Measuring economic impacts caused by a natural disaster under a context of global warming

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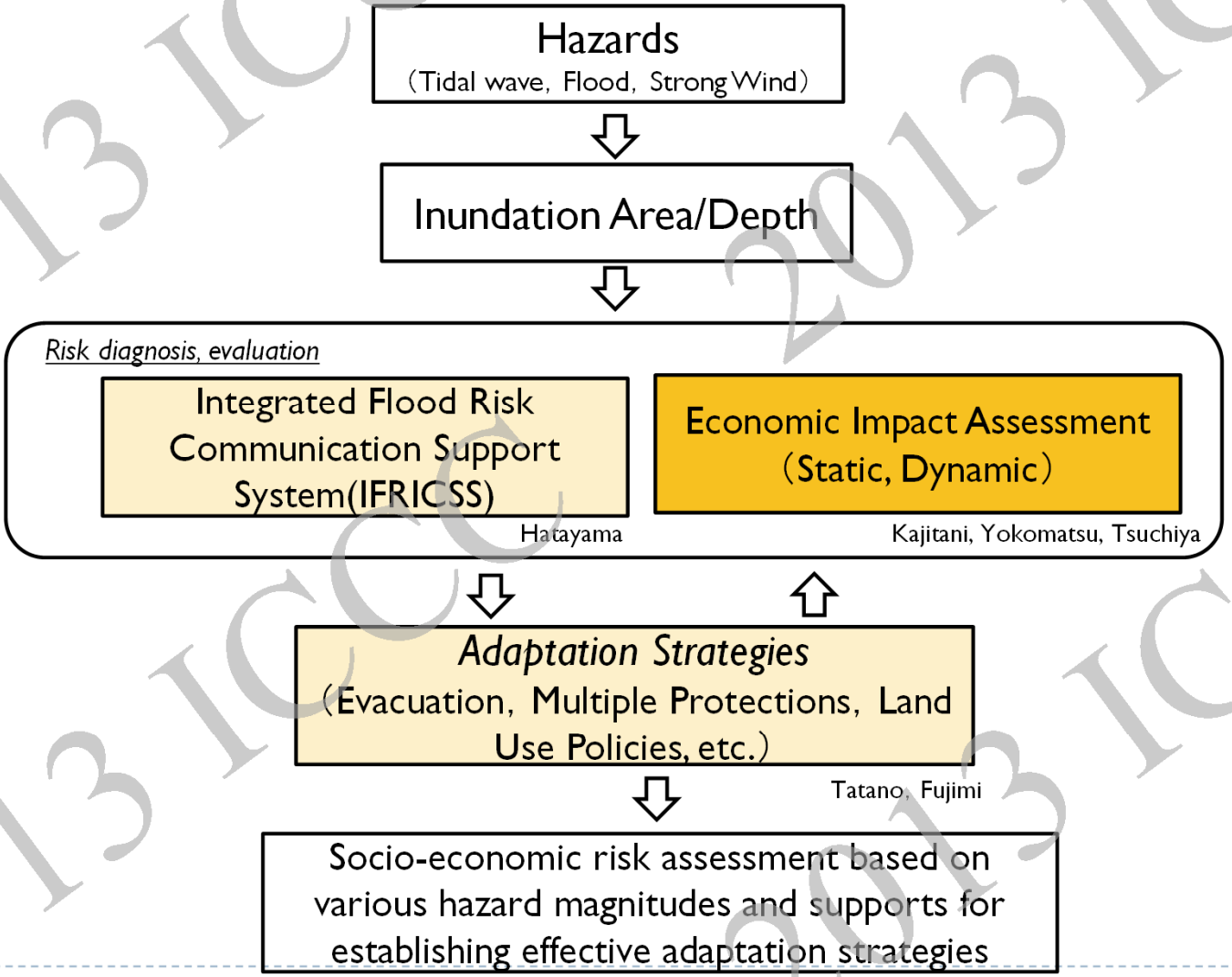
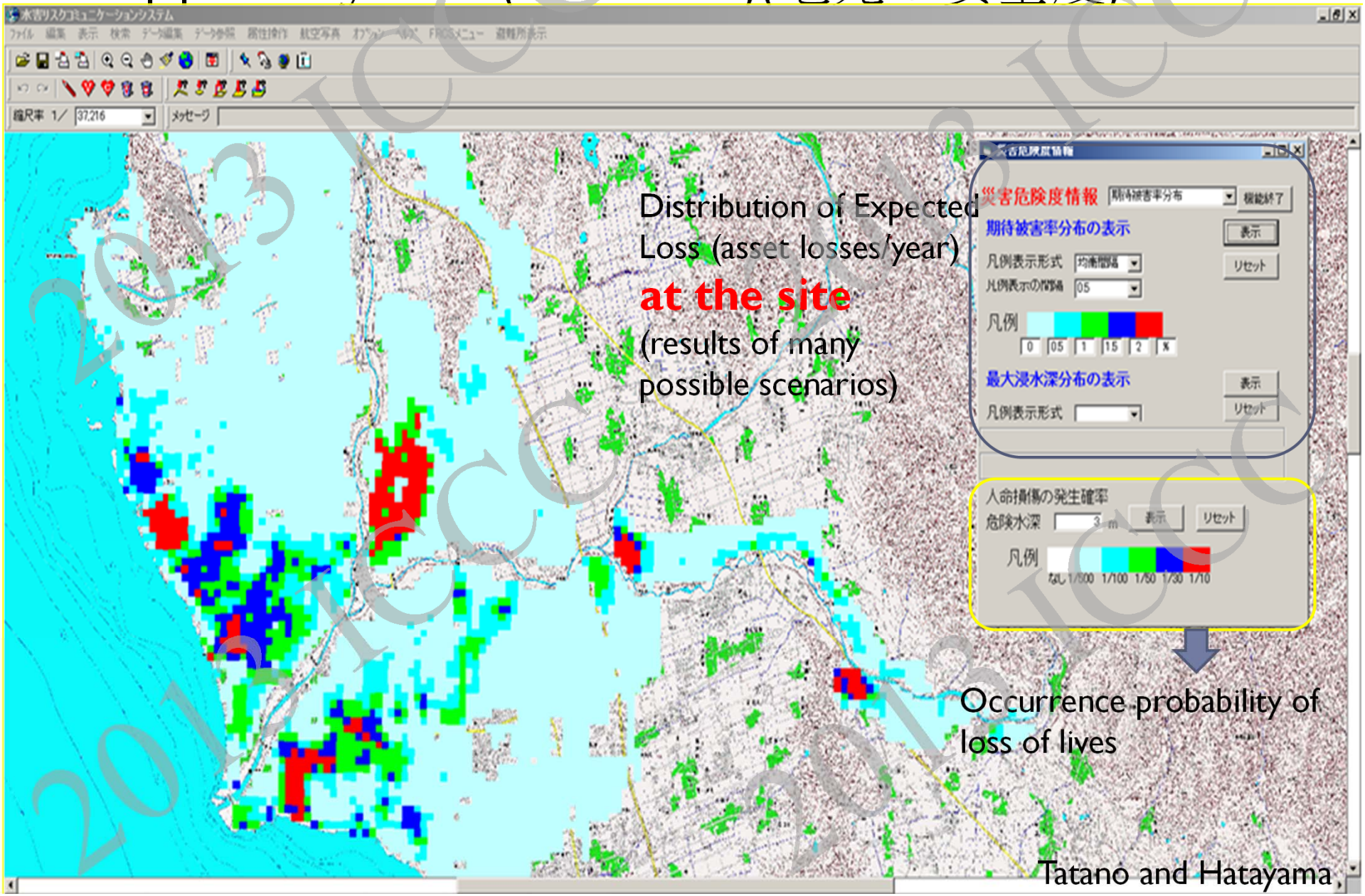
Socio-economic risk assessment/ Adaptation Strategies (Prof. Tatano)

(On-going Researches in a subgroup of Sousei Project Group D (PI: Prof.Nakakita))

