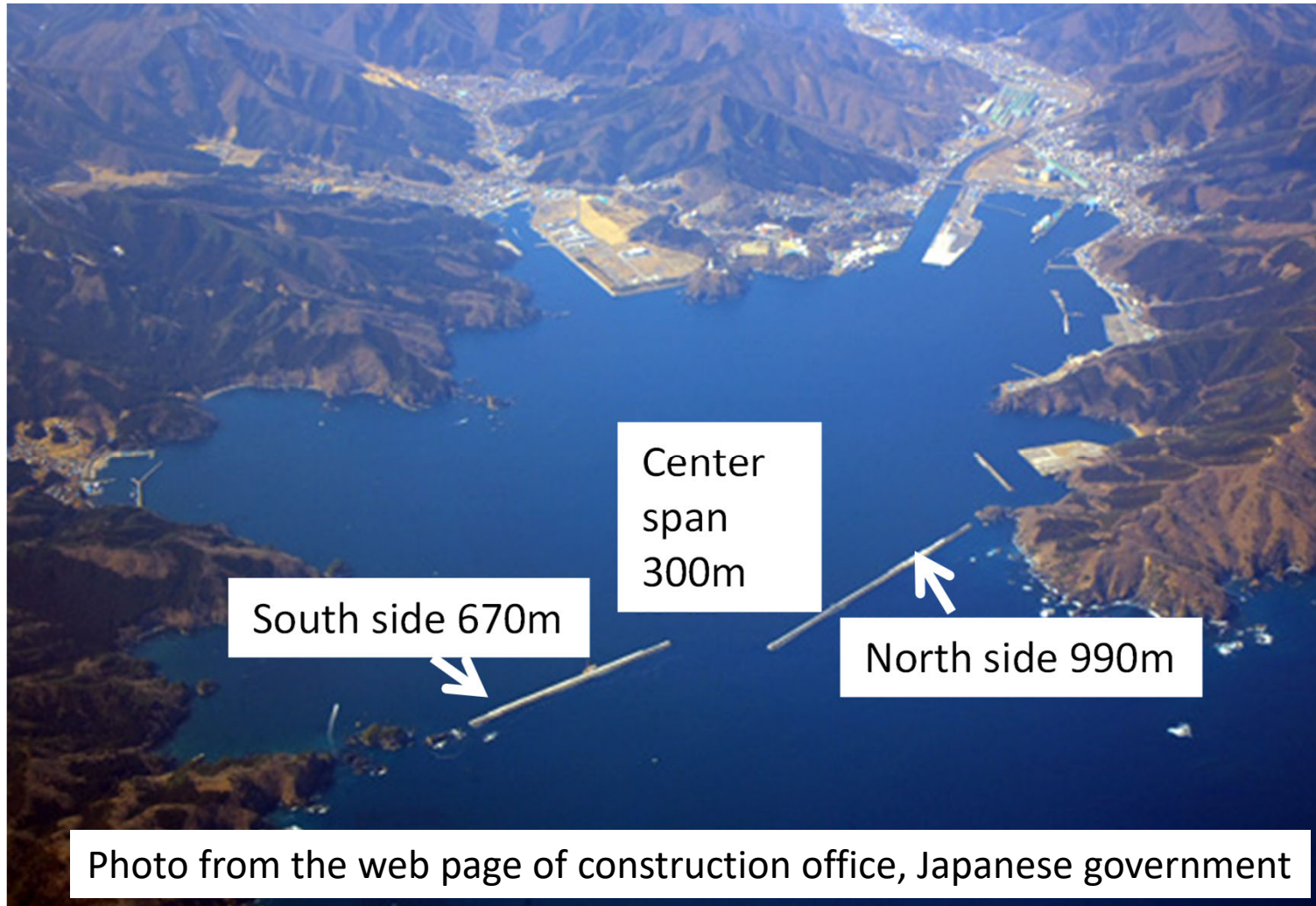
I want to start my talk from 2011 Tohoku Tsunami Disaster



You can find a lot of video
in you-tube or something...



What if expected tsunami height is really high...

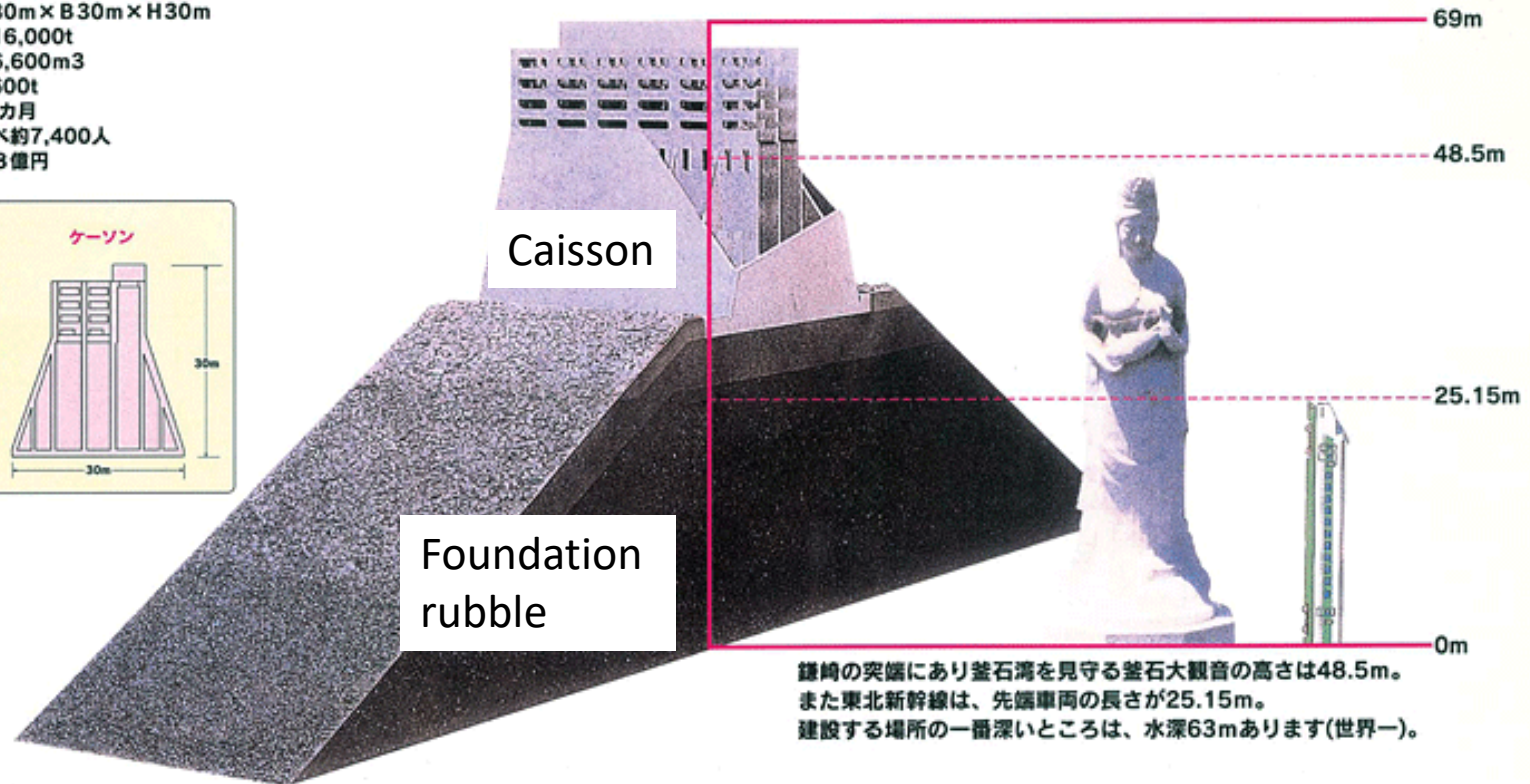
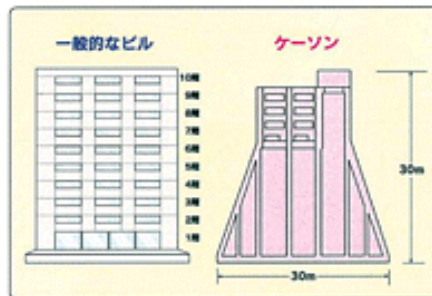


Construct tsunami breakwaters...(i.e. Kamaishi Port)

69 m high !

