

Communication of risks associated with nuclear power

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Introduction

1. What is risk? What risk are we talking about?
2. Traits of risk perception
such as acceptability depends on willingness to take risk



3. Three Regions: Acceptable, de-facto accepted, and unacceptable risk
4. Risks arising from nuclear power
 - Dominated by severe accident (Other components are uranium mining and reprocessing. Risks from operation and HLW disposal are minor.) (Extern-E)

1. What is risk? What risk are we talking about?

1. In the field of engineering, $RISK = Probability \times Consequence$

2. In discussing risks arising from nuclear power;

a) Mostly on “Health risk” to mankind by radiation

✓ Man-day lost by illness

✓ Acute fatality

✓ Latent cancer fatality } *Explicitly used in US safety goal*

✓ Associated psychological risk

b) Environmental risk

c) Socio-economic risk

✓ Loss of opportunity including job,
rumor-induced market loss

✓ Loss of land and asset

✓ Power replacement cost

} *Considered in V/I analysis by USNRC*

We are very often too narrowly defining risks

2. Traits of risk perception

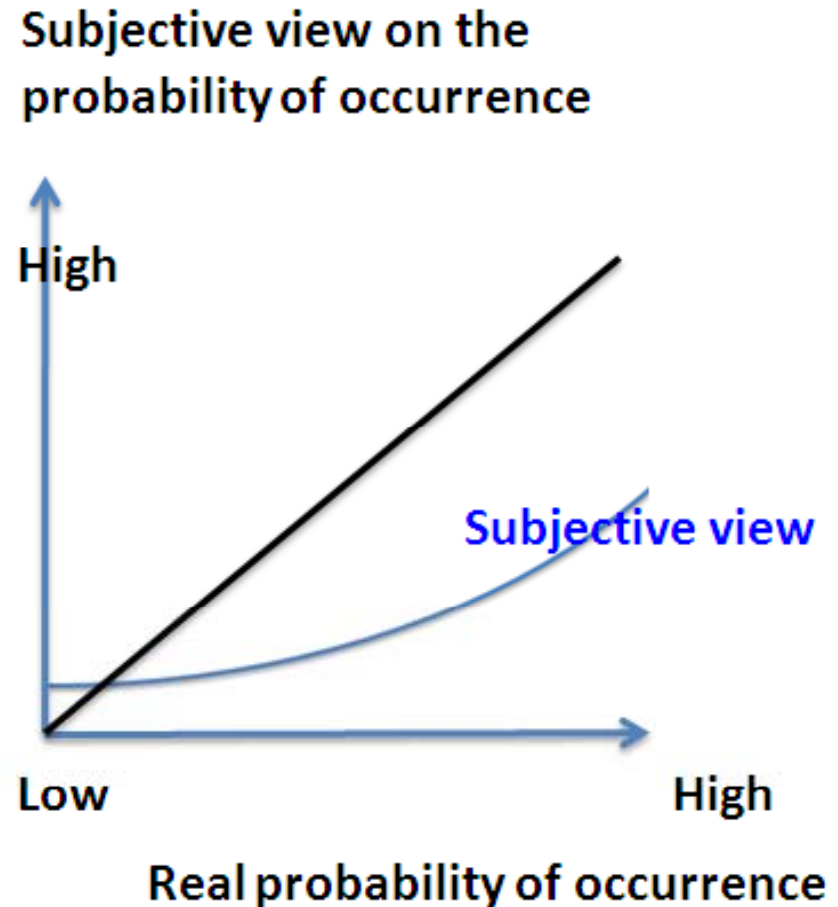
- ✓ Dread
- ✓ Control
- ✓ Is it a natural risk or a man-made one?
- ✓ Choice
- ✓ Effects on children and on future generations
- ✓ New risk
- ✓ Awareness
- ✓ Possibility of personal impact
- ✓ Cost-benefit ratio
- ✓ Trust
- ✓ Memory of risk
- ✓ Spread over time and space
- ✓ Effects on personal safety and personal properties
- ✓ Fairness
- ✓ Process

