# *Incorporating Scientific Research Outputs into Emergency Preparedness and Response Planning:*

## *Two Case Studies on Nuclear Accident Consequence Assessment*

Kampanart SILVA, Ph.D.
Wasin VECHGAMA
Thailand Institute of Nuclear Technology (Public Organization)

**2018 Southeast Asia Disaster Risk Governance Academic Seminar**

**24-26 September**

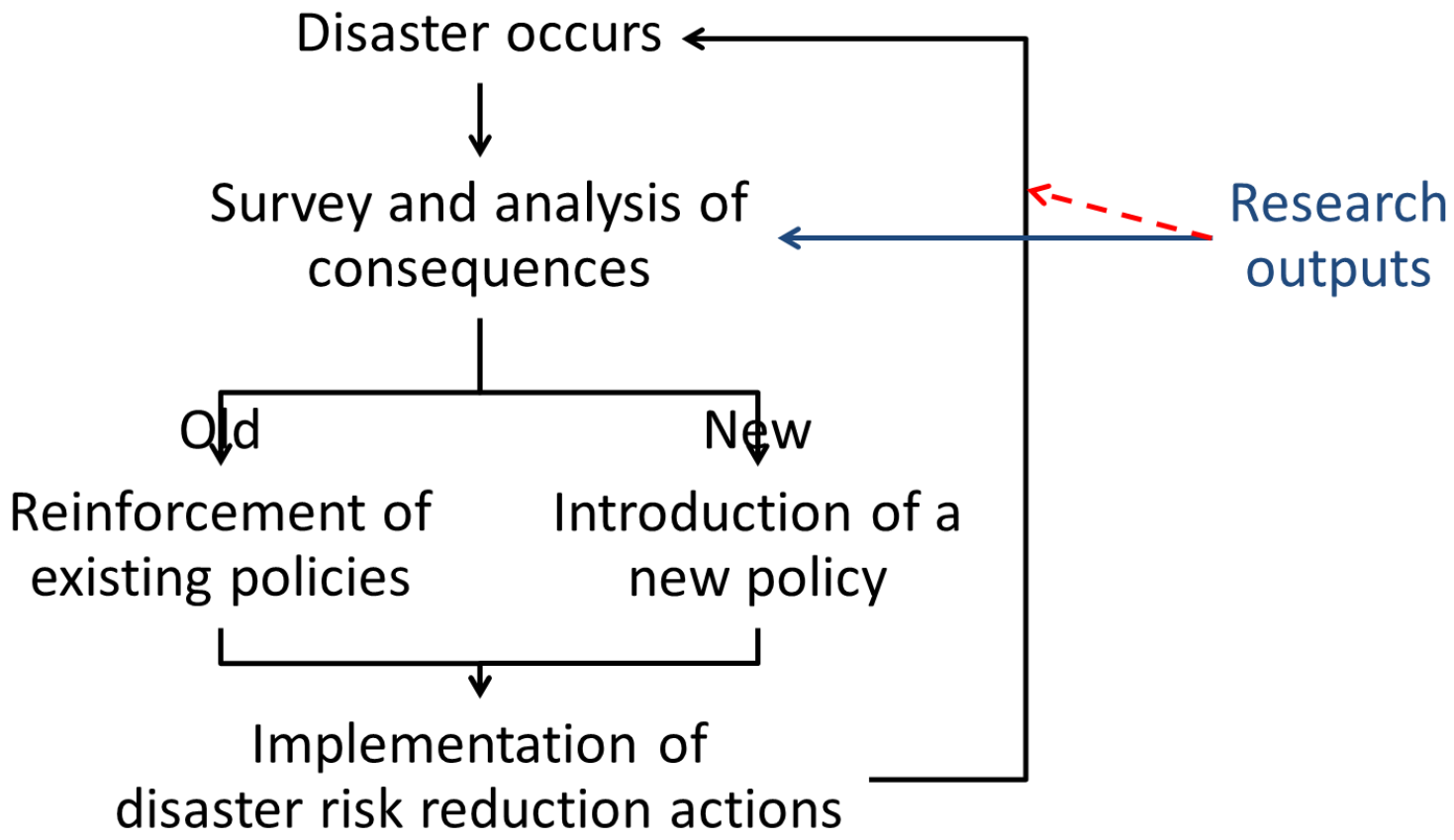
**Bangkok, Thailand**

# Thailand is NOT a disaster-prone country.




1 https://money.cnn.com/
2 http://www.freepressjournal.in/
3 www.hospitalitynet.org/
4 https://sites.google.com/site/risbiologyc8/sanjana

