EST-Frame workshop
Integrated assessments of emerging science and technologies

PACITA conference March 15 2013

Chair: Frans Brom (Rathenau, EST-Frame advisory committee)

Presenters:

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EST FRAMEPROJECT

Integrated EST framework (EST-Frame)

An FP7, Science in Society, Collaborative Project, Small or medium-scale focused research project.

SEVENTH FRAMEWORK PROGRAMME

What's special about emerging science and technologies (EST)?

- Because of their early stage uncertainties about risks and benefits abound.
  - Who might be affected? How? Do we know all the risks? Who will benefit?
- Because of their novelty, ethical concerns arise.
  - Does this change the relation between people? The way will look upon health? Does it affect what is sacred? Might already vulnerable groups stand to gain or lose? How does it affect global or intergeneration justice?
- Moreover, both the facts and values are contested.
- As the impacts of the technologies must be considered in the medium to long term, the potential for responsible governance of these technologies is affected by contextual policy trends.

What's special about assessment of emerging science and technologies (EST)?

- In order to be responsible we need to take action in the face of uncertainties and controversies. However, the uncertainties and controversies about risks and benefits must be assessed.

- The fact the facts and values surrounding EST often are contested means that there is no 'view from nowhere', a value free point of departure for assessment (neither for risk/cost/benefit assessments, TA, ethics assessments, etc.). This requires special attention to – and interdisciplinary deliberation of - situation analysis and methodological choice.

  - These points can be argued from the perspective of Post Normal Science, RRI, the precautionary principle, discourse ethics, or other. Such theoretical justification is not our focus in the project.

→ This complexity must be captured in integrated assessments in order to support responsible EST governance

The EST-Frame project

- Studies how four kinds of emerging technologies are being assessed
- Studies how different assessment practices (risk assessment, ethics assessment, TA, impact assessment, foresight, economic assessment, etc.) deal with the challenges of assessing such technologies
- Studies how relevant situation analysis factors, including contextual policy trends, are accounted for in the assessments

- Develops a cross-domain approach to EST assessment based on viewing the assessments not from within specific assessment practices, but from the total assessment status related to the problem
- Develops a framework for integration of assessment

What is integration?
What is integrated assessment?

- Scrase and Sheate (2002): 14 definitions...in a sustainability context
- In the context of a broader emerging science and technologies we revised their list and added some more, ending up with 23 different definitions of sustainability
- Of these, 11 seemed of most importance for EST assessment

A simplified heuristic tool for analysing aspects of integration in assessments/fields:

Integration of assessment topics	a) Inclusion of all areas of topics into assessments b) Inclusion of values into assessments c) Inclusion of narratives into assessments d) Not isolating one topic at the expense of the whole e) Identifying the right frame of the assessment (technologies, societal challenges, regions)
Integration of assessment elements/methods	f) some specific elements (such as anticipation) are necessary in assessments g) targeted use of methods in assessment
Integration of assessment participants	h) Integration of a wider range of experts, stakeholders or the public into assessments
Integration between assessments	i) Integration among assessments
Integration of assessment and governance	j) Integration of governance concerns into assessments k) Better integration of assessment into governance

We used this list to analyse how the different dimensions of integration are currently addressed in the assessments in the case studies, and to determine the potential for better integration.

This presentation will

- Present findings from the case studies (Nils and Rasmus, Anne-Charlotte and Philip)
- Show how the notion of ’integration’ and ’integrated assessment’ captures some important, but diverse, concerns about responsible governance of emerging technologies. Present the basic structure for a framework on integrated assessment (Ellen-Marie and Rasmus)

THE CURRENT ASSESSMENT SITUATION: SynBio, CloudCom, Nanofood, Biofuels

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Synthetic biology

New ICTs

Nano foods

New biofuels

General approach of the 4 case studies

- Identification of assessments in the field (between 70 and 100 per case study)
- Selection of assessments for review (between 10 and 20 per case study)
- Selection criteria:
  - European level (EU)
  - Country of project partner (The Netherlands, Germany, UK, Denmark)
  - High variety/dissimilarity
- Analysis of the selected assessments according to a common research protocol (document analysis, interviews, analysis tables)
- Discussion of the findings with experts of the field (expert workshops)

