

# Lessons Learned from Deficits Analysis of Nuclear Risk Governance

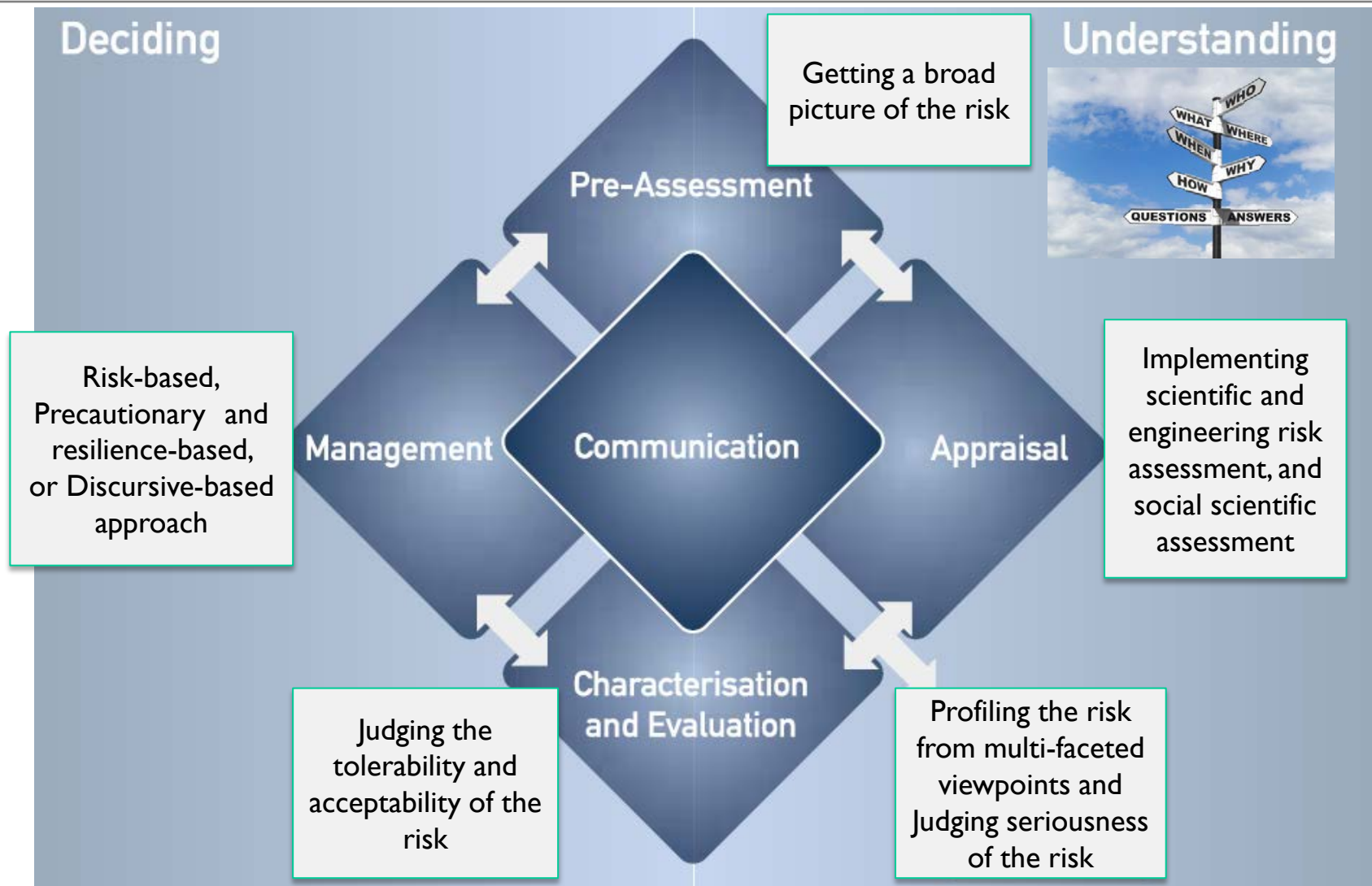
