University of Sussex

SPRU – Science & Technology Policy Research

STEPS centre

Opening Up Scientific Incertitude:

implications of uncertainty for science policy and expert evidence

presentation to International Symposium on
Scientific Incertitude and Society: Lessons from Law Courts
Hitotsubashi Memorial Hall, National University, Tokyo,
26 August 2012

Andy Stirling
SPRU & STEPS Centre

‘Sound Science’ in Policy and Regulation

on zoonotic pandemics:

“… sound science … science-based decisions”

- UN WHO DG Margaret Chan

on genetic modification:

*“… this government's approach is to make decisions … on the basis of **sound science**”*

- former UK Prime Minister, Tony Blair

on chemicals:

“ …***sound science*** will be the basis of the Commission's legislative proposal…”

- EC RTD Commissioner, Philippe Busquin

on energy:

*“[n]ow is the right time for a cool-headed, evidence based assessment … I want to sweep away **historic prejudice** and put in its place **evidence** and **science**”*

former UK Energy Minister Malcolm Wicks

Justification: from political ‘problems’ to technical ‘puzzles’

Ambiguity in Evidence

Energy technologies: mature, sophisticated comparative analysis…

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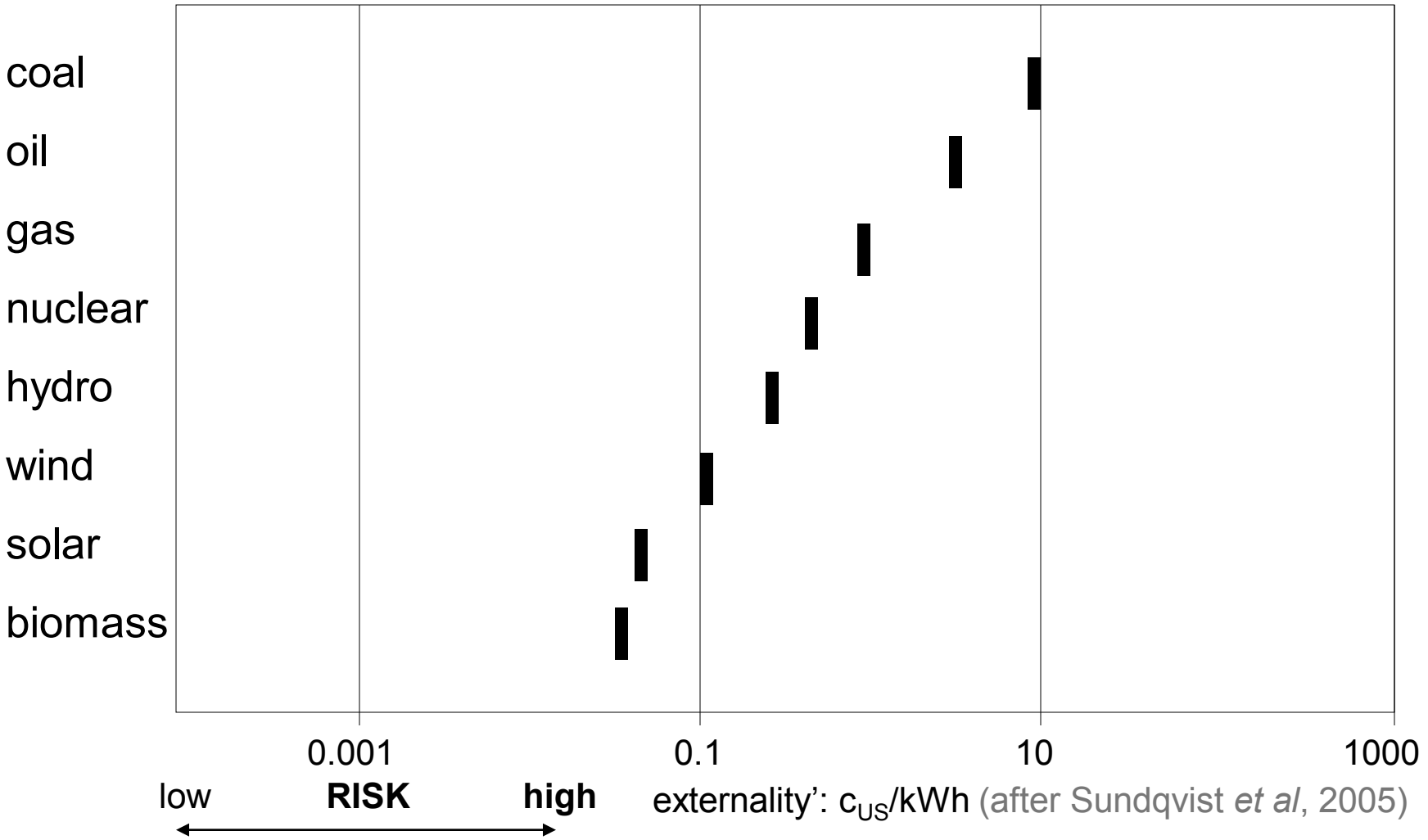
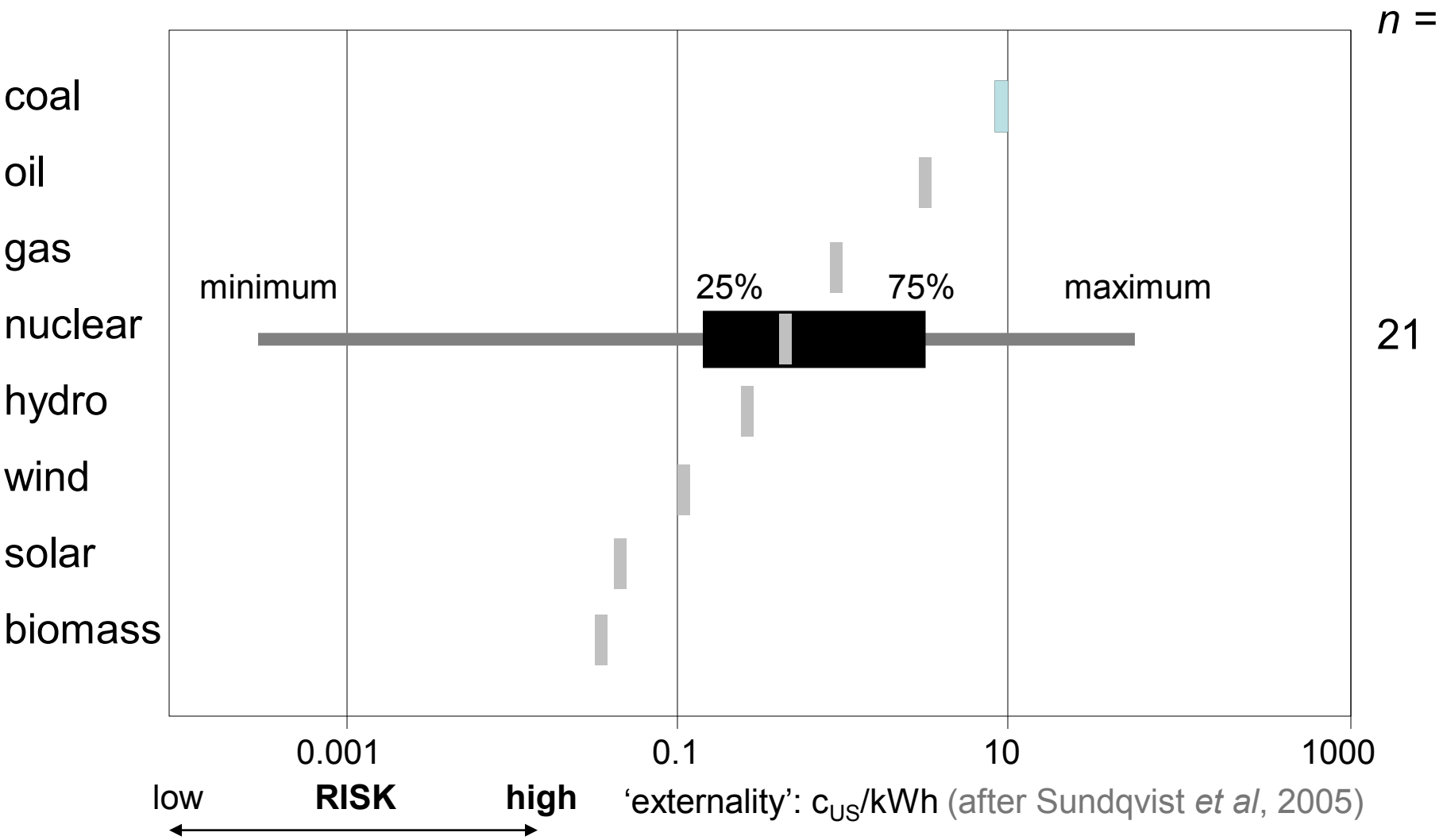
Energy technologies: mature, sophisticated comparative analysis…



Ambiguity in Evidence

Energy technologies: mature, sophisticated comparative analysis…



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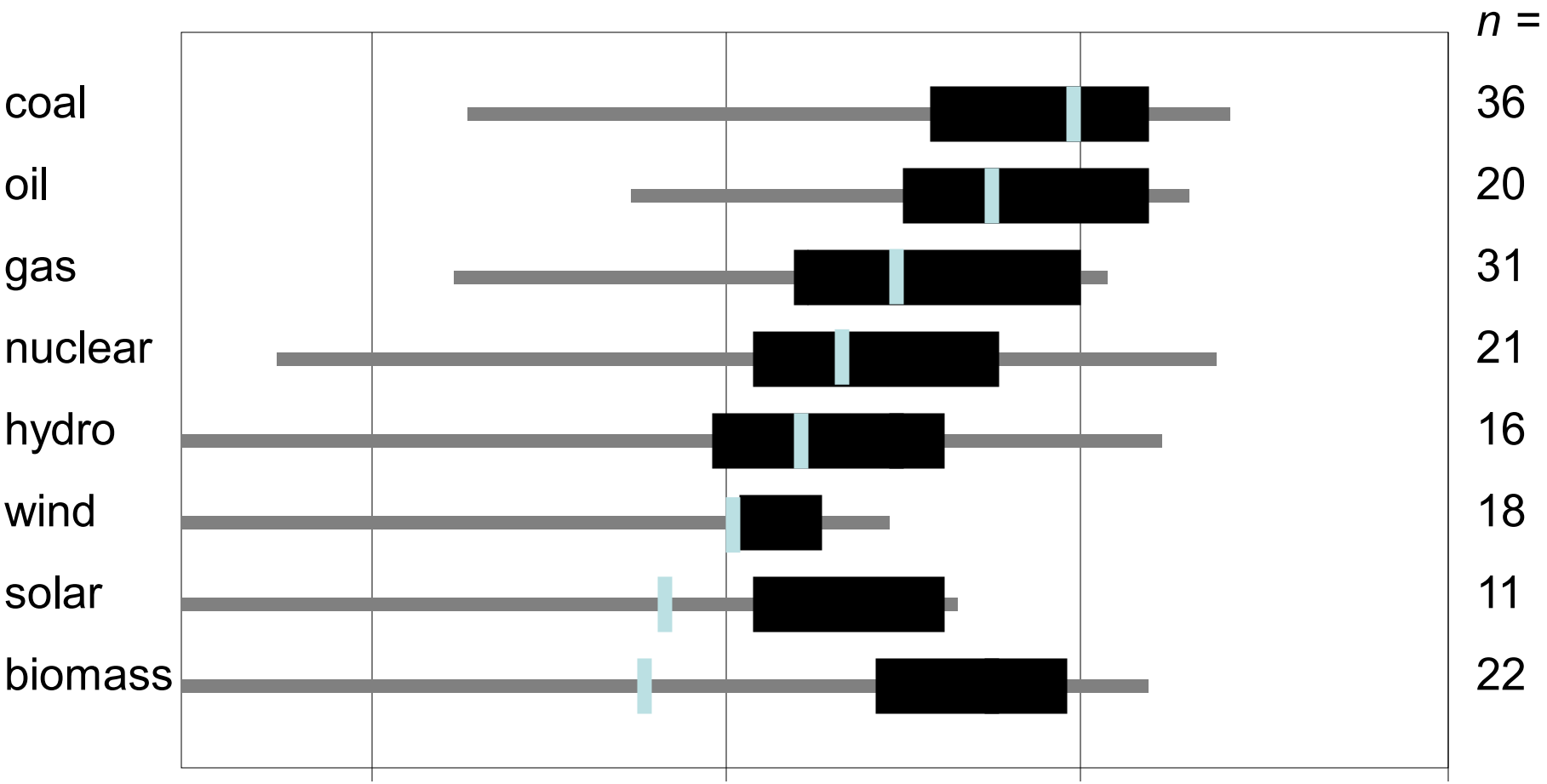


Knowing Knowledge

Conventional ‘risk practices’ suppress our ‘knowledge about knowledge’

Knowing Knowledge

Conventional expert practices suppress our ‘knowledge about knowledge’

marginalises, elides, ignores, (often) denies radical openness of ‘incertitude’:

- insufficiency: knowledge efficacy is not normative basis for action *Aristotle, Kant, Habermas know-how is less important than know-why*

*– eg: how to apply **neuroscience?***

Knowing Knowledge

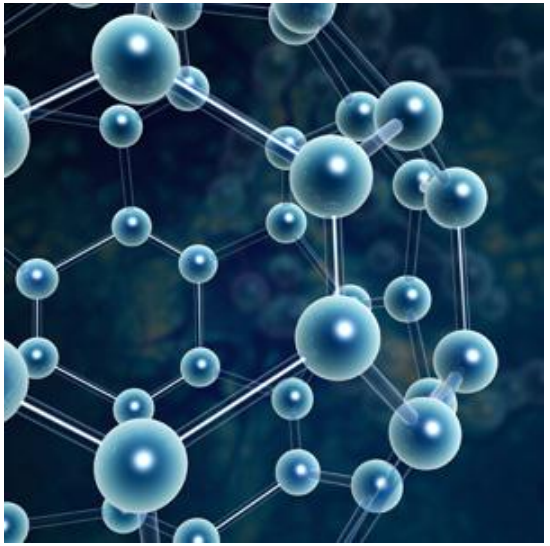
Conventional expert practices suppress our ‘knowledge about knowledge’

marginalises, elides, ignores and (often) denies **realities** of knowledge:

- **insufficiency:** knowledge efficacy is not normative basis for action

- **incompleteness:** knowledge enabling utility is limited on wider effects *Lao Tzu, Socrates, Keynes* *‘unknowns’ as important as ‘knowns’*

*– eg: unexpected mechanisms in **nanohealth** technologies*



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- **insufficiency:** knowledge efficacy is not normative basis for action

- **incompleteness:** knowledge enabling utility is limited on wider effects

- **indeterminacy:** effective knowledge does not preclude surprise *Gödel, Dosi, Collingridge ”known knowns” foster hubris*

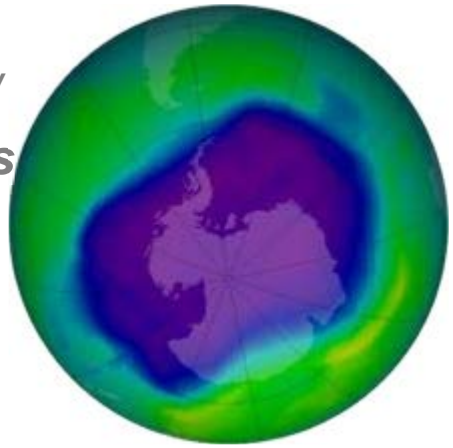
– eg: dangers of thinking we know

halogenated hydrocarbons

***CFCs** and the ozone hole*

endocrine disruptors

methyl tertbutyl ether



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- ‘**inversity’:** increased knowledge can increase ignorance
Einstein, Ravetz, Beck… *area / perimeter of known*

– ***nonlinear dynamics*** *of climate and oceans*

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- **intractability:** knowledge-commitments compound vulnerability *Ellul, Wynne, Tenner not existence but exposure to unknown*

eg: ***nuclear***

dependency

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- **intractability:** knowledge-commitments compound vulnerability

- incommensurability: knowledges are plural and often conflicting
Kuhn, Arrow, Jasanoff… *knowledge often not linear / additive*

*- eg: agronomy, ecology, soil science, molecular biology on **GM***

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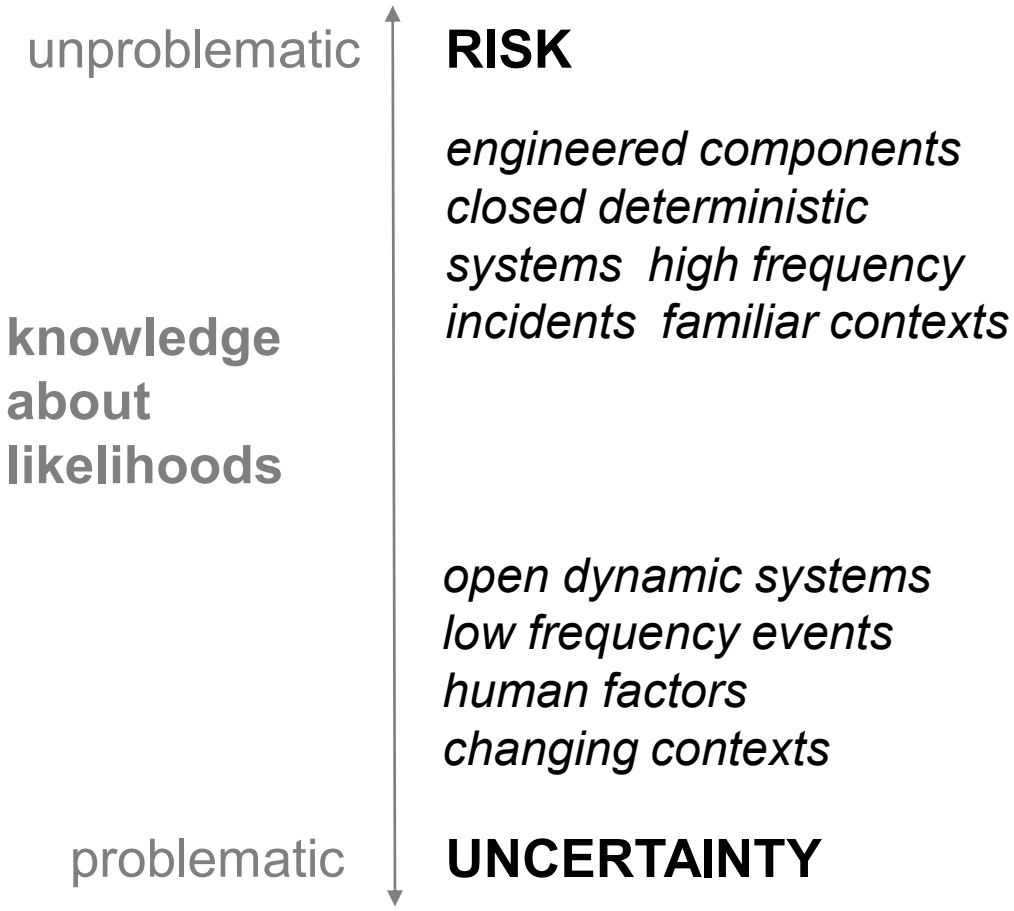
representing incomplete knowledge as expert 'risk' is deeply problematic

Beyond Risk

contrasting aspects of 'incertitude'



- Socrates, Lao Tzu, Knight, Keynes, Shackle, Collingridge, Smithson, Ravetz, Wynne ...

Beyond Risk

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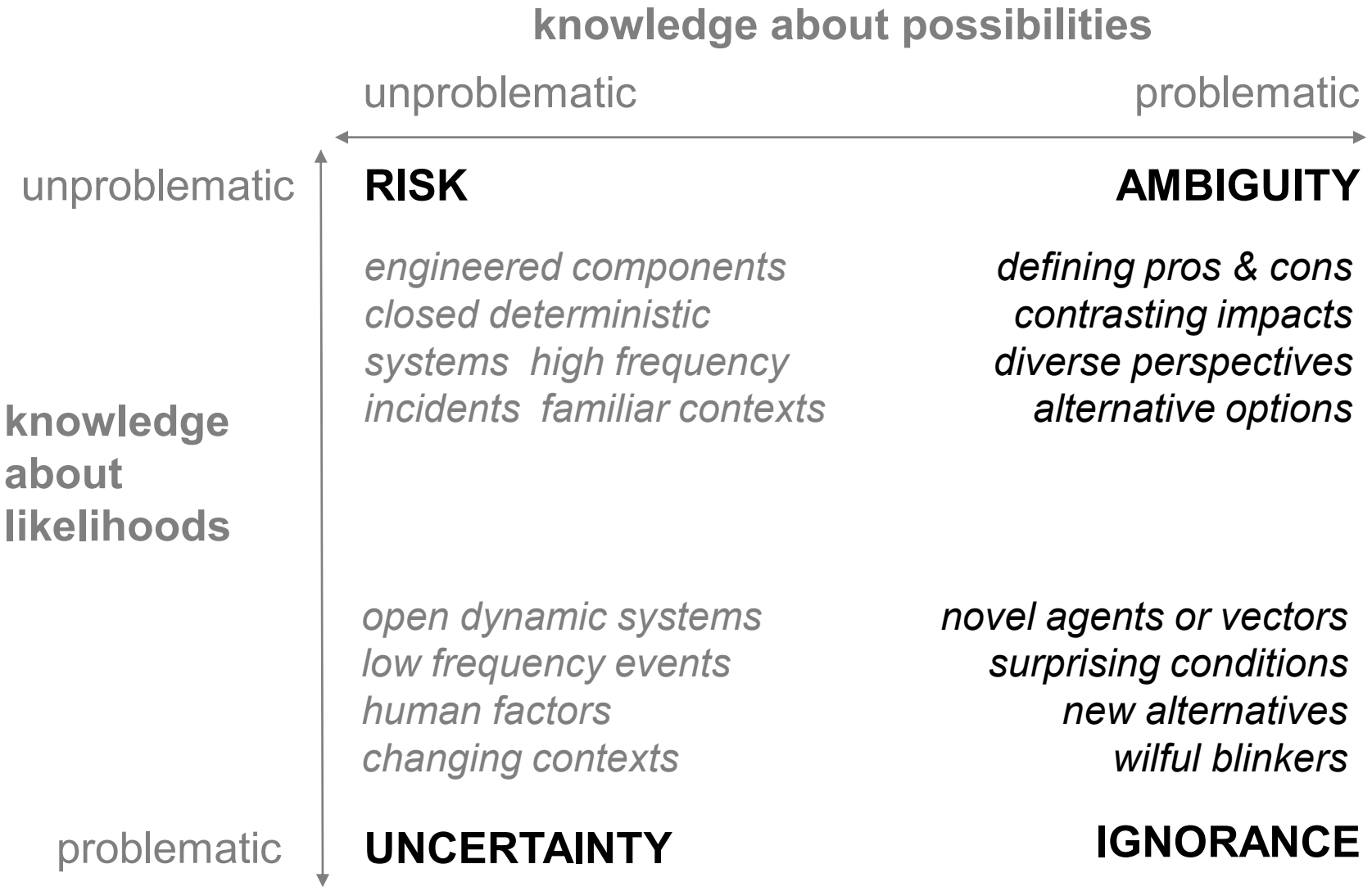

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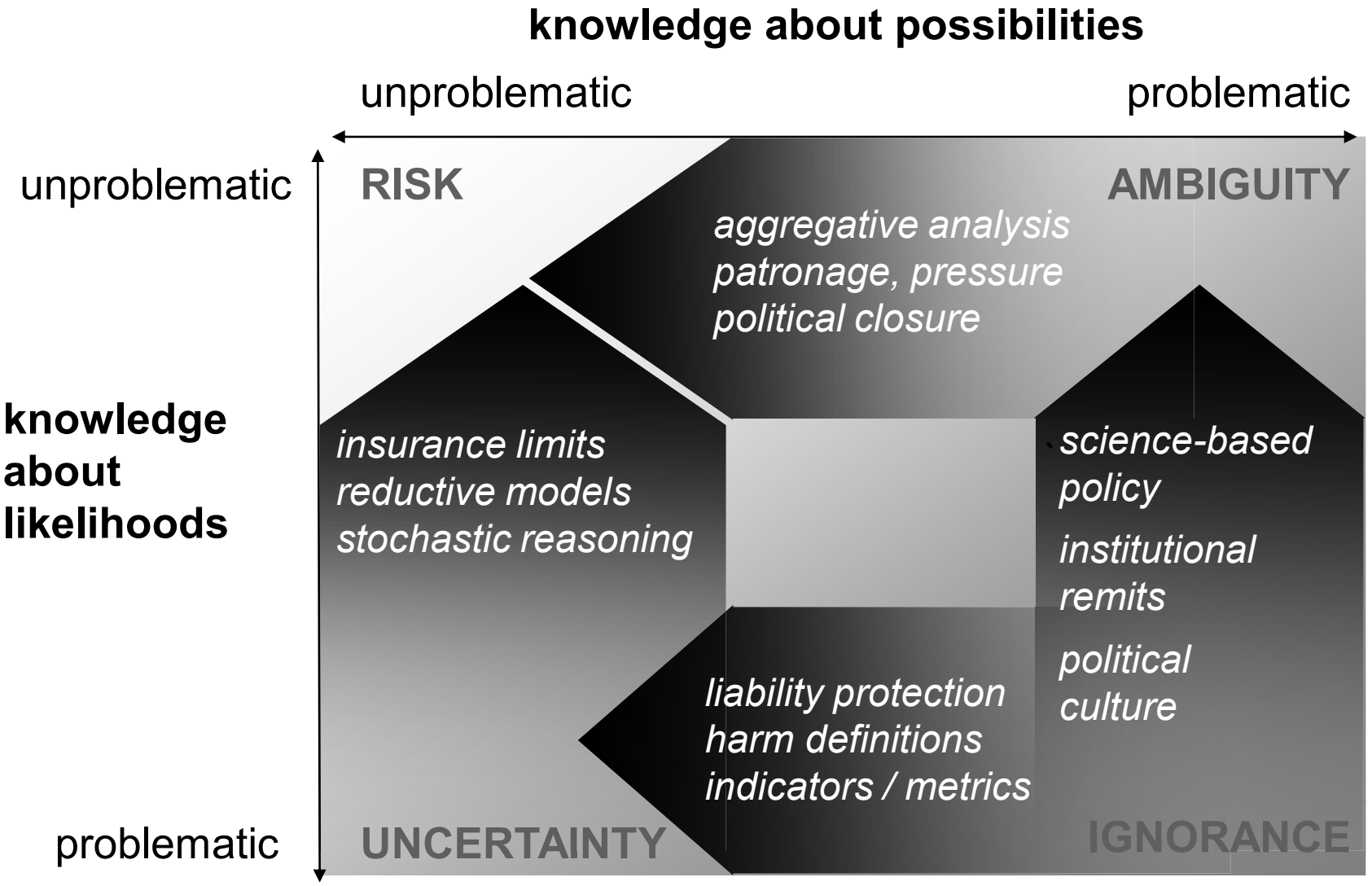
Pressures for Closure

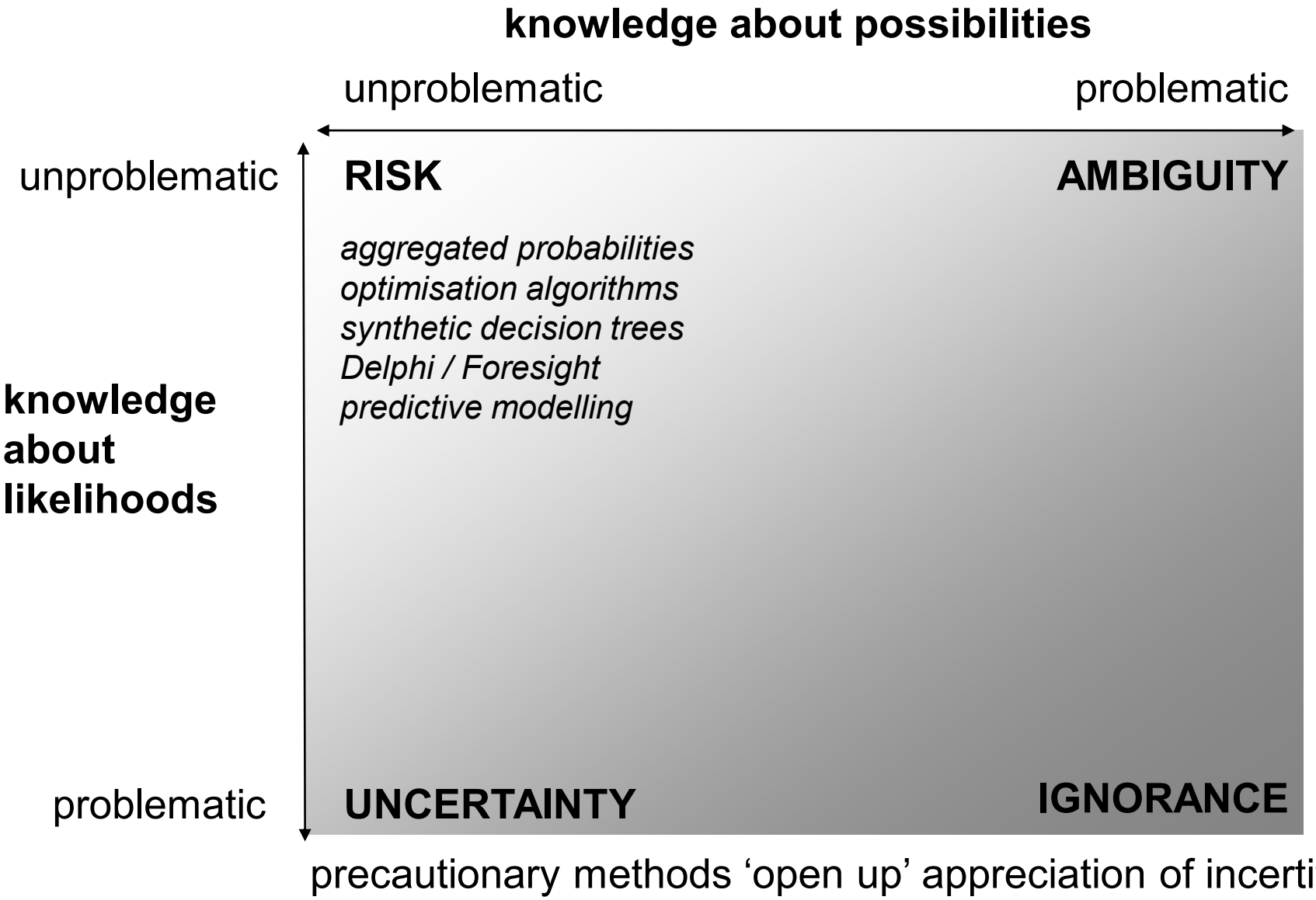
institutional drivers of risk assessment



risk focus is shaped by power – Beck's "organised irresponsibility"

Methods for ‘Opening Up’

precaution and participation are about rigour



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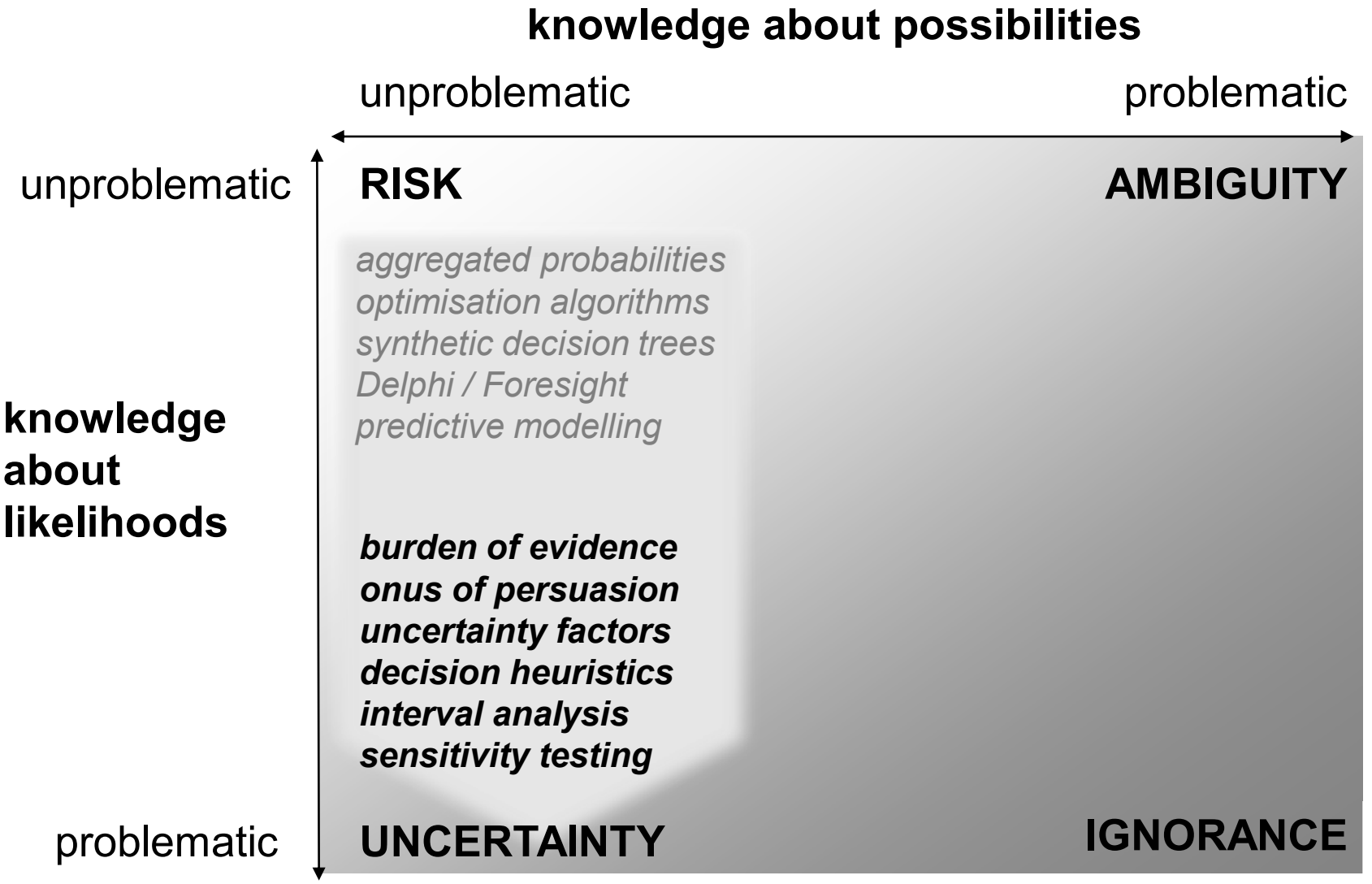

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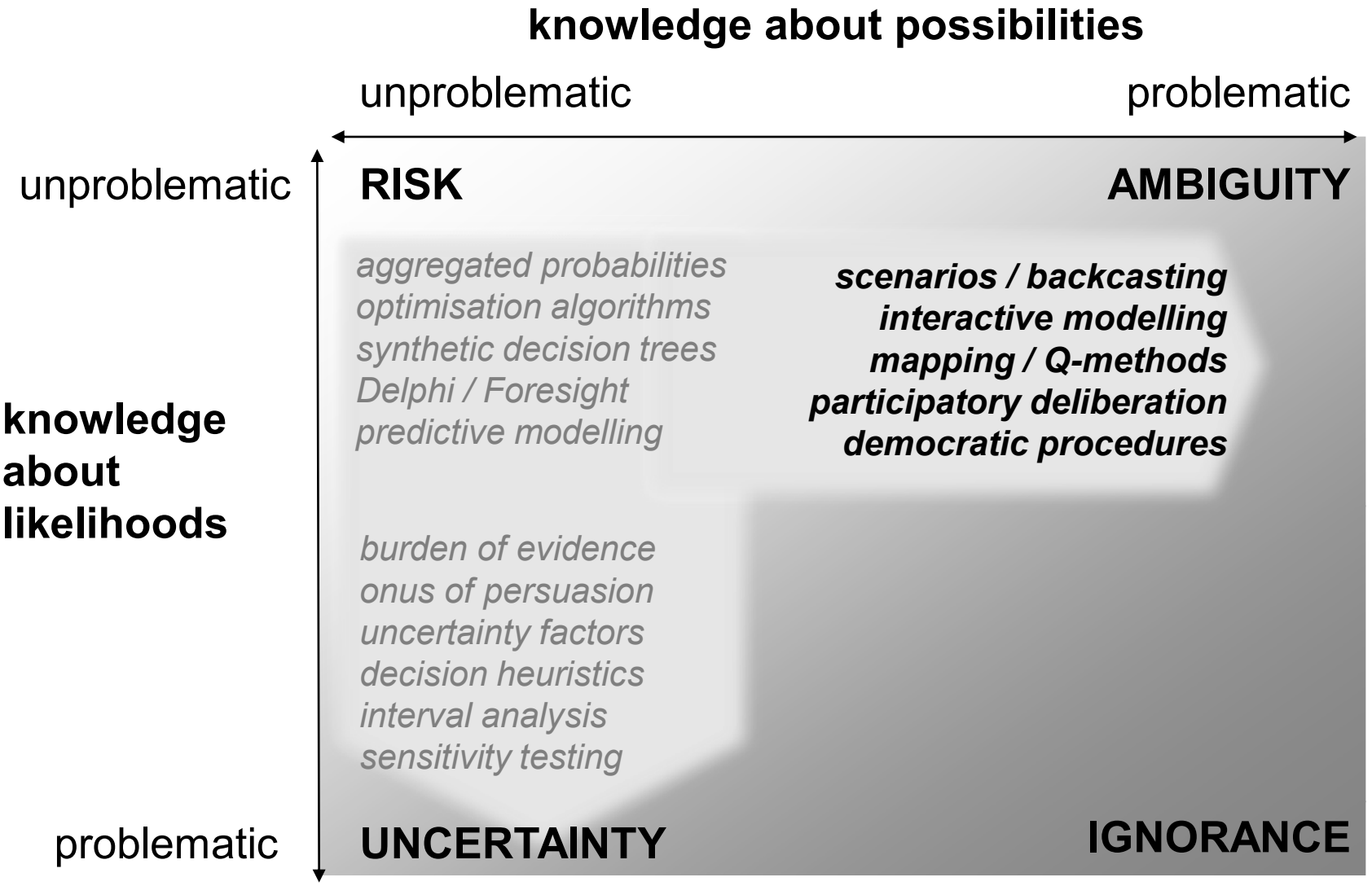

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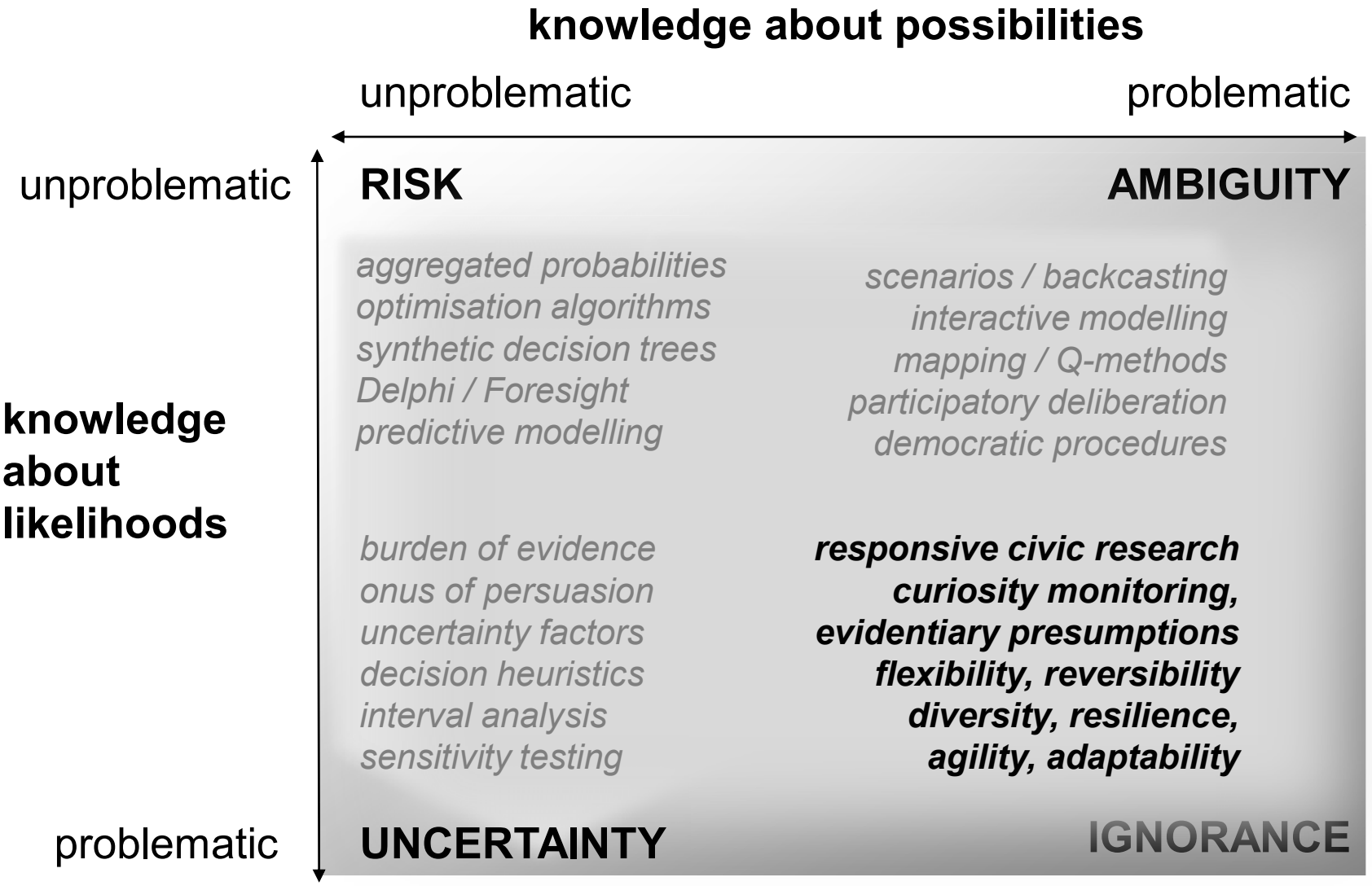


‘Opening Up’ Incertitude

precaution and participation are about rigour

knowledge about possibilities

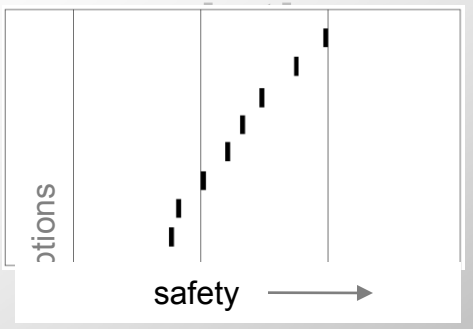
unproblematic — problematic

knowledge about likelihoods

unproblematic — problematic

RISK

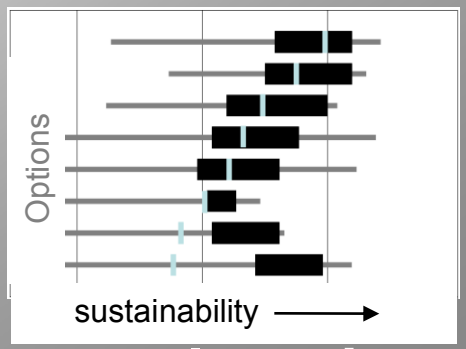
definitive



AMBIGUITY

participatory deliberation

humility reflexivity



precautionary appraisal

learning

UNCERTAINTY

IGNORANCE

‘opening up’: options, issues, approaches, possibilities, perspectives

Precaution, Participation, Adaptive Learning *(cf: EEA, 2001)*

From narrow ‘decision rules’ to broad-based ‘deliberative process’

extend scope additive, cumulative, synergistic effects; life cycles, compliance

***real world effects: closed systems’: MTBE PCBs**, DES; ‘*

Precaution, Participation, Adaptive Learning *(cf: EEA, 2001)*

From narrow ‘decision rules’ to broad-based ‘deliberative process’

extend scope additive, cumulative, synergistic effects; life cycles, compliance ; ‘

explicit incertitude explicitly engage with uncertainty, ambiguity and ignorance

reduction to risk: CFCs, EDCs, GMOs,

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,

humility on science sensitivities & proxies: mobility, persistence, bioaccumulation

omission of persistence *in organochlorines, MTBE, CFCs*

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pro-active research prioritise open monitoring & surveillance & targeted experiment
neglected monitoring: TBT, BSE*; asbestos, benzene, PCBs*

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deliberate argument levels of proof, burden of evidence, onus of persuasion
Swann Committee *on antimicrobials, 1967 later ignored*

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alternative options pros, cons, justifications for range of options & substitutes
***ALARA**, BAT, BPM – ionising radiation, fisheries, acid rain*

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transdisciplinarity collect all relevant knowledge, beyond ‘usual suspects’
***MTBE** / engineers; **BSE** / vets (clinical / toxicology / epidem.)*

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engage public	independence through pluralism and robustness on values ***benzene, DES, asbestos, acid rain, fisheries***

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'open up' politics	'plural conditional' (not unitary definitive) inputs to policy debate *'**GM**' (trans / syn / MAB), '**low carbon**' (nuclear / CCS / renews)*

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Plural Conditional Advice

Risks of different agricultural strategies
under assumptions of selection of UK expert policy advisers

organic

environmental

intensive

GM + labelling

GM + monitoring

GM + voluntary controls

Plural Conditional Advice

Risks of different agricultural strategies
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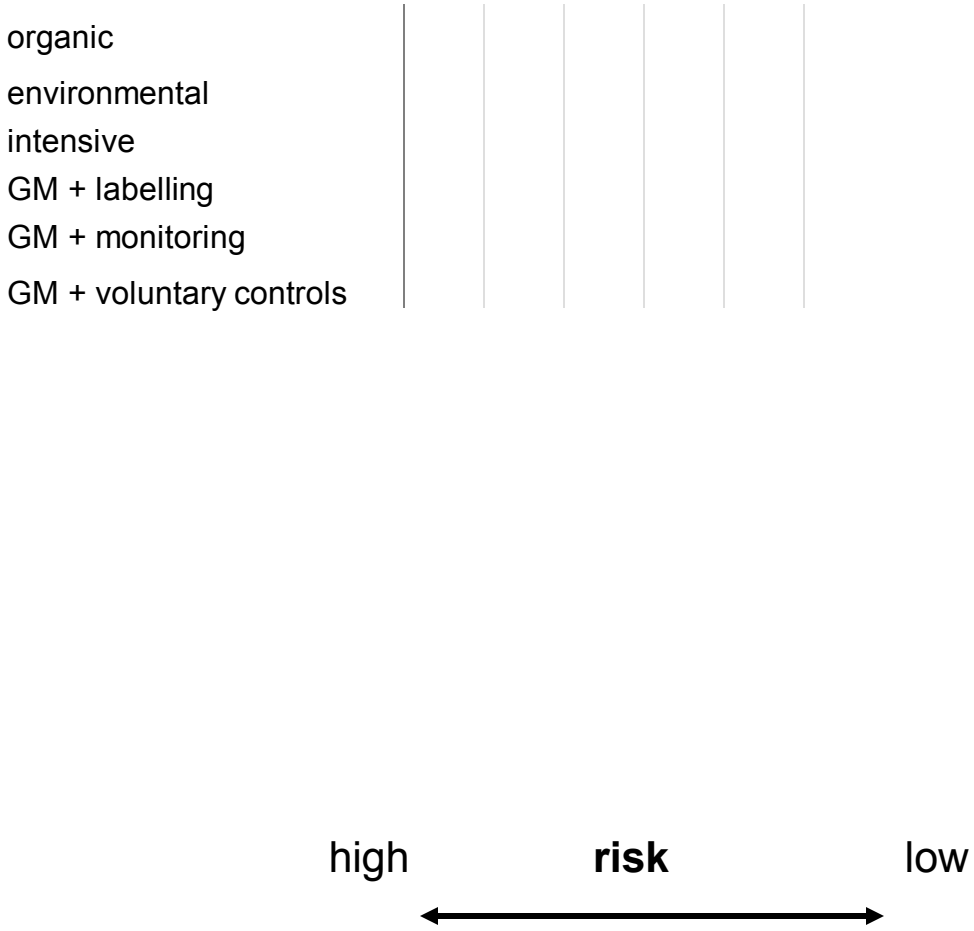

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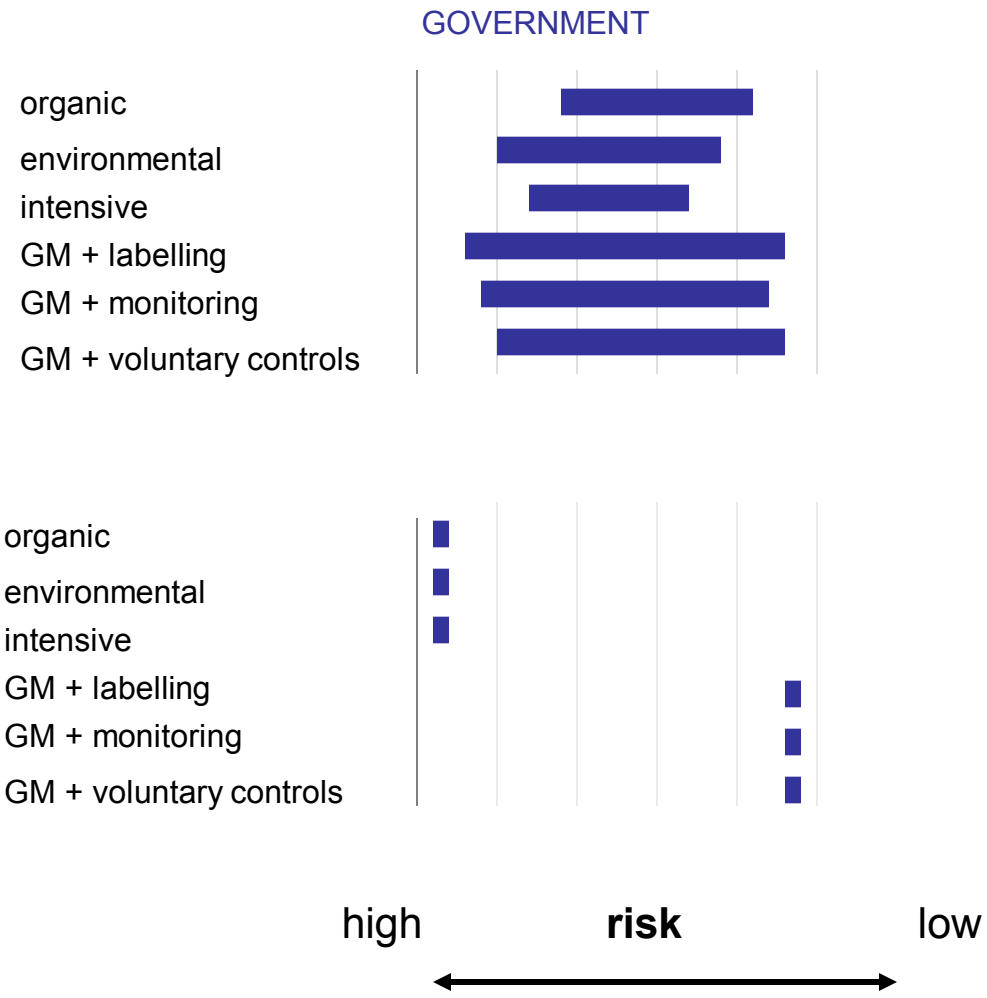

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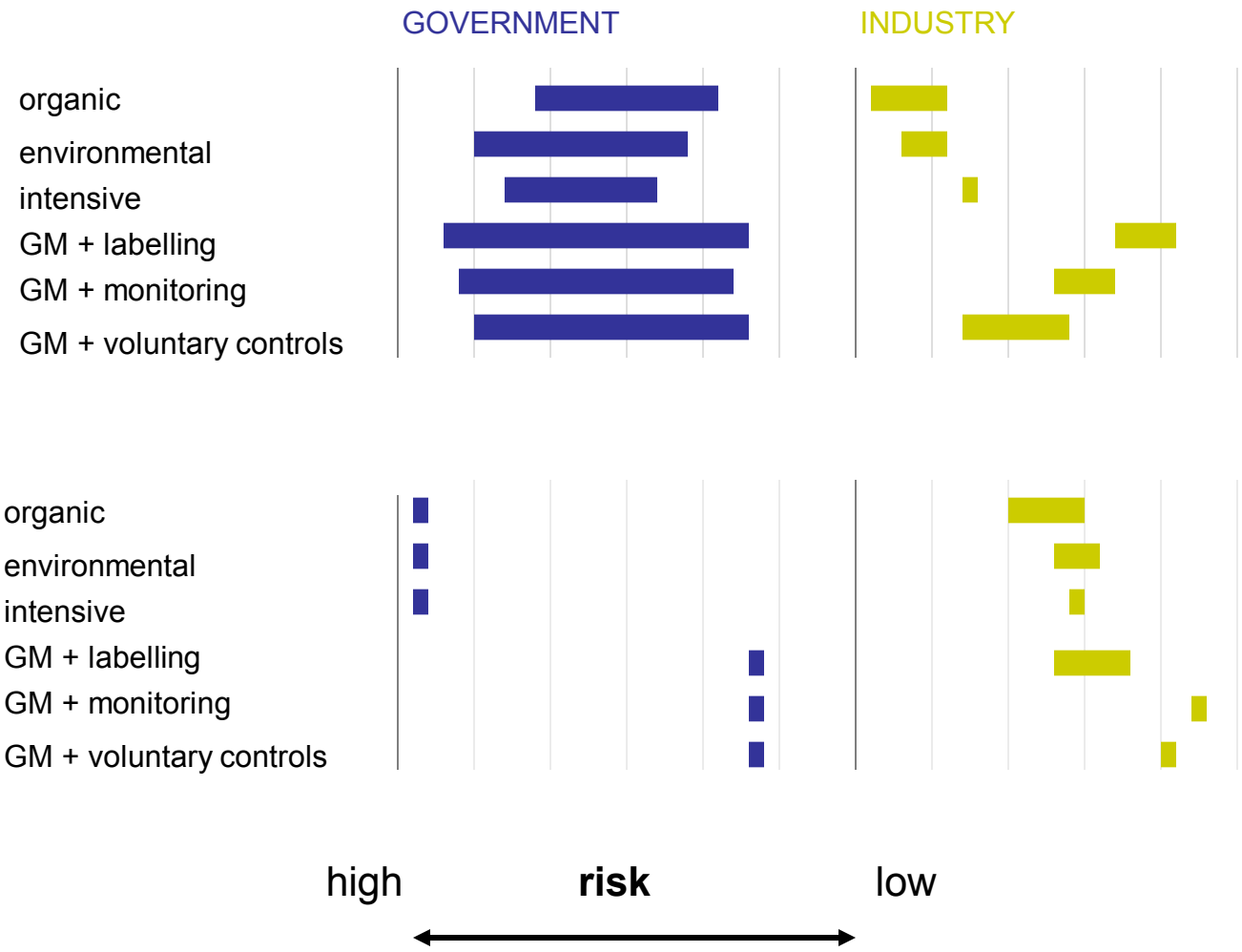

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