Synthetic Biology: Basics

- Synthetic biology is a relative recent development within biotechnology, focussing on introducing engineering principles at various levels of biological systems
- There is still no consensus on a clear definition of synthetic biology
- Most activities are still directly related to science and basic research
- Potential applications include bio-sensing, bioremediation, biofuels, biomaterials, therapeutics and pharmaceuticals
- Synthetic biology products are being questioned with regard to their potential negative impacts on society (e.g. boundaries of ethics, biosecurity), environment (e.g. biosafety) and the economy (e.g. distribution of intellectual property rights)
- One of the most pressing issues relates to the uncertainty to what extent activities in synthetic biology require a (fundamental) revision of current biotechnology regulation

Case Study Synthetic Biology: Assessment Field

- Most assessments are quite generic and abstract, it is not being differentiated between different application domains, time horizons, visions and concrete scenarios
- The number of used tools and the methodological reflections are quite limited:
  - Mainly based on literature review and workshops with experts in synthetic biology
  - The participation of stakeholders and especially laypeople is very limited
  - Mainly expert-based, non-participatory Technology and Ethical Assessments; no Economic, Risk or Impact Assessment, no Foresight
- Although some of the reports have been mentioned within political circles, there doesn't seem to be a clear impact on policy making processes
- The current assessment situation seems to be dominated by self-initiated statements and position papers from organisations which are either close to (biotechnological) science or industry on the one hand (scientific discourse) or belong to a rather critical NGO scene on the other hand (public discourse)
- Since the public awareness of synthetic biology and the level of protest is rather low, it seems that there is not enough pressure (yet) for political decision makers to act. "Wait and see" seems to be the device

Synthetic biology: some main conclusions

- Low impact of assessments on policy: In the future clearer assessment needs must be formulated in a dialogue with policy makers in order to design assessments with more targeted policy relevance and impact.
- The time dimension is not explicitly taken into account: Future assessments should apply more structured designs for anticipation.
- Mostly scientific experts are involved in assessments: Increased participation in assessments is needed.
- The assessments are generally characterised by literature review: A larger diversity of methodological approaches is needed in the future.
- The effect of internationalisation, liberalisation, policy integration, etc. is not systematically discussed in the assessments: More systematic assessment of contextual variables and trends is needed
- Synthetic biology is usually assessed across its manifold of application areas: More specific assessments, starting in specific problem areas/applications, are needed.

Cloud Computing: Basics

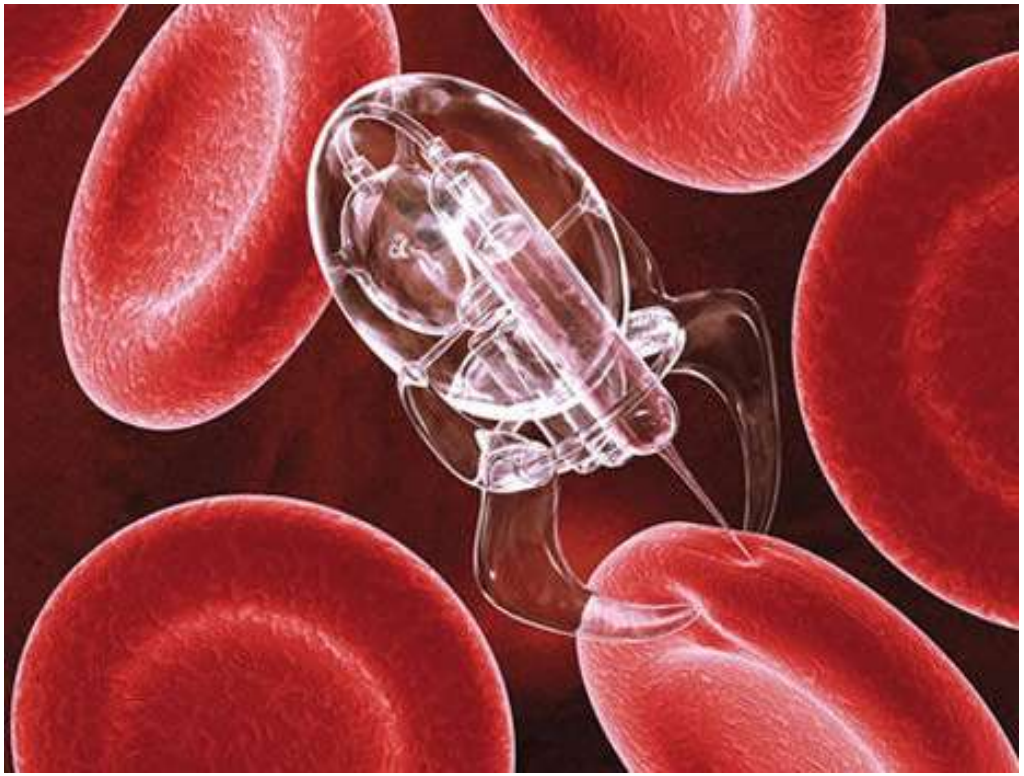
- Cloud computing is the delivery of computing resources (hardware and software) as a service, typically via broadband
- Many believe that cloud computing will be among the key enablers of economic growth in the coming decade. Therefore, the emergence of the technology is very much powered by industry and welcomed by governments
- The key common benefits are cost-efficiency, multi-user and multi-site accessibility, an easier and cheaper access to vast amounts of storage and computing power as well as to constantly upgraded software solutions
- The key political question is that of security, e.g. issues of data protection, privacy, intellectual property rights, cybercrime, cyberwar, and homeland security
- The general challenge is to protect citizens by privacy and security legislation without hindering the technology's growth