ケーソン(一函当たり)

形状寸法：L30m×B30m×H30m
完成重量：約16,000t
コンクリート量：約6,600m³
使用鉄筋量：約600t
製作期間：16カ月
就労人員：延べ約7,400人
製作費用：約8億円



鎌崎の突端にあり釜石湾を見守る釜石大観音の高さは48.5m。
また東北新幹線は、先頭車両の長さが25.15m。
建設する場所の一番深いところは、水深63mあります(世界一)。

These are really huge breakwaters!!!

Illustration from the web page of construction office, Japanese government



This is the disaster
in Kamaishi Port.

The place where
huge breakwater
was constructed.

Video recorded
at the construction office,
Japanese government



Video recorded
at the construction office,
Japanese government



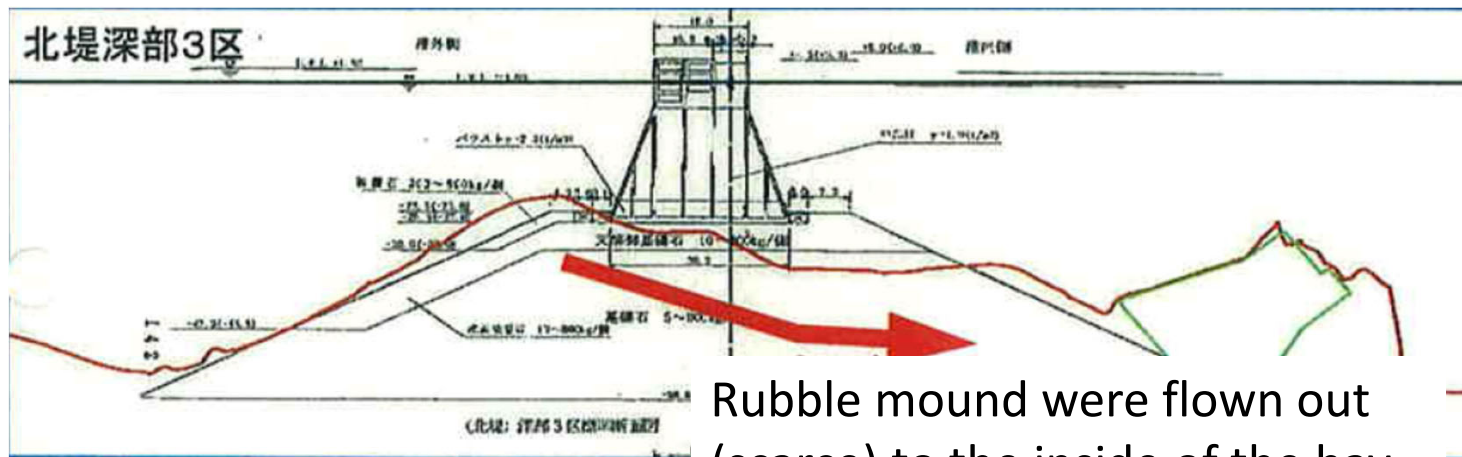
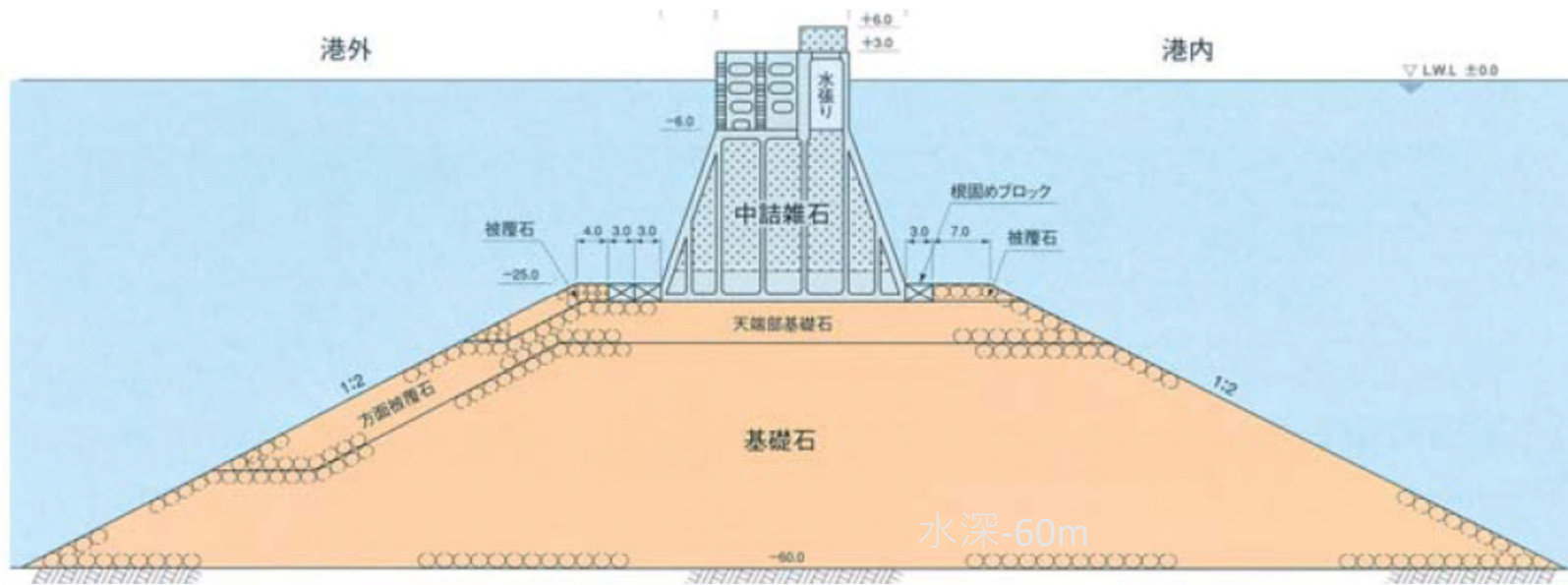
At tsunami breakwater (Kamaishi Port),
white bubbles were observed behind caisson...



Video recorded
at the construction office,
Japanese government

Tsunami overflowed...

Damage to breakwaters..



Rubble mound were flown out (scarce) to the inside of the bay

Illustration from the construction office,
Japanese government

The effects of the break water

Ministry says,

40 % reduction of the tsunami height :

=> 13.7 m to 8.1 m

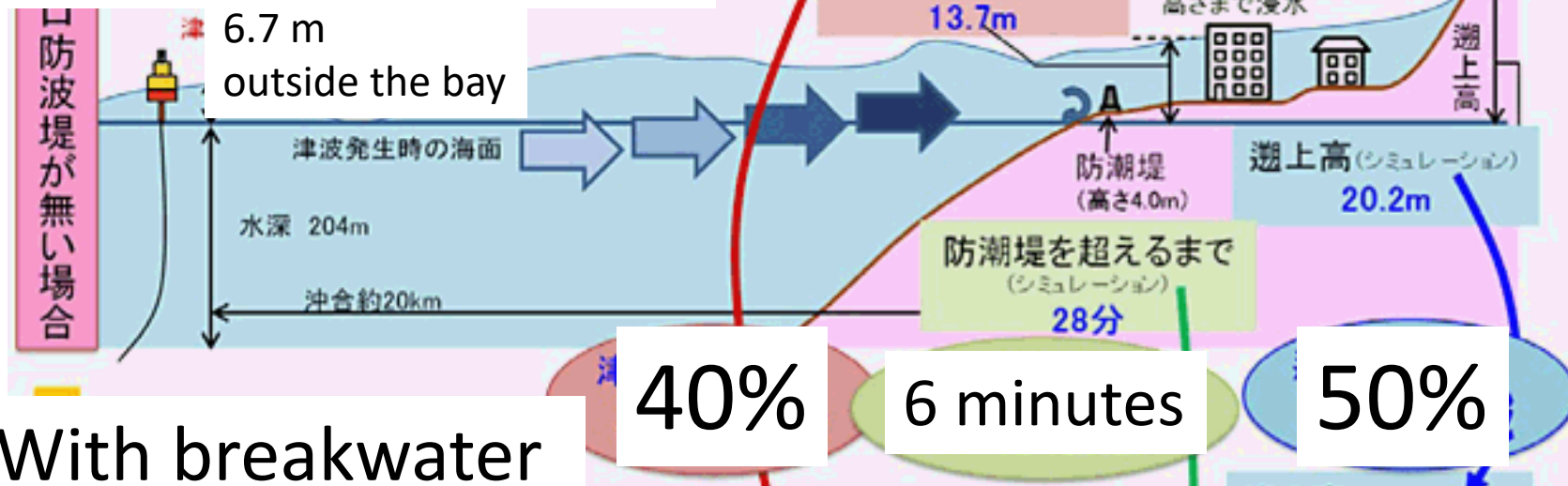
Reduction of the maximum tsunami inundation height:

=> 20.2 m to 10.0 m

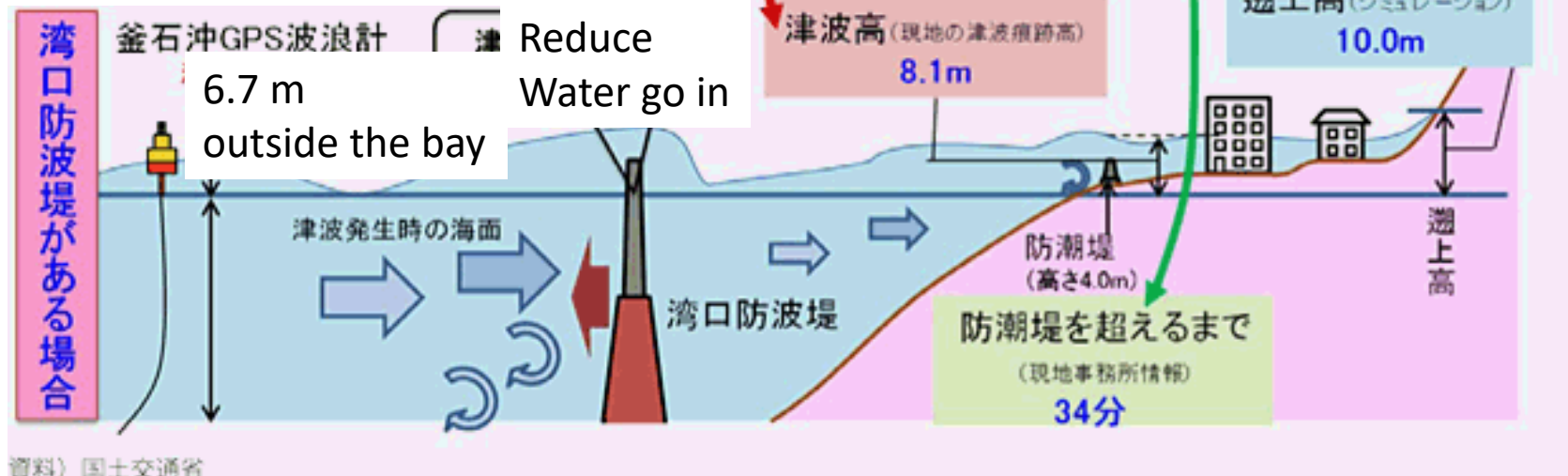
6 minutes to evacuation

<http://www.mlit.go.jp/hakusyo/mlit/h22/hakusho/h23/html/k1112ce0.html>

Without breakwater



With breakwater



資料) 国土交通省

<http://www.mlit.go.jp/hakusyo/mlit/h22/hakusho/h23/html/k1112ce0.html>

Peoples evacuate if the good education was done, even if a huge breakwater was constructed.



Then how about the evacuation in reality?



Rikuzentakata city office

From some video thru internet...

