Responsible innovation of shale gas...

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Zimmermann: A functional theory on resources

"Resources are not, they become; they are not static but expand and contract in response to human wants and human actions"

- Mainz (1888), Austin (1961)
- Dr. Phil. Political Economy (Bonn)
- Univ. of North Carolina, Texas
Zimmermann observed that:

**Economists** neglected the study of resources:
- ... working tools of the entrepreneur: land, labor, capital
- only recognized through their effects on cost and price, supply and demand.

**Natural scientists** (geographers) identify resources with substances or things:
- Disconnect natural resources from human and cultural resources
- Think of resources as a single asset, instead of a complex (system) of substances, forces, conditions, relationships, policies, etc.

A false impression: resources as static and fixed
He proposed that resources:

- Are living phenomena, expand, contract in response to human effort and behaviour
- to a large extent, man’s own creation

- Do not refer to a thing or a substance but...
  - to a function which a thing or a substance may perform or to an operation in which it may take part
  - of attaining a given end such a satisfying a want

- go hand in hand with “resistances”,

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A functional theory on resources

**FIG. 1.1.** Dynamic Interrelationship Between Primitive Man and His Natural Environment.
The creation of resources

- Is driven by “the mother of all other resources”: Knowledge
- Changes with each change in civilization

- Dynamic not only in response to increased knowledge, improved arts, expanding science, but also...
- changing individual wants and social objectives
- Reflecting every change in the purpose of the appraiser

- Culture modifies natural environments and resources, and affects human attitudes and relations
The **destruction of resources**

- Dissipation in use
- Ceasing to be a resource, returning to “neutral stuff”
- “human folly and cussedness”, short-sighted views
- Lack of knowledge of complex natural processes
- Complexity of social order
To conclude: Resources – Where the Sciences Meet…

Global shale gas basins, top reserve holders

- Top reserve holders 200 Trln cubic metres

- Canada 11.0
- U.S. 24.4
- Mexico 19.3
- Argentina 21.9
- Poland 5.3
- Libya 8.2
- Algeria 6.5
- Brazil 6.4
- South Africa 13.7
- Australia 11.2
- China 36.1

Assessed basins
- With resource estimate
- Without resource estimate

Source: EIA based on Advanced Resources International Inc data, BP

Reuters graphic/Catherine Trevethan
Where are the values in design?

- Value sensitive design aims at incorporating human values in technological design
  - First developed in ICT, and furthered in other engineering fields
- This research will broaden the field of application to include institutional design and Stakeholders Participation

- This projects aims at developing design criteria for three three fields

Institutional context  Technology  Stakeholders Participation
Specifying values

- Values: Generally considered important
- Norms: Formulated to realise values
- Design criteria: Very specific design criteria

Environmental friendliness
Prevent pollution surface water
Context dependent: e.g. standards for drinking water purification
Example: nuclear energy

Example: cattle farm

Fig. 3. The specification of animal welfare in EU Council Directive 88/116/EEC

Top-down or bottom-up

- **Value hierarchy:**
  - A value hierarchy can be constructed top-down or bottom-up.
  - Most arguments are voiced on the level of norms.

- **Assumption:**
  - Controversies are often positioned on the level of norms
    E.g. it is undisputable that health is a value.

- **Challenge:**
  - To ensure that controversies are overcome (with norms and design criteria) despite differences of opinion.
Values around shale gas

- Different values with different stakeholders
- Map arguments of different stakeholders
- Relate the arguments to values
- Overview relevant values
- Input for design criteria

Institutional context  Technology  Interaction processes
Arguments favouring shale gas:

• Shale gas can generate additional income for the State (material welfare)

• Shale gas can serve as a transition fuel towards the large scale use of renewable energy. (resource durability, environmental friendliness)

• Shale gas exploration can create additional jobs. (well-being, material welfare)
Arguments against shale gas:

- Shale gas can induce seismic activities that could damage properties.
  (safety, material welfare)

- Shale gas exploration uses large quantities of water.
  (resource durability)

- Shale gas is a fossil fuel and can contribute to climate change.
  (environmental friendliness, safety, well-being)
Next steps:

• Validate values using interviews

• Create insight in values and norms per design criteria.