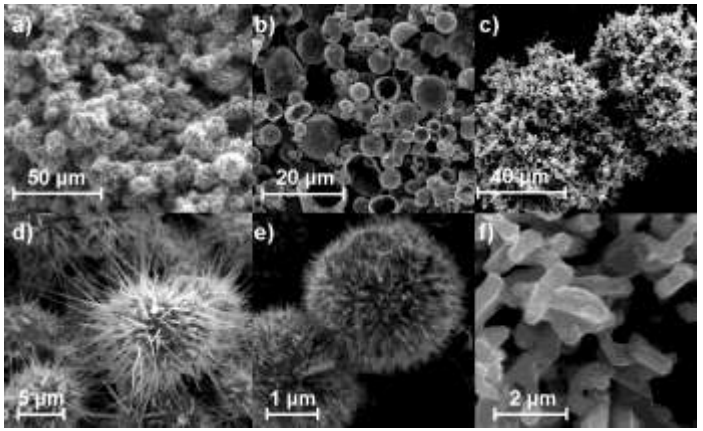
Cloud computing: some main conclusions

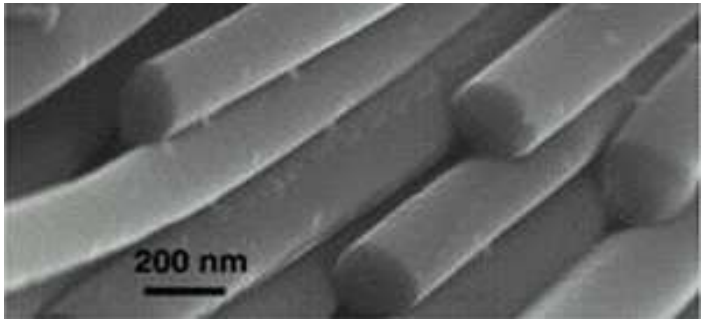
- Individual agenda setting assessments focus mainly on one separate perspective each, e.g. technical options, risk, privacy, legality or economic benefit.
- Policy initiatives (the EC Cloud Strategy) may be seen as integrating otherwise opposite assessment perspectives, creating a common ground for debate
- There is a large variety of input to the cloud strategy. Classic assessments are only a small part of this input. Other inputs range from legislation and political strategies to strategic papers, blog posts, programming handbooks, meeting minutes, etc.
- Explicitly ”integrative” (ethical, (P)TA) assessments emerge only in reaction to the production of the cloud strategy, lending themselves to supporting parliamentary oversight rather than ”primary” policy formulation in the EC.