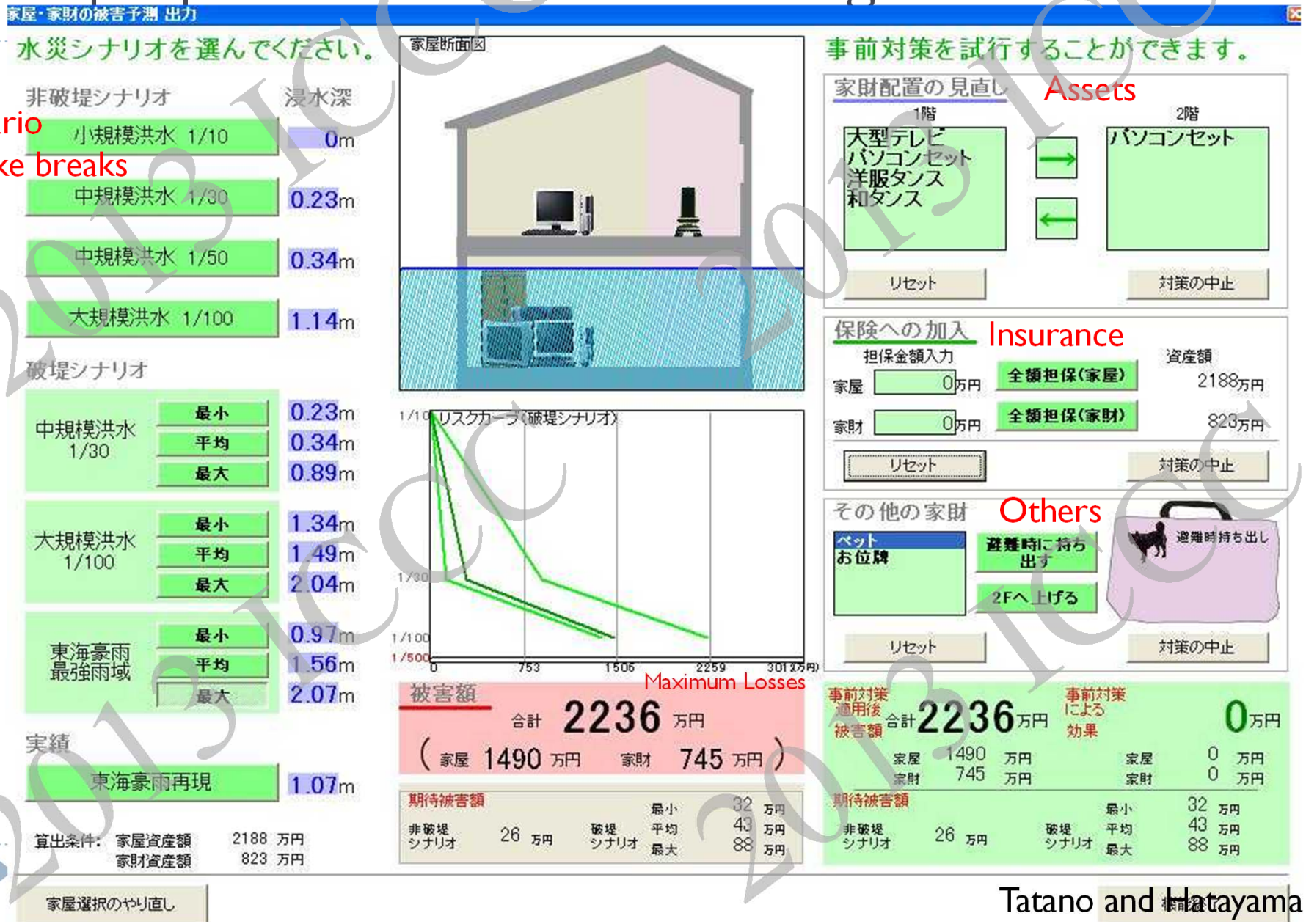


Disaster Prevention Reasearch Institute
Kyoto University

Integrated Flood Risk Communication Support System(IFRICSS)(地先の安全度)



Risk Assessment（for individual)
-> propose risk transfer strategies



Scenario of dyke breaks

Assets

Insurance

Others

Maximum Losses

Tatano and Hatayama

Case of the 2011 Great East Japan Earthquake

Disaster Prevention Reasearch Institute
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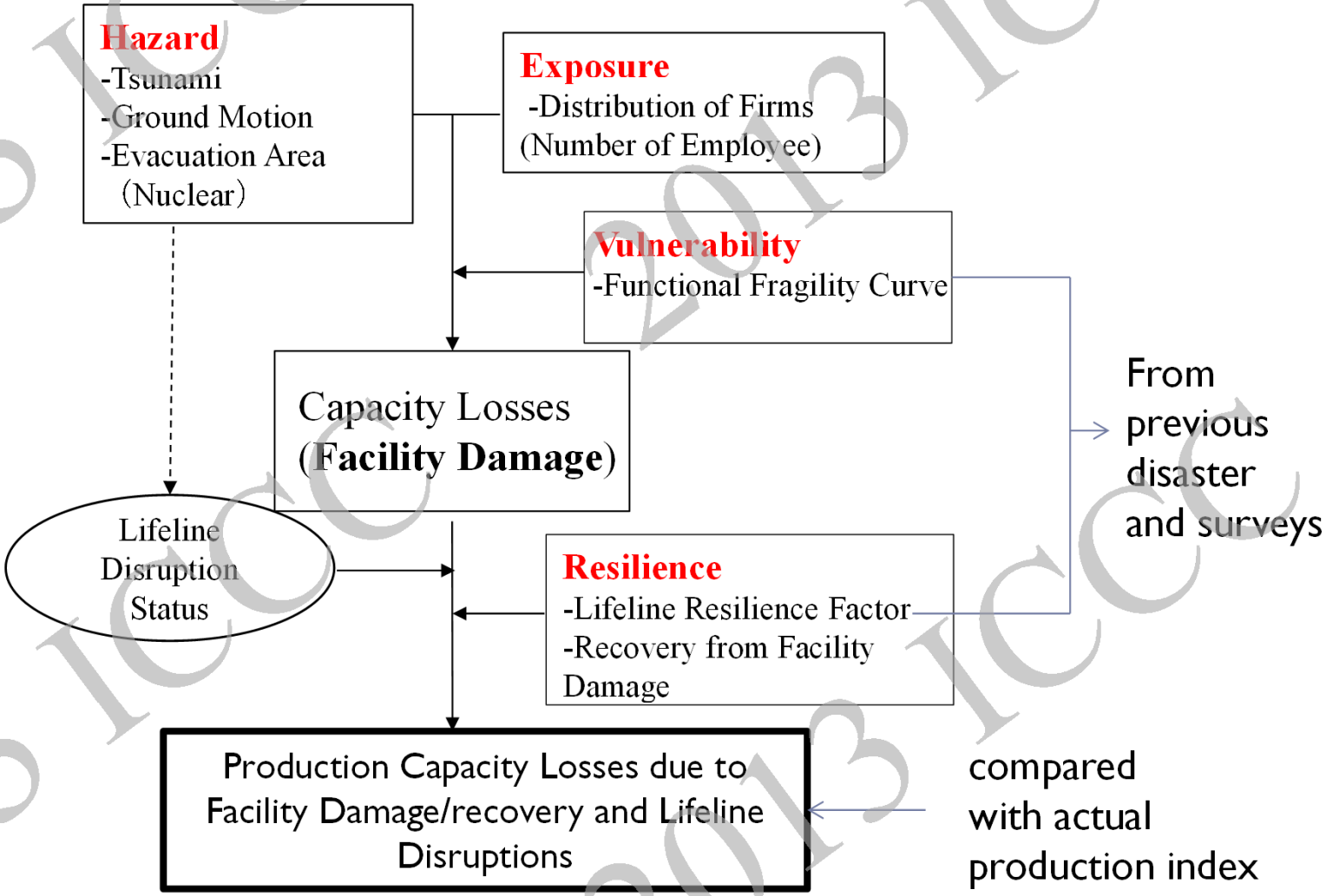
Economic Loss (Indirect Loss) Assessment

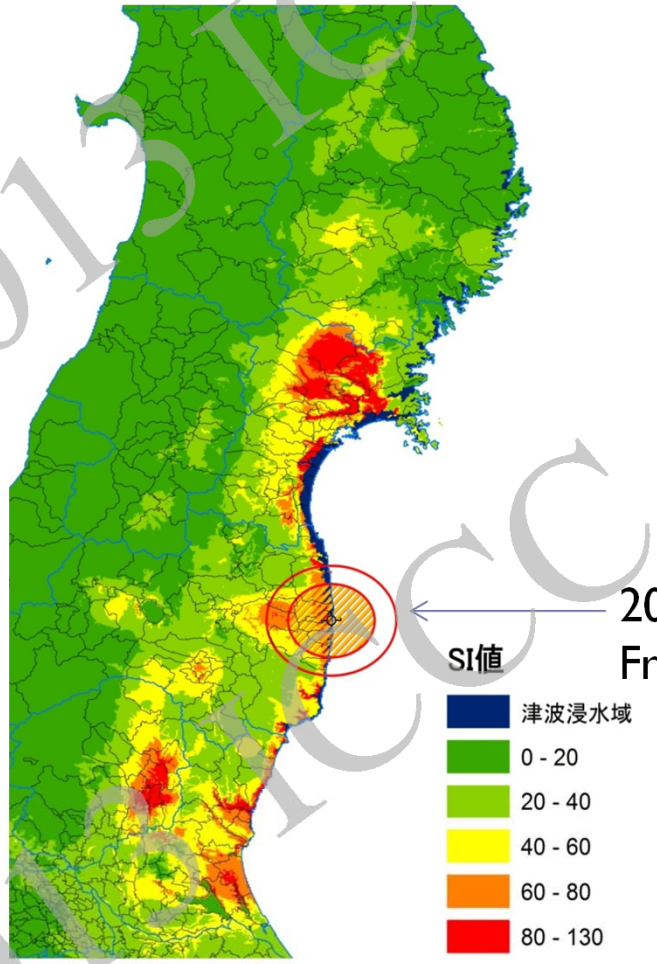
- **Production Capacity Loss Estimation**
  (production/operation ability under damaged resources)
  (supply side)

- Regional Economic Loss Estimation
  (Spatial General Equilibrium Model (SCGE))
  (including supply-chain impacts, etc)

How to evaluate "Capacity Loss" of industrial sector ?



