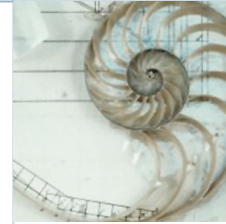




RISK GOVERNANCE:
Towards an Integrative Framework



Davos
August 29, 2006

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DIALOGIK gGmbH

STRUCTURE OF TALK



- Characterization of Risk
- The IRGC Risk Governance Model
- Application to Risk Management Strategies and Policy Making
- Lessons for Stakeholder Participation
- Conclusions

GENERIC RISK CHARACTERISTICS: THREE CHALLENGES OF RISK MANAGEMENT

- **Complexity** in assessing causal and temporal relationships

- **Uncertainty**
 - variation among individual targets
 - measurement and inferential errors
 - genuine stochastic relationships
 - system boundaries and ignorance

- **Ambiguity** in interpreting results
 - Interpretative ambiguity (What does it mean?)
 - Normative ambiguity (Is it tolerable?)

PURPOSE OF THE IRGC FRAMEWORK

- Facilitate terminological and conceptual clarity, consistency and transparency in the daily operations of the IRGC and beyond
- Assure the feasibility of comparative approaches in the governance of risks across a broad range of hazardous events and activities
- Foster IRGC's provision of scientifically sound, economically feasible, legally and ethically justifiable and politically acceptable advice to its targeted audience

