



Special report on
energy technology

PUBLIC ANGER?

Never. Stop. Listening.

Page 04

[Donation](#) | News

Money for your body parts

Page 05

[Electricity](#) | News

Ready for a big power outage?

Page 06

[Energy](#) | Special Report

How to deal with public resistance?

Page 14

[Geoengineering](#) | Library

Cooling our planet
- bold or bonkers?

Page 15

[Serious Game](#) | The Method

Real life dilemmas on
your iPhone

Page 16

[Science & policy](#) | Interview

Daniel Sarewitz: Politicians cannot
place their faith in science

Page 19

[Technology Assessment](#) | Masterclass

OTA - The rise and fall of the
world's first TA organisation

Page 20

[Biocouture](#) | Highlight

Suzanne Lee grows frocks...

Page 21

[Technology & Society](#) | Feature

Moving towards innovation
governance

Page 24

[Health](#) | Speaker's Corner

Travelling for treatment

Editorial

Dear reader,

Welcome to the first issue of Volta, a brand new magazine on Science, Technology and Society in Europe.

I am not telling you anything new by saying that we are fellow citizens of Technotopia. Surrounded by machines and devices that make our lives easier and connected to the outside world day and night through mobile phones and the internet.

New technology helps us to explore problems – think about climate change - but it also confronts society with questions and dilemmas. It is these questions that European technology assessment institutes address. Their aim is to contribute to responsible innovation.

In this first issue of Volta we look at a field that exemplifies this struggle between society and new technology: our energy supply. We can't do without energy. We all know that a secure supply for the future is critical. But at the same time Europeans have become experts in delaying or even stopping the introduction of energy initiatives like shale gas drilling and carbon storage injection projects - even wind farms. Is technology the problem or the solution? Can we learn from the Scottish Islanders who love their turbines, or the Italian organisation aiming to banish the Nimby Syndrome in exchange for community benefits? How essential is transparent information and communication for authorities as well as citizens? These issues at the heart of the energy agenda are the focus of this first edition.

Volta is an initiative of fifteen Technology Assessment Institutes that work together in the European Pacita-project, and will be published twice a year. Please do let us know what you think - email us and share your thoughts.

Antoinette Thijssen, on behalf of the Editorial Team
a.thijssen@rathenau.nl

Volta - Volume 2011 – no 1

Advisory Board

Sergio Bellucci – Ta Swiss – Swiss Centre for Technology Assessment – Switzerland

Iva Vancurova – Technology Centre ASCR – Czech Republic

Lars Klüver – Danish Board of Technology – Denmark

Leonhard Hennen – Institute for Technology Assessment and Systems Analysis (ITAS) – Germany

Editorial Team

Antoinette Thijssen (editor-in-chief), Rathenau Instituut – The Netherlands

Pascal Messer, Janneke Visser (managing editors), Rathenau Instituut

Belén López, Catalan Institution Foundation for Research Support (FICSR) – Catalonia

Katalin Fodor, Hungarian Academy of Sciences – Hungary

Marianne Barland, Norwegian Board of Technology – Norway

Ingrid Geesink, Rathenau Instituut

Contributors

Claartje Doorenbos, Gaston Dorren, Philip Dröge, Niala Maharaj, Marjan Slob.

Text Editor

Ann Maher

Concept

Pascal Messer

Design & Distribution Co-ordination

Belén López, Sonia Herrero

Design

Petit Comitè (Catalonia)

Photography

Agcfotostock, Masterfile, Getty Images, Corbis, Alberto Mosquera, Wikipedia, Marisa Beretta

Cover

Petit Comitè (Catalonia)

Printing

Industrias Gráficas Galileo, S.A. (Catalonia)

Subscriptions

Newsletter and HTML
belen.lopez@fundaciorecerca.cat

Print

belen.lopez@fundaciorecerca.cat

Legal deposit

B-40368-2011

Website

www.pacitaproject.eu

Volta Was made possible by



© Volta. All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the prior permission of the copyright holders.

Money for your body parts

How far can society go in persuading people to act for a good cause - that is, donating parts of their body?

Volunteers financially better off after participation?

Organs, eggs, sperm and other bodily material for medicine and research, are in high demand, but current levels of donation fall short of need. A new report by the Nuffield Council on Bioethics, sets out guidance to help people consider the ethical acceptability of various ways of encouraging people to donate, both for treatment of others and for scientific research. The research incorporates organ transplantation, gamete (ova or sperm) donation and participation in 'first-in-human' trials as a healthy volunteer.

While focussing on the UK, the report also considers cross-border issues. The results are based on public consultation, through contact with professionals and interested members of the general public. One chapter deals with incentives to encourage donation or volunteering, with a six-stage 'intervention ladder' leading from simple information about the possibilities of donating and volunteering (rung 1) to a situation where the donor/volunteer is financially better off after their participation (rung 6). But moving up the rungs should not be regarded as moving from 'ethical' to 'less ethical' or 'unethical' argues the report, but rather, "that the higher one goes on the Intervention Ladder, the more there will be a requirement for close examination of the ethical implications in this particular context."

The report can be downloaded from www.nuffieldbioethics.org

Intelligence needed

The growing significance of science and technology puts new demands on the type of intelligence that is needed for informing parliamentary decision-making. Hence a new study on European Parliamentary Technology Assessment (PTA).

Technopolis studied the organisation, practices and effects of parliamentary technology assessment in Europe. The report provides the institutional settings, methods and themes of fourteen PTA organisations in Europe. It also takes a closer look at the impact of these organisations on parliamentary decision-making.

www.technopolis-group.com

Coming up

Public communication of technology

The 12th Public Communication of Science and Technology conference features twelve themes including: 'Public communication of technology: the 'Cinderella' of PCST?' Speakers include Helga Nowotny (President, European Research Council) and Felice Frankel (MIT), www.pcst2012.org

PCST2012, Florence, Italy,
18-20 April 2012

Science in dialogue

The University of Southern Denmark hosts a conference around the Responsible Research and Innovation agenda in Europe.

Science in Dialogue, Odense, Denmark, 23-25 April 2012

How to measure your impact

Impact. This year's theme of the Science Communication Conference of the British Science Association and the Wellcome Trust aims to address ways to measure the impacts of public engagement activities and to see how scientists and engineers could consider the impact agenda of their research. The 2012 Science Communication Conference is an annual two-day event which brings together people involved in public engagement.

www.britishecienceassociation.org

Science Communication Conference, London,
14-15 May 2012

City of science

Dublin has been elected as the City of Science for 2012 and a program of science-related events and activities will run throughout the year across the whole of Ireland.

www.dublinscience2012.ie

European Science Open Forum (ESOF), Dublin, 11-15 July 2012



The lights are out. Now what?

Are we ready for what really happens when our electrical systems shut down? A recent German report looks at the consequences of a prolonged and widespread power outage.

'It would be nearly impossible to prevent a collapse of all of society.'

Communication systems are down. There's no water to drink or cook with and even if you could get access to your money, the supermarket shelves are empty. The sewage system is blocked and the transport system is at a standstill with people still trapped inside subways and trains. The baby needs milk. You're stuck.