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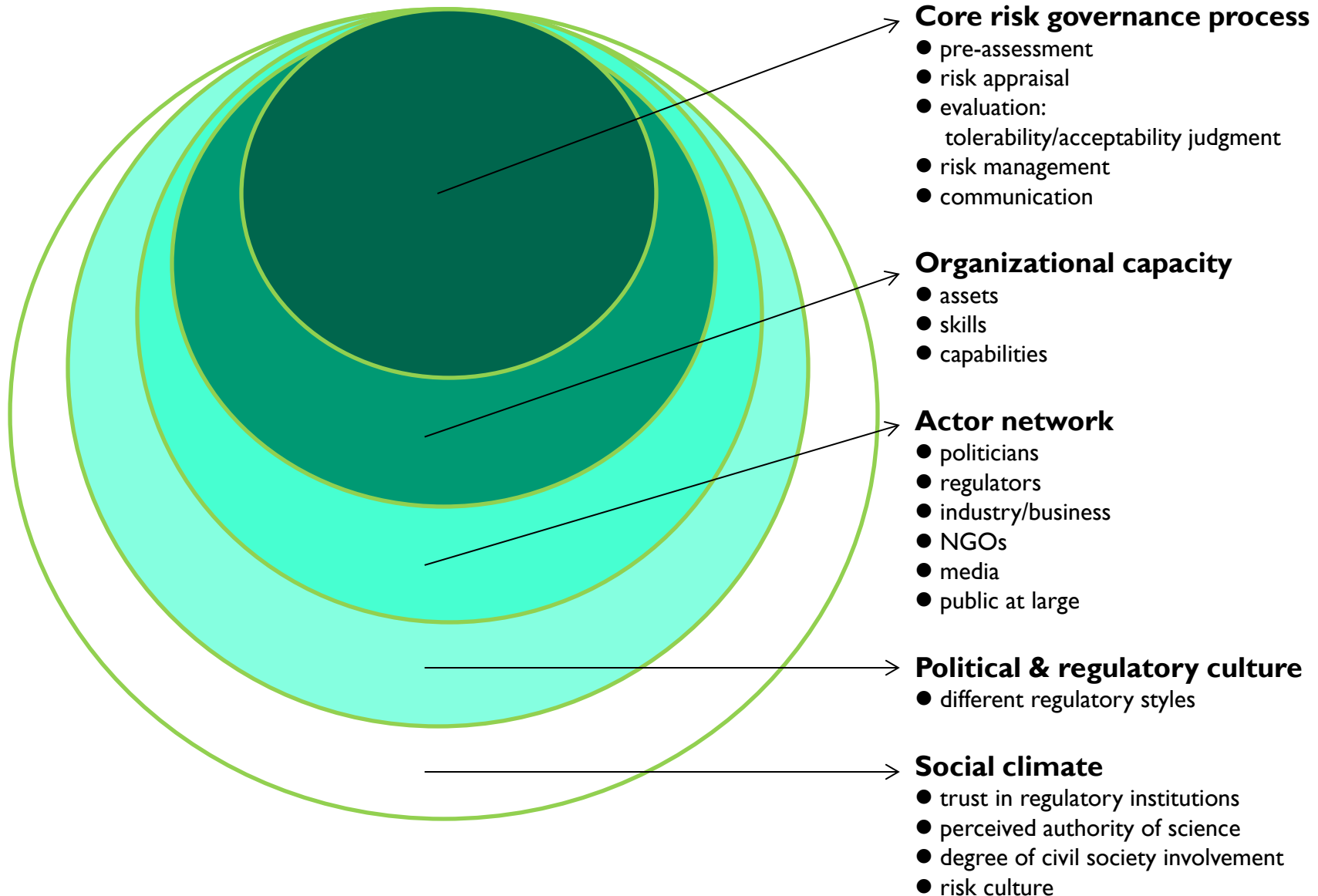