# Typical flow of disaster risk management policy design



# Can things be better?

Learning from disaster-prone countries:
Chile, Japan

- Incorporating STI into policy making
- Disaster resilience → design of disaster risk reduction scheme
- Both natural and technological disasters

## Objective

Emphasize significance of incorporating research outputs into disaster management policy making before occurrence of the disaster, using case studies.

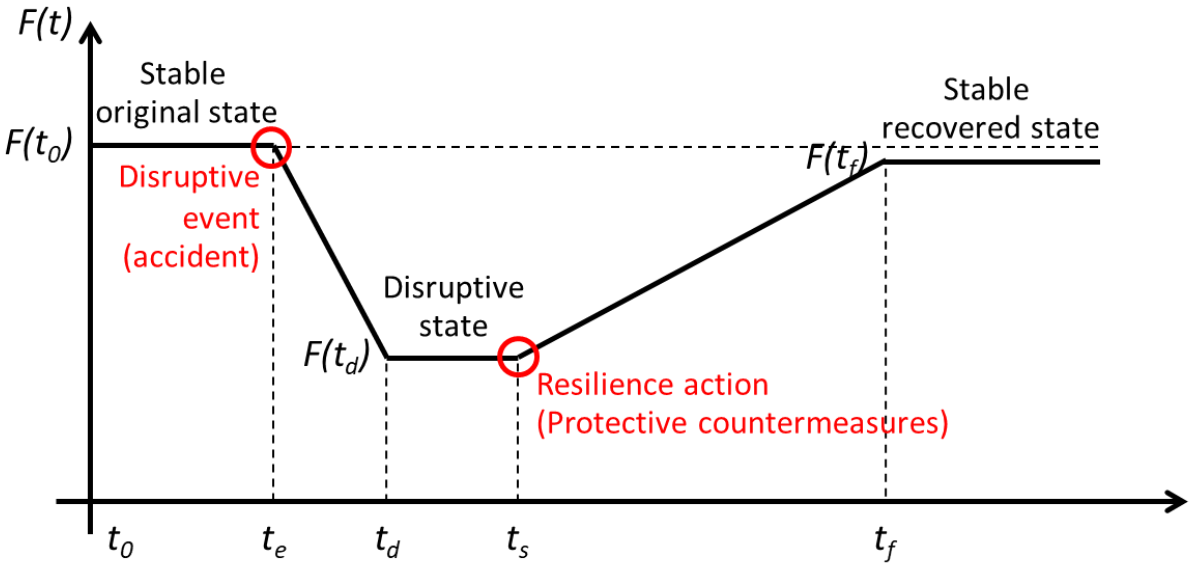
# Method

- Compare disaster risks (consequences) of cases **with and without** scientific insights incorporation.

Application of resilience metrics to nuclear accident consequence assessment

2017 Benchmark Problem (Identification of region affected by a hypothetical radiological release after a nuclear accident)

# Resilience metrics




| Figures-of-merit (F(t)) | Resilience actions |
|---|---|
| Number of people being exposed to radiation dose over prescribed dose limit | Relocation, decontamination |
| Number of relocated people | Decontamination |
| Size of relocated area | Decontamination |
| Size of contaminated area | Decontamination |