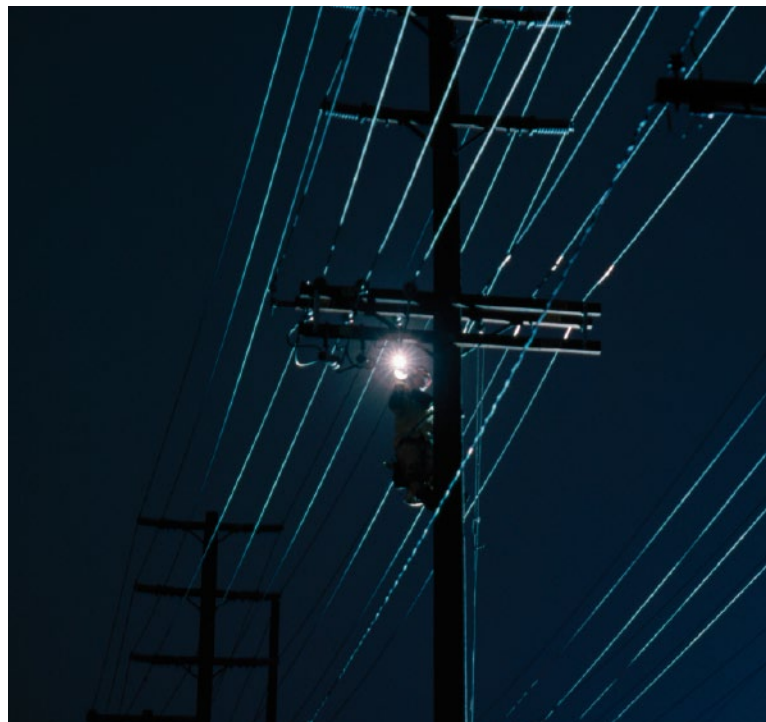
No, this is not the scenario of a new disaster movie but the nightmarish consequences of a prolonged and widespread electrical outage. Electrically powered equipment has almost completely penetrated environments in which we live and work. According to a recent report by the office of Technology Assessment at the German Bundestag (TAB), a prolonged and widespread outage would "affect each component of our critical infrastructure, and it would be nearly impossible to prevent a collapse of all of society." Although many expect the probability of an outage to grow, due to the increased chance of technical and human failures, criminal or terrorist action or climate-related extreme weather, to what extent are we prepared?

Catastrophe

The report notes how previous German outages have lasted only a few days, but revealed shortcomings in the national system of disaster

management. TAB illustrates these by assessing components of the critical infrastructure: information technology and telecommunications, transportation and traffic, water supply and sewage disposal, food, financial services and health care. It shows how vulnerable the critical infrastructure is, because of the internal complexity of these components and their great interdependence.

unprepared: "The power supply, although a critical component of our infrastructure, is not a topic for the public." the report suggests. Personal experiences of a power outage are usually quickly forgotten, and potential causes, such as terrorism, viewed with a degree of fatalism. TAB therefore strongly advises the formulation of a scientifically grounded strategy for communicating with the public about the risks, before there is one.



The consequences for information technology and telecommunications, for example, would be dramatic. Most public telecommunications and data services would be lost immediately, and the rest after just a few days. How would authorities, the public, companies or emergency workers communicate? According to TAB, there are no plans ('as far as is visible') that have been developed that offer a specified minimum level of service if there is a power outage that lasts, let's say, two weeks or more.

No passive victims

In the meantime, the general population remains unaware and

In this strategy, citizens should not be viewed as passive victims but as competent and active actors.

So get reading. Power outages are no longer restricted to national borders or disaster movies.

Hazards and vulnerability in modern societies – using the example of a large-scale outage in the electricity supply

Thomas Petermann, Harald Bradke, Arne Lüllmann, Maik Poetzsch, Ulrich Riehm - TAB report no. 141. Berlin 2010, 264 pages

European power struggles

Can public resistance be overcome?

Text:
Philip Dröge
and Pascal Messer

Photos:
© Masterfile,
Agefotostock

Call it people power. Or rather, people against power. Ordinary Europeans have become experts in delaying or even stopping the introduction of energy technologies. How can public resistance be overcome?

"It's not the technology, it's the way you use it"

There have been protests all over Europe against wind farms, geothermal facilities and other green initiatives. People are organising, demonstrating, and attempting to elect politicians who promise not to build anything. If that isn't enough, citizens are using the courts to tie up planners and builders of new energy technologies for years, often with the help of local municipalities or environmental groups.

Yet if we want to have energy in the future, we have to build new power generating facilities, if only to replace the old ones. And not too far away from large population centres either, so as not to waste power. How can policymakers, politicians and planners overcome the serious lack of societal acceptance of future energy plans?

Transparency is the key, says Stefan Gold, from the Institut de l'entreprise, Université de Neuchâtel in Switzerland. He researches stakeholder management in energy production: "Politicians who are planning any kind of energy facilities have to be completely open about their plans. Honesty is the only policy,

any kind of deceit or ambiguity will come back to haunt you.”

Blind spot

There's no doubt public participation complicates things. Indeed, communicating with local communities is a bit of a blind spot for most of our leaders. In a democracy, politicians are chosen by us to make tough decisions. Strictly speaking, they can ignore protests and plan new facilities wherever they like. But involving the general public should be an integral part of the decision making process according to Gold, because it enhances the legitimacy of the choices a government makes.



"People have a deep mistrust of planners and politicians who lack transparency"

While you are probably not going to come up with a single location for a future wind farm or biomass facility that is acceptable to everyone, with greater citizen involvement, the dilemmas involved can be seen by all; the process is clear. There is no 'democratic deficit' in the planning process and hopefully politicians gain a better understanding of the societal impact of the project.

"By consulting with those who live near a future site you also get a clear idea of the preferences of the population," continues Gold. "You can build consensus among a large part of the population and

garner support. Of course, there are always going to be people who are against building anything anywhere. And they can be very strident about it."

Nimby? Pimby? Banana?

All over Europe, people have found effective ways to kick planners out of their backyards. Protesters in Wales stopped the building of a biomass power plant in Port Talbot. Tidal power projects were cancelled in Ireland. Fishermen in France torpedoed an offshore wind park comprised of 100 turbines in the Arromanches. There is European-wide resistance against shale gas drilling and carbon storage injection projects [see text boxes] while the *European Platform against Wind Power* group unites turbine haters across the continent.

The Nimby (*Not In My Backyard*) syndrome is often believed to be the problem. We all want electricity, the theory goes, but we do not want it to be generated anywhere near us. As the list of failed energy projects goes on and on, a new acronym was coined a couple of years ago. Some say we have now advanced to Banana: *Build Absolutely Nothing Anytime Near Anyone*. Should we give up on a greener future?

No, says Maria Pia Misiti, secretary of the *Associazione Pimby* in Italy. Her organisation – the name is a pun and stands for 'Please in my back yard' – tries to get planners, politicians and the general public to engage in dialogue in order that fewer projects fail.

"We studied all the cases in which people successfully opposed infrastructure projects and found flaws in the government's communications every time", she states. But there were also similarities between the successful projects: local communities almost always gained something. Does she mean you can buy the support of communities? "It is not so much buying as compensating. The country needs a new road or a power plant, but what do the local people need? It could be a park, a local road or a community centre. When you lose something, for instance an uninterrupted view or peace and quiet, it is reasonable you should get something in return."

The Pimby manifesto was signed by politicians, community leaders and those responsible for Italian infrastructure. The next step is to get the central government to sign a law that makes it mandatory for planners to compensate local communities. As a bonus, they have to communicate with people near the site at an early stage. It's something that Italy needs in order to move into the future, according to

Misiti. “Some infrastructural projects in our country are delayed for decades because authorities and communities are battling it out in court. By making it compulsory to negotiate about a project at an early stage, we hope to move forward.”

Top-down decision making

As the Italian example shows, the struggle of local communities is not so much with technology, as with failed processes and rigid top-down decision making. A lot of research on societal sustainability corroborates that. Nimby is an empty concept, scholars say. It is a simplification of a complex interaction between governments and the general population. Some academics believe that acknowledging the Nimby concept actually hinders policymakers and energy companies in achieving public acceptance of energy technology.

“The recognition of any Nimby-motivated resistance has become a weapon in the small wars that are fought to influence place-making decisions. It is the ultimate legitimisation for not considering the arguments that are put forward. This practice of disregard of important elements of the issue is counterproductive, though, and it might eventually become one of the major sources of societal resistance”, writes researcher Maarten Wolsink in a ‘critique on the persistence of the language of Nimby’.

There are long-term risks, continues Wolsink: “As the opponents as well as their arguments are lumped together and collectively ignored, their acts will rapidly turn into strategic behaviour only, focusing on obstruction, rather than on adjustment and influence. All studies on location conflicts, including those that claim to look at ‘Nimby and beyond’, show that it is not a wise policy strategy to disregard the objections.”

