From Disaster Risk Management to Disaster Risk Governance

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GADRI
Global Alliance of
Disaster Research Institutes

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- What is Disaster Risk Assessment?
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- GADRI has been established as the outcome from the second Global Summit of Research Institutes for Disaster Risk Reduction （2GSRIDRR), March 19-20, 2015.

Why we are

2.2 GADRI Objectives

To achieve the above purpose, GADRI has the following objectives:

(a) to establish global research network

(b) to provide a road map, plans and organization of disaster research groups

(c) to promote capacity development of disaster research institutes and encourage researcher and student exchange

(d) to promote exchange and sharing of data and information for scientific research across the globe

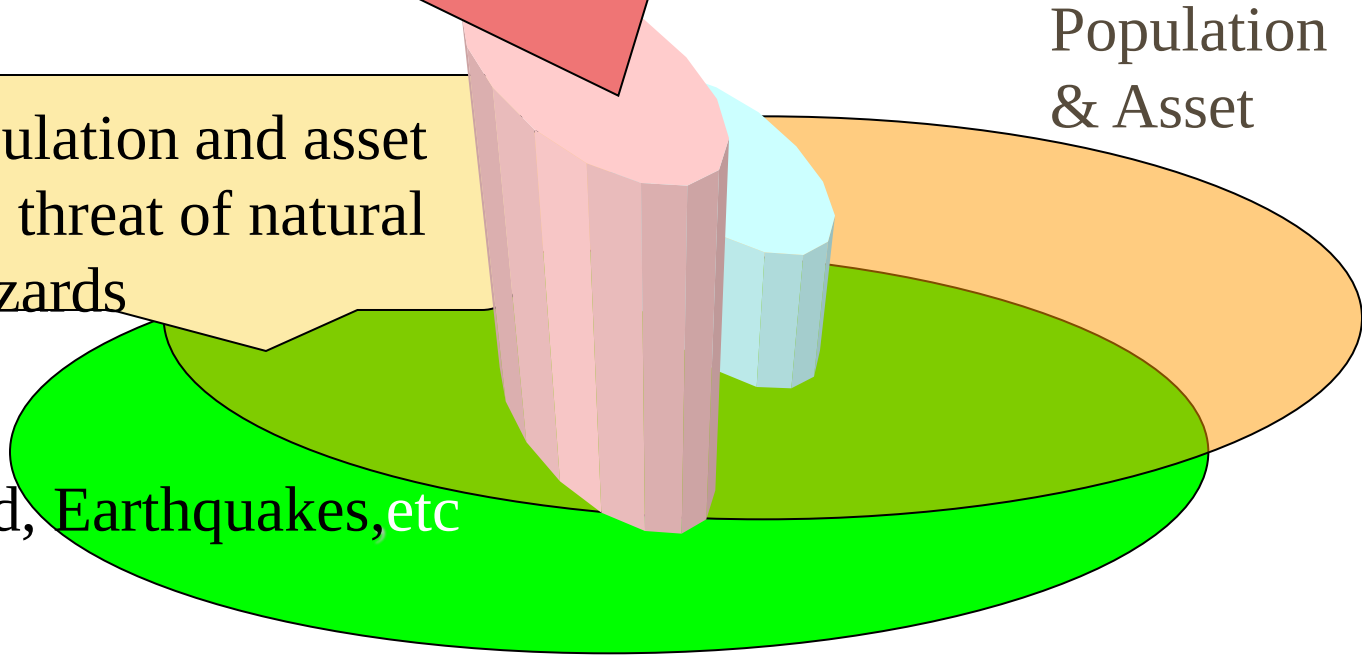
(e) to serve as an advocacy organization to speak with one voice in an effort to influence decision making processes

Three Components of Disaster Risk

Consequences of Human Behavior

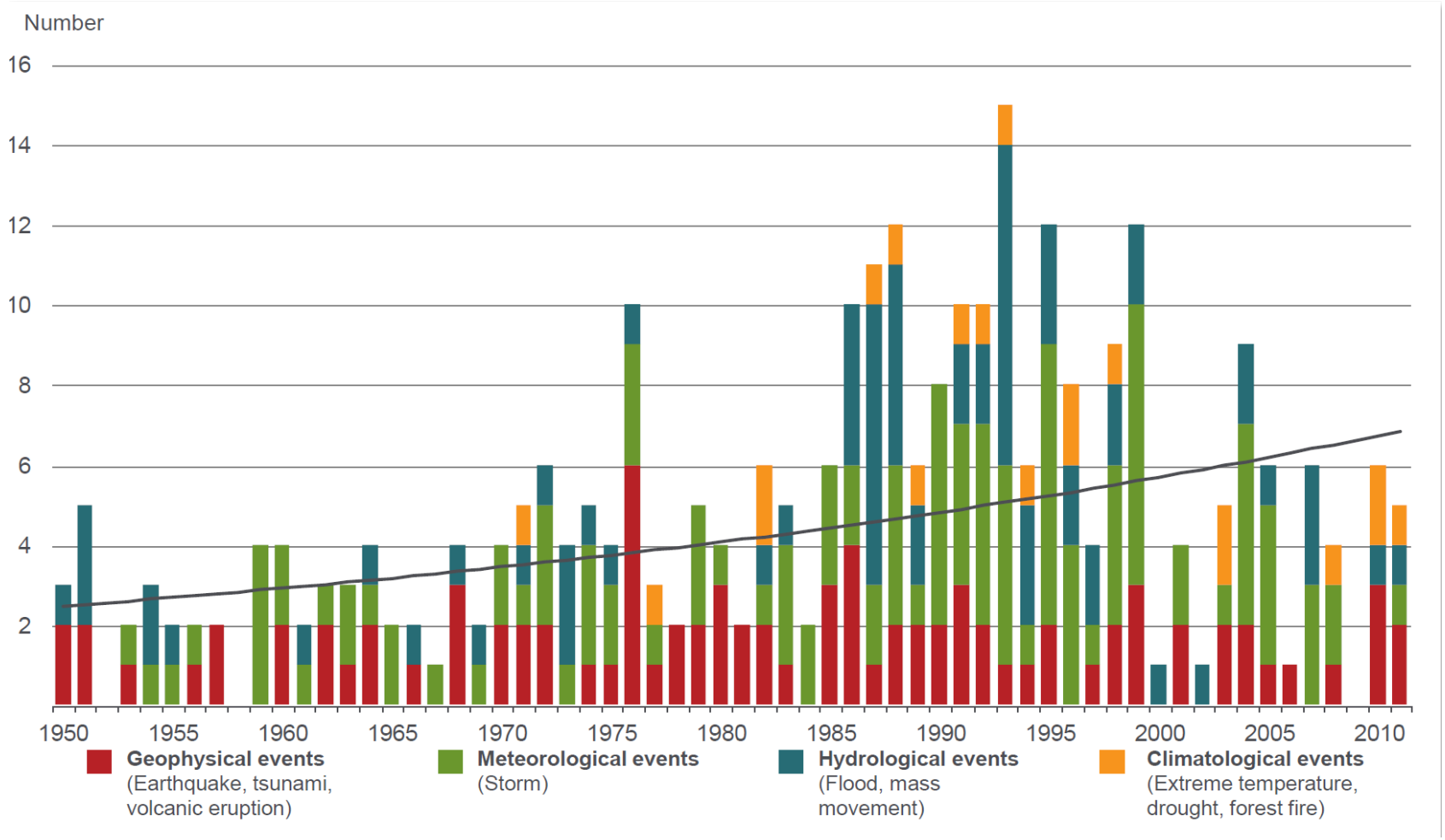
Vulnerability: degree of resistance of the asset & population against disaster