[SOURCE] http://www.bvsde.paho.org/tutorial6/i/pdf/topic_04.pdf

BVSDE: Virtual Library of Sustainable Development and Environmental Health

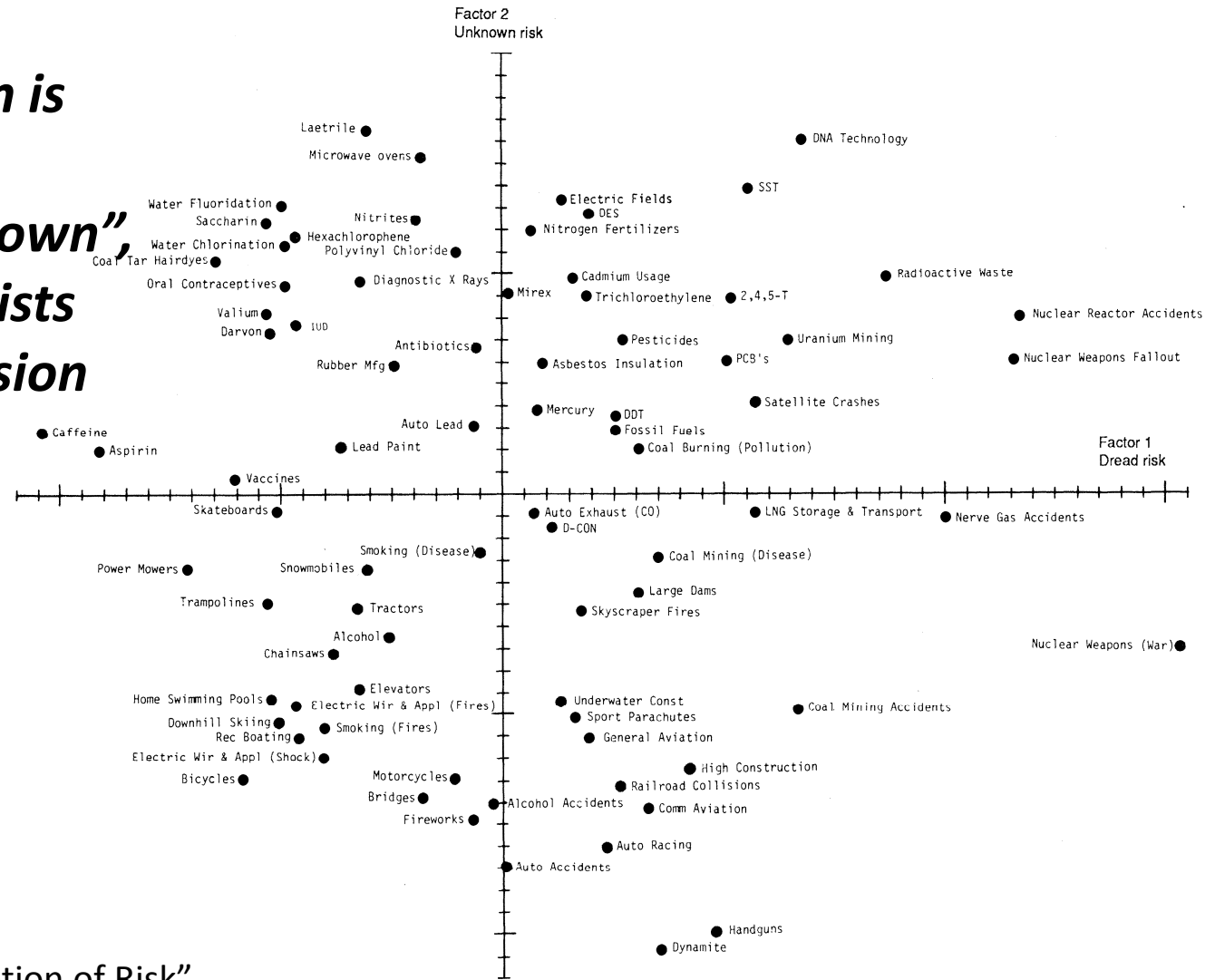
Frequently-referenced theory on public perception of risk

1. *Over-estimation of probability of events with LPHC risk*

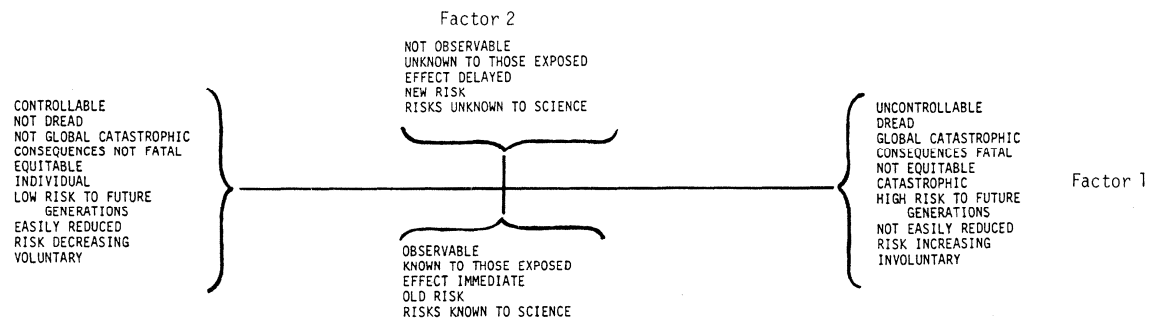


[SOURCE] Howard *Margolis*, "Dealing with Risk: Why the Public and the Experts Disagree on Environmental Issues", University of Chicago Press, 1996.