Hazards: Earthquake Ground Motion

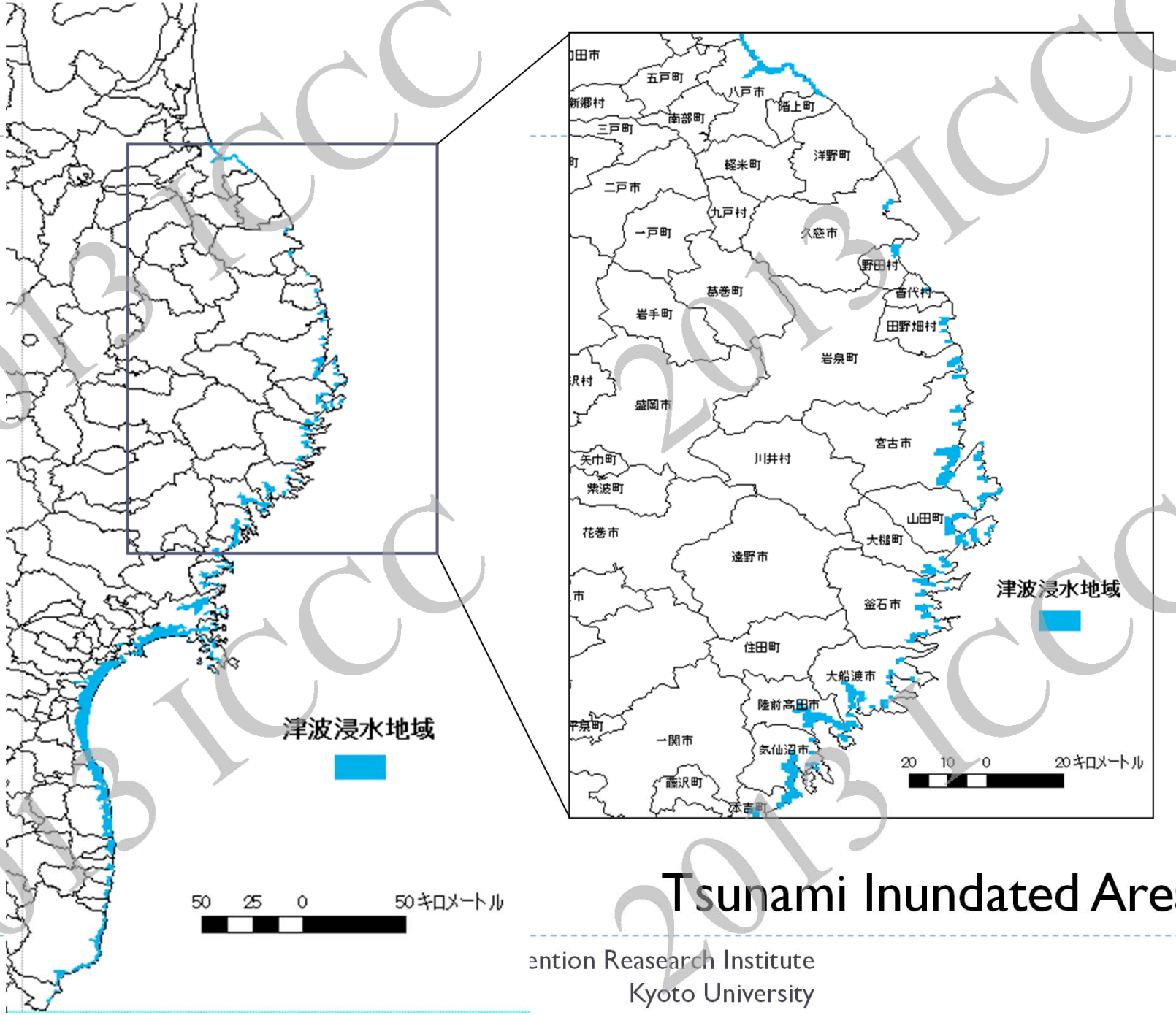


20 km radius
From F1NP

$$SI = \frac{1}{2.4}\int_{0.1}^{2.5} Sv(h,T)\,dT$$

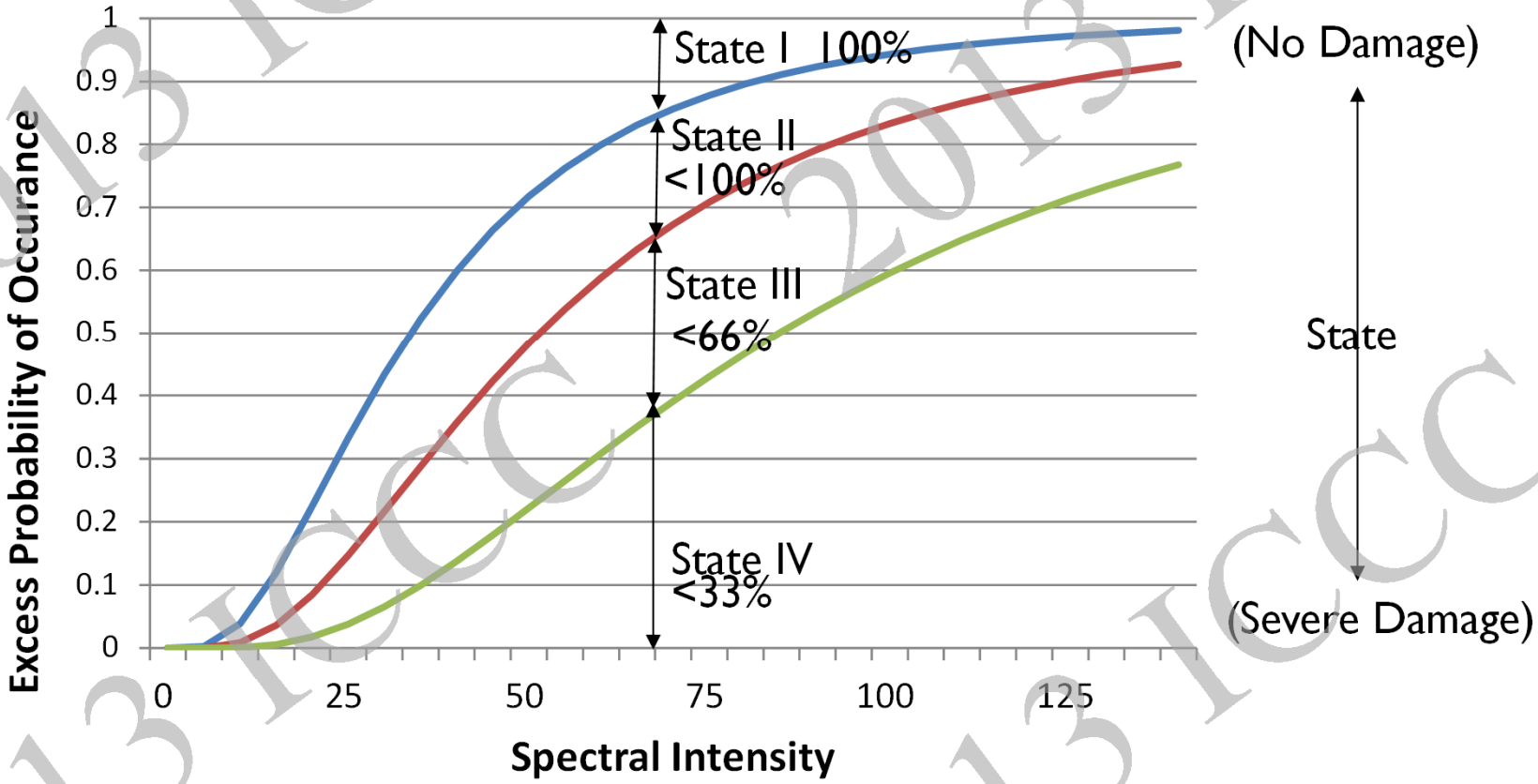
Response Spectrum
for velocity
h: damping Factor (20%)
T: natural period

(Suetomi, 2011)