Exposure : population and asset exposed to the threat of natural hazards



Hazard: Flood, Earthquakes, etc

Great Natural Disasters in the World

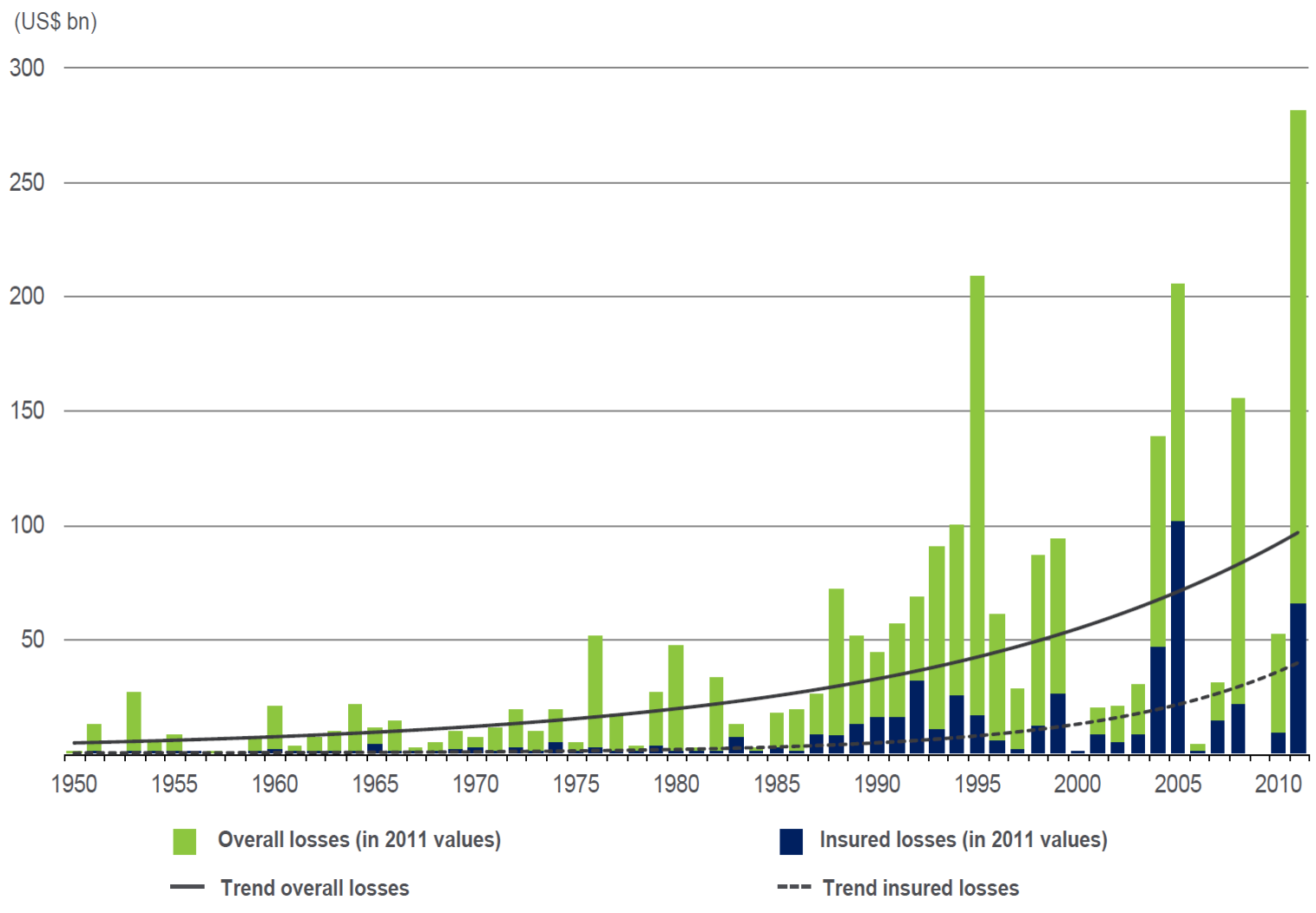


Source: Munich RE. 2012

Natural Disasters in the world and Asia

- To show significance of Infrastructure Resilience

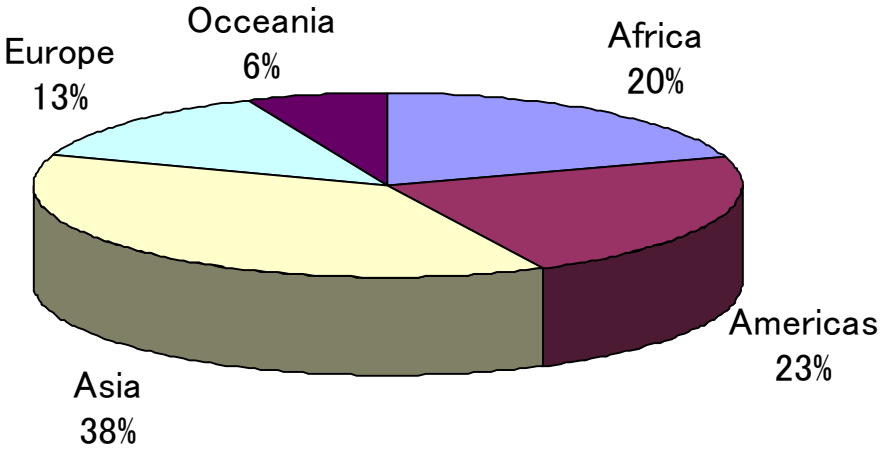
Economic losses and insured losses with trend



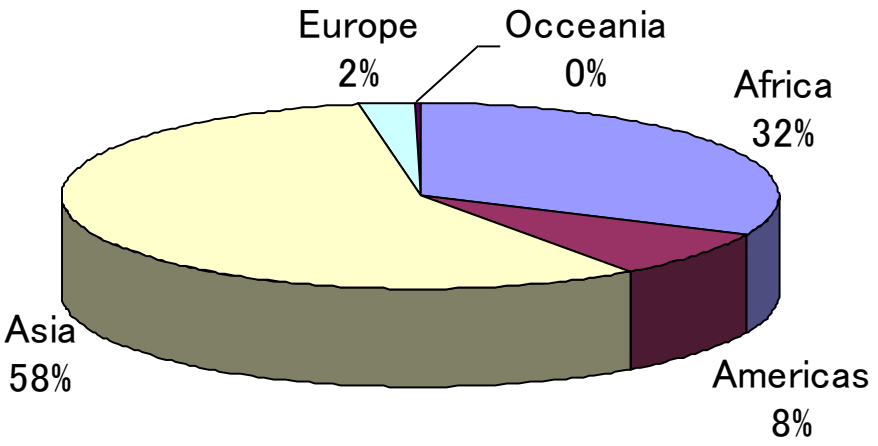
Source: Munich RE. 2012

1975-2006 Disasters and Impacts by Region

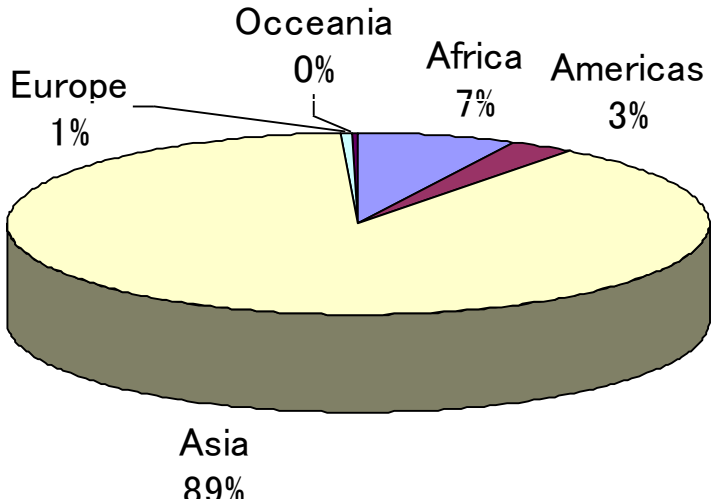
Number of Disasters



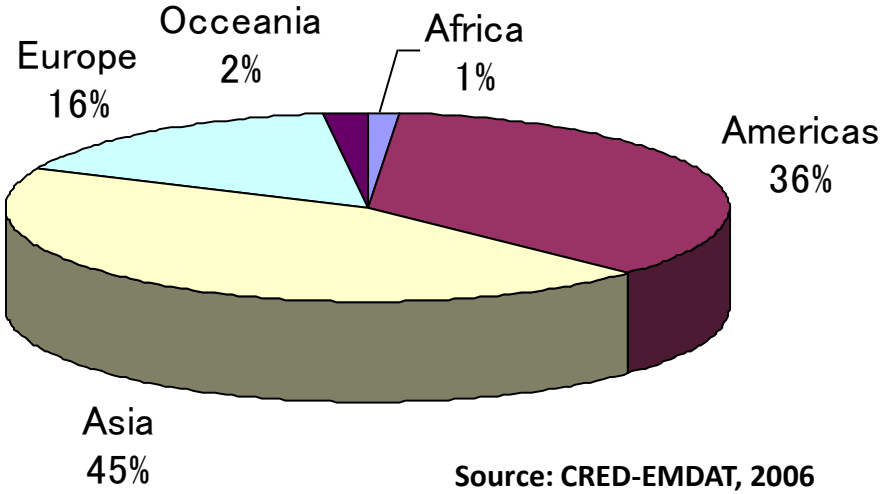
Number of Killed



Number of Total Affected People



Economic Loss (2000's Value)



Source: CRED-EMDAT, 2006

What is happening?

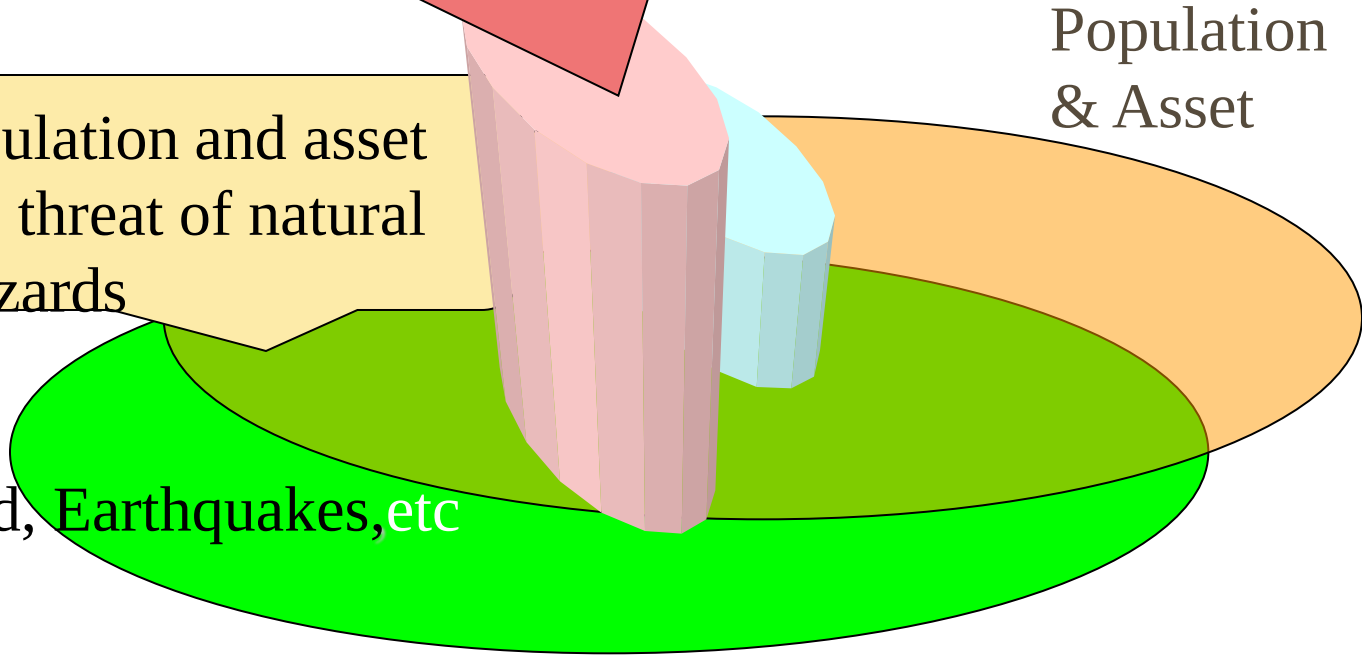
- Increase in exposure : Population and assets are concentrating to hazardous area
- Vulnerability : Population and assets have not enough resistance against natural hazards

