REPORT

Towards Robust European Air Pollution Policies:

Constraints and Prospects for a wider dialogue between scientists, experts, decision-makers and citizens

A workshop report

Peringe Grennfelt, Rolf Lidskog, Lars Lindau, Rob Maas,
Frank Raes, Göran Sundqvist, Jenny Arnell

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The workshop was organised by the Swedish ASTA program and the ACCENT Network of Excellence

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Title and subtitle of the report

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Constraints and Prospects for a wider dialogue between scientists, experts, decision-makers and citizens

Preface

The international regulation of transboundary air pollution in Europe is often considered a success story. The success is usually explained by a close relationship between scientists and policy makers. When looking into other international environmental areas (e.g. climate change, marine pollution), there have generally been larger obstacles in the science-policy relationships.

Social scientists have for many years studied the international policy development processes for air pollution and pointed to certain factors of importance in for its success. There have however seldom been opportunities for social scientists, policy makers and scientists to discuss together the interrelations between science and policy in the area.

In order to further evaluate the science policy interactions and discuss possibilities for social scientists to play a role in the further development of air pollution strategies a workshop was organised in Gothenburg, Sweden 5-7 October 2005. The workshop was organised by the Swedish ASTA programme and the EU Network of Excellence ACCENT in collaboration with the Convention on Long-Range Transboundary Air Pollution and the EU CAFE initiative.

Approximately 35 participants from 12 countries representing Europe, North America and Japan attended at the workshop. This report compiles the outcome of the workshop. The report is also available at http://asta.ivl.se/

Keyword

Air pollution, Policy, Social science, Science-policy

Bibliographic data

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1 Workshop Conclusions

International and National Abatement Strategies for Transboundary Air Pollution

ACCENT
ATMOSPHERIC COMPOSITION CHANGE
THE EUROPEAN NETWORK OF EXCELLENCE

Toward Robust European Air Pollution Policies Workshop, Göteborg, October 5-7, 2005[1]

Science - Policy interactions in the field of transboundary air pollution

Science and policy have been closely interlinked in the development of international air pollution policies, in particular the strategies and protocols under CLRTAP. The development of the CAFE strategy under the European Commission has taken advantage of the collaboration and also developed the relations further in particular with respects to effects to human health.

Even if there are different opinions about the role of science for the overall success in terms of emission reductions, science has strongly influenced the formulation of the policies. Several examples were presented at the workshop.

Lessons across cases

The organisation of the work under the CLRTAP has facilitated the science - policy interactions and the diffusion of expertise between the science and policy arenas. The connections are well established between applied science and policymakers. There are however results indicating that basic science (e.g. within atmospheric chemistry) to a large extent is disconnected from the applied science.

The formulation of air pollution policies and how science is used in policy development differ substantially between Europe, North America and Japan. These differences may have caused problems in a broader acceptance of international air pollution policies and in the collaboration between different regions in the Northern Hemisphere.

A key factor for the success in all international environmental negotiations is the formation of trust between the scientific and policy communities. Several aspects important for the formation of trust were identified including long term engagement of key actors on both sides, shared understanding of problems, the possibility of creating abatement strategies that are seen as credible by scientists, and people that are willing to cross borders and act on both sides without loosing confidence

[1] The workshop was organised by the Swedish ASTA program and the ACCENT Network of Excellence. Further information on the workshop can be find at http://asta.ivl.se/Workshops/.

Future cost-efficient air pollution policies may to a larger extent include non-technical measures. Such measures are often also reducing emissions of greenhouse gases. Air pollution and climate change policies may therefore benefit from each other.

Communication

In general there has been a large common interest in air pollution both from the public and from politicians. Media have often highlighted air pollution issues and the needs for action. However, several of the participants indicated that there seems to be a declining interest in recent years. Already achieved improvements competition with other issues (environmental as well as non-environmental) and general changes in societal attitudes were identified as main factors for the decreasing interest. The decreasing interest may influence the outcome of upcoming international proposals negatively. Increased knowledge on health effects from air pollution and an increasing interest in personal health risks may work in the opposite direction.

Communication can be an important mean for achieving increased interest in air pollution issues. However, lessons from risk communication and public consultations state that top-down communication aiming for influencing the public may be counterproductive in the long run. Communication may therefore be designed to involve public in the design and targetsetting in air pollution policies.

The role of social science

Transboundary air pollution and related environmental problems have for many years been a topic for systematic social science research in North America, Europe, and Japan. This research has been important for our understanding of how the international policy processes have emerged and reached consensus and agreements.

Obviously, social science can contribute to the policy process in many ways. Often social science is considered useful in phases of negotiation and implementation, but it could also play an important role in the early phase when problems are identified, agendas formulated, and organisations formed. In the workshop several examples were given on the approaches and outcome of social science research (see background papers).

So far social science has only to a very limited extent been exposed, discussed and considered in the international air pollution framework.

New possibilities (challenges)

Air pollution policies are facing several new challenges including intercontinental transport of air pollution, emissions outside the areas under the international treaties (e.g. emissions from sea and air traffic) and the inclusion of non-technical measures.

Social science can play a role in the understanding and further development of air pollution policies. In the future social scientists can contribute in the frame-forming process: to advice on ways to design a negotiation process and to learn from experiences in CLRTAP and other international fora. Social science can in this way serve with complementary knowledge to the role already given to policymakers, technical experts and natural scientists in the development of policies.

The workshop identified an interest and a need for a continued and formalised interaction between ongoing social science research and policy development. There are several possibilities for a more active involvement including a formal attachment to CLRTAP in the form of an expert group (c.f. the NEBEI expert group within the field of economy).

Some areas of crucial importance for a successful development of policy, where social science can contribute were identified:

- New initiatives (hemispheric air pollution). How to take the outcome of the Task Force on Hemispheric Transport of Air Pollution, (TFHTAP) into a policy development.
- Keeping the air pollution agenda alive. New possibilities for communication that attract the interest of target groups.
- The conditions for and characteristics of social robust policies, i.e. a regulation that by stakeholders are seen as trustworthy, relevant and efficient.
- A better understanding of sectors, NGOs and citizens that have to change their activities in order to implement agreements and make possible further developments.
- Identification of windows of opportunities in the negotiation process.
- Formulation of new concepts for air pollution strategies, including non-technical measures.
- Handling of uncertainties in negotiation processes.

1.1 Recommendations

Social science, its competence, scientific results and role should be more visible and take a more active participation in the further development of air pollution strategies. This can for example be done through a formal expert group under CLRTAP.

Similarities and obstacles of importance for the further collaboration between key actors should be further investigated in the light of changing scales (from continental to hemispheric), interests (from ecosystems to human health) and control possibilities (increased interest in NTM).

Natural science should be aware of and take a more active role in discussions with social scientists.

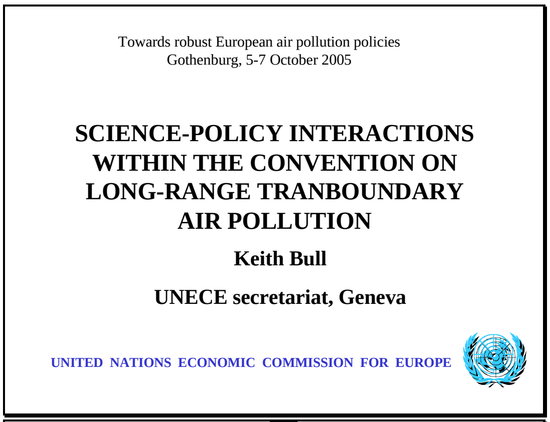
Scientists working with basic questions in the field of air pollution in a wide sense should be made aware of policy development.

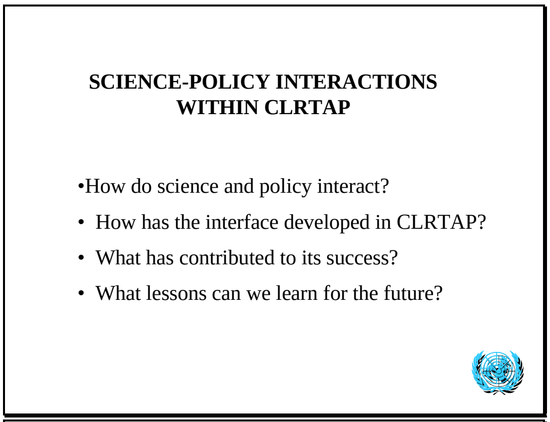
A conference (workshop) outlining scientific and policy challenges for the next 10-15 years should be organised late 2006 early 2007. At such a conference social science may play a role outlining new possibilities for policy development.

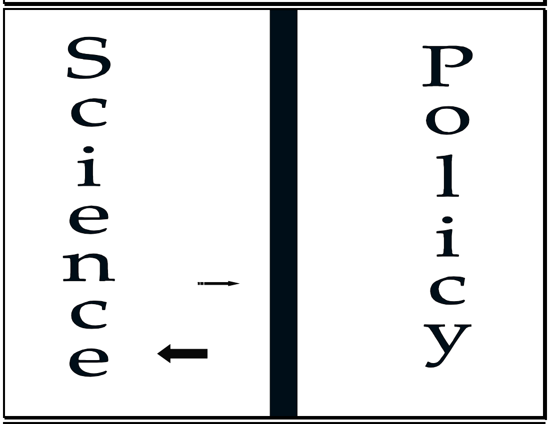
2 Presentations

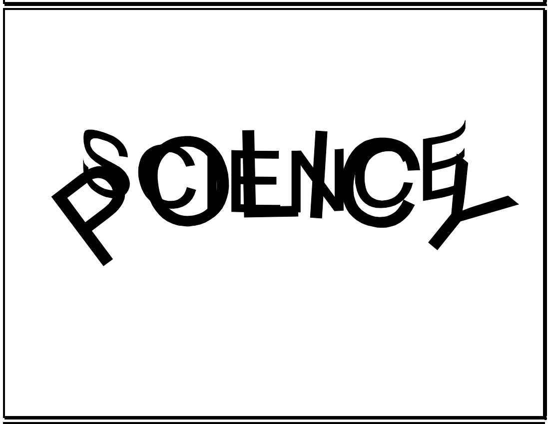
Slides from the presentations made at the workshop. The presentations can be downloaded from the ASTA webiste: http://asta.ivl.se/

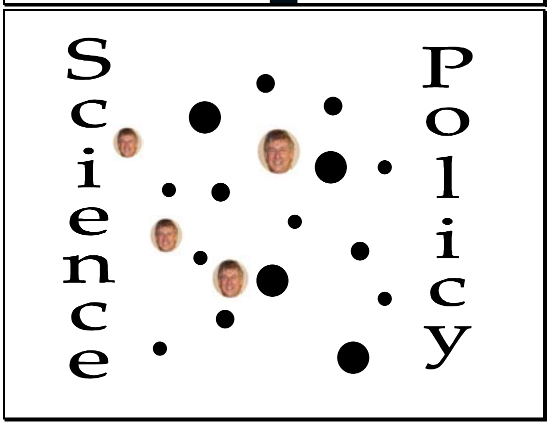
2.1 Keith Bull, UNECE

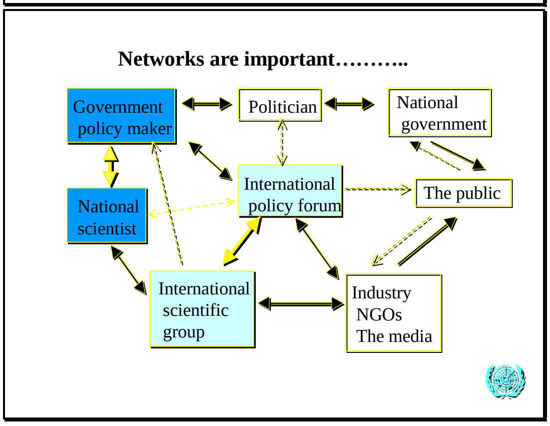












But what makes the acid rain story so successful?

Is the science of acid rain so easy to understand and so simple to deal with?

In the beginning there was public awareness and science……

Local air pollution awareness is part of history

Scientists in the 1960's were drawing attention to environmental problems

EMEP was established within the framework of UNECE before the Convention was negotiated

The Convention's Working Group on Effects was established before the first protocol was agreed

STRUCTURE OF THE CONVENTION ON LONG-RANGE TRANSBOUNDARY AIR POLLUTION

EXECUTIVE BODY

Implementation Committee

Working Group on Strategies and Review

Working Group on Effects

EMEP Steering Body

Expert Groups

Task Forces

International Cooperative Programmes

THE SCIENCE TOOLS

Long-term monitoring – air pollution and effects – the basis of much of our knowledge

Transport models – quantify the movement of air pollution (can be used for "blame" matrices)

Effects – demonstrate the scale and extent of problems

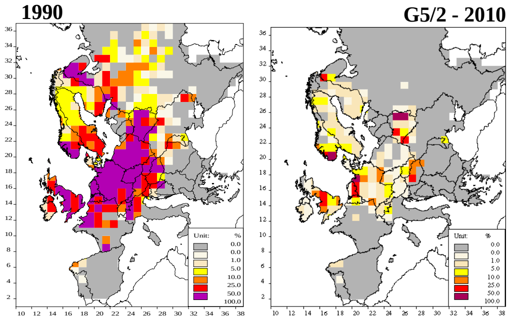
Critical loads – "quantify damage" by relating it to deposition

Integrated assessment models – provide cost-effective solutions showing benefits

ENVIRONMENTAL IMPACTS

% Ecosystems not protected against acidification

1990 **G5/2 - 2010**



Source: IIASA

Other key factors………..

The stepwise process has built confidence and understanding

Individual champions have developed or communicated key parts of the process, such as critical loads

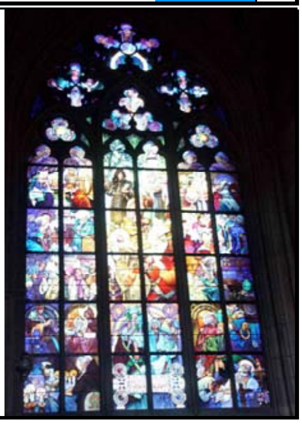
Win-win situations for all countries are demonstrated through source-receptor matrices, critical loads maps and multi-pollutant approaches

Negotiations are supported by the science not replaced by it, e.g. there is still a need to select ambition levels

Timing…………….

A window of opportunity….

Kingdon (1984) Theory of policy windows



Kingdon's Window of Opportunity

← **Problem stream** (knowing what the problem is – basic science, awareness)

← **Policy stream** (knowing how to solve the problem – science, technology, policy)

← **Political stream** (action to address the problem)

The three streams converging create the window

Unless all three streams come together at the same time then the window remains closed!

City air pollution problems – increasing awareness and a recurring issue across the globe

THE BIRTH OF THE CONVENTION

©Scientific evidence available – scientific awareness

© Public outcry on forest and freshwater damage –public awareness and pressure on political stream

© The policy solution – cut emissions – seemed obvious

© A need to improve East-West relations - an additional political pressure

© A ministerial meeting provided the window

BUILDING ON THE WINDOW………

SCIENCE AND POLICY IN THE CONVENTION

©Building trust between political blocks

© Creating awareness and shared perceptions as a basis for action

© Developing acceptable tools for illustrating problems and their solutions

© Developing acceptable ways of addressing several linked problems at the same time

LESSONS LEARNED IN THE CONVENTION

•Science can play an important role to help find solutions to policy questions

• The science needs to have some continuity

• Science should be easily understood (tools such as critical loads help provide interpretation)

• Higher ambition levels and multi-pollutant/multi-issue policies can lead to greater complexity of the science and technical work

CONCLUDING POINTS

Maintaining simplicity and focus will be a major challenge as the issues and the science become more complex

Linked to this communication will remain a challenge

Attracting the political interest will also be necessary for any major step forward

2.2 André Zuber, DG Environment, European Commission

How to use science in policy development for CAFE

The Thematic Strategy on Air Pollution and proposed new Air Quality legislation

ACCENT ASTA Workshop
Gothenburg, 5 to 7 October 2005

André Zuber, Clean Air and Transport Unit
DG Environment, European Commission

Clean Air for Europe

Thematic Strategy is a response to

6th EAP: Objectives for Air Pollution

- *'achieving levels of air quality that do not give rise to* ***significant*** *negative impacts on and risks to human health and the environment';* (Art 7.1. of 6th EAP)

Towards a Thematic Strategy on Air Pollution

- **Integrated approach; consistency with other environmental policies, exploit synergies.**
- **Cost effectiveness to reach objectives**
- **Knowledge based approach**

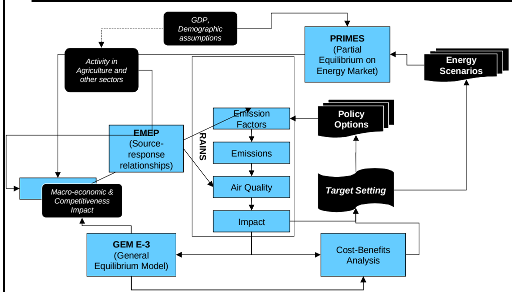
Clean Air for Europe

How were these interim objectives defined?

