SCK•CEN
STUDIECENTRUM VOOR KERNENERGIE
CENTRE D'ETUDE DE L'ENERGIE NUCLEAIRE

SCK•CEN ACADEMY
FOR NUCLEAR SCIENCE AND TECHNOLOGY

# "Time for the reflexive mind"
# Preparing the next generation of nuclear scientists and engineers for our complex world

Gaston Meskens
*Science & Technology Studies Unit, SCK•CEN (Belgium)*
*Centre for Ethics and Value Inquiry, University of Ghent (Belgium)*
gaston.meskens@sckcen.be

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# “Time for the reflexive mind”
# Preparing the next generation of nuclear scientists and engineers for our complex world

1 The idea of fair energy governance

2 Dealing with risk: between knowledge and fairness

3 Seeking societal trust: the challenge for science, education and training

# 1 The idea of fair energy governance

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# The idea of fair energy governance

## Energy governance is a ‘complex social problem’ with risk as its central concern



# 1 The idea of fair energy governance

## What we can agree on: setting policy priorities right to minimise adverse impact on health and the environment now and in the future

# The idea of fair energy governance

## What we can agree on: setting policy priorities right to minimise adverse impact on health and the environment now and in the future

1. Minimise energy consumption (or thus maximise energy savings) through democratic deliberation on how and where;
2. Maximise renewables through democratic deliberation on how and where;

# The idea of fair energy governance

## What we can agree on: setting policy priorities right to minimise adverse impact on health and the environment now and in the future

1. Minimise energy consumption (or thus maximise energy savings) through democratic deliberation on how and where;

2. Maximise renewables through democratic deliberation on how and where;

3. Organise a fair debate on how to produce what cannot be done with 1 and 2 yet, and 'confront' in that debate fossil fuels and nuclear, being the two ‘nasty’ risk-inherent energy technologies, with each other.

   Democracy in this sense implies that a society would need to be able to decide on how to produce 'the rest' of its needed energy for the time to come: with nuclear, with fossil fuels or with a combination of both.

# 1 The idea of fair energy governance

## Fairness articulated as the ethical principles of energy governance

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## Fairness articulated as the ethical principles of energy governance

| | |
|---|---|
| → | set priorities for **minimising adverse impact** on health and the environment now and in the future: |
| 1 – minimise | energy consumption |
| 2 – prioritise | renewables |
| 3 – fill the gap | with a deliberate use of nuclear and/or fossil fuels |
| general principles | **precaution**, **protection**, **participation, accountability** |
| → | foster a politics of **cooperation** on local and global scale (among communities, regions & nation states) |
| general principles | **the 'global commons'**, **burden sharing** |
| → | ensure **affordable access** to energy **for all**, for this and next generations, respecting local contexts and needs |
| general principles | **inclusion**, **equality**, **accountability** |
| → | ensure **transparency** of markets, enforced by regulation |
| general principles | **accountability, corporate social responsibility** |

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available technologies

**(promising) capacities:**
- availability (resources)
- availability (technology)
- flexibility, efficiency
- burden minimisation
- resistance to misuse
- reasonable cost

**(acceptable) risk:**
- potential harm to health and the environment
(- potential misuse)

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→ There is no rational link between the ethical principles of energy governance and the criteria for available energy technologies to meet or respect these principles.

Therefore → **fairness also relates to technology assessment**, or thus to the way we make sense of **the promises of capacities** and **the acceptability of risks**, of energy technologies