Nanotechnology & food Basics

The manipulation of matter on an molecular scale





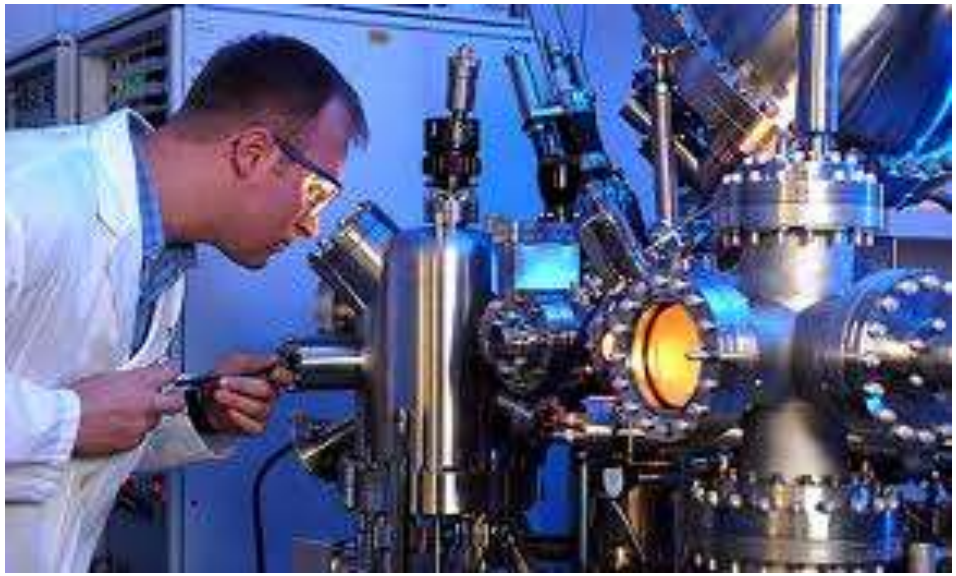


Animation by Coneyl Jay, winner of the 2002 Visions of Science Award, (Rip & Ruivenkamp, 2012, p.15)

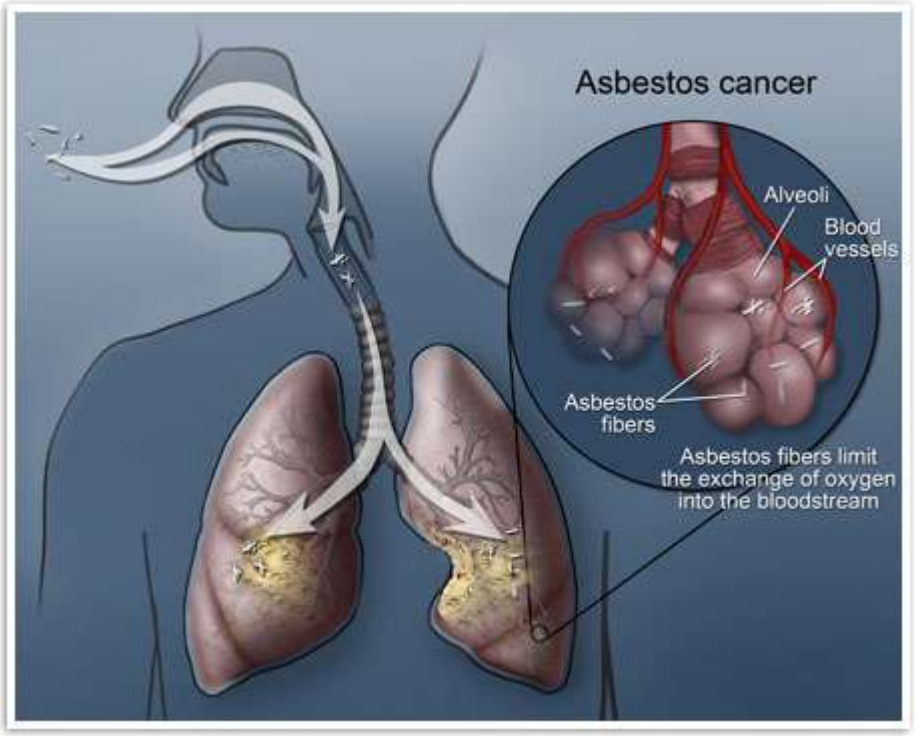
Nanotechnology & food
Basic

Applications:

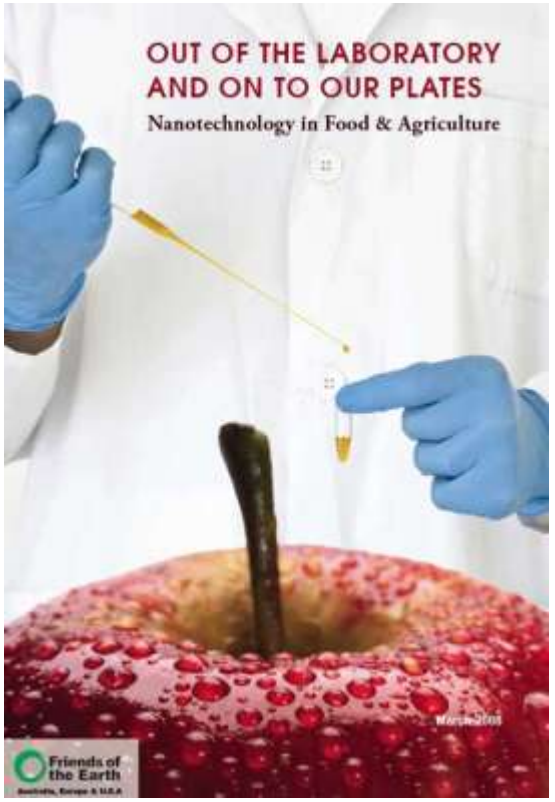
- Nanoparticles
  - In food
  - In packaging, sensors, agriculture
- Nano-tools / structures
  - Food processing
  - Kitchenware
- Nano-scope / perspective



Nanotechnology & food
Basic



HES-values (Health, Environment, Safety)



Desirability, transparency, power relations

Nanotechnology & food Assessments

‘Assessment Regime’ (Kaiser et al., 2010)

- Low impact (Delgado et al.,2010)
- Weak links between assessment domains (Est et al., 2012)
- Food industry is not a key ‘target group’ or ‘client’

Nano food: some main conclusions

- In 2012 NGO's have 'moved on'
- Main issues;
  - Lack of standardised measurement method in risk assessment
  - Lack of decision making – assessments don't lead to adjustments in regulation
  - Lack of general public concern (nano-phobia phobia (Rip, 2006)) → are we assessing the wrong things? Nanotech or food politics?
- Work on main issues;
  - There are moments of dialogue (or reflection) within stakeholder groups and assessment domains
    - Lack of dialogue among people within the different assessment domains for 'sense making'

Biofuels Basics

- Transport fuels (diesel/ethanol) from biological material.
- Promise of GHG emissions reductions, rural development and energy security
- New market opened by EU directives on renewable energy use (~4.5%)
- Controversy stimulating new ‘advanced’ or 2G technologies
- 3G algal biofuels far from market.
- Problem areas are many and varied:
  - Agriculture, international development, climate change, biodiversity, energy, transport…

Biofuels: some main conclusions

THE ASSESSMENTS:

- Have low policy impact
  - Policymakers not engaging with academics
  - Research is commissioned to fill immediate gaps
- Adopt 'opening' roles
  - generating more technical knowledge
  - recommending further research and broader policy scope
  - often introducing new visions
- Recognise high complexity (problem space) and uncertainty (impacts)
- Focus on technical, economic and policy aspects, not societal aspects
- Exhibit high scientific literacy, low participation
- Differ in assumptions, scope and method, making comparisons difficult
  - Implications for integration of assessments at a data level