岩手県陸前高田市市役所前
津波が来る直前の映像

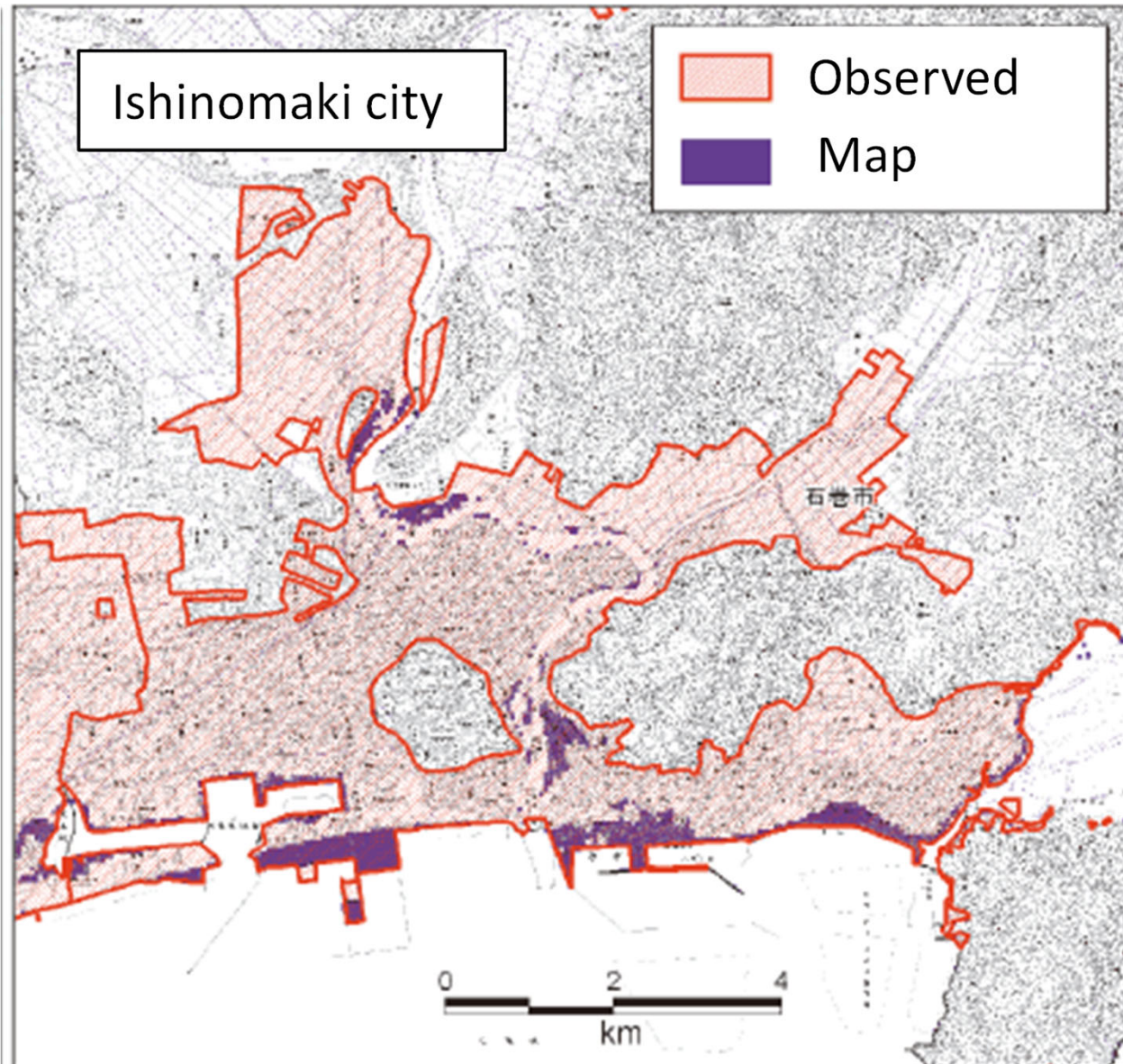
USTRAMで津波直前まで
生中継された。





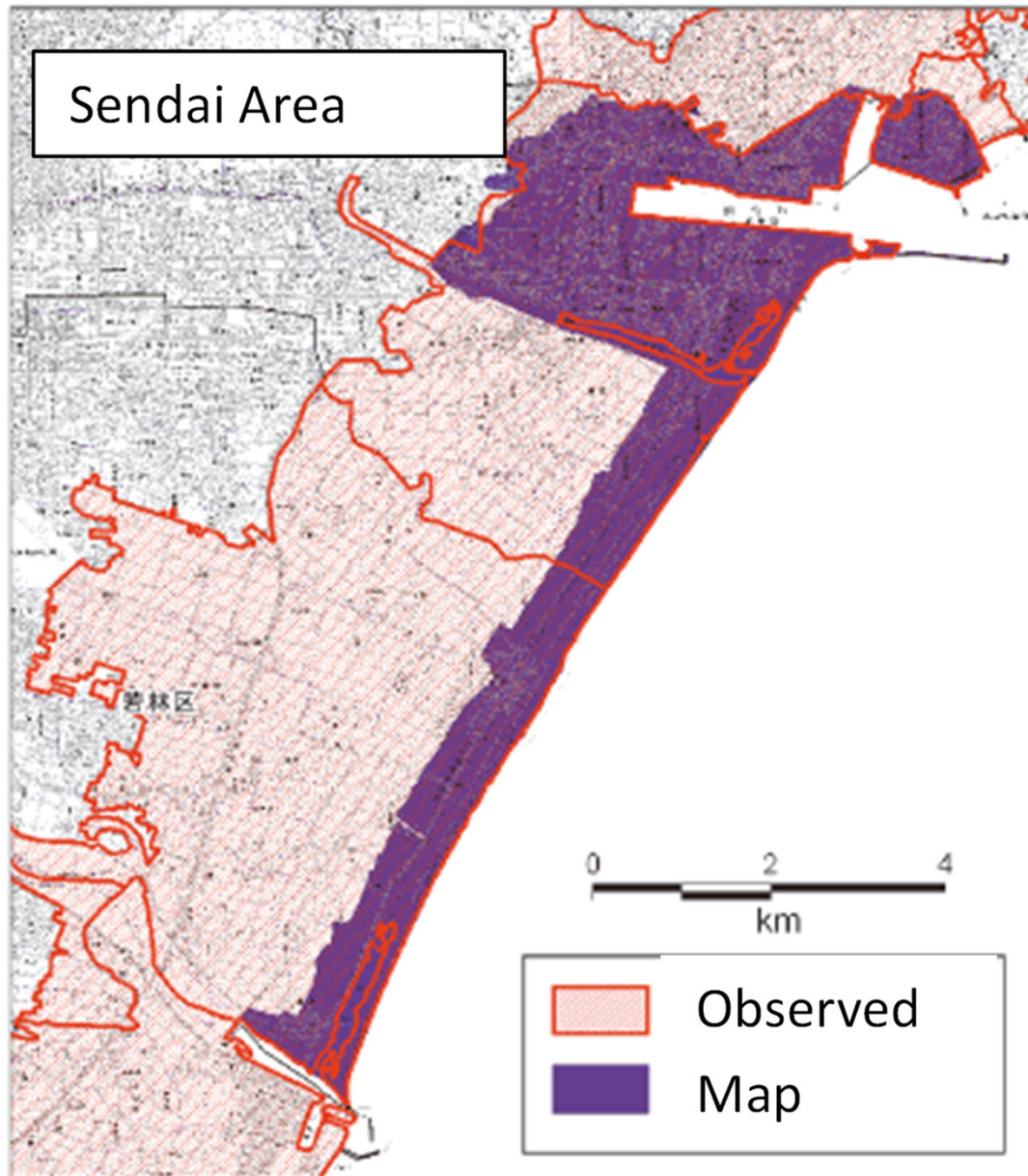
Why emergency stairs
did not reached
to the roof terrace?

Tsunami height was more than our imagination...



Comparison between hazard maps and observed inundated area.

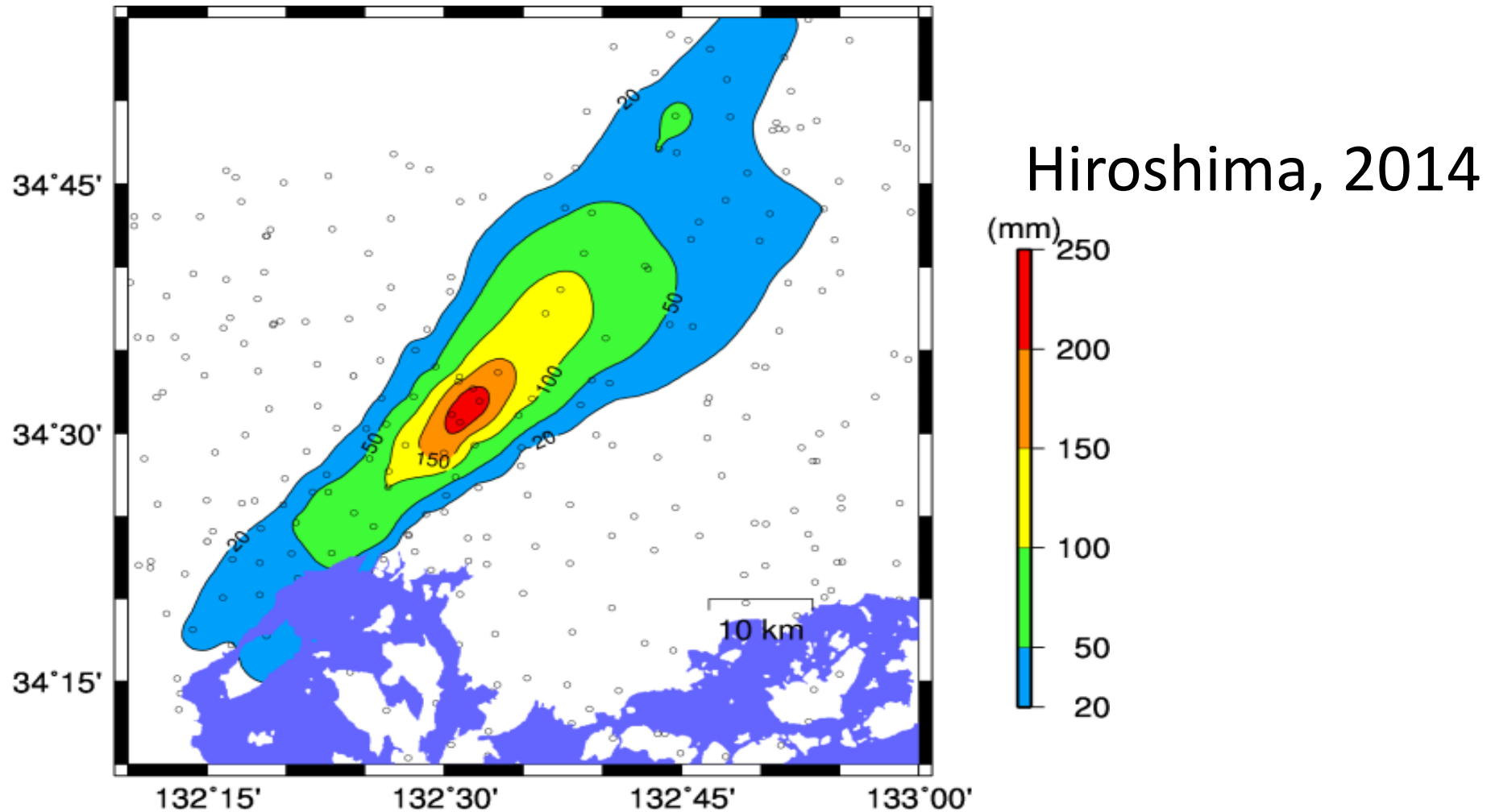
Tsunami height was more than our imagination...



