

# **FILLING THE PERCEPTION GAP OF ACCEPTABLE RADIATION RISK BETWEEN STAKEHOLDERS**

**IUHW CLINIC**

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# PERCEPTION GAP ABOUT ACCEPTABLE RISK

- **DIFFERENT APPROACHES TO ACCEPTABLE RISK:**

- (1) NO ACCEPTABLE RISK for radiation**

- con: There are no place with NO RISK.**

- Reducing small radiation risk may increase other health RISKS**

- (2) Practical THRESHOLD (TOXICOLOGISTS' approach)**

- Determine no-observed adverse effect level (NOAEL) in experiments, then apply it to human beings with a safety factor of 10 and an individual sensitivity factor of 10 (in total a safety factor of 100.)**

- con: radiation risk is believed to have no threshold**

- note: epidemiology data have already included individual factor**

# **PERCEPTION GAP ABOUT ACCEPTABLE RISK**

## **(3) ALARA (As Low As Reasonably Achievable) APPROACH**

**Supposing NO THRESHOLD, acceptable DOSE can be chosen based on BALANCE between estimated radiation RISK LEVEL and DEMERITS associated with avertable dose.**

**con: UNCERTAINTY in risk estimates**

**con: NO UNIVERSAL MERITS and DEMERITS among stakeholders**

**•RISK COMMUNICATION is essential to reach consensus about BALANCE.**

# **PERCEPTION GAP ABOUT ACCEPTABLE RISK**

## **“Oishinbo debate” in May 2014**

**Mr. Kariya, a writer of famous comic strip “Oishinbo” wrote in his comic in May 2014 “I hope people living in Fukushima will show bravery by escaping from dangerous places”.**

**Are radiation levels dangerous enough to justify “escaping” from Fukushima in May 2014 ?**

**Are they justify “not returning” to zones in preparation for the lifting of the evacuation order?**

# PERCEPTION GAP ABOUT ACCEPTABLE RISK

## FACT 1

External doses in 17 municipalities in 2012 fiscal year measured by glass-badge dosimeter

median: 0.6 mSv/y

min & max: 0.1 & 1.4 mSv/y

Internal doses by WBC measurements from Jun 2011 to Oct 2013

a total number of subjects:

164, 142

doses from  $^{134}\text{Cs}$  and  $^{137}\text{Cs}$ :

< 1 mSv in 99.98%

Typical personal annual dose range in the world  
(UNSCEAR 2006)

External exposure from space

0.3~1 mSv/y

External exposure from soil

0.3~1 mSv /y

Internal exposure by radon

0.2~10 mSv /y

Internal exposure from water & foods

0.2~1 mSv /y

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In total

1~13 mSv /y

# PERCEPTION GAP ABOUT ACCEPTABLE RISK

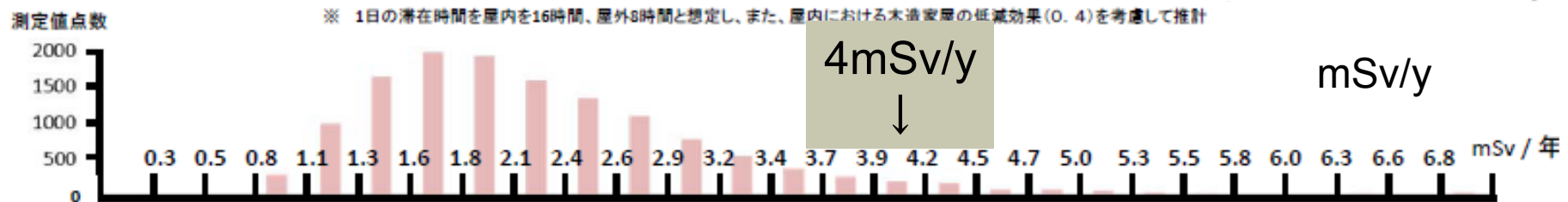
## FACT 2

Expected annual radiation dose of residents who return to TAMURA city after lifting the evacuation order