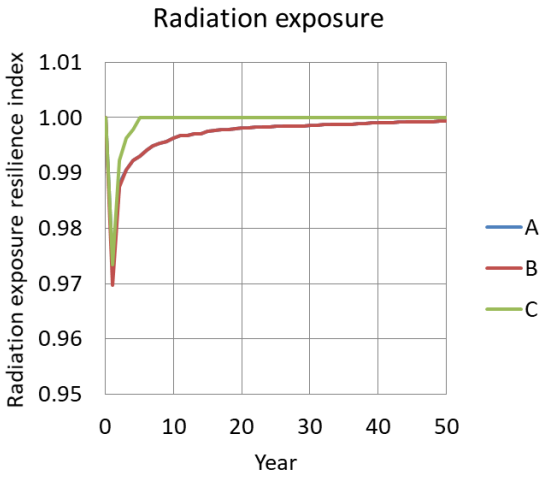
| Conditions | A | B | C |
|---|---|---|---|
| Relocation initiation dose [mSv/y] | 20 | 100 | 20 |
| Relocation lifting dose [mSv/y] | 20 | 20 | 1 |



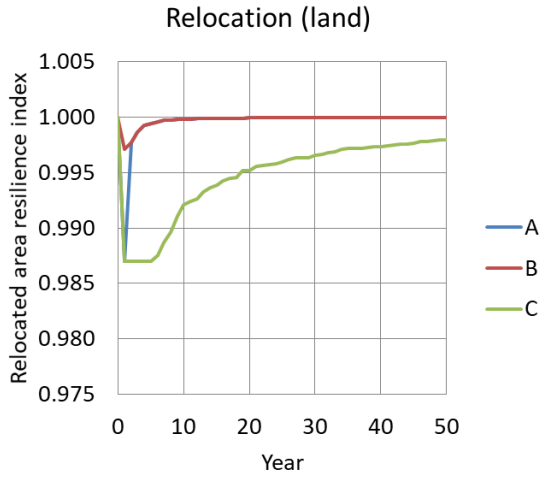
D. Henry, J. E. Ramirez-Marquez. Reliability Engineering and System Safety, 99, pp. 114-122, (2012).

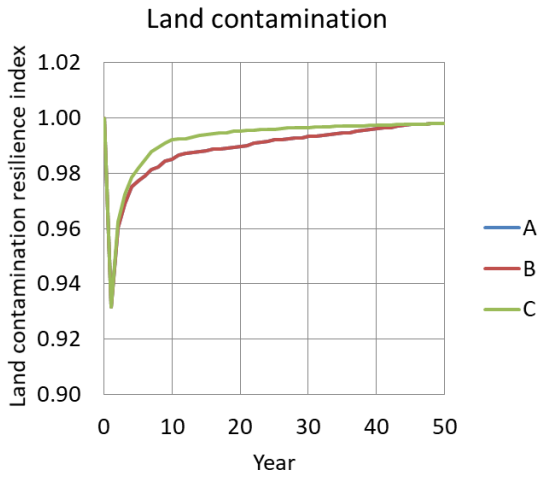
# Resilience indices

| Conditions | A | B | C |
|---|---|---|---|
| Relocation initiation dose [mSv/y] | 20 | 100 | 20 |
| Relocation lifting dose [mSv/y] | 20 | 20 | 1 |