Natural Hazard →Disaster

Consequences of Human Behavior

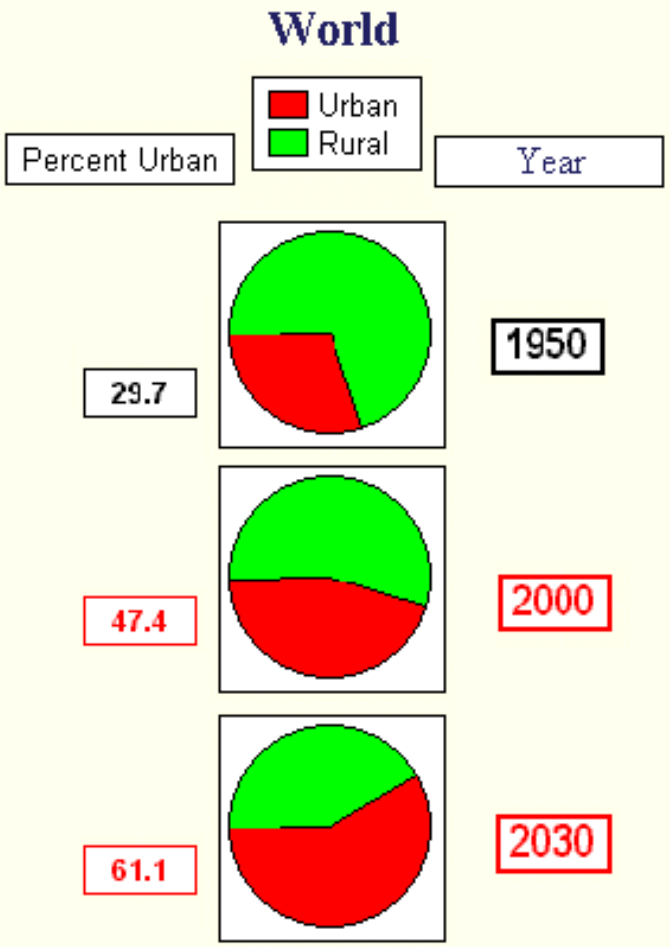
Vulnerability: degree of resistance of the asset & population against disaster

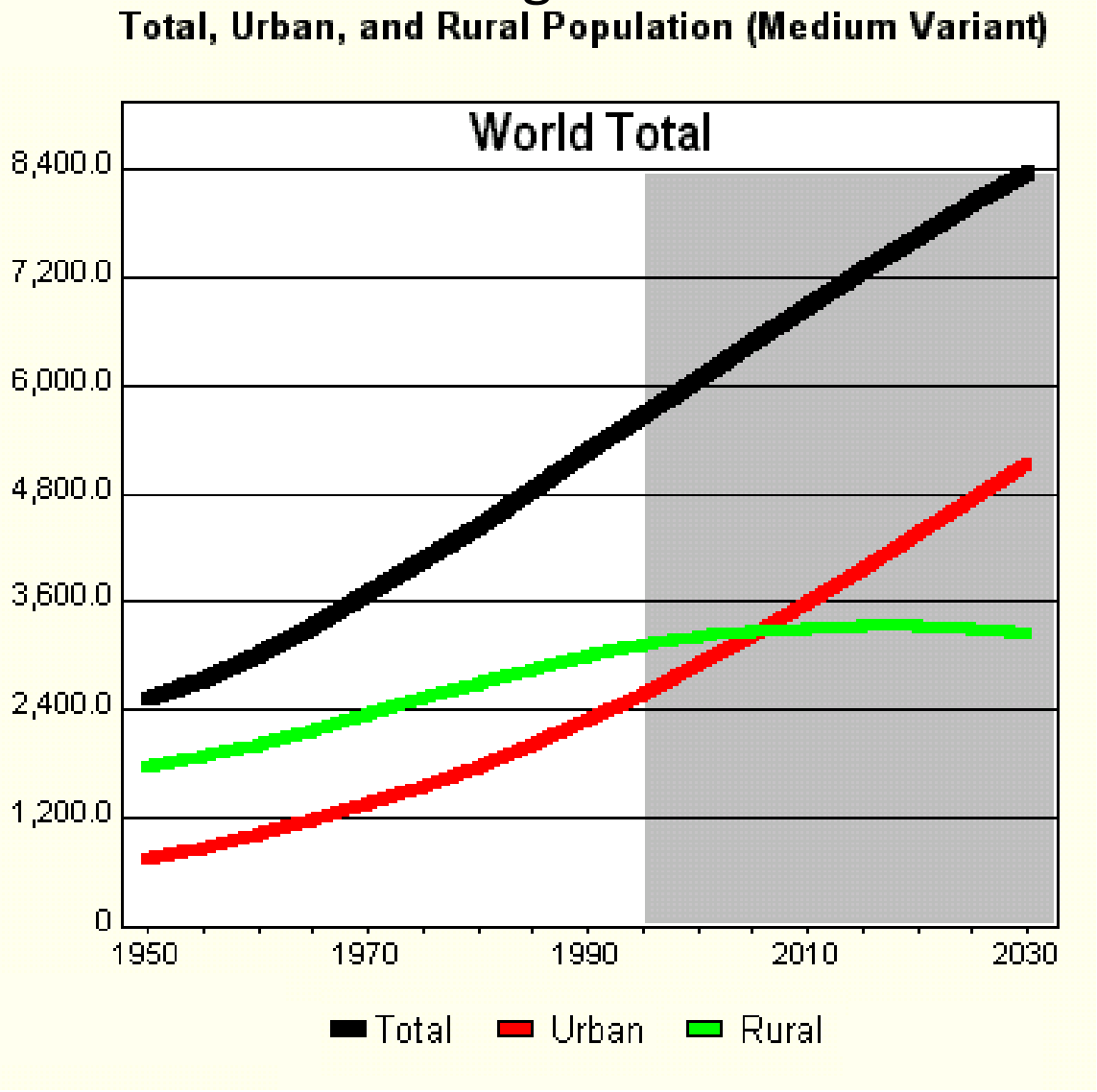
Exposure : population and asset exposed to the threat of natural hazards



Hazard: Flood, Earthquakes, etc

Urban population is dominating in the world



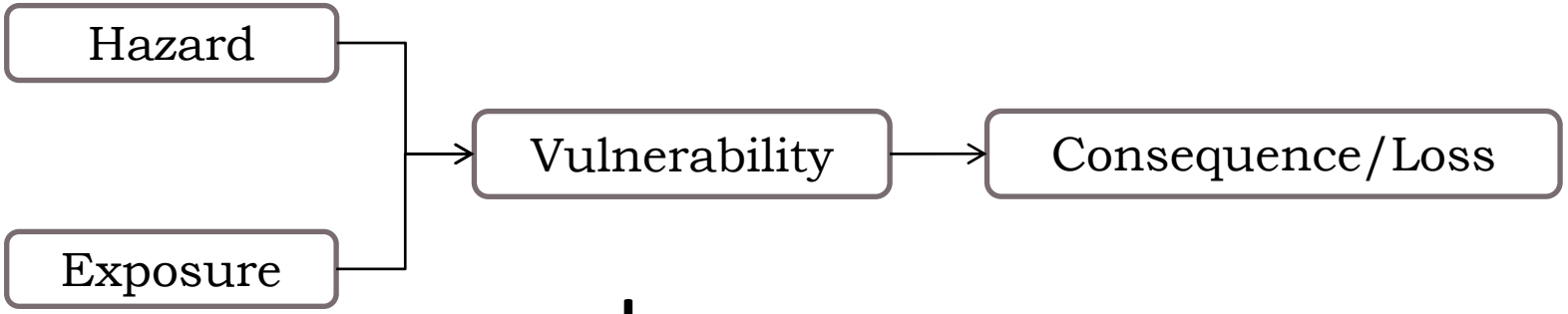


http://www.faculty.fairfield.edu/faculty/hodgson/Courses/so11/population/urbanization.htm

Disaster Risk Assessment

Risk = frequency × consequence

Loss estimation procedure for a scenario



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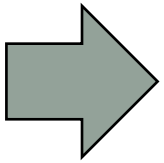
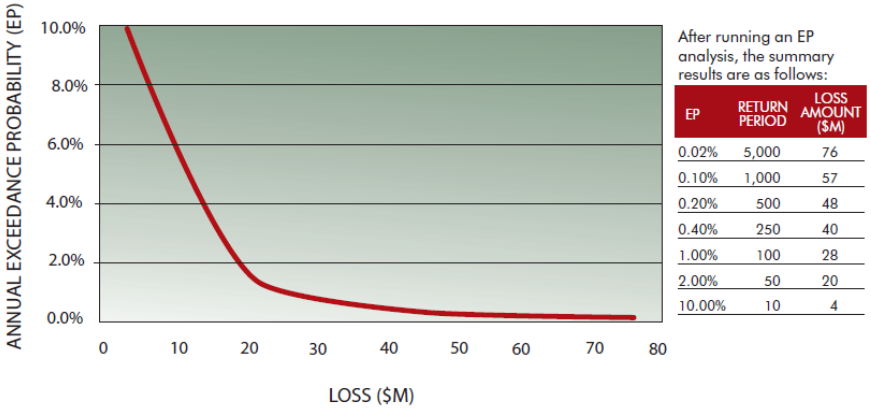
Probability of occurrence of the scenario