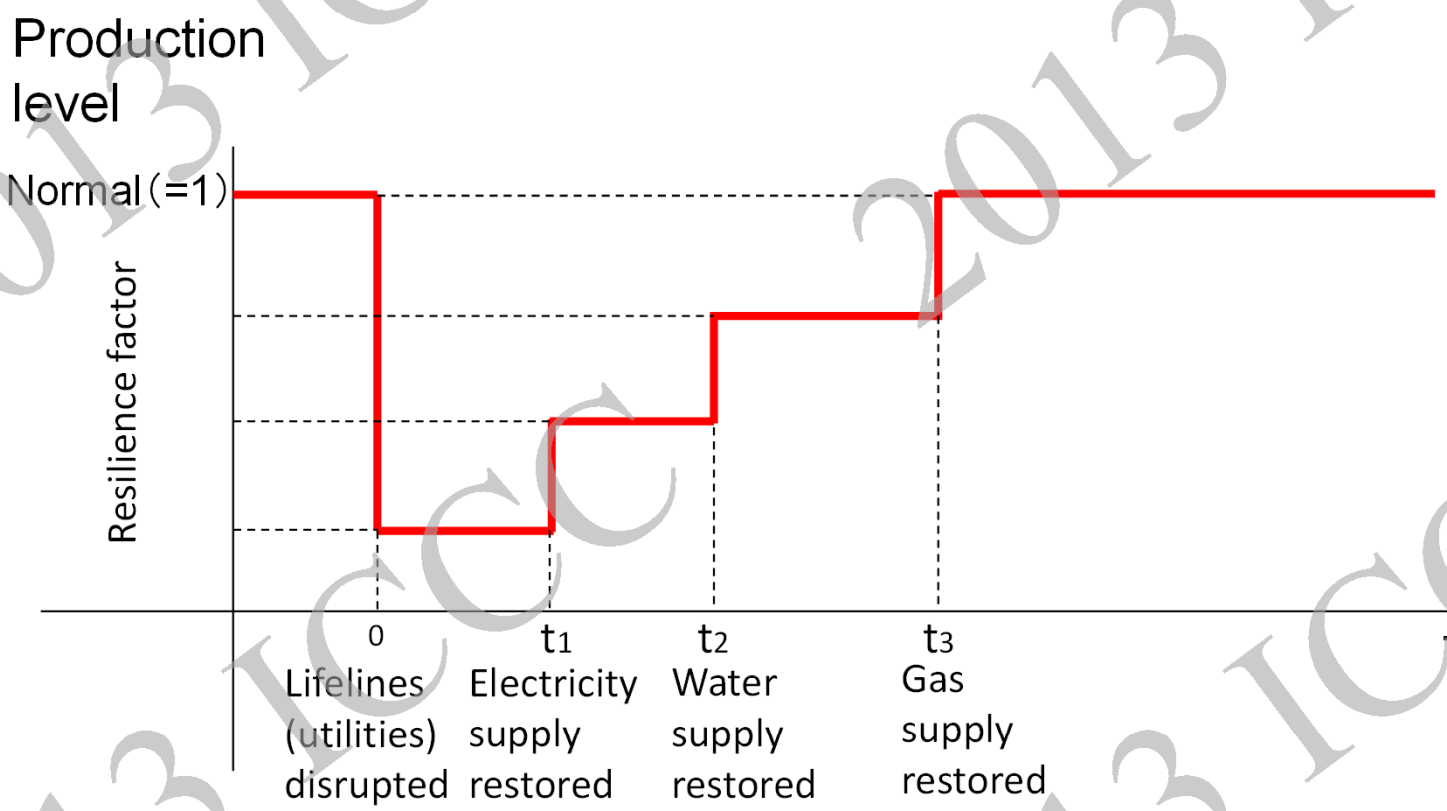
Tsunami Inundated Area

Functional Fragility Curve



Nakano, 2011

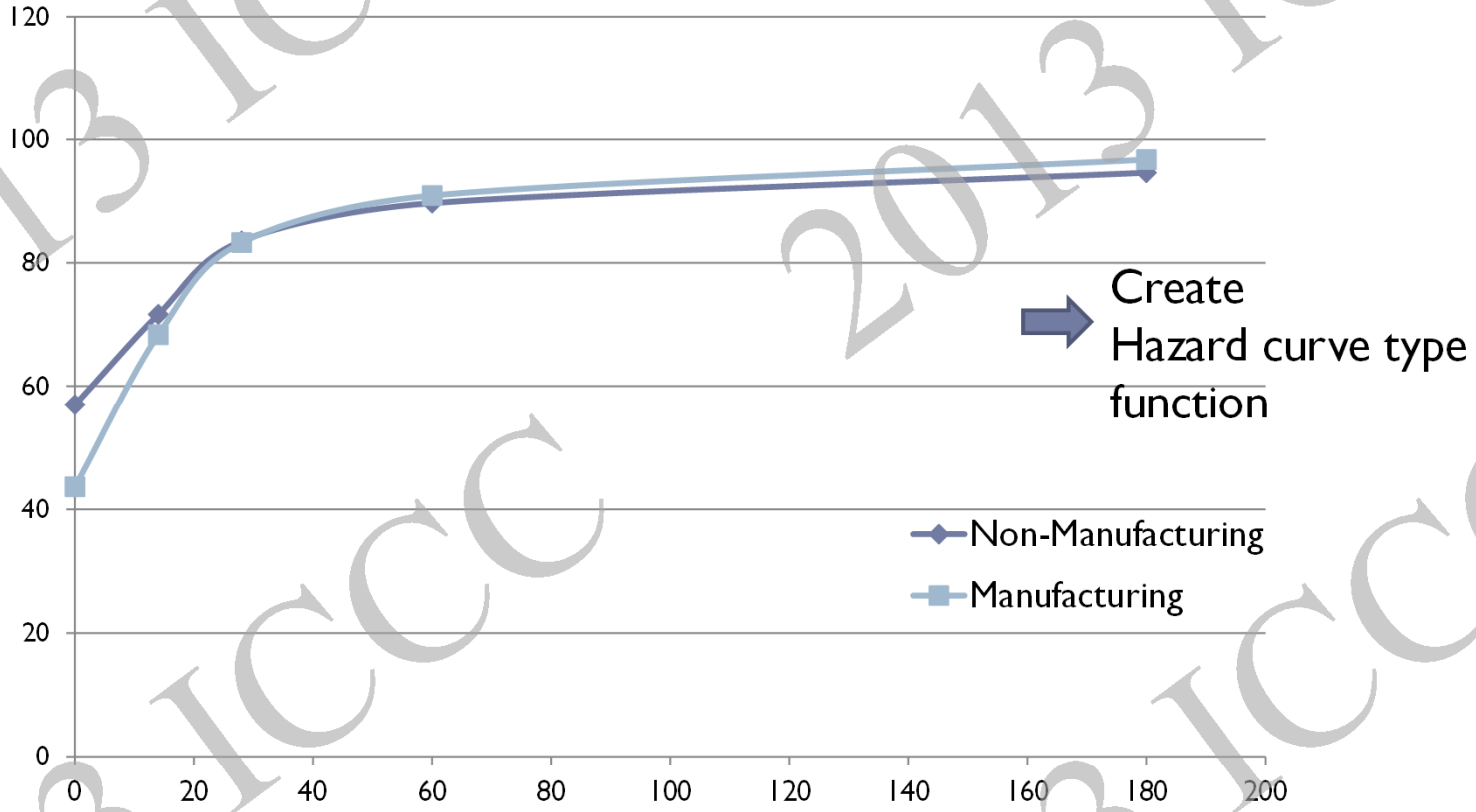
Lifeline Resilience Factor



Kajitani and Tatano, 2005, 2009

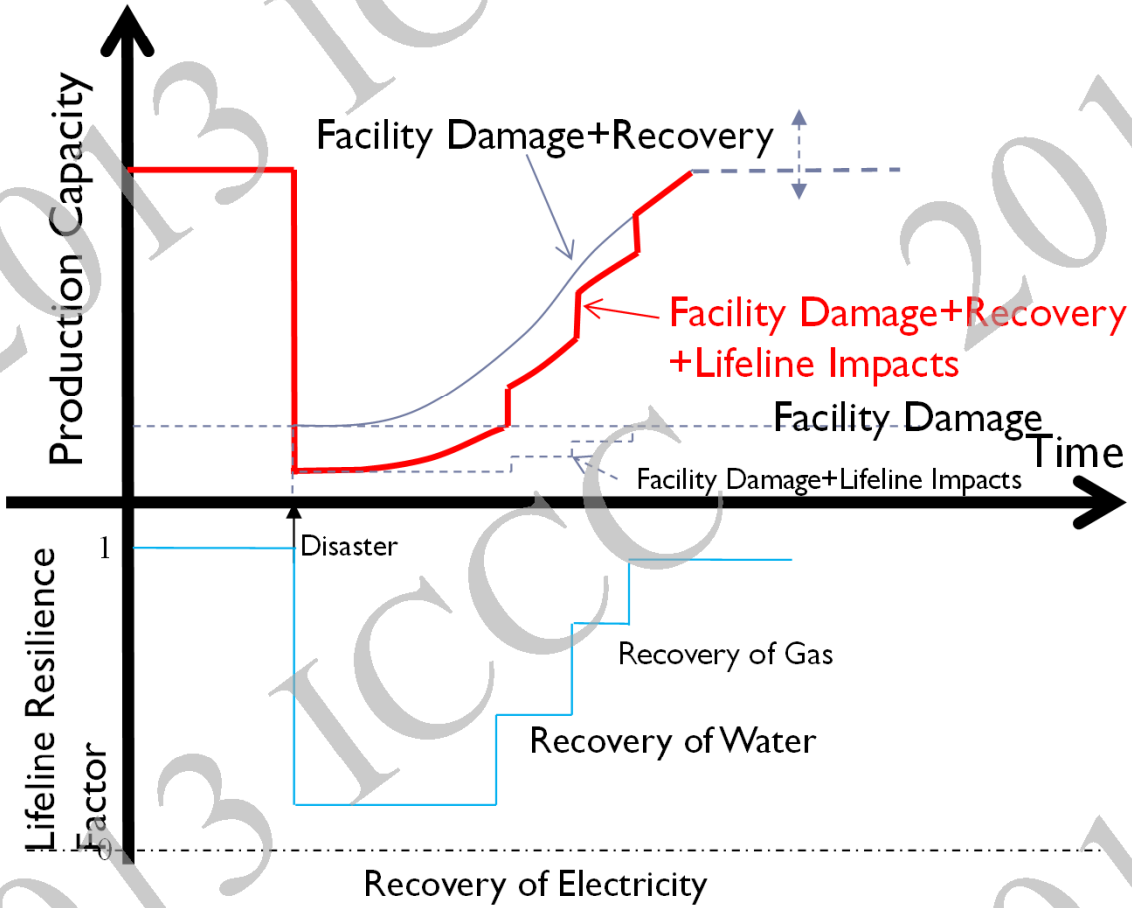
Based on the surveys in Tokai regions

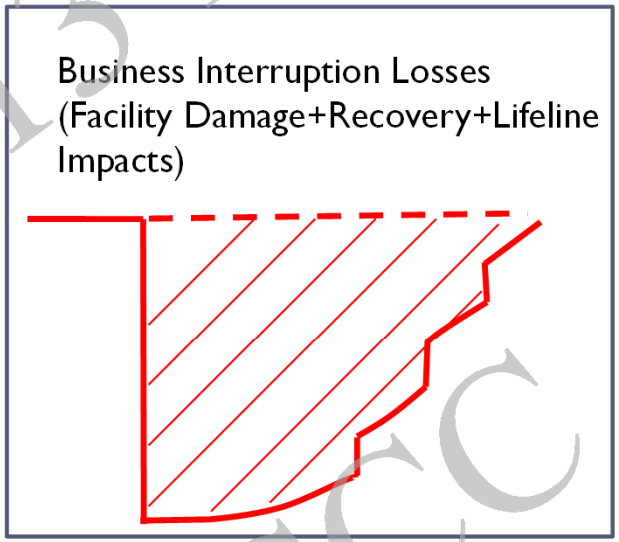
Recovery of Facilities from the EQ Damage