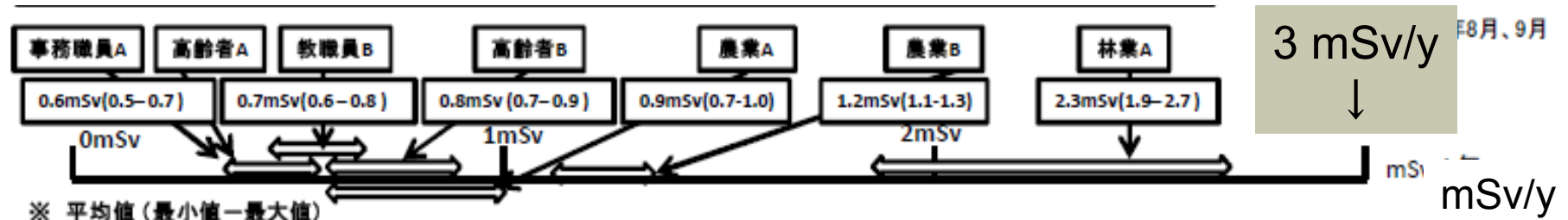
Annual dose estimated by ambient dose rate in living area in 2013

(indoor 16h, outdoor 8 h, and reduction factor of wooden house of 0.4)

年9月～25年11月



Annual doses estimated by personal dosimeter in different job categories



# **PERCEPTION GAP ABOUT ACCEPTABLE RISK**

**As to the proposal raised by Mr. Kariya,**

## **Question 1**

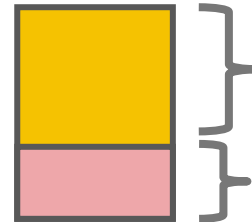
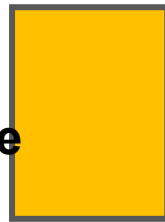
**Is radiation level in Fukushima, a few mSv in the first year, dangerous enough to justify “ESCAPING” or “NOT RETURNING”?**