**Hazard map
(and constructed
infrastructures
to protect us)
gave us
too much relief?**

How about flood cases

=> Let me see a landslide (debris flow due to heavy rainfall)



JSCE Chugoku branch et al.:

Reconnaissance report at <http://www.jsce.or.jp/branch/chugoku/report.html> (N/A now)

Landslide
(debris flow)
in Hiroshima, 2014

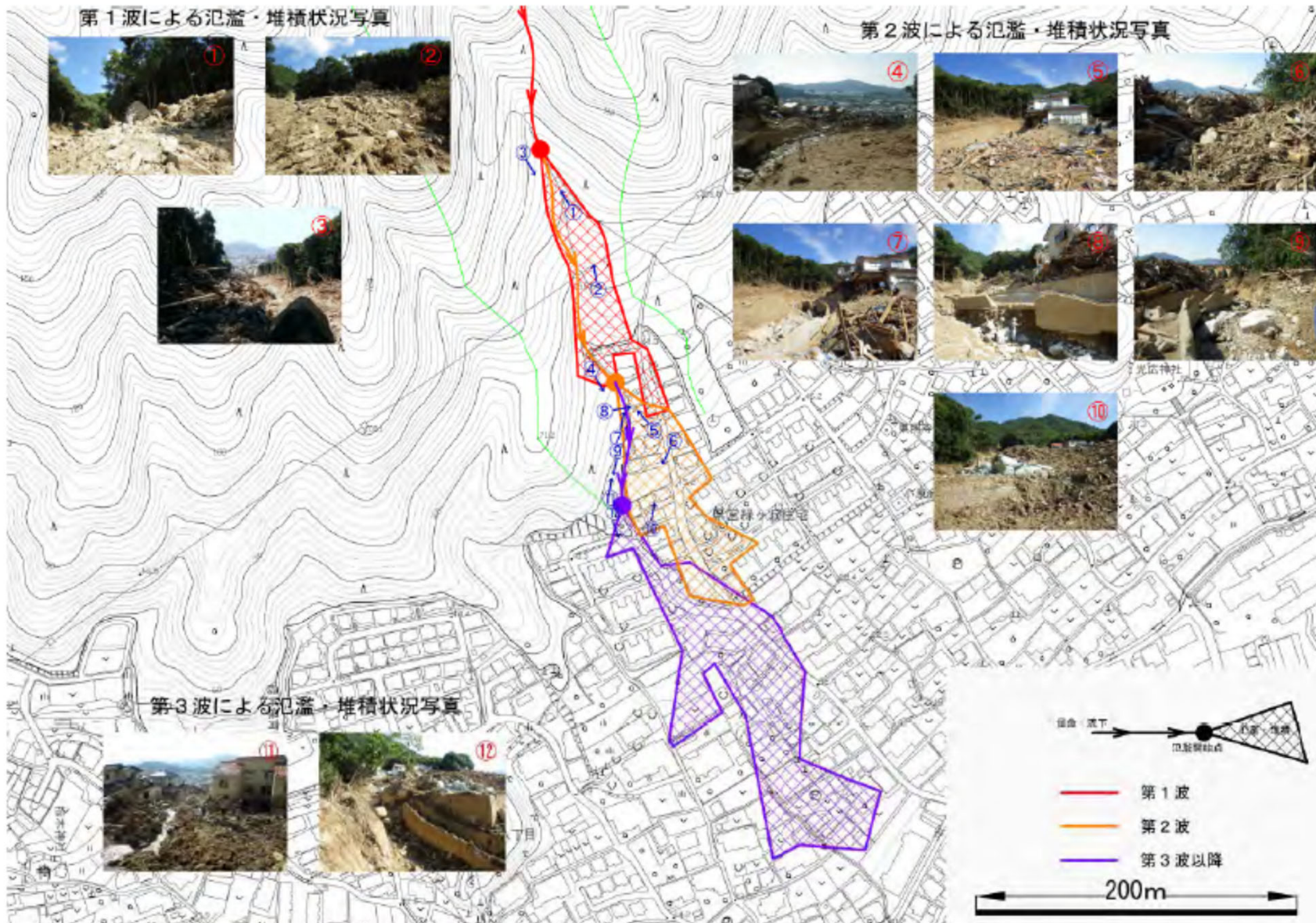


5:20
LIVE 広島・安佐南区 緑井

解説 土砂災害はこうして起きた
地盤の専門家が緊急視察
広島は今夜も雨…対策は？ J

一井 康二 准教授
広島大学大学院(地盤工学)

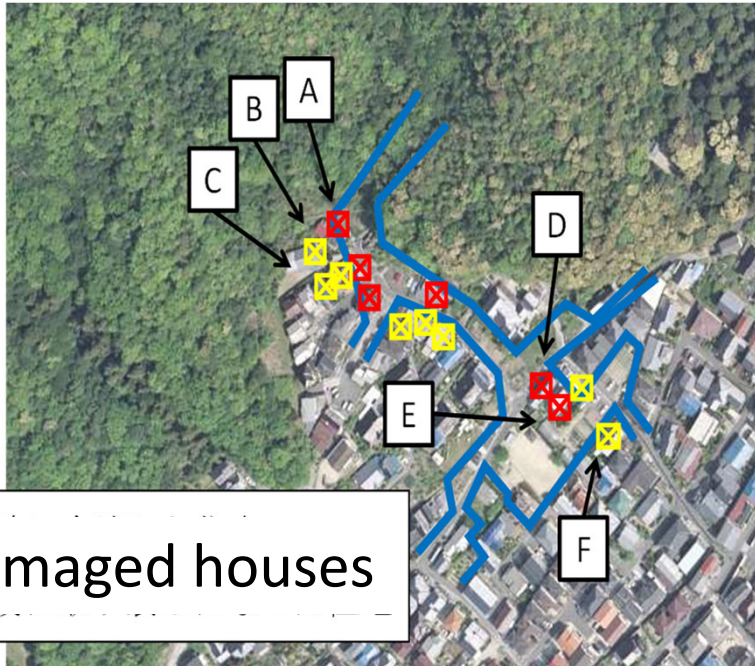
An example of debris flow attack: 3 times





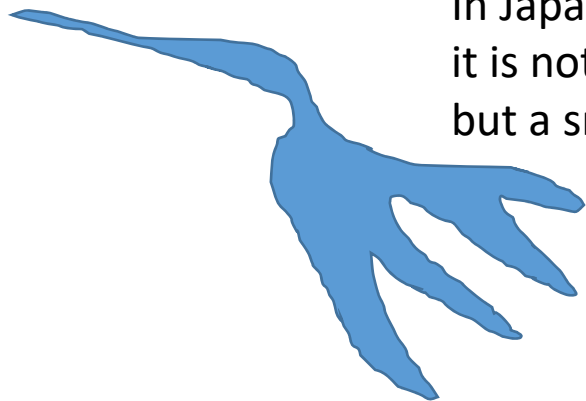
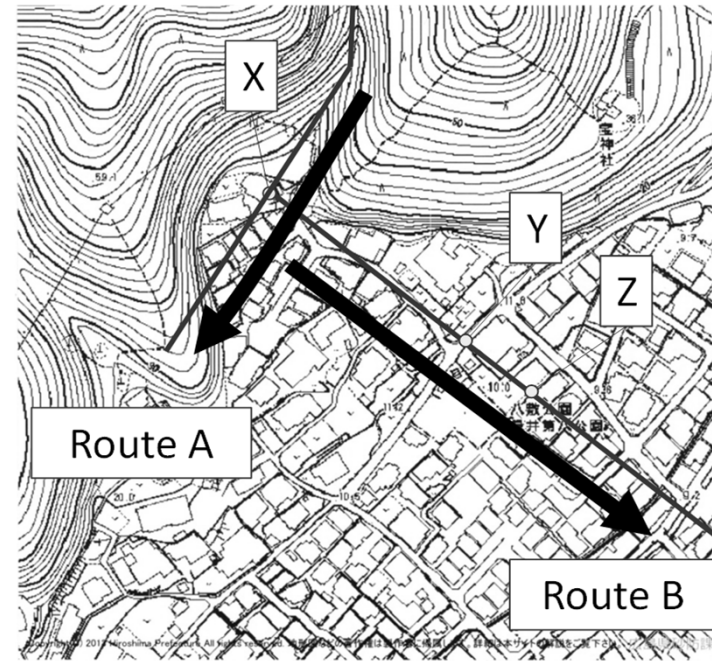
JSCE Chugoku branch et al.:

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Debris flow changed the route, such as a snake dancing