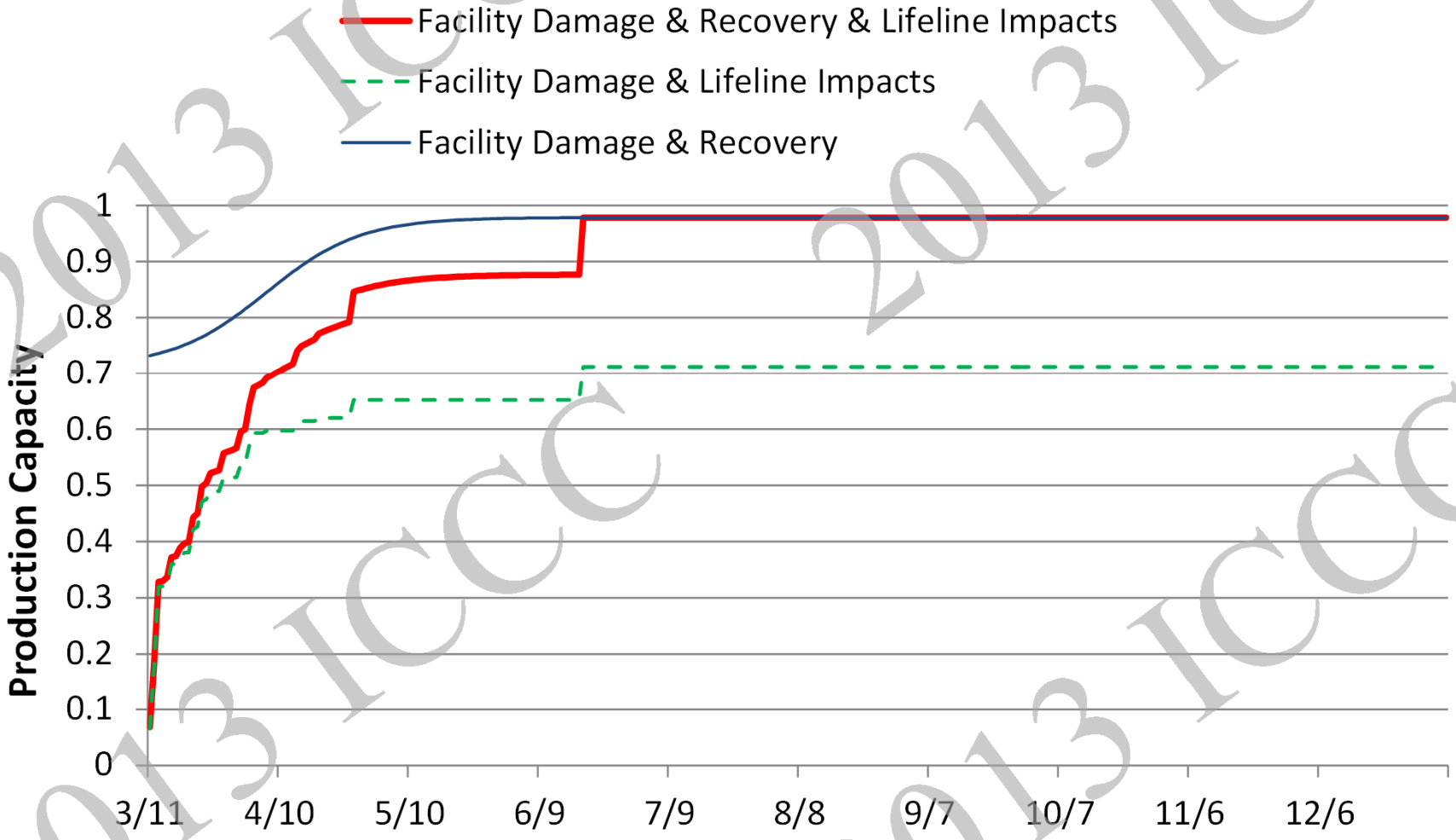
Based on the Surveys by Nakano et al., 2012 (Manufacturing 700, Non-Manufacturing 1300 in the part of Tohoku region, excluding Tsunami region)

Loss Estimation with Resilience:



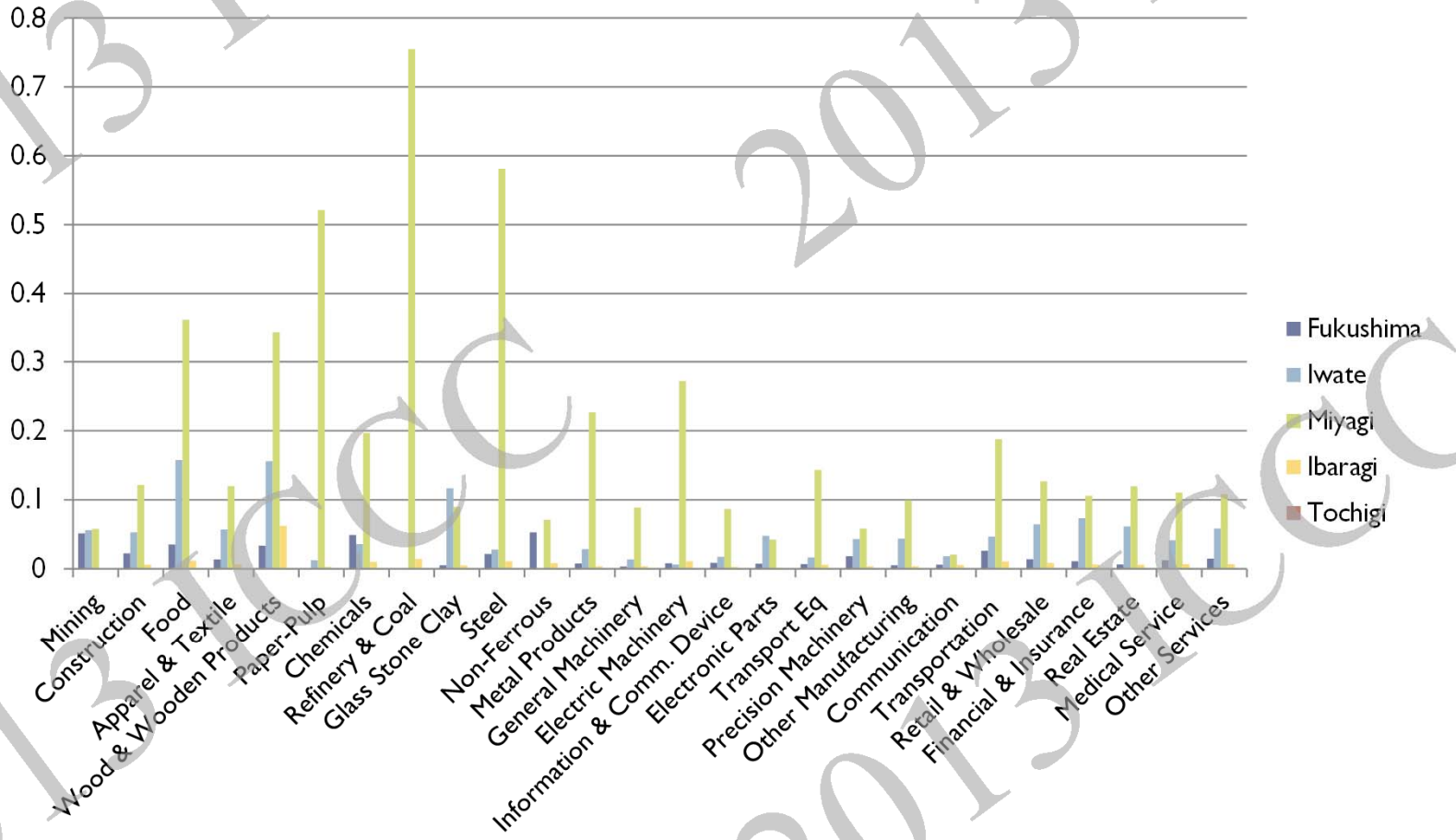


Est. Result (Transport. Manf. in Fukushima)