## **Question 2**

**What kinds of new risks are likely to be associated with relocation for averting a few mSv?**

# TWO KINDS OF BALANCE IN RISK COMMUNICATION

Radiation Risk  
Before countermeasure



Radiation Risk averted  
By countermeasures

Radiation Risk  
After  
countermeasures

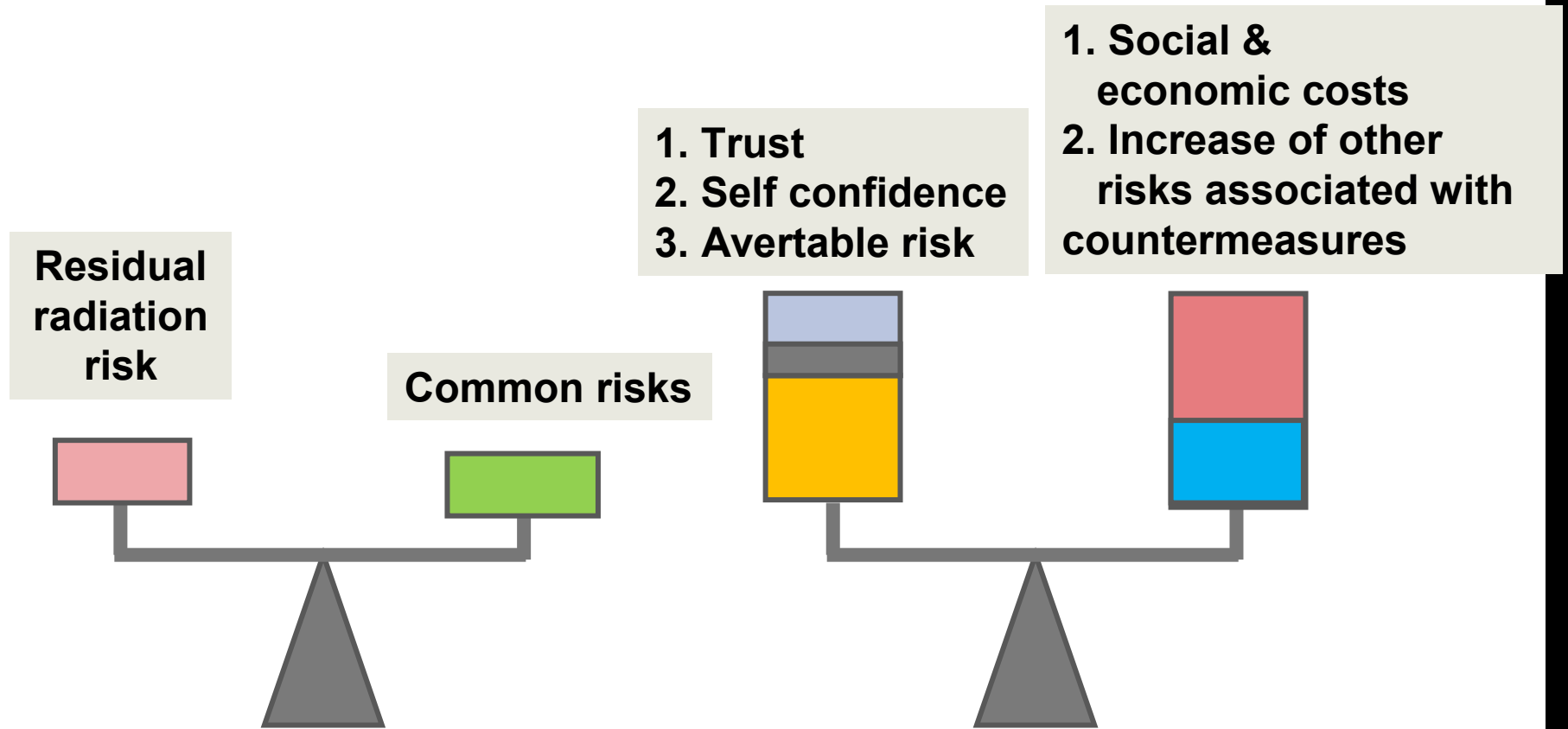




# TWO KINDS OF BALANCE IN RISK COMMUNICATION

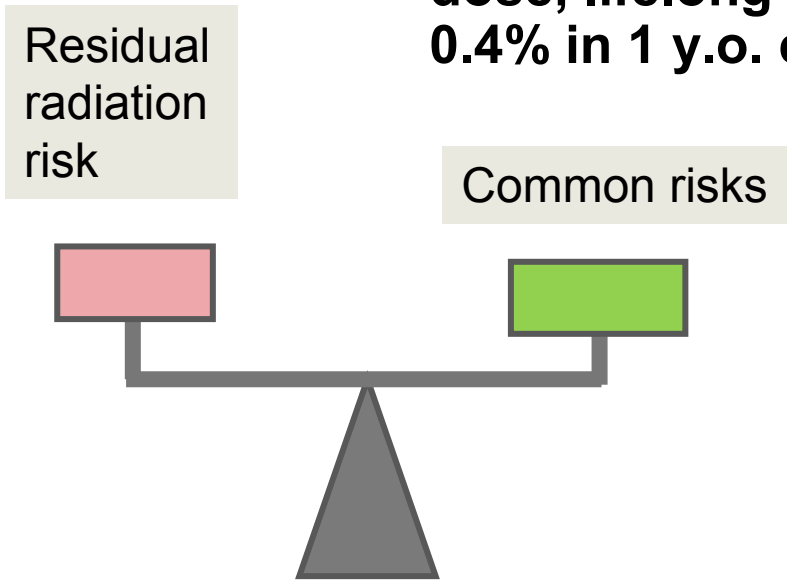
Evaluate the Residual Risk  
After countermeasures

Evaluate the Merits and  
Demerits associated with  
Countermeasure



# FILLING PERCEPTION GAP ABOUT ACCEPTABLE RISK

- Supposing excess dose in the 1<sup>st</sup> year is 4 mSv, a total excess dose will be 10 mSv / life (UNSCEAR). By this dose, lifelong cancer/leukemia risk will increase 0.2 ~ 0.4% in 1 y.o. children and 0.1 ~ 0.2 % in 20 y.o. adults.



