Technology Assessment Methods and Techniques

Technology in Sustainable Development

www.sustainable-everyday.net

Karel Mulder

January 4, 2010

TUDelft

Delft University of Technology

TA- Methods and Techniques
TA in 5 Steps

0. Problem orientation, research question & research objectives

1. Exploring technological developments and/or the problem

2. Judging effects (social, socio-economical, environmental)

3. Normative assessment of effects

4. Feedback to technology-developers and/or social service

TUDelft

TA- Methods and Techniques
Scenarios and Exploration

Scenarios

    Formulated with care

    Possibilities for the future (global, national, local)

    Following trends, or breaking trends

Surrounding scenarios (Shell, CPB)

Vision and Future Scenarios (DTO)

Design scenarios

Socio-technical scenarios

TU Delft

TA- Methods and Techniques

Scenarios and Exploration

Shell's Global Scenarios for 2020

TINA: There Is No Alternative

Globalization, Liberalization and Technological Dominance

Just do it (US-type capitalism, individualism)

Da Wo - 'Big Me': (civil society, more community based)

www.Shell.com

ŤUDelft

TA- Methods and Techniques

Scenarios and Exploration

SusHouse- Project

Sustainable Vision for 2050

 Smart cooking and storage
 Super-rant
 Local and green

www.sustainable-everyday.net

TUDelft

TA- Methods and Techniques

Delphi-method and Exploration

Delphi (technology-oriented):

> Survey among experts in several rounds
>
> Anonymous feed back of arguments & estimates
>
> Disadvantages: Group bias remains, elf-interest

Example of external sustainability drive:

- 25 experts (global, 50% return, variation)
- 14 technologies assessed
- 4 technologies that have a sustainable potential
- Different opinions about feasibility

TUDelft

TA- Methods and Techniques

Methods to Explore Technology Assessment: Step 1

Current situation &monitoring

Literature, internet, expert and stakeholder interviews

Scenarios (Shell, CPB)

Expert & stakeholder workshops,

Brainstorming (Creative Problem Solving)

Delphi

Analogy with existing cases

Trend extrapolation (qualitative-quantitative)

Analysis of trends

Technological map

1: EXPLORING

TUDelft

TA- Methods and Techniques

Methods to Explore Technology Assessment: Step 2

Problem definition and identifying relevant
   aspects (actor-specific)

Environmental aspects in production and products

Risks and safety (chemicals, airports, fireworks)

Environment (environmental effects reported)

Working conditions

Peace, safety, arms control

Socio-economic consequences

Social, ethical and gender-related implications

2: JUDGING

TUDelft

TA- Methods and Techniques

Step 2: Quantitative Method Effects

Health and safety (noise, toxins, vibrations)

Analyzing risks (factory, airport)

LCA, life-cycle-analysis

Environment, Energy, Toxins

Analysis of investments and returns

Economical input and output analysis.

But: Control Dilemma

2: JUDGING

TUDelft

TA- Methods and Techniques

Step 2: Methods to Judge Effects

Social-mapping

    Developers, users, regulators, others

    Parties in society, companies, governments, researchers

Round-table, workshops, interviews

Documentanalysis

Impact and effect-structures

Scenario analysis

Analogies

Checklist

2: JUDGING

TU Delft

TA- Methods and Techniques

Step 2: Checklist TU Delft

Excerpts:

How acceptable is the needed R&D?

Resistance, contributions, flexibility

How acceptable is the new product?

Values, costs, environmental effects, risk, level of acceptance, new activities, influence on different levels of society etc.

How acceptable is the new method of production?

Values, working conditions, physical effects, employment, local environment and community

2: JUDGING

TUDelft

TA- Methods and Techniques
Methods to Explore Technology Assessment: Step 3

Stakeholder & actor interviews

Stakeholder workshops

Interactie tussen stakeholders

3. NORMATIVE ASSESSMENT

TU Delft

TA- Methods and Techniques

Example Step 3: Novel Protein Foods

3 scenario's for 2035:

1. Completely industrial, based on bacteria and fungi
2. Based on agricultural raw material A
3. based on agricultural raw material B

20 actor-interviews considering social aspects

www.quorn.nl

www.tivall.nl

www.valess.nl

3. NORMATIVE ASSESMENT

TUDelft

TA- Methods and Techniques
Feedback and Anticipation: Step 4

Feedback to technology-developers and/or social service

Communication between parties involved.