Clean Green

Psychologist Gundula Hübner of the Martin-Luther-University in Halle-Wittenberg, Germany, studies the acceptance of green technologies and environmental law by the general public. Despite all the resistance against energy technologies, she thinks implementing cleaner technologies could be the answer. Technology is contrarily the solution as well as the problem.

“When it comes to public opposition, there is a huge difference whether you want to build a nuclear reactor, a coal firing plant or a wind farm. People have a clear preference for green technologies”, Hübner claims, citing a study of public views on power lines in Germany and England: “We do still have opposition if the lines are for green. However, people are less sceptical. When they assume the lines are used for nuclear power or coal they object to them more strongly.”



But what about the protests against wind farms? Doesn't that prove that even they are not readily accepted? Hübner also points to the examples of communities which volunteer to have wind farms. It is not the turbines as such that people usually have trouble with, but who decides where they will be erected. "Research shows people have a deep mistrust of planners and politicians who lack transparency. They want to be in on the decision making process, not stand on the sidelines and wait for others to

decide about their region. Go over people's heads and they are going to block any decision you make. Use their knowledge and you might be surprised how co-operative people really are."

No sense of urgency

Senior researcher Jurgen Ganzevles of the Rathenau Instituut, a Dutch technology assessment institute, recently painted a grimmer picture of the acceptance

Shale gas ignites local hostility

'Environmental protests could kill the nascent industry in Europe'

Attempts to start drilling for shale gas in Europe have met with fierce public opposition. Local hostility is seen as a major challenge to large scale European shale gas extraction.

Shale, a fine-grained, sedimentary rock formed from mud, contains a lot of natural gas. Vast deposits of it have brought a drilling boom across much of the United States, and interest has spread to many potential gas shale formations in Europe, Australia Canada and Asia.

The good news is that shale gas boosts worldwide gas supplies and can help to reduce market costs. It is contributing to a flow of energy that has halved gas prices in the US domestic market, and a worldwide rush to map deposits with speculation of a gas glut. Shale gas can be found around the globe.

Resources in the US and Canada could provide a domestic source of gas supply for about 100 years, it has been estimated. But although presented as an opportunity to generate electricity at half the CO2 emissions of coal, recent calculations of methane emissions during extraction suggest shale gas is less carbon friendly than it appears. "The footprint for shale gas is greater than that for conventional gas or oil when viewed on any time horizon, but particularly so over 20 years."*

Small earthquake

The bad news is that drilling for shale gas is a disruptive – and controversial – procedure. The layers of rock that contain the gas have to be fractured using hydraulics for the gas to escape, a technique called 'hydraulic fracturing' or simply 'fracking'. Basically, that means causing a small earthquake. Water, sand and toxic chemicals are pumped deep underground at a tremendous pressure to break up the layers of shale and release the gas so it can be pumped to the surface. More bad news is that fracking has become a serious environmental and health issue with a moratorium in place in New South Wales (Australia), Karoo basin (South Africa), Quebec (Canada), and some of the states in America.

Frack off

Public protest against fracking is on the rise. Earlier this year, public pressure forced France to become the first nation to officially ban the technique. Internationally, protesters are organizing rapidly and exchanging information through Youtube and websites such as Frack-off.org.uk. The UK recently saw its first 'Frack Mob' mass action, where protesters halted work at a drilling site in Hesketh Bank, Lancashire.

Protestors question the potential contamination of ground water, earthquakes, risks to air quality, the potential migration

to the surface of gases and chemicals involved in the fracking process, the potential mishandling of waste, and the health effects of all of these. On Youtube some Americans claim that shale gas leaking into their drinking supply caused tap water to ignite.

None of the counter-arguments from politicians and companies seem to convince the public. Bruno Vigier is the mayor of Les Vans, a town in the French Ardèche that stopped energy companies from drilling. Vigier himself sided with the protesters: "I was angry and shocked that we were not informed about the decision to drill near our town. As soon as we saw the plans, we knew that it was going to cause great damage to the environment. That is contrary to our policy of protecting nature and having clean rivers and lakes for tourists to visit."

Local Hostility

According to Oxford Institute for Energy Studies researcher Florence Gény, the biggest challenges to full-scale production of shale gas in Europe will be cost and land access. "Land access is a huge issue linked to severe spatial restrictions resulting from high levels of urbanisation in North Western Europe; extensive regulatory protection of sites and landscapes; and difficulties in accessing private land due to local hostility", she writes.

Gény advises the involvement of operators to develop mechanisms that incentivise landowners and integrate stakeholders in decisions impacting local socio-economic and environmental conditions.

But perhaps most importantly, if the industry is to develop in Europe, she says there must be: "Better communication on environmental impact and responses to growing public concerns arising from US operations. Environmental issues could be a killer to the nascent industry in Europe, as it could be a serious brake to US shale gas operations. We think the US needs to clear its environmental debate before Europe can fully embrace unconventional gas."

Read more?

* Climatic Change Letters

Robert W. Howarth, Renee Santoro and Anthony Ingraffea (2011)

www.propublica.org

Propublica - 'Investigative journalism in the public interest'.

Pullitzer prize-winning journalists track US gas drilling.

www.frack-off.org.uk – don't frack with the UK.

Can Unconventional Gas be a Game Changer in European

Gas Markets? Florence Gény, Oxford Institute for Energy Studies (2010)

of green technologies. In a comprehensive study of future energy systems, Ganzevles states how all energy technologies are controversial, 'whether new or old, grey or green'. The root of the problem is the lack of a sense of urgency felt by both the public and policymakers, resulting in collectively shared myths about an easy and painless transition to sustainable energy systems - lullabies that send people to sleep. Key to Dutch local resistance, Ganzevles believes, is the non-existence of a firm national political strategy on the future energy mix. He advises Dutch politicians and policymakers to rapidly start educating the general public. People need to realise that painful choices will ultimately have to be made if they want clean, affordable and reliable energy in the future. Good government communication and collective knowledge might well help tackle public resistance in the future.

Keep talking

Hübner believes governments and local populations often communicate on different levels, perhaps even in different languages: "A civil servant is used to working with facts and figures. His boss tells him he wants to generate more wind energy, so he consults



CO2 storage

'Glossy brochures are not the right communication tool'

Saying a planned facility is 'green' or 'safe' won't work - at least not in Germany or the Netherlands. 'There is a great enthusiasm for science. However, when scientific discoveries are transferred into technology, opposition comes forth.'

In September 2011, the Bundesrat, Germany's parliament, blocked a law allowing the storage of carbon dioxide underground in a bid to reduce emissions. The government must now come up with a revised bill to conform to a directive from the European Union on the technology. One year earlier, the Dutch national government had to announce that a similar test site underneath the residential area of Barendrecht, near Rotterdam, was to be scrapped. "The three year delay to the project and the total lack of support in the locality were the main reasons behind the decision", economic affairs minister Maxime Verhagen said.

Buying time

Carbon Capture and Storage (CCS) is a relatively new technique for permanently storing the greenhouse gas CO₂, in order to curb emissions. It is pumped out from fossil-fuel burning plants or from industrial processes, liquefied and then buried underground, usually in disused natural gas storage

chambers. It's a technology that has been used in gas fields under the sea, but not near populated areas. In Europe, many of the pilot projects are being partly funded by the European Union. CCS is seen as a way of buying time for politicians to forge an effective treaty on greenhouse gases and wean the global economy off fossil fuels.

Not in our community

In both the German and Dutch cases, national governments met with fierce opposition. Locals feared gas leakages or the possibility of explosion-like uncontrolled emissions. In the case of Barendrecht, the local community also feared a decrease in property values. In Beeskow, a quiet town in the eastern German state of Brandenburg, local Mayor Frank Steffen said: "A field trial under our community is not acceptable."

Critics believe that the large amount of investment required would be better spent on renewable sources of energy, such as solar and wind power, or on nuclear power.

"In my view, CCS is fundamentally wrong", said mayor Steffen to newspaper *Der Spiegel*. "It was invented to keep the old-fashioned way of producing energy from coal alive."