- **Peer-reviewed health (WHO) and scientific advice**
- **CLRTAP Expert groups advice – Critical loads and levels, etc**
- **Assessment of the effect of current policies**
- **Peer-reviewed integrated assessment to develop cost-effective solutions for both health and environment**
- **Peer-reviewed Cost-Benefit Analysis**
- **Macro-economic analysis**
  - **Lisbon Strategy & Competitiveness**
- **Stakeholder involvement and consultation**
  - **Over 100 stakeholder meetings and over 10.000 responses in Internet based consultation**
- **Accompanied by Comprehensive Impact Assessment (170+ pages)**

Clean Air for Europe

Modelling Framework



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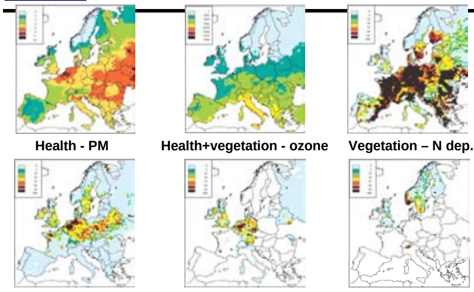
Remaining problem areas in 2020 - CAFE Baseline



Health - PM | Health+vegetation - ozone | Vegetation – N dep.

Forests – acid dep. | Semi-natural – acid dep. | Freshwater – acid dep.

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(Light blue = no risk)

PM dominates Health effects

- **PM**
  - **Annual 2.5 million years of life lost or 250000 deaths + 500 infant deaths**
  - **60000 (serious) hospital admissions, 23 million respiratory medication use days, and 200 million restricted activity days**
- **Ozone**
  - **Annual impacts EU 25 ~ 20 000 deaths brought forward in year 2000**
  - **20 millions respiratory medication use days**

	Value of health damage in 2020 (€ Millions)
PM Mortality	**129,495 - 548,190**
PM Morbidity	**54,072**
Acute mortality from ozone	1,085- 2,435
Morbidity from ozone	4,197
Total Health damage	**188,848 - 608,893**

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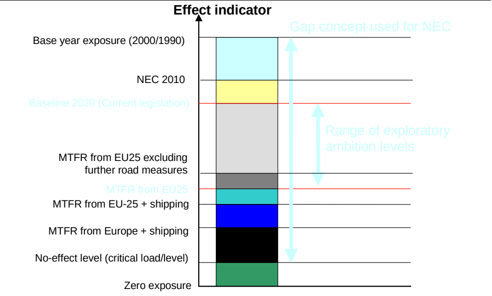
Definition of "gap closure"
used for the Thematic Strategy



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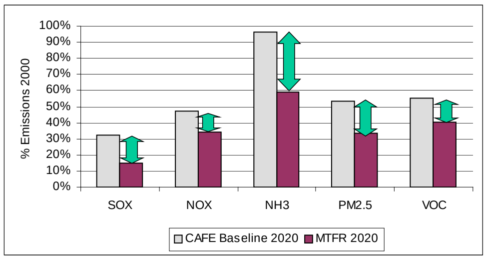
Scope for further technical emission reductions



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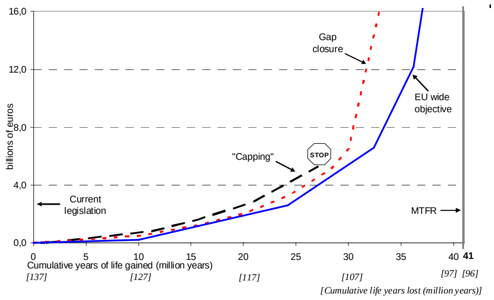
PM: Cost-effectiveness of the target setting approaches



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Final set of policy options June 2005

			Ambition level			
	2000	Baseline 2020	Scenario A	Scenario B	Scenario C	MTFR
EU-wide cumulative years of life years lost (YOLL, million)	203	137 (0%)	110 (65%)	104 (80%)	101 (87%)	96 (100%)
Acidification (country-wise gap closure on cumulative excess deposition)	120	30 (0%)	15 (55%)	11 (75%)	10 (85%)	2 (100%)
Eutrophication (country-wise gap closure on cumulative excess deposition)	422	266 (0%)	173 (55%)	138 (75%)	120 (85%)	87 (100%)
Ozone (gap closure on SOMO35)	4081	2435 (0%)	2111 (60%)	2003 (80%)	1949 (90%)	1895 (100%)

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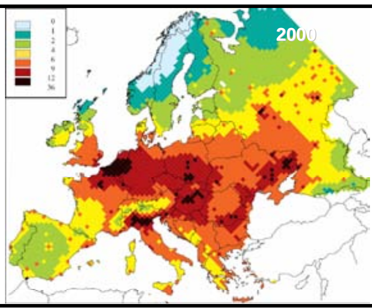
Impact Assessment of policy options

- **Impact on emissions and air quality**
- **Uncertainty / sensitivity analysis**
  - **Gaps in the modelling framework**
    - Discussion robustness result on PM
    - Advice from WHO vs SCHER
  - **Influence of the chosen environmental end point (Joint optimisation vs PM optimized)**
  - **Agriculture: Abatement cost data, impact CAP, Nitrate and IPPC Directives**
  - **Road transport (EURO 5 and 6)**
  - **Maritime transport**
- **Comparison costs and health impact**
- **Description impacts on ecosystems and crops**
- **Wider economic and social impacts**
  - **GEM-E3 : macro-economic modelling**
  - **Analysis competitiveness issues US, China**
- **Impact on other environmental polices (Climate, Soil, Water…)**

Clean Air for Europe

Loss in life expectancy attributable to exposure to fine particulate matter



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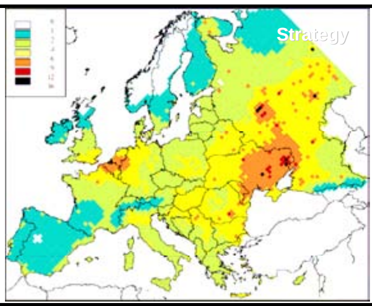
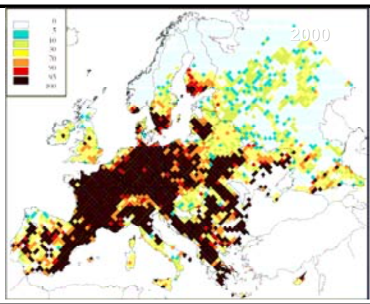


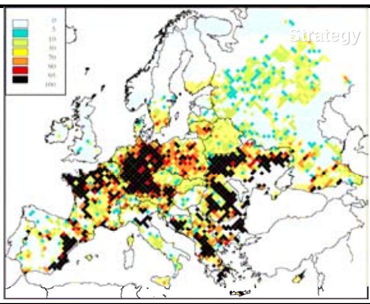
Clean Air for Europe

Excess nitrogen deposition



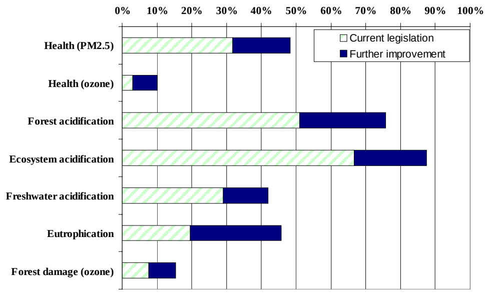
Clean Air for Europe

Excess nitrogen deposition



Clean Air for Europe

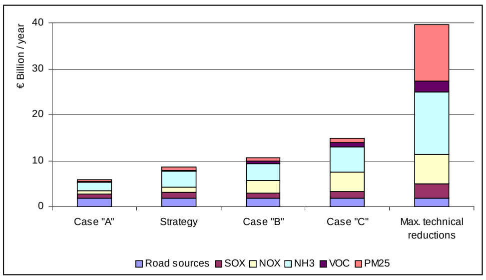
Improvement of health & environment indicators following the Strategy (improvement relative to 2000)



Clean Air for Europe

Emission control costs

of the CAFE policy scenarios in EU



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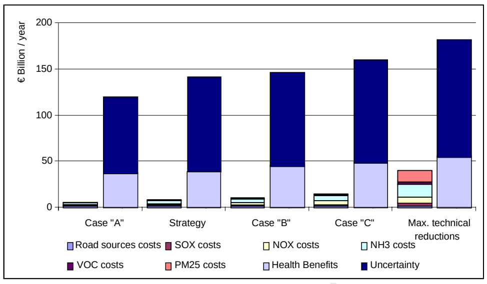
Costs and benefits of the CAFE policy scenarios



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Proposal for a new AQ Directive

- **Health Advice (WHO, SCHER)**
- **Maintaining the present standards**
- **Proposals for**
  - **Reduction average concentration for PM2.5**
  - **« Concentration cap » for PM2.5**
  - **Accounts for natural sources of pollution**
  - **Flexibility - allows MS to apply a time extension in meeting AQS up to five years if objective criteria are met**
- **Better regulation - Improved streamlined provisions for reporting and monitoring**

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Conclusions and what's next

- **CAFE process has been using the 'state of the art' in knowledge-based approach:**
  - **Baseline and Integrated Assessment Modelling**
  - **Cost-effectiveness analysis**
  - **Cost-Benefits analysis**
  - **Macro-economic analysis**
- **Thematic Strategy and proposal on AQ legislation also account for the "political and practical reality"**
- **Next steps**
  - **Pass legislation on AQ Directive**
  - **Revise the NEC directive (mid/fall 2006)**
  - **Review and revise existing legislation on sources**
  - **Develop new legislation and policy on sources not covered in EC**
  - **Initiate new research for the next policy cycle – High priorities: AP health impact, Hemispheric air pollution, nitrogen cycle – CAFE and research needs**

Clean Air for Europe

2.3 Ragnar Lofstedt, King's Centre for Risk Management, King's College London

Risk communication in post trust societies

Presented at the meeting:

Towards Robust European Air Pollution Policies: Constraints and prospects for a wider dialogue between scientists, experts, decision-makers and citizens

Ragnar Lofstedt PhD
Professor and Director
King's Centre for Risk Management
King's College London

kcm THE KING'S CENTRE FOR RISK MANAGEMENT 1

Risk issues are getting increased media attention

- Farmed salmon scare
- Bird flu
- MMR vaccine
- Mobile telephones

kcm THE KING'S CENTRE FOR RISK MANAGEMENT 2

What is happening?

- Growing level of public distrust toward regulators/policy makers
- Public demanding access to information-want to make their own decisions
- Public trusting others-NGOs
    - **Pluralism of science**
    - **Amplification of risk by media**
    - **Pluralism of information sources**

kcm THE KING'S CENTRE FOR RISK MANAGEMENT 3

What are the main drivers?
Researchers (specifically Fischhoff, Renn, Sjoberg, Slovic, and White) uncovered a series of drivers that influence how the public perceive risks:

- Voluntary-involuntary
- Natural-technological
- Control-non control
- High probability and low consequence risk vis-à-vis low probability and high consequence risk (dread)
- Familiar-non familiar

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Drivers continued:

- Reproductive organs-non reproductive organs
- Children-no children
- Trust-no trust
- Male-female
- White-non white
- Fair-not fair

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Research led to interest:

Governments and industry alike too the view that we now know how the public perceive risks

Therefore lets develop communication strategies with our understanding of how people perceive risks

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Three types of risk communication strategies

- Top down
  One way presentation of facts
- Dialogue
  Two way form of persuasive communication
- Bottom-up
  Stakeholders communicate from local-national-international levels

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New thinking and theories

To date many of the implemented risk communication programmes have not worked

It is difficult to size and build hazardous installations or any large infrastructure projects

Academics have identified several reasons for this

- Social amplification of risk
  Risks can be socially amplified or attenuated
- Narrative approach
  People like anecdotes
- Trust
  Need to establish trust

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Why is this of relevance to this workshop?
Why dialogue/communication?
How do we develop a wider dialogue with scientists, experts, decision makers and citizens

- When
  Decision makers, scientists, experts (or their institutions) are not trusted by citizens
- When
  Media is amplifying risks and attenuating benefits
- When
  Public is not interested in a dialogue

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So what can we do?

- Recommendations need to re-establish trust
- Realise that trust is composed of Fairness, Competence, Efficiency
- Measure for trust and act accordingly

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Understand how the media works

- Work with media
- Treat media as friends
- Provide media unbiased information
- Develop media guidelines

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Public(s) are rational responding to the information they receive

(taking into account heuristics and biases we all have)

Develop tools to increase public participation in dialogues (but these have to be real and not facades)

Self selection problem at present

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Conclusions

- All publics are affected by a number of risk factors
- Trust is the key factor-without trust no dialogue
- Need to re-establish trust
- No such thing as a formula for risk communication

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2.4 Stacy VanDeveer, University of New Hampshire

Assessment and Policymaking: Lessons Across Cases

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Gothenburg, Sweden
October, 2005

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  - Global Environmental Assessment Project, Harvard University, John F. Kennedy School of Government
- Thanks to the conference organizers for inviting me and for my first visit to Gothenburg

How Environmental Science is Often Used

Motivating Questions

- Why does some environmental science transform environmental policy while much other science "sinks without a trace"?
  - What are the main obstacles to linking knowledge & action?
  - Are there particular institutional features that overcome obstacles?

Environmental Assessments

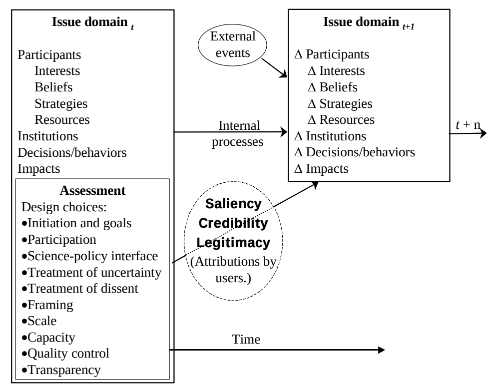
- What is an "assessment"?
- *Environmental assessment* refers to the <u>entire social process</u> by which <u>expert knowledge</u> related to a policy problem is <u>organized</u>, <u>evaluated</u>, <u>integrated</u>, and <u>presented</u> to inform decisionmaking.
  - Not the report
  - Not (usually) original research, except in the integration
  - Not an Environmental Impact Statement (EIS)

Cases Studied

- Five year analysis of influence of global environmental assessments on policy
  - Global assessments: climate change; biodiversity; ozone
  - Water management in US Great Plains
  - Coastal zone mgmt in Hawai'i and Maine
  - ENSO forecasts and farmers in Zimbabwe
  - Fisheries management in North Atlantic
  - Air pollution issues in Europe and US

What do environmental assessments change?

- The "issue domain"
- Actors, institutions, behaviors, and impacts associated with global and regional environmental risks.
- Allows us to focus on not just on policy outcomes but also upon a much richer set of factors that earlier studies have suggested may affect long-term issue development.
- Can be usefully linked to earlier useful concepts in the study of environmental policy
  - Agenda setting and Issue-attention cycles
  - Advocacy coalitions and networks
  - Learning



Influence Requires...

- Salience
- Credibility
- Legitimacy
- These are *attributions* - multiple audiences each have their own individual views of these for a given assessment – they are not attributes of the assessment itself

What tends to make an environmental assessment effective?

- A focus on Salience, Credibility and Legitimacy
- Salience – *Does the assessment address questions relevant to decisionmakers?*
  - The user must be aware of the assessment
  - The user must deem the assessment to be relevant to current policy or behavioral decisions
- Credibility – *Is the assessment scientifically supported?*
  - The user must be convinced that the facts and causal beliefs promoted in the assessment correspond to those that the user would have arrived at had they conducted the assessment.

SCL continued

- Legitimacy – *Were various stakeholder interests taken into account fairly during the assessment process?*
  - The user must believe the process was fair
  - The user must be satisfied that their interests were taken into account in the process

Key Findings

- Influential science is the exception not the rule and influence is usually indirect
- Multiple audiences using different criteria
- Salience, credibility, and legitimacy
  - Trade-offs
  - Assessment design decisions matter
- Information not always used "strategically" to pursue immediate self-interest of producer

Lessons for Environmental Scientists

- Involve stakeholders in science, e.g., fishermen, loggers, farmers, biz-people
- Integrate science, governance, management
- Create linked but distributed systems of research, governance & management
- Science is "co-production" of knowledge by experts and users

Conclusions

- Science can be influential, but only under demanding conditions
- Science's influence depends on salience and legitimacy, not just credibility
- Doing policy relevant science requires doing policy relevant science - *not* doing science and hoping its policy relevant

LASTLY, More to read!