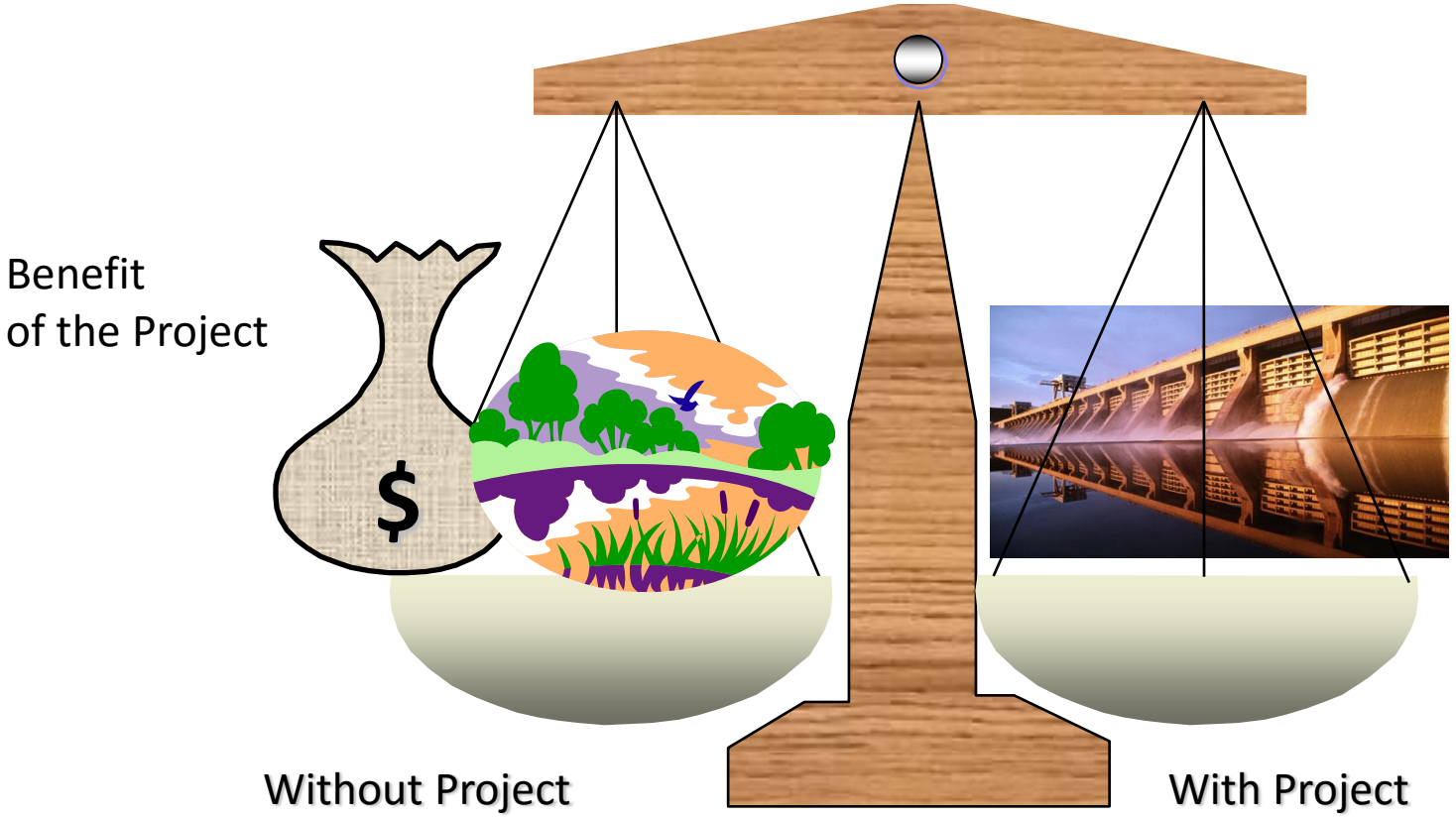
Probability distribution of losses



After running an EP analysis, the summary results are as follows:

EP	RETURN PERIOD	LOSS AMOUNT ($M)
0.02%	5,000	76
0.10%	1,000	57
0.20%	500	48
0.40%	250	40
1.00%	100	28
2.00%	50	20
10.00%	10	4

Conventional Definition for Benefit of a Project



What is the benefit of DRR?

$$b_i = EL_i^0 - EL_i^1$$

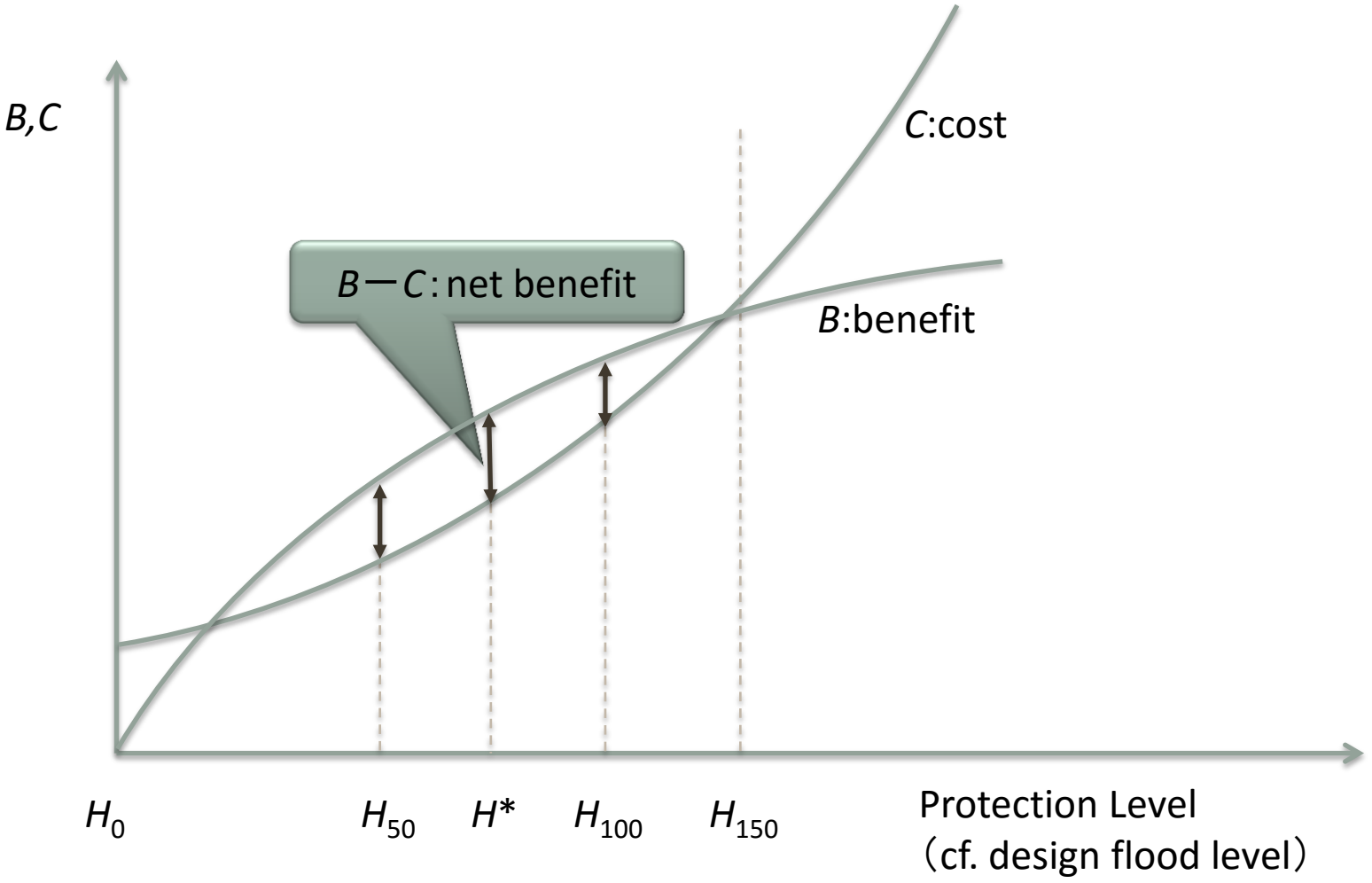
where b_i: expected anual benefit at year i,

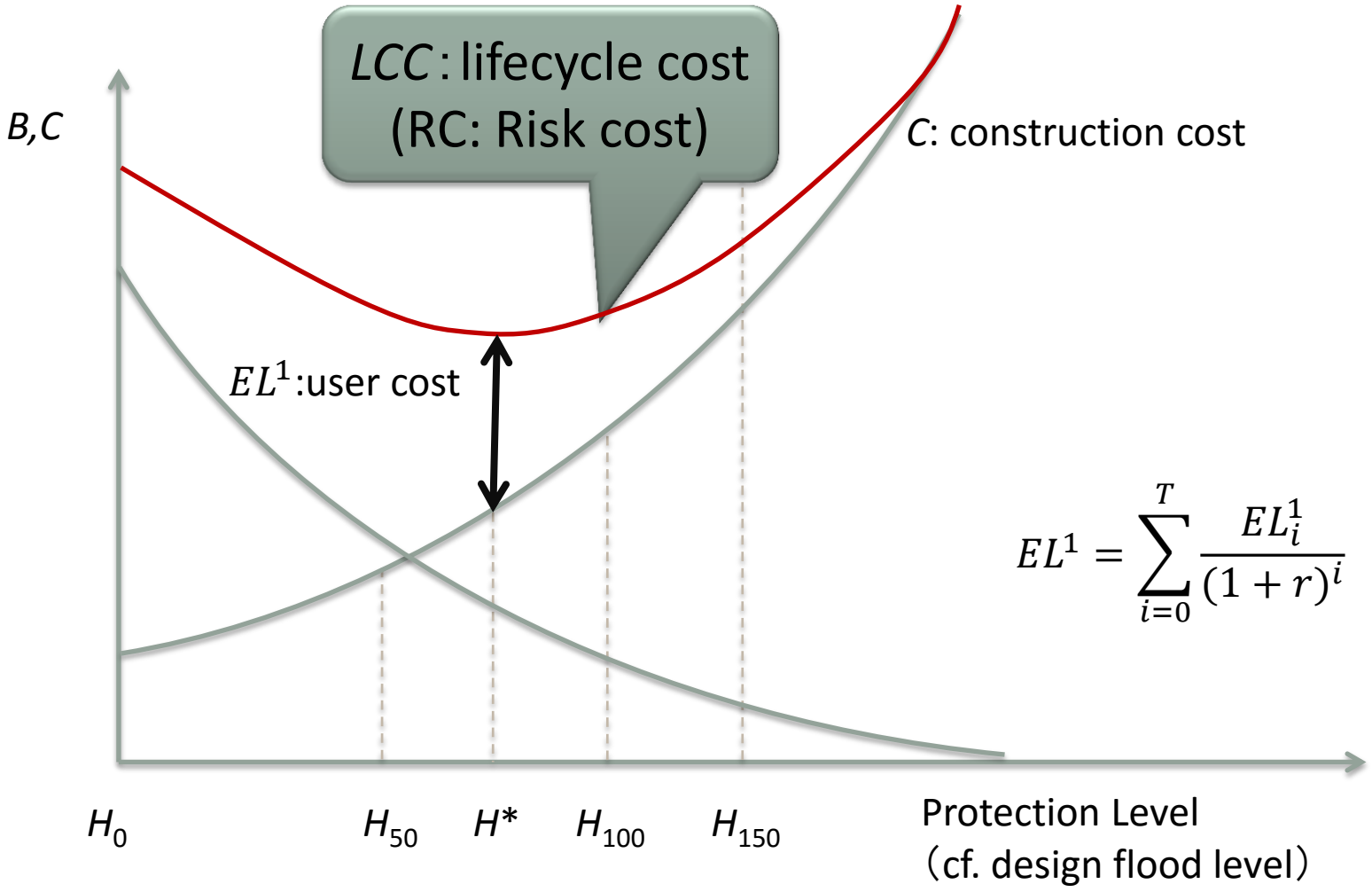
EL_i^0: expected annual loss at year i without a DRR project,

EL_i^1: expected annual loss at year i with the DRR project.

$$B = \sum_{i=0}^{T} \frac{b_i}{(1+r)^i}, \; C = \sum_{i=0}^{T} \frac{c_i}{(1+r)^i}$$

where c_i: expected anual benefit at year i, r: social discount rate, B : benefit of the project, C:cost of the project


B,C
C:cost
B—C: net benefit
B:benefit
H0
H50
H*
H100
H150
Protection Level
（cf. design flood level）



$$EL^1 = \sum_{i=0}^{T} \frac{EL_i^1}{(1+r)^i}$$

Lifecycle cost

- Lifecycle cost (Net Benefit of Infrastructure) should include environmental benefits and costs.