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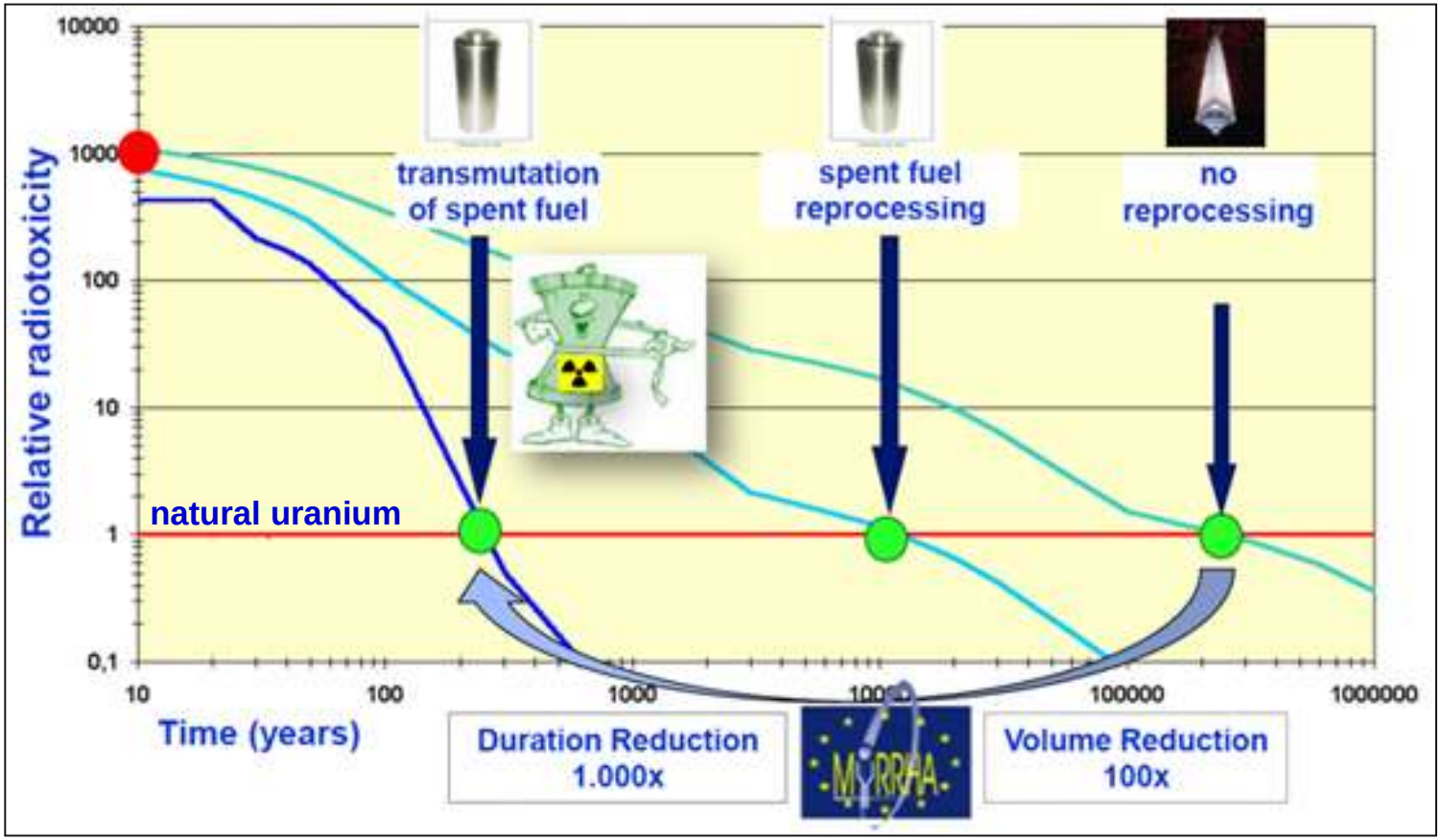
# The idea of fair energy governance