CTA-process

Anticipation related to Control Dilemma:

    can decisions be corrected late on?

    flexibility (by taking into account alternatives)

    susceptibility to mistakes

    wide view of social factors

4. FEEDBACK

TUDelft

Constructive TA
Influencing developments in Technology

Broadening the process of technological change with social considerations

Process of design, development and implementation

Can be done on the level of a product/ technology/ involved party/ sector

TU Delft

Constructive TA
Influencing developments in Technology

Characteristics according to Schot (1996):

Anticipation:

foresee effects and act upon this

Reflexitivity:

calculated, co-evaluation, scripts and effects connected to several options

Learning from society:

1st order: facts and improvement of designs

2nd order: considering assumptions, one's principles and other's principles

TUDelft

Constructive TA

Why?

Rather than an 'early warning', steering technology in socially desirable direction

Governments: combining economical and social objectives to prevent controversies

Developers: design social responsibility

Social services: influence technological developments (democratic!)

Companies: create products that fulfill needs in a better ways, prevent failures and expensive alterations

TUDelft

Constructive TA
Classification

Starting debate about technology:

    public debate, scenario workshops with civilians non-experts

Short term introductions and niches:

    strategic niche management, social experiments (spontaneous, planned), social simulations/gaming

Long term exploration and planning:

    taking into account multi-actor processes and social criteria

    e.g DTO-programme, SusHouse project, interactive TA

TUDelft

Constructive TA
Example: Genetics and Food

Public Debate in the Netherlands

   Commissioned by the Terlouw-committee

   To engage a broader crowd (not just those supporting and opposing)

   To explore conditions relevant to the public

Method:

   Use realistic, tangible examples

   150 Dutchmen in group debates

   Flanking research and polls of public opinion

   Hearing experts and parties with an interest

   Discussion in the media and on internet (Southern Voices)

www.infeite.nl

Constructive TA

Example: Genetics and Food

Tomato with new gene (can be stored longer)

Corn with a bacterial gene (herbicide tolerance)

Yeast with a calf-gene for cheese-rennet

Rice with a gene that provides extra vitamin A

Potato that is resistant to late blight

Seeds with a gene that prevents germination

Salmon with a fish-gene for cold-resistance

Cows with a gene that prevents mad cow disease

Cows with a gene that prevent saturated fats

Wikimedia.org

TUDelft

Constructive TA
Example: Genetics and Food

Dutchmen reserved in relation to biotechnology in food

Conditions to make it possible are very ticht

Outspoken reservations when it comes to animals

People should have freedom of choice

Little public support for the examples

People who are informed set sharper restrictions

The public doesn't fully trust the government, science and companies

Wikimedia.org

TUDelft
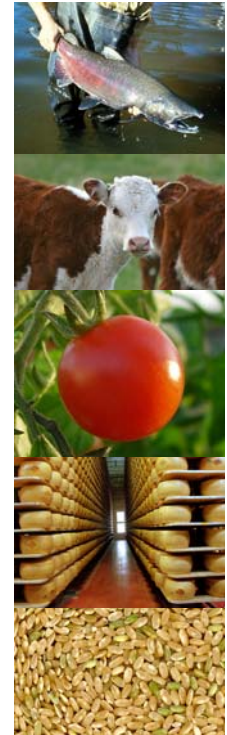
Constructive TA
Example: Genetics and Food

Response:

Achterhuis (opinion maker): use and risk have been evaluated, but what about ethics?

Social organizations: go/no go, but conditions are restricted

VNO-NCW (employees): biotechnology is needed, and the government needs to create social support

The business community fails to appreciate the public debate

TU Delta: Delft-biotechnology keeps a low profile

TUDelft

Constructive TA

Exercise

What, according to you, is a technology/problem you can research with a apply a TA- method?

In a group, decide on a subject, and set-up a TA-research: method, steps, questions

How does your set-up differ from a problem-based research?

What questions are necessary to explore the problem?

TUDelft