- Assessments of Regional and Global Environmental Risks: Designing Processes for the Effective Use of Science in Decisionmaking. A. Farrell and J. Jager, eds. (Washington, DC: Resources for the Future, 2005)
- Global Environmental Assessments: Information and Influence. R. Mitchell, et. al. (Cambridge, MA: MIT Press, 2005)
- Earthly Politics: Local and Global in Environmental Governance. Sheila Jasanoff and Marybeth Long Martello, eds. (Cambridge, MA: MIT Press, 2004)

ANNEX SLIDES

Influence Requires Salience

- Salience: relevance of information for an actor's decision choices (both macro-policy and micro-individual decisions)
- Timing important, not too early or too late relative to decisions being made
- Right scale & scope, not too narrow or too broad
- Options considered must be "viable"

Influence Requires Credibility

- Must be "worth believing"
- Judged by proxy
  - Participants: expertise & trustworthiness
  - Process rules: methods & funding
- Even "truth" may be rejected if proposed by those, or in ways, that "can't be trusted"

Influence Requires Legitimacy

- Process must treat concerns and values of those affected (stakeholders) fairly and with respect
- Judged based on:
  - Participants: were those with "my" views included?
  - Process: were my concerns and values inputs to process and given fair hearing?

Tradeoffs Among Salience, Credibility, and Legitimacy

- Across attributions
- Across audiences
- "Best" scientists may provide credibility but not salience and legitimacy
- Representativeness aids legitimacy and salience but may reduce credibility
- Success requires balancing attributions

Stakeholder Participation Matters

- Increases salience by getting questions right
- Can increase credibility if increases access to new data and information
- Increases legitimacy by respecting stakeholder perspectives

Assessment Process Matters

- Large stakeholder participation early on to increase salience and credibility
- Smaller stakeholder participation during assessment to maintain credibility and avoid influence on recommendations
- Larger stakeholder involvement in framing of outputs to make accessible to users

Initiation and Goals
"The Many Meanings of Effectiveness"

- Change the issue domain, or delay such change
- Obtain research funding
- Affect beliefs, especially by accumulating new evidence or analysis
- Identify new R&D priorities
- Identify interests and agendas
- Identify and evaluate options for action
- Legitimize policy preference (has public purpose, not just private)
- Demonstrate competence/leadership to enhance personal or institutional prestige and credibility
- Increase the awareness outside the issue domain/recruitment
- Change the framing and perceptions of issues

Science-Policy Interface

- Do scientists and decisionmakers interact directly? How?
- Consensus status is an important determinant
  - Less scientific consensus on key hypotheses ⇒ less interaction
- Built-in flexibility to change the science-policy interface over time is desirable
  - Make potential continuation or iteration a possibility from the start
  - Embed the assessment into an institution or process with an indefinite lifetime
  - This institution may be a "boundary organization" that is accountable to both science and politics

Uncertainty

- Multiple approaches
  - Ignore uncertainty
  - Scenarios
  - Expert elicitation
  - Sensitivity analysis
  - Stochastic modeling
- Integrated Assessments of climate change in the 1990s showed how important uncertainty is.
- Consensus-based assessments tend to avoid dealing with low-probability events
  - Example: West Antarctic Ice Sheet (WAIS) collapse in climate change assessments (Patt)

Fatal Flaws for Environmental Assessments

- Lack of scientific credibility
  - Inadequate quality control
  - Apparent discrepancy between Executive Summary and body
  - Unresolved disputes about what counts as evidence
- Failure to be salient
  - Assume questions of most interest to the scientific community are those that decision makers are (or should be) most interested in.
  - Adopt a "one size fits all" approach rather than tailoring assessment to intended users
  - Deliver the assessment too late*
- Inadequate legitimacy
  - Excluding (or just forgetting) relevant stakeholders

Participation

- Choices often balance between credibility and legitimacy
- Participation takes many forms
  - Substantive
  - Nominal
  - As an input
  - Sitting and listening
- Other process design choices help determine the form (and cost) of participation that is needed
  - Example: TAP Quality Control rules lowered the cost of participation
- Capacity is a key factor
  - Technical
  - Financial

Dissent

- How to come to agreements on contentious issues?
- Multiple approaches
  - Consensus (i.e., unanimity or least-common-denominator)
  - Voting
  - Minority reports
  - Reframing to avoid dissent (e.g. scenarios)
- Dependable Dynamism
  - "The ability for an assessment/decisionmaking process to put off or modify scientific conclusions later, with confidence that they indeed will be addressed later." (Eckley-Selin)
  - An important feature of some very successful assessment processes (e.g., Montreal Protocol and LRTAP)

More is not always better

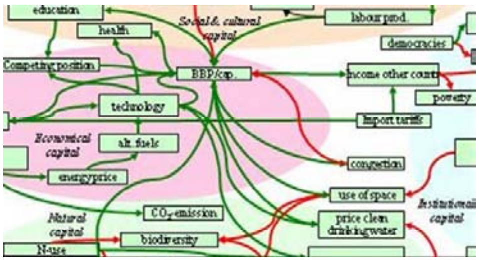
- Example: transparency
  - The ability of participants *and* observers to observe the assessment processes and understand:
    - How and why choices were made,
    - Where the data comes from,
    - Specific methods for analyzing the data,
    - And so forth.
- Usually more transparency is better
  - Climate impact assessments (Long-Martello and Iles)

2.5 Rob Maas, Netherlands Environmetal Assessment Agency

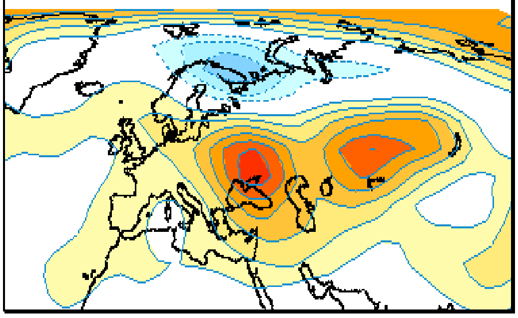
How to communicate complex problems?

Rob Maas,
Netherlands Environmental
Assessment Agency

Complexity: there is no accurate description of a system simpler than the system itself.



Is it difficult to communicate complex science?

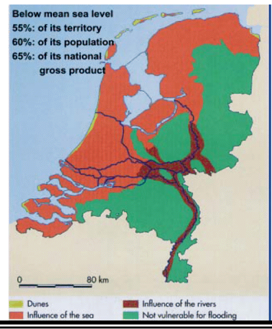


How to deal with uncertainties?

- Scientists frame the system
- Can scientific simplifications and the choice of the system boundaries affect policy advice?
- How to communicate systematic biases?

- Assessment and decision taking belong together!

The poldermodel: 800 yrs of nteraction between science and policy



Successful dialogue

- Common goal
- Continuity
- Mutual trust
- Voluntary sharing of knowledge leads to new knowledge
- Gradual process of increased complexity
- Vague boundary between science and policy
- Collaboration rather than competition or top-down co-ordination

Successful dialogue (2)

- Political preferences are constructed during the process.
- Well designed procedures to
  - include stakeholder openness,
  - disclosure of beliefs and values,
  - willingness to understand the other (to go beyond the given perspective)
  - manage conflicts (both legally and scientifically)

Milieu en Natuur Planbureau

RISKS

- Group think (blind spots)
  → openness, respect dissidents
- Conservatism (we always did it this way)
  → paradigm shifts ?
- Partial solutions
  → look beyond boundaries, reframe problem
- Denial of the role of values
  →

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When uncertainty is large, values become important

- Competing policy targets & stakeholders
- When science is not conclusive → scope for different interpretations of risks involved
- Large uncertainties + high stakes = unstructured debate

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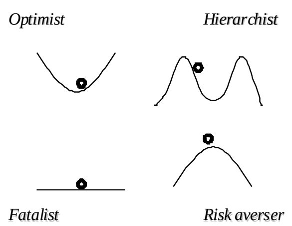
Structuring unstructured problems

Is there a problem?



Source: M. Thompson

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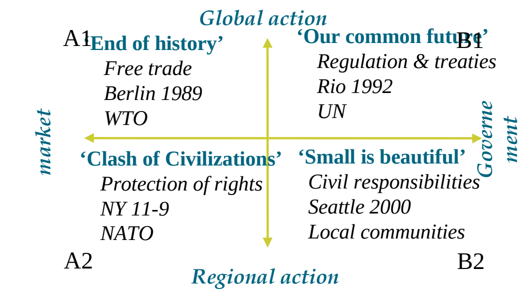
World views



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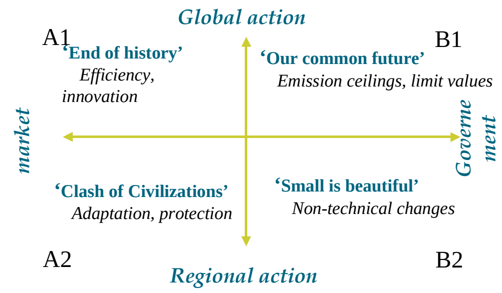
World views



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World views

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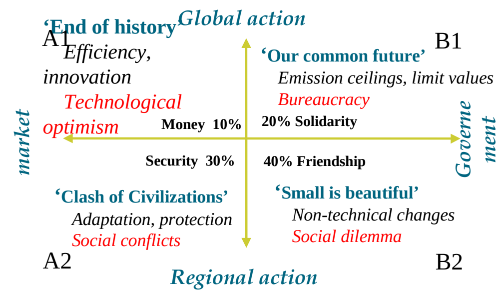
World views



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Concluding questions

- How can the quality of the decision taking process be further improved? More SD-thinking?
- How to extend towards 'forgotten' stakeholders & issues (other departments, politicians, local authorities, press, public?)
- Sooner or later a discussion on values & ultimate ends will also penetrate the air pollution arena – how to prepare?
- How to combine the targeted & demand driven EU-approach with the bottom up UN-approach?

2.6 Christer Ågren, The Swedish NGO Secritariat on Acid Rain

The role of science and public awareness for air pollution policies in Europe

Christer Ågren
The Swedish NGO Secretariat on Acid Rain
www.acidrain.org

1

Policy background (1)

- **EU citizens rank air pollution among top environmental problems**
  - Confirmed by Eurobarometer 2003 and 2005
- **Attaining the environmental objectives of the 6EAP require additional abatement of air pollutant emissions.**
  - Confirmed by CAFE baseline scenario 2000 ? 2020
- **Monetised benefits of action outweigh estimated costs.**
  - Ex. CAFE scenario C: costs max. €15 bn - benefits min. €49-160 bn
- **Even "high-ambition" actions have no significant impact on EU growth, jobs or competition.**
  - Confirmed by CAFE macro-economic analysis

2

Eurobarometer: Concerns

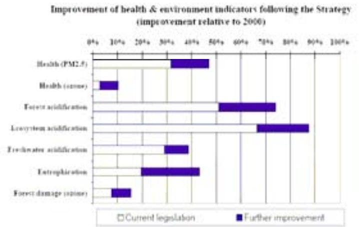
2005	2003
1. Water pollution (47%)	1. Nuclear power (50%)
2. Man-made disasters (46%)	2. Man-made disasters (45%)
3. Air pollution (45%)	**3. Air pollution (44%)**
3. Climate change (45%)	4-7. Water pollution (42-43%)
5. Chemicals-health (35%)	11. Climate change (39%)

2005: List the five main environmental issues that you are worried about (from list of 15).

2003: At present, are you very worried/fairly worried/not very worried or not at all worried about the following topics (from list of 25). Result show % very worried.

3

Relative improvement 2000 - 2020



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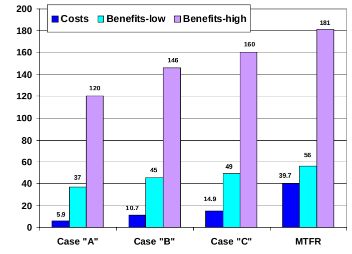
CAFE CBA 2020
(billion euro per year)



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Policy background (2)

- **The 4-year CAFE-process has been highly advanced as regards scientific underpinning and stakeholder consultation and involvement.**
- **Despite this, proposals for further action are met by great opposition by certain member states and industries.**
- **Resistance not only against air pollution control, but more general against environmental action.**
  - E.g. REACH-debate, and Commission turmoil this summer on TS
- **Counter-arguments are primarily related to concerns about costs, competition, and jobs**

6

Science-policy-public interaction

- The LRTAP Convention has clearly demonstrated the importance and benefits of science-policy interaction.
- CLRTAP experience (and scientific output) has since the mid-1990s been used by and integrated into EU air pollution policy processes.
- The CAFE-programme has improved the process of stakeholder consultation and involvement.

- Scientific underpinning of policy proposals has gradually increased, but focus is mostly on natural science, engineering, and economy.
- So far relatively little efforts spent on:
  - understanding the policy processes (social science);
  - building public awareness and understanding;
  - strengthening capacity of economically weak stakeholders (NGOs)

7

Policy needs knowledge (science)

Knowledge can always be improved.

For CAFE II better knowledge/methods are needed regarding e.g.

- Measures (costs; potentials; synergies; non-technical measures)

- Effects (health - PM; biodiversity/protected areas; nitrogen accumulation/release; recovery; corrosion)

- IAM (shipping; agriculture; non-technical measures; recovery; climate interactions (e.g. O_3); hemispheric dimension)

Science* <-> *Policy (<-> NGOs/Industry)

8

Policy needs public awareness

Public acceptance is dependent upon public awareness and understanding, and (usually) political acceptance is dependent upon public acceptance…

Consequently, there is a need for improving:

- Transparency (policy/science)

- Public/stakeholder participation (policy)

- Active and strategic information/communication (policy/science/NGOs)

- Capacity building among NGOs (funding)

Policy <-> Science <-> NGOs/Industry <-> Media <->Public

9

Eurobarometer: Trust

2005	2003
1. Env. prot. org. (42%)	**1. Env. prot. org. (48%)**
2. Scientists (32%)	**2. Scientists (35%)**
3. Television (27%)	3. Consumer org. (23%)
4. Consumer org. (18%)	4. Television (18%)
5. Newspapers (15%)	5. EU (13%)
8. EU (12%)	6. Nat. government (12%)
9. Nat. government (11%)	10. Newspapers (9%)
14. Companies (2%)	14. Companies (1%)

"Who do you trust (most) when it comes to environmental issues?"

10

The current debate needs…

…good, credible facts & arguments regarding, e.g.

- "Shorter-term" concerns about costs/competition/jobs are closely linked to "longer-term" concerns about ecologic and economic sustainability.
How to demonstrate credibly that good environmental policy is in harmony with good economy and a welfare society?

- Current debate is dominated by short-term regional/local concerns about economy, jobs and welfare.
How to shift (some of) the focus to sustainability, climate change, health, biodiversity, cultural heritage, etc.?

Policy <-> Science <-> NGOs/Industry <-> Media <-> Public

11

Policy needs attention

- Brings us back to:
  - transparency
  - participation/involvement
  - information/communication
- Plus:
  - public pressure & publicity (media coverage)

12

Needs for CAFE II
(role of social science)

Examples:

- Documentation of good - and bad - examples of abatement policies, incl. impacts on economy (*)
- Integration of non-technical measures into scenario analyses
- Understanding of and accounting for interactions between air pollution and climate change
- What air pollutants are most harmful to health?
- Biodiversity – how/why is it important? (*)
- Traditional legislation and/or economic instruments? (*)
- Funding for research, monitoring, studies, broad participation, and information
- Actions for improved public awareness (*)

(*) Contributions from social science?

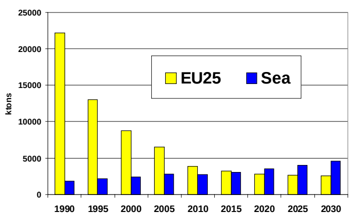
13

Some conclusions

- **Policy needs knowledge/science**
  - Science to provide "Best Available Knowledge" (agreement vs. conflict)
- **Policy needs public awareness**
  - Improve communication, NGO-cooperation, and media links
- **Policy needs attention**
  - Public pressure, publicity, etc.
- **Science, studies, stakeholder involvement, and awareness-building need funding**
  - Policy-makers must make necessary funding available

14

Emissions of SO_2



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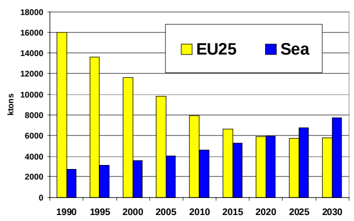
Emissions of NOx



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2.7 Atsushi Ishii, Center for Northeast Asian Studies, Tohoku University

The science and politics in the East Asian transboundary air pollution

Atsushi Ishii
Center for Northeast Asian Studies
Tohoku University

Contents

- **ðTatemae to Hon-neö=superficial principles and real intentions**
  - ðManagement of Realityö(Karel van Wolferen 1989)
  - Let's talk about the real political reality of Japanese acidrain diplomacy
- **EANET (Acid Deposition Monitoring Network in East Asia; initiated by Japan)**
  - Slow progress – why?
- **LTP (Joint Research Project on Long-range Transboundary Air Pollutants in Northeast Asia; initiated by Korea)**
  - Established in 1995; now under TEMM
  - Promising development?