## The promises of transmutation



# 2

# Dealing with risk: between knowledge and fairness

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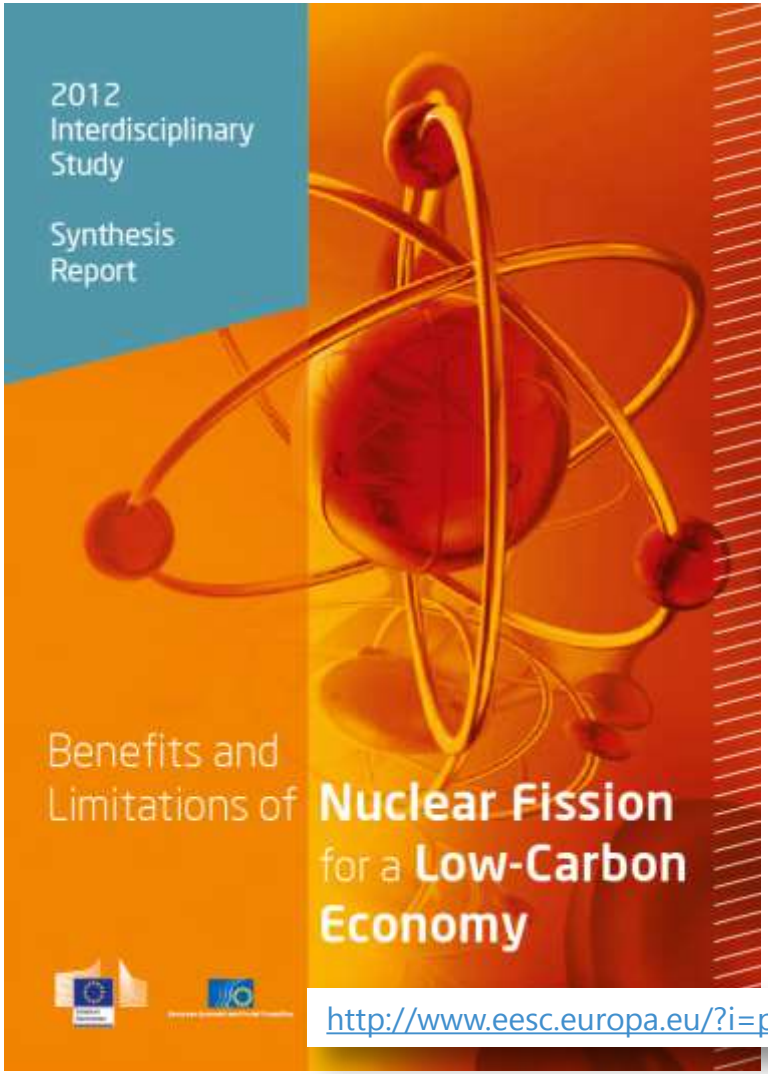


http://www.eesc.europa.eu/?i=portal.en.events-and-activities-symposium-on-nuclear-fission-papers

# Dealing with risk: between knowledge and fairness

## What is an 'acceptable risk'?


**Topical socio-economic reports / expert viewpoints**

[…]

"Risk governance:
What is an acceptable level of (nuclear) risk for the public at large?"

http://www.eesc.europa.eu/?i=portal.en.events-and-activities-symposium-on-nuclear-fission-papers

# Dealing with risk: between knowledge and fairness

## What is an 'acceptable risk'?


**Topical socio-economic reports / expert viewpoints**

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"Risk governance:
What is an acceptable level of (nuclear) risk for the public at large?"

my answer:

*There exists no objective (scientific, economic, social, political or philosophical) rationale for the determination of the acceptable level of nuclear risk for the public at large.*

*An acceptable nuclear risk is simply a risk that an informed democratic society justifies as acceptable.*

http://www.eesc.europa.eu/?i=portal.en.events-and-activities-symposium-on-nuclear-fission-papers

# Dealing with risk: between knowledge and fairness

## What is an 'acceptable risk'?

- In policy, justification of technological risk is still in the hands of technocracy.

# Dealing with risk: between knowledge and fairness

## What is an 'acceptable risk'?

- In policy, justification of technological risk is still in the hands of technocracy.


- In nuclear energy policy, the attitude towards the public is still paternalistic.