	Synthetic Biology	Cloud Computing	Nanotech & Food	Biofuels
Starting point	Around 2000 (1910)	Around 2006	1980s	Current wave since 2000s
Origin	Natural sciences, basic research	Business, IT	Natural sciences, industry	Motor industry
Hope/Hype/ Fear	Hope and Fear	Hype	Some Hype and Fear, mostly Hope and Ambivalence	Hype and Fear
State of development	Mainly research, almost no applications in practice yet	Applications already in practice, high distribution	Applications in practice, in food not transparent about usage	4.5% of UK transport fuel, mandatory growth targets
Critics (with regard to risks)	External: mainly by NGOs, not by community itself	Internal: by community itself	NGOs, Risk Assessment, TA, Social Science	NGOs, some social and natural scientists
Scientific evidence basis	High, with considerable attention to uncertainties	High, with considerable attention to uncertainties	Differs – from high to low	Quite high
Participation	Only experts; no stakeholders, no laypeople	Mainly experts and some stakeholders; no laypeople	Only experts; no stakeholders, no laypeople	Low amongst consumers, some expert/stakeholder consultation
Contextual trends	Oscillating between liberalisation and state control; high importance of internationalisation; high priority of consumer acceptance	Oscillating between liberalisation and state control; high importance of internationalisation	(High, with considerable attention to uncertainties)	Particular reference to sustainability, internationalisation and liberalisation
Advisory domain of assessments	Mainly TA and Ethical Assessments; no Economic, Risk or Impact Assessment, no Foresight	Mainly Economic and Risk Assessment, but also TA and Ethical Assessment; no Impact Assessment and Foresight	All	Many scenario analyses and impact assessments
Aimed role	Scientific assessment, agenda setting, policy analysis	Scientific assessment, agenda setting, policy analysis	Mostly scientific assessment, agenda setting, policy analysis,	Mostly scientific assessment and policy analysis
Assessment sphere	Mainly public discourse and scientific discourse	Mainly regulatory discourse, followed by public discourse	All	Scientific & regulatory discourse, low public discourse
Impact on policy process	None	Unclear	High awareness, low decision making	Unclear, likely low
Integration of assessments	Few	Few	Few	Many are incommensurable
Integration of assess. field	Low, with regard to both contents and methods	High	Not on paper, unclear about practice	Low (or low visibility)

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Critics (with regard to risks)	External: mainly by NGOs, not by community itself	Internal: by community itself	Both externl and internal (NGOs, Risk Ass, TA, Social Science)	External: NGOs, some social and natural scientists
Participation	Only experts; no stakeholders, no laypeople	Mainly experts and some stakeholders; no laypeople	Experts and stakeholders and laypeople	Low amongst consumers, some expert/stakeholder consultation
Advisory domain of assessments	Mainly TA and Ethical Assessments; no Economic, Risk or Impact Assessment, no Foresight	Mainly Economic and Risk Assessment, but also TA and Ethical Assessment; no Impact Assessment and Foresight	All	Many Impact Assessments and Foresights (scenario analyses)
Aimed role	Scientific assessment, agenda setting, policy analysis	Scientific assessment, agenda setting, policy analysis	Mostly scientific assessment, agenda setting, policy analysis, **NO** decision making	Mostly scientific assessment and policy analysis

We have now an impression of results from the case studies. Let’s see what lessons on integration we’ve learned.

Findings

- The case studies have different profiles with regard to these dimensions
- This is likely to be due to factors such as the technologies' different levels of maturity and diffusion, public awareness and concern, and the technologies' ability to penetrate society
- Still, we have found some commonalities

Findings across case studies I

- Though assessments focusing on the generic issues of technologies are important as a knowledge basis, there is a need to assess on a more problem based levels
- Problem based assessments will necessarily be interdisciplinary and consider the complexities of real life situations

Findings across case studies II

- Potential changes in contextual factors, like policy trends, demographic developments, etc. are rarely taken systematically into account.
- Technology questions are often isolated from questions of liberalisation, internationalisation, democratisation, loss of national autonomy, the fate of supranational institutions, etc.