2. Public perception is dominated by “dread” and “unknown”, even though scientists use data for discussion



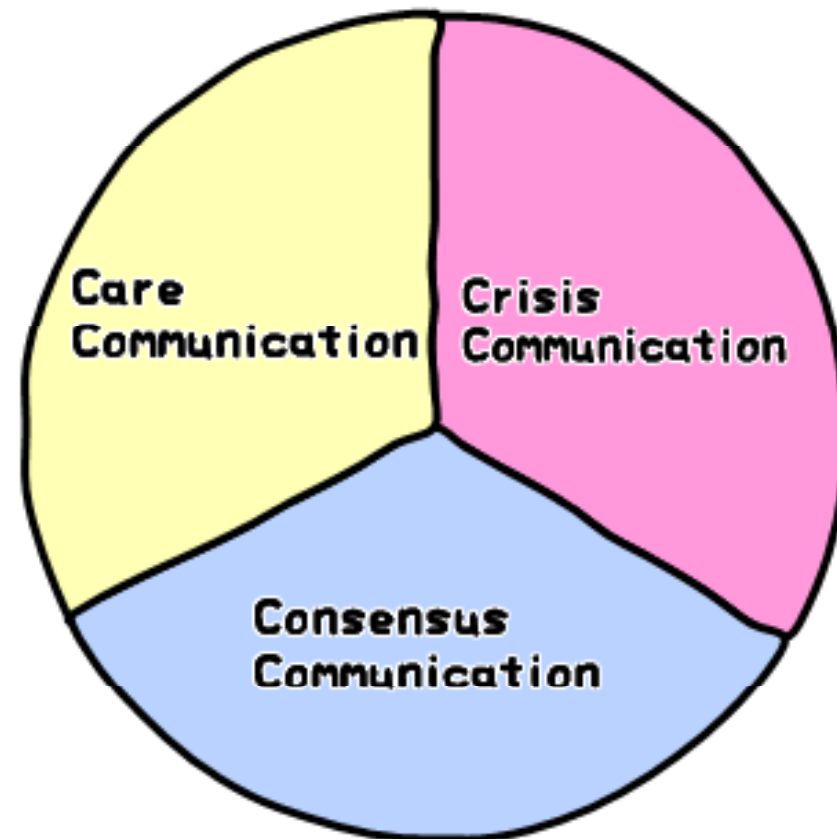
[SOURCE] Paul Slovic “Perception of Risk”, Science, Vol 236