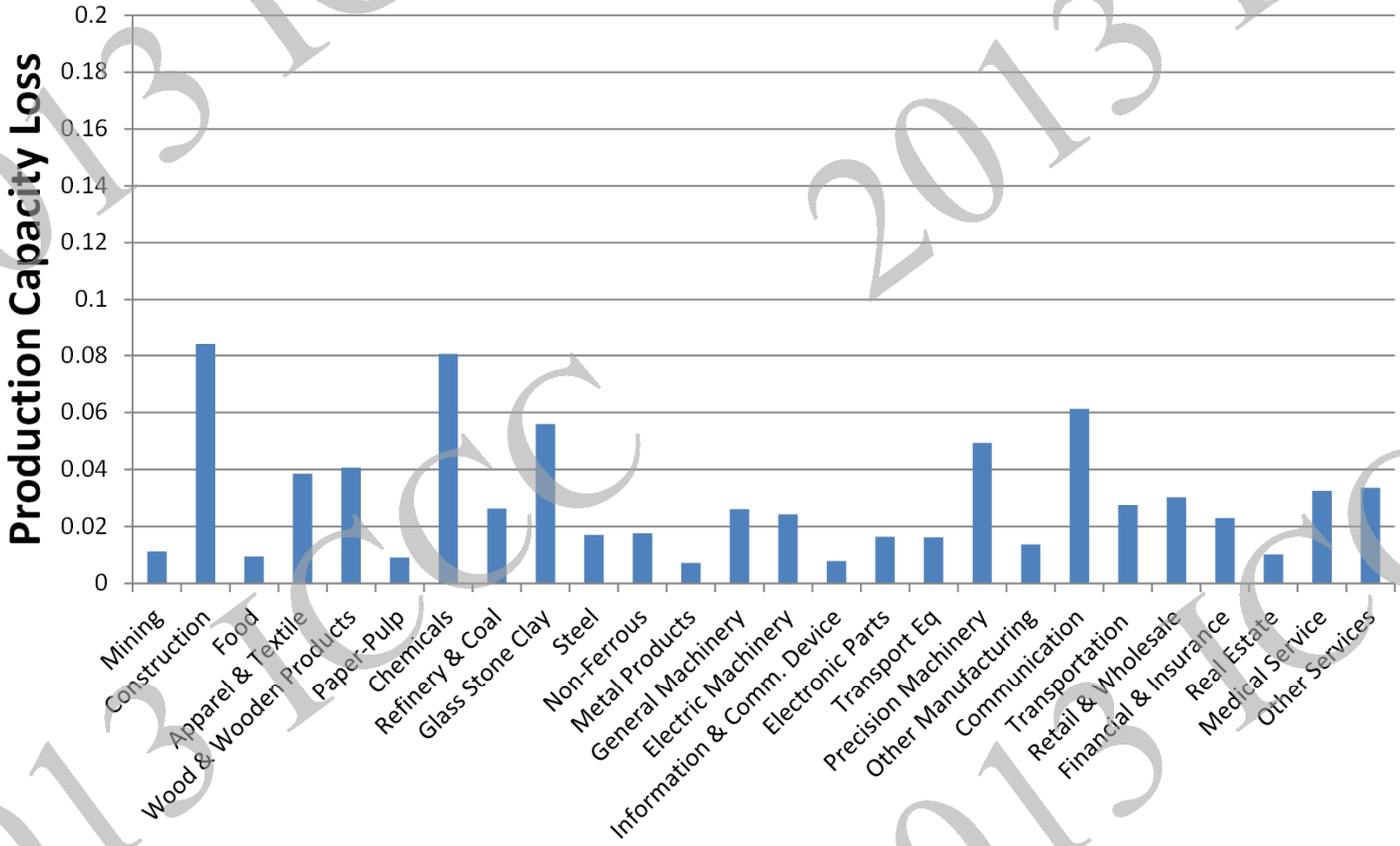
Estimated Capacity Losses

- Tsunami



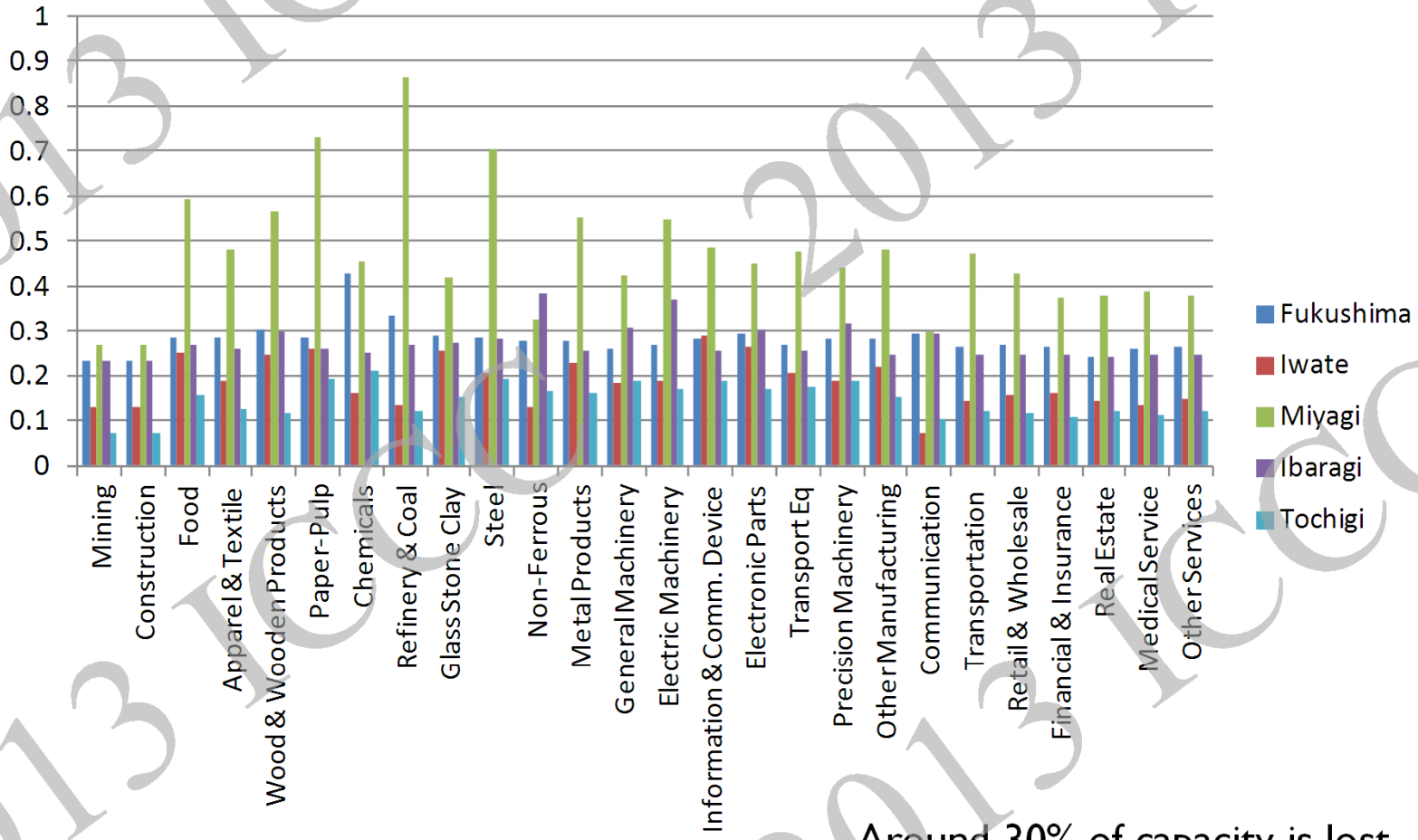
Estimated Capacity Losses

- Nuclear (effects of 20 km radius)



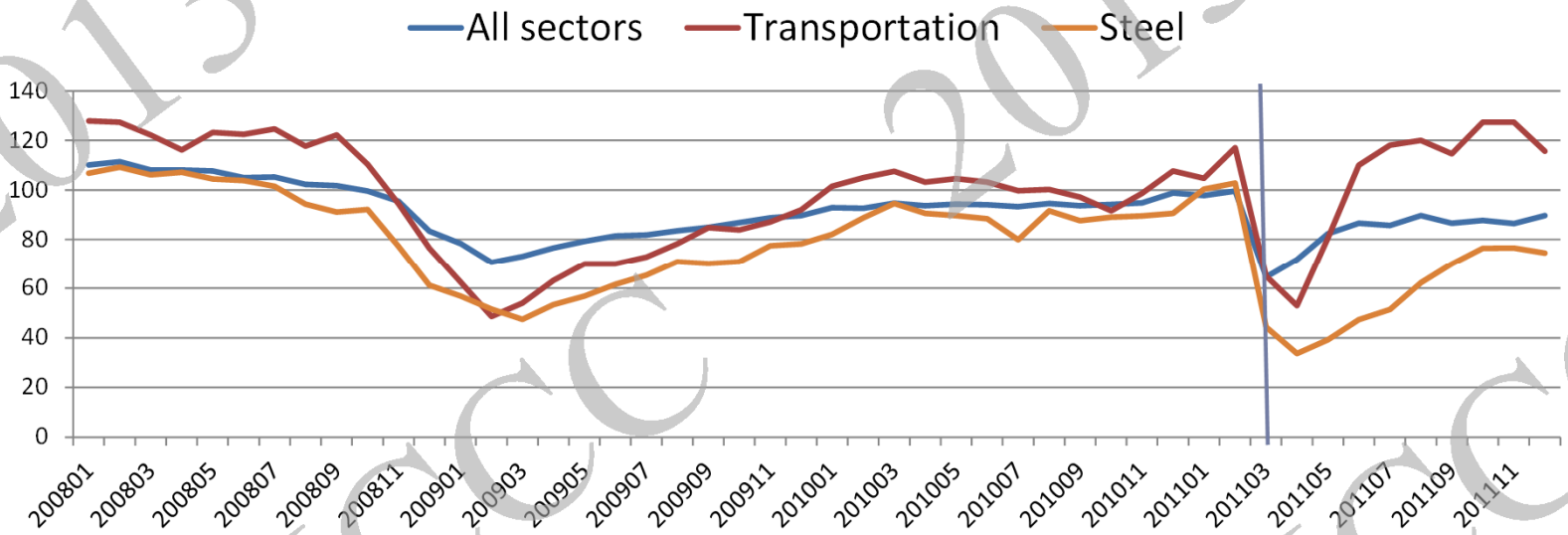
Estimated Capacity Losses

Ground Motion, Tsunami, and Nuclear(20 km radius)