EANET

- **Background**
  - Social construction of the transboundary acidrain problem in Japan
    - 1991 Asahi Shimbun interview with SEPA chief: ðconcern of transboundary air pollution from China to Japanö
    - 1992 Earth Summit – announcement of EANET
    - With Chinese economic boom, accelerated feeling of being victimized
  - No consensus among researchers that there is actual acidrain damage made by transboundary air pollution

EANET

- **Ministry of Environment tend to claim EANET as successful as EMEP**
  - ðIntergovernmental meetingö but ðInter-ministerialö in reality
    - Based on joint announcement agreed between environment ministries – not based on protocol with national ratification
  - No financial agreements
  - Not recognized as an international common resource
    - China's suspicion
      - Exporting domestic ðmanagement of realityö
    - Lack of transparent diplomatic process
- **Present EANET is in the pre-establishment phase of EMEP**

EANET

- **Some positive developments**
  - EANET becoming more international
    - Secretariat=United Nations Environment Programme / Regional Resource Centre for Asia and the Pacific
    - More foreign personnel working in EANET
  - Some member countries demand more official international agreement
  - MOE of Japan learned to let the Koreans take the initiative in East Asian transboundary pollution
    - Korea has geopolitical advantage over Japan
    - Avoid paternalistic attitude by Japan

EANET

- **Additional negative issues**
  - Japanese researchers critical against ðcritical loadsö
    - They tend to disregard policy-relevant science
      - non-involvement in policymaking regarded by scientists as virtue
  - Very limited chance to develop an ðepistemic communityö
    - A community of experts who share the causal factors of the problem in question, scientific credibility criteria for policy-relevant research, and a policy enterprise to aim at

LTP – some positive developments

- **Back to ACIDRAIN 1995 …**
  - National contribution of sulphur deposition to Japan

	Model type	Calculated year	Japan [%]	Korea [%]	China [%]
CAS	**Eulerian**	**1989**	**94**	**2**	**3**
CRIEPI	**Hybrid**	**1988.10-1989.9**	**40**	**15**	**25**

LTP – some positive developments

- **LTP calculations …**
  - National contribution of acid deposition to Japan (Mar 2002)

	Japan [%]	Korea [%]	China [%]
China Model3/CMAQ	**55**	**13**	**33**
Korea CADM	19.9	20.1	58.2
Japan RADM	**61**	**11**	**28**

LTP – some positive developments

- **Future plan (2005-2007)**
  - Planning to develop a critical load model and calculation of acidrain effects
    - Common model? Japanese Scientists?
  - In 2007, introduction of science-based abatement strategies
- **Synergies between initiatives**
  - QA/QC by Japan and China same as EANET
  - Some EANET monitoring stations are used in LTP
  - Possible synergy in calculating critical loads
- **Some concerns**
  - Cannot overcome the weakness of EANET?
  - Competition between LTP and EANET?

2.8 Steve Yearley, School of Social and Political Studies, University of Edinburgh

Roles for public participation in the generation of robust knowledge about urban air quality in Europe:
making models more robust through public engagement

Steve Yearley

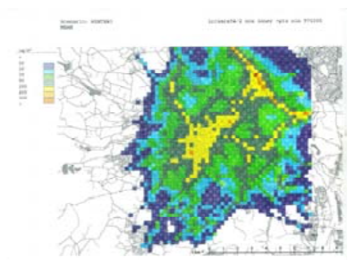
Outline

Three cases of air pollution where there may be potential for public engagement:

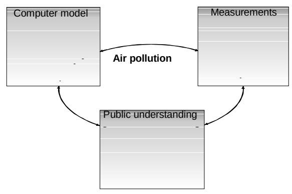
- public assessment of a model in Sheffield
- participatory mapping exercises in the UK
- LRTAP-type issues

Relation to "sustainability science" arguments.

Illustrative model output from Sheffield



Approach taken in 'Citizen Groups'



Summary of responses from 'Citizen Groups'

1. A concern with the value of the enterprise
2. A concern about the extent of monitoring and therefore the validity of the modelled projections
3. A concern about unchecked assumptions, for example about factory emissions or traffic surveys
4. A worry about how the model is used (or not) in council processes

Chief results from Sheffield study

- In this case, the public was capable of meaningful engagement;
- The public's role in this case was similar to that labelled as 'extended peer review' except that their engagement ranged far more widely than this term usually suggests.

Facilitating public engagement spatially

Initial study was limited because participants were largely unable to present their knowledge spatially. New approach adopted:

- Captures local stakeholder knowledge in a spatial framework
- Represents knowledge in a form compatible and comparable with the outputs and inputs of computer models
- Intended to be useful for creating dialogue between local stakeholder and planners, modellers and policy makers

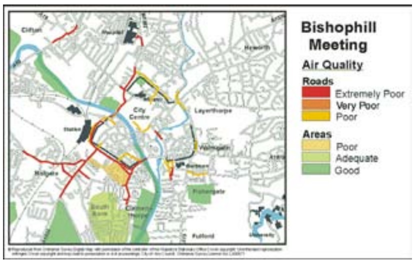
Four stages of the engagement process

Stage 1 – Local stakeholder framing of the issue(s)

- air pollution from transport
- air pollution from industry and agriculture
- dust problems
- smells
- noise (transport, industry)
- health impacts of air pollution

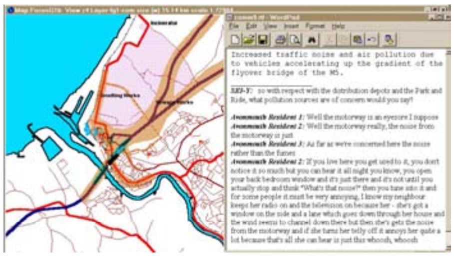
Second stage of the engagement process

Capture of local knowledge in a spatial framework



Stages of the engagement process

Transformation of knowledge into digital database

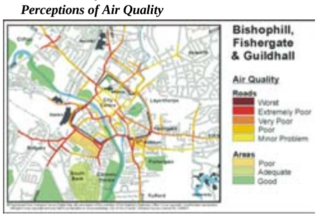


Stages of the engagement process

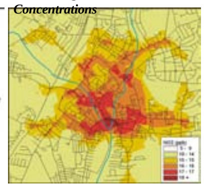
Validation of transformed digital data by local stakeholders.

Stakeholder perceptions vs. official computer modelling

Combined City-Centre Stakeholders Perceptions of Air Quality



Computer Model Prediction of 2005 Nitrogen Dioxide Concentrations



Chief results from mapping study

- The mapping exercises seemed to work well in that people responded readily to it and councils found it a good tool for consultation;
- The public's role in this case turned out to be less critical than in the less spatial, more propositional exercise.

LRTAP

Precisely to make it trans-national and to respect national sovereignty

- suffers are not originators
- pollutants are stealthy, invisible, and slow acting so people are not good detectors
- they are transboundary so local people are not knowledgeable about the original context.

It appears to be an expert's charter

Conclusions

Relation to “sustainability science” arguments:

- who determines when science is uncertain?
- is participation limited to cases of uncertainty?

Conclusions

In relation to climate change, Kasemir et al (2003) have claimed that there is a strong rationale for the involvement of public participation in environmental decision making. They assert that, if scientific understanding about environmental issues is uncertain, as it is with significant aspects of climate change, then policy decisions cannot simply be led by expert advice. Decisions will inevitably be matters of political judgement and in democratic societies such decisions should be democratic and transparent. Participatory techniques are one powerful means for democratizing the handling of such topics.

Conclusions

Relation to “sustainability science” arguments:

- who determines when science is uncertain?
- is participation limited to cases of uncertainty?

2.9 Göran Sundqvist, Göteborg University

ASTA Workshop:
"Towards Robust European Air Pollution Policies"
Gothenburg, October 5-7, 2005
Göran Sundqvist, Göteborg University

Experiences from the ASTA project (the social scientist view)
How to account for success?

(not necessarily the ASTA success, but the success usually ascribed to the regulation of transboundary air pollution in Europe)

1
2006-02-20

Participants in the ASTA Social Science Sub-Programme

Göran Sundqvist,	Section for Science and Technology Studies, Göteborg University
Rolf Lidskog,	Man–Technology–Environment Research Centre, Örebro University
Martin Letell,	Section for Science and Technology Studies, Göteborg University

2
2006-02-20

Science Must be Explained

If science plays an important role in environmental regulation, the reason for this must be explained (Lidskog & Sundqvist, 2002)

3
2006-02-20

The STS Opinion on How Scientists Present Science in Public

The problem is that scientists have surrounded their enterprise with a false aura of certainty.

There seems to be only two ways of thinking about science. Science is either all good or all bad. Both these ideas of science are wrong and dangerous. This is the flip-flop thinking of science.

(Harry Collins & Trevor Pinch 1993, 1998)

4
2006-02-20

Conclusions from a Meeting Between STS and Transboundary Air Pollution

- STS argues that scientists in public present scientific results as certain.
- Scientific experts connected to air policy do not strongly focus on certainty.The external pressure to deliver certainty has by tradition been weak: it was enough if scientists could come together
- Therefore, these scientific experts are of great importance to study due to their focus on the negotiability and adaptability of scientific knowledge. This case offers lessons to other policy areas and also to the field of STS.
- STS scholars are right when they consider a strong focus on certainty as an enemy to fight.

5
2006-02-20

Waldsterben – Not Scientifically Important but Important for Science

- Waldsterben played an important role for the development and quick agreement of the first two protocols under the Convention, the first sulphur protocol signed in 1985and the protocol on nitrogen dioxides in 1988
- Scientific knowledge was by most scientists considered uncertain and data relating to effects were interpreted in different ways
- The general public and mass media were more convinced than the scientific community about the existence of a clear connection between air pollution and forest damage.
- Most scientific experts connected to air policy work were not very unhappy about this situation. They took advantage of the situation of certainty which was not created by themselves.
- Once again (compare the Cold War logic ten years earlier) the surrounding society gave science a prominent role to play

6
2006-02-20

Critical Loads and RAINS – Science-Based Policy Instruments

- Science-based policy instruments have been supported and considered credible by both the scientific community and the policy community (negotiators).
- This has (once more) given room for scientific experts to establish innovative, but in scientific respects uncertain, policy tools.
- Scientific experts (once more) did not complain about this situation.
- It was not science that decided the Oslo protocol, but scientific experts were given (or took) the opportunity to formulate science-based policy instruments which were of crucial importance in the negotiations.
- Scientific experts were close to the negotiators and their policy tools facilitated and gave important direction to the work.

7
2006-02-20

Air Quality, WHO and the Integrity of Science

- WHO strongly emphasize scientific integrity and a will to stand free from political and sectoral interests.
- The work carried out by scientific experts under the Convention is about to serve policy makers with what they need and, not least, present innovative ideas of what they could or should need.
- The WHO experts want to do this in a way that protects scientific integrity and this means that policy makers and not scientists should make policy. What policy needs is good science! (see Letell, forthcoming).

8
2006-02-20

Conclusions: To Explain Success

Contextual factors (not so easy for scientists to change)

- For a long time there has been a consensus in society about the problem of air pollution and that air quality is important for health. No one can say ”I do not breathe!”
  Compared to other risk issues this is a good starting point for avoiding strong conflicts.
- The public debate on air policy has not been completely in black and white. Citizens have not been forced to choose between simplified versions of right or wrong, true or false.
- Big politics has been supportive: the Cold War logic in the 1970s, Waldsterben in the 1980s, and today perhaps urban air quality is playing a role.

9
2006-02-20

Conclusions: To Explain Success

The organisation of scientific expertise (easier for scientists to change)

- Scientific experts were early on given room for making policy, and they took it.
- A focus on certainty has been avoided. Alternative interpretations of scientific results have been discussed quite openly. No strong pressure on showing certainty to the outside world.
- Close contacts have been established between the scientific community and policy makers. The LRTAP organisation of working groups and task forces are guaranteeing this.

10
2006-02-20

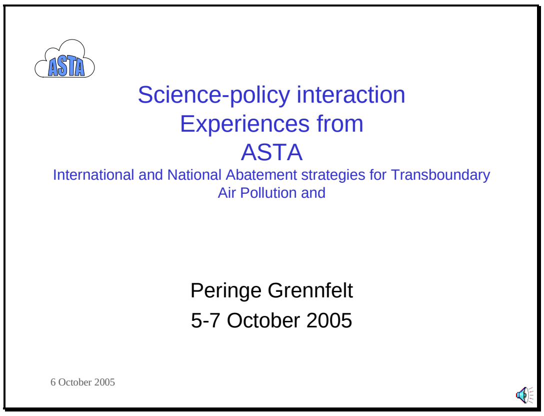
Conclusions: To Explain Success

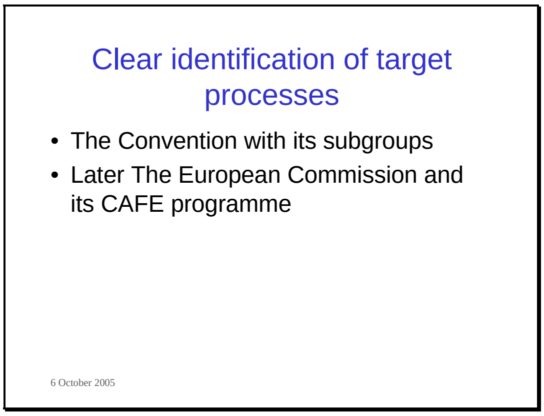
STS lessons for good communication

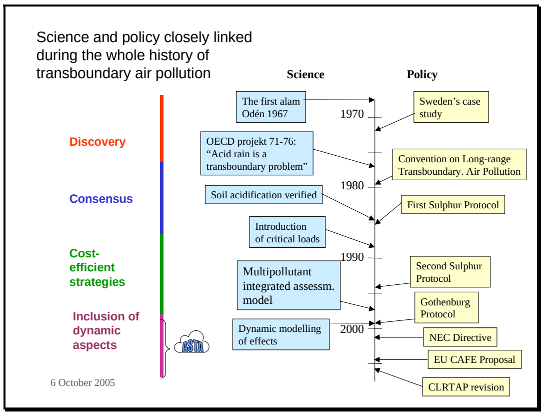
- Avoid focussing on certainty.
- Make room for meeting places where actors can discuss and negotiate both their knowledge opinons and their identity as actors.