  *"People have problems with nuclear energy because they don't understand it."*

  *"It is our duty to educate people about nuclear energy."*

↘ Narrow view on 'the public', ignoring the existence of informed civil society;

Seeing citizens as stupid;

Not understanding that even with sufficient knowledge about nuclear energy, one can be against the use of it.

# Dealing with risk: between knowledge and fairness

## What is an 'acceptable risk'?

do we need calculation
to support informed consent?

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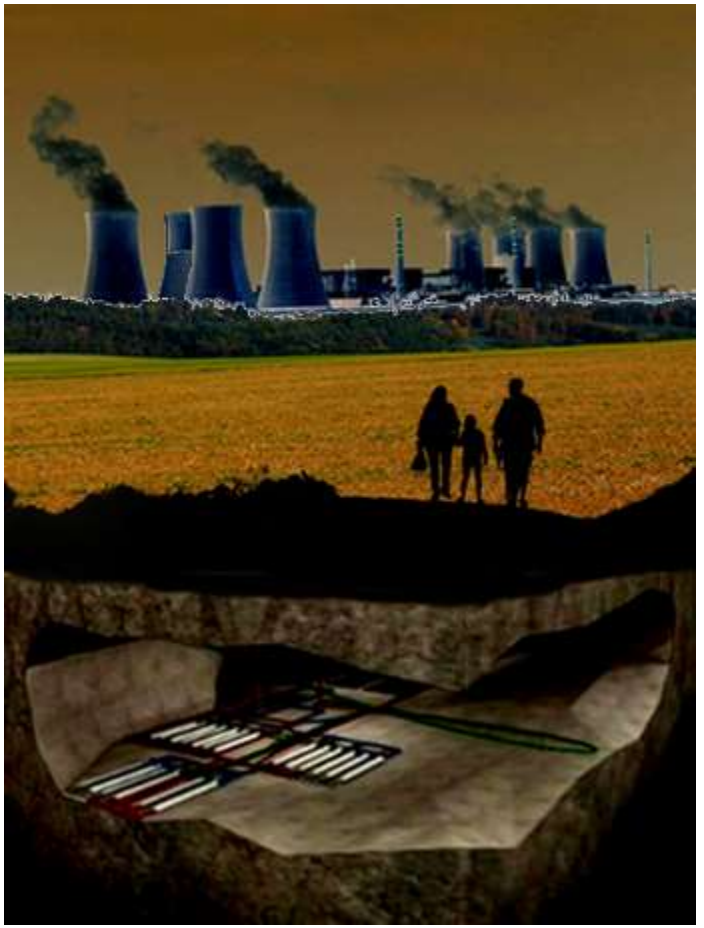

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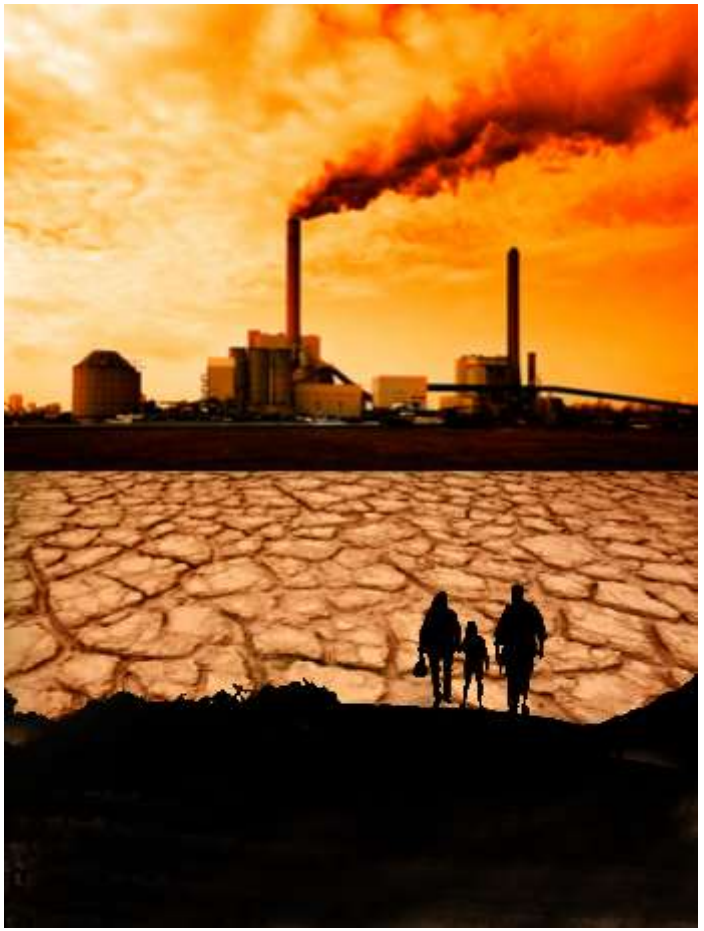