# Risk Governance Process



Source: An Introduction to the IRGC Risk Governance Framework, 2008

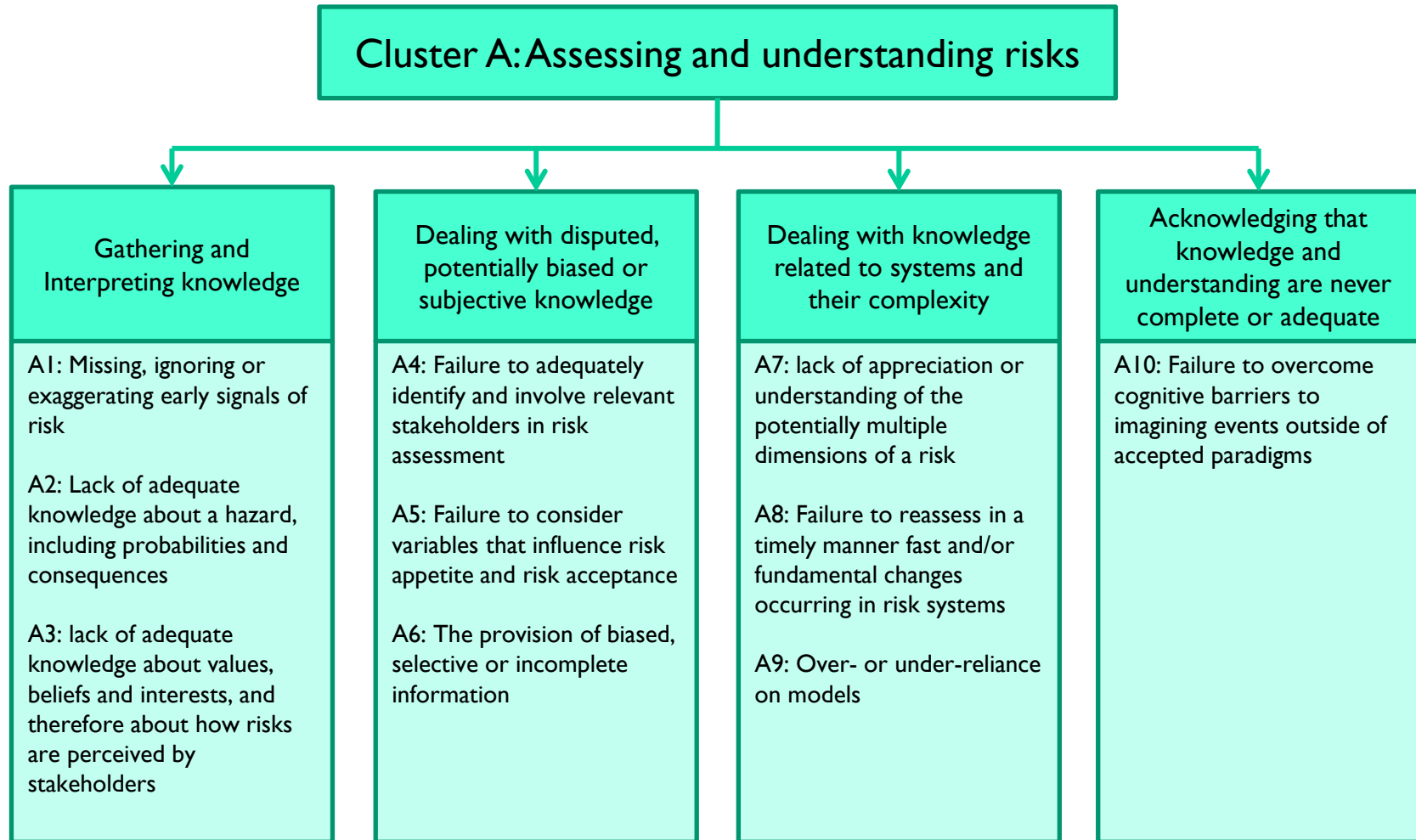
# Different dimensions of context affecting the risk governance process



# Risk Governance Framework: Assessment Sphere

- Knowledge generation
  - Needed to reduce complexity and uncertainty and to understand ambiguity
  - Needed to clarify the often confusing interactions between multiple sources of harm, what causes them to become risks, and their potential physical, social and economic consequences
  - Help to quantify the levels of risk to be experienced by different individuals and communities
  
- If knowledge exists but is not understood by decision-makers, stakeholders and the public, risk governance becomes highly vulnerable to error and unpredictability .
  
- Risk governance deficits emerge when the knowledge base is deficient or inadequate as the result of:
  - ✓ A lack of scientific evidence about the risk itself, or of the perceptions that individuals and organizations have of the risk;
  - ✓ Application of inappropriate methods, models or scenarios to derive this evidence;
  - ✓ Failure to understand or take account of available knowledge; and/or
  - ✓ Misuse of available knowledge, intentionally or unintentionally

# Deficits in Assessment Sphere



IRGC has identified the common deficits of risk governance that are defined as deficiencies (where elements are lacking) or failures (where actions are not taken or prove unsuccessful) in risk governance structures and processes.