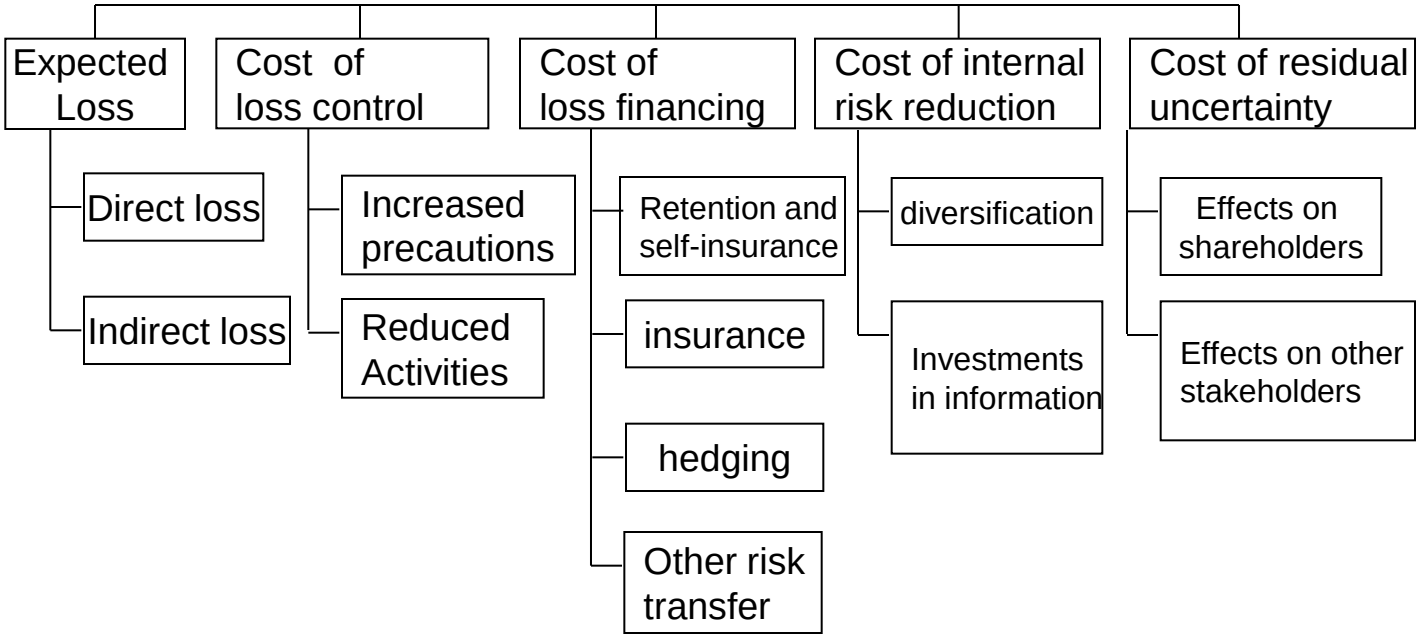
  minimize LC

  =Construction Cost + Maintenance cost

  +(Net) User Cost + Environmental Cost

RM and the Cost of Risk

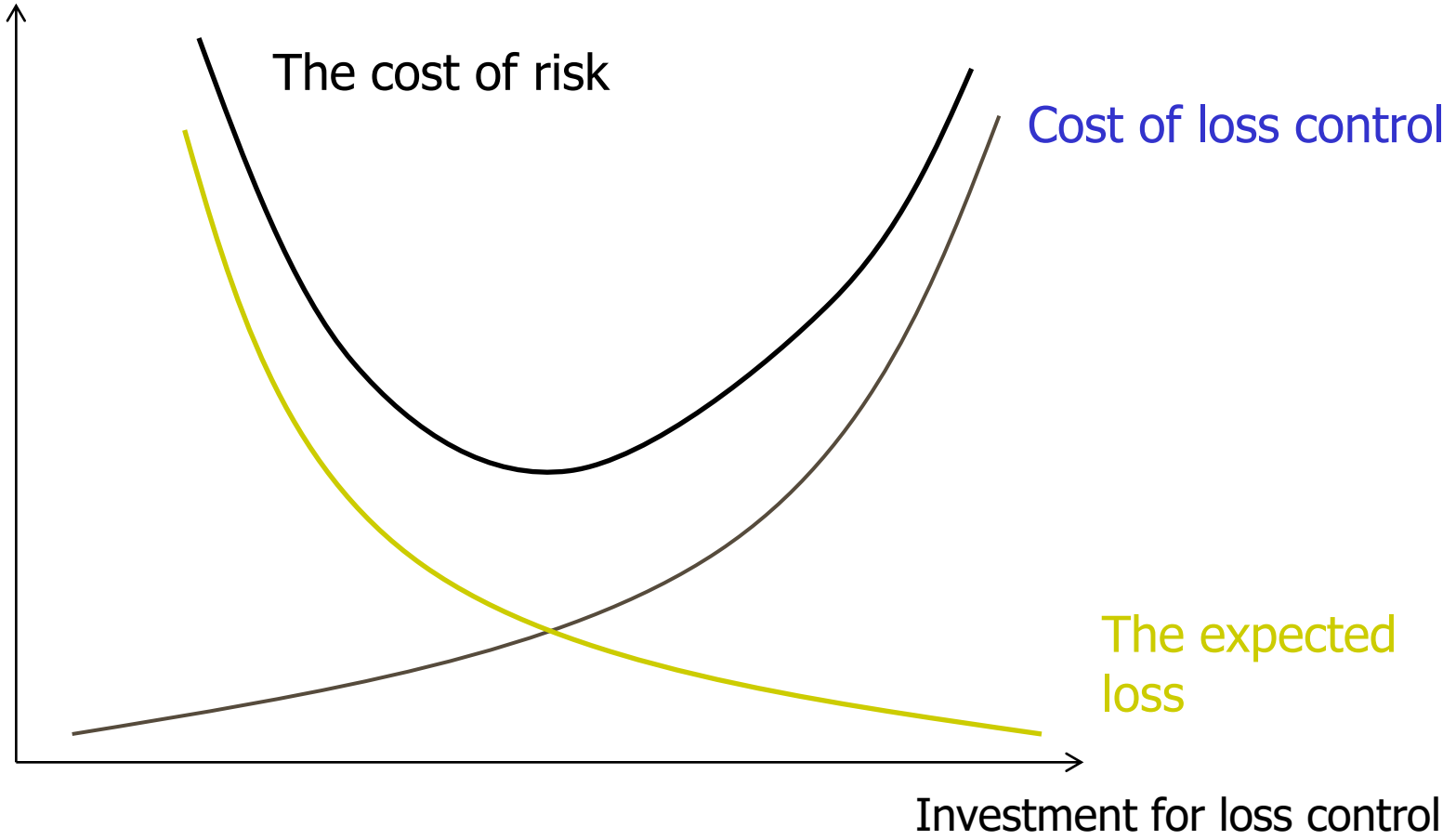
- The objective of RM is minimizing of the cost of risk.
- Component of the cost of risk:



Cost Trade-offs

- The expected cost of direct/indirect losses vs. loss control costs
- The cost of loss financing and internal risk reduction vs. the expected cost of indirect losses
- The cost of loss financing and internal risk reduction vs. the cost of residual uncertainty