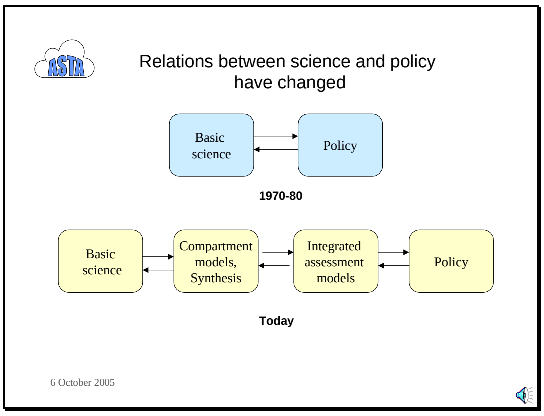
11
2006-02-20

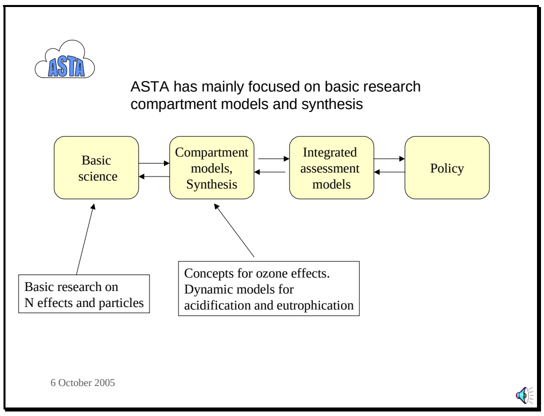
2.10 Peringe Grennfelt, IVL Swedish Environmetal Insitute

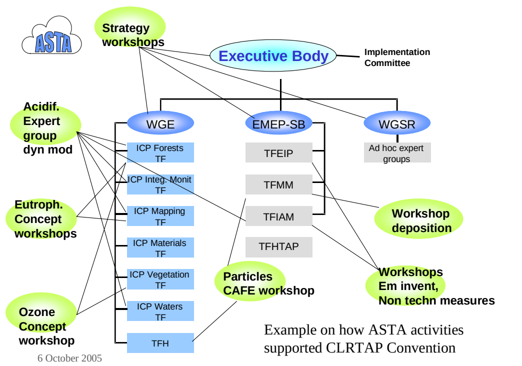












Example on how ASTA activities supported CLRTAP Convention

6 October 2005

Communication an important part of ASTA

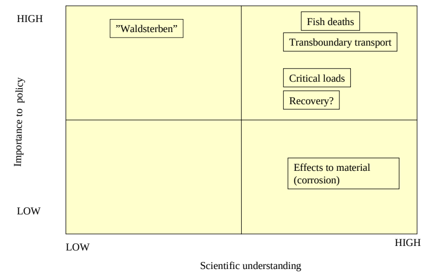
- **Support to the development of the CLRTAP and CAFE agenda**
  - Workshop at Saltsjöbaden April 2000
  - Review of the strategies for EU and CLRTAP Oct. 2004
- **The introduction of dynamic aspects for acidification**
  - Conference in Copenhagen Nov. 1999
- **Organisation of specific workshops and expert meetings**
  - Five meetings on dynamic modelling 2000-2004
  - Seven additional workshops on validation of emission inventories, new concept for ozone effects, health effects from particles. deposition of base cations, science - policy interactions and non-technical measures

The role of social science in ASTA

- Improved our understanding of our roles and the way we are working
- Bridges between science and policy (critical loads)

6 October 2005

Scientific understanding and importance for policy for some concepts within transboundary air pollution



6 October 2005

Some experiences

- The process often as important as the outcome.
- Transparency and participation crucial
- Timing. Windows of opportunity.
- Visualisation of experiments and results
- It takes time. Credibility is mostly achieved through long term relations.

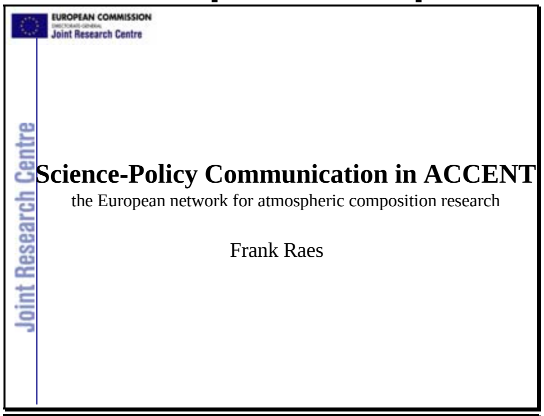
6 October 2005

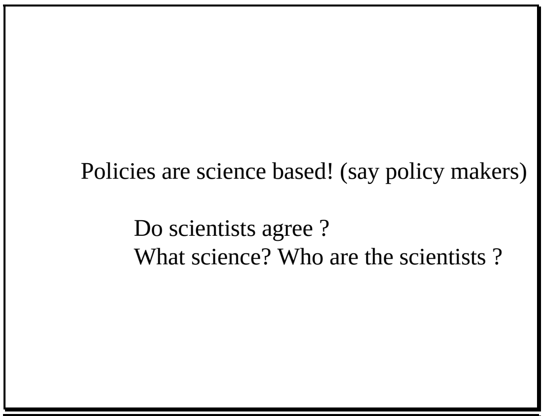
Some experiences

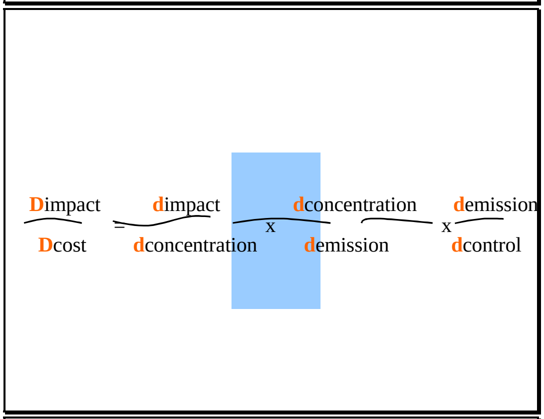
- Common concepts. Critical loads helped bridging the gap between science and policy. Concepts do not need to mean the same for scientists and policymakers.
- National initiatives often questioned. Better to use “independent” organisations (Nordic Council of Ministers, international workshops, IIASA, international projects).
- Maintaining scientific quality has not been a problem (results mainly published in peer reviewed journals).

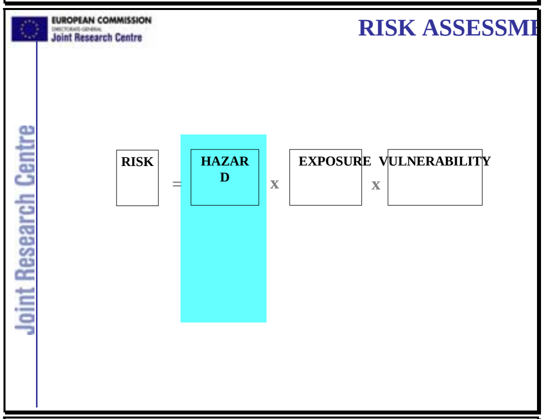
6 October 2005

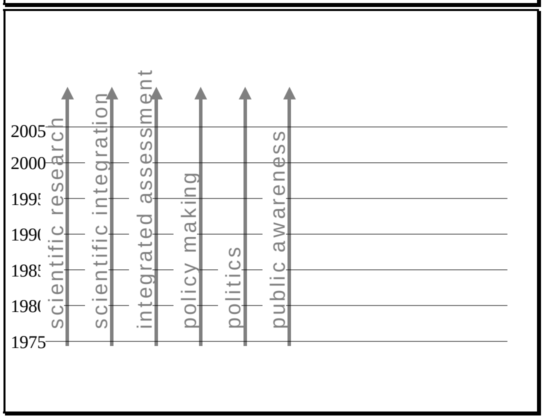
2.11 Frank Raes, ACCENT The European network for atmosperic composition research

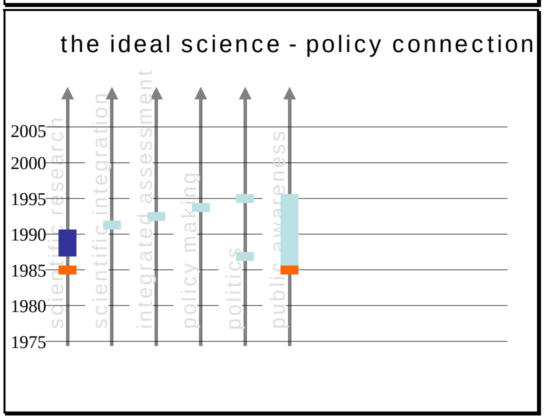


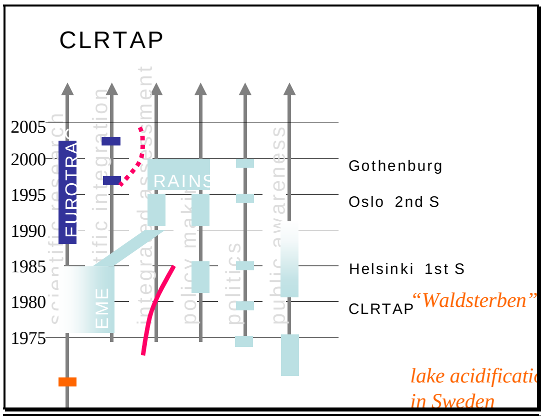


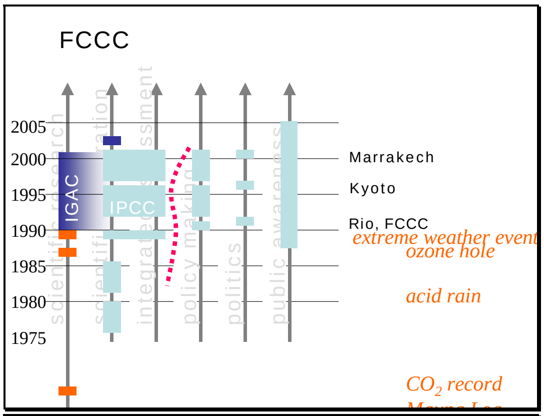












what do we learn about the science/poli

scientific research plays a role in indicating a problem
public awareness is needed to promote action
policy making goes in steps
first a "political regime" *then* a more "scien

there are many players in the link between r
policy, each with an own perspective.

synthesis and integration is key when contributing to policy making and when reaching out to the public

can we improve science/policy dialogue

scientific research plays a role in indicating a problem
public awareness is needed to promote action
keep basic curiosity driven research alive
reach out to public / use the media / educate

policy making goes in steps
first a "political regime" *then* a more "scientific regime"
be aware of economic social political reality

there are many players in the link between research and policy, each with an own perspective.
contribute to the setting priorities
co-production of a common perspective

synthesis and integration is key when contributing to policy making and when reaching out to the public
synthesize in quantitative models and narratives

all these are additional efforts for whic additional resources are needed.

need for re-organization of european la of atmospheric chemistry research?

local scales	regional scales	global scale
EUROTRAC	IGAC	
top-down		bottom up
EC DG RTD projects		EUROTRAC IGAC
fundamental research		applied research
IGAC EUROTRAC		WGE's EMEP

all these are additional efforts for which additional resources are needed!

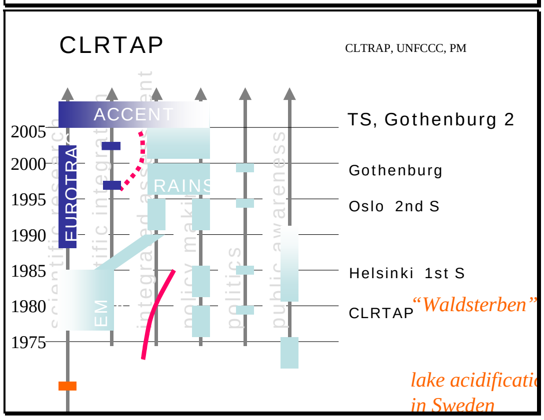
need for re-organization of european landscape of atmospheric chemistry research?

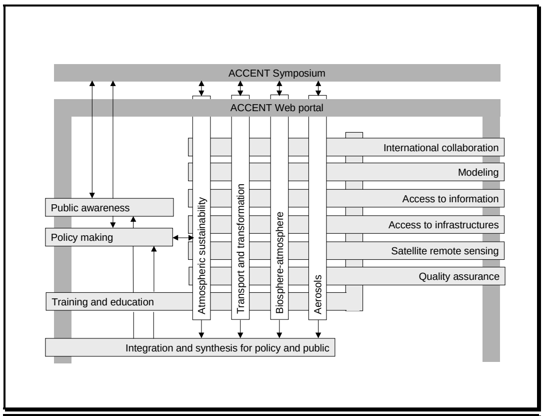
YES and now is the time

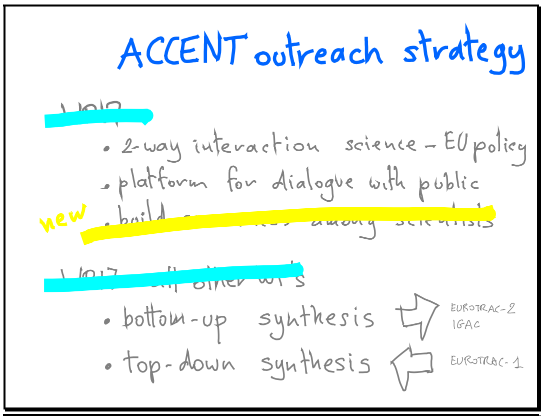
(garmisch partenkirchen, march 14 2002)

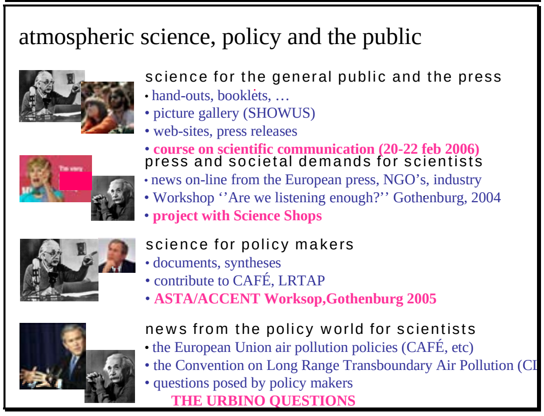
NoE ACCENT

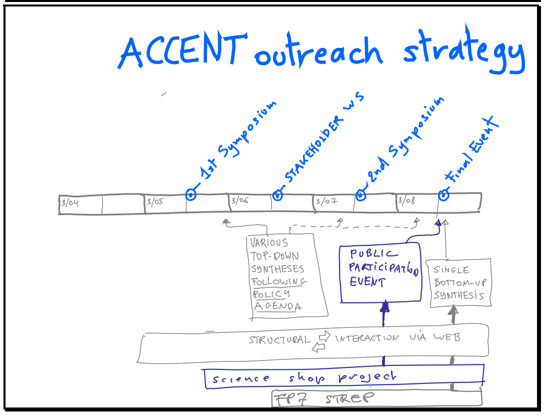
maintain richness
maintain and improve comunications
reach out to other areas (economy, policy)



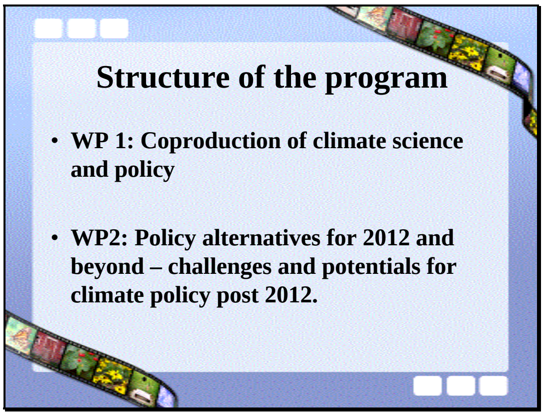

ACCENT Symposium
ACCENT Web portal
International collaboration
Modeling
Access to information
Access to infrastructures
Satellite remote sensing
Quality assurance
Public awareness
Policy making
Training and education
Atmospheric sustainability
Transport and transformation
Biosphere-atmosphere
Aerosols
Integration and synthesis for policy and public

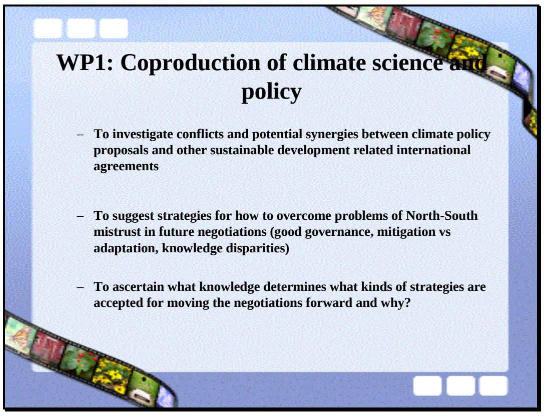

ACCENT outreach strategy
• 2-way interaction science – EU policy
• platform for Dialogue with public
new
• bottom-up synthesis
EUROTRAC-2
IGAC
• top-down synthesis
EUROTRAC-1

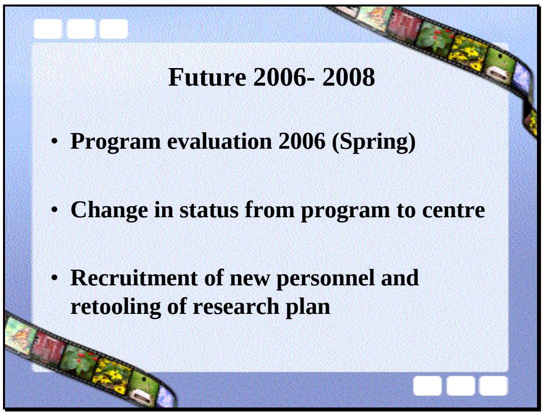

atmospheric science, policy and the public
science for the general public and the press
• hand-outs, booklets, …
• picture gallery (SHOWUS)
• web-sites, press releases
• course on scientific communication (20-22 feb 2006)
press and societal demands for scientists
• news on-line from the European press, NGO's, industry
• Workshop ''Are we listening enough?'' Gothenburg, 2004
• project with Science Shops
science for policy makers
• documents, syntheses
• contribute to CAFÉ, LRTAP
• ASTA/ACCENT Worksop,Gothenburg 2005
news from the policy world for scientists
• the European Union air pollution policies (CAFÉ, etc)
• the Convention on Long Range Transboundary Air Pollution (Cl
• questions posed by policy makers
THE URBINO QUESTIONS


ACCENT outreach strategy
1st Symposium
STAKEHOLDER WS
2nd Symposium
Final Event
3/04
3/05
3/06
3/07
3/08
VARIOUS TOP-DOWN SYNTHESES FOLLOWING POLICY AGENDA
PUBLIC PARTICIPATION EVENT
SINGLE BOTTOM-UP SYNTHESIS
STRUCTURAL INTERACTION VIA WEB
science shop project
FP7 STREP

2.12 Merle Jacob, Linköping University and Lund University







3 Working group reports

3.1 Working group 1 - Science-Policy interactions

Theme 1: Science-Policy Interactions: Are robust relations between experts, politicians and stakeholders reachable? What is characterizing such interactions? To what degree is today's interaction in European air policy work robust and in what way should it be improved?