	All solid cancers		Leukemia	
	Background lifetime risk	10 mSv risk	Background lifetime risk	10 mSv risk
1 y.o. boy	40.6 %	0.23%	0.6%	0.006%
1 y.o. girl	29%	0.35%	0.43%	0.008%

WHO Health risk assessment (2013)

## Common risks

**Death risk by traffic accident in 80 years: 0.4%**

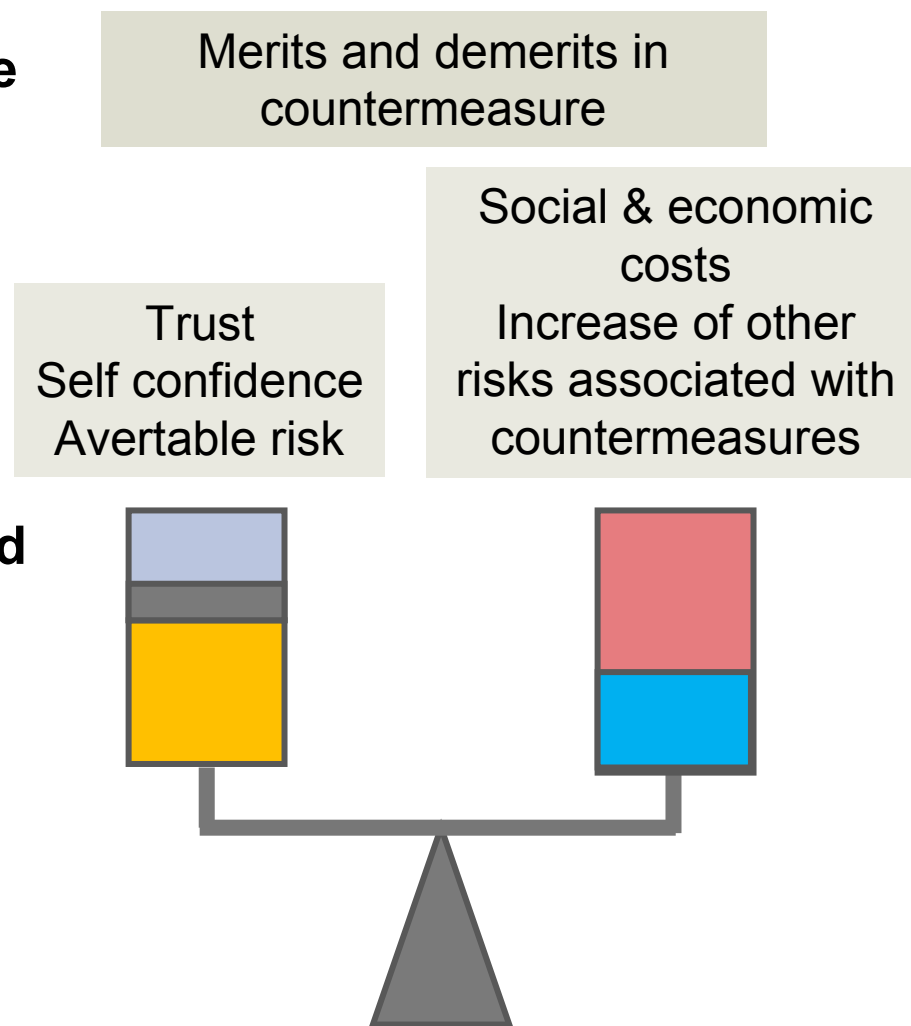
**(using 2012 national statistics)**

**Cancer mortality risk by obesity in adult: 3~4% / BMI 5)**

**(Lancet 373: 1083, 2009)**

# FILLING PERCEPTION GAP ABOUT ACCEPTABLE RISK

- Even though avertable dose is small, some people may choose further countermeasures such as permanent relocation or complete decontamination
- Any kind of countermeasure will accompany with merits and demerits.
- Countermeasure by itself may associate with other risks (risk trade off).