In an interview in newspaper *Der Tagesspiegel*, Brandenburg's economy minister, Ralf Christoffers said: "In Germany, there is a great enthusiasm for science. However, when scientific discoveries are transferred into technology, opposition comes forth." He pointed out that public resistance to CCS goes hand in hand with opposition to building a new power infrastructure for renewable energy – notably wind power. "The focus of our energy policy is the expansion of renewable energies. That is a huge problem, because the resistance is growing. In Brandenburg, we must build nearly 1000 kilometres of new lines for electricity but we need acceptance." When asked how to achieve acceptance, Christoffers stated: "You need to talk to the people."

Safe soda?

Indeed in both CCS cases, poor communication seems to be the problem. Carbon dioxide gas is odourless and not in any way dangerous, local communities were told. And even if the gas did somehow escape to the surface, the risk, it was said, would be zero. If it were to creep into the drinking water supply, as some people feared, scientists said it would merely carbonate the water, not unlike a soda.

a wind map to decide where to build the turbines. If you live near that place, you do not care about wind charts. Your response is based on your emotions. These turbines might produce noise and they are going to spoil your view.”

Smart planners use local expertise to find the right location, but whatever happens, keep talking. In the German region of Niedersachsen, a wind developer had to go to court to win permission to build a windfarm. It won; local protesters had to accept that their horizon would include turbines. It would have been very easy for the developer to build on the site and ignore its neighbours. But when the court battle was over, the company went back to the community. A plan was drawn up to have an independent authority measure the noise of the turbines and if they were deemed to be too noisy, the company would take action. Hübner: “I know the measurements are going to be impartial because they asked me and my colleagues to do them.”

Dancing Ladies

Listening to local people is what Andy Clements does very well. But then again, the chairman of *Gigha*

Renewable Energy has no other choice. As is usual on small Scottish islands, Clements has more than one job. He is the local fire chief, the head of island maintenance and a farmer. But most importantly, he runs three wind turbines on the island of Gigha (pronounced Gee-ya). This gorgeous speck in the Mull of Kintyre (of Paul McCartney fame) is energy self-sufficient thanks to the wind, with the electricity surplus sold to the mainland. Was there opposition before the turbines were built?

"You might be surprised how co-operative people really are"

A lot of discussion, says Clements. But what clinched it for locals was managing the project as a community. He recently visited a remote part of Norway where local tensions were running high. Why? “Because all of the turbines and biogas installations were privately owned. So people were irritated by the sounds and smells of other people’s businesses. I gave them one piece of advice: solve

Wrong, says stakeholder management researcher Gold [see *main story*]. “There should be no absolutes in risk-communication. Never pretend to have all the answers. Admit that it is a relatively new technology and you expect risks. Don’t feign certainty.”

The people of both Barendrecht and Beeskov proved Gold right. They started lobby groups and organized fierce protests. Politicians, planners and engineers assured locals that nothing could go wrong, but to no avail. Citizens remained passionately opposed to the plans.

Jurgen Ganzevles, senior researcher at the Rathenau Instituut in the Netherlands, believes the Dutch authorities should have painted a much broader picture instead of underlining the safety of the technology. “What they should have done in Barendrecht is demonstrate how important heavy industry is to both the local and national economy. Only then do you explain that a former gas field is a good place for storage. Concerns about safety will be seen in a different light after that.”

early benefits from a coordinated European action’. In May 2011, the experiences and lessons learned from six full-scale European CCS demonstration projects were shared with the public in Rotterdam. In their online newsletter, the CCS network dryly reports: “Ignoring stakeholders and under-estimating the influence of the local community is likely to cause delays.”

It’s a lesson learned, the network writes: “It is generally felt that development of and engagement in dialogue, especially with local stakeholders, is to be preferred above one-sided dissemination of ‘corporate’ project information. This is especially true for those projects who foresee onshore storage of CO₂.”

The network gives an example of how not to communicate with local people. In 2009, Vattenfall, a Swedish energy company involved in CCS, announced CO₂ storage plans using its ‘standard’ communication format. But it became clear that “glossy brochures are not the right communication tool in order to get local people to trust the company.”

purpose of public engagement is the ‘challenging’ task of communicating and educating the public about the risks related to CCS: “Whereas analysts and risk experts tend to employ quantitative risk assessments to methodically evaluate hazards, the majority of citizens rely on intuitive risk judgments, called ‘risk perceptions’. The public may regard CCS projects as a new technology and not necessarily trust experts’ claims that it’s safe. Furthermore, the distribution of risks and benefits are bound to be perceived as uneven (since some people must be the ones living closest to a storage site). The hazard of a leak is difficult to observe for ordinary people. Also risks may be amplified through social mechanisms, according to the report, “thus contributing to the dread factor.”

Read more?

Public Engagement: Lessons Learned in 2010 - A Report from the European CCS Demonstration Project Network
www.ccsnetwork.eu

Lessons learned

Meanwhile, the European Union has established a Network of CCS demonstration projects, ‘to generate

Dread factor

In the 59-page Thematic Report on Public Engagement, the CCS network concludes that an important

your energy needs together. Don't build five small turbines, build one big one."

The 'dancing ladies' as locals call the Gigha turbines, have saved the island and Clements believes it's a model that could work in many places. "You can see a wind park on the mainland from here. It is owned by a big electricity company. The people who live next to it are not happy. We love our turbines; they pump new life into our community. Even the guy who lives right next to them is comfortable with them, because otherwise our existence here would be a lot harder. It's not the technology that makes the difference, it's the way you use it."

Read more?

Social Acceptance of Renewable Energy innovation: an introduction to the concept. Rolf Wüstenhagen, Maarten Wolsink, Mary Jean Burer (2006)

Sustainability Assessment of Energy Technologies via Social Indicators: Results of a Survey among European Energy Experts. Diana Gallego Carrera, Alexander Mack (2009)

Invalid Theory Impedes our Understanding: a Critique on the Persistence of the Language of NIMBY. Maarten Wolsink, Transactions of the Institute of British Geographers (2006)

The Relative Importance of Social and Institutional Conditions in the Planning of Wind Power Projects. Susanne Agterbosch, Ree M. Meertens, Walter J.V. Vermeulen (2007)

It's the communication, stupid!

Communication

Communicating with locals and the general public is a key factor to public acceptance. It is a two-way process, so do not just send your message, but listen first.

Forget about Nimby

The Nimby label often turns into a depreciative disqualification of public protest. It can be perceived as an attempt to qualify opponents beforehand, in terms of 'others', or at least 'the other side'. This leads to conflicts.

Paint the whole picture

Explain your policy of making the energy supply more sustainable, and explain why the biogas plant you want to build is a crucial part of that plan.

Show and tell

Explain to the general public what choices have to be made, why, and how you make them. Do not withhold information. It will come back to haunt you.

Use local knowledge

People who know an area can help you choose the right location for a new power station.

Let the locals benefit

Supply local communities near a wind farm or geothermal power station with cheaper electricity or other benefits.

Listen

Never. Stop. Listening. Even after you build a (green) power station, keep lines of communication open.

PUBLIC ANGER?

Never. Stop. Listening.

Accept, consider, reject?

How do we form opinions on issues like energy and technology? What information influences us in shaping our views? Volta takes a look.

Context matters

You are confronted with a new technology you know next to nothing about. Do you already have an opinion about it? You might, according to research by Eindhoven University in the Netherlands. Researcher Wouter van den Hoogen found that people base their positive or negative emotions about a new technology on the context in which they are exposed to it. "If another energy source was casually mentioned just before the assessment of biomass, then their opinion about the use of biomass was assimilated to the use of the other energy source", writes AlphaGalileo about the research.

Context Affects Opinion about Novel Energy Sources

Eindhoven University of Technology, July 26, 2007

Wind farms? Mais Oui!