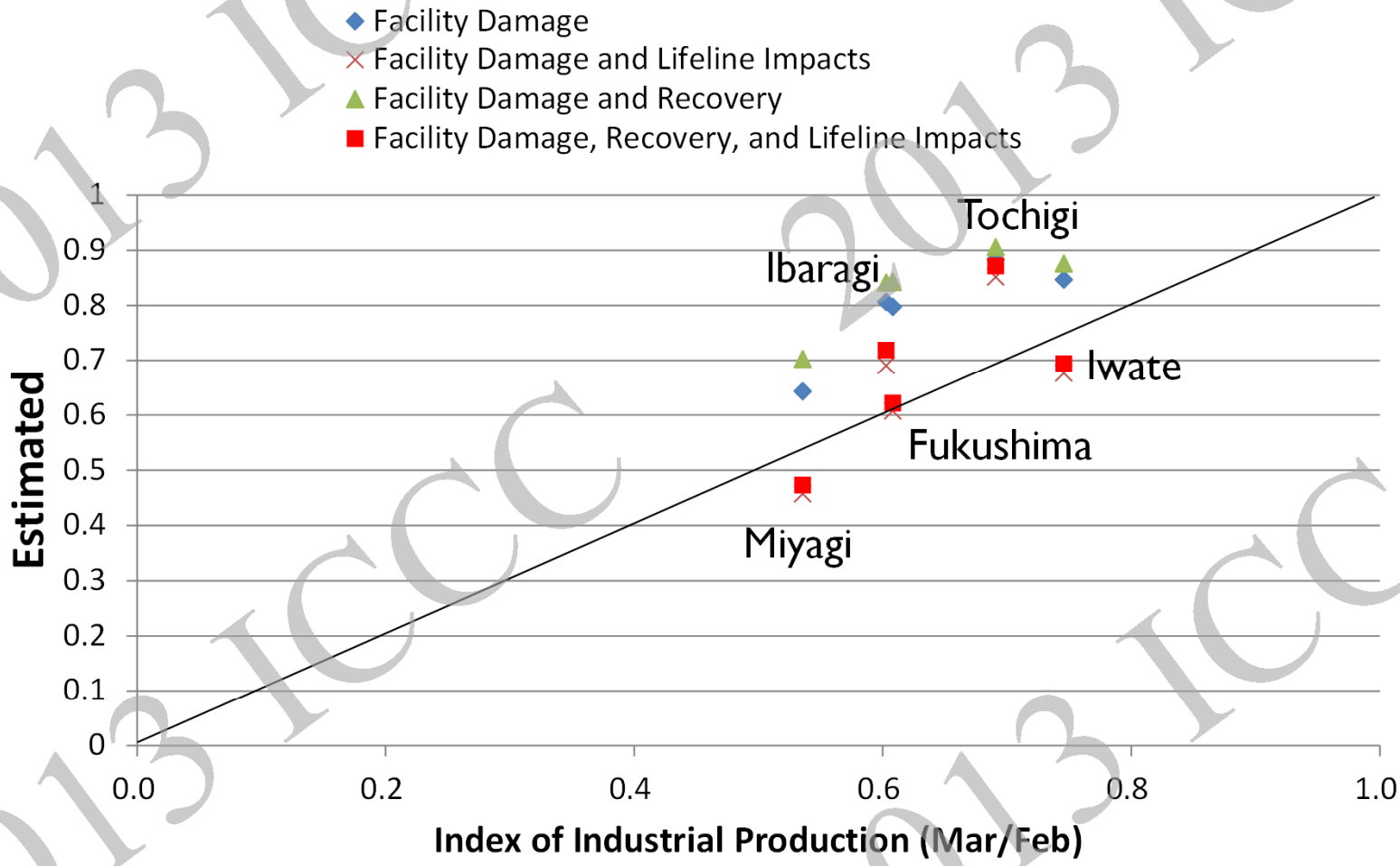


Around 30% of capacity is lost

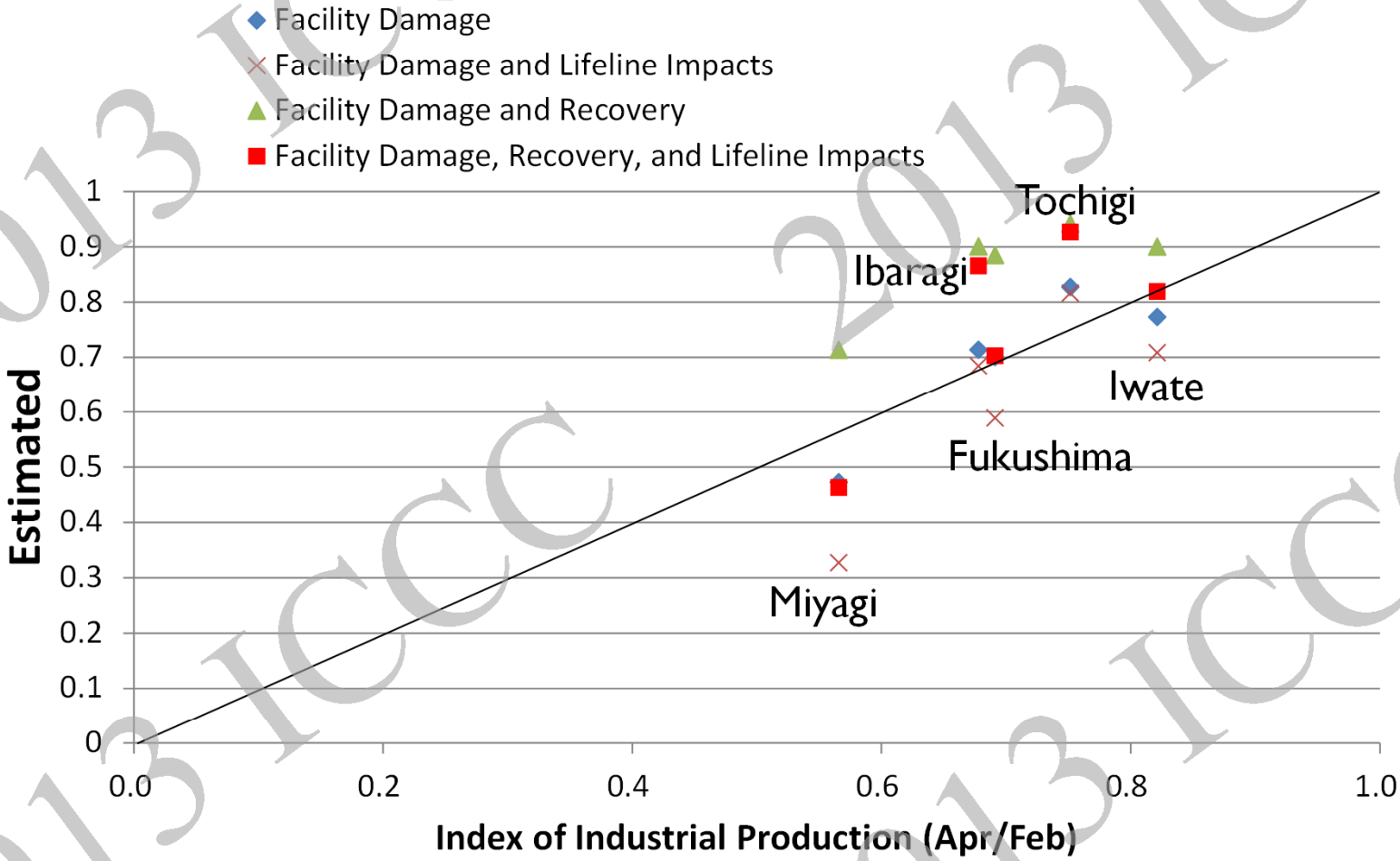
Index of Industrial Production (IIP)



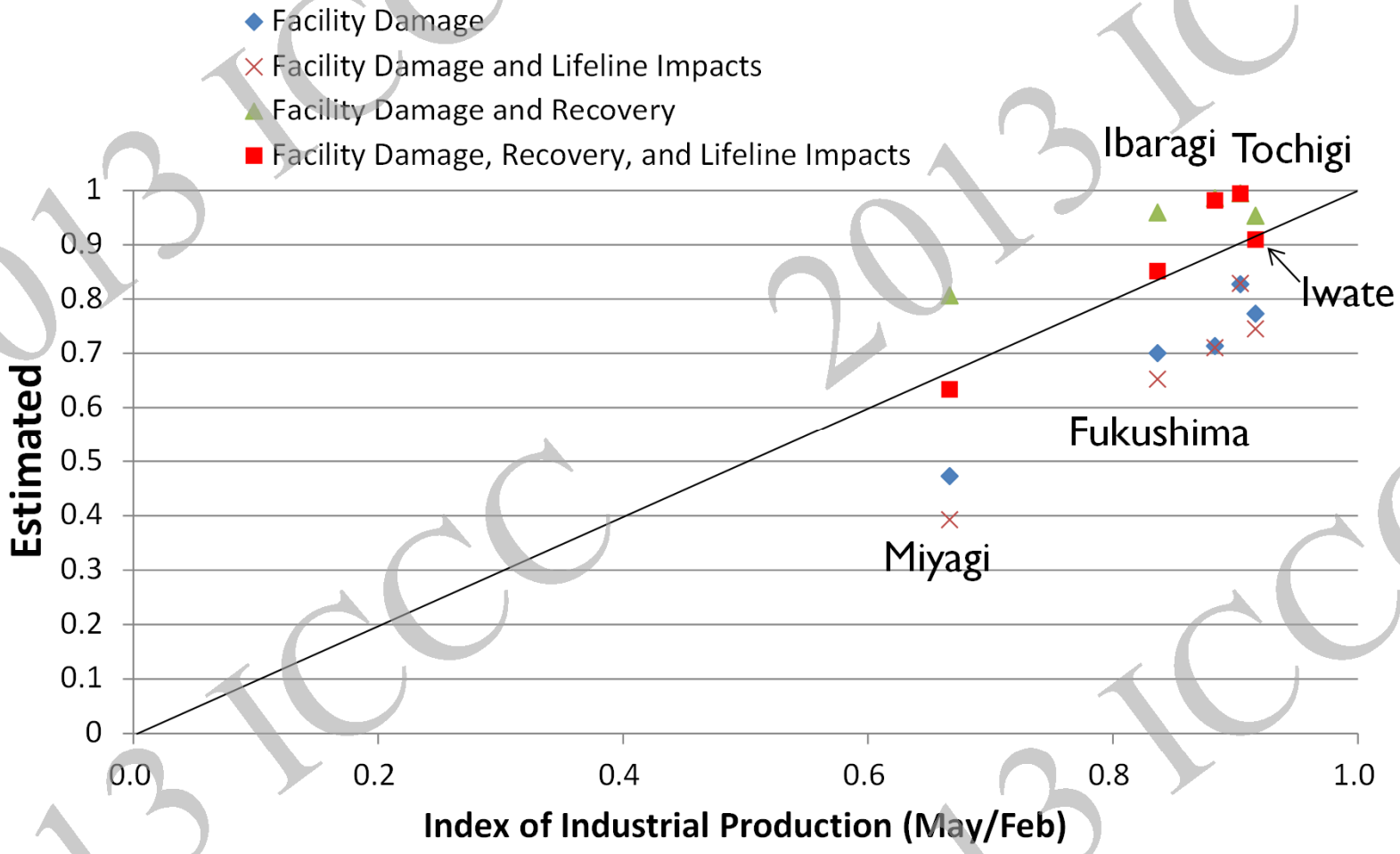
Estimated Results 1 (March, 2011)



Estimated Results 2 (April, 2011)



Estimated Results 3 (May, 2011)