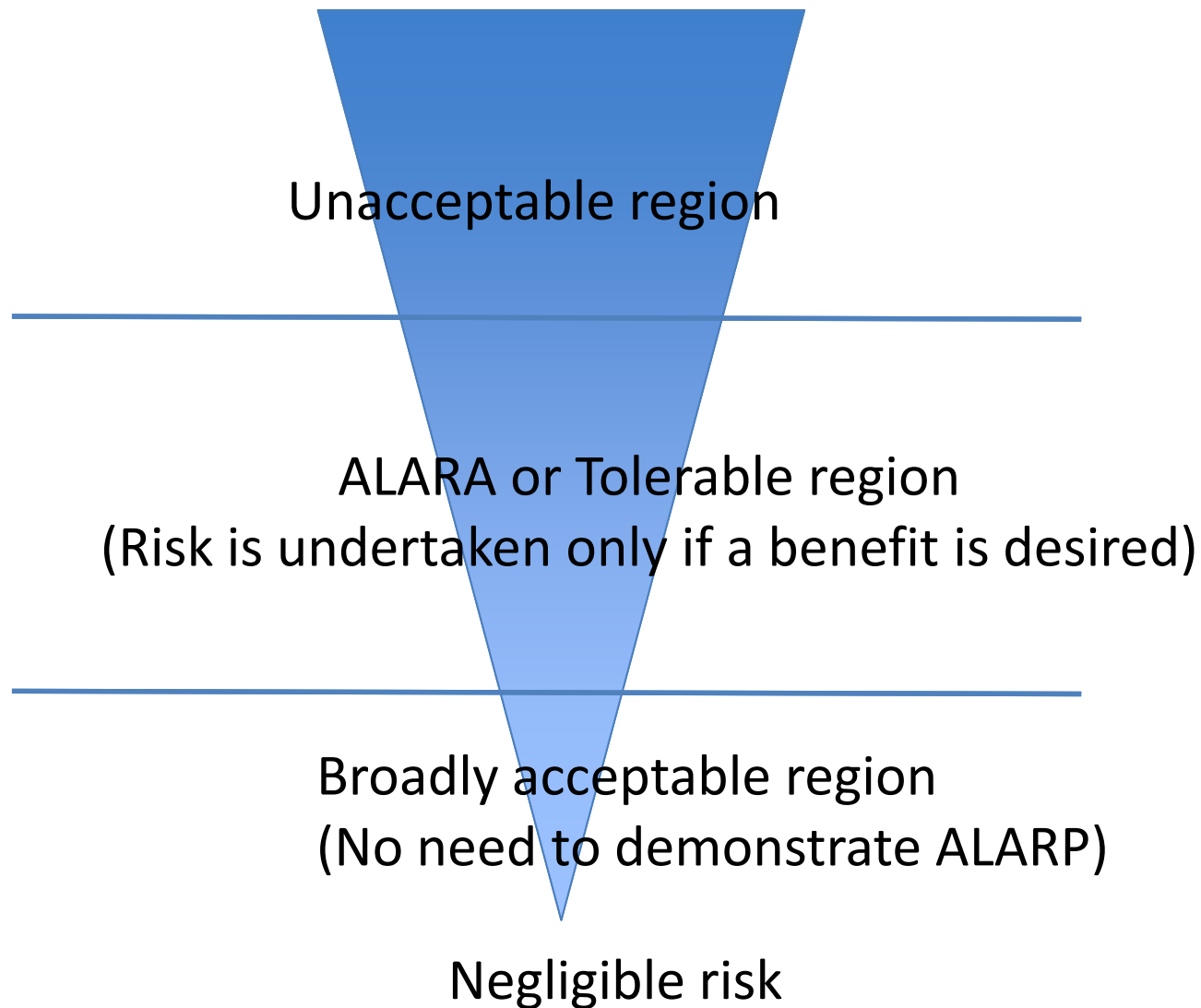
Transparency as a key element for “consensus communication”

- a) Access to information,
- b) Stakeholders’ participation to decision-making process, and
- c) Access to justice

...but, could be different,
depending on traits of
specific culture.