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# Dealing with risk: between knowledge and fairness

## The assessment of what is an acceptable risk for society is not a matter of science; it is a matter of justice

# 2 Dealing with risk: between knowledge and fairness

## The assessment of what is an acceptable risk for society is not a matter of science; it is a matter of justice

- A risk is not a mathematical formula; it is a potential harm that
- → you cannot completely know and
- → you cannot fully control

- Acceptable risk?
  People will accept a risk they cannot completely know and that they cannot fully control simply when they **trust** that its justification is **marked by fairness**.

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Fairness: the **possibility of self-determination** ensured by 'the right to be responsible'

| | | |
|---|---|---|
| risk for society | the right to co-decide | → from a joint decision follows |
| | ↑ | ↓ |
| | **the right to be responsible** | **the right to be protected** |
| risk taken by an individual | ↓ | |
| | the freedom to hurt yourself | |

- For any health risk that comes with technological, industrial or medical practices and that has a wider impact on society, 'the right to be responsible' equals 'the right to co-decide'. **Enabling this right is a principle of justice**

2 case

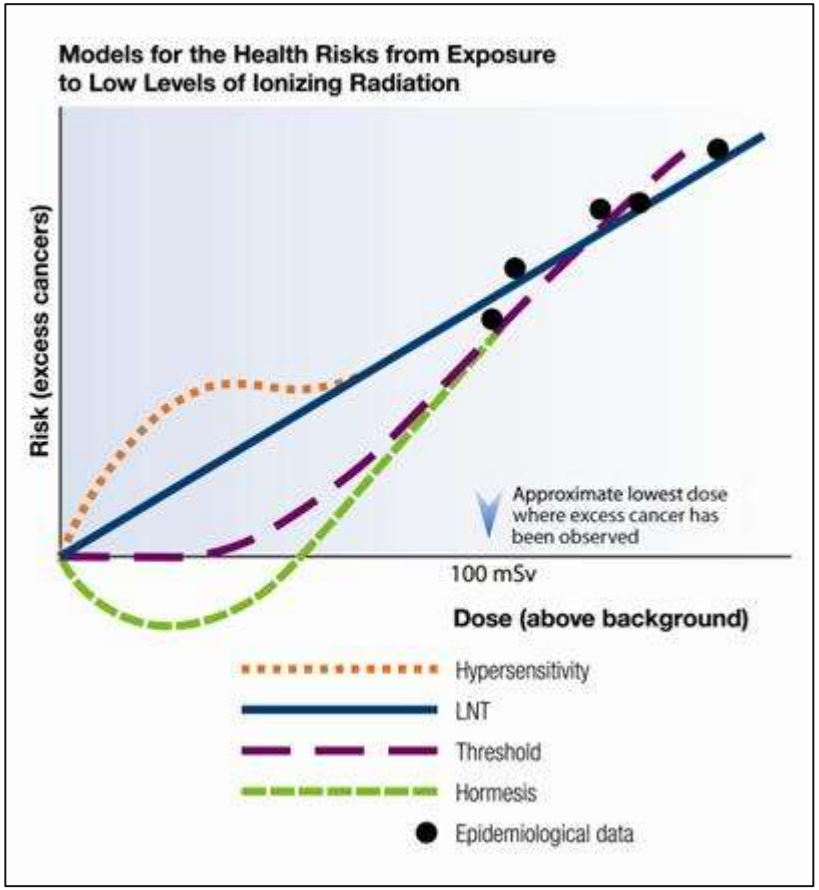
# Dealing with risk: between knowledge and fairness