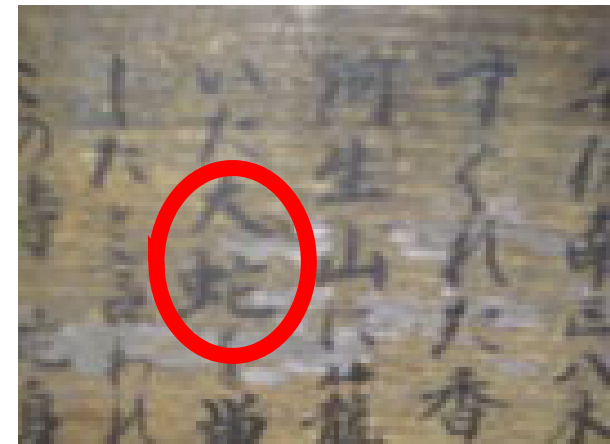


  Damaged houses



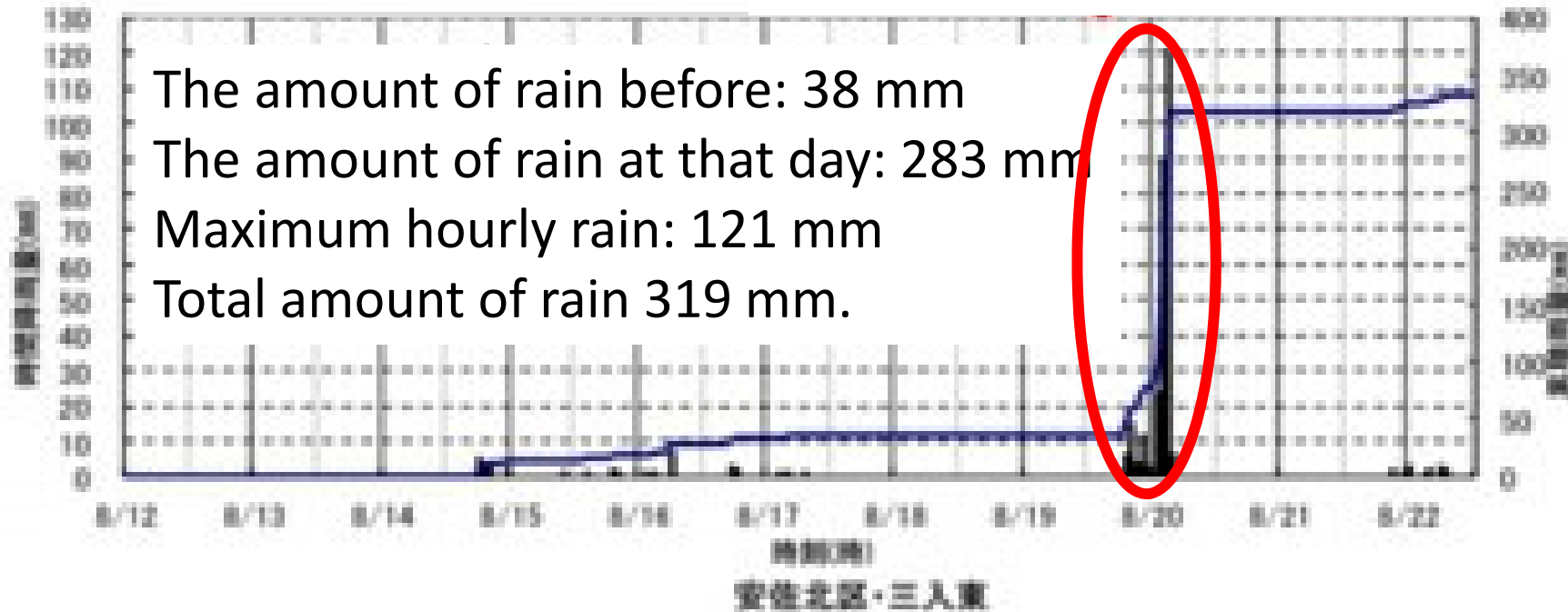
In Japanese legend, it is not snake dance but a snake with multiple head.

Old story showing a big snake



Was the hazard map useful for evacuation?
... maybe NO!

The rain start at 2:00AM
Disaster happened at 4:00AM



JSCE Chugoku branch et al.:

Reconnaissance report at <http://www.jsce.or.jp/branch/chugoku/report.html> (N/A now)

It is a kind of suicide running the steep slope
(more than 10 degree of inclination)
in midnight, in heavy rain.



How about the performance of infrastructure?
... concrete dams



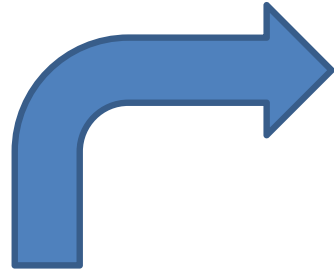


Concrete dam broke, and
a big concrete block
attacked houses.



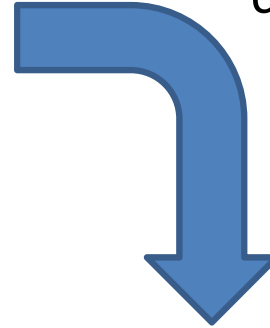
**Construction of dams
gave us
too much relief?**

Request of countermeasures



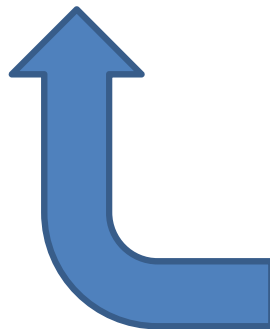
Safe life

Acknowledgement of the effect of countermeasures



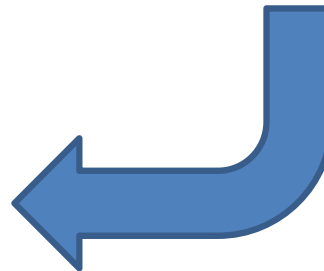
Relief to the people

Uneasiness of people



Edification (Agitation?)