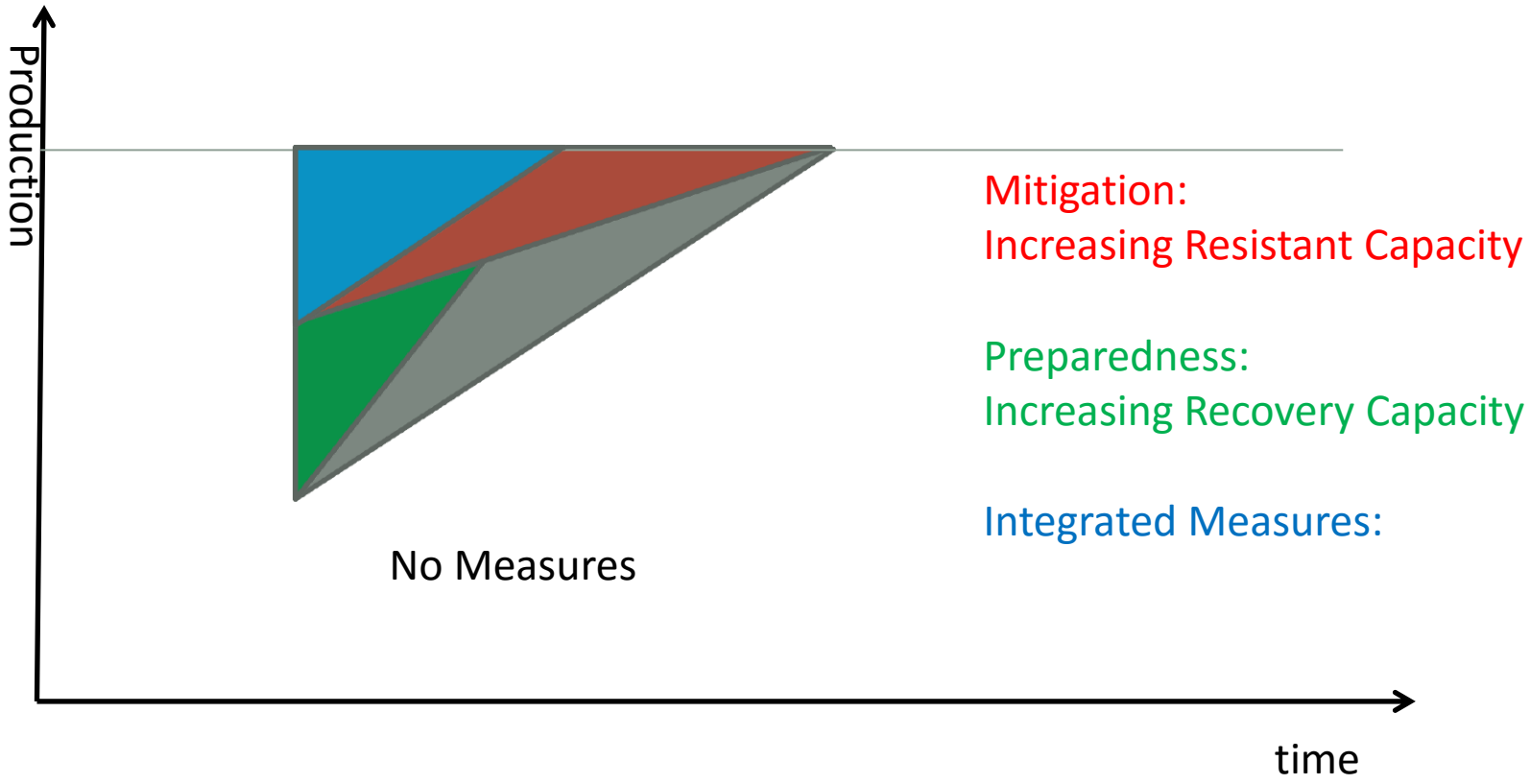
Effects of loss control



Resilient Infrastructure

- Resilience : Bounce back

  = Resistant capacity + Recovery capacity



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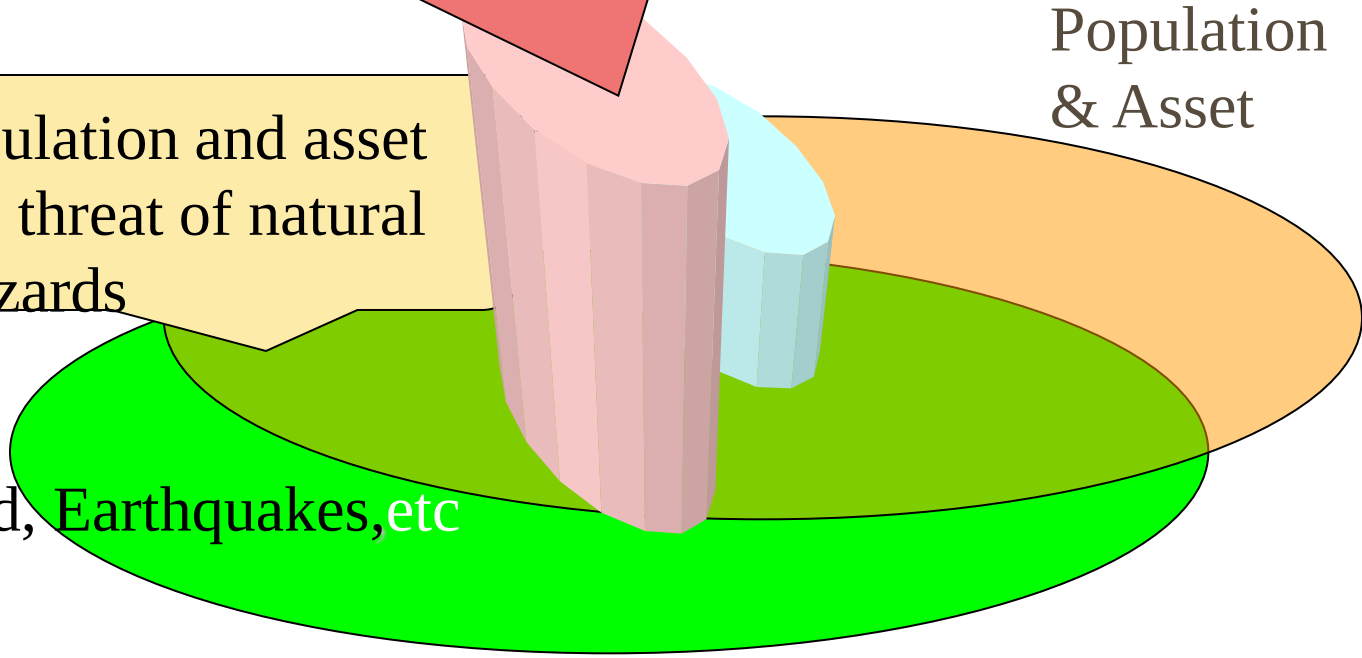


Hazard: Flood, Earthquakes, etc

What is required for DRA?

- Data: Hazard, Exposure, Vulnerability
- Model: Hazard models

  Exposure (Inventory, GIS)

  Vulnerability (Fragility Curves, Loss functions)

Vulnerability: conditional probability of occurrence of losses

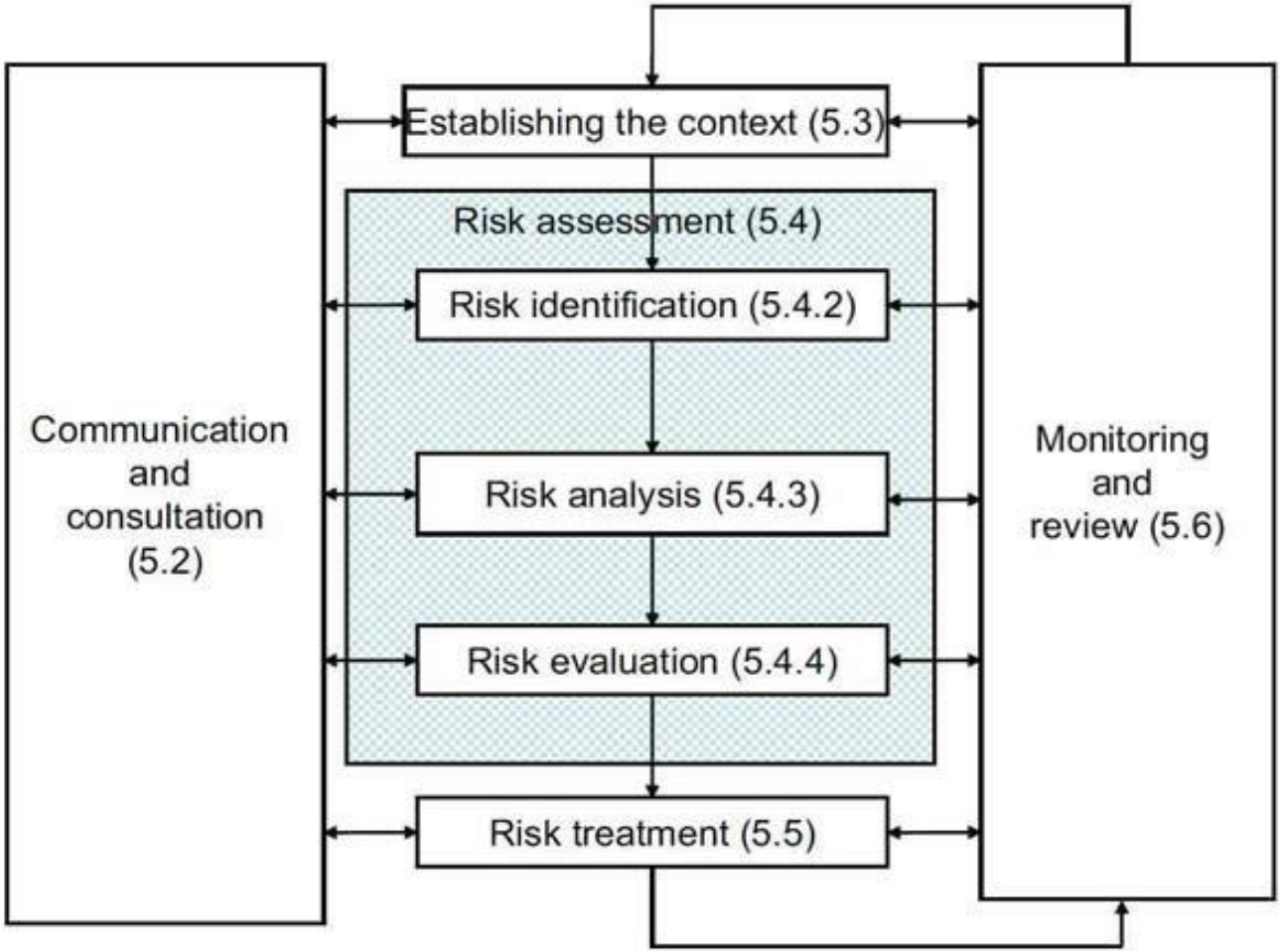
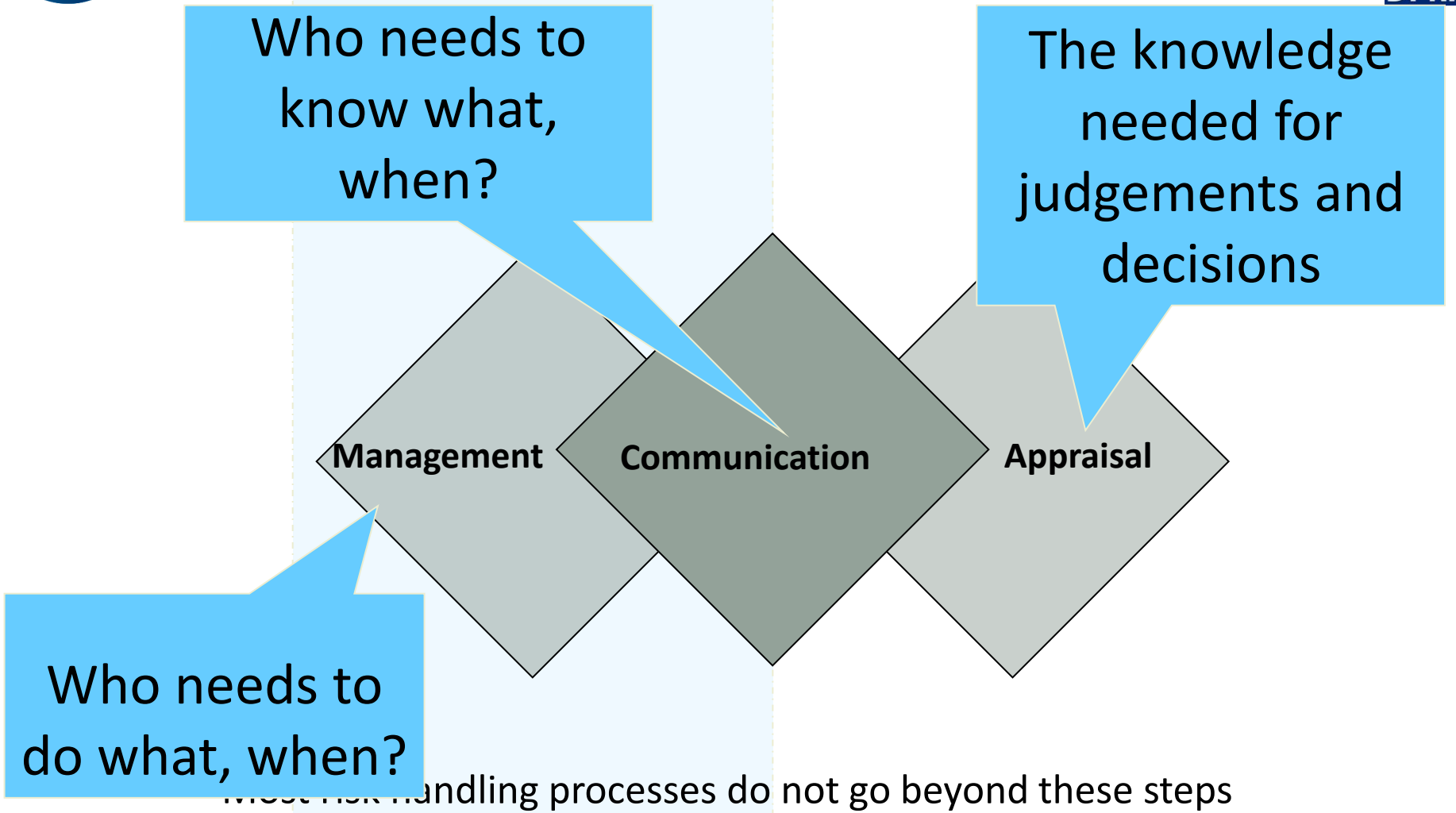