• Create a framework that incorporates all relevant values.

• Incorporate the dynamics of stakeholder interaction.

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Values

- **Ethics** relates to:
  - The value disposition of individuals
  - Values embedded in technologies
  - Reflection on values

- **Economics** relates to values that are (or have become) embedded in institutional contexts
  - The economic system as a fixation of values
  - The market and political realm as formative contexts in which values are stabilized

- **Science-and technology studies** (STS) look at the **dynamics of values**
  - In relation to their emergence during innovation trajectories
  - In relation to their articulation in stakeholder interaction
The societal dynamics of values

- People do not know how to relate to a new or future development
- People cannot always express how they relate to a development
- During a process, new values may emerge
- Values are provoked by the framing of other parties
The difficulties of values in socio-technical systems

- The values that are at stake in a socio-technical system (can) emerge during the development of the system itself.

- Once values have come embedded, they become hard to change ('lock-in')

→ the perpetuation of the system becomes a value in itself
  - Vested interests of stakeholders
  - Technological interdependencies
Stakeholder interaction

• Not only values in relation to technology but also in relation to decision making process
• Values are articulated in the interaction between stakeholders
• “Acceptance” or support is therefore a dynamic societal process (and not a result)
Stakeholder interactie

Responsible innovation: Dealing with diversity of stakeholder perspectives

- Wicked/unstructured/ill-defined problems
- Multiple stakeholders, multiple perspectives: no consensus on norms & values at stake (problem definition) and knowledge needed (solutions)

- Multiple, sometimes even conflicting perspectives exist
- Some perspectives may be articulated, some may not
- Safe assumption: there are more than two perspectives
Responsible innovation: accommodating diverse perspectives

- Constructive conflict (Cuppen, 2012):
  \[ P_1 \rightarrow P'_1 + (P'_1) \]
  \[ P_1, P_2, P_3, P_4, P_5, \ldots P_n \rightarrow P'_1, P'_2, P'_3, P'_4, P'_5, \ldots P'_n \]

- Open dialogue: all issues on the table
- Diversity of perspectives explicit role in the process
- Opening up, learning & searching for robust strategies & designs
- Use of methods, e.g.
  - Constructive technology assessment (e.g. Parandian 2012)
  - Constructive conflict methodology (Cuppen, 2010)
  - Q methodology (e.g. Cuppen, Breukers, Hisschemöller & Bergsma, 2010)
  - Backcasting (e.g. Quist & Vergragt 2006)
Combating Misconceptions & Communicating Opportunities

Unblocking Obstacles To Project Approval By Engaging Stakeholders On The Environmental Impact Of Unconventional Gas

1. Cuadrilla’s CEO Case Study: Opening Keynote
2. Fracking Facts, Not Fiction: Tackling misinformation around the environmental and human health risks of hydraulic fracturing
3. A Local Battle: Winning hearts and minds and proactively educating communities to build trust and minimize opposition locally
4. Engaging The Public At Large: Mitigating public backlash by clarifying misconceptions and cutting through public fear
5. Working Closely With Government: Engaging and educating policy makers and regulators to gain political support and project approval
6. Propaganda, Media Today & The Climate Change Debate: Understanding how to best engage with powerful lobbying groups, sensationalist journalists and bloggers
7. Lessons From Our American & Canadian Counterparts: Avoiding the pitfalls and highlighting the differences
8. Best-Practice Reputation Management & Stakeholder Engagement: Building trust with transparent and open communication
9. Communicating The Opportunities: Help increase consumer acceptance and turn stakeholders from opponents to advocates

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"Tackling misinformation…"

"...educating communities to build trust and minimize opposition locally."

"...cutting through public fear"