## In search of post-accident justice in Fukushima

# Dealing with risk: between knowledge and fairness

## In search of post-accident justice in Fukushima

The issue of the so-called '100 mSv threshold' is an issue in urgent need of formal public intellectual confrontation between all responsible and concerned parties.




There is major support for the vision that no such threshold exists and that one needs to maintain the linear relation between radiation dose and risk (LNT) based on the precautionary principle.

Who shall take the initiative to launch and organise this confrontation?

source:
Canadian Nuclear Safety Commission
http://nuclearsafety.gc.ca/eng/resources/health/linear-non-threshold-model/index.cfm

# Dealing with risk: between knowledge and fairness
## In search of post-accident justice in Fukushima

The argument in favour of a “100 mSv treshold” relies on a wrong interpretation of a quote from the ICRP 2007 recommendations

In the section on fundamental data on radiation response, it is said that

[… ] *There is, however, general agreement that epidemiological methods used for the estimation of cancer risk do not have the power to directly reveal cancer risks in the dose range up to around 100mSv* [… ]

*ICRP 2007, page 173 (A.4.1. Fundamental data on radiation response)*

↘ insufficient statistical power to observe elevated risk ≠ no elevated risk

# Dealing with risk: between knowledge and fairness

## In search of post-accident justice in Fukushima

In Fukushima, the ongoing scientific discussion on possible thyroid cancer with children would benefit from a serene and open atmosphere, but is now hindered by power politics and distrust.


**Epidemiology**
Issue: Volume 27(3), May 2016, p 316–322

Publication Type: [Environmental Epidemiology]
DOI: 10.1097/EDE.0000000000000385
ISSN: 1044-3983
Accession: 00001648-201605000-00003

**Thyroid Cancer Detection by Ultrasound Among Residents Ages 18 Years and Younger in Fukushima, Japan: 2011 to 2014**

Tsuda, Toshihide; Tokinobu, Akiko; Yamamoto, Eiji; Suzuki, Etsuji

# 3 Seeking societal trust: the challenge for science, education and training

# Seeking societal trust: the challenge for science, education and training

## To what extent should scientists and engineers be concerned with fairness?

# Seeking societal trust: the challenge for science, education and training

## To what extent should scientists and engineers be concerned with fairness?

- We know that the practice of scientific research is influenced by

→ the market
→ political programmes (research funding opportunities, custom-made research)
→ competition

but also by

↘ the ideology of finding and presenting the truth
↗ 'self-organised' quality control (through peer review)

- All this tends to stimulate

→ knowledge brokerage, (delivering knowledge in the 'right form' to the user)
→ tailor-made scientific consultancy
→ political 'science shopping'

# 3 Seeking societal trust: the challenge for science, education and training

## The challenge for science is to go beyond its traditional quality criteria of objectivity and independence

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## The challenge for science is to go beyond its traditional quality criteria of objectivity and independence

- … in making sense of **the promises of capacities** of energy technologies:

→ Science should have the 'freedom' to explore possibilities (gen III/IV, plant life extension, decomissioning, transmutation, waste, …), but should do it in close interaction with society, transparent wrt its intentions and prepared for confrontation wrt its rationales;

- … in making sense of **the acceptability of risks** of energy technologies:

→ No scientific or political authority can determine alone what would be an acceptable risk for society.