# Items to be discussed among stakeholders

## Merits, demerits, and the priority of countermeasures

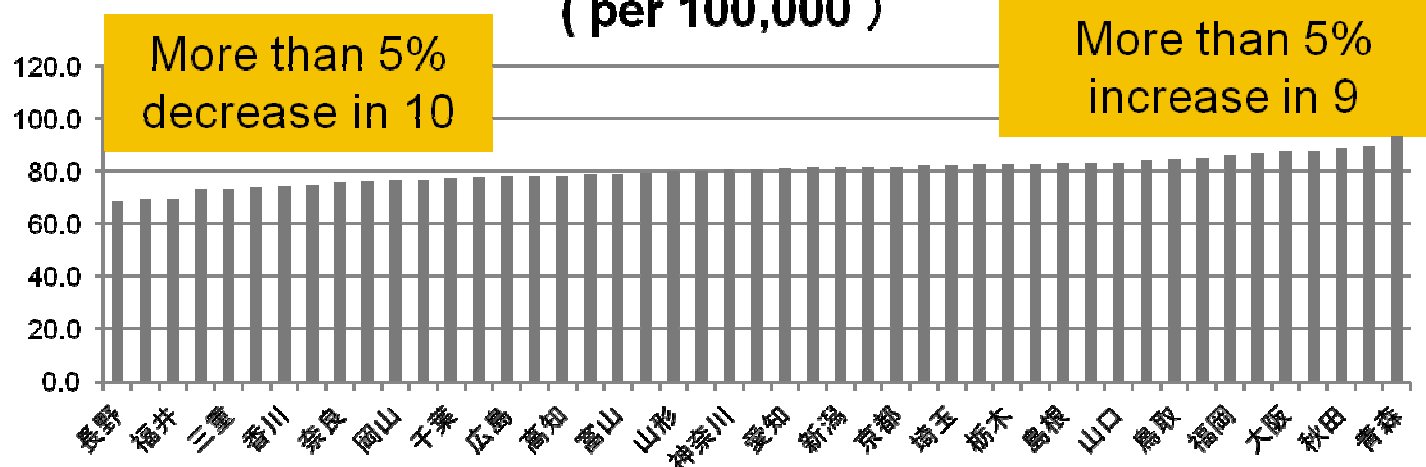
For example, relocation may associated with

- Break down of community and family, which may increase psychological and economic stresses in family members.
- Background health hazards in “relocated” place may be better or worse than those in Fukushima.

(Differences in cancer incidence, traffic accident rate between municipalities )

**Age-adjusted cancer mortality rate in 47 administrative divisions in 2012**

( per 100,000 )