→ Responsible technology governance in the medium to long term must include these dimensions more systematically

Findings across case studies III

- A finding from all the case studies is that the methodological choice of assessment topics, recruitment of assessment participants, appropriate time frames and choice of specific methods, rarely are explicitly discussed
- Such choices depend on the framing of the assessments, including e.g.
  - comparator technology/policy
  - narratives of science, nature, life, human beings and society

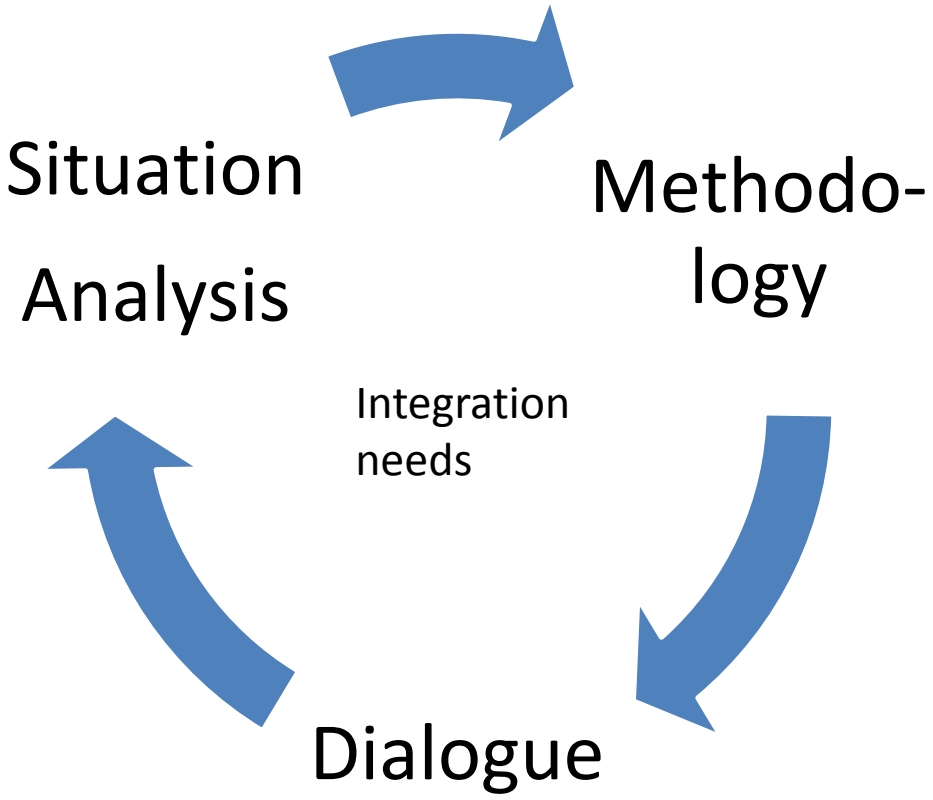
Findings from WP1 (domain studies)

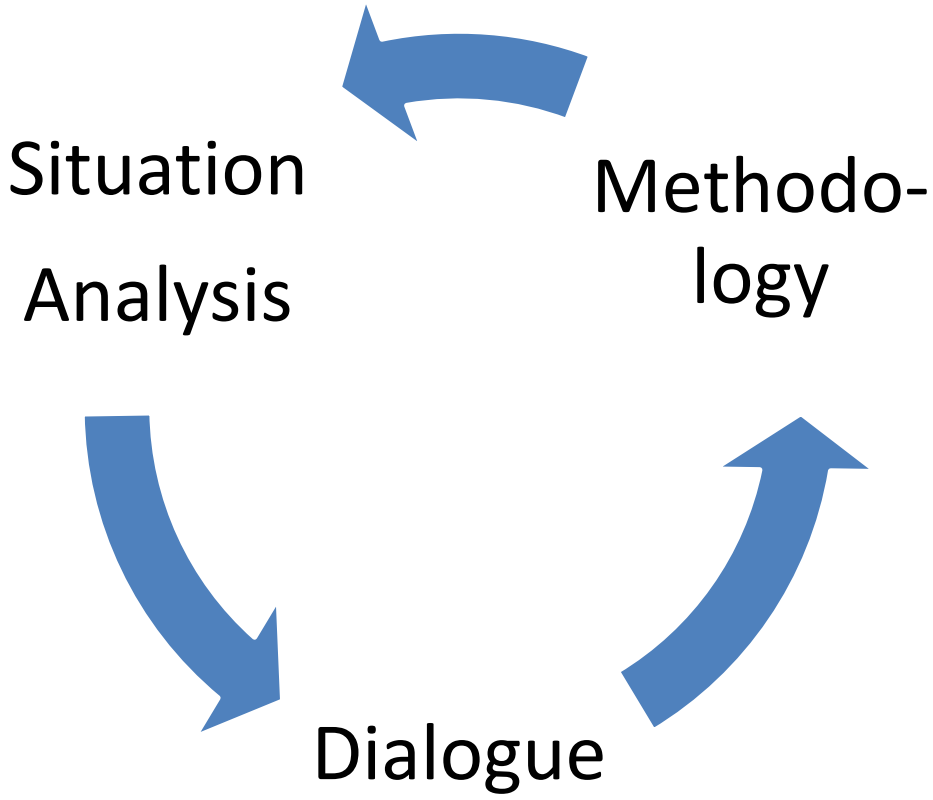
- There is little systematic interaction between the scientific assessments (risk), the cost-benefit/impact assessments and the societal assessments (TA, ethics)
- These assessment spheres are targeted to different recepients (simplified: for instance environmental/health ministries, the ministry of finance, general public/political discussion)