Chairman: Lars Lindau

Rapporteur: Henrik Selin

Mohammed Belhaj

Sonja Boehmer-Christiansen

Sosser Brodersen

Keith Bull

Karin Bäckstrand

Merle Jacob

Tim Oxley

Frank Raes

Mikaela Sundberg

Göran Sundqvist

Willemijn Tuinstra

Factors Important for Shaping Air Policy Development

• Context dependent; not all contextual factors are equally important and not all contextual factors can be influenced

• *The emergence of "windows of opportunities"*

• Interface between science and policy making and interactions between scientists, policy makers and politicians

• Communication between participants and stakeholders; scientists, policy makers, politicians and media

• Differences across scales; taking scales into consideration

• Funding of research

• Lobbying

Science-Policy Interactions: How achieve robust and successful involvement of scientists and policy makers in policy development

• Open participation in the scientific process; active efforts and resources to open up scientific processes and science-policy interactions; include critical voices

• Facilitate sharing of scientific data and knowledge

• Improve interface between basic and applied science

• Improve communication between scientists, experts, policy makers, politicians and stakeholders

• The importance of continuing interaction over time building understanding and trust

• Organized peer review of scientific data and quality assurance

• *Identify different kinds of uncertainties and address them in a productive way*

• Produce synthesis of knowledge and understanding to be reviewed

• Different interpretations of 'success;' can mean different things in different forums and at different times

Social Science Contributions

• Social science can contribute; not a question of 'if' but 'how'

• Important to discuss and clarify expectations of social science and social scientists

• Social science can be used both for problem solving purposes and for more fundamental reflection; these are not mutually exclusive

• Distinguishing between short-term vs. long-terms contributions

• Examples of contributions:
- Identify central contextual factors and examine changing contexts over time
- Conflict resolution
- Identify and assess policy specific costs and benefits
- Identify central issues and fundamental values and examine value conflicts
- Help design more effective assessment and policy making processes
- Help designing effective institutions
- Identify factors relevant for successful implementation and explain policy successes and failures; policy uptake
- Analyze similarities and differences across countries and regions
- Communication and strategies for successful communication

• Identify and help overcome gaps between natural science communities and social science communities

3.2 Working group 2 - Lessons from other policy areas

Theme 2: Lessons from other policy areas: How are science-policy interactions organised in other environmental policy areas, and to what extent have they been successful? What can be learned from these areas and how could the air policy field contribute in order to inspire other fields? What are the differences and similarities between air policy and climate change?

Chairman: Aant Elzinga

Rapporteur: Stacy van Deever

Leif Bernergård

Bert Bolin

Peringe Grennfelt

Atsushi Ishii

Nav Khera

Markus Åhman

Lessons across cases – interfaces of knowledge production and policymaking

I. Roles for social science:

- The group agreed that social science must be more than a task-master for natural scientist and/or bureaucrats. (social scientists are social engineers)
  - In other words, we don't like the frame of the "what is the role of social science" question ☺
  - Social sciences can also produce useful information and knowledge through synthesis exercises (not just answering "how to" questions)
    - Examples: Assessments of the impact or importance of different decision making strategies and rules on various types of outcomes; analysis of various ways of learning and/or interpreting data, images, etc.; and social science methods may yield insights on the causes of persistent disagreements (about policy issues or scientific and technical ones and such methods may explain the origins and ramifications of various consensus positions.
- Social science traditions, concepts and methods exist for examining and comparing the following:
  - Problematic issues such as representation, legitimacy, knowledge production and diffusion, and different equity/justice concerns;
  - The effects of various institutional design choices on decision-making, implementation and compliance, consensus building, etc.
  - The effects/ ramification of transferring natural science concepts, practices, measurement/units of assessment, into social and political debates (for example, the ramifications of basing international political debate on yearly, national CO2 emissions rather than other metrics such as per capita emissions or historical emissions).
- The social sciences offer s host of methods for examining and altering participation patterns, stakeholder development, capacity building, etc.
- Social scientist should be expected to 'problematize' some assumptions, approaches and/or institutions – in the same way that interdisciplinary groups of natural and engineering scientists often do when they are asked to grapple with interdisciplinary issues.
- The inclusion of social scientists and various social science discimplines and methods can potentially help to generate more reflective institutions and practices around air pollution issues in both political and science/technical realms.
- Social science methods exists to assist in systematize anecdotal experiences and comparison/assessment of institutions and a host of other outcomes. That is, social scientists have methods to generalize from various individual and collective experiences.
- Social science might make valuable contributions toward understanding and addresses mutually understood "problems" in air pollution and other environmental issue areas for which natural/technical sciences have few methods. For example
  - transatlantic differences
  - varying perceptions of effectiveness
  - divergent views among participants about scientific and technical information.

II. Repeatedly, the following theme was articulated: Social sciences are as differentiated as natural sciences – and should be expected to be so.

III. Working group participants listed numerous cases/issue areas that might be better analyzed to yield lessons about many of the points above. These included:

- Assess and study a broader range of LRTAP & EU CAFE experiences;
- Explicit investigation of failures and challenges and well as perceived successes;
- Case Examples: Climate change, global mercury pollution assessment, marine pollution issues and assessment, ozone layer assessment and policy, fisheries management

IV. Lessons across the cases we discussed in the group:

- It is clear that “space” for basic natural and social science work must be preserved and supported.
- Such work often prepares various knowledge communities for the “windows or opportunity” and/or perceived crises that often engender demand for new policy making initiatives.

3.3 Working group 3 - Stakeholder communication

Theme 3: Stakeholder Communication: How to increase interest in air quality issues? How to make air pollution policies meaningful and relevant for stakeholders? What communication strategies are used in European air policy work? New prospects?

Chairman: Rob Maas

Rapporteur: Heather Morrison

André Zuber

Jenny Arnell

Mark Elam

Mattias Järpe

Rolf Lidskog

Malin Mobjörk

Carole Ory

Steven Yearly

Christer Ågren

How to get policy attention in balance with the seriousness of the problem? Can more media attention and influencing public opinion be instrumental in this cause? What are the current trends?

Trends with negative effect on public interest:

- It used to be worse (a lot of improvement has taken place);
- Growing individualism and focus on materialistic values.

Trends with positive effect on public interest:

- Improved scientific facts and figures;
- Asthma is still increasing (but is it related to outdoor air pollution?);
- Increased concern about personal health;
- Increase in post-materialistic values (according to R, Inglehart).

Trends with undetermined effect on public interest:

- People are aware that air pollution measures will include behavioral or non technical measures as major point sources are already tackled.

Who to include in a communication strategy? The current focus is on communication between policy oriented science and national policy makers. Communication can be improved with:

- basic natural and social sciences
- media
- public
- politicians
- industry including car producers
- local authorities and city planners
- schools & universities
- banks & insurance companies
- police & justice (law enforcers).

What are successful media strategies?

- Make the issue visible (maps, sensitive groups)
- Translate effects, costs & measures in individual consequences: health risks, 20 euros per year, present individual trade offs
- Beware of oversimplification & exaggeration - remain credible!
- Counteract misinformation (eg. exaggeration of costs and job consequences)
- Improve quality of information via the mass media - requires a more active role of scientists; involve scientific journalists
- Name and blame approach (no consensus)
- Present air pollution as a security issue (a crisis, involving life or death) that belongs in realm of high politics (no consensus)
- Compare risks (including the way and age of dying)
- Use all types of media, including the internet
- Include air pollution info in the weather forecast
- Make personal energy use & air pollution visible in cars & houses
- Stimulate use of personal footprint inventories & ecoteams
- Experiment with tradable personal emission quota
- Involve the public in monitoring changes in ecosystems
- Improve the quality of environmental education
- Make expectations on what (protection) the government can deliver more realistic via critical & credible ngo's

Research questions for social scientists:

- explain peoples resistance & ways to overcome resistance
- advise on more effective information exchange: how to reach the public and use public opinion and experience (dialogue). Learn from information campaigns
- advise on successful social experiments involving non technical measures (eg. London road user charges)
- make policy makers more aware of other paradigms and ways of framing the problem (eg. people are not the means but the goal of the exercise; if the problem is defined as a matter of life and death public involvement in the decision process is less needed; explain different views on the role of government and the public)

- advise on improvement of the process of knowledge construction (reflect & learn)
- advise on improvement of the international negotiation process

Although communication appeared to be possible there remains a big gap between the approach of the social scientists in the group and the expectations of the scientists involved in the policy process. How to reach more realistic expectations of the input of social sciences in the process? How to reach generalized conclusions, lessons and advice? How to bridge the gap between basic social science and integrative multidisciplinary (applied policy oriented) science? Who dares to make 'dirty hands'?

4 Background papers

4.1 Reflection on ever cleaner air

Author: Sonja Boehmer-Christiansen, Hull University, Sonja.b-c@hull.ac.uk

Background

1990-2004, Chinese and Indian coal use increased from 10.8% to 17.2 % of world primary energy- of which 66% is coal. Coal elsewhere comprises just under 20%. 2000-04 coal use in China rose from 495 to 957 and in India from 171 to 205 (up 20%). What are the implications for air pollution?

Coal fired power stations will close because the EU's Large Combustion Plant directive will set efficiency and pollution standards that most cannot possibly meet when it takes effect in 2008.

Assumptions

- Bureaucracies, not environmentalists and scientists are today the major actors in clean air policy-making.
- Bureaucracies seek growth in size and competence and need to be restrained.
- Environmental regulation is a luxury that thrives best in 'good times' and is subject changing societal (including environmental) priorities. [2]
- Environmental regulation may also thrive on error or more commonly serious exaggerations…like, the death of the ocean, running out of resources (1970s), Waldsterben (1980s), the ability of humanity to control the climate (1990s). Such exaggerations may serve positive purposes - to 'lubricate sluggish political systems – but there are penalties. Who is to judge when protection/ regulation has gone too far? -surely not bureaucracies and their allies.

Aim

To discuss air pollution control, including 'combating global warming' with reference to the attempted solutions, the regulation of fossil fuel use and point out weaknesses in the regulatory system.

Position

I tend to see (relatively) cheap energy as more important than ever, more important even than cleaner air in the EU/ECU. I see the contemporary environmental lobby and its allies inside 'expanding' bureaucracies and research establishments as no longer representing the public or necessarily the common good. In order to maintain itself, it tends to misuses science, especially forecast from environmental models the limitations of which that the public and politicians do not understand. More needs to be done to explain how pretty maps used to demonstrate disaster to policy-makers unless the legislate, are arrived at, what their assumptions and limitations are. If this is not done, science ands scientists will be the losers.

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[2] S Boehmer-Christiansen and A Kellow, International Environmental Agreements: Interests and the failure of the Kyoto process, E Elgar, 2002.

Argument

Environmentalists should be no more than one among many stakeholders in the regulatory game. The green lobby increasingly a proponents of ideology tending to downgrade human needs and abilities; a dangerous if once useful ally of bureaucracy. Environmentalism may became a tool of reactionary forces, as well as for excessive regulation by the state. Emission reduction strategies need a pause for reflection until more is known about the impacts of expensive energy.

Air Pollution Control

Pollution is not equal to emissions into the atmosphere, it is damage done to the environment. To protect the air from excessive waste disposal, we need better science and fewer self-selected stakeholders, as well as greater awareness of the political drivers of the regulatory process, especially of the non-environmental benefits and 'no-regret' aims. Many business and revenue raising agendas attach themselves to emission reduction efforts. Non-environmental aims and interests need to be taken into account. While striving for cost efficiency is legitimate, there are many other economic objectives that may drive emission reduction: desire for investments into new technologies, enhancing competitiveness and the ambitions of bureaucracies may be mentioned. They are not made explicit in computer models that therefore give a false picture of costs and benefits of regulation. Ecosystem sensitivity may not be the best criteria for setting emission limits. Which 'ecosystem'? Ecosystem are political constructs based on some ideal natural state. Emission limits should include regional and even local human priorities and sensitivities. International emission limits are likely so serve political rather than scientific ends, enabled, alas, by post-modern science and the political nature of air pollution.

Post-modern Science and Economics.

Here refer to the use of computer models as authority for policy-making, giving the often false impression that they 'predict' reality (of impacts and post-regulation natural changes). Post-modern science - some call it junk science - is used to persuade rather than inform politics. Critical load models and climate change models are indeed useful, but they should only be used for policy if it is understood that they do NOT

- NOT CLEARLY DIFFERENTIATE BETWEEN VALUES, FACTS AND INTERPRETATIONS ;
- CLEARLY STATE UNCERTAINTIES AND PROBABILITIES AND SCALE EFFECTS;
- CONVEY TO USERS METHODOLOGICAL SHORT- COMINGS AND IGNORANCE; THIS APPLIES TO THE MANIPULATION OF BOTH NATURAL AND SOCIAL SCIENCE DATA.

Simplified models, especially when they predict disasters than are claimed to be preventable by policy, are easily misused by groups that tend to benefit from pollution control financially or politically. Spending on pollution control needs be evaluated against other benefits along the lines suggested by Lomborg for 'global warming'. I am concerned about justifying public policy with selected and politicised science, as we are observe today with respect to global warming and in the past over *Waldsterben*.[3] The German economy might be in better shape if less had been spent on 'de-acidification' and more on education. Yet people were frightened into agreeing to higher energy prices and more regulation. Models that claim they can predict emission and temperature decades ahead deserve particular criticism. Advocates tend to claim that something 'will' happen rather than

[3] Boehmer-Christiansen and J Skea, The Politics of Acid Rain, Belhaven, 1992. *The Politics of Vehicle Emission Reduction in Britain and Germany,* with Helmut Weidner, Pinter, London, 1995.

that something 'may happen' IF all model assumptions were correct and everything important were known and included.

Emission Reduction: a tool of energy politics?

The environmental problem faced by regulators is the widespread use of air for gaseous waste disposal. "Waste" may be unwanted but it is a thermodynamic inevitability - useful work cannot be done without an ultimate sink. It is interesting that nature also evolved CO_2 as its low-grade, end-of-pipe sink. The atmosphere is a sink, with the ocean - why should they not be used by the human species? Why has the atmosphere (after the oceans) rather than the ground, become the subject of much environmental attention since the early 1980s, that is after the seas 'nationalised'? Like the oceans once, the atmosphere remained a space for political contest because:

- Air moves fast and unpredictably, especially in horizontal direction crossing human-made boundaries; inviting international politics.
- The atmosphere is home for weather and climate; it is of value but cannot be owned. It has long been a theme for international politics, international research and NGOs, especially the 'trans-nationals' who live off states in order to wrest power from them.
- The atmosphere is not well understood. Thanks to technological developments, it is now a primary research object of earth systems science and experimental medium for new technologies, both are very costly. This brings the research enterprise into the policy-making picture as actors and stakeholders (receiver of public monies), and especially as creators of futures from which other political actors can select.

Air pollution control is one of many problems faced by industrial society to be solved by administrative action. Paehlke argued ago that because of the 'insurmountable obstacles' in doing this effectively, 'a more democratic approach to administrative inquiry and practice is needed'.[4] This is generally agreed and called the stakeholder or participatory approach in which experts and administrators are seek 'better' policy with the help of outsiders. In practice this tends to mean that those in power select supportive stakeholders. Genuine information is only rarely sought from outside. The selection of uncooperative stakeholders may make decision-making impossible, or decision-making may become hopelessly politicised. This has happened with carbon dioxide at the global level because emissions from fossil fuel combustion have been turned into a (dubious) yardstick for measuring future climatic change.

Solution and Promise : Decarbonisation and carbon-neutrality

In its move to drive out coal from the energy mix and find substitutes for petrol, the EU is close to defining CO_2, a building bloc of life, as pollutant. Europe may yet regret this, especially if the fear of nuclear power also continues.[5] Air pollution control has become a tool of energy politics encouraged by the prevailing politics of fear.[6] (I doubt that the reverse is true, given the far greater

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[4] R.Paehlke and d Torgerson, Managing Leviathan 2nd edition, Broadview Press, Canada , 2005.