Unsafe life



No concern on the danger

A possible bad cycle between safety and relief

An example of miserable (avoidable) disaster

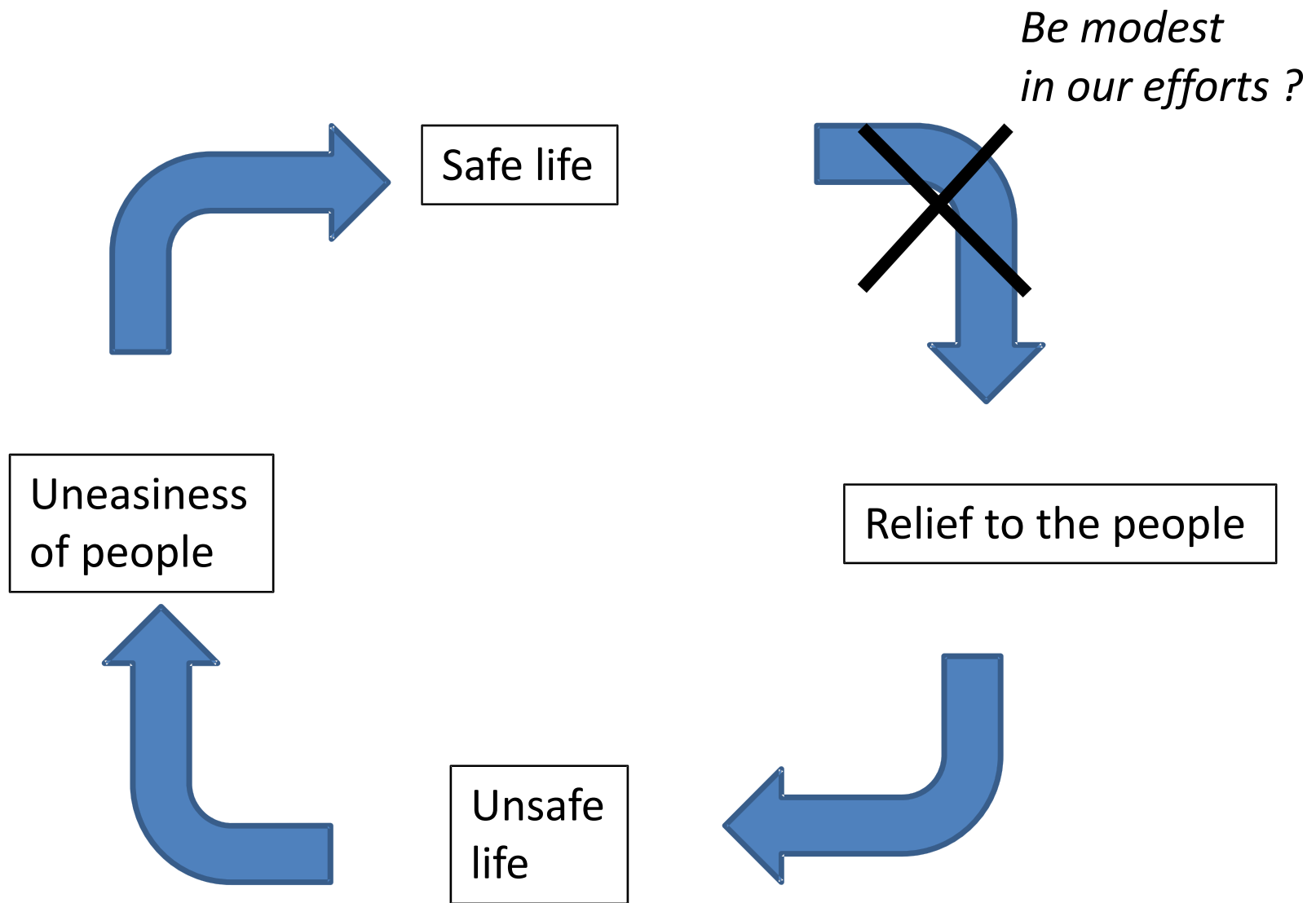


JSCE Chugoku branch et al.:

Reconnaissance report at <http://www.jsce.or.jp/branch/chugoku/report.html> (N/A now)

Sometimes, there is a space for survival
... people can move there





Give a safe life, but no relief?

This is a question (lessons) learned in recent disaster

Of course, engineers/researchers can do something.
... some other aspect of lessons learned.



Flat area (i.e. road) can stop the debris flow

Of course, engineers/researchers can do something.
... some other aspect of lessons learned.



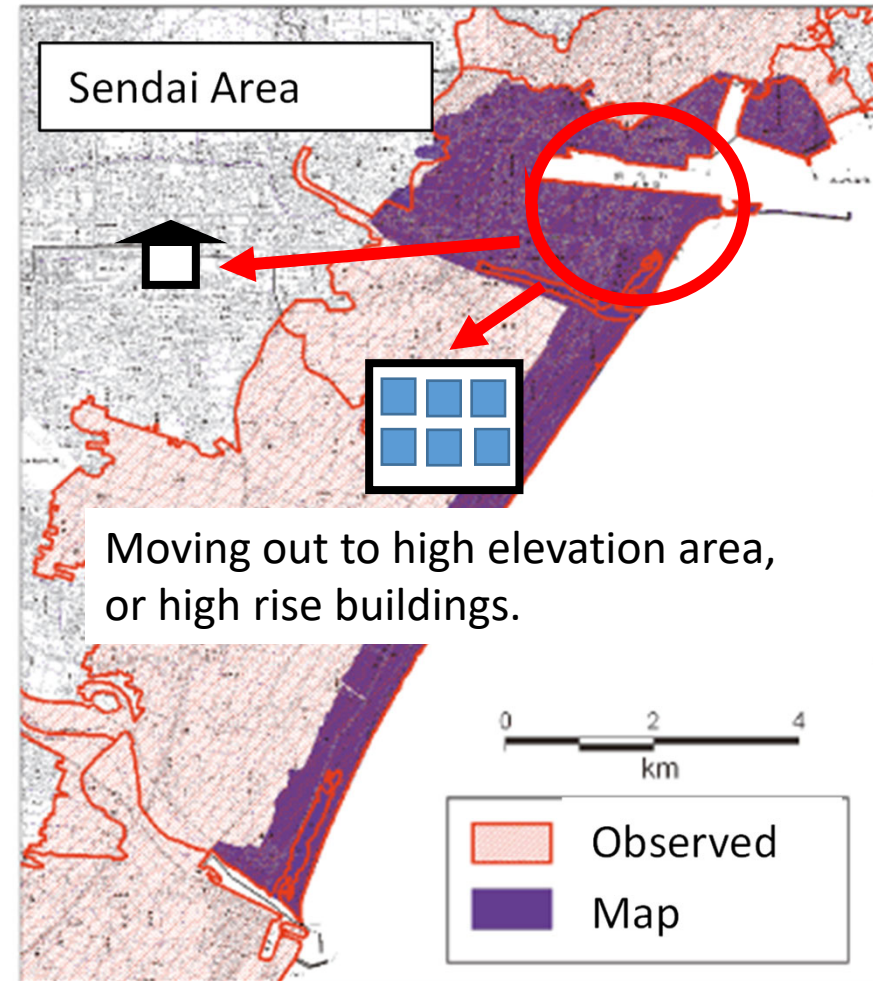
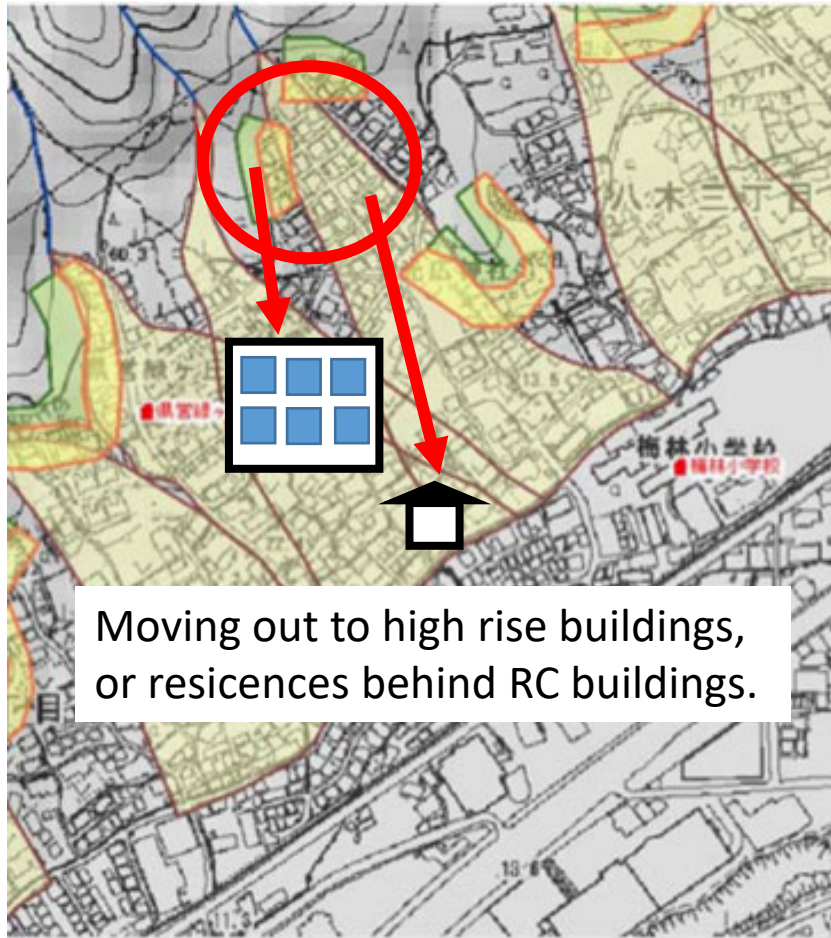
RC Building can be a dam?

Of course, engineers/researchers can do something.
... some other aspect of lessons learned.



Appropriate urban planning
(construction of buildings) can help us?

Living in a safe place is most important:
... preparation of safe place is the role of government.



So, what I want to introduce is,
my colleagues in psychology, economics, etc.

For example,

Katsuyuki Kamei

Professor



Subjects of Instruction :

Risk Management

Crisis Management and Leadership

Shoji Tsuchida

Professor



Subjects of Instruction :

Risk Perception

Risk communication

Shingo Nagamatsu

Professor



Subjects of Instruction :

Economics of Risk and Disasters

Public Policy

Faculty of Societal safety Science, Kansai University

*Only one faculty in societal safety science, launched 9 years ago,
and a challenge to working together from various field.*

We have launched English-based PhD course last year!!