# Deficits Observed in Assessment Sphere (Generation of Knowledge)

## Case: Emergency preparedness and response and Severe accident management of Nuclear Facilities

	Before Fukushima Nuclear Disaster					Comments
	Utilities	Regulatory Bodies (NISA/NSC)	Scientific & Engineering Professionals	Government (Cabinet/ METI)	Local Government & Residents	
A1: Missing and ignoring early signals of risk						False negatives and false positives in risk assessment and preventive actions against natural hazards, with the benefit of hindsight. The underlying problem is a failure of interdisciplinary communication.
A2: Lack of adequate knowledge about hazards and risks						Under constraint of safety myth, health/environmental/economic risks research of nuclear facility has been at a standstill during 1990s. Regulatory bodies and academia had not focused on safety research incl. social impact. The subject of PRA studies was internal events only.
A3: Lack of adequate knowledge about values, risk perception, interests						Nuclear fraternity had little concern on understanding of stakeholders' risk perception and importance of social sciences. Persuasion is first, only one-way communication without risk information.
A4: Stakeholder involvement in risk assessment						Same as A1. RA and risk policy making have been done by limited scientific experts, not considering interdisciplinary approach, improvement information input and conferment of legitimacy on the process.
A5: Failure to consider the acceptability of the risk						Strongly relevant to A2 and A3. NSC has drawn up nuclear safety goals (tentative) at last in 2003, but it has not been applied to risk decisions both in regulation and utility's safety management.
A6: Provision of biased, selective or incomplete information						Strongly relevant to A2 and A3. Nuclear fraternity has DAD (decide, announce, and defend) approach for promoting nuclear power with safety myth.
A7: Lack of understanding of complex system						This deficit is a root cause of A2, A3 and A4. Inward-looking and non-holistic management might hinder awareness of the systemic nature of many risks of critical infrastructure and economic system advancement.
A8: Failure to reassess in a timely manner fast and/or fundamental changes in systems						The organizational inertia, in particular, of electric utilities and governmental, organizations is la really large and decision-making takes time even if recognizing fundamental change or reaching at tipping point.
A9: Over- or under- reliance on models						Being influenced strongly by A10. Periodic drills in order to verify effectiveness and feasibility of nuclear emergency preparedness were based on the simplified model or scenario. SAM also remained only in name because of the existence of safety myth.
A10: Failure to overcome cognitive barriers to imaging potential surprises						Same as A2 and A5. Even if risk assessor was aware that such events could occur, they should downplay them, ignore them or be helpless in considering how to take them into account.

Color are used for our initial judgment: red corresponds to serious, yellow to considerable, green to slight.