[5] Chernobyl also shows selective scare mongering. According to Fred Singer's September newsletter: "The long-awaited UN report on Chernobyl is an eye-opener. After all the hype, there are only some 50 deaths among personnel involved in the immediate accident, and 9 deaths from thyroid cancer. 4000 eventual cancer deaths are mentioned, but these are statistical calculations based on the unrealistic Linear-No-Threshold hypothesis and are more likely zero. Even the 4000 number represents only a 3% increase in naturally occurring cancer deaths. The most important after-effects were psychological and caused by fear of radioactivity.

[6] Frank Furedi, sociologist and critic of contemporary culture, in *Politics of Fear: Beyond Left and Right*, Continuum , 2005, explains why he has focused his fire on politics, analyses the exhaustion of public life and

strength and importance of energy interests, though societies are known to be led astray by myths.) If decarbonisation is the objective on EU environmental policy and energy policy, would air pollution benefit from a return to wood, nuclear power, or waste incineration? Is the 'sequestration' of CO_2, 'safe'? Are the costs of reducing particulates justified when higher energy and mobility costs also have health consequences?

Anti-fossil fuel policies primarily involve moving public sector money into private pockets; they are in the process of being implemented and research into the implications for EU economies is urgently needed and seems to be beginning.[7] The movement of this money is based on the promise that the recipients will provide solutions to a catastrophe only decades away. These technological solutions are marketed as being of political and commercial benefit long before catastrophe strikes, but they have to paid for now. Society is being scared into paying. This is not necessarily a bad idea, but does this not involve the misuse of science? EU senior bureaucracy and its allies in the political class are therefore either stupid, which I doubt, misled by ideology, possibly - or – most likely - do not really expect environmental salvation via the control of climate. Rather they seek administrative power, enhanced energy security and new markets, especially abroad. Experts on the 'green' or sustainable technology already appeal to potential investors, promising the transfer of clean technology and seeking of first mover advantage. Renewables and fossil fuels now seek 'a level playing field' with only fossil fuels being required to 'internalise their environmental costs'.[8] Non-environmental benefits are not modelled by integrated models (as far as I know) and hence 'mislead' outsiders about true costs and expected benefits. Big and costly packages for a transition to a world no longer dependent on fossil fuel world is sold to the public with the promise that speedy action will save them and the planet, .. and Africa from poverty and worse! Are these promised improvement in health achieved by reducing emissions into air really worthwhile when they also lead to increased energy costs for the poorest and even relatively poor? Can the models tell? Poverty seems to be a price our 'Northern' societies are prepared to pay, for the poor are rarely at the decision-making table. Who looks after their interests?

But why should emission reduction be based on the end of the production chain, on cutting emissions from suppliers, rather than mitigating power needs? Power stations and to a lesser degree cars and aeroplanes are the focus of regulatory action. The reason seems to be the formers' greater potential for stimulating regulation, growth and investment. Reducing the overall demand for energy is not an attractive option and poses serious problems for administrations. This again suggests that the aim of emission reduction is not primarily environmental, but political and economic. The driver of global warming politics - in short-hand - is likely to be 'green imperialism': a mixture of fuel competition, technological innovation supporting northern energy security and the search for export opportunities in the growing energy sectors of industrialising countries. Here emission reduction policy is a major tool. Will it work? Surely only if science remains honest enough to be accepted as underpinning authority.

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comes to a stark conclusion that the end of the historic struggle between left and right has taken us, not towards a more secure future of greater choice and consensus, but into a pre-political age dominated by misanthropic mistrust.

7 For challenges see articles, inter alia, by Castles and Henderson, in *Energy &Environment*,(Multi-science UK) and the House of Lords' Select Committee on Economic Affairs Report, The Economics of Climate Change, London, 2005.

8 S.Retallack and T.Grayling, Catalysing commitment on climate change, Paper for the International Climate Change Task Force, IPPR, London , 2005. According to the IPPR (Institute for Public Policy Research, a Blairite think tank) UK policy should be to decarbonise the global economy.

Conclusion

Air pollution control strategies at national and international levels have not undergone adequate overall risk-benefit analyses and either reflect

- an excessively risk–aversive society, or
- serve other than environmental objectives, i.e. require explicit political interest analyses.

Europe may need a rest from environmental legislation.

4.2 How to communicate complex problems

Author: Rob Maas, Netherlands Environmental Assessment Agency, Chair Task Force on Integrated Assessment Modelling - LRTAP

There is no accurate representation of reality, simpler than reality itself. In communicating the complex reality we have to leave out things. Approximating reality can be done from different perspectives. Scientists have a responsible role in the way they frame problems and communicate consequences for policy makers and the wider public. It is not necessary that decision takers know all the details: we do not want to know all the technological details when we buy a car and we don't want to know what models are used in making the weather forecast. We only want to know whether we should take an umbrella. We even respect the fact that sometimes scientists are uncertain: 'sunny spells and scattered showers' means that people should decide for themselves whether they are risk aversive or not. But when political stakes are high and scientific uncertainties are large more intensive communication is needed than the daily weather forecast. It is than better to involve policy makers in the framing of the problem, to develop a common language, to create a platform for sharing knowledge around a 'nucleus' or 'common memory', to organize the creation, storage and transformation of knowledge as a joint learning process.

Based on a broad common goal (reduce air pollution), continuity and mutual trust a gradual process of increased complexity can emerge, as was the experience in the work under the Convention of Long Range Transboundary Air Pollution and EMEP. The boundary between science and policy was in this process rather vague: the policy makers involved showed interest in the scientific details and uncertainties, the scientists were open to discuss the use of there knowledge in a policy context and translate scientific uncertainties into political risks. In order to avoid the risk of 'group think' (common blind spots) such a network should be constantly open to new participants and to external peer review. Moreover the network should respect dissident views (even within the 'group') and open to comparison of results. In the LRTAP-experience this lead to a constant revision of the framework: from a partial solution for SO_2 via an integrated multi-pollutant multi-effect approach, towards an increased coherence with climate & energy policy, biodiversity policy, agricultural policy and trade & transport policy.

Thus far the work of the LRTAP/EMEP-network was a bottom-up process, based on collaboration rather than competition. Financial means were to be generated by the participants. The process guided itself. Currently the network is encountering a new phenomenon: in order to guarantee long term funding the European Commission is preparing a more targeted work plan for the next 5 years or so. The challenge is to reconcile this demand driven approach with the more chaotic bottom-up approach of LRTAP/EMEP. The latter being probably more creative and more focussed on scientific consensus, coherence and robustness.

4.3 Roles for public participation in the generation of robust knowledge about urban air quality in Europe: making models more robust through public engagement

Author: Steven Yearley, School of Social and Political Studies, University of Edinburgh

Background

Many of the aspects of science which today touch the public most deeply involve some aspect of modelling (e.g. the dispersion of pollutants, the spread of infection, the rate of sea-level rise, or projections of the impact of currency harmonisation). Typically, these models are run on high-speed computers, often raising new obstacles to public understanding and participation. For example, difficulties in public understanding may be aggravated because of limited physical access to the computer model or because the assumptions underlying the model are 'buried' within the model itself. At the same time, a number of commentators have lately become interested in the various ways that the public can engage with environmental models (see Yearley 1999; Kasemir et al 2003).

Of particular relevance here has been the proposal that certain forms of citizen engagement with environmental modelling may actually function not only to inform the public and promote public confidence in the models but to enhance the quality of those environmental models. For example, in one case (reported in Yearley et al 2001 and Bailey et al 1999) it was shown that targeted forms of engagement between local citizens and an urban air-quality model run by a local authority in Sheffield (England) could lead to the citizens acting as 'extended peer reviewers' of the model, its operation and assumptions. This study drew on the abstract idea of extended peer review (advanced by Funtowicz and Ravetz 1991) and indicated how it could be applied in practice to an engagement between local citizens, with everyday knowledge of pollution and its causes, and environmental-control officials. Through the case study sessions, practical insights into the model and its projections were fed back to the local authority. A subsequent study (Yearley et al 2003) examined a novel method for eliciting spatial representations of local urban pollution issues from groups of citizens. These representations, once digitized, could be directly compared with the output from official models, once again acting as a form of quality assurance mechanism. In the English city of York, this procedure was actually employed by the local authority in identifying the precise inner-city area to be included in its air quality management strategy (see http://www.york.gov.uk/environment/airquality/aqma.html).

This experience raised the intriguing possibility that developments in the CLRTAP process (the Convention on Long Range Transboundary Air Pollution) could seek to benefit from a form of citizen engagement. The UN body for CLRTAP has all along been concerned with communicating its work to the public. But the possibility to be investigated here was a subtly different one: that forms of public engagement might strengthen the modelling and analytic work behind the CLRTAP process and not just aid with the transmission of results to the public.

<u>Limits to participation in attempts to enrol citizens in transboundary air-quality issues</u>

This example should be considered in the context of recent discussions about ways to advance the well known and generally acclaimed United Nations CLRTAP process. In particular, there is an interest in examining whether there is potential to extend CLRTAP through the consideration of initiatives for public engagement (see Sundqvist et al, 2002).

In considering whether citizen perspectives could be brought to bear on this policy process, developing the knowledges which ordinary people possess and devising ways to pool their various forms of expertise, it appears that CLRTAP had – for quite understandable historical reasons – developed in such a way as to minimize the obvious scope for participation of the sort promoted in the case of local authority modelling in Britain. In order to emphasize the legitimacy of its international aspects and to minimize the extent to which it stumbled into the realms governed by national sovereignty, CLRTAP had been agreed to focus only on long-range, transboundary pollutants (see Levy, 1993). Through the emission of such pollutants one might do damage to one's neighbours without at all meaning them any harm, and steps to reduce these kinds of harm would simultaneously mend fences while (potentially) improving the state of the environment (I say "potentially" here since it appears that it was only long-range, transboundary pollution which some signatories tried to stop, with the USSR for example reported, early on, to have moved some of its long-range pollution emitting facilities deeper within the country so that emissions were no longer transboundary, even if they were still long range). This meant that the business of the Treaty was confined to being about pollutants which came from a considerable distance, and typically extra-territorially.

The UN's publicity material on the successive generations of the Treaty emphasized the ways in which people's lives could be affected by pollution coming stealthily from far away to acidify their lakes or rot their public buildings or impair their children's health. In one widely distributed leaflet marking twenty years of the CLRTAP (United Nations, 1999), all this was done rather beguilingly in the form of personalized vignettes. The stories ran roughly as follows: Sven used to fish this lake with his father but when he came to teach his daughter how to use a lure, fish numbers had steeply declined. Matilde had been coming to the state park all her life. As a young woman she remembered how tall the plants grew and how prodigiously the flowers bloomed. These days plant growth is very restricted and the park is much less appealing. In other words, the problems these stories told of were exactly the kind of environmental difficulty where – on the face of it – citizen input would be least valuable.

There are at least three factors at work here. First, though this may often be urban pollution (and thus in some way comparable to the Sheffield case study), the sufferers are not the originators of the problem so the solution cannot be directly in their own hands. They cannot easily be empowered to resolve their own air-pollution problems. Second, the CLRTAP promotional literature stressed the extent to which the environmental pollutants operate almost by stealth, imperceptibly causing problems which only become apparent rather late on, after years of invisible pollution. Accordingly, lay people are not good detectors of the problems. Their 'lay expertise' in the matter of barely perceptible gases that build up and cause problems at very slow rates is likely much less than in the matter of conspicuous urban pollution from bus engines or industrial plant. Finally, since the causes are far away and are located in other cultures with different legislative contexts, patterns of industry, agriculture and economic life, and even different customs, people's understandings of the exigencies of everyday life may not even be much of a guide to the sources of the problems. People in one locality may not even have much insight into the everyday concerns and motivations of the people who are causing the long-range pollution from which they are suffering. In short, CLRTAP looks like an experts' charter.

In such a case, even if officials and the Parties are interested in participatory initiatives, it is unclear that the rationale for those initiatives could be the same as in the above-cited examples of urban air management. Of course, there may be a role for public engagement in discussions about the value for money and worthwhileness of these forms of international pollution abatement as against local initiatives. And public consultations might lead to more interest in the distributional consequences of existing air-quality agreements under CLRTAP and other agreements. None the less, it seems that here is a case of air-quality policy in which public engagement is not easily converted into a form of extended peer review. This suggests that, while public engagement in air quality management has been shown to be practical and potentially beneficial, the exact nature of public engagement for the CLRTAP process will require further investigation and, quite possibly, the development of novel methods.

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4.4 Translating climate research – The role of IPCC

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Reports in general and assessment reports in particular have been important in raising the public and political interest for environmental problems.[9] In terms of climate change, the formation of the United Nations International Panel of Climate Change (IPCC) has played a crucial role and IPCC has become a major authority by establishing itself as a credible and scientific basis for climate knowledge and politics.[10] In this short paper however I will primarily discuss the relationship between IPCC and the producers of new knowledge, based on the assumption that the latter should also be taken into account in the analysis of science-politics relations.

The United Nations Environmental Program and World Meteorological Organization (WMO) established the IPCC in 1988. The panel comprises three working groups which have been responsible for one volume in each of the three published assessment reports. The volumes include "The Scientific Basis", "Impacts, Adaptation and Vulnerability" and "Mitigation". In first volume, WG1 present the current state of knowledge and the most important areas of lacunae in our understanding of human induced climate change, based on a summary of research in the field. The scientists involved in IPCC are primarily from the atmospheric sciences and especially from meteorology. For example, Bert Bolin, a Swedish meteorologist from the Department of Meteorology, Stockholm University (MISU), was the first chairman. The meteorological dominance is due to that IPCC was created under the auspices of the WMO, but also due to how the climate question has been defined as a research question (Elzinga & Nolin 1998: 48f.): IPCC has derived its understanding of climate from the work of climate models (Miller 2004: 54) and climate models have primarily developed from numerical weather prediction models. The structure of (atmospheric) climate models and NWP models is very similar but gradually, processes that are of importance in a longer time-scale have been taken into account by including more so-called parameterizations, in which the effects of these processes are simplified and represented as relations between simulated parameters.[11] Observations are often required to determine constants and/or coefficients in parameterizations.

In Sweden, climate research started to grow dramatically after 1990 and MISU has been the most important site for this type of research (e.g. Nolin 1999). Bolin hold a chair in meteorology at MISU, but to follow the work of Bolin, or other *policy entrepreneurs* (Hart & Victor 1993) from MISU, does not inform about research work. Some scientists produce the state of the art; others participate in policy processes (cf. Becker 1982; Latour 1987). However, if the relationship between science and policy is multi-dimensional (Liftin 1994), there are a number of co-production activities in different arenas and between different types of actors (e.g. Jasanoff 2004). Thus, different researchers may be connected to politics in different ways and the producers of new knowledge should therefore not be excluded from the analysis of this complex relationship *a priori*. While the function of (parts of) IPCC as a mediator or knowledge broker between the producers of

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[9] See e g. van der Sluijs et al. (1998); Hart & Victor (1993).
[10] See e.g. Miller (2004); Miller & Edwards (2001); O' Riordan & Jäger (1996); Shackley & Wynne (1996) about the importance of the panel. About its structure and effect on science-policy interaction see e.g. Siebenhüner (2003); Skovdin (2000); Miller (2004); Agrawala (1998). See e.g van der Sluijs et al 1998; Skovdin 1999 on how credibility has been produced and maintained.
[11] There are also coupled climate models where e.g. atmospheric models are connected to models of the ocean. These are not discussed here.

knowledge and the policymakers (Miller 2004; Mattson 2005; cf. Liftin 1994) have been studied, the relation between IPCC and the researchers producing new knowledge is consequently also important to consider. I will do so by using examples from interviews and grant proposals of how researchers at MISU define climate research and the role of climate models and the IPCC in this.[12]

Meteorological researchers have different ideas about what should be included in what is called climate research. For example, one scientist claimed that since clouds are one of the most important parts of the system that affect the climate, the development of clouds becomes a part of climate research. Another scientist said: "[Climate research for me] includes understanding the processes regulating the climate and understanding the radiation balance of earth; what is hindering the incoming radiation, what hinders outgoing radiation to go to space?" These quotes are from field experimentalists and a common theme among those is that they suggest it is too narrow to focus on climate modeling exclusively, whereas simulation modelers tend to hold a relation to climate models as essential. The close relationship between weather and climate "forecasting" is also emphasized. "There are many research problems that are based in both climate and weather forecasts. Today it is perhaps a tendency to use the climate label for things that are mostly about forecasting since it is easier to sell climate rather than forecasts", said one modeler, who suggests a different framing because of funding opportunities. In line with this, another scientist commented: "Now [the climate question] has become so hot that everyone tries to jump on it and (…) use climate as some kind of keyword to get attention and resources."