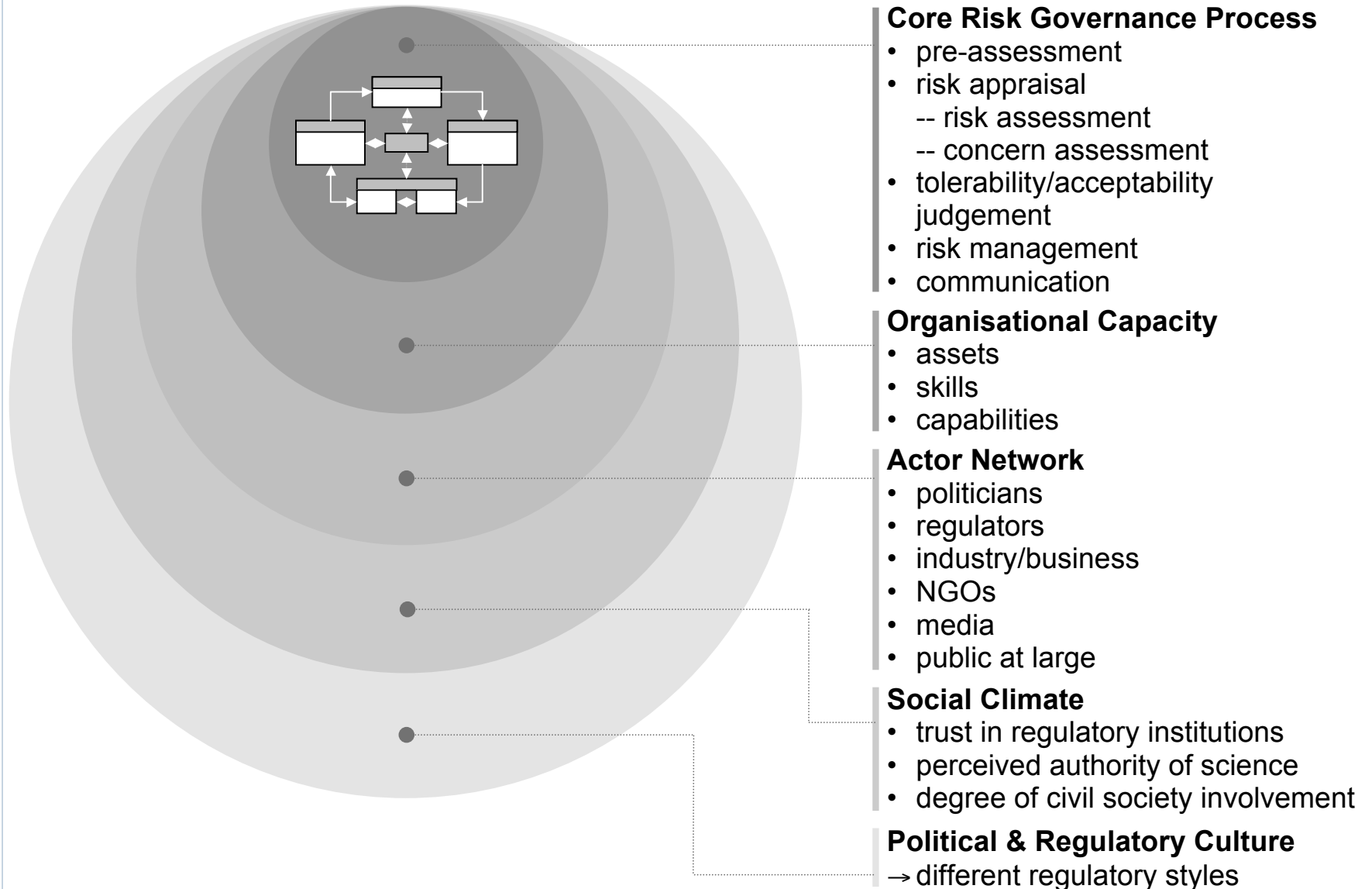
Model of IRGC

- International Risk Governance Council in Geneva
- White Paper on Risk Governance
 - Comparisons of international and national risk taxonomies
 - Development of a consistent and overarching framework
 - Emphasis on risk governance
- CDs available with White Paper
 - Contact me after the talk
 - I have 80 copies with me
 - Available on the web: www.irgc.org

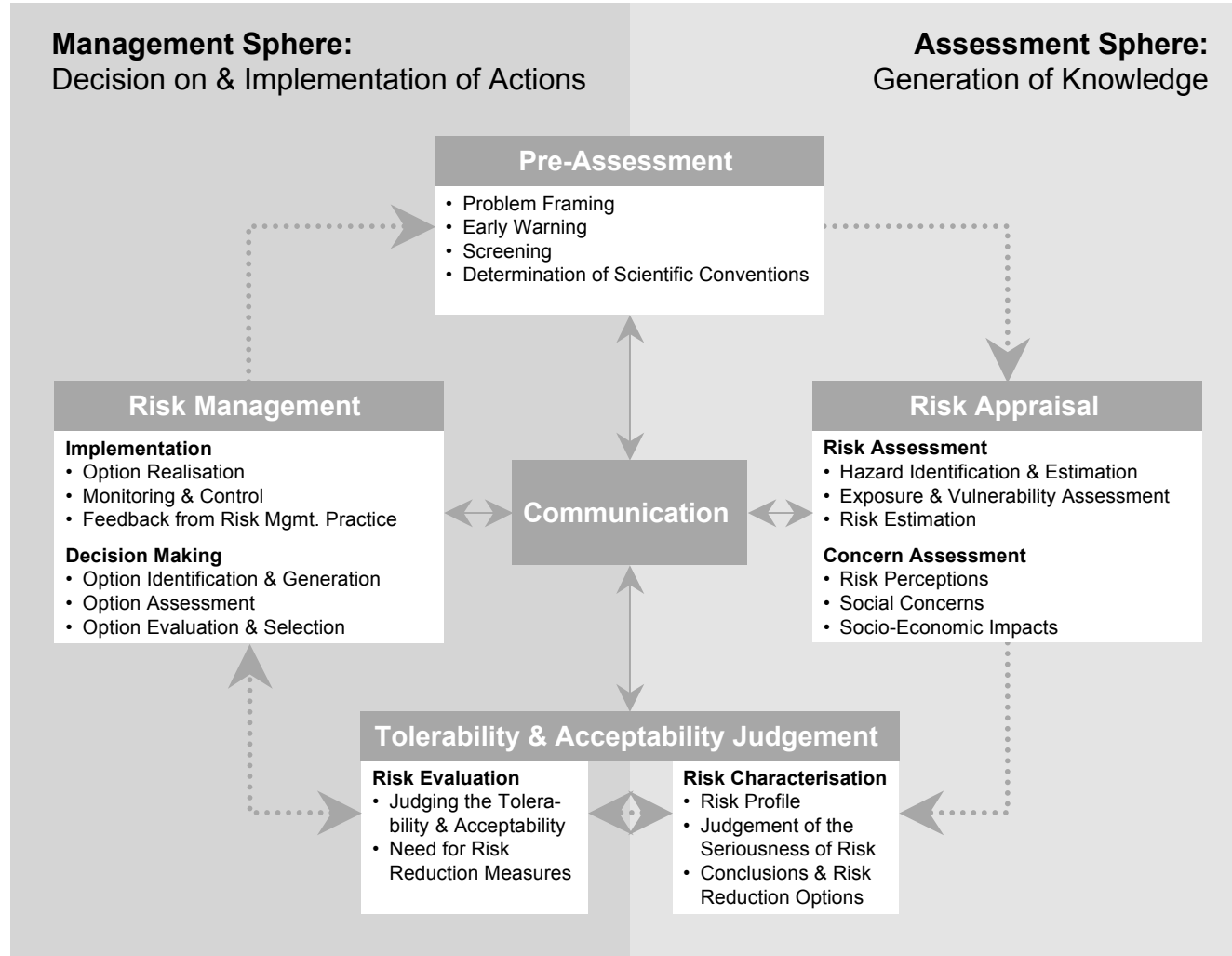
LIST OF HAZARDS COVERED BY IRGC FRAMEWORK