3 Policies

Faculty

Curriculum

Graduate School of Societal Safety Sciences

Research Center

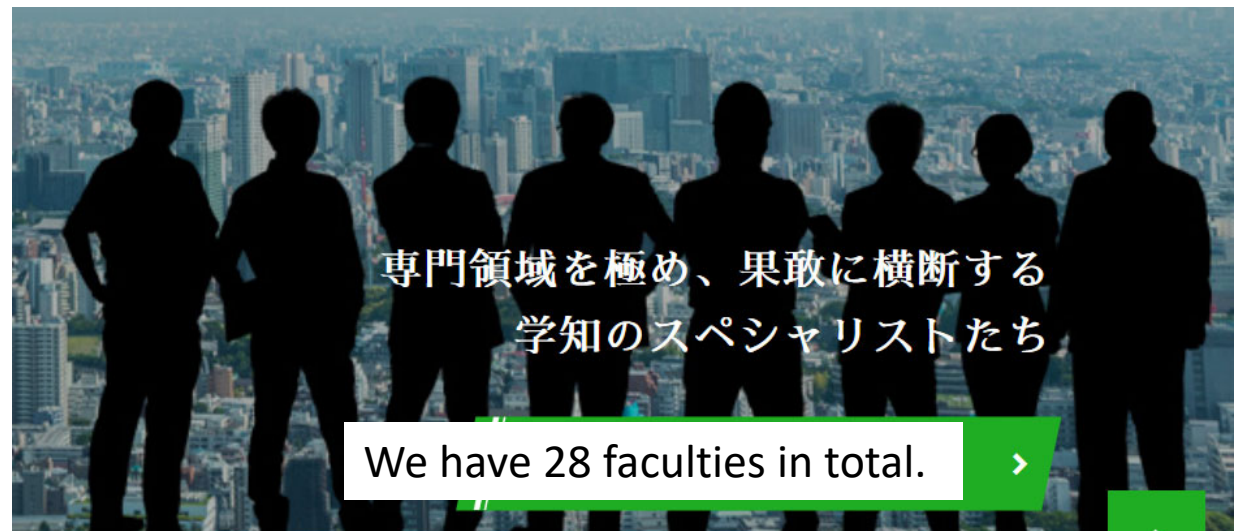
It is a challenge of our 2nd phase.

Vision and Objectives

Geographically located along the Ring of Fire where frequent earthquakes, tsunamis, typhoons and volcanic activity occur, Japan faces a wide variety of adverse conditions including threats of man-made disasters as well. Promoting preventative measures and establishing means of mitigating damage created by these negative forces is a top priority facing the government at both the local and national levels. With ever increasing demands to promote safety for the whole of society, there is an urgent need to prepare well-balanced and equipped leaders with specialized knowledge and diverse skills to meet the challenges.

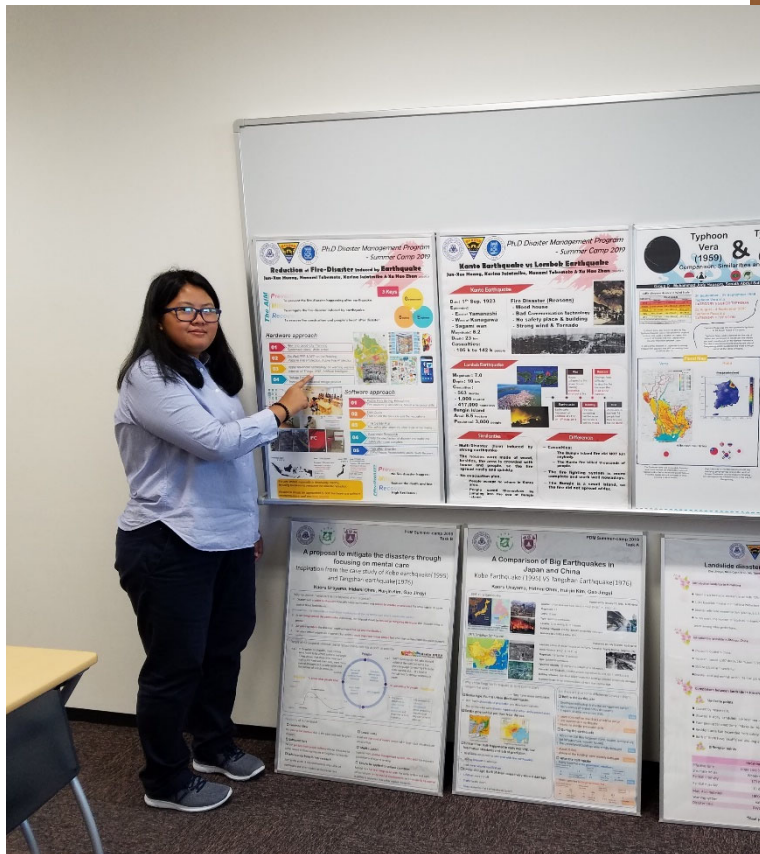
In April of 2010, Kansai University opened its Faculty of Safety Science at its new MUSE Campus in Takatsuki, Osaka, to address the safety issues of the 21st century.

Our campus is in Takatsuki, Osaka

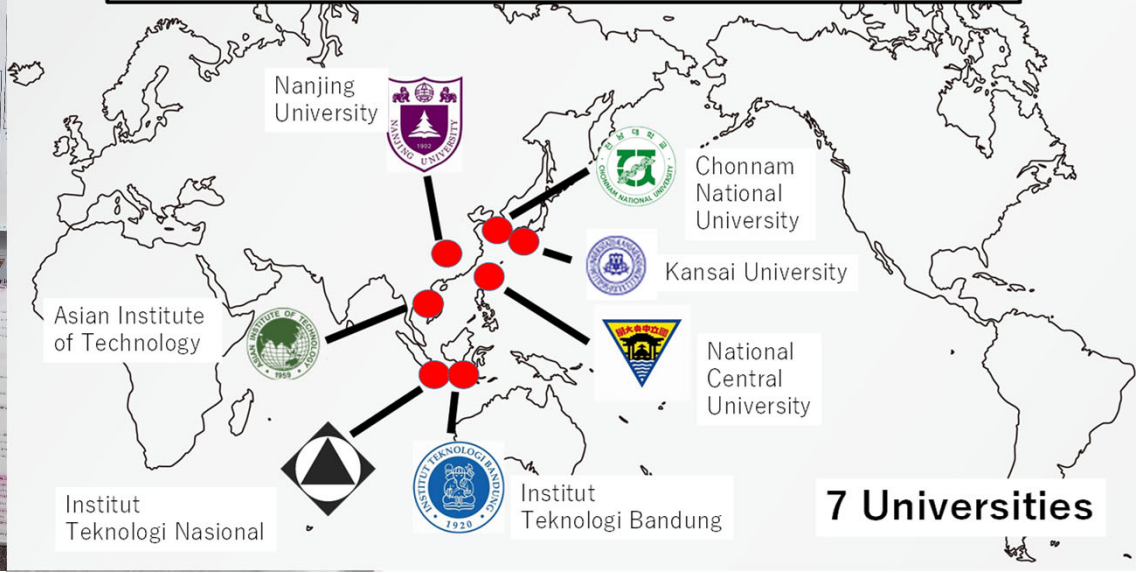


PDM summer-camp 2019

An example of collaboration from various field. (various background such as countries)



The universities where student come from



Summary

- 1) Engineers have payed effort for disaster mitigation.
But it was not enough against 2011 tsunami.
- 2) Peoples are not in panic. But they died.
- 3) Tsunami height was beyond our imagination.
So, the evacuation place has not enough elevation.
- 4) Hazard map information was wrong.
It may gave us too much relief.
- 5) In Hiroshima landslides disaster 2014,
it was almost impossible to evacuate.
- 6) Concrete dam were expected to stop debris flow,
but it was damaged. Broken dam attacked residences.
- 7) Engineers should not be too much confident on our works.
- 8) Not only construction of infrastructures,
but appropriate urban planning may be necessary.
- 9) Collaboration with other research field is necessary.