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- … in making sense of **the acceptability of risks** of energy technologies:

→ No scientific or political authority can determine alone what would be an acceptable risk for society.

- Good science and engineering, open and transparent communication and the 'promises' of a responsible safety and security culture are necessary conditions but can never generate societal trust in themselves.

↘ The reason is that there will always be essential factors beyond full control (nature, time, human error, misuse of technology), which implies that one always has to deal **with a complexity of interpretation** (due to **incomplete and speculative knowledge** and **value pluralism**) in making sense of these capacities and risks.

# Seeking societal trust: the challenge for science, education and training

## The challenge for science is the construction of credible hypotheses

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## The challenge for science is the construction of credible hypotheses

- Confronted with the need to deal with incomplete and speculative knowledge and value pluralism in making sense of the promises of capacities and the acceptability of risks of technologies, **the challenge of science** is not the production of credible proofs, it **is the construction of credible hypotheses**.

↘ The challenge is there as well

with respect to the issue of justification of risk-inherent energy technologies in energy governance

as with respect to issues of protection, restoration and compensation in crisis situations.

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- In the general interest of rendering hypotheses with credibility

science has no choice but **to involve society in general and the (potentially) affected in particular** in constructing its hypotheses.

# Seeking societal trust: the challenge for science, education and training

## A new vision on science, informed by ethics, able to grasp the complexity of risk-inherent technology assessment

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## A new vision on science, informed by ethics, able to grasp the complexity of risk-inherent technology assessment

key words transdisciplinarity & participation

# 3 Seeking societal trust: the challenge for science, education and training

## A new vision on science, informed by ethics, able to grasp the complexity of risk-inherent technology assessment

key words transdisciplinarity & participation

- The 'integration' of social sciences and humanities into research that traditionally relies on natural, engineering and technical sciences

→ **helps to improve the understanding of concrete challenges** within specific research fields that have implications for the wider society outside of the reseach office or laboratory (f.i. low dose health effects, the choice for open or closed fuel cycles, the choice for (non-)retrievable waste disposal, ...);

→ **facilitates stakeholder participation** in research and decision making processes that rely on science and engineering;

→ **enables the research to become self-reflexive** and thus – as an accountability towards society – critical with regard to its own working, in the sense that the research can become better aware of

(1) the social, political, cultural and historical context wherein it operates;
(2) the rationales, possibilities and limitations of its own research methods and the relevance and possible interpretations of its own hypotheses.

Self-reflection can be seen as an ethical attitude of science towards society.

# Seeking societal trust: the challenge for science, education and training

## A new vision on education & training, informed by ethics, able to grasp the complexity of risk-inherent technology assessment

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## A new vision on education & training, informed by ethics, able to grasp the complexity of risk-inherent technology assessment

- The 'reflexive mind': **reflexivity** as a **critical-intellectual capacity** ↘
  an **ethical attitude** (an ethical 'experience')

wrt the social, political, cultural and historical context wherein you grow up, live and 'operate'

the own position, interests, hopes, hypotheses, believes and concerns,

and this in any formal role or social position (as scientist, engineer, politician, manager, citizen, civil society representative, activist, ...).

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- Nuclear scientists and engineers have the right to develop deeper insight into the ethical, political, social and scientific complexities that mark 'their' technology and, thus, to get courses that focus on

↘ policy analysis (energy policy, nuclear waste policy, R&D policy, ...);
↘ the way science works as policy advice and in relation to society;
↘ ethics (underlying theories and case studies).

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- The courses on **Ethics** and **Nuclear and Radiological Risk Governance** organised by the **SCK•CEN Academy for Nuclear Science & Technology** are welcomed with great enthusiasm by all the participants up till now.
  See info on http://academy.sckcen.be/