France is planning to substantially increase the amount of electricity generated through wind power by 2020. But this government-sponsored programme could be seriously delayed if the acceptance of wind turbines is low. So a study was conducted in four coastal regions of France where multiple wind farms are already operating. It shows there is high acceptance of wind turbines among those who live near them. Not only do the respondents at the four sites have a positive perception of wind energy in general, but they also look proprietarily at 'their' wind farm. Only five percent of those whose home is near a wind farm believe that turbines are a bad idea.

Evaluation of Some External Effects Produced by Wind Turbines

Commissariat général au Développement Durable (CGDD), June 2009

Local positivism

People like renewable energy (or say they do). So why the protests when a renewable power station is planned near their home? According to this report, the acceptance of new energy technologies at the local and regional level is first and foremost shaped by non-technological aspects. History plays an important role. Have other projects in the region contributed to a general opinion that green energy is a good thing? Then people are a lot keener to support new local projects, the authors suggest: "Positive experiences gained at individual sites can expand to a broader regional level or even influence national policies".

Factors Influencing the Societal Acceptance of New Energy Technologies: Meta-analysis of recent European Projects

E. Heiskanen et al, Create Acceptance, 2008

To compensate or not?

Compensation is a favourite government strategy to overcome low acceptance for large energy infrastructure projects. Governments use it as a cure-all when confronted with resistance from local populations but confidence in compensation is excessive and the costs associated with it sometime prohibitive. A better way would be to stimulate dialogue, this study concludes.

The Location of Regassification Plants, is Compensation a Cure-all?

Matteo Bartolomeo, Politecnico di Milano, 2007

Risk-free Green please

The Bureau for Technology Assessment of the German Parliament (TAB) has been measuring technology acceptance opinions since 1997. Although Germans have a positive attitude toward technology and technological advances, it is also ambivalent: when questioned about the impact of technological progress, a significant number of respondents selected a negative or undecided option. While the acceptance of green technologies remains high, the acceptance of technologies that are perceived as dangerous, like nuclear energy, has dropped dramatically.

Monitoring Technikakzeptanz und Kontroversen über Technik; Positive Veränderung des Meinungsklimas,
TAB 1997-2009

Rethinking Nimby

Selfish? Or the expression of a desire for a better environment and quality of life? This paper urges a rethink of the Nimby (not in my back yard) syndrome. "Generalized distrust [has] hidden deeper reasons from view", the authors write. Nimby syndrome could be a way to bring hidden conflicts in society out in the open and "help translate perceptions and intentions and build partnerships between various civil society members and between them and government bodies."

The Nimby Syndrome and the Health of Communities

Canadian Journal of Urban Research, Senecal et al, 2006

Energy choices for Europe. Who decides?

Big-tech and Small-tech are two 'essentially different' development pathways for the European energy sector, according to this report commissioned by the European Parliament. We can opt for a scenario in which new gas and coal firing power plants are built with CCS technology to curb emissions. Or we can decentralise power generation to smaller wind farms, bio mass facilities and other green technologies and concentrate on energy saving. In the first case we end up using more energy and polluting the landscape in a few places, in the second we use less energy, but have more turbines and other structures on our horizons. Or can we have both?

Future Energy Systems in Europe

European Parliament Science and Technology Options Assessment, 2009

Cooling our planet?

We're failing to reduce the emissions contributing to global warming. So why not try something more direct, say geoengineers. Let's cool the earth by shooting sulphur particles into the atmosphere to imitate the shading effect of a volcanic explosion. Bold or bonkers?



Jeff Goodell
Text:
Pascal Messer

Volta Magazine on the rapidly growing debate on geoengineering

Dumping iron into the oceans to stimulate the plankton blooms which absorb CO₂? Sucking CO₂ from the air with huge contraptions? Painting roofs and pavements white to cool our planet by increasing its reflectivity? Geoengineering technologies sounded outlandish to Jeff Goodell, a contributing editor to *Rolling Stone* and *The New York Times Magazine*. But after several years of researching the characters, ideas and motivations of a small band of geoengineers, he came to realize that we have to start taking geoengineering seriously. Or at least explore it.

In *How to Cool the Earth*, Goodell's scary but compelling book about some more extreme approaches to tackling global warming, he investigates the scientific, political, financial and moral aspects of geoengineering. How are we going to change the temperature of entire regions if we can't even predict next week's weather? What about wars waged with climate control as the primary weapon?

The thing that Goodell - who is certainly no geoengineering groupie - fears most is that we won't do anything at all. "The rising interest in geoengineering is driven less by mad scientists than by spineless politicians", he writes. The villains are politicians who dither and do nothing to reduce our emissions, until a technological fix may be all that saves us.

But geoengineering is going mainstream, according to the ETC Group in *Geopiracy - the*

Case against Geoengineering, and policymakers are beginning to test the waters. "It is now politically correct to talk about geoengineering as a legitimate response to climate change", they wryly conclude. The ETC Group has called for a moratorium not just on geoengineering, but all technology: "A wider global mechanism for Technology Assessment is long overdue."

This summer, the United States Government Accountability Office published a technology assessment report on climate engineering. The agency evaluated two broad categories of engineering solutions: carbon dioxide removal and solar radiation management. It also tested potential public responses. GAO

concluded that current technologies are 'immature', and many have 'potentially negative consequences'. Based on GAO's survey, a majority of US adults are not familiar with climate engineering: "When given information on the technologies, they tend to be open to research but concerned about safety."

Claudio Caviel from the German TA office TAB, described the pros and cons along the axes of 'hope, hype and fear' in their BRIEF magazine. Obligatory reading, for spineless politicians and civilians alike.

Read more



How to Cool the Planet – Geoengineering and the audacious quest to fix Earth's Climate

Jeff Goodell, Houghton Mifflin Harcourt, Boston / New York (2010)

Geopiracy – The Case against Geoengineering

ETC (Action group on erosion, technology and concentration) Group (2010)

Climate Engineering – Technical Status, Future Directions, and Potential Responses

Technology Assessment – GAO-11-71 (2011)

Geoengineering: Combating Climate Change with White Paint?

Claudio Caviel, TAB (Büro für Technikfolgen-Abschätzung beim Deutschen Bundestag) Brief nr. 39, Special Edition (2011)

Albedo Enhancement by Stratospheric Sulfur Injections: a Contribution to Resolve a Policy Dilemma?

Paul J. Crutzen – Max-Planck-Institute (2006)

Geoengineering the Climate: Science, Governance and Uncertainty

Royal Society, United Kingdom (2009)

Fixing the Sky – The Checkered History of Weather and Climate Control.

James Rodger Fleming, Columbia University Press, New York Chichester, West Sussex (2010)

Online reading

www.itas.fzk.de/eng/infum/gch_CE.htm
See the website of the Institute for Technology Assessment and Systems Analysis (ITAS)

Serious game

How far would you go to become stronger, fitter or more competitive? Ritalin for your child to improve its educational chances? A robotic arm to boost strength? With the Rathenau Instituut's new human enhancement app you can put your ethics to the test.

Text:
Antoinette Thijssen
Photo:
Alberto Mosquera.
Game screenshot
courtesy of IJsfontein



The Rathenau Instituut, the technology and science system assessment institute for the Dutch parliament, is launching their first iPhone app this winter: a game on human enhancement. “We want to reach new audiences, that we do not reach through more traditional media”, explains senior researcher Ira van Keulen. The game is designed to encourage players to think about the ethical dilemmas of human enhancement. It’s a topic that reaches way beyond cosmetic surgery and doping for athletes: “Sooner or later, everyone will have to make choices about whether to tinker with their appearance or performance. If only because others are already doing so.”

The social game, which will be free of charge, offers players three missions to choose from. In the first, your child takes part in a competition to enter a top five university. In the second, players are scientists competing for research funding for a cancer vaccine. The third option is to be an elderly person who has to prove they are mentally and physically capable of living independently. A team of players can either

spend time in training or use enhancements – mild and radical - to accomplish their mission.

These enhancements come at a price, though, mirroring real-life dilemmas. Ritalin is designed to improve concentration but are the side effects too risky? Deep brain stimulators are designed to improve moods, but what else do they do? What are the downsides of a superstrength robotic arm? Players are encouraged to think about the ethical dilemmas as they are interacting with the other members of their team.