Figure 3 — Risk management process

COMMON DEFICITS IN RISK GOVERNANCE

- **Framing –** different stakeholders have conflicting views of the issue
- **Scope –** a risk perceived as only local may have global consequences (and vice versa)
- There is a **scarcity of data** about the risk or people's perceptions of it or, if data does exist, there is a failure to accept it
- **Transparency –** trade-offs are not made explicit and hidden agendas seem to determine the outcome
- **Inequity** – decisions allot the risk and benefits unfairly
- **Accountability** – decision makers are isolated from the impact of their decision
- **Alienation** – people or organisations are ignored (can lead to social mobilisation) (also "Authority knows best")
- **Lack of trust** in the process or the communication channel
- **"Paralysis by analysis" –** overly inclusive process leads to inertia

CONVENTIONAL RISK HANDLING

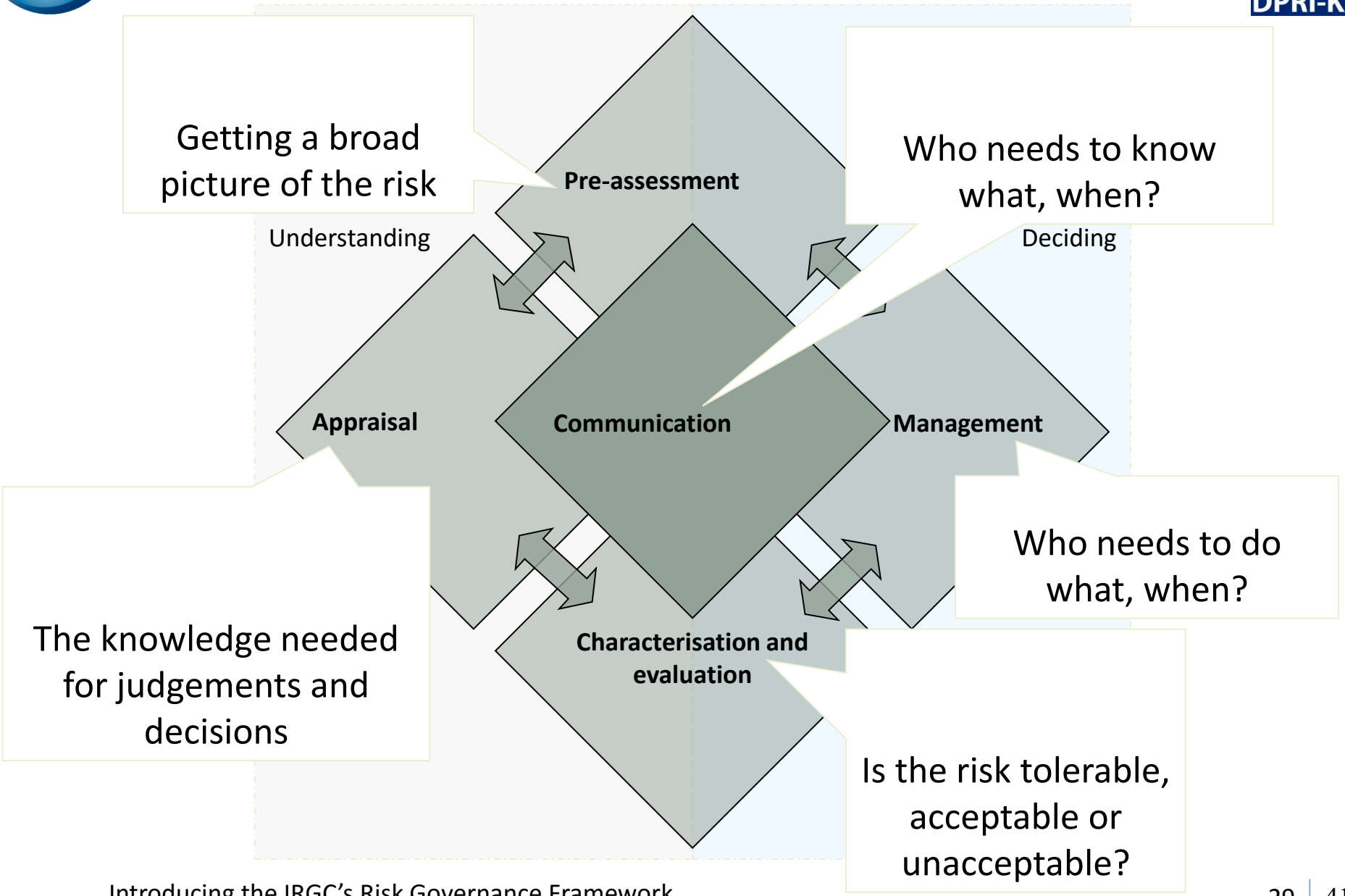


Most risk handling processes do not go beyond these steps

INNOVATIONS IN THE IRGC'S FRAMEWORK

1. The **pre-assessment** phase
   - extending problem definition
2. Including **concern assessment** as part of risk appraisal
3. **Categorising the knowledge** about the risk as:
   - linear
   - complex
   - uncertain
   - ambiguous
4. The **characterisation and evaluation** phase
   - is the risk acceptable, tolerable or unacceptable?

IRGC's RISK GOVERNANCE FRAMEWORK



HOW CATEGORISING THE KNOWLEDGE CAN HELP

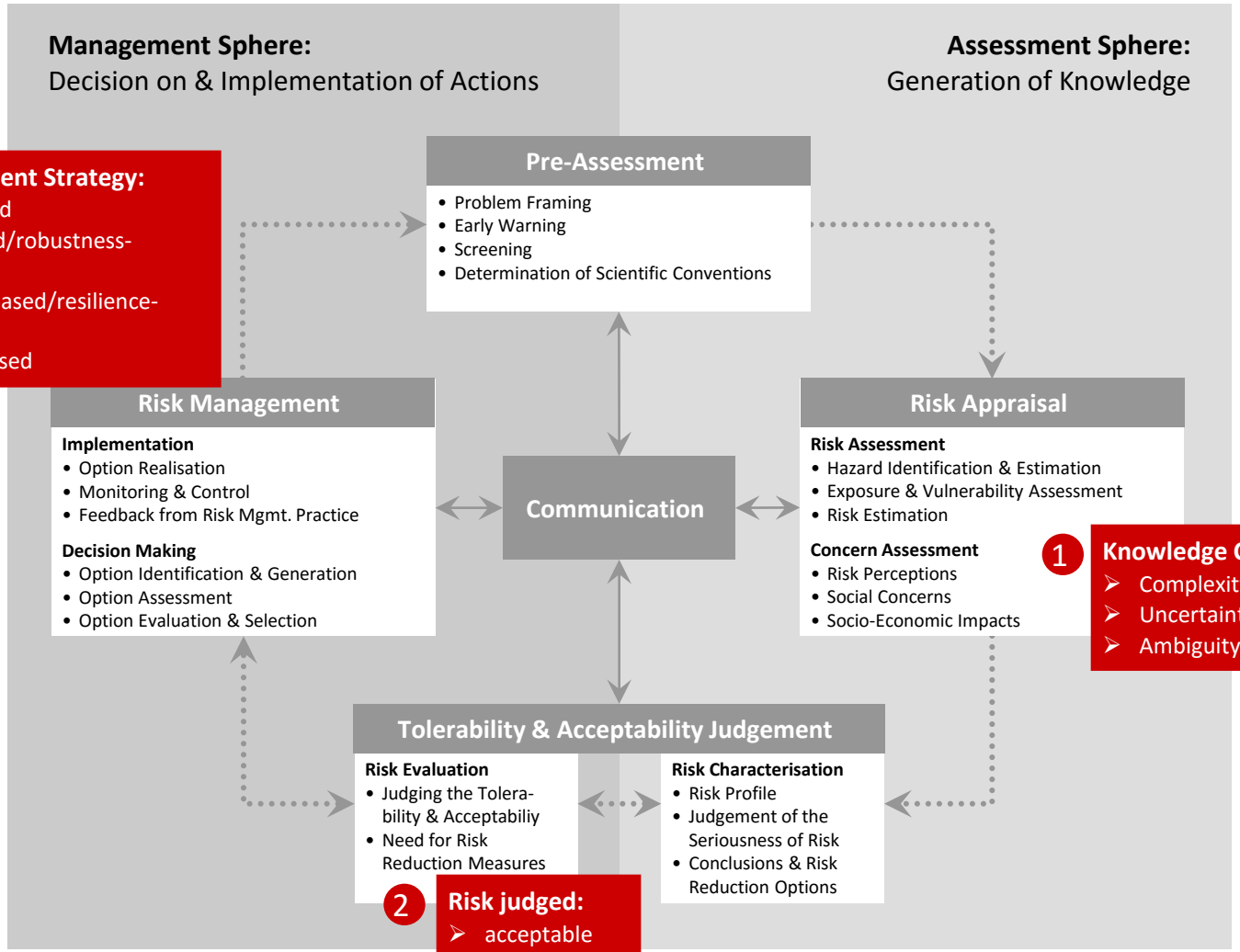
- **Linear** risk problems can be managed using a '**routine-based' strategy**, such as introducing a law or regulation