Physical Agents	<ul style="list-style-type: none"> ■ Ionising radiation ■ Non-ionising radiation ■ Noise (industrial, leisure, etc.) ■ Kinetic energy (explosion, collapse, etc.) ■ Temperature (fire, overheating, overcooling) 	Natural Forces	<ul style="list-style-type: none"> ■ Wind ■ Earthquakes ■ Volcanic activities ■ Drought ■ Flood ■ Tsunamis ■ (Wild) fire ■ Avalanche
Chemical Agents	<ul style="list-style-type: none"> ■ Toxic substances (thresholds) ■ Genotoxic/carcinogenic substances ■ Environmental pollutants ■ Compound mixtures 	Social-communicative Hazards	<ul style="list-style-type: none"> ■ Terrorism and sabotage ■ Human violence (criminal acts) ■ Humiliation, mobbing, stigmatising ■ Experimentation with humans (such as innovative medical applications) ■ Mass hysteria ■ Psychosomatic syndromes
Biological Agents	<ul style="list-style-type: none"> ■ Fungi and algae ■ Bacteria ■ Viruses ■ Genetically modified organisms ■ Other pathogens 	Complex Hazards (Combinations)	
<ul style="list-style-type: none"> ■ Food (chemical and biological) ■ Consumer products (chemical, physical, etc.) ■ Technologies (physical, chemical, etc.) 		<ul style="list-style-type: none"> ■ Large constructions such as buildings, dams, highways, bridges ■ Critical infrastructures (physical, economic, social-organisational and communicative) 	

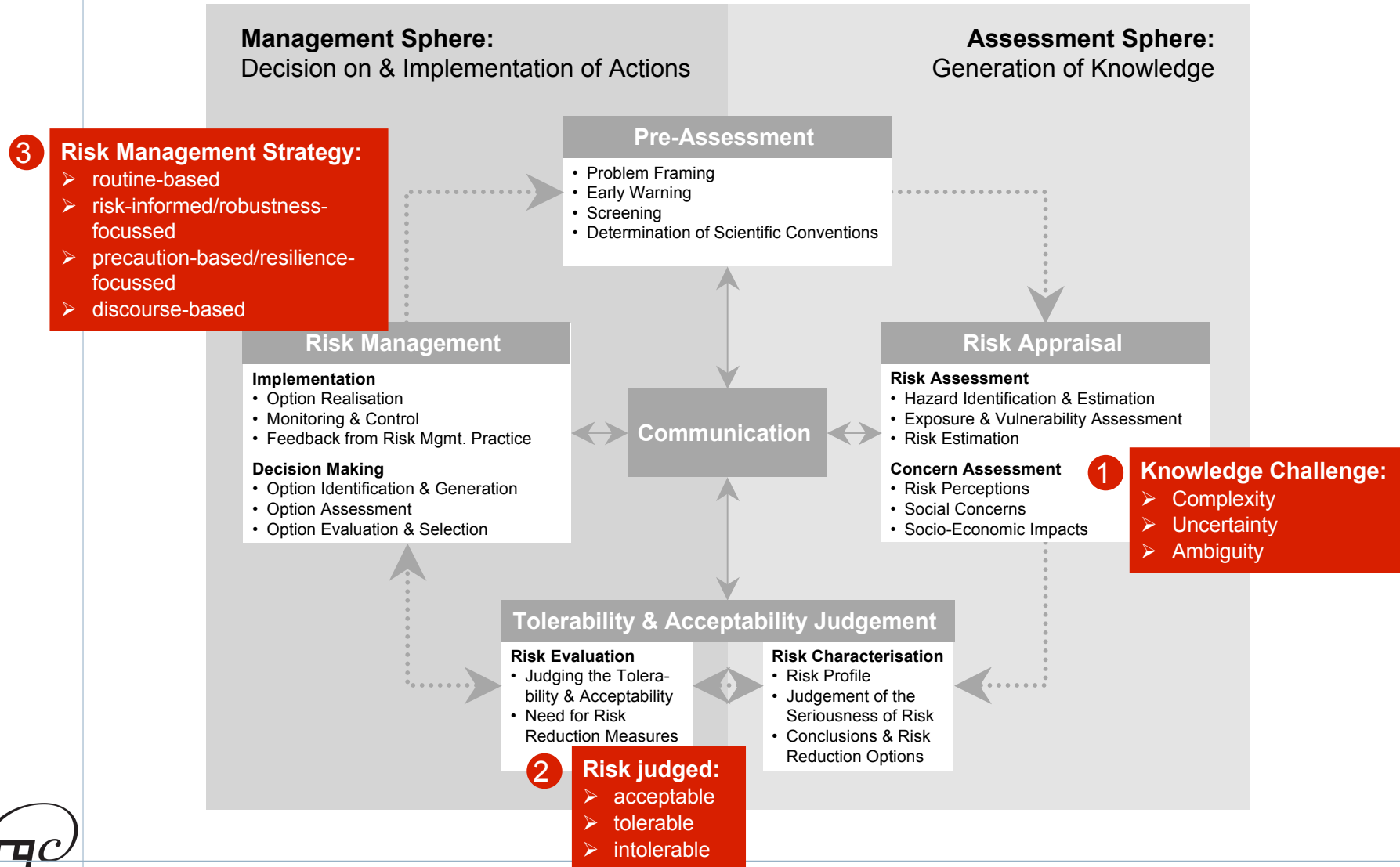
IRGC RISK GOVERNANCE FRAMEWORK (I/III): OVERVIEW



IRGC RISK GOVERNANCE FRAMEWORK (II/III): CORE PROCESS



IRGC RISK GOVERNANCE FRAMEWORK (III/III): ESSENTIAL DISTINCTIONS WITHIN THE CORE PROCESS



COMPONENTS OF PRE-ASSESSMENT

Pre-Assessment Components	Definition	Indicators
1 Problem framing	Different perspectives of how to conceptualize the issue	<ul style="list-style-type: none"> ■ dissent/consent on goals of selection rule ■ dissent/consent on relevance of evidence ■ choice of frame (risk, opportunity, fate)
2 Early warning	Systematic search for new hazards	<ul style="list-style-type: none"> ■ unusual events or phenomena ■ systematic comparison between modeled and observed phenomena ■ novel activities or events
3 Screening (risk assessment and concern assessment policy)	Establishing a procedure for screening hazards and risks and determining assessment and management route	<ul style="list-style-type: none"> ■ screening in place? ■ criteria for screening: hazard potential, persistence, ubiquity, etc. ■ criteria for selecting risk assessment procedures for: known risks, emergencies, etc. ■ criteria for identifying and measuring social concerns
4 Scientific conventions for risk assessment & concern assessment	Establishing a procedure for screening hazards and risks and determining assessment and management route	<ul style="list-style-type: none"> ■ definition of NOAEL ■ validity of methods and techniques for risk assessments ■ methodological rules for assessing concerns

RISK APPRAISAL

■ Risk Assessment

- Hazard identification and estimation
- Exposure assessment
- Risk estimation

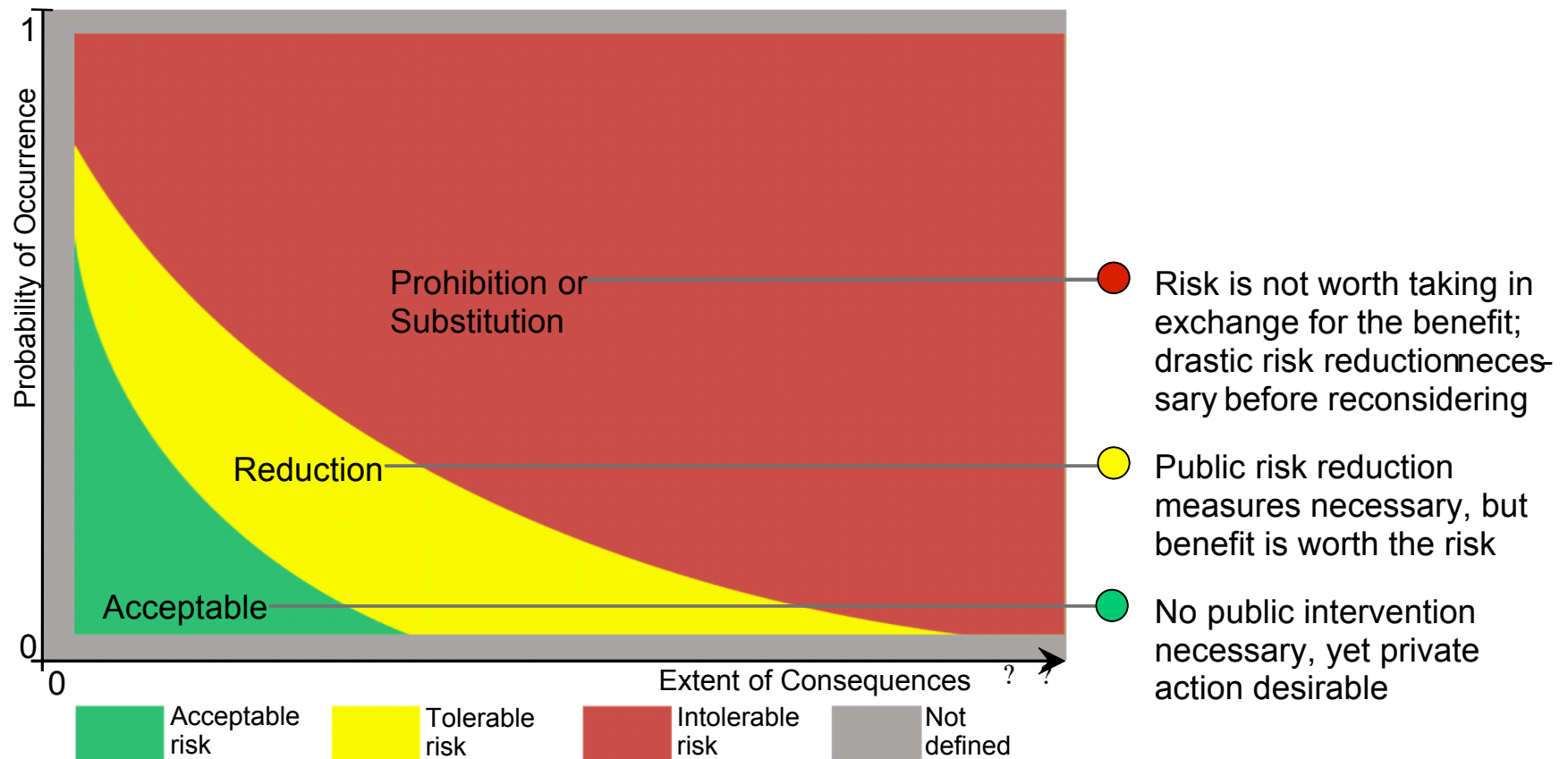
■ Concern Assessment

- Socio-economic impacts
- Economic benefits
- Public concerns (stakeholders and individuals)

COMPONENTS OF RISK ASSESSMENT

Assessment Components	Definition	Indicators
1 Hazard identification and estimation	Recognizing potential for adverse effects and assessing the strength of cause-effect relationships	<ul style="list-style-type: none"> ■ properties such as flammability, etc.: – persistence – irreversibility – ubiquity – delayed effects – potency for harm ■ dose-response relationships
2 Exposure / vulnerability assessment	Modeling diffusion, exposure and effects on risk targets	<ul style="list-style-type: none"> ■ exposure pathways ■ normalized behavior of target ■ vulnerability of target
3 Risk estimation	<ul style="list-style-type: none"> ■ <i>Quantitative</i>: probability distribution of adverse effects ■ <i>Qualitative</i>: combination of hazard, exposure, and qualitative factors (scenario construction) 	<ul style="list-style-type: none"> ■ expected risk value(s) (individual, collective) ■ xx% confidence interval ■ risk description ■ risk modeling as function of variations in context variables and parameters

ACCEPTABLE, TOLERABLE AND INTOLERABLE / NOT-ACCEPTABLE RISKS (TRAFFIC LIGHT MODEL)



TOLERABILITY / ACCEPTABILITY JUDGEMENT

Assessment Components	Definition	Indicators
1 Risk characterization	Collecting & summarizing all relevant evidence necessary for making an informed choice on tolerability/acceptability of the risk in question; suggesting potential options for dealing with the risk from a scientific perspective	
	a risk profile	<ul style="list-style-type: none"> ■ risk estimates ■ confidence intervals ■ uncertainty measures ■ hazard characteristics ■ range of 'legitimate' interpretations ■ risk perceptions ■ social and economic implications
	b judging the seriousness of the risk	<ul style="list-style-type: none"> ■ compatibility with legal requirements ■ risk-risk trade-offs ■ effects on equity ■ public acceptance
	c conclusions and risk reduction options	suggestions for: tolerable risk levels, acceptable risk levels, options for handling risks
2 Risk evaluation	Applying societal values and norms to the judgment on tolerability and acceptability and, consequently, determining the need for risk reduction measures	<ul style="list-style-type: none"> ■ choice of technology ■ potential for substitution / compensation ■ risk-benefit comparison ■ political priorities ■ conflict management ■ potential for social mobilization

COMPONENTS OF RISK MANAGEMENT

Assessment Components	Definition	Indicators
1 Option generation	Identification of potential risk handling options, in particular risk reduction, i.e. prevention, adaptation and mitigation, as well as risk avoidance, transfer and retention	<ul style="list-style-type: none"> ■ standards, voluntary agreements ■ performance rules ■ restrictions on exposure or vulnerability ■ economic incentives ■ compensation ■ insurance and liability ■ labels, information/education
2 Option assessment	Investigations of impacts of each option (economic, technical, social, political, cultural)	<ul style="list-style-type: none"> ■ effectiveness and efficiency ■ minimization of side effects ■ sustainability ■ fairness ■ legal and political implementability ■ ethical acceptability ■ public acceptance
3 Option evaluation and selection	Evaluation of options (multi-criteria analysis)	<ul style="list-style-type: none"> ■ assignment of trade-offs ■ incorporation of stakeholders & the public
4 Option implementation	Realization of the most preferred option	<ul style="list-style-type: none"> ■ accountability ■ consistency ■ effectiveness
5 Monitoring and feedback	<ul style="list-style-type: none"> ■ Observation of effects of implementation (link to early warning) ■ Ex-post evaluation 	<ul style="list-style-type: none"> ■ intended impacts ■ non-intended impacts ■ policy impacts

NEED FOR DIFFERENT RISK MANAGEMENT STRATEGIES

- dealing with routine, mundane risks
- dealing with complex and sophisticated risks (high degree of modeling necessary)
- dealing with highly uncertain risks (high degree of second order uncertainty)
- dealing with highly controversial risks (high degree of ambiguity)
- dealing with imminent dangers or crisis (need for fast responses)

RISK CHARACTERISTICS AND THEIR IMPLICATIONS FOR RISK MANAGEMENT (I/II)

Knowledge Characterisation	Management Strategy	Appropriate Instruments	Stakeholder Participation
1 'Simple' risk problems	<i>Routine-based:</i> (tolerability / acceptability judgement) (risk reduction)	→ Applying 'traditional' decision-making <ul style="list-style-type: none"> ■ Risk-benefit analysis ■ Risk-risk trade-offs ■ Trial and error ■ Technical standards ■ Economic incentives ■ Education, labelling, information ■ Voluntary agreements 	Instrumental discourse
2 Complexity-induced risk problems	<i>Risk-informed:</i> (risk agent and causal chain)	→ Characterising available evidence <ul style="list-style-type: none"> ■ Expert consensus seeking tools, such as Delphi or consensus conferencing, meta analysis, scenario construction ■ Results fed into routine operation 	Epistemological discourse
	<i>Robustness-focussed:</i> (risk absorbing system)	→ Improving buffer capacity of risk target via: <ul style="list-style-type: none"> ■ Additional safety factors ■ Redundancy and diversity in designing safety devices ■ Improving coping capacity ■ Establishing high reliability organisations 	

EXAMPLES: COMPLEXITY INDUCED RISKS

- Industrial plants with hazardous material
- Large dams
- Bridges and highways
- LNG Terminals
- Weapon complexes
- Dense settlements
- Classic infectious diseases
- Deterministic health risks (threshold)

RISK CHARACTERISTICS AND THEIR IMPLICATIONS FOR RISK MANAGEMENT (II/II)

Knowledge Characterisation	Management Strategy	Appropriate Instruments	Stakeholder Participation
3 Uncertainty-induced risk problems	<i>Precaution-based:</i> (risk agent)	<p>→ Using hazard characteristics such as persistence, ubiquity etc. as proxies for risk estimates</p> <ul style="list-style-type: none"> ■ Tools include: Containment, ALARA, BACT 	Reflective discourse
	<i>Resilience-focussed:</i> (risk absorbing system)	<p>→ Improving capability to cope with surprises</p> <ul style="list-style-type: none"> ■ Diversity of means to accomplish desired benefits ■ Avoiding high vulnerability ■ Allowing for flexible responses ■ Preparedness for adaptation 	
4 Ambiguity-induced risk problems	<i>Discourse-based:</i>	<p>→ Application of conflict resolution methods for reaching consensus or tolerance for risk evaluation results and management option selection</p> <ul style="list-style-type: none"> ■ Integration of stakeholder involvement in reaching closure ■ Emphasis on communication and social discourse 	Participative discourse

EXAMPLES: PRECAUTION- AND RESILIENCE-BASED MANAGEMENT

- “Green” biotechnology
- Internet sabotage
- New epidemics (new mutations)
- BSE
- Endocrine disruptors
- Extreme weather events due to global climate change

EXAMPLES: DISCOURSE-BASED MANAGEMENT

- “Red” biotechnology and genetic engineering
- “Industrial” food production
- Biochips for human implementation
- Electromagnetic fields
- Globalization of consumer technologies
- Projects of geo-engineering

THE RISK MANAGEMENT ESCALATOR AND STAKEHOLDER INVOLVEMENT

- **Function:** Allocation of risks to one or several of the four routes
- **Type of Discourse:** Design discourse
- **Participants:** A team of risk and concern assessors, risk managers, stakeholders and representatives of related agencies

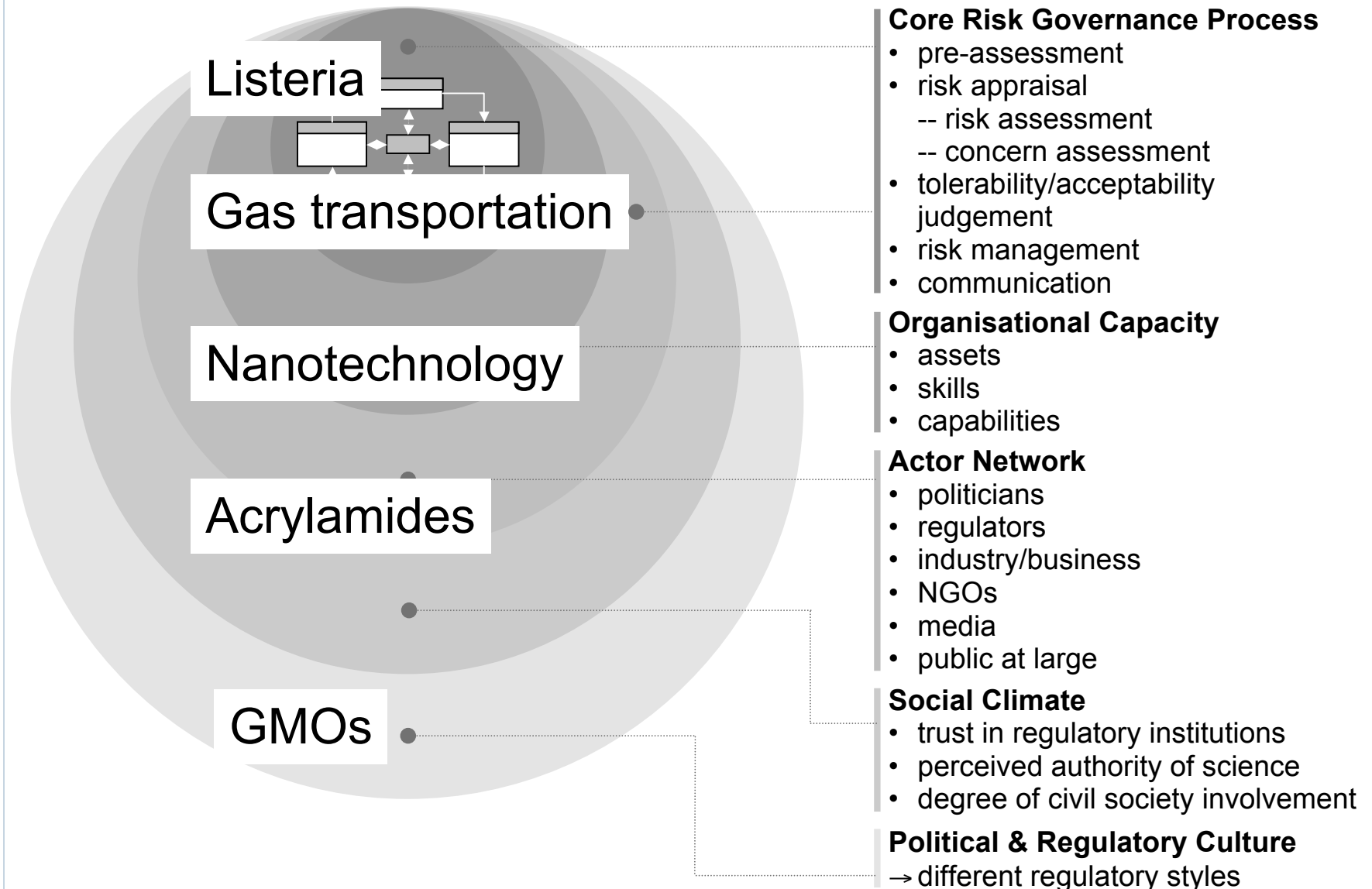
			<i>Risk Trade-off Analysis & Deliberation necessary</i> +Risk Balancing +Probabilistic Risk Modelling
		<i>Risk Balancing Necessary</i> +Probabilistic Risk Modelling	Remedy
		Remedy ➤ Cognitive ➤ Evaluative	Remedy ➤ Cognitive ➤ Evaluative ➤ Normative
		Type of Conflict	Type of Conflict
Statistical Risk Analysis Remedy	Probabilistic Risk Modelling Remedy Cognitive Type of Conflict	➤ Agency Staff ➤ External Experts ➤ Stakeholders – Industry – Directly affected groups	➤ Agency Staff ➤ External Experts ➤ Stakeholders – Industry – Directly affected groups – General public
Agency Staff Actors	Agency Staff External Experts Actors	Actors	Actors
Instrumental Type of Discourse	Epistemological Type of Discourse	Reflective Type of Discourse	Participative Type of Discourse
Simple Risk Problem	Complexity induced Risk Problem	Uncertainty induced Risk Problem	Ambiguity induced Risk Problem

OVERVIEW OF TEST APPLICATIONS



- Listeria in raw milk soft cheese, Ewen Todd et al, Michigan University, USA
- Genetically modified crops, Joyce Tait, Director of INNOGEN, University of Edinburgh
- Nagara River Estuary conflict, Norio Okada et al, Disaster Prevention Research Institute, University of Kyoto, Japan
- Nature-based tourism, Jeff McNeely, Chief Scientist, World Conservation Union, and Caroline Kuenzi, IRGC
- Acrylamide in food, Dr. Bonneck, University of Cologne
- Energy security for the Baltic region, Warner North, Northworks Inc and Stanford University
- Nanotechnology, Mike Roco, National Science Foundation, and Ortwin Renn, University of Stuttgart and DIALOGIK gGmbH

IRGC RISK GOVERNANCE FRAMEWORK (I/III): OVERVIEW



CONCLUSIONS (I/II)

- Problems in handling risks:
 - Plural values and knowledge claims
 - Expert dissent on risk and benefits
 - Transboundary nature of risks
 - Social amplification and attenuation via perception and social mobilization
 - Pressure from globalized economy
 - Lack of organizational capacity in many countries
 - Lack of effective governance structures

- Emergence of systemic risk that cross national and sectoral boundaries (ripple effects)

- Need for integration of risk und sustainability policies

CONCLUSIONS (II/II)

- Four risk management regimes should be used to deal with these new risk challenges:
 - simple risk management: standard risk assessments
 - **risk-informed management:** expanded risk assessments; seeking expert consensus and epistemological clarification
 - **precaution-/resilience-based management:** negotiated safety level under uncertainty; seeking stakeholder consensus and relying on containment and resilience
 - **discourse-based management:** value-based orientation; seeking more public input and stakeholder involvement for interpretative variability and normative controversy

QUOTES

- No risk is the highest risk of all
Aaron Wildavsky
- Ignoring risk is the highest risk of all
David Goldblatt
- Risk governance includes both:
taking opportunities and reducing unacceptable risks