3. Concept of three regions of risk relative to acceptance

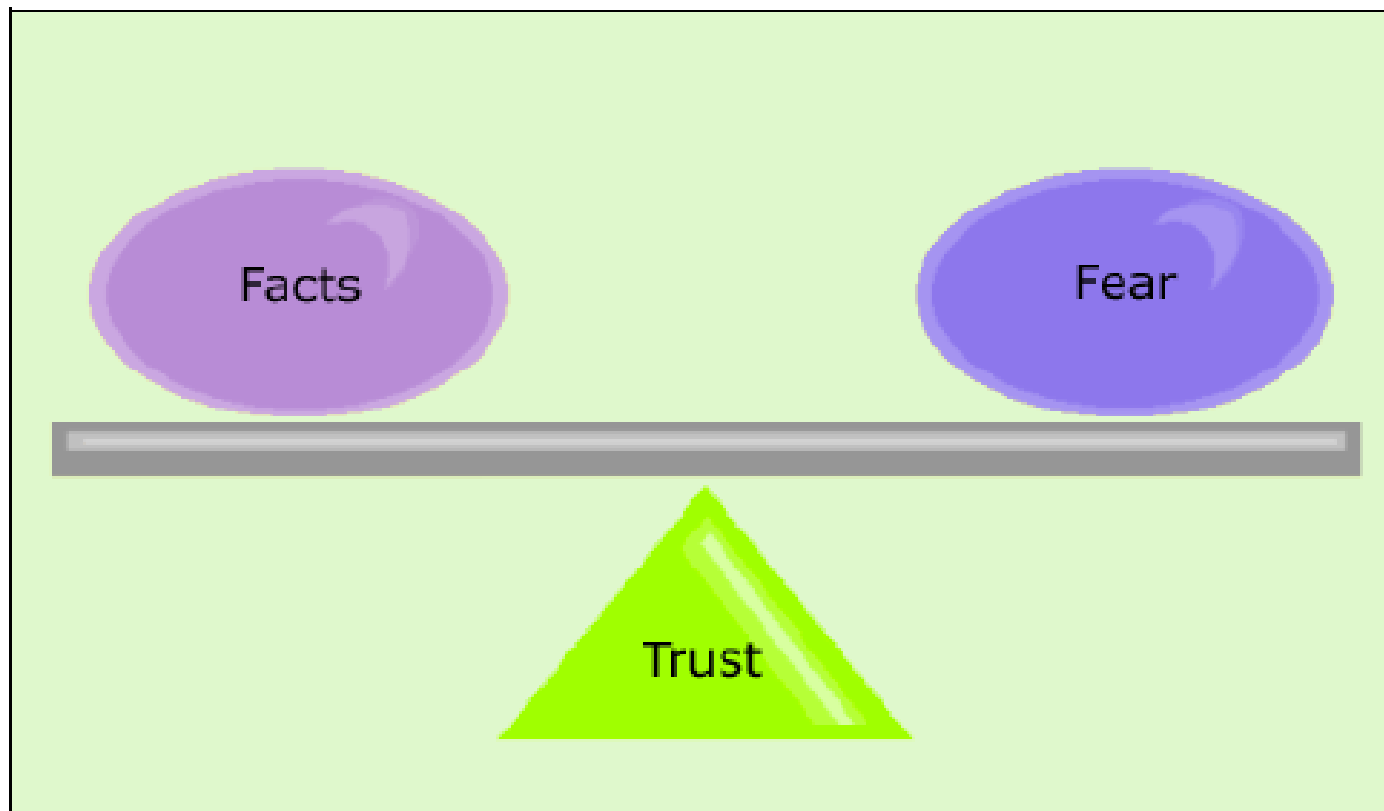


[SOURCE] The Tolerability of Risk from Nuclear Power Stations, HSE, 1992

Considering communication on risks

1. Who is talking?

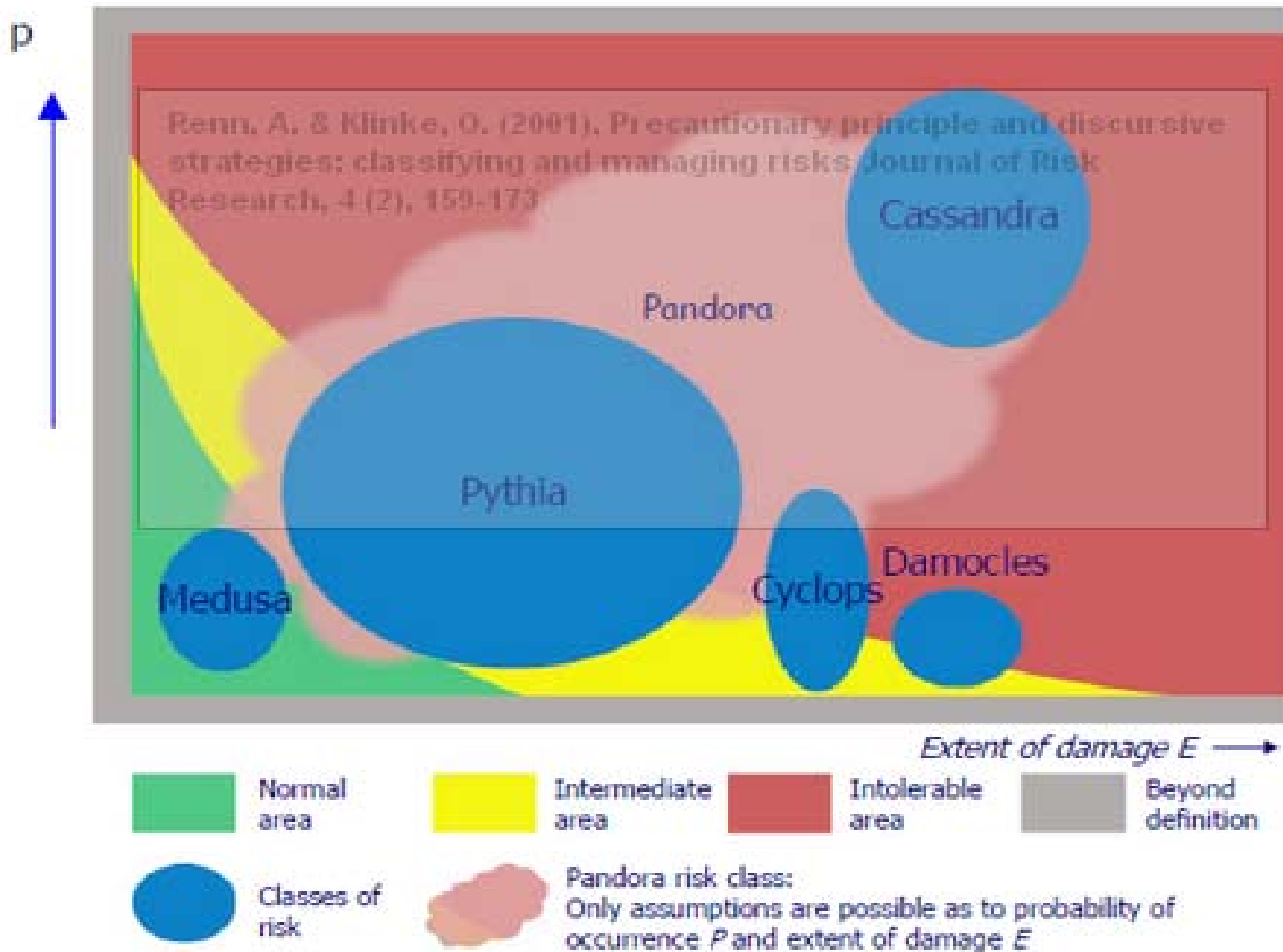
Trust, credibility and mindfulness (responsible use and caring people)