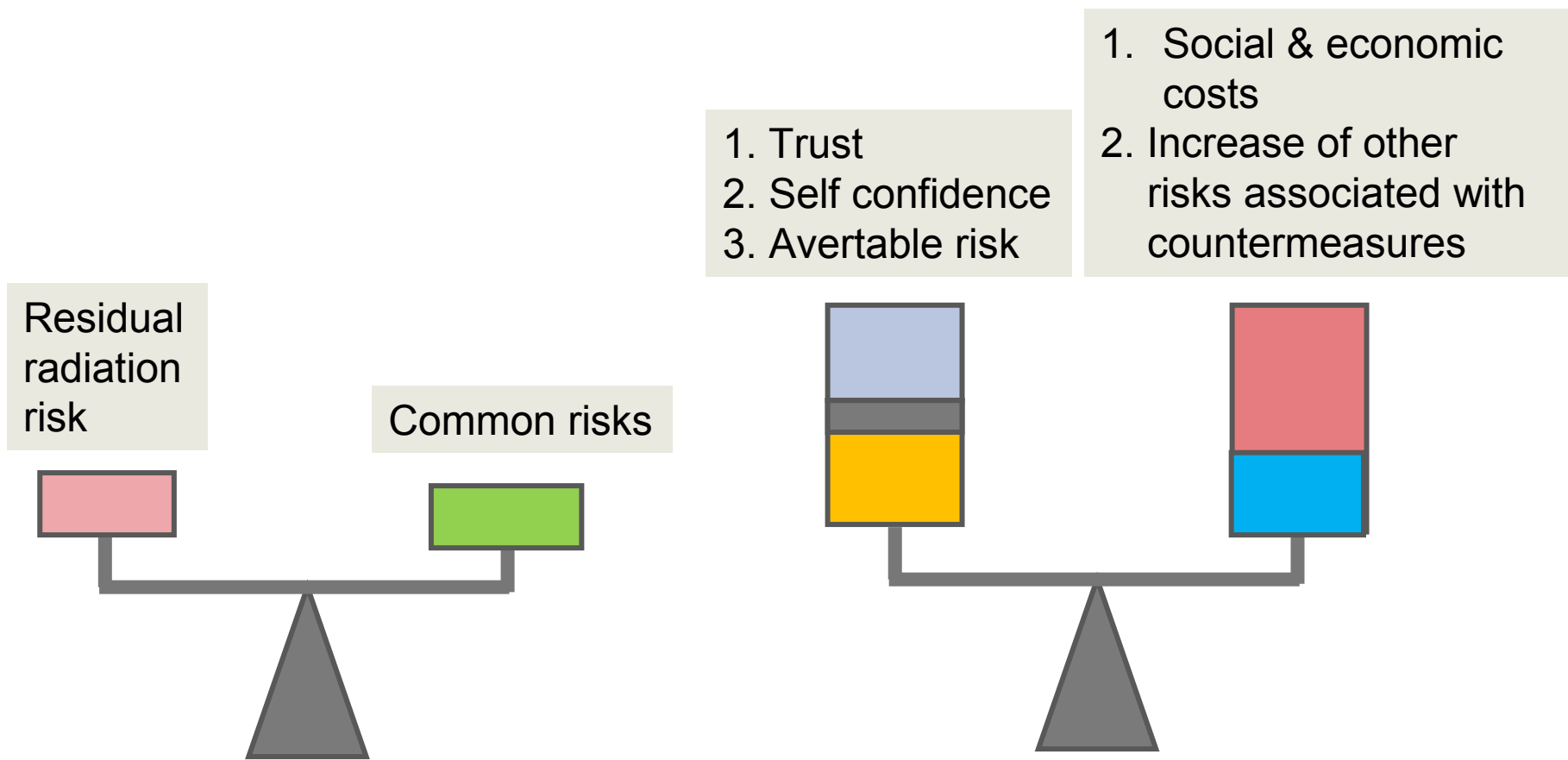


# **Items to be discussed among stakeholders**

## **Merits, demerits, and the priority of countermeasures**

**For example, removing soils in a large area**

- Removing soils take time and may delay returning.**
- Storage of a large amount of radioactive soil in one place becomes a new risk.**
- Are there other measures that effectively reduce dose?**
- Economic cost for removing soils can be converted to other measures that can promote healthy life or facilitate community reconstruction.**



- **These TWO BALANCES may differ among stakeholders.**
- **Co-thinking about the BALANCES will be a way to reach consensus.**
- **Although there is uncertainty in the risk estimation, scientists can provide a estimate with intervals, and empower residents to judge by themselves.**