The desire for self-improvement won't stop

Human enhancement technologies were originally developed as medical technologies for people with a disorder, but are increasingly being used by healthy people to improve performance or appearance. Well-known examples are Viagra and liposuction. In liberal Western countries, individuals can decide for themselves whether to use such enhancements or not. But what is the impact of these individual decisions for society as a whole? How does it change our ideas about what a normal human being is? And who has access to these technologies? What if a government uses enhancement technologies for collective goals, such as a safety and justice? Ira van Keulen: “Most of the public debate has been about doping in sports. We wish to invite people to think about the broader trend of healthy people using technologies to become smarter, fitter or more beautiful. After all, new technologies will keep being developed – and people’s desire to improve themselves will keep raising these issues.”

The game will be available in January, through the iTunes AppStore. You can stay up to date via www.rathenau.nl.

Daniel Sarewitz
on evidence-based policy:
**Science will not provide
the solution**



“Where societal tensions are high, politicians cannot afford to place their faith in the neutrality of scientific information”, believes American writer Professor Daniel Sarewitz. He does not see this as cause for regret.

Daniel Sarewitz meets me in the lobby of my hotel, arriving slightly late. The bearded American apologizes and explains that he tends to misjudge distances in Washington D.C. This is ironic, given that Sarewitz has made his name by accurately assessing the distance between Washington and scientists. He knows that science has relatively little influence here in the seat of American power. But he believes scientists themselves are not sufficiently aware of this fact. They devote much time and thought to their own disciplines, but far less to their own position within society and the defining characteristics of their own community. This is the message that Daniel Sarewitz has presented in countless academic papers and journal articles.

“Did you know that only ten per cent of American scientists vote Republican? And you will have to look long and hard to find any evangelical Christians in the scientific community. Or any far right conservatives – those who wish to limit the power of the state. The vast majority of American scientists are part of a privileged elite whose politics are far from right-wing. If anything, they are slightly left of centre. These people have values and interests which differ from those of large sections of society. But because academic scientists form such a homogenous group, they are unaware of this fact.”

"Scientists do not have a monopoly on the truth"

It is when scientists wish to offer knowledge to politicians that the effects of this situation become apparent. Good politics and good government entail taking account of the different values and interests of all sections of society. Scientists have little ‘feel’ for such differences because they have been isolated in their own hidebound academic community for so long, he asserts. “This gives rise to the ludicrous notion among scientists that people would all work together if politicians and citizens had access to the knowledge that science can provide. Wrong!”

The homogeneity of the scientific community is, Sarewitz continues, well illustrated by the statements one hears at conferences. “A speaker might claim, ‘the climate is changing, *as we all know*.’ I then think, oh really? Do we actually know that? Don’t misunderstand me – I too believe that the earth is becoming warmer and that this will cause serious problems. But I don’t know for certain. I believe it based on the statements made by scientists who are experts in their field. I do not have the knowledge needed to assess all the information on its merits. And I am enough of a scientist to know that there is absolutely no one who is expert enough in all subdisciplines of climatology to arrive at any firm and unequivocal conclusions. In the end, it all comes down to confidence in the judgement of certain experts, and a personal belief that certain opinions are more likely to reflect the truth than others.”

Sarewitz is not saying that science is inevitably ‘subjective’, or that scientists are necessarily

motivated by personal interests. Rather, he believes that the natural world is so rich and complex that it offers scope for a range of different scientific approaches. Each approach results in a different type of knowledge, and that knowledge can prompt different, sometimes contradictory, political responses. “The problem is not that scientists are producing knowledge which is incomplete or inaccurate. The problem is that scientists are producing *too much* information. There is a glut of facts and findings from various branches of science. Those facts are all valid in themselves, but there is no cohesion between them.”

Arrogance

The result of this ‘objective surfeit’ of facts is that it will always be possible to find two scientists with diametrically opposing opinions, although neither is by definition ‘wrong’. This is amply illustrated by the climate debate: “If the proponents of climate policy had said that they wished to follow a certain course based on values and principles, such as the precautionary principle, the sceptics would have had far greater difficulty in opposing them. But those in favour of measures rarely mention values or principles – they merely claim that the facts are on their side.”

This ‘arrogance’ makes it both easier and safer for the sceptics to make their voice heard. “After all, it is possible to find scientific grounds to oppose practically any model, so the political opponents need only produce their own scientists to present counter-evidence. They need not take the interests of, say, the oil industry into account. When science is given such a major societal role, there is no room for the crucial political debate about standards and values. The emergence of the climate sceptics was therefore very interesting, from a political point of view.”

Scientists are not used to examining their own values, and neither are they used to laying those values bare for all to see. However, different disciplines entail different world views and will therefore lead to different policy recommendations. A molecular biologist will approach genetic modification from a completely different angle to that of an ecologist. These two scientists have different sensibilities and different ways of looking at the world. As Sarewitz points out, the differences were probably apparent long before either had chosen to study his particular discipline.

Daniel Sarewitz (55) is director of the Consortium for Science, Policy, and Outcomes at Arizona State University, and is based at its centre in Washington D.C. He is the author of several books and articles, including ‘How science makes environmental controversies worse’ in *Environmental Science & Policy*, which has become the most cited article from this influential journal. Until recently, Sarewitz had a regular column in *Nature*. From 1989-1993, he was science consultant to the House of Representatives Committee on Science, Space, and Technology. Sarewitz originally studied Geological Sciences at Cornell University.

"Once you realize this, everything falls into place. You understand why one of your contemporaries at high school opted to study psychology, while another wanted to be a psychiatrist. Those choices were determined by the type of people they are, by their view of their own role in life. It then comes as no surprise that psychologists accuse psychiatrists of attempting to 'medicalize' society, while the psychiatrists accuse the psychologists of using 'vague and unscientific' language. In science, these differences can be traced back to schooldays or even earlier."



"The problem is that scientists are producing too much information"

Once you appreciate this, you come to understand something else: that there is absolutely no point in turning to science if you are hoping to divorce a social issue from ideology. "Where societal tensions are high, politicians cannot afford to place their faith in the neutrality of scientific information."

According to Sarewitz, the standard model in which science provides neutral knowledge to the politicians, who can then use that knowledge to establish a prudent policy, is false. However, it will be difficult to shake off that assumption, since both politicians and scientists have a vested interest in maintaining the status quo. "The scientists enjoy authority and admiration as the 'revealers of the truth'. For their part, the politicians can defer awkward discussions about standards and values by saying that there is insufficient scientific knowledge on which to base any responsible decision."

How can this impasse be resolved? The first move, Sarewitz suggests, must be made by the scientists. "In the long term, the idea that science offers 'the truth' to 'the power' represents a fundamental threat to scientists' ability to influence society and edge it in the direction of prudent policy. Society itself will increasingly question the validity of this notion. If the scientists nevertheless cling to it, their position will eventually be seriously eroded even though they still have a very important role to play. They can offer knowledge which is extremely valuable based on the

methodology of science itself: the rigour, the precision, the mutual control are all unique to science. However, scientists do not have a monopoly on the truth. We must create a culture which acknowledges that different disciplines and different world views result in different, incomplete, insights. It will be culture in which we feel comfortable with uncertainties."

In short, we must dispense with the traditional 'enlightenment model' in which the scientists provide the information we use to shape our world. This model does not and cannot offer solutions to the majority of the issues we face in practice, Sarewitz contends. Society's problems are not like a great puzzle to which there is a standard solution if only one was clever enough to find it. "The major societal issues of today are more of the nature of a condition, a situation in which we now find

ourselves. We cannot turn back the clock; there is no solution as such. So, if the situation cannot be resolved, we must find ways of living with it. In many cases, good management is the best we can achieve."

So far, we have coped remarkably well, Sarewitz believes. "It seems that politicians are able to make decisions despite not having all the scientific knowledge at their fingertips. The main issues facing the USA at the moment are healthcare and the crisis in the financial sector. No politician has said, 'Well, we are going to have to wait until the scientists tell us what to do'. These issues are seen for what they are: political problems in which there are various, often conflicting, interests and values at stake. I think we should celebrate the ability of a democratic society to take action in the face of uncertainty and the glut of incomplete knowledge."