What constitutes, and has been constructed as, "climate research" and *what does not* is the result of negotiation and problematization. Problem translations *make* things relevant (Latour 1987: 126) and in this case, the centrality of climate modeling has become self-evident due to the establishment of climate modeling as an *obligatory point of passage* for truth claims about future global warming (Edwards 2001; cf. Callon 1986). Yet all scientists who claim to perform climate research are not working with climate models, as noted above. However, Shackley et al. (1998) note the *potential* of climate models to unite several areas of environmental science and refer to this as an example of a *translation process*, where the interests of the other scientists have been translated into those of climate modelers. Therefore, studies of local practice and small-scale climate research are also required in order to understand if, and in that case how, climate modeling has translated interests more in detail.

Since Swedish climate change research has not been funded through a special program researchers have to apply for new, climate-marked money in the "old way" (Nolin 1999: 129). Consequently, funding proposals to the National Research Council can be used to see how "climate research" is constructed, especially since climate is suggested as a keyword to attract resources. Funding proposals consist of chains of problem translations which start with a problem and then translate the reader to specific problem-solution (Callon et al. 1986: xcvii). It is through these elaborations that financing agencies and scientists negotiate how a problem should be translated into actual research tasks (cf. Knorr Cetina 1982: 123f.), and, I suggest, in this case also how to construct the meaning of climate research. However, from the point of view of meteorological researchers, IPCC has already done a large part of this job (cf. Miller 2004), but the researchers' accounts as well as funding applications confirm that the IPCC still has an important mediating role. One scientist said, "You can call [the IPCC report] a communication surface between the ones who do research and the ones who have money. Of course it's good with a (…) report to lean against." The IPCC reports have been very useful for researchers in this respect since they represent a credible source to rely on in motivating research and also because the reports include sections for a scientific

[12] See Sundberg (2005), especially Chapter Three for more detailed information about methodology and sources.

audience as well as for executives. Another researcher asserted: "A reason to write the IPCC reports from the beginning was obviously to get more money to that type of research and the [human induced climate change] question."

The effects of larger amounts of CO_2 in the atmosphere have been the most well-known cause behind climate change question, but during the last decade, the effects of aerosol particles have gained increased attention. While researchers began to acknowledge the influence of particles (on climate) during the mid-1980s, more extensive discussions about the so-called aerosol effects were largely lacking until the third IPCC report in 2001, when the IPCC recognized the representation and understanding of aerosol and cloud processes as major uncertainties in climate models (interview with NN, see also www.ipcc.ch). Probably related to this is that among the studied proposals, all introductions involving aerosol and cloud measurements refer to the aerosol effects on climate. On this basis, a chain of new statements leads to the specific research problem that the researcher or group of researchers intends to focus on. This is often implicitly or explicitly related to the constructions of parameterizations that could improve the understanding of these processes, if implemented in climate models. However, connections to parameterizations are potentially fruitful from the point of view of climate significance more generally, and researchers involved in both modeling and experimental work formulate the rationale for their research in terms of producing or improving parameterizations for climate models. The situation is perhaps especially favorable for experimentalists. The IPCC reports provide opportunities to connect their research to climate models and their identified uncertainties, independently of their knowledge about for example the construction of a cloud parameterization or its function in models. In addition to insufficient description of a process, lacking knowledge about some important regions, e.g. the Arctic, has also been emphasized. This has also been useful to attract funding. One researcher said: "[The IPCC report] shows that we have the largest uncertainties in the climate simulations in the Arctic basin. Why? Then I can go on [in the application] why this is why we have to do this research. It's clear that it is a support." As a final point, it is notable that one researcher complained about that some processes are not presented as uncertainties in the latest IPCC report, perhaps because there was no available research on the topic he suggested.

To conclude, the IPCC assessment reports serve different parts of the research community with information about what is considered to be the largest and most important uncertainties. Thus, the reports offer the possibility to attach to established problem formulations, uncertainties, and with "climate research" the way it has come to be defined in relation to climate models. Assessment reports *summarizing* the state-of-the-art in terms of scientific results are not only more important political tools for these scientists than publications used to *build* the state-of-the-art in scientific research (cf. Hart & Victor 1993: 668), they are also useful for scientists in formulating politically relevant research questions which they believe increase the chances of funding. Hence, meteorological researchers translate their research problem into climate terms by pointing at the gaps and uncertainties that the IPCC reports have identified. This mediating function of the first volume of the IPCC assessment reports is important to acknowledge, in addition to the focus on the relationship between politics and ready-made science (i.e. the second and third volumes of the assessment reports, see e.g. Mattson 2005). Furthermore, while the arguments of the IPCC are used in motivating *current research,* the IPCC reports also *influence* current research in a sense. Researchers may concentrate on *known* uncertainties and exclude questions that no one has studied, including processes whose potential importance we are ignorant of. In addition, the reports do not only privilege the results of climate modeling by focusing on uncertainties in *climate modeling,* they also serve to re-affirm their importance in enabling scientists to relate their research to an established problem formulation. Through the emphasis on the uncertainties in process descriptions (parameterizations), the meteorological core in climate models is emphasized. Therefore, the problematization provided by the IPCC reports - based on climate modeling as a point of departure for understanding climate change - potentially organizes both climate politics *and* climate research. This may also be important to consider in terms of other environmental problem.

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4.5 Experiences from the ASTA project - The social scientist view

Author: Göran Sundqvist, Göteborg University

The ASTA programme was set up in the year 1999 with the aim to produce scientific data for international measures to control transboundary air pollution in Europe. The ASTA programme became Sweden's way of strengthening and securing the future supply of Swedish expertise for the purposes of international negotiations on environmental agreements. And as we all know Sweden has a proud tradition to defend in this field. Not to say that it is all about protecting the self interest of Swedish scientists but that Sweden, at least according to what we are told by natural scientists, is located in the wrong wind direction and due to sensitive soils and tough climate is more affected by transboundary air pollution than many other European countries.

The ASTA programme already from the beginning included a sociological sub-project in order to promote a better understanding of the science-policy interface. But what should be known better? And how could this better understanding of the interface between science and policy contribute to better control measures on the European level?

Background

The first thing we did in our sub-programme was to check the widespread talk about success, what was actually explained as a success and what explained this success. Obviously, the success is about the establishment of the LRTAP Convention, one of the first international treaties for environmental protection, and the agreement of eight protocols that have been reached without big conflicts and long time delay. The most common explanation of this success is proposed to be the existence of a close relationship between science and policy. This opinion is repeated by scientists, policy makers as well as social scientists. The work under the Convention is characterised as science-policy interactive. However, the interaction seems to go in only one direction: from science to policy. In short: what is generally recognised as a success is that policy is science-based (e.g. Sliggers and Kakebeeke, 2004).

However, a few other voices complementing this explanation could be found. One of the most interesting is Lars Björkbom's, the former chairman of the LRTAP working group of strategies. He has argued that the existence of the Convention and its early success could not be explained by science, at least not by science alone. On the contrary external political factors is the important reason: the logic of the Cold War (Björkbom, 1997). In the 1970s the Soviet Union proposed European collaboration on evironmental matters due to its need of communication over the iron curtain. Cooperation on environmental and scientific issues was considered a possible area. The Convention became a result of the 1975 Helsinki agreement between the two superpowers. This made us conclude that: If science plays an important role in environmental regulation, the reason for this must be explained (Lidskog and Sundqvist, 2002). In this respect both Björkbom and the others, promoting science as the single explanation, could be right. But their opinions should be combined.

Politicians tried to neutralise the East-West conflict by suggesting cooperation in the field of environmental protection. Thereby scientific reasoning became the politically supported way to treat transboundary air pollution in Europe. The scientists accepted an expanded role for science, and this gave scientists space to act according to their own will.

What could be noticed among the scientific experts from the very beginning and up to today is that science has been important due to its adaptability to new demands and circumstances. It is not certainty that is pointed out by the involved actors as the important thing with science. On the contrary, what is valued is the flexible, negotiable character of science. Politics is hard and therefore science could be used as a catalyst for political change, it is argued.

The STS perspective

This way of understanding science as flexible and soft is similar to how science is understood in our field of research, Science and Technology Studies – STS. However, in an interesting way scientific experts involved in the air policy process seem to "falsify" the picture presented by STS scholars on how scientific experts present their expertise in public. According to STS the problem is that scientists have surrounded their enterprise with a false aura of certainty. There seems to be only two ways of thinking about science. Science is either all good or all bad. Both these ideas of science are wrong and dangerous. This is the flip-flop thinking of science (Collins and Pinch, 1993, 1998). But the scientific experts in the field of air policy do not seem to fit very well into the formula of flip-flop. In public they show a picture of science as changeable and possible to interpret and put together in different and new ways. Comparing the STS view on scientific experts with the way air pollution experts act in a policy context and in public the following could be concluded:

- STS argues that scientists in public present scientific results as certain.

- Scientific experts connected to air policy do not strongly focus on certainty. The external pressure to deliver certainty has by tradition been weak: it was enough if scientists could come together.

- Therefore, these scientific experts are of great importance to study due to their focus on the negotiability and adaptability of scientific knowledge. This case offers lessons to other policy areas and also to the field of STS.

- STS scholars are right when they consider a strong focus on certainty (the false aura) as an enemy to fight.

Three examples

It is now time to give some examples on how scientific experts in the field of air pollution have interpreted their knowledge in relation to policy making. I will give three short examples from three different periods of European air policy work.

My first example is from the 1980s and about forest damage, Waldsterben. Roughly speaking we could say that at this time some scientists, the general public and the mass media were more convinced about a strong connection between observed effects on forest and transboundary air pollution, while other scientists considered also other causes of importance, such as drought, untimely frost, age, fungi, and insects (Roll Hansen, 1994). However, what is clear is that:

- Waldsterben played an important role for the development and quick agreement of the first two protocols under the Convention, the first sulphur protocol signed in 1985 and the protocol on nitrogen dioxides in 1988.

- Scientific knowledge was by most scientists considered uncertain and data relating to effects were interpreted in different ways.

• The general public and mass media were more convinced than the scientific community about the existence of a clear connection between air pollution and forest damage.

• Most scientific experts connected to air policy work were not very unhappy about this situation. They took advantage of the situation of certainty which was not created by themselves.

• Once again (compare the Cold War logic ten years earlier) the surrounding society gave science a prominent role to play.

My second example is about the shift from emissions to effects and the use of computer models in order to simulate costs and effects in order to reach cost-effectiveness. This shift took place in the late 1980s, in the process of preparing the second sulphur protocol, signed in Oslo in 1994. As you know I'm talking about critical loads and the interactive computer model RAINS. It is important to notice that scientists consider these two tools more as policy instruments than scientific instruments, in a way that would give policy a stronger scientific underpinning. Scientific experts accepted the results from these instruments giving a quite rough and uncertain picture of how nature and society actually work (Tuinstra, Hordijk and Amann, 1999). From the case of critical loads and RAINS we can conclude that:

• Science-based policy instruments have been supported and considered credible by both the scientific community and the policy community (negotiators).

• This has (once more) given room for scientific experts to establish innovative, but in scientific respects uncertain, policy tools.

• Scientific experts (once more) did not complain about this situation.

• It was not science that decided the Oslo protocol, but scientific experts were given (or took) the opportunity to formulate science-based policy instruments which were of crucial importance in the negotiations.

• Scientific experts were close to the negotiators and their policy tools facilitated and gave important direction to the work.

My third example is about the work carried out today in the European Union on air quality and health issues. The focus on health means that a new kind of expertise is entering the scene: medicine. And new organisations have to be adapted to the air policy framework, and the most important of these is the World Health Organisation – WHO. Is this new player changing the relationship between science and policy so well established during more than two decades between scientists and the LRTAP Convention and its parties? Is a new view of science emerging, implying a stronger barrier between science and policy?

Let me just give one example, and this I borrow from a piece of work carried out by my colleague Martin Letell. In December 2001 the CAFE Steeering group identified a number of questions to be answered by the WHO. The Scientific Advisory Committe (SAC), set up by WHO in order to review health aspects of air quailty in Europe, did however not regard the questions from the Steering group as scientific enough. The reformulation made by the committee transformed the questions to testable hypotheses. This transformation created a boundary between policy makers and scientific experts. This was an effort by the scientists to on the one hand make policy issues more scientific and on the other hand make science more independent of policy, to protect scientific integrity. This transformation was made in an explicit way making clear that the work of

WHO is something else than the work carried out by the CAFE steering group. From this we can conclude that:

• WHO strongly emphasize scientific integrity and a will to stand free from political and sectoral interests.

• The work carried out by scientific experts under the Convention is about to serve policy makers with what they need and, not least, present innovative ideas of what they could or should need. The WHO experts want to do this in a way that protects scientific integrity and this means that policy makers and not scientists should make policy. What policy needs is good science! (Letell, forthcoming).

Conclusions

To explain success we should distinguish between contextual factors, not so easy for scientists to change, and the organisation of scientific expertise, easier for scientists to change. In relation to air policy work these factors could be assessed as follows:

Contextual factors (not so easy for scientists to change)

• For a long time there has been a consensus in society about the problem of air pollution and that air quality is important for health. No one can say "I do not breathe!". Compared to other risk issues this is a good starting point for avoiding strong conflicts.

• The public debate on air policy has not been completely black and white. Citizens have not been forced to choose between simplified versions of right or wrong, true or false.

• Big politics has been supportive: the Cold War logic in the 1970s, Waldsterben in the 1980s, and today perhaps urban air quality is playing a role.

The organisation of scientific expertise (easier for scientists to change)

• Scientific experts were early on given room for making policy, and they took it.

• A focus on certainty has been avoided. Alternative interpretations of scientific results have been discussed quite openly. No strong pressure on showing certainty to the outside world.

• Close contacts have been established between the scientific community and policy makers, The LRTAP organisation of working groups and task forces are guaranteeing this.

Additionaly, the STS lesson for good communication is that experts should avoid focussing on certainty and that there must be room for meeting places where actors can discuss and negotiate both their knowledge opinons and their identity as actors.

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5 The Agenda

Wednesday 5th October		
13:00	Welcome	Lars Lindau, Swedish EPA
	Session 1	**Chair:** Frank Raes, JRC
13:10	Science - Policy interactions within CLRTAP	Keith Bull, UNECE
13:30	How to use science in policy development for CAFE	André Zuber, European Commission
13:50	Reflections on EU politics and 'postmodern' science: Making energy policy by emission regulation?	Sonja Boehmer-Christiansen, Department of Geography, Hull University
14:20	Risk communication in post trust societies	Ragnar E. Lofstedt, Centre for Risk Management, King's College London
14:50	Coffee	
	Session 2	**Chair**: Rolf Lidskog, University of Örebro
15:20	Assessment and Policy Making: Lessons across Cases	Stacy VanDeveer, University of New Hampshire
15:40	How to communicate complicated scientific problems	Rob Maas, The National Institute for Public Health and the Environment (RIVM)
16:00	The role of science and public awareness for air pollution policies in Europe	Christer Ågren, The Swedish NGO Secretariat on Acid Rain
16:20	Refreshments	
16:40	The science and politics in the East Asian transboundary air pollution	Atsushi Ishii, Tohoku University
17:00	The roles for public participation in the generation of robust knowledge about urban air quality in Europe	Steven Yearley. Stockholm Environmental Institute at York and Department of Sociology, York University
17:30	Planing of working groups.	Peringe Grennfelt, IVL
19:30	Dinner talk. The need for trustworthy scientific knowledge in the climate negotiations.	Bert Bolin, former chairman of IPCC

Thursday 6th October		
08:30	Working groups	
10:00	Coffee	
	Session 3. Experience from ongoing research	**Chair:** Sonja Boehmer - Christiansen, University of Hull
10:30	Experiences from the ASTA project	Göran Sundqvist, Section for Science and Technology Studies, Göteborg University
10:50	Experiences from the ASTA project	Peringe Grennfelt, Swedish Environmental Research Institute, Göteborg
11:10	Research-policy communication in ACCENT the European network for atmospheric composition change research.	Frank Raes, Joint Research Centre, Ispra, ACCENT Network of Excellence
11:30	Climate Change research	Merle Jacobs, Linköping University
12:00	Lunch	
13:00	**Session 4.** Short reports from working groups	**Chair:** Peringe Grennfelt, IVL
14:00 – 18:00	Working groups (Cont.)	
19:30	Dinner	

Friday 7th October		
09:00	**Session 5.** Presentations of results from working groups	**Chair:** Rob Maas, RIVM
10:00	Coffee	
10:30	General discussion	
11:30	Workshop conclusions	
12:00	Closure of the workshop - Lunch	

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