	After Fukushima Nuclear Disaster					
	Utilities	Regulatory Bodies	Scientific Professionals	Government	Local Government & Residents	Comments
A1: Missing and ignoring early signals of risk	Yellow to Red	Red	Yellow to Red	Yellow	Green	Widening gap of risk sensitivity within each sector such utility companies, professionals and local residents
A2: Lack of adequate knowledge about hazards and risks	Yellow to Red	Red	Yellow to Red	Yellow	Green	Regulators focus on technological safety measures without taking into consideration prioritization in terms of effective risk reduction
A3: Lack of adequate knowledge about values, risk perception, interests	Yellow to Red	Red	Yellow	Yellow to Red	Green	Failure to understand what local stakeholders, especially fishermen's cooperative, want to say and concern in the context of onsite contaminated water problem. NRA pursues only scientific rationality and validation. "risk is interdisciplinary phenomenon and social", but they are still poorly understood.
A4: Stakeholder involvement in risk assessment	Yellow	Yellow to Red	Yellow to Red	Green to Yellow	Green	In regulatory examination process of seismic risks of NPS, someone points out a biased or arbitrary selection of the experts. Additional safety enhancement is based on a unilateral decision by the utility, not reflected local stakeholders' voices in the decision
A5: Failure to consider the acceptability of the risk	Yellow to Red	Red	Yellow	Green to Red		Same as A3. "risk is interdisciplinary phenomenon and social", but they are still poorly understood.
A6: Provision of biased, selective or incomplete information	Yellow to Red	Red	Yellow	Yellow to Red	Green	Utilities, NRA and the Government say "risk communication is important!", but they still apply DAD approach. Their understanding of what information are needed are probably insufficient due to A3 and A4.
A7: Lack of understanding of complex system	Red	Yellow to Red	Yellow	Red	Yellow	Not improve at all. Inward-looking, short and narrow perspective horizon are dominant in the way of thinking of decision-makers who face a tough problem of NPS restarting.
A8: Failure to reassess in a timely manner fast and/or fundamental changes in systems	Yellow to Red	Green to Red	Green to Red	Red	Green	Root cause is a loss of public trust to utilities, regulators and decision-makers. They also hesitate to take actions proactively. They are trapped in a vicious circle.
A9: Over- or under- reliance on models	Yellow	Yellow	Yellow	Yellow	Green	NRA introduced operational criteria in emergency plan and response without relying heavily on simulation or multiple judgments and both.
A10: Failure to overcome cognitive barriers to imaging potential surprises	Red	Red	Yellow to Red	Yellow to Red	Yellow	Utilities, NRA and the Government scarcely consider improvement of crisis management capabilities such as the red teaming. "Think the unthinkable!" is only slogan.

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# Risk Governance Framework: Management Sphere

- Both the public and private sectors play important roles in risk management although they have different objectives and perspectives. Each has separate responsibilities, but the effective management of many systemic risks requires cohesion between them.
- They are also prone to some similar deficiencies.
  - ✓ Pressures to address near-term concerns are prevalent in both sectors.
  - ✓ The scope for action of politicians may be shaped by electoral cycles, while corporate actors are constrained by pressure from shareholders to maximize profits and short-term shareholder value.
  - ✓ Even leaders of NGOs dedicated to long-term causes may focus on short-term publicity to bolster their visibility and acquire an edge in fundraising and political influence.
- A pervasive challenge in risk management is to bring some long-term perspective to bear on risks when the pressures to focus on near-term concerns are powerful. This is heavily influenced by an **organization's risk culture**.

# Risk Culture

- Risk culture refers to a set of beliefs, values and practices within an organization regarding how to assess, address and manage risks.
- A major aspect of risk culture is how openly risks can be addressed and information about them shared among a risk community.
- *“The norms of behavior for individuals and groups within an organization that determine the collective ability to identify, understand, openly discuss, and act on the organization’s current and future risks.”*