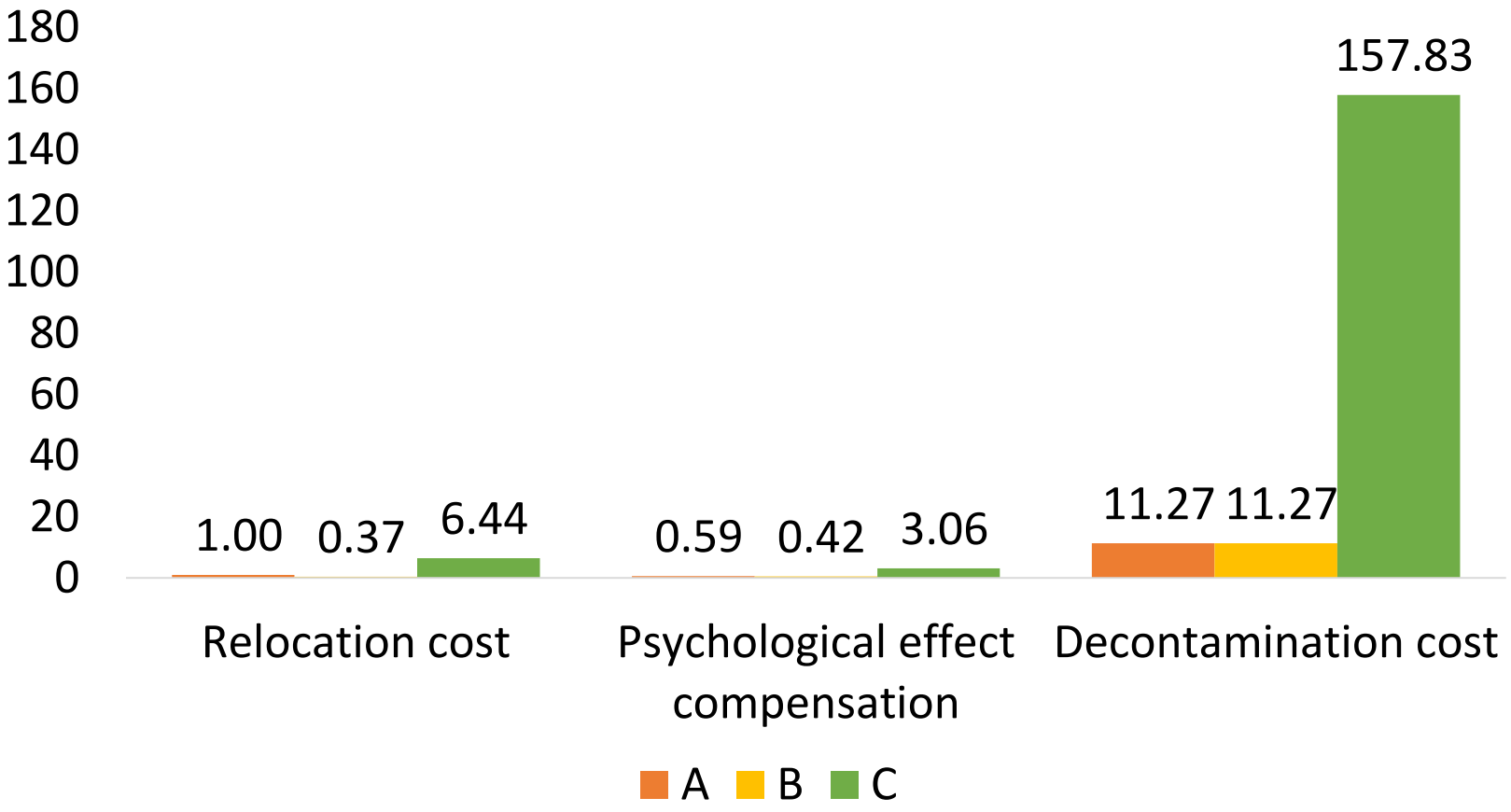




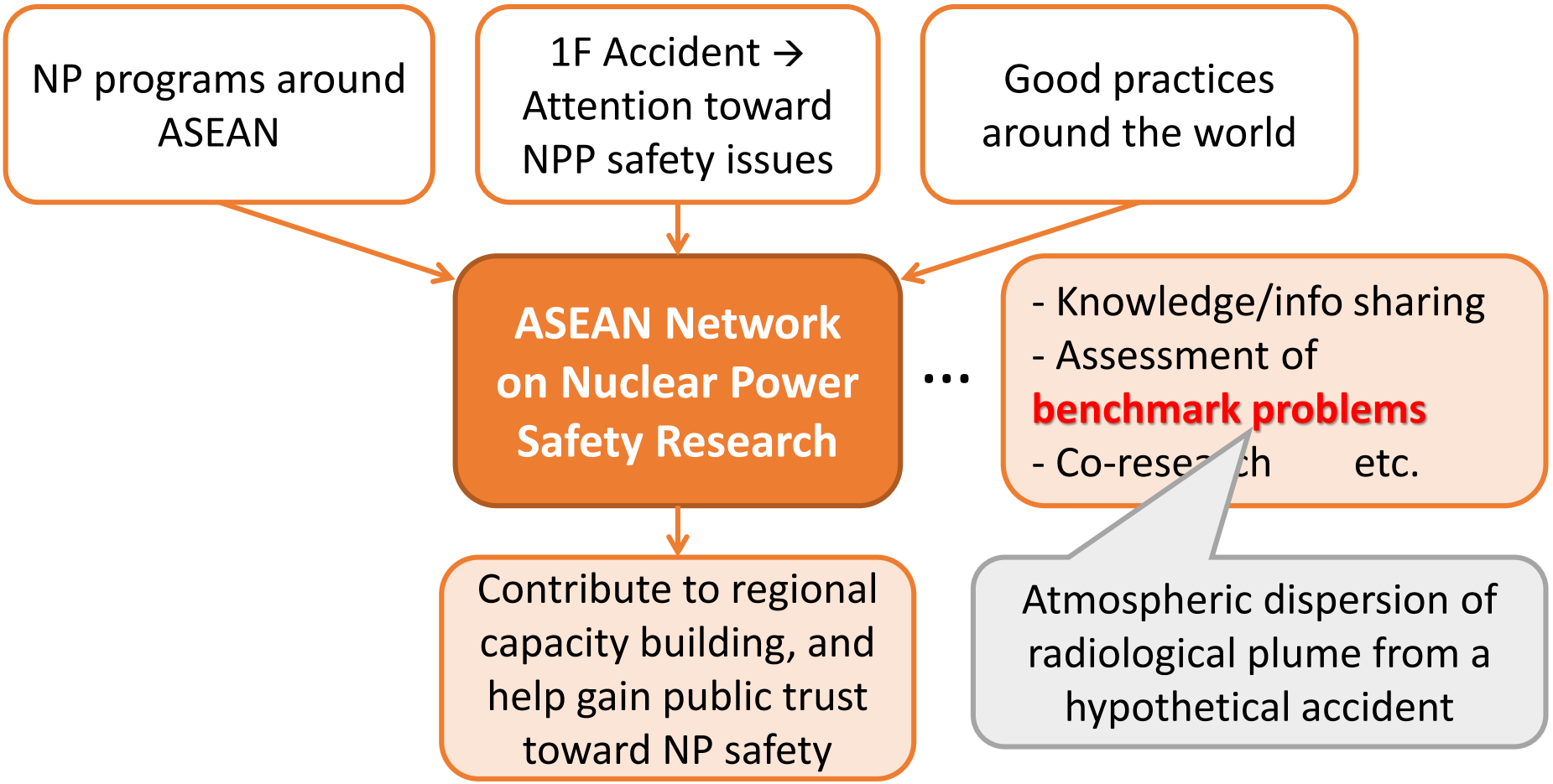
# Costs of resilience

| Conditions | A | B | C |
|---|---|---|---|
| Relocation initiation dose [mSv/y] | 20 | 100 | 20 |
| Relocation lifting dose [mSv/y] | 20 | 20 | 1 |