Source: Canadian Food Inspection Agency

Considering communication on risks

2. Difficulty of talking about ‘**Damocles risk**’ (LPHC risk)
 - How the 15 traits of risk perception apply to nuclear?
3. Severe Accident dominates the risk arising from nuclear power
 - *“Probability is low enough”*
 - Agree?, given TMI, Chernobyl, Fukushima
and natural hazard with high uncertainties in probability
 - *“Damocles risks be avoided as much as possible”*
 - efforts for *“benign consequence”* & for resilience
 - ✓ Avoidance of environmental impact (spill, land contamination) and other societal costs
 - ✓ “Prepared to unexpected”
4. No power generation technology is free from risk →
 - **Comprehensive comparative assessment** of risks arising from the use of energy could help capture a big picture



[SOURCE] Andreas Klinke and Ortwin Renn, "Precautionary principle and discursive strategies: classifying and managing risks", *Journal of Risk Research*, Volume 4, Issue 2, 2001

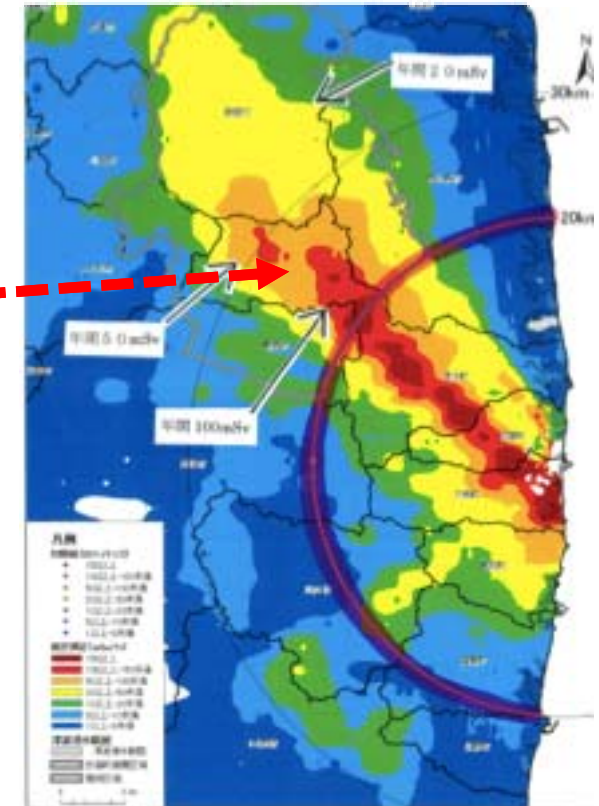
Estimated release fraction to the environment

	Noble gas (Xe-133)	I-131	Cs-137
Half life	Very short	8 days	30 years
Unit 1	100%	0.9%	0.2%
Unit 2	65%	6%	2%
Unit 3	82%	0.3%	0.1%