-Levy, Lamarre, & Twining 2010

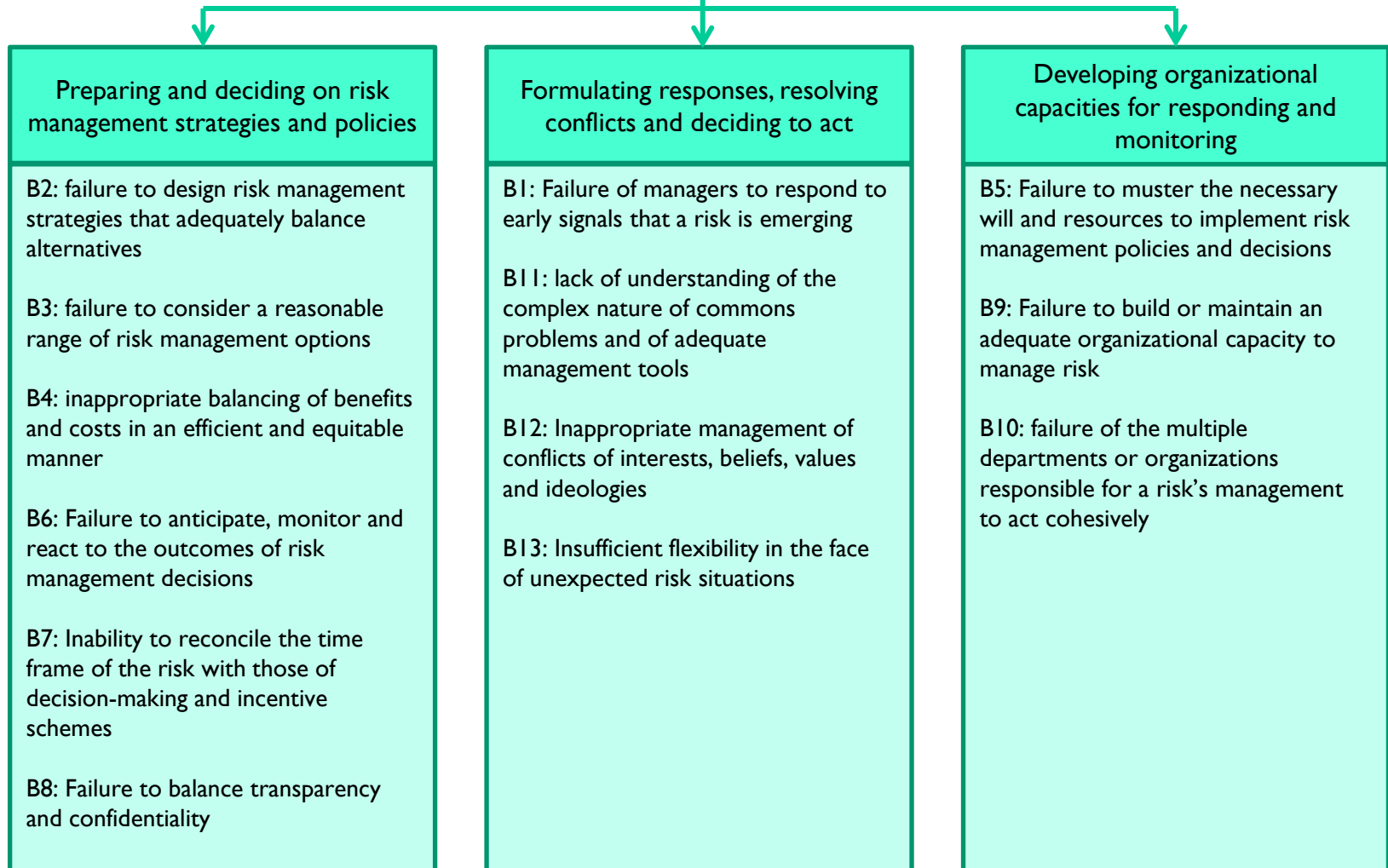
## Ref. Safety Culture

“assembly of characteristics and attitudes in organizations and individuals which establishes that, as an overriding priority, nuclear plant safety issues receive the attention warranted by their significance.” (IAEA-INSAG)

- Safety culture is reflection of risk awareness. (SwissRe)

# Deficits in Management Sphere

## Cluster B: Managing risks



# Deficits Observed in Management Sphere (Decision & Implementation)

## Case: Emergency preparedness and response and Severe accident management of Nuclear Facilities

	Before Fukushima Nuclear Disaster					Comments
	Utilities	Regulatory Bodies (NISA/NSC)	Scientific & Engineering Professionals	Government (Cabinet/ METI)	Local Government & Residents	
B1: Failure to respond to early signals of risk	Red	Yellow	Yellow	Green		Both utilities and regulatory bodies were unwilling to know risk signals when they contradicted with the existing plan or objectives even if they were certain warning signals. Lack of risk culture in organizations was fatal and led postponement of countermeasures. Paralysis by analysis.
B2: Failure to design balanced RM strategies	Red	Yellow		Green		TEPCO's executive failed strategic decision of trade-off between short-term loss of power supply due to SAM preparation and potential long-term liability risks. Strongly relevant to B7.
B3: Failure to consider a reasonable RM options	Red	Yellow		Green		Same as B2. TEPCO has neglected an entire set of SAM options such as those that aim to build redundancies and resilience into systems because of complacency and not well-understanding of precautionary approach. Regulatory bodies also had same awareness
B4: Inappropriate balancing of B&C in efficient and equitable manner	Red	Yellow		Green		So far both utilities and regulatory bodies had not carried out explicitly risk-cost-benefit analyses at all for designing emergency preparedness and SAM due to A2.
B5: Failure to muster the will and resources to implement RM decisions	Red	Red	Green	Yellow	Green	The underlying deficit of other deficits. SAM was a voluntary action that NISA gave order in the form of administrative guidance (not legally binding). The regulatory bodies, however, have not prepared any system to follow through utilities' voluntary actions.
B6: Failure to anticipate, monitor and react to the outcomes of RM decisions	Yellow	Red		Green	Green	Both utilities and regulatory bodies have not learned seriously from emergency drills and SAM exercises at all that what type of effects were accompanied by decisions in drills and exercises, and what were the intended or unintended consequences.
B7: Inability to reconcile the time frame of risk with incentive schemes	Red	Yellow		Green		Same as B2. Recognition of corporate risks of nuclear power utilities has been changing since the early 1990's because of prioritizing economic competitiveness.
B8: Failure to balance transparency and confidentiality	Red	Red	Green	Red	Green	Desire to avoid public panic and lawsuits may justify a prioritization of confidentiality over transparency. No recognition about the necessity of interdepartmental consultation on contradictory and complementary demands between nuclear safety and security assurance. An inaction of B.5.b was a typical example.