Legend and legacy

Academic excellence and wide-reaching research was not enough to save the world's first Technology Assessment organisation in the United States. Can support from scientists and citizens spark a revival?

Text:
Niala Maharaj
Photo:
Wikipedia

"Most members of Congress avoid science at all costs" / Rush Holt, Wired 2009

advisory council of 10 eminent citizens from industry, academia and elsewhere. On top of that, for each study it undertook, OTA assembled an advisory panel of stakeholders and experts.

In spite of wide support, OTA closed suddenly in 1995 - 'de-funded' during the 'republican revolution' in the House of Representatives led by Speaker Newt Gingrich. The reason given was cost-cutting, but the institutional spend of under \$30 million a year was a trifle in comparison to the quality and quantity of its output.

Even today, OTA's legacy is kept alive. Both Princeton University and the Federation of American Scientists maintain websites and in July 2011, Rush Holt, New Jersey's Representative in the House of Representatives, tried to get the US legislature to re-open the organisation on a modest basis. While Holt's motion was voted down, it seems fair to predict that history hasn't closed the books on the OTA quite yet.

Want to know more?

www.princeton.edu/~ota/
www.fas.org/ota/
www.youtube.com/watch?v=BhAM-u2F0kl

The OTA legacy - 1972-1995 on CD-ROMS

OTA's analysis of the scientific and technological issues are increasingly relevant to public policy and legislative action. Five CD-ROMs contain all the formally issued reports of the OTA, as well as many background papers. Over 100,000 pages of the best available analyses of the scientific and technical policy issues of the past two decades.

Contact U.S. Government bookstores or the U.S. Library Services Program for availability.

The first Technology Assessment organisation in history was the US Congress' Office of Technology Assessment (OTA). Set up in 1972, this pioneering institution lasted for 23 years before its abrupt closure in 1995. Calls for its revival have mounted in the last years, and have come from a diverse range of parties - from *Wired* magazine through to the *Bulletin of the Atomic Scientists*.

"OTA provided Congress with in-depth technical assessments to support congressional decision making" explained Laura H. Kahn in 2007 in the *Bulletin of the Atomic Scientists*. "By estimating the economic, social, and environmental impacts of technological advancements, it was known for its impartial advice and analysis. OTA published up to 55 reports each year and its work was diverse, evaluating everything from health-care technology to agricultural needs. Nothing has come close to filling its mandate since."

"In clear and simple language, supported by attractive illustrations", noted Professor M. Granger Morgan, head of the Department of Engineering and Public Policy at Carnegie Mellon University, in the *Pittsburgh Post-Gazette* in 1995, "they summarized the technical facts, identified problems, laid out alternatives, and discussed their pros and cons."

Bestsellers

The reports produced by some 200 OTA staff members were often bestsellers at the Government Printing Office. "OTA reports usually gave alternatives matched to different goals Congress might want to achieve" stated *Scientific American* in 2005. "Instead of watering down recommendations to achieve a consensus, as is the custom of many blue-ribbon panels, the OTA deliberately sought out conflicting viewpoints. Often people on both sides of an issue would cite the same report during debate." OTA reports were widely respected for incorporating different points of view, while maintaining academic quality standards. The OTA's structures and methodologies fostered objectivity, non-partisanship and public participation. Its governing board had equal representation from both political parties. It was also guided by an



T-shirt created and worn by some staff of the OTA to express their sentiments about the intent of the 104th Congress to terminate their service.

Growing a frock

Suzanne Lee, fashion designer and Director of BioCouture, investigates the use of microbial-cellulose, grown in a laboratory, to produce clothing. She collaborates with scientists to unite design with cutting edge bio and nano-technologies. Ultimate goal? To literally grow a dress in a vat of liquid.

Text:
Pascal Messer
Photos courtesy of
Suzanne Lee

State of mind?

Excitement and optimism! After my talk went on TED.com I had so many enquiries and offers of support from around the world that it has been inspirational. I've been made a Senior TED Fellow for 2012 so have to rise to the challenge!

Biggest success?

Hmm, I take every day as it comes and as long as there is support for what I'm doing from my peers and people like TED, it makes me feel I have ideas worth sharing.

How did you get where you are?

With a willingness to swim against the tide. While the fashion industry has pursued ever faster and cheaper, unsustainable production, I've become driven to find radical alternatives, such as growing clothing.



Failures?

I'm not sure I view anything I've done as a failure. I've always taken risks by not following an established path, but that's all part of being creative.

Dreams?

I'd love to see my research become a successful commercial product and transfer some of that design knowhow to social entrepreneurs in developing countries.

What will it take?

A design/science team who collaborate well, backed by sufficient funding! It might also take some major rethinking on the part of certain industries to pioneer new production facilities.

Fears?

That fighting entrenched resistance kills my passion before I succeed.

What would you change?

I'd force everyone in the fashion industry to be transparent about where, how and by whom their products were produced. This trillion dollar industry exploits and pollutes while selling seduction. I still love fashion, but boy, could we do better.



Until 2 January 2012 Lee's work is part of the Power of Making exhibition at the Victoria and Albert Museum in London.

Science for society

Whether sustainability, energy, aging or the ethics of emerging technologies, technology assessment addresses the grand challenges of our time.

Text:
Gaston Dorren
and Niala Maharaj
Photos:
Marisa Beretta
© Getty Images

Science is too important to be left to scientists

In the Stone Age we became better hunters, the Agricultural Revolution led to civilisation, the Industrial Revolution turned us into consumers. Technological development has always shaped human life. But each rise in productivity came at a price. More efficient hunting led to the extinction of large mammals, agriculture created opportunities for epidemics and tyrants, while industry has had so many nasty side effects that there is hardly any point listing them. But think exploitation, industrial warfare, pollution, and the high-pitched tones leaking from fellow passengers' earphones.

The trouble was that for all our ingenuity, humans did not sit down and seriously consider, at an early stage, what the effects of new technologies on society would be. On health, on well-being, on security, the environment, or on the distribution of power and influence. In other words, we did not yet practise *technology assessment*.

That was to change, but it didn't until quite recently. Thalidomide babies and nuclear accidents like Chernobyl have engendered fear and distrust in the second half of the 20th century, according to professor Armin Grunwald of the Karlsruher Institut

für Technologie (KIT) in Germany. "There have been on-going technology conflicts for decades" he explains. "Introduction of new technologies was often carried out in a non-democratic way. For example, there was no early public dialogue over nuclear energy in Germany and the result is that the programme has now ended. The scientific community started learning from that."

Technology assessment (TA) institutions began to be established in northern Europe in the 1970s, based on the example of the US Office of Technology Assessment (1972-1995 – see page 19). Their first aim was to head off social conflicts over technology by conducting research to generate reliable information and develop well-informed projections as to likely social, economic and environmental consequences.

Since then, TA institutions have spread to southern Europe. Today, 14 of them are linked in the European Parliamentary Technology Assessment (EPTA) network. Some are state agencies, others are independent research institutes, and depending on the local situation, they provide policy advice, stimulate public debate and offer policy options to parliaments.

Outside the Western world, TA as such is incipient at best. But in several countries the ground seems to be fertile. India has a tradition of critical NGOs representing the interests of civil society, while in China the Academy of Sciences tends to be sober and prudent regarding the introduction of innovations.

The role of TA has shifted from that of a 'watchdog', to becoming 'a tool for policy analysis of emerging technologies', suggests a 2011 report prepared by the Dutch Technopolis Group for the European Parliament. It has become an instrument that not only supports parliament, but many other actors, in decision-making and strategy development on science, technology and innovation.

In fulfilling this role, TA institutions use a wide range of methodologies, including impact and risk assessments, forecasting, benchmarking, and bibliometric studies. Another interesting method is technological road-mapping, which serves to match societal goals with specific technological solutions.