→Given that EST is about controversial facts and values and these need to be considered this should be strenghtened

→Implication: There is a need for communication between these assessment spheres!

If we want changes on these dimensions, what do we need?


Situation Analysis
Methodo-logy
Integration needs
Dialogue


Situation
Analysis
Methodo-
logy
Dialogue

Based on this diagnosis EST-Frame will deliver:

- *A framework for integrated situation analysis*
  - Analysis of the situation in order to determine the need for integrated assessment as well as clarifying crucial framing issues
- *Recommendations for organising transdisciplinary assessment dialogues*
  - New dialogues that takes the complexities of emerging science and technologies into account
- *Methodology for designing integrated assessment projects*
  - Design of the assessment adapted to the most important variables for integration

→And these three aspects are mutually dependent

The EST-Frame approach: *Integrated situation analysis*

- All assessors explicitly or implicitly perform a situation analysis (see method choice), here we are focused on situation analysis dimensions specifically related to integration:

a) There is a need to review the main uncertainties and controversies regarding harms and benefits that need to be addressed for responsible governance and to review what facts and values are being contested

b) Where fact and values are contested and uncertain there is never a neutral position in assessment. This necessitates analysing important framing issues related to what, where, by whom and how an assessment topic is raised and what the alternatives are

c) In order to provide a contribution to governance there is a need to review the current assessment status (as we've done in EST-Frame) to uncover unaddressed assessment needs and earlier framing choices.

The EST-Frame approach: *Dialogue*

- In order to have an impact on governance of technologies there has to be a dialogue with policy makers about assessment needs
- In order to have a legitimacy among the stakeholders and the public there must be a dialogue on framing issues (incl. comparator technologies and implicit narratives)
- In order to contribute to policy integration there must be dialogue between assessors
- In order to be able to take an appropriate range of topics and values into account more inter- and transdisciplinary communication within assessments and between the assessments and their surroundings must be set up
- As such, integration must involve:
  - (self)reflecting on the identity of the assessment agent, institution, role, power, leadership, organisation, worldviews, culture, trust
  - developing a shared language to discuss situation analysis across disciplinary, professional and interest backgrounds

The EST-Frame approach – *Methodology for designing integrated assessment projects*

- Different situations, different integration:
  - Integration of methods through dialogue
  - Integration of persons, organizations
  - Mediation of viewpoints
  - ...
- A methodology of integration must:
  - Create an indicative map of different types of integration
  - Relate them to the situation in which they are useful
  - Describe ways of working with them
- Such a methodology will help structure reflections on situation analysis, including relevant uncertainties and disagreements, contextual trends, review of the current assessment situation and integration needs – leading to better reflected decisions on method selection and design
- The methodology we aim to produce will be a „practical theory“ for people working with assessment of technology on how to handle perceived needs for integration.

Conclusion

- With integrated situation analysis we uncover the need for integrated assessment and the crucial framing issues
- With dialogue we will facilitate the integration of diverse perspectives and the integration of assessment in governance
- With methodological tools we will find the concrete ways to design our assessment adapted to integration needs

EST-Frame practical outputs

- Advice on organising trans-disciplinary assessment dialogue
- Advice on good assessment leadership
- A practical theory for analysis methodological design

- Academic outputs

Thank you!

www.estframe.net

NB!