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	Before Fukushima Nuclear Disaster					
	Utilities	Regulatory Bodies (NISA/NSC)	Scientific & Engineering Professionals	Government (Cabinet/ METI)	Local Government & Residents	Comments
B9: Failure to build or maintain an adequate organizational capacity to manage risks						Both utilities and regulatory bodies had little awareness about the value of building organizational risk management capability, although they had no problems of assets such financial and human resources. "Safety first" fizzled out. They may have not understood more specific the meaning of the word of "safety culture" under a spell of safety myth.
B10: Failure of the multiple departments or organizations responsible for RM						Situations such overlapping shared or unclear responsibilities, with poor communication and cooperation could be observed in the relationships among METI (former MITI)-NISA-MEXT (former STA)-NSC=cabinet. Nuclear power department in utility, is a scared department with original culture and behavioral principles, could be an obstacle for dealing with complex risks cohesively as an organization.
B11: Lack of understanding of the complex nature of commons problems						Relevant to A2 and A3. In the deliberative process for drawing up the safety goals for operating nuclear facility by the NSC, environmental externalities such as land and sea contaminations by radioactive materials released from nuclear severe accident have not been taken into account.
B12: Inappropriate management of conflicts of interests and ideologies						Same as B9. Capabilities of communicating and consulting with stakeholders, which are important element of organizational capability and underpin sound governance of risk, were of critical deficiency.
B13: Insufficient flexibility in the face of unexpected risk situations						Scenarios with the unexpected situations have never been adopted even if in the drill of emergency preparedness. Utilities, regulatory bodies and governments lost any opportunities of building capabilities of adaptation and resilience against extreme emergency situations.

# Deficits Observed in Management Sphere (Decision & Implementation)

## Case: Emergency preparedness and response and Severe accident management of Nuclear Facilities

	After Fukushima Nuclear Disaster					Comments
	Utilities	Regulatory Authority	Scientific Professionals	Government	Local Government & Residents	
B1: Failure to respond to early signals of risk	Red	Yellow	Yellow	Green		Widening gap of risk sensitivity within and among sectors. Being influenced strongly by dealing with B5.
B2: Failure to design balanced RM strategies	Red	Yellow		Green		Being implemented safety improvement according to new regulatory requirements that reflected technological lessons learned from the Fukushima and international standards. But nobody consider a holistic risk management strategy including societal resilience yet.
B3: Failure to consider a reasonable RM options	Red	Yellow		Green		Relevant to B2, safety improvement measures done by the utilities are not exactly based on a holistic examination of risk reduction that includes creation of options to meet regulatory requirements and analysis of tradeoff of the options etc. NRA does not provide the utility with incentive to consider a reasonable options.
B4: Inappropriate balancing of B&C in efficient and equitable manner	Red	Yellow		Green		Relevant to B2 and B3. Both utilities and NRA don't still show explicitly the results of risk-cost-benefit analysis relating to policy-making on emergency preparedness and response and SAM.
B5: Failure to muster the will and resources to implement RM decisions	Red	Red	Green	Yellow	Green	Utilities and nuclear industry set about improving voluntarily and continuously nuclear safety through reinforcement of organizational risk management, establishment of Nuclear Risk Research Center etc.
B6: Failure to anticipate, monitor and react to the outcomes of RM decisions	Yellow	Red		Green	Green	NRA decided the back-fit rule of new regulatory requirements, but doesn't still conduct the regulatory impact assessment that is implemented in US, UK and EU.
B7: Inability to reconcile the time frame of risk with incentive schemes	Red	Yellow		Green		Same as B2. Risk environment the utility's management faces will be more complex according to the course of the reform of electric power industry and policy-making of climate change.
B8: Failure to balance transparency and confidentiality	Red	Red	Green	Red	Green	No recognition about the necessity of interdepartmental consultation on contradictory and complementary demands between nuclear safety and security assurance.
B9: Failure to build or maintain an adequate organizational capacity to manage risks	Red	Red		Yellow	Green	NRA obtained the required number of staff by consolidating JNES. Challenges ahead are to enhance skill, expertise and capacity of staffs based on the identification of core capabilities needed in regulatory activities. Utilities also are in same situation.