[SOURCE] <http://www.meti.go.jp/press/2011/10/20111020001/20111020001.pdf>

Land contamination In N-W region

Possibly linked

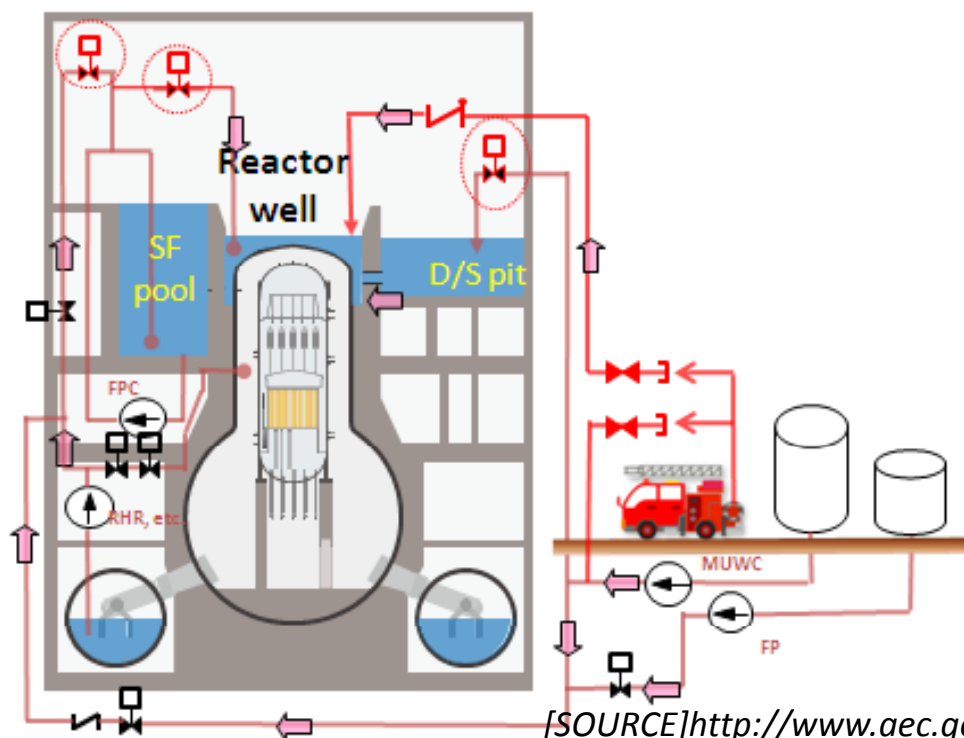


Filtered venting

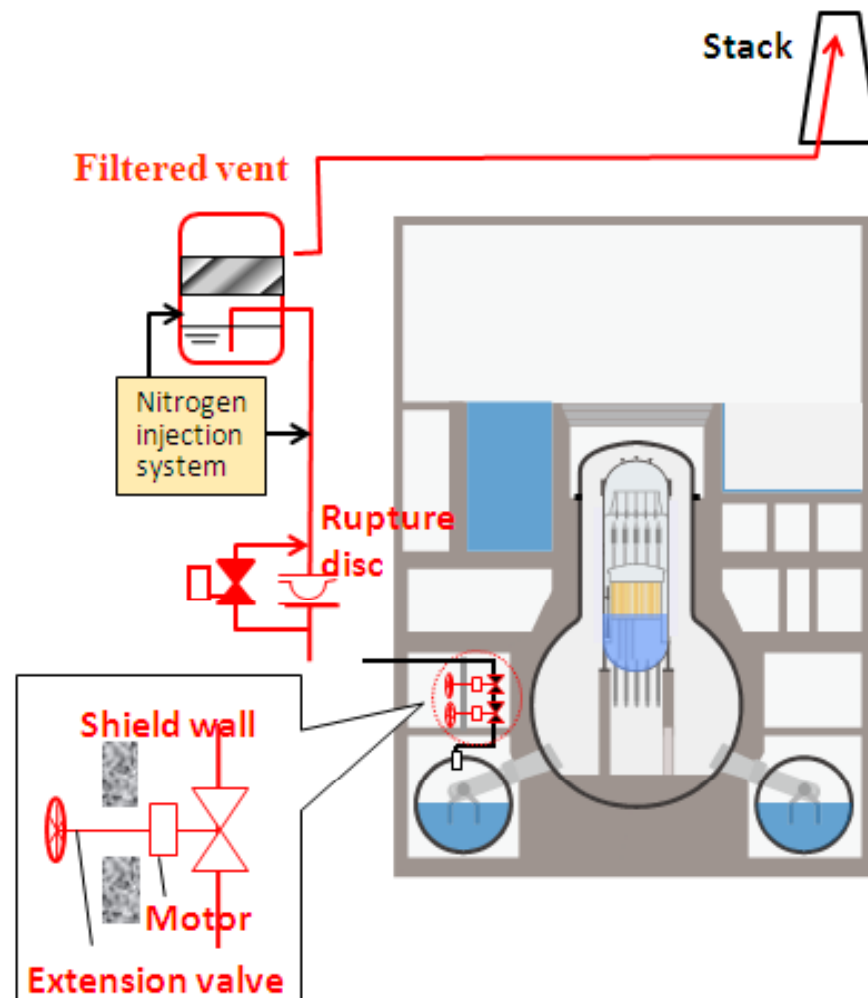
- ✓ Over-pressure protection
- ✓ Land contamination