Consensus

A diverse range of stakeholders are involved in considering whether and how new technologies should

TA in a nutshell

Technology assessment is a scientific, interactive and communicative process that aims to inform and contribute to the formation of public and political opinion on societal, ethical, legal, economic and environmental aspects of science and technology. TA practices include:

- studying and evaluating new technologies;
- identifying potential areas that can give rise to conflict or controversy;
- garnering public opinion on technological developments;
- providing information to decision-making bodies, i.e. parliaments;
- providing information to the public and to groups of stakeholders about these technologies and their potential social, economic and health consequences.

be developed and introduced into society. These stakeholders not only include scientists and industrialists working on new products, but also governments, NGOs, the media and even the general public. Consensus among these groups can provide assurance that a new technology is well embedded in society.

For this purpose, the EU's Directorate General for Research has an Ethics Unit that tries to be at the forefront of technological development. It funds research into the governance and ethics of new technologies, conducts impact assessments, and develops soft-law provisions to govern technology development. These measures are matched to the values enshrined in the EU Treaty, which include social justice, sustainability and gender equality. One example is the 2008 code of conduct for responsible nanosciences and nanotechnologies research.

Nanotechnology is a fairly recent item on the to-do list of TA institutions; a list which has grown as technology reaches into ever more areas of human life (*See TA hotspots box*). New and somewhat controversial technologies like service robots and cloning are assessed but also fisheries, for example. The Swedish TA institute has examined the ecological consequences of this age-old, but still innovative industry. The obesity epidemic has been scrutinised by The Danish Board of Technology (DBT) who have advised that prevention efforts be targeted at high-risk groups.

Cocktail of insecurity

"Technology assessment addresses the same questions ordinary people address" stresses Lars Klüver, director of the DBT. "We deal with the grand challenges of our time: issues of sustainability, food security, health security. Economic sustainability is

an underlying issue – the coinciding financial crisis, upcoming energy crisis and global redistribution of work is shaken into a cocktail of insecurity – and technology plays an important role."

The 25-year-old DBT, he says, is particularly well-known for 'participatory TA'. Its staff designs methodologies to enable public participation in the process of evaluating new technologies and making policy about their deployment. "We let actors in society investigate a science and technology issue and develop the points, conclusions and policy options together" Klüver explains. "The fact that experts, industry, unions, NGOs, citizens and politicians themselves are involved in making the policy advice increases the legitimacy of our work, and therefore policy-makers investigate the message instead of the messenger."

Zooming eyes

Some current developments, especially in nanotechnology, synthetic biology, cognitive science and – still – computer science, hold huge promises, both in terms of economic potential and impact on our daily lives – even our bodies. "We may be able to enhance the human eye, to integrate capabilities to allow it to zoom, for instance" says Grunwald (as just one example among many).

TA hotspots

Throughout Europe, there are particular technologies that are at the centre of TA attention. Some are relevant to policy goals, while others represent innovations that make citizens uneasy. Uncertainty about the future of the planet's climate may be the single most important issue to steer TA activities.

Whether it's called energy, energy policy, renewable energy, global warming, climate change or biofuels, the concern underlying these programmes is roughly the same: how do we keep temperatures from going through the roof? Another, particularly European, topic on the technology assessment agenda is aging, which has ramifications into several areas including care technology and ICT. Privacy is yet another much debated and researched issue, especially in the light of the threats posed to it by the ready availability and interconnectedness of digital data.

Fields of innovation that seem to have a hard time appealing to the public are nanotechnology and, even after all those years, biotechnology. Concerns about their environmental and health effects inflame determined NGOs, generating the sort of response that nuclear energy has had for most of its existence producing the type of stalemate that TA organisations are trying to avoid.



TA advice: prevention for high risk groups to tackle the obesity epidemic.

'Global TA': in 2009 more than 4000 citizens participated in the World Wide Views on Global Warming project.



The risks involved in the deployment of such technologies are not yet apparent – and how much risk should societies take? Questions have already been raised about health hazards associated with the dissemination of carbon nanotubes, for example. Another issue is the potential emergence of two classes: one that can afford physical and mental upgrading while the other has to make do with non-zoomable eyes. How can these have-nots ever compete with the enhanced haves?

The setting of research priorities with their anticipated impacts needs to be subjected to a societal review, according to René von Schomberg of the European Commission. In a recent paper entitled *Prospects for Technology Assessment in a framework of responsible research and innovation*, he states that the TA process should: “go beyond risk governance and move to innovation governance”. He gives the example of the company BASF who have established a dialogue forum with civil society organizations and developed a code of conduct for the development of new products.

It's an approach labelled responsible research and innovation, and for both von Schomberg and Grunwald, it is the way to go.

Read more?

Prospects for Technology Assessment in a framework of responsible research and innovation

Von Schomberg, M. Dusseldorp and R. Beecroft (eds)
Technikfolgen abschätzen lehren: Bildungspotenziale transdisziplinärer Methoden, Wiesbaden (2011).

Major Technology Assessment Institutions

- Scientific and Technological Options Assessment (STOA), European Parliament
- Danish Board of Technology (DBT)
- Committee for the Future, Finnish Parliament
- Institute Society and Technology, Flemish Parliament, Belgium
- Parliamentary Office for Evaluation of Scientific and Technological Options, France
- Office of Technology Assessment at the German Parliament
- Committee on Technology Assessment, Greek Parliament
- Committee for Science and Technology Assessment, Italian Parliament
- Rathenau Instituut, Netherlands
- Norwegian Board of Technology (NBT)
- Centre for Technology Assessment, Switzerland
- Parliamentary Office of Science and Technology (POST), UK Parliament
- The Advisory Board of the Parliament of Catalonia for Science and Technology
- The Parliamentary evaluation and research unit, Swedish Parliament
- Sub-Committee on Science and Ethics of the Parliamentary Assembly of the Council of Europe, Strasbourg
- Institute of Technology Assessment Austria
- Federal Science Policy Office, Belgium
- The Bureau of Research, Polish Parliament
- Government Accountability Office (GAO), Center for Science, Technology and Engineering (CSTE) of the US Congress

Medical treatment Crossing borders, or not?

The EU has recently made it easier for patients to cross borders to take advantage of shorter waiting times, newer or cheaper medical treatments, or different rules. Members of the European Parliament have their say.

Text:
Philip Dröge
Photo:
© Masterfile



Health tourism?

"Care is not a commercial, tradable good; it is a basic need for everyone. The new EU directive will mean that insurers drive patients abroad in search of cheaper treatment. But patients - especially if they are seriously ill - just need care in their region, close to their family and a doctor who speaks their language. Health tourism will be a logical consequence of this law, with patients from rich countries able to travel to less expensive countries, where they may be given priority over the local, poorer patients."

Kartika Liotard (European Parliament, SP, Netherlands), www.imtj.com

Long overdue

"At present, the waiting list for a hip replacement in the UK is over 12 months, so a British person waiting for a hip replacement will be able to go for an operation in France and be reimbursed for the bulk of the cost by the NHS in Britain. The [European] directive [on medical tourism] is long overdue and will profit all patients."

Peter Liese (European Parliament, EPP, Germany), www.imtj.com

Read more?

Health portal of the European Union: www.health-eu.eu

Closer Co-operation

"People prefer to receive their healthcare close to home. However, sometimes the need for certain treatments, such as for rare diseases, leads patients to go abroad. That will also bring about closer and improved health co-operation between member states."

John Dalli (European Commissioner for Health and Consumer Policy, Malta - www.imtj.com)

Milestone

"The new rules [for medical tourism] represent a real milestone for cross-border healthcare in Europe. [...] The right balance has been found between protecting national health systems and strengthening patients' rights."

Sarah Ludford (European Parliament, Liberal Democrat, UK), www.imtj.com

Bus loads of citizens?

"We are not trying to promote medical tourism . . . I'm quite convinced we are not going to see bus loads of citizens going from one member state to another. If the treatment abroad is cheaper than at home, only the cost of the treatment will be reimbursed."

Francoise Grossetete (European Parliament, UMP, France), Irish Times