	After Fukushima Nuclear Disaster					
	Utilities	Regulatory Authority	Scientific Professionals	Government	Local Government & Residents	Comments
B10: Failure of the multiple departments or organizations responsible for RM	Yellow	Red to Yellow	White	Red to Yellow	Green	Institutional reform in regulatory activities resulted in improvement to some extent. However, NRA seems to exaggerate their “independency” and not to build frank dialogue with other department in the government. Whole-of-government approach for extreme emergency is a big issue. In utility’s case, depends on dealing with B5.
B11: Lack of understanding of the complex nature of commons problems	Yellow	Red	Green	Yellow	Green	Relevant to A2 and A3. Looking at activities for managing the contaminated water issues at the Fukushima Daiichi site, TEPCO, NRA and the Government still have this deficit. Little awareness about problem of environmental externalities.
B12: Inappropriate management of conflicts of interests and ideologies	Yellow	Yellow	White	Yellow	Green	Capabilities of communicating and consulting with stakeholders, which are important element of organizational capability and underpin sound governance of risk, don’t improve yet.
B13: Insufficient flexibility in the face of unexpected risk situations	Red to Yellow	Red to Yellow	Yellow	Red to Yellow	Yellow	It starts to try emergency drills incorporated scenarios with the unexpected situations and/or multiple disasters. It is not explicitly intend to have any opportunities of building capabilities of adaptation and resilience against extreme emergency situations.

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# Awareness and Behavior Behind Deficits

- Attitude that justifying and maintaining the present situation
  - To keep consistently past explanation on safety assurance and policy to local government and residents,
  - To reduce or avoid too much impacts to the operating power plants and lawsuit against permission of nuclear facility installation (keeping infallibility of regulation)
- Following the precedent
- Stopgap solution syndrome, Putting off the essential problem
- Only formality; Plowing the field, don't forget the seed.
- Spread of moral hazard of the thought, Willful blindness,
- Inward and narrow perspective

# Concluding Remarks

- In knowledge generation sphere, it can be observed that all of the deficits existed in not only both utility companies and regulatory bodies but also the community of scientific and engineering professionals. Lack of understanding of complex societal system with high interconnectivity would be relevant to other deficits.
- In decision and management sphere, there were many grave deficits in both utility companies and regulatory bodies. Specifically, failures to build or maintain an adequate organizational risk management capability and to muster the will and resources to implement risk management decisions were crucial.
- After the Fukushima a few deficits are slightly corrected, but critical deficits are the status quo. Rather it seems that some deficits are getting worse.
- Most serious deficit is a lack and/or dysfunction of interface for communication and deliberation among policy-makers and the public about social justification of nuclear energy use. Both utility companies and regulatory authority do not get out of a narrow perspective such technological safety yet.

- “The major risks are social”, but they are still poorly understood. Risk is a highly interdisciplinary phenomenon and it takes an integrated view from all of different perspectives to get it right.
- Many nuclear-related problems we face never can be technologically fixed, or rather these are likely to be able to solve by changing to societal mechanism enabling collaborative processes for knowledge generation, informed decision-making and so on.
- Challenges ahead for nuclear community are to dare make corrective actions to deal with the deficits of risk governance, build a new societal mechanism in collaboration with stakeholders, and operate it under transparently where social responsibilities lay. There is “no one-size-fits-all” approach to gain societal trust. The first step toward the reform depends entirely upon the nuclear community's will.