- **Complex** risks may be best addressed by accessing and acting on the best available scientific expertise, aiming for a 'risk-informed' and **'robustness-focussed' strategy**

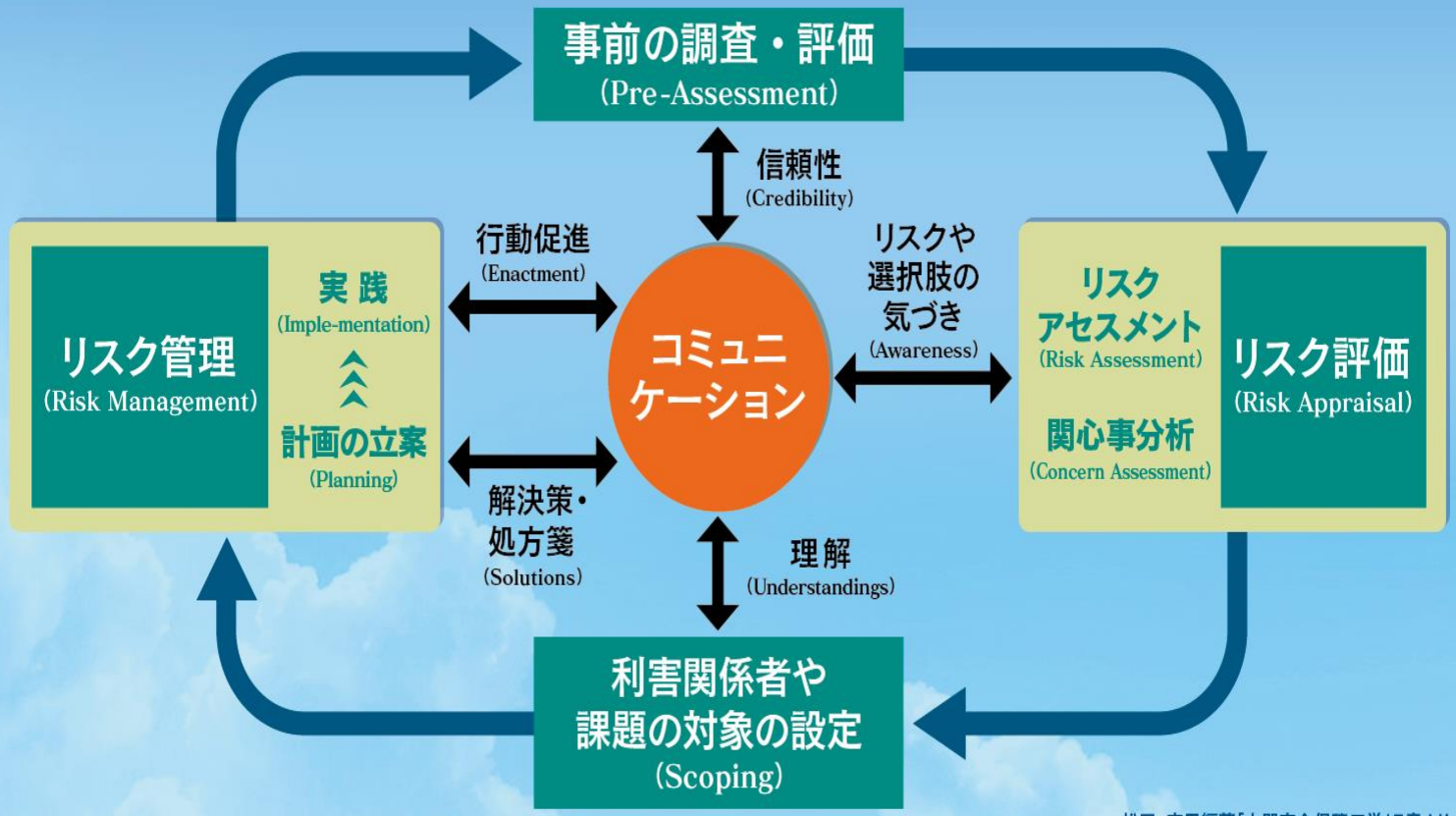
- **Uncertain** risks are better managed using 'precaution-based' and **'resilience-focussed' strategies**, to ensure the reversibility of critical decisions and to increase a system's capacity to cope with surprises

- **Ambiguous** risk problems require a **'dialogue-based' strategy** aiming to create tolerance and mutual understanding of conflicting views and values with a view to eventually reconciling them

ESSENTIAL DISTINCTIONS WITHIN THE CORE PROCESS



水害リスクガバナンスとリスクコミュニケーション



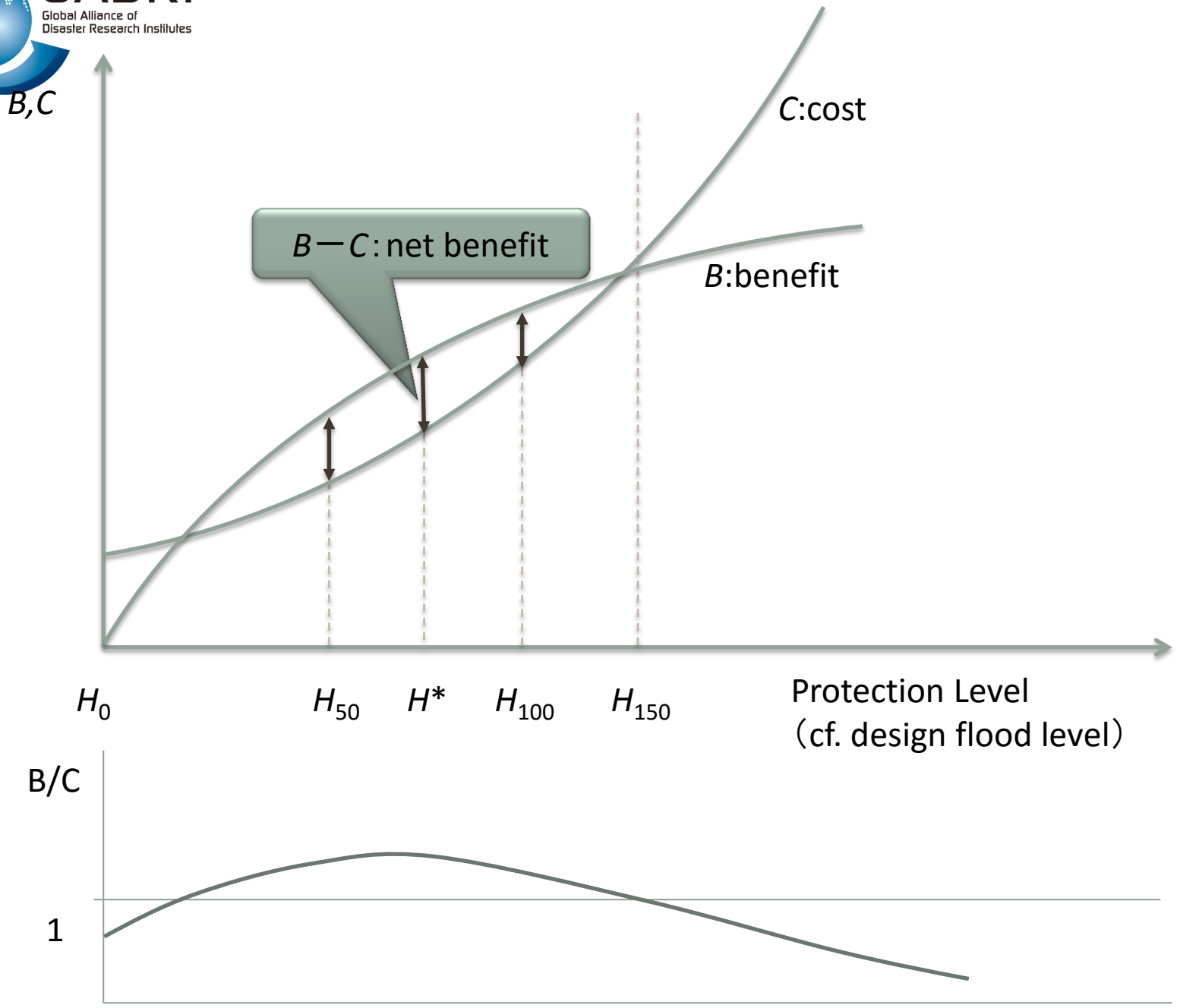
松岡・吉田編著「人間安全保障工学」5章より

Why we need risk management in the disaster risk reduction?

- How can we make a good decision?: Objectives and Constraints
- Net Benefit should be maximized!
  - LCC and RC will be minimized simultaneously.
- Other objectives?

Under budget constraint

- We can not choose the protection level which maximizes the B-C.
- B/C or IRR is used to find most the cost-effective project from the alternatives.


B,C
C:cost
B－C：net benefit
B:benefit
H0
H50
H*
H100
H150
Protection Level
（cf. design flood level）
B/C
1

Can you implement or improve DRM/DRG in your country?

- What should we do?
- Discussion!!

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