External cooling of containment

- ✓ Over-temperature protection

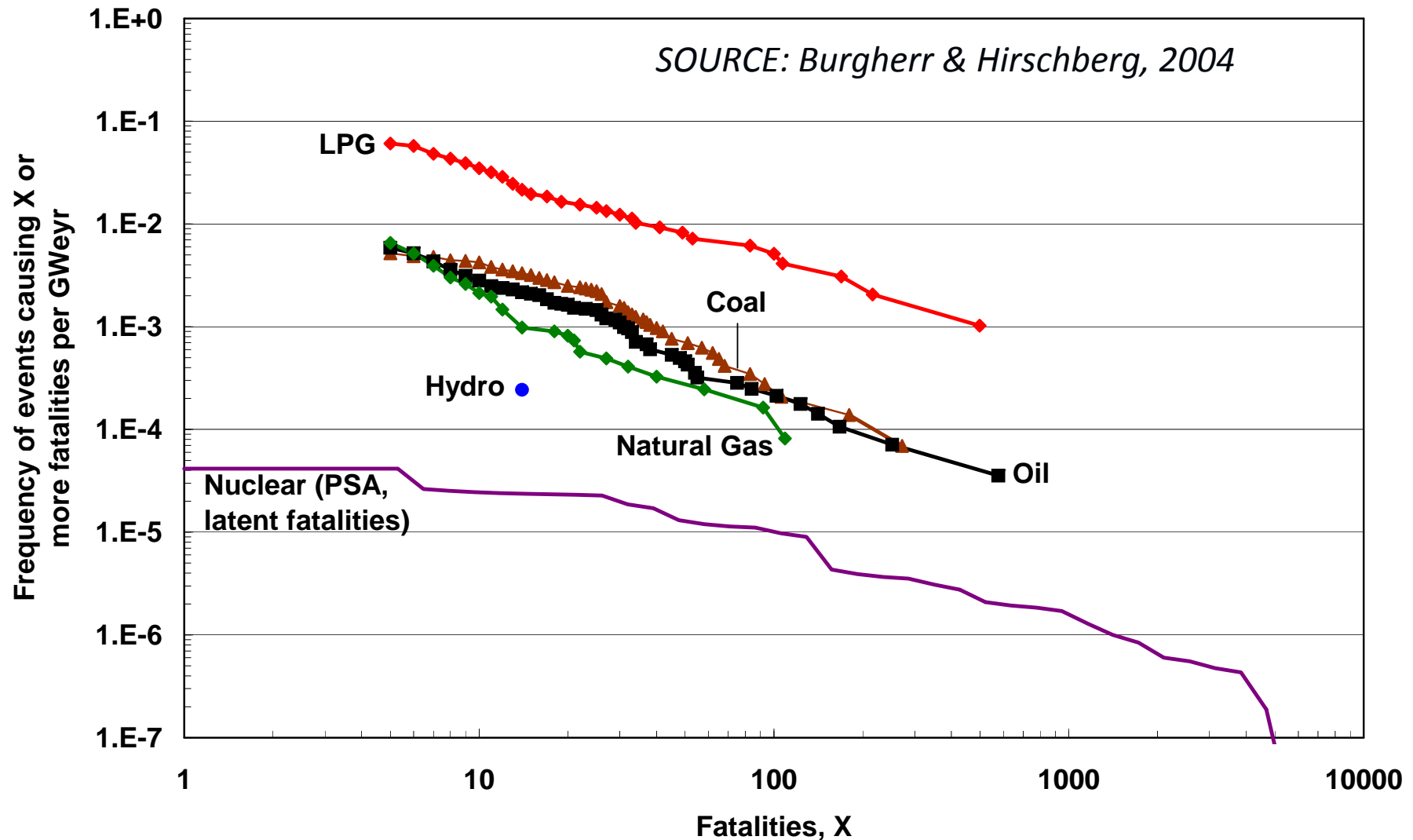


[SOURCE] <http://www.aec.go.jp/jicst/NC/tyoki/sakutei/siryoy/sakutei13/siryoy1-3.pdf>



Example of comparative assessment of risks arising from electricity generation by F-N curve

Frequency-Consequence Curves for Severe Accidents in Various Energy Chains, OECD countries, 1969-2000 (NE → latent only, Others → acute fatality)





Thank you for your attention