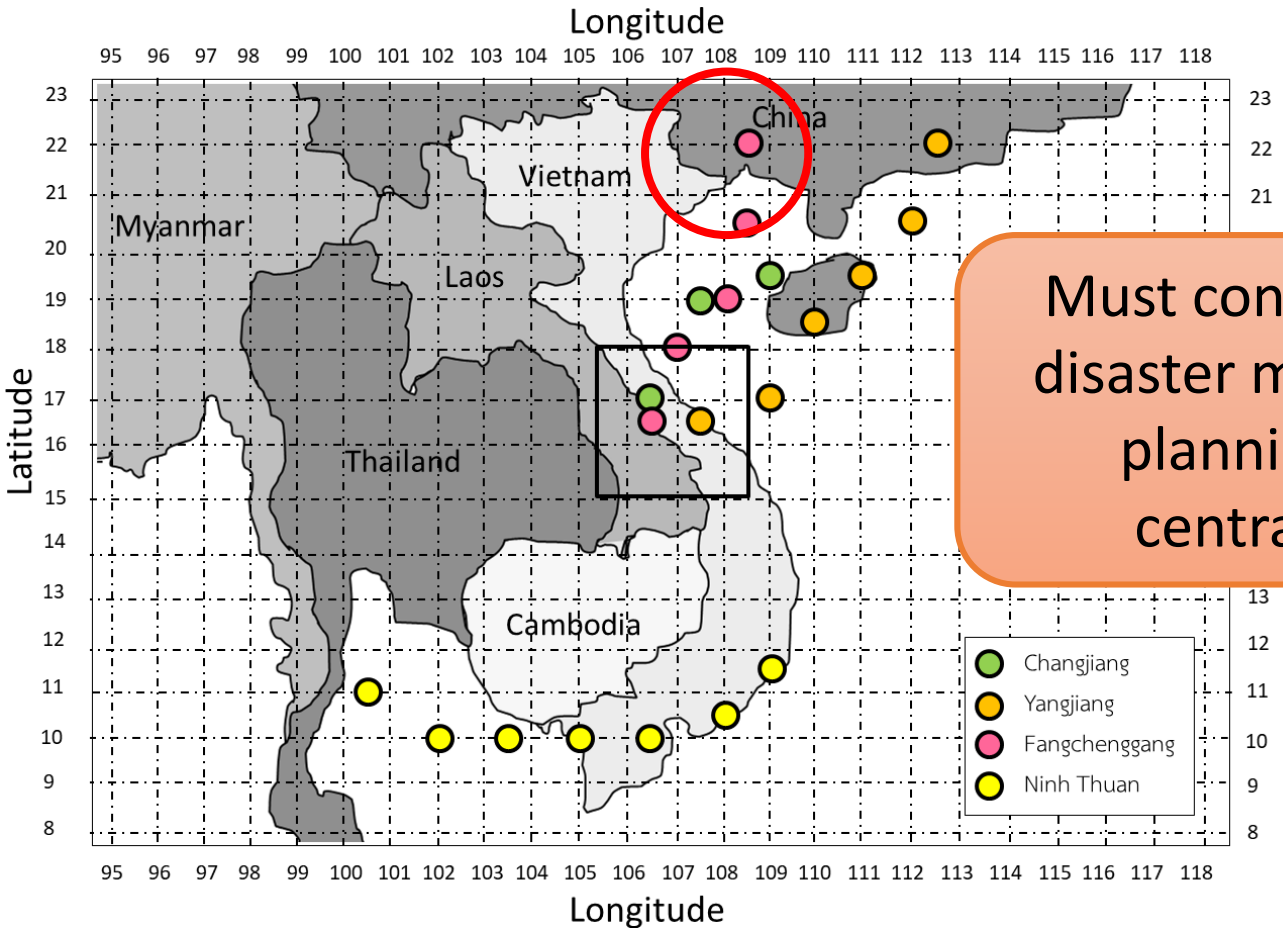


ASEAN Network on Nuclear Power Safety Research

# 2017 Benchmark Problem



# Region affected by a hypothetical radiological release




Must concentrate on disaster management planning in the central region

# Conclusions

Significance of incorporating scientific research outputs into disaster management policy was demonstrated

Simulation of resilience indices help determine the balance among radiation exposure, relocation and decontamination.

↓

Emergency response design

2017 Benchmark problem help identify the area we need to focus when considering the national nuclear EPR strategy.

↓

ASEANTOM

# THANK YOU

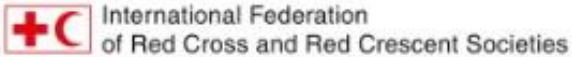
Detail can be found in:

[Resilience Metrics] K. Silva, W. Vechgama, Application of resilience metrics to nuclear accident consequence assessment, the 14th Conference on Probabilistic Safety Assessment and Management, Los Angeles, September 16-21, 2018

[2017 Benchmark Problem] K. Silva, W. Vechgama, R&D activities to be conducted by TSO in embarking countries: R&D to support understanding of severe accident and planning of emergency response, International Conference on Challenges Faced by Technical Support Organizations (TSOs) in Enhancing Nuclear Safety and Security, Brussels, October 15-19, 2018

kampanarts@tint.or.th

Co-organized by:





In partnership with: