OPENING UP AND CLOSING DOWN:
science, precaution & participation in technology governance

presentation to seminar at Centre for Environmental Strategy, University of Surrey, Guildford, 28th February 2008

1: Precaution and the open nature of technological progress

2: 'Broadening out' technology appraisal

3: 'Opening up': technology choice

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SPRU – science and technology policy research

STEPS centre

The Challenge of Precaution

" Where there are ***threats***
of ***serious*** or ***irreversible*** damage,
lack of ***full scientific certainty*** shall not be used
as a reason for postponing ***cost-effective*** measures
to prevent environmental degradation "

Principle 15, 1992 Rio Declaration

Ambiguous as a 'science based' 'decision rule'

threat? seriousness? irreversibility? full scientific certainty? cost-effective?

Prompts unfavourable comparison with 'sound scientific' approaches

(eg: risk, cost-benefit, decision, life cycle, environment impact analysis)

Major international political tensions: Kyoto, WTO, GM, Chemicals

Science and Technological Progress

On GM technologies:

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

Tony Blair, House of Commons
10 November 2003

Science and Technological Progress

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On energy technologies:

"[n]ow is the right time for a cool-headed, evidence based assessment of the options open to us … I want to sweep away historic prejudice and put in its place evidence and science"

*Energy Minister **Malcolm Wicks***
4 December 2005

Treats political decisions on technology choice as a matter for science

Science and Technological Progress

On general technology policy:

"[we need] more ***pro innovation*** policies …"

Gordon Brown, *House of Commons,*
26 January 2004

On public attitudes to technology:

"[there is] an ***anti-technology***
culture in the UK …a **pro-technology** culture must be created…"

UK ***Council for Science and Technology***,
February 2000

Treats innovation as homogeneous

No distinctions … no alternatives … no politics … no choice !

The Open Nature of Technological Progress

Underlying view of technology:

- single linear path
- determined by science …

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Lord Broers' BBC Reith Lectures
President of RAEng, 2006
on "the Triumph of Technology"

technology:
"… will determine the future of the human race…"

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"… will determine the future of the human race…"

history is:
"a race to advance technology"

aim of politics:
"to strive to stay in the race"

role of the public:
to "…recognise … and give [technology] the profile and status it deserves…"

The Open Nature of Technological Progress

Underlying view of technology:

– single linear path

– determined by science …

gives us Mark Malloch Brown

as UN Deputy DG, 24 July 2001:

*'**anti-technology** protestors'* are "… members of the 'flat earth society,' opposed to modern economics, modern technology, modern science, modern life itself."

The Open Nature of Technological Progress

Underlying view of technology:

– single linear path

– determined by science …

politics of technology:

just about

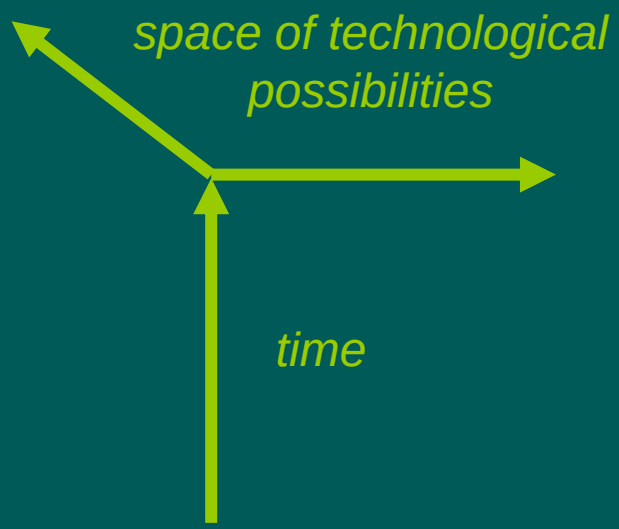
- *how much?*
- *how fast?*
- *how efficient?*
- *how fair?*

The Open Nature of Technological Progress

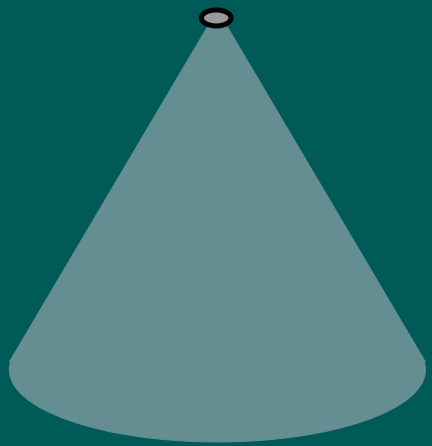
BUT:

this is not how it is!

every discipline concerned with
nature of technological innovation
yields a different picture

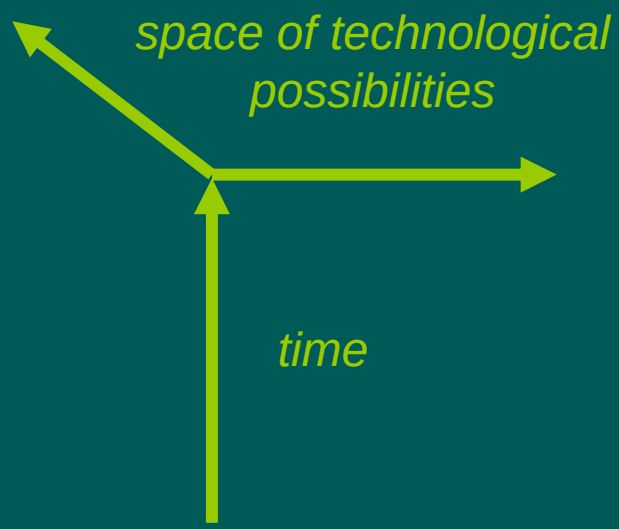


The Open Nature of Technological Progress



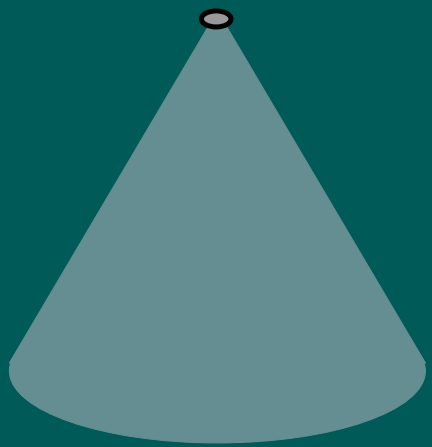
Determinist view

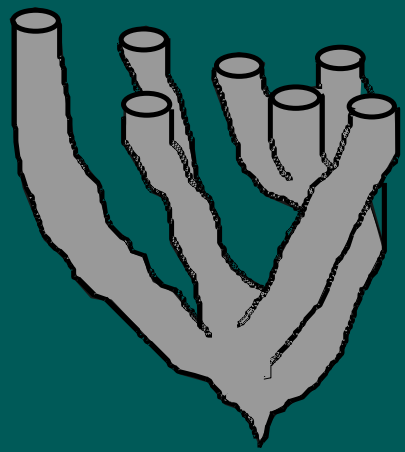
initial multiple potentials converge on 'inevitable' optimal form

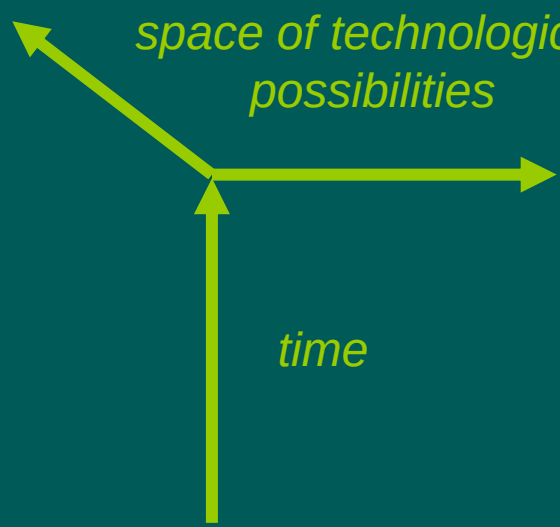


Technology is a wonderful thing – but more complex…

The Open Nature of Technological Progress







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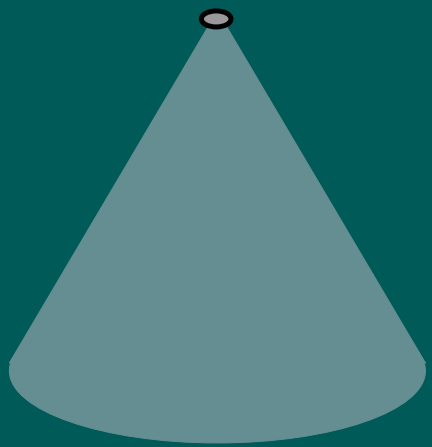
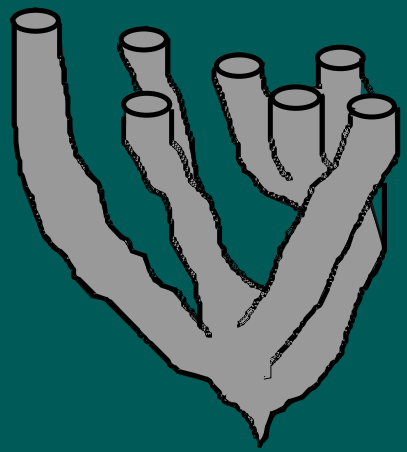
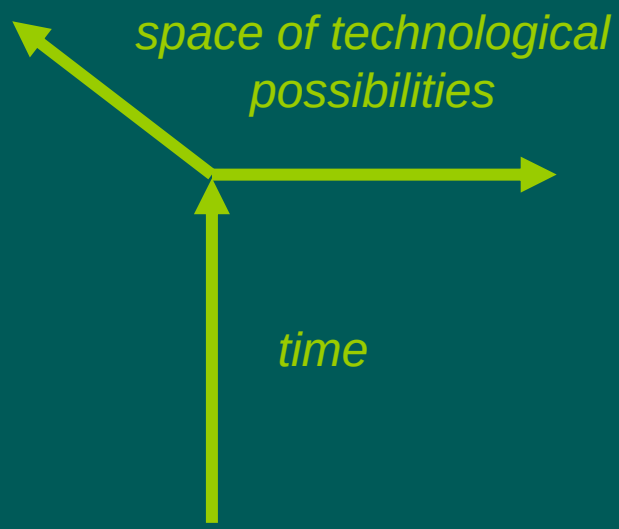






Technology is a wonderful thing – but more complex…

– many different possible pathways …
– fertile with creativity and agency …
– indeterminate: constantly open to surprise

Technological Progress as Social Choice

Economics, history, management, political science, social studies:

Show path-dependence, momentum and ‘lock-in’ around poor choices

VHS and Betamax

… media standards …

… Windows software…

Narrow Gauge Railways

… urban transport …

… internal combustion engine …

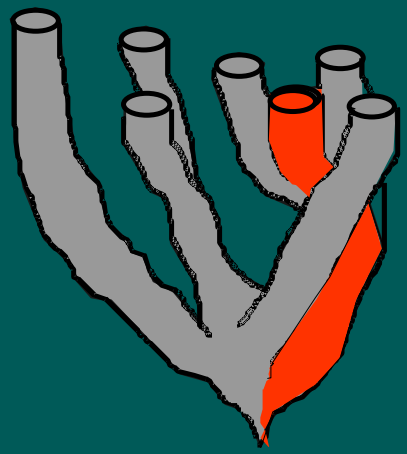
QWERTY keyboards

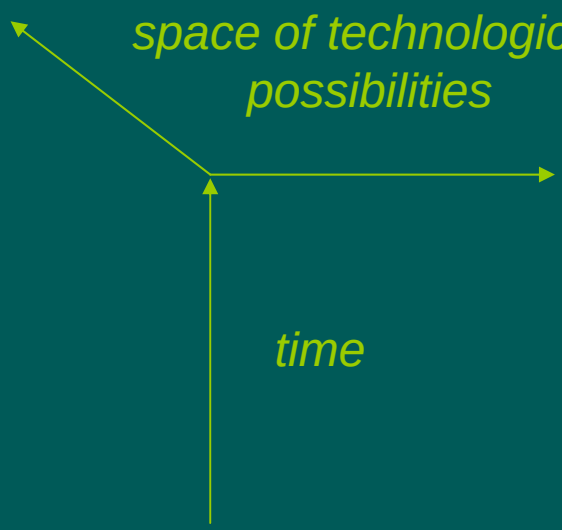
… light water reactors …

… military systems …

(David, Arthur, Cowan, etc)

Technological Progress as Social Choice

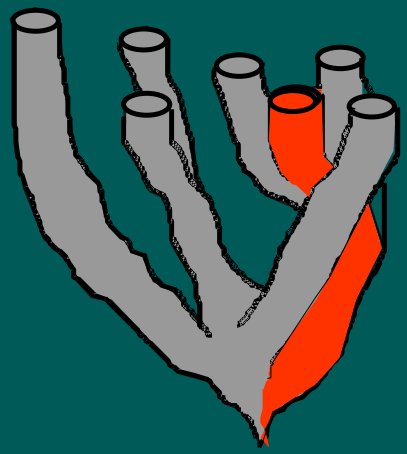


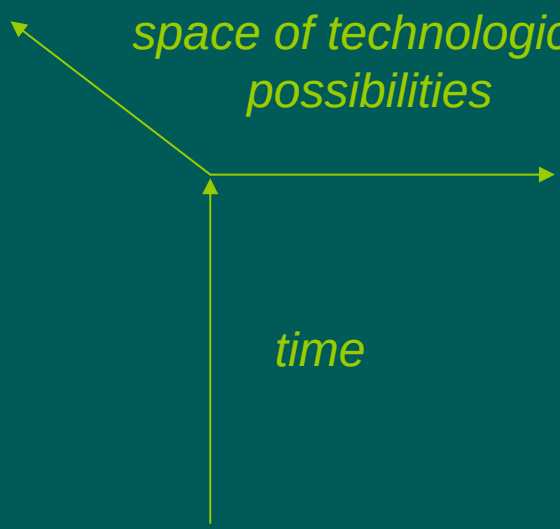


not all possibilities can be fully realised in globalised markets

eg:
- centralised thermal power / distributed renewable energy
- industrial GM agriculture / locally marketed low-input farming
- chlorinated plastics / recycled materials and energy
- private fossil-fuel cars / electric public transport
- IP-intensive medicine / community-based public health

Technological Progress as Social Choice

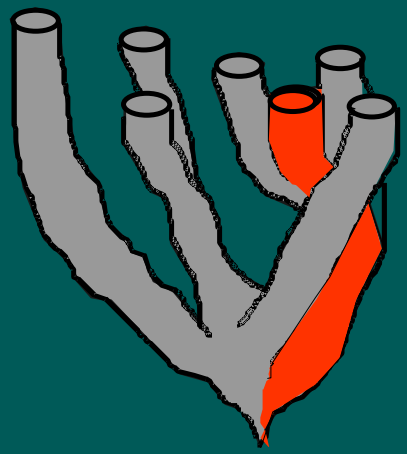


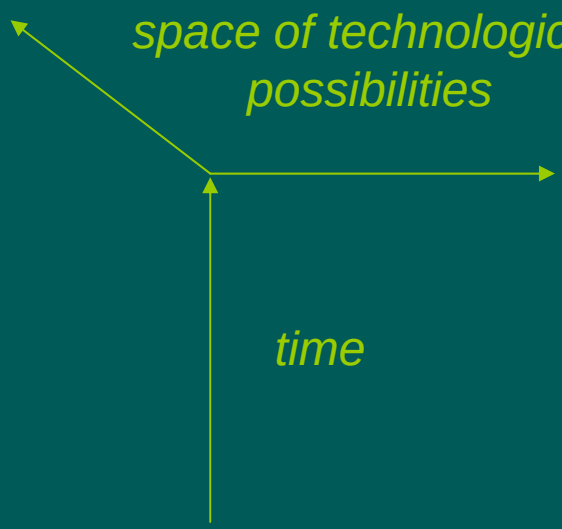


not all possibilities can be fully realised in globalised markets

outcomes driven by necessity, chance and the exercise of power

Technological Progress as Social Choice





not all possibilities can be fully realised in globalised markets

outcomes driven by necessity, chance and the exercise of power

‘science based risk’ conceals a “hidden politics of technology”

Terms ‘anti-science’ / ‘pro-technology’ are as invalid as ‘pro’ / ‘anti’ policy

Queries are: Which policy? Which technology? Which direction for science?

‘Closing Down’ with ‘Sound Science’

Quantitative assessment appears precise

low RISK high

‘externality’: c_{US}/kWh (after Sundqvist *et al*, 2005)

‘Closing Down’ with ‘Sound Science’

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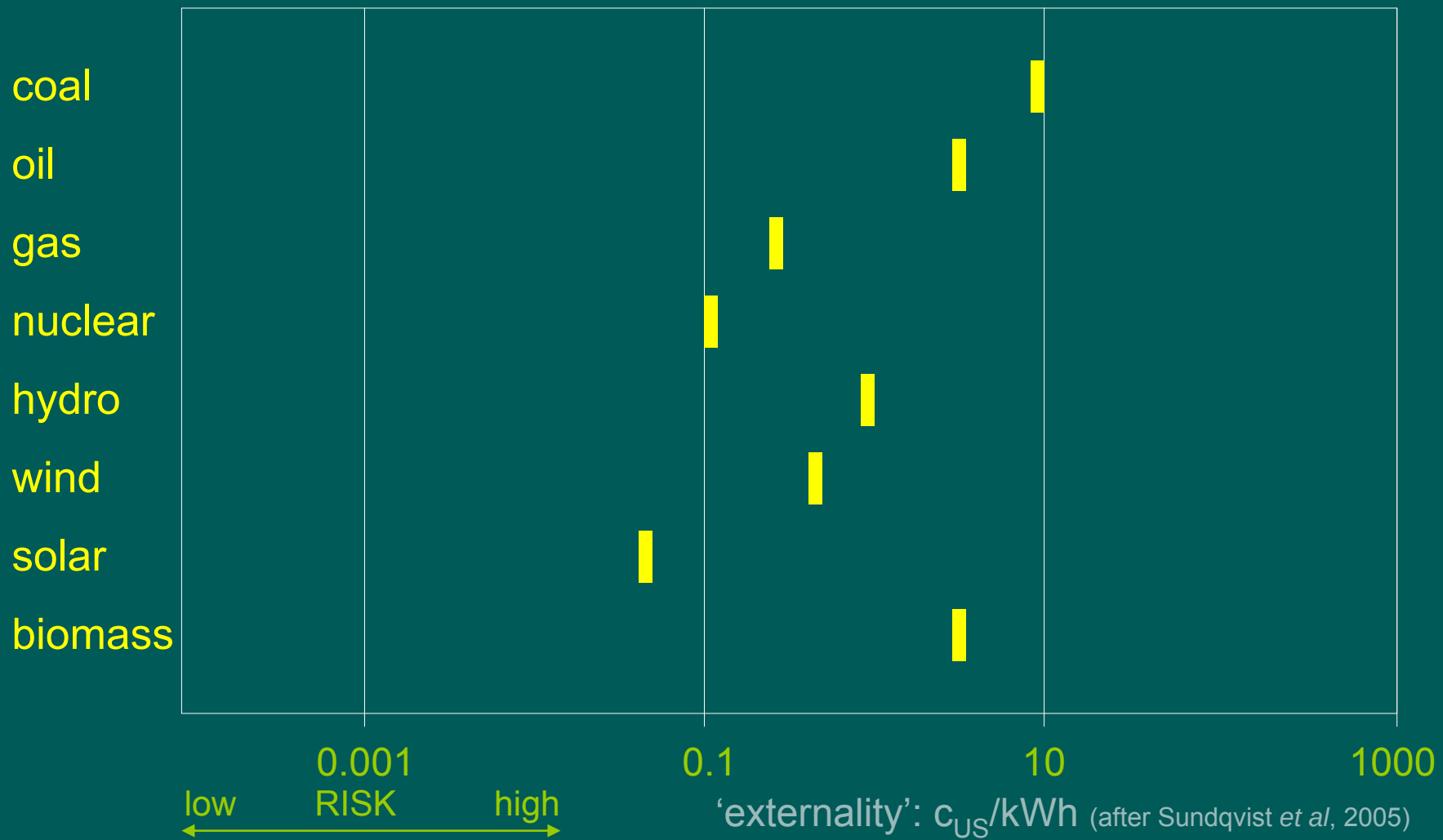
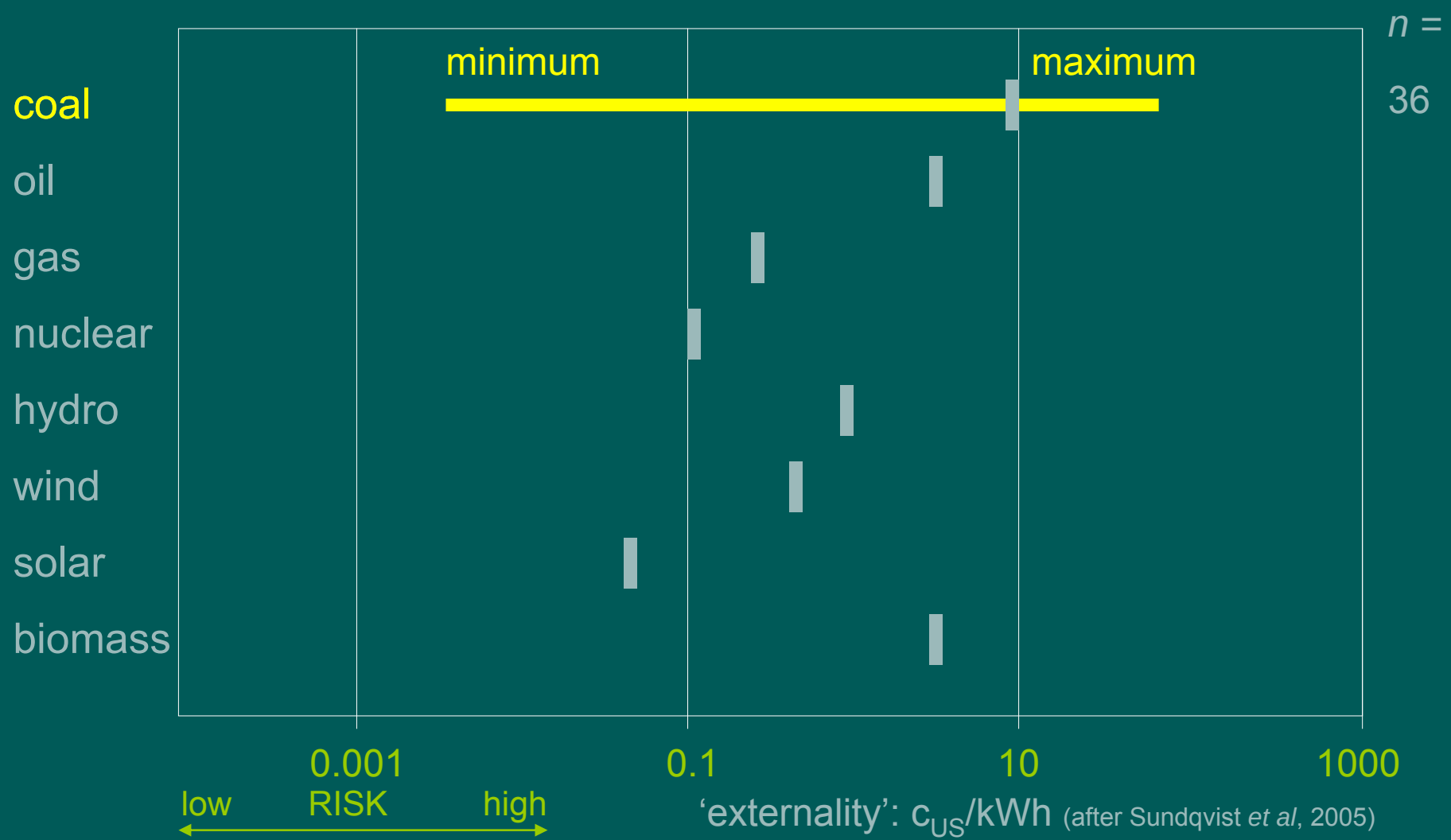


‘Closing Down’ with ‘Sound Science’

Quantitative assessment appears precise, **but is sensitive to ‘framing’**



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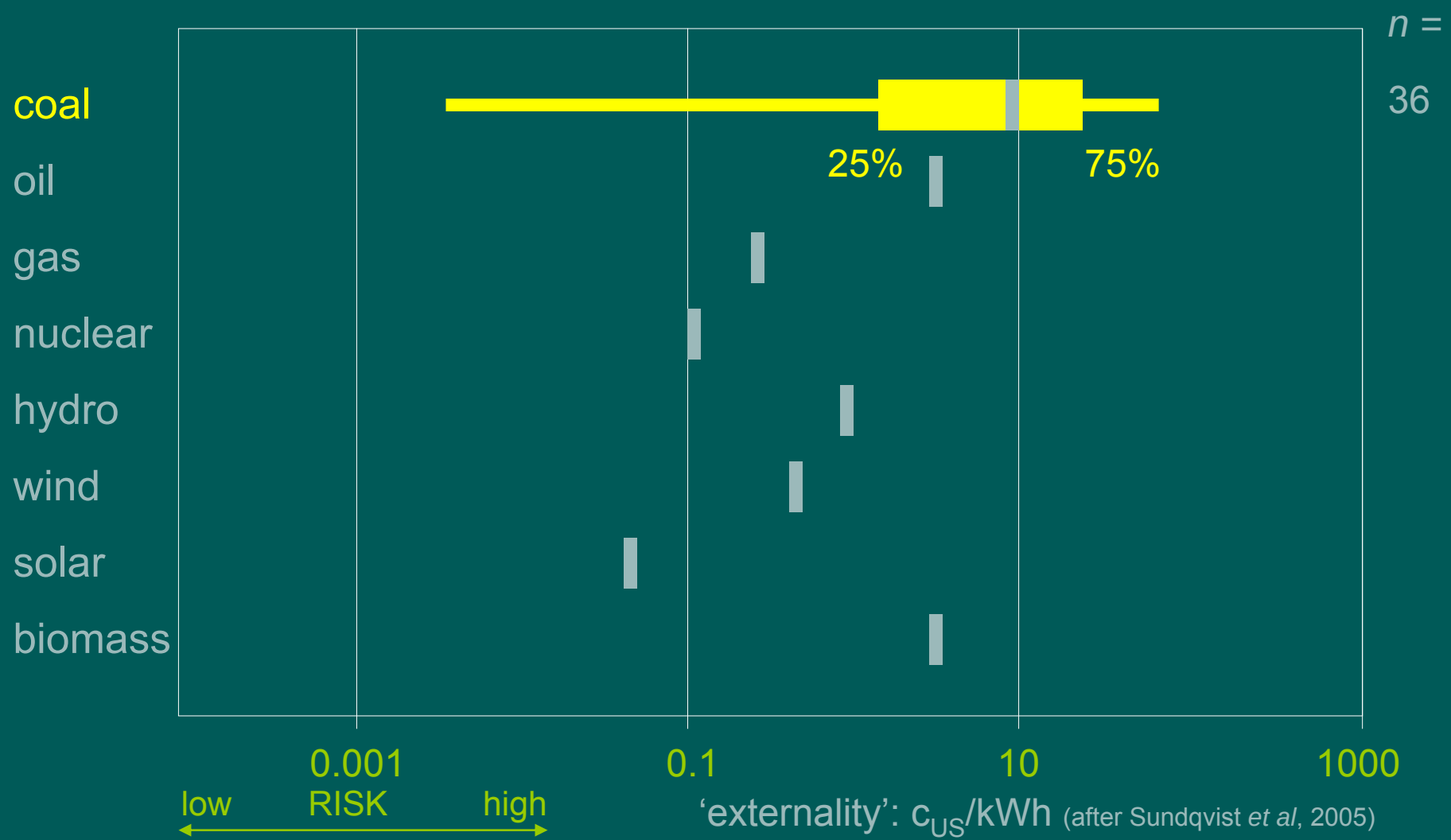

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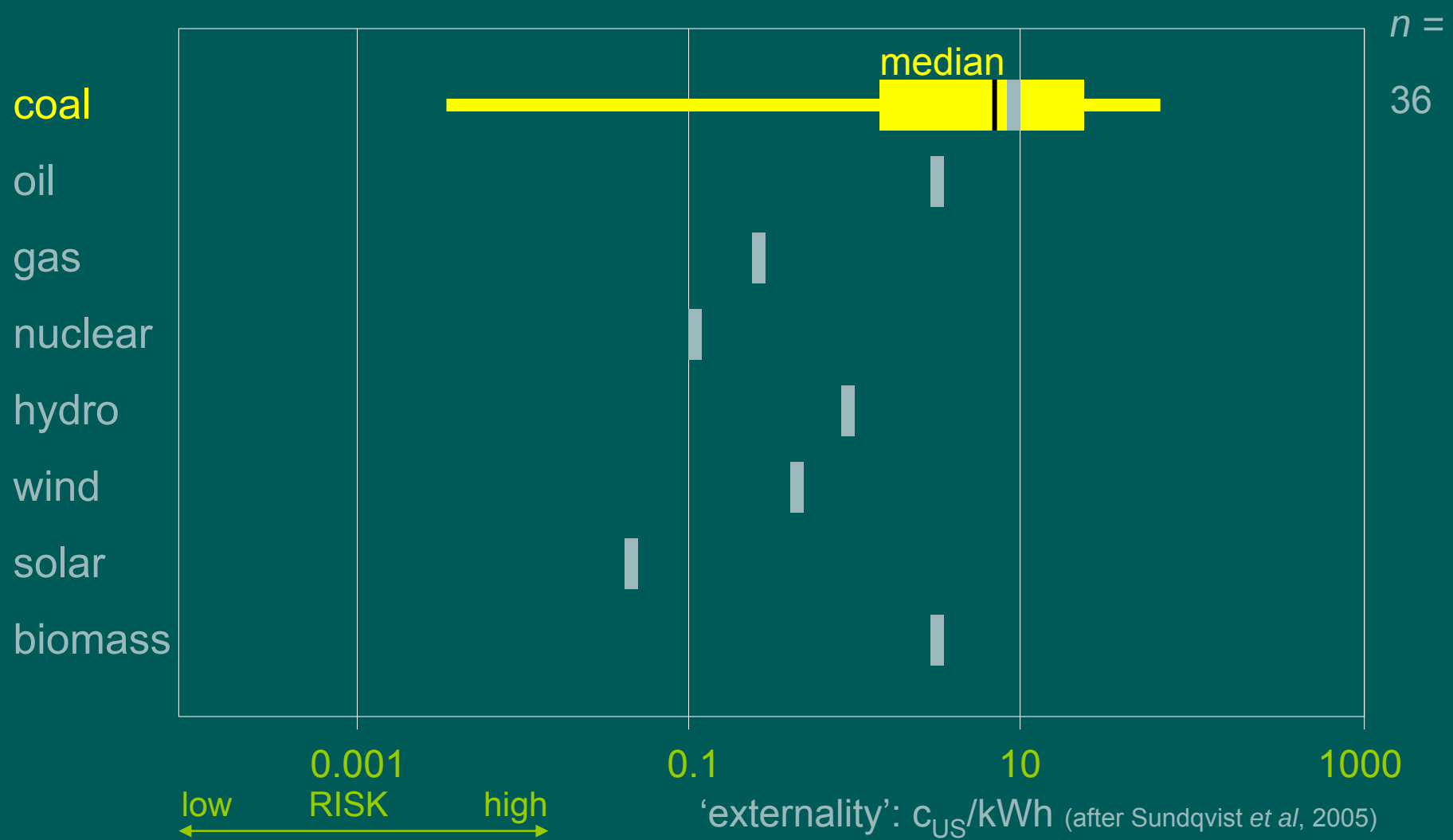

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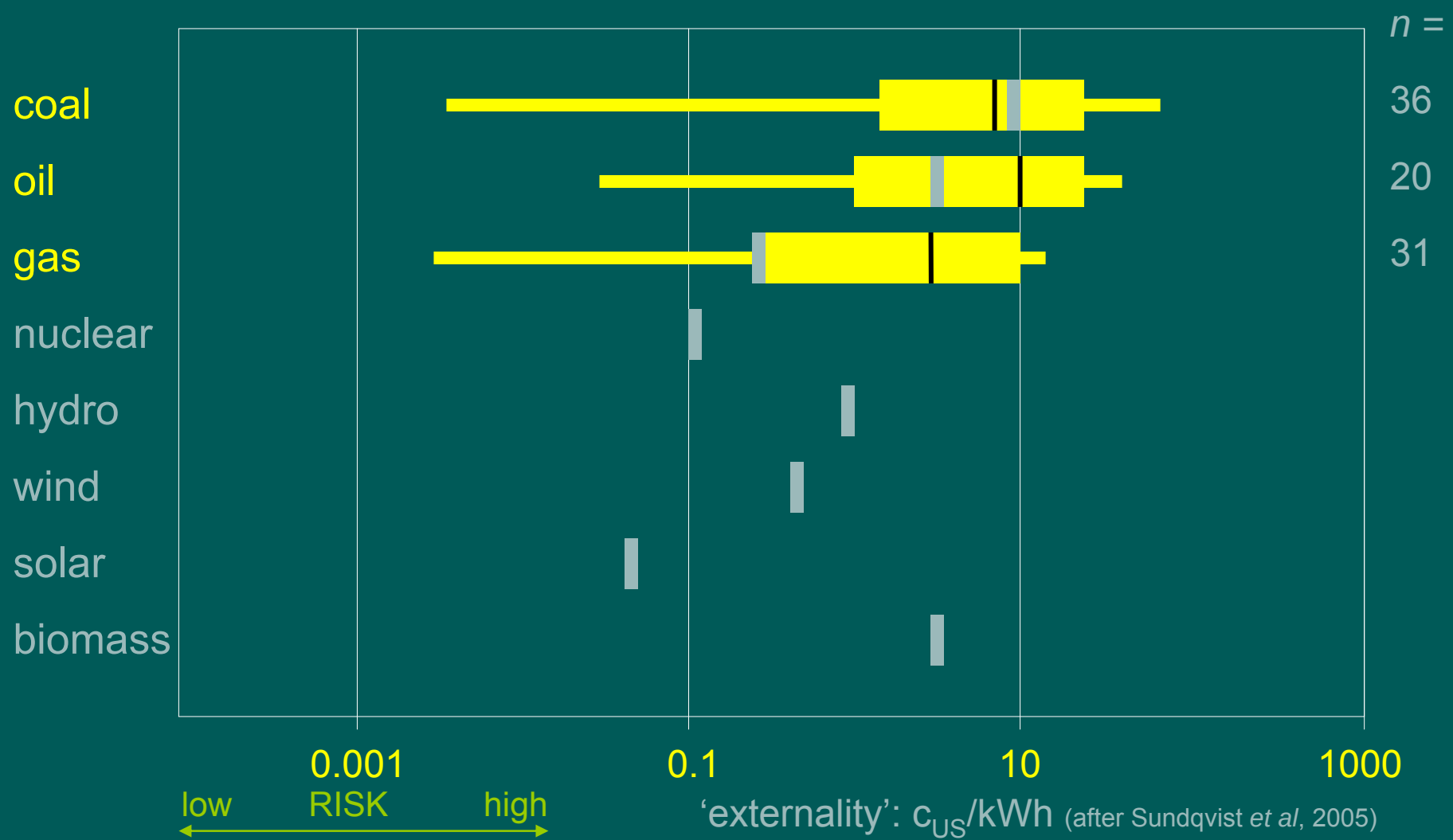

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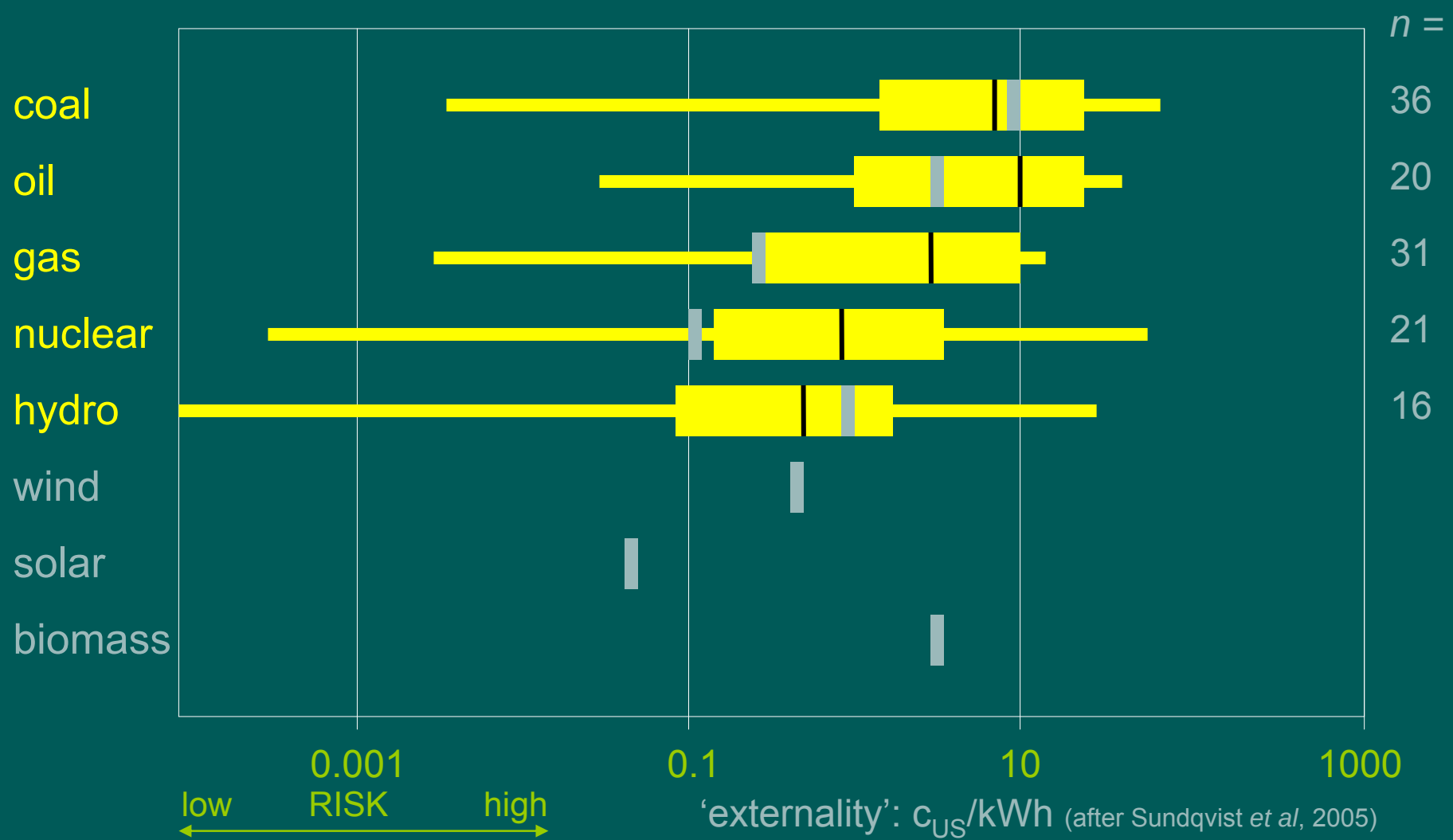

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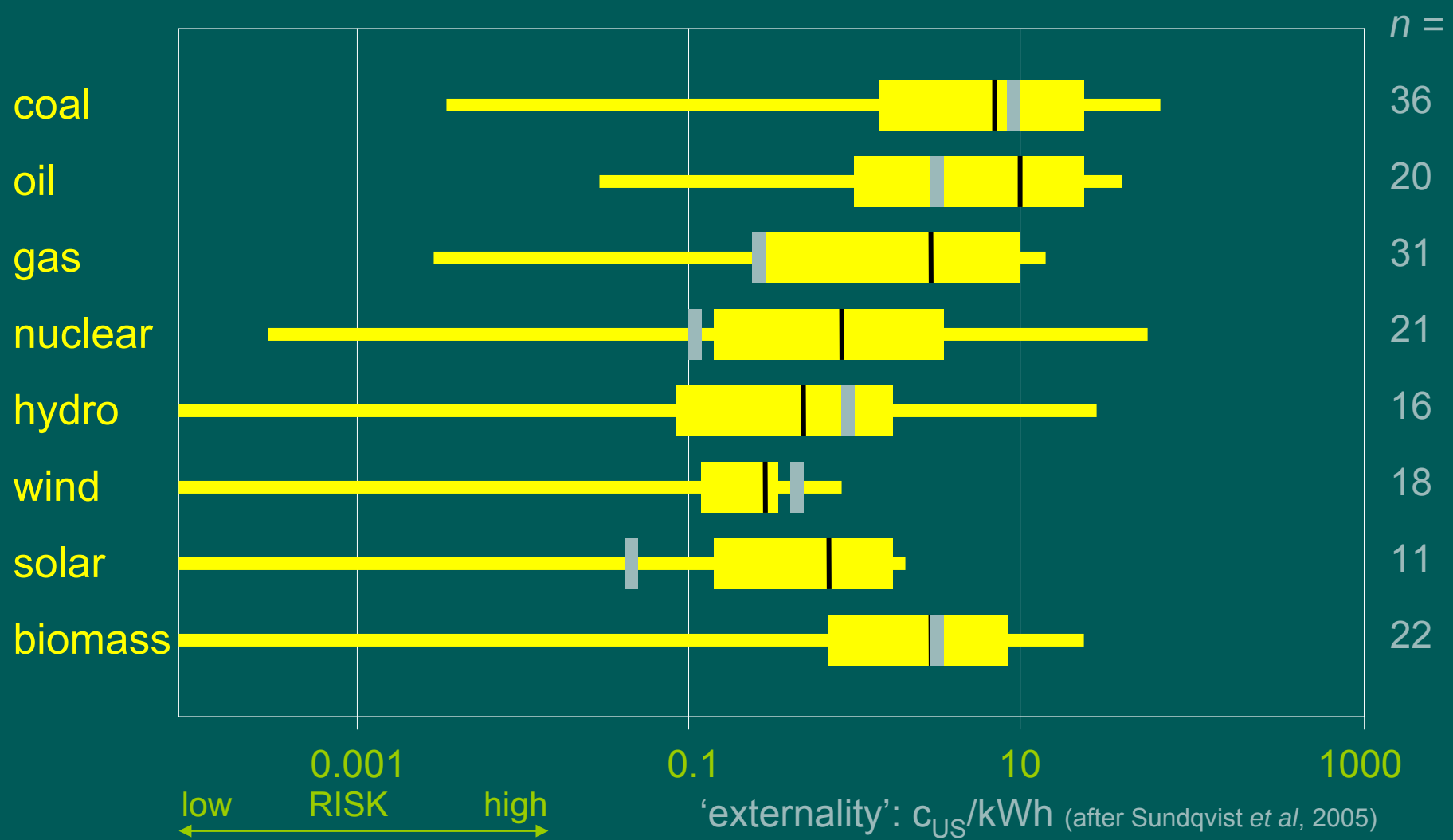


‘Closing Down’ through ‘Framing’

Dimensions of ‘framing’ in technology appraisal *(Wynne. Jasanoff)*

setting agendas	defining problems	characterising options
posing questions	prioritising issues	formulating criteria
deciding context	setting baselines	drawing boundaries
discounting time	choosing methods	including disciplines
handling uncertainties	recruiting expertise	commissioning research
constituting ‘proof’	exploring sensitivities	interpreting results

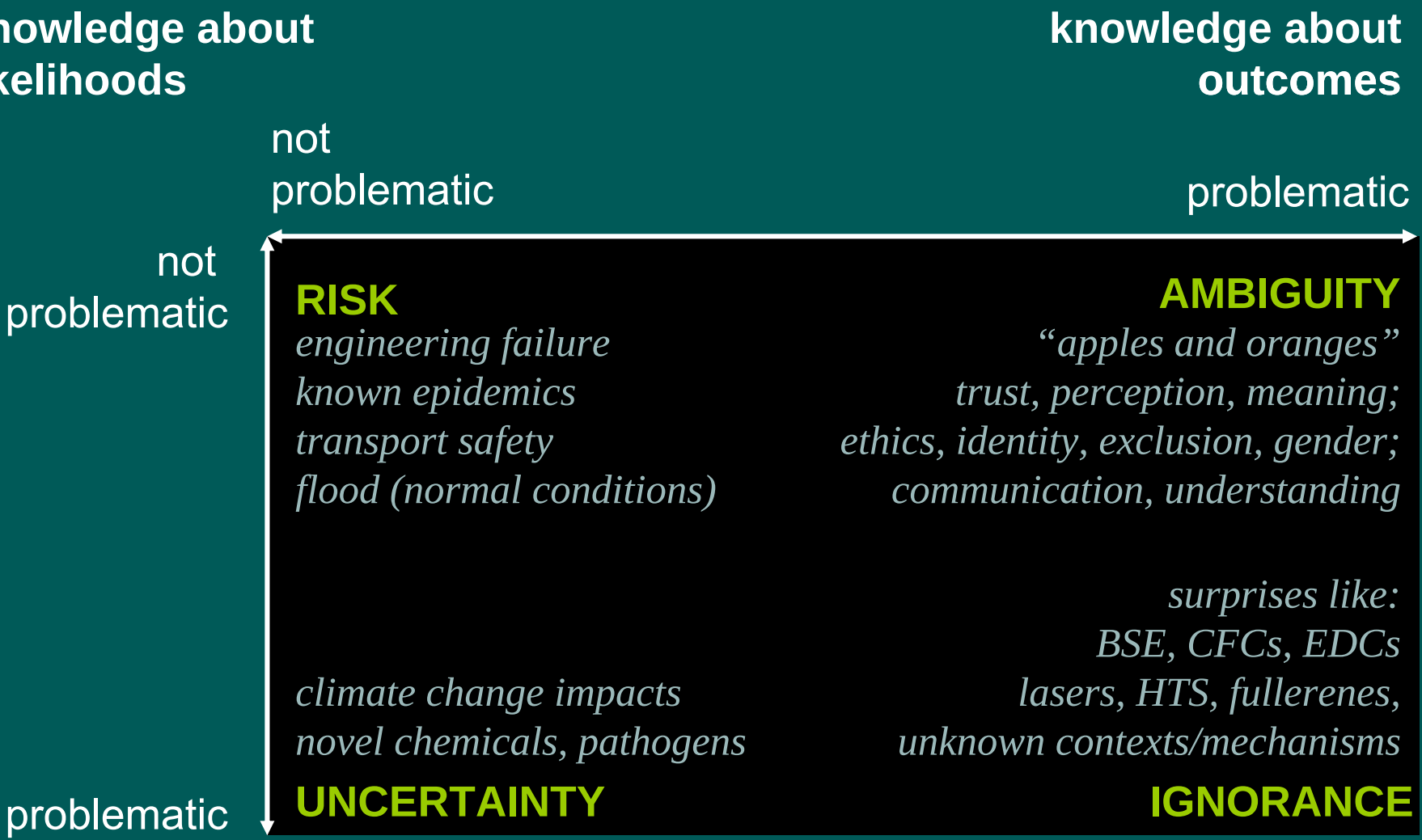
eg: ***nanotechnology regulation aims :*** *‘safe?’* *‘safe enough?’* *‘safest?’* *‘best?’*

All analysis requires framing … all framing involves value judgements

‘sound science’ and expertise give different answers to different questions

… we should be as rigorous about validating the questions as the answers

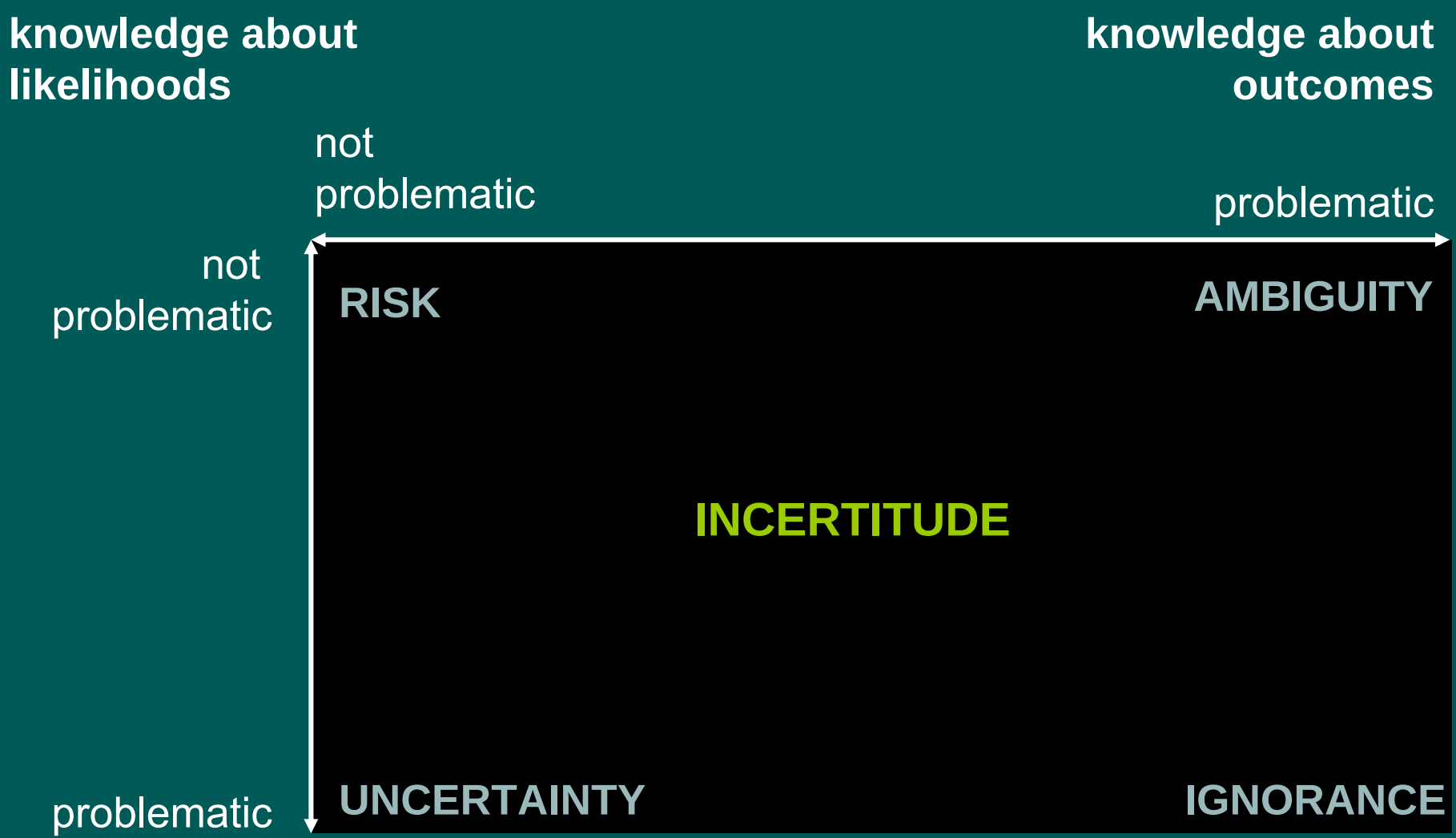
‘Closing Down’ to Risk



Social science has broadened understandings beyond ‘risk’

knowledge bases for policy can be problematic in many different ways

‘Closing Down’ to Risk



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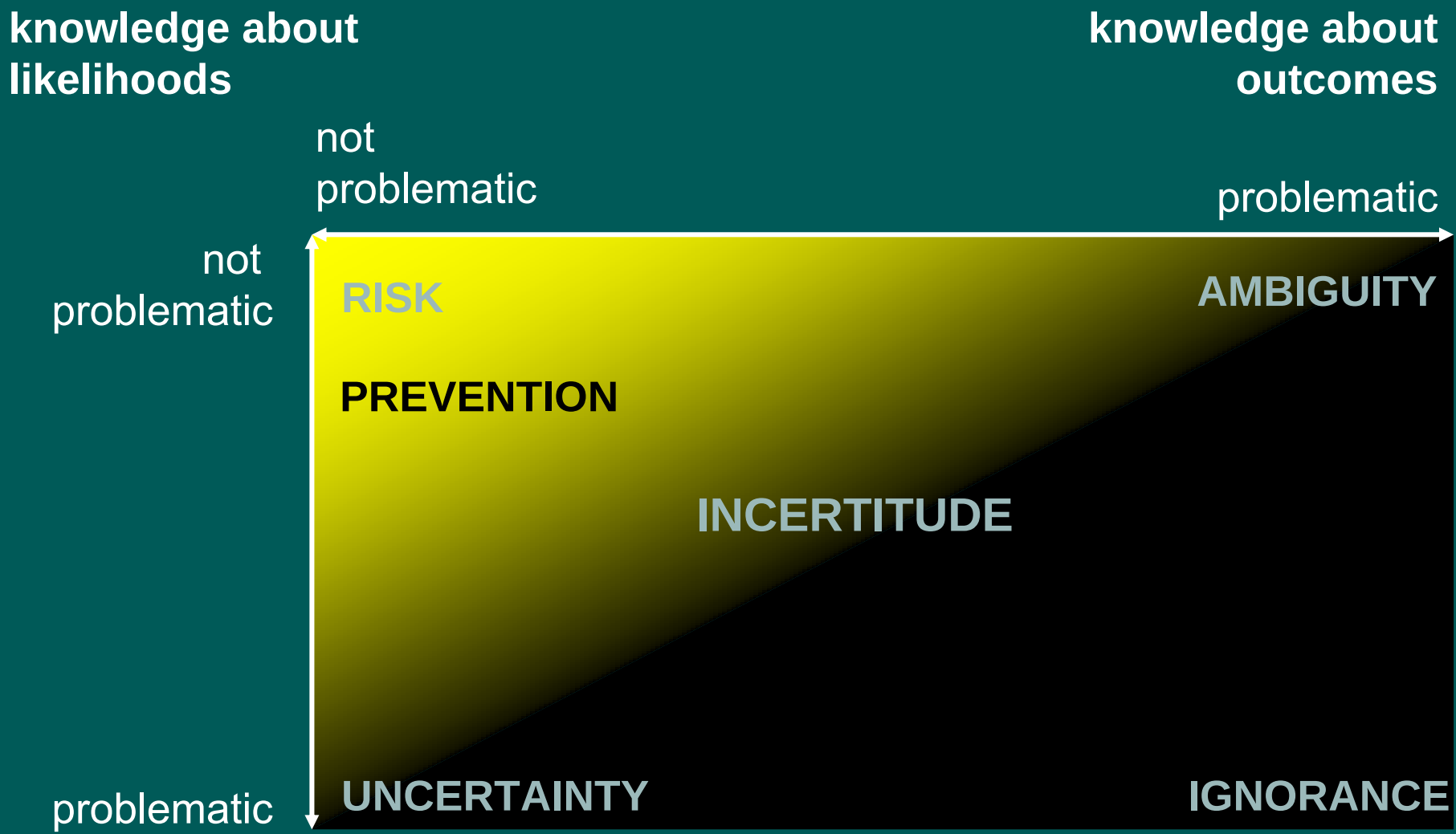

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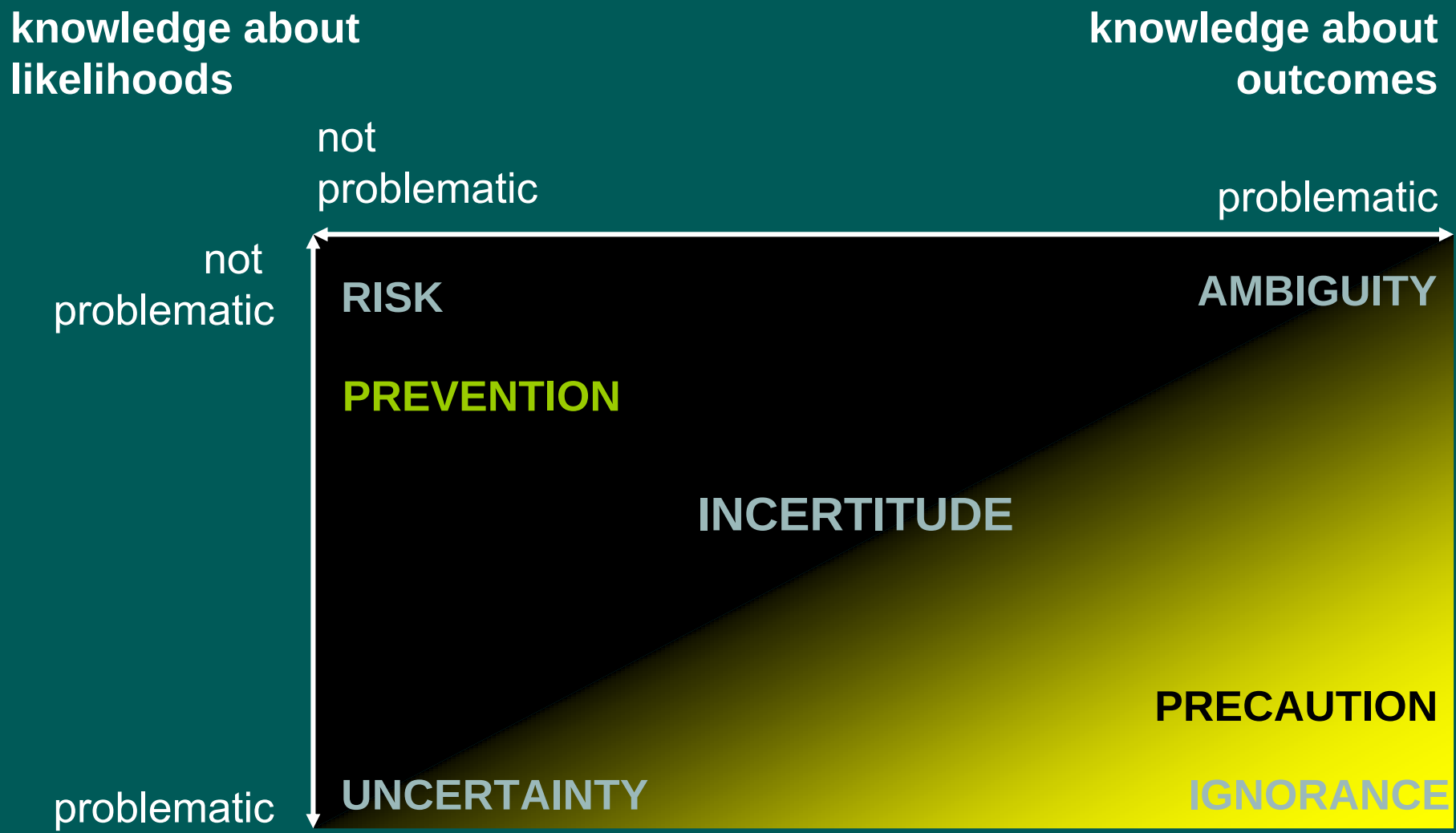
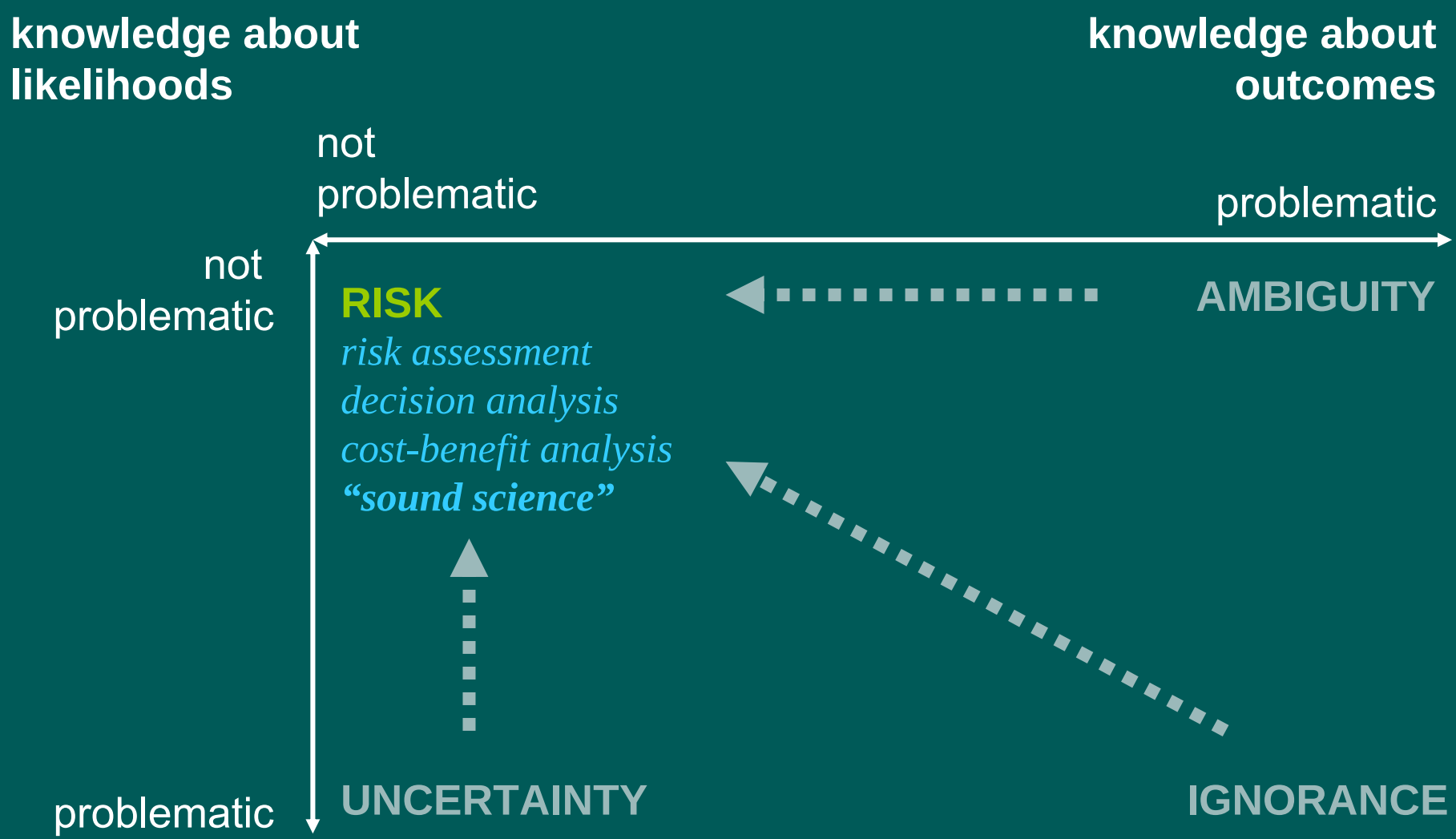


Precautionary approaches hold same scientiic basis as risk assessment

recognise simply that science should be “on tap, not on top”

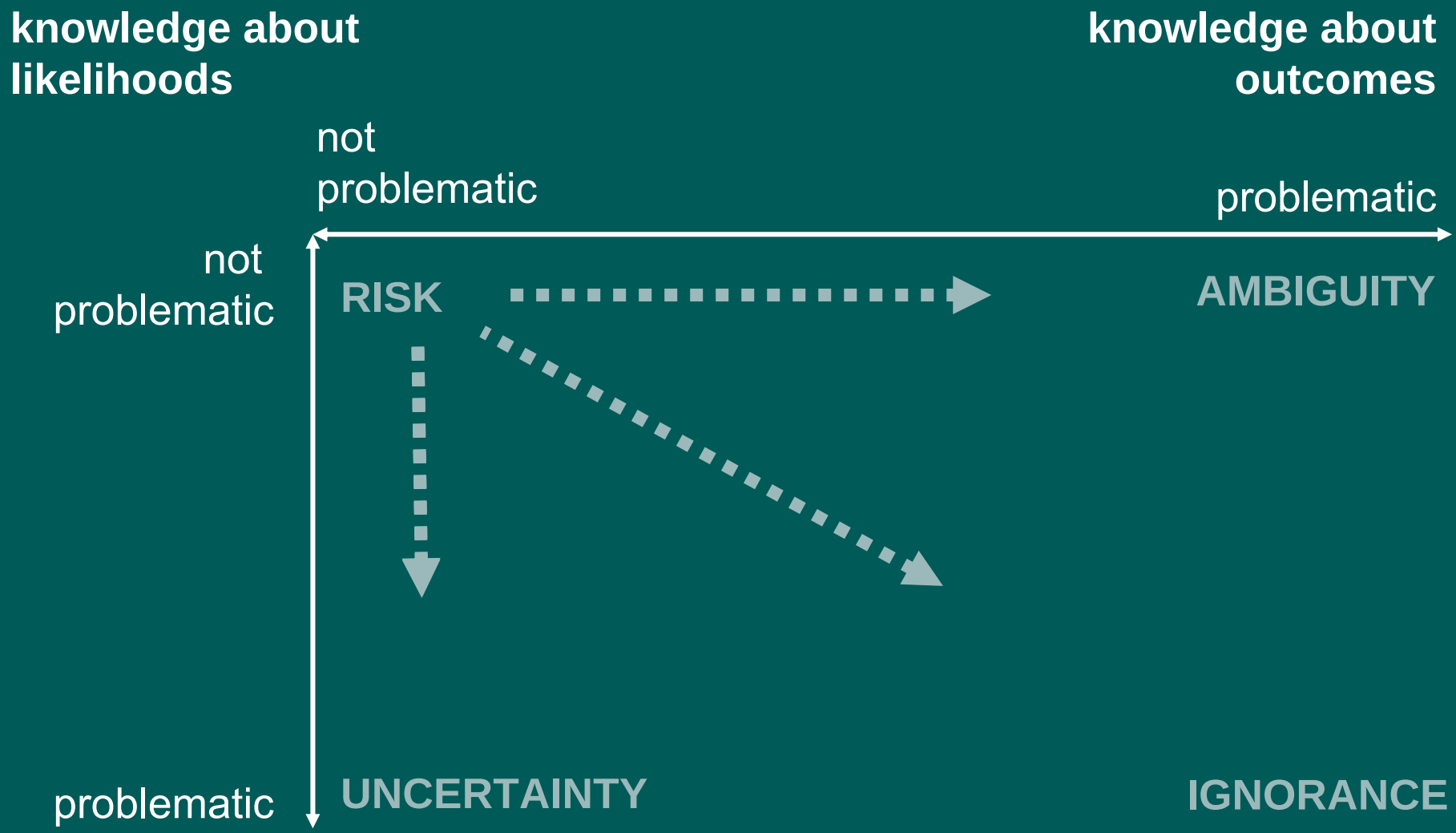
‘Closing Down’ to Risk



Methods, regulations, institutions: reduce incomplete knowledge to ‘risk’

this denies and excludes complexity – Beck’s “organised irresponsibility”

‘Broadening Out’ Technology Appraisal



Precaution is about rigour under uncertainty, ambiguity, ignorance *(EEA,2001)*

broader methods, possibilities, options, issues, assumptions, perspectives

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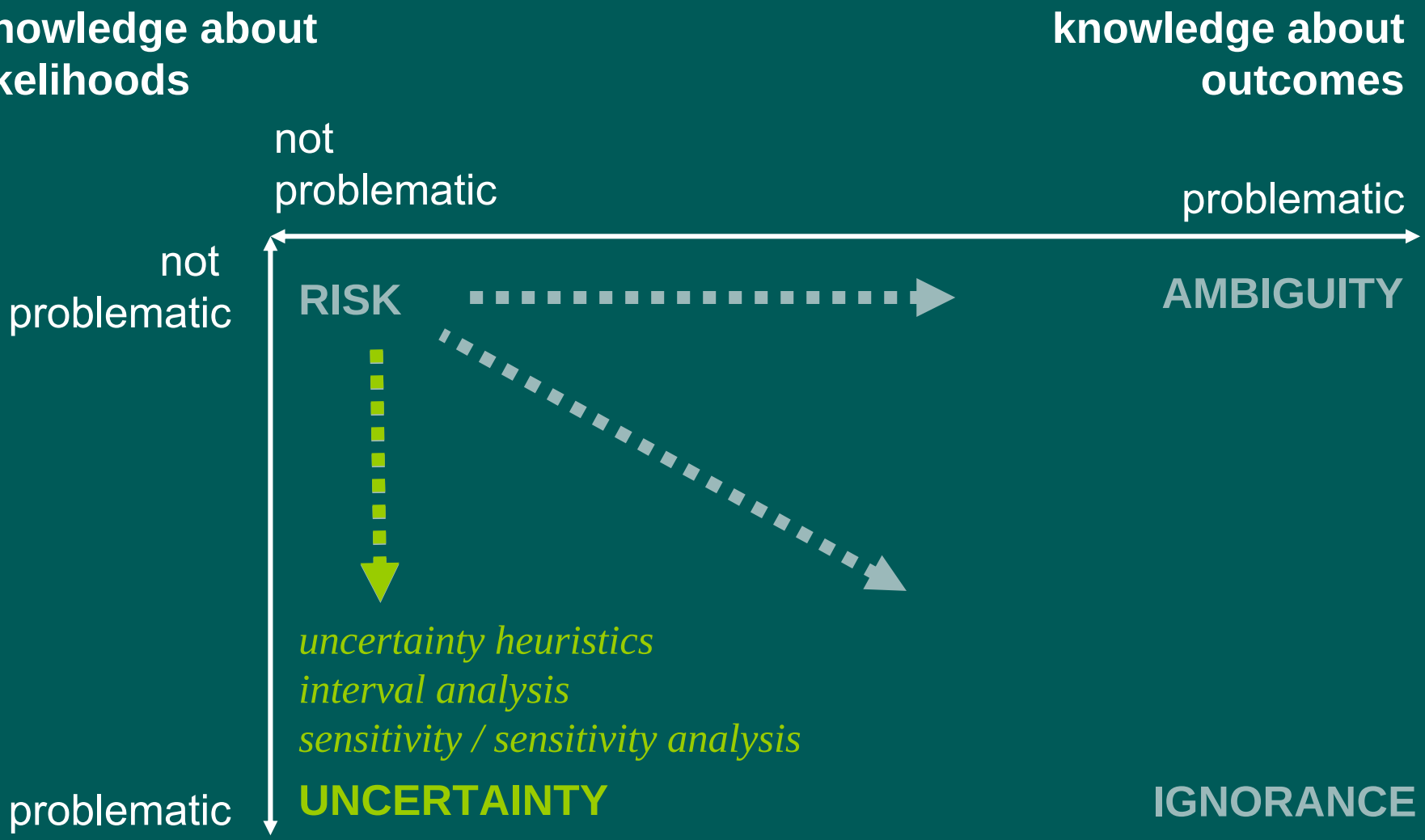

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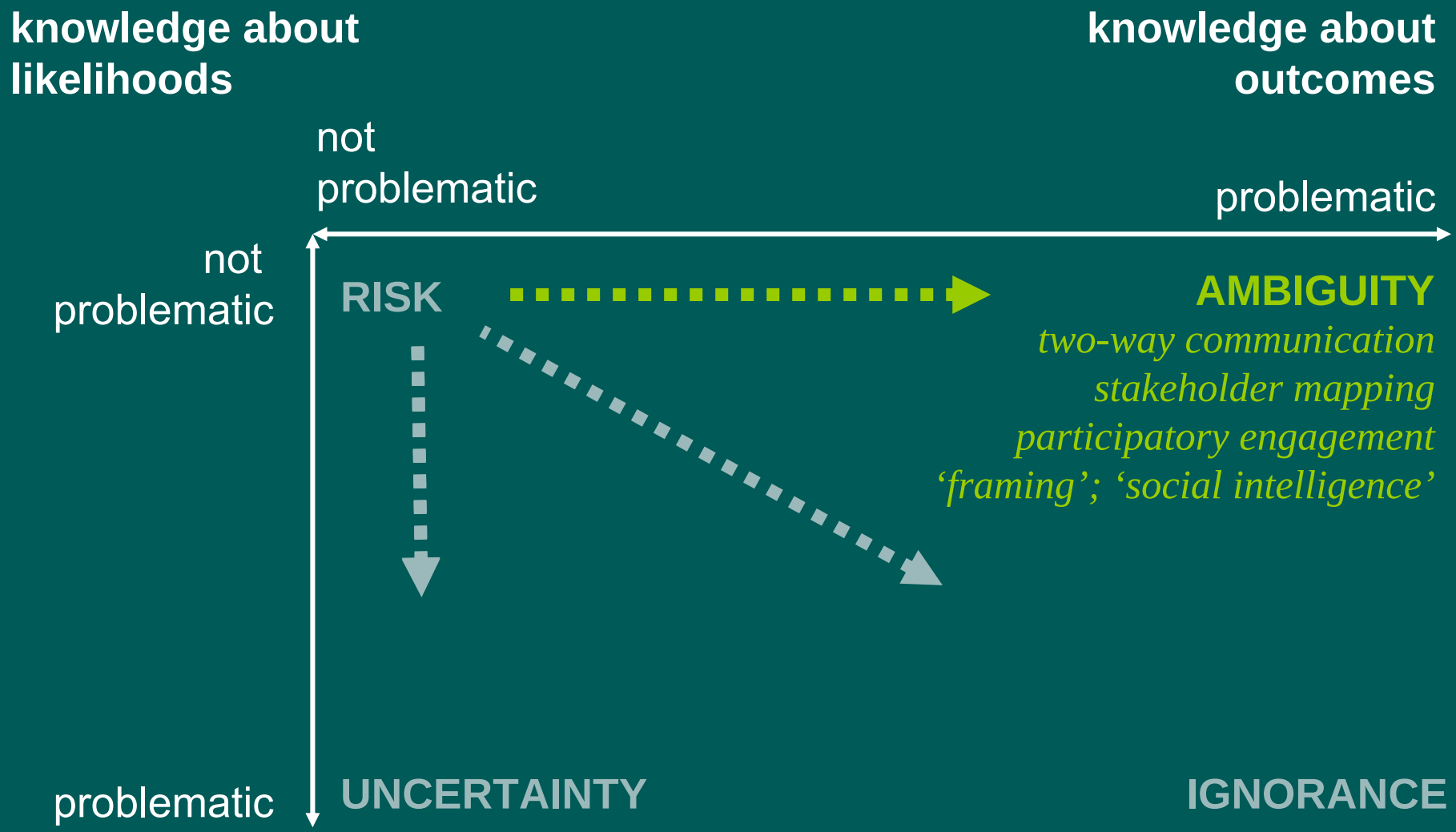

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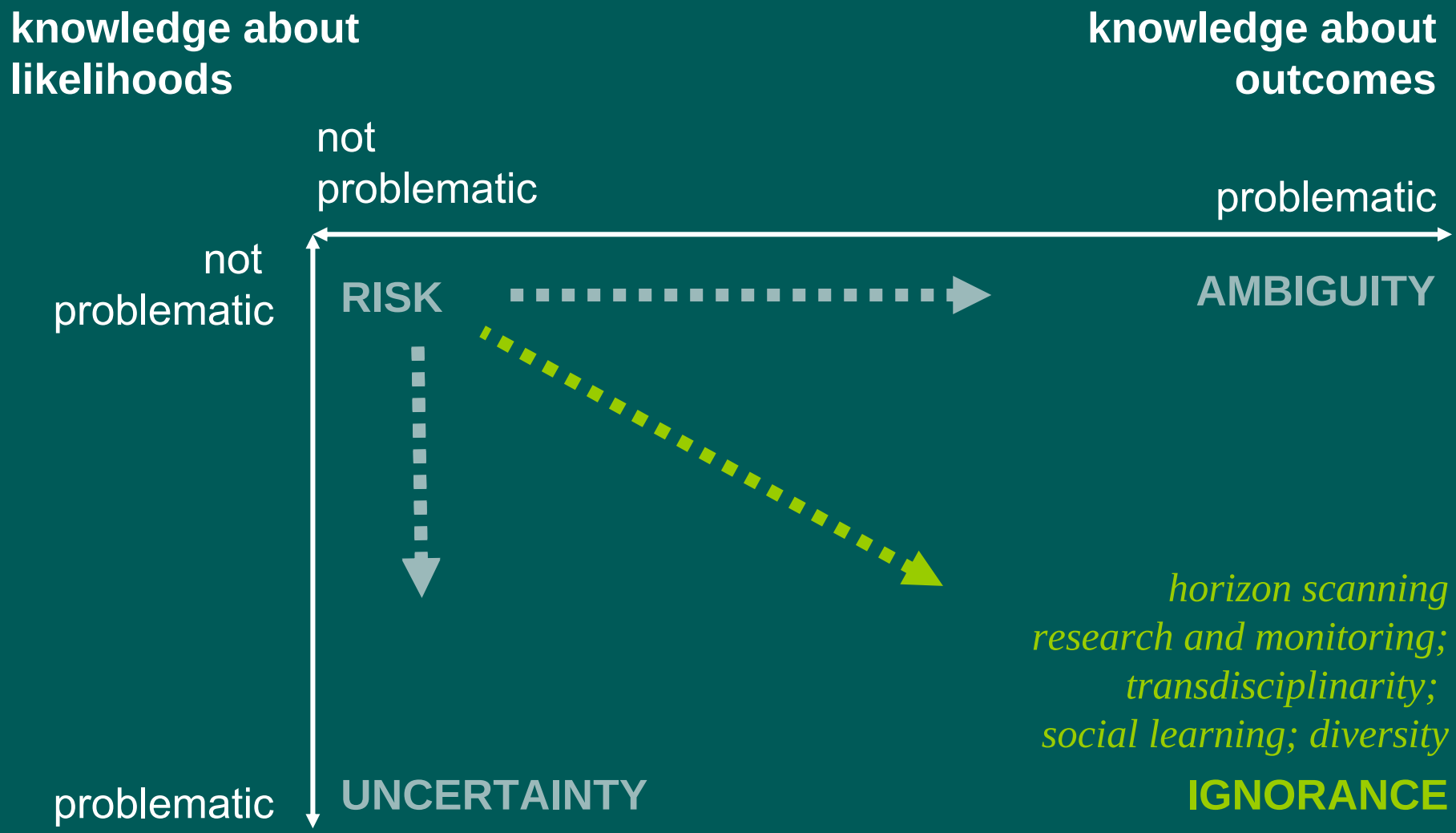

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Precaution as Broader Appraisal Process

(after EEA, 2001)

extend scope	additive, cumulative, synergistic effects; life cycles, compliance *real world effects: CFCs, DES; 'closed systems': MTBE, PCBs*
humility on science	sensitivities & proxies: mobility, persistence, bioaccumulation *omission of persistence in organochlorines, MTBE, CFCs*
active research	prioritise open monitoring & surveillance & targeted experiment *neglected: TBT, BSE; no monitoring: asbestos, benzene, PCBs*
deliberate argument	levels of proof, burden of evidence, onus of persuasion *Swann committee on antimicrobials, 1967 later ignored*
alternative options	pros, cons, justifications for range of options & substitutes *ALARA, BAT, BPM – ionising radiation, fisheries, acid rain*
X-disciplinary learning	collect all relevant knowledge, beyond the 'usual suspects' *MTBE / engineers; BSE / vets (clinical / toxicology / epidaem.)*
engage public	independence through pluralism and robustness on values *benzene, DES, asbestos, acid rain, fisheries*

From Broadening Appraisal to Opening Up Choice

Beyond participation / analysis dichotomies …

‘Sound Science’	⟷	‘Public Engagement’
Narrow and exclusive	⟷	**Broad and participatory**
BUT: Multicriteria appraisal *can be wide and inclusive*		Citizens’ Panels *can be selective and constrained*
Complex and opaque	⟷	**Straightforward, transparent**
BUT: Scenario backcasting *can be accessible, intuitive*		Deliberative process / focus groups *can be elaborate and highly mediated*
Conceals uncertainty	⟷	**Reveals uncertainty**
BUT: Minority views / sensitivity analysis *can illuminate uncertainty*		Citizen’s Jury *‘evidence’ / ‘verdicts’ conceal uncertainty*
Sensitive to framing	⟷	**Transcends Framing**
BUT: Mapping approaches *can explore different framings*		Consensus conference *focuses on discrete findings*

From Broadening Appraisal to Opening Up Choice

Distinction applies both to 'analytic' and 'participatory' approaches to technology appraisal

Not just about broadening of '**inputs**' to technology appraisal

like precautionary addressing of uncertainty, ambiguity and ignorance

(issues, disciplines, perspectives, options, uncertainties in assessment)

Instead, about the '**outputs**' of appraisal to wider governance

reflexively addressing how divergent framings yield contrasting pictures

(humility, accountability, pluralism and diversity in technology choice)

Arguably often more salient than conventional distinctions:

specialist / non-specialist

quantitative / qualitative

analysis / deliberation

…but strangely neglected

Closing Down and Opening Up

	‘closing down’	‘opening up’
focus on:	defining the ‘right’ questions eliciting ‘appropriate’ knowledge finding ‘most likely’ outcomes	contingencies and sensitivities contending knowledges dissenting views
emphasise:	aggregation, consensus reducing complexity objectivity / legitimacy	diversity and pluralism exploring complexity transparency / accountability
result in:	identify ‘best’ option ‘*unitary prescriptive*’ advice	mapping range of options *‘plural and conditional’* advice
eg:	*risk, cost-benefit, decision analysis* *prescriptive ethics, social expertise* *‘consensus conference’, jury verdicts,*	*scenarios, sensitivity analysis* ***ABM**, multi-criteria mapping* *Q-method, dissonance panels*
vulnerable:	strategic behaviour by practitioners or sponsors	strategic behaviour on part of participants

Conclusions: new challenges for technology governance

False dichotomy: rational 'sound science' / 'emotive' precaution / participation

All analysis is 'framed' by problems, priorities, values and interests

Misleading language: pro- / anti- rhetorics' obscure ***directions*** of innovation

Undermines rigour on uncertainty and democratic accountability alike

Precaution: 'broadening out' methods, framings, perspectives in appraisal

Rigour over uncertainty, ambiguity and ignorance on implications of directions

Public engagement: not only about 'democracy' / 'justification' / 'robustness'

Reflexivity over values and interests in framing appraisal of different directions

Practical approaches: many ways to 'open up' analysis & deliberation alike

Mapping methods, participatory modeling, plural and conditional advice

Rare chance to address both scientific rigour and democratic accountability

‘Opening Up’ through Participation?

Three rationales and imperatives for participation (cf: *Fiorino, US NRC)*

1: Normative (Democratic) the ‘right thing to do’ in a democracy

- about process: equity, inclusion, empowerment

(even if ‘ineffiective’ or ‘inefficient’ according to incumbent interests)

2: Instrumental expedient means to some particular end

- about narrow interests: trust, credibility, acceptance, “sedation”

(offers justification and blame management in decision making)

3: Substantive improves general ‘robustness’ of policy advice

- about broad consequences: low harm, high benefit, sustainability, precaution

(according to publicly reasoned, socially deliberated values and priorities)

‘Broadening Out’ through Participation

Many different modes, contexts and perspectives in engagement

transcend Arnstein’s ‘ladder’ of 1968 – all extant on nanotechnology

transdisciplinary deliberation

social science, religious interests, ethicists, ‘lay’ membership

eg: strategic commissions; ethics councils, extended foresight, FP7 Committees

stakeholder engagement

employers, unions, consumer organisations, ‘social parttners’, special interests

eg: occupational health, sustainability / agenda 21, co-operative research

citizen participation

workers, local people, consumers, citizens

eg: consensus conferences? citizens juries? focus groups? nanodialogues?

Driving aim in UK: ‘public engagement’ as ‘fire walls’ for ‘sound science’

‘Broadening Out’ through Participation

Some dimensions of ‘framing’ in participatory deliberation

identification of stakeholders	phrasing of questions	bounding of remits
recruitment of participants	provision of information	choice of focus
personalities of protagonists	medium of discourse	style of facilitation
selection of alternatives	treatment of dissensus	design of process
documentation of findings	dynamics of persuasion	adoption of norms

Participation outcomes are open to contingency & exercise of power

eg: Prajateerpu on GM in India *(Scoones, Thompson, Pimbert, Wakeford)*

implications for ‘nano-participations’ by researchers, think tanks, governments?

transcendant ‘public reason’, ‘social robustness’, ‘democratic legitimacy’

… are as problematic as naïve positivist faith in ‘sound scientific analysis’

Participatory process also offers a means to justify ‘closing down’ decisions

‘Broadening Out’ through Participation

Just like expert and quantitative analysis, participation can …

obscure contextual, contingent and constructed complexities in appraisal

Susceptible to influence by power to justify decisions *(Collingridge, 1980)*

Weak justification
of any decision

maximise trust and consent
minimise controversy and conflict
manage accountability and blame

for ***general*** institutions and procedures associated with decision-making

Strong justification
of specific decision

foster acceptance and ‘sedation’
construct legitimacy and credibility
manage dissent and opposition

benefiting ***particular*** outcomes favoured by incumbent interests

As science-based appraisal loses public confidence …

… instrumental pressures for justification are shifting to participation

‘Broadening Out’ through Participation

SOME TYPICAL EVALUATION CRITERIA (eg: Rowe & Frewer, Petts, Renn)

ubiquitous calls for evaluation in bio-, nano-, neuro-technology field *(eg: Involve)*

generally invoking some permutation of the following kinds of criteria

representativeness	inclusivity and representative mix of interests
independence	process should be conducted in independent, unbiased way
resources	sufficient time, expertise, information to allow agency
structured dialogue	active steps to ensure effective and unbiased debate.
transparency	accessibility, feedback, clarity on outputs, role of sponsors
task definition	clear and achievable aims and objectives. participants clear about their role in the task.
influence	the output from the engagement should have a genuine impact on policy.

Evaluation discourses reflect, reinforce and conceal instrumental imperatives