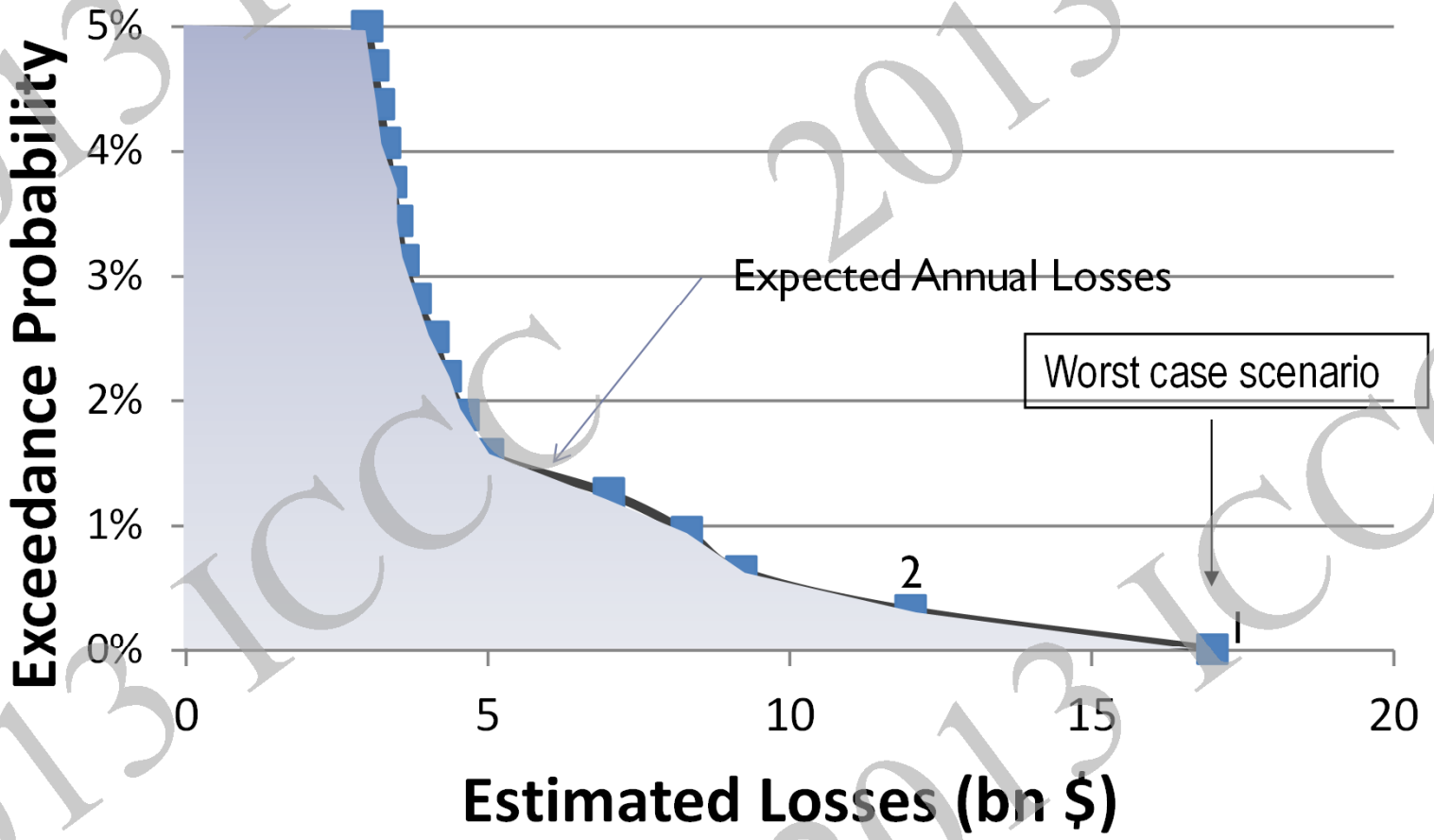
Regional/national/global economic model

Cost-Benefit Analysis of Adaptation Strategies

- How do you reflect a worst case scenario to adaptation strategies?

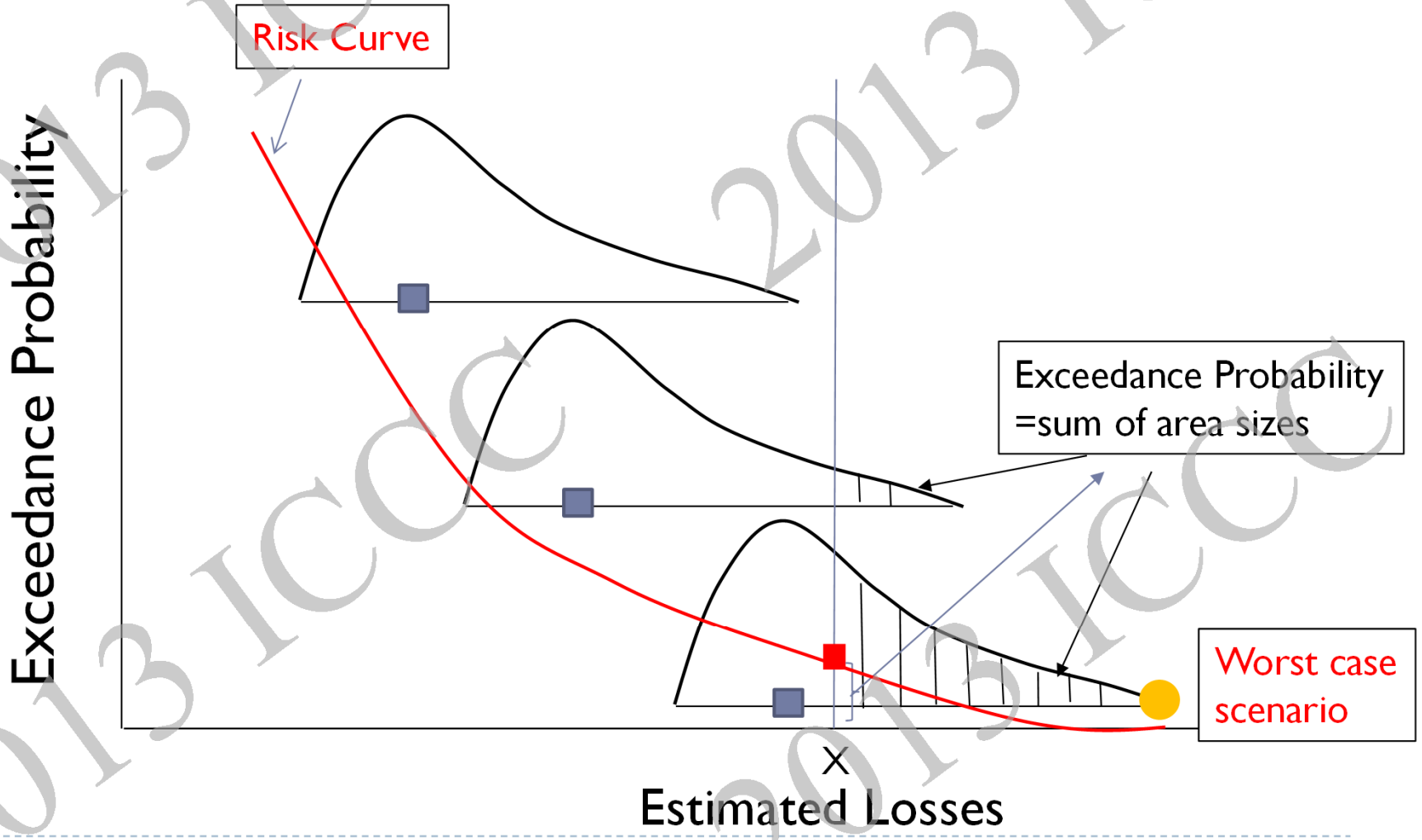
≒reflect secondary uncertainty（scientific uncertainty）

Event curve (representative scenario)

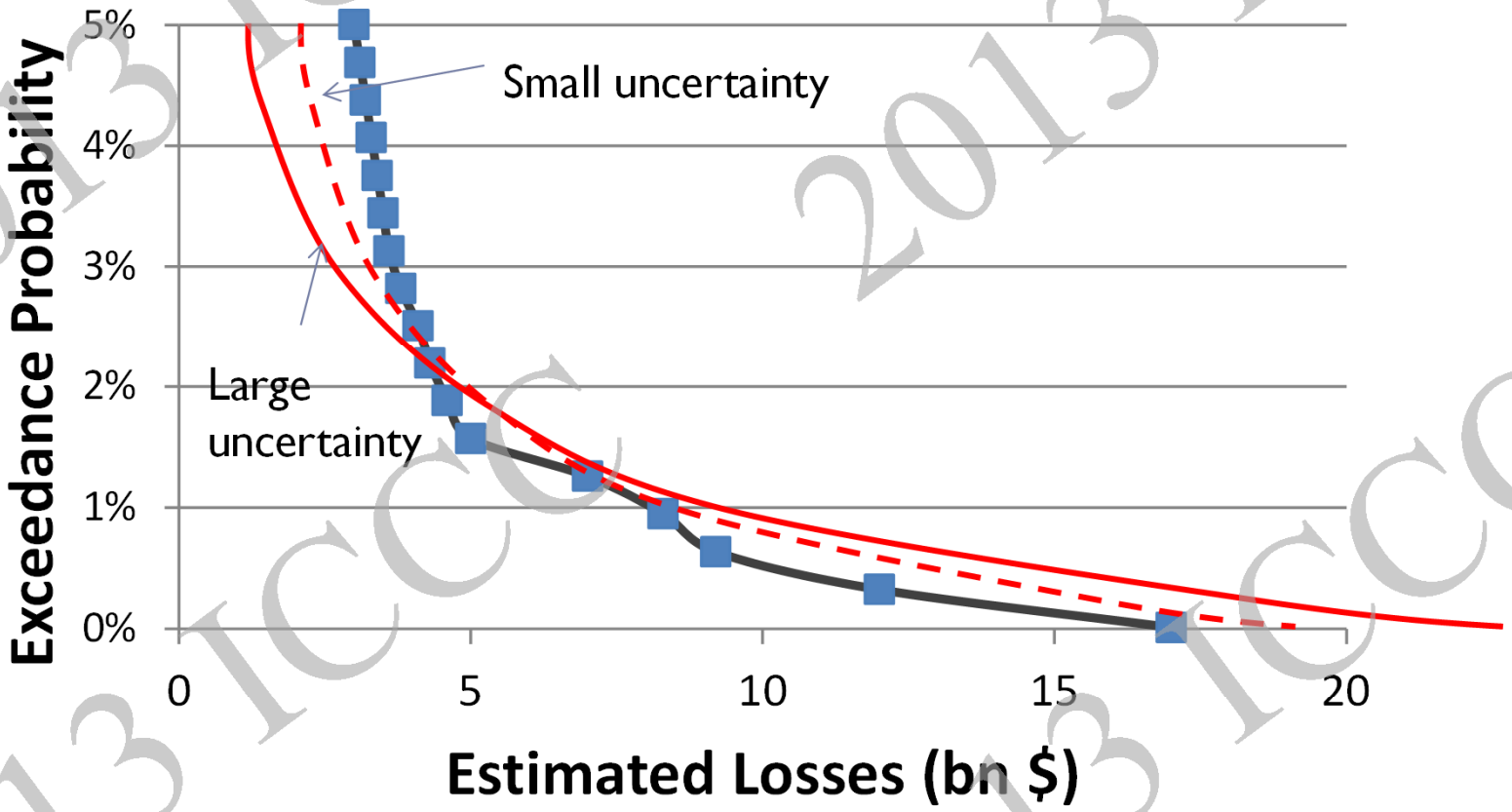


Risk Curve

Exceedance Probability Curve with Secondary Uncertainty



Effects of uncertainty



Adaptation strategies can be changed if we include uncertainty

Conclusions

- Socio-economic risk/impact assessment

-Risk communication (citizen participation) is the area which has been drastically advanced in recent years.

(being expanded to many areas/supporting systems are necessary)

-Assessment models need to be advanced especially through the tests in actual disasters (Tokai heavy rain in japan)

- Adaptation Strategies

- Basic ideas have to be listed and compared/discussed

-> Try to overcome these in a Sousei Poject!