

ESRC Festival of Social Science,  
Leeds, Nov 6<sup>th</sup> , 2012

“Late Lessons from Early Warnings  
about Environment & Health  
Hazards: what can we Learn?”

David Gee, European Environment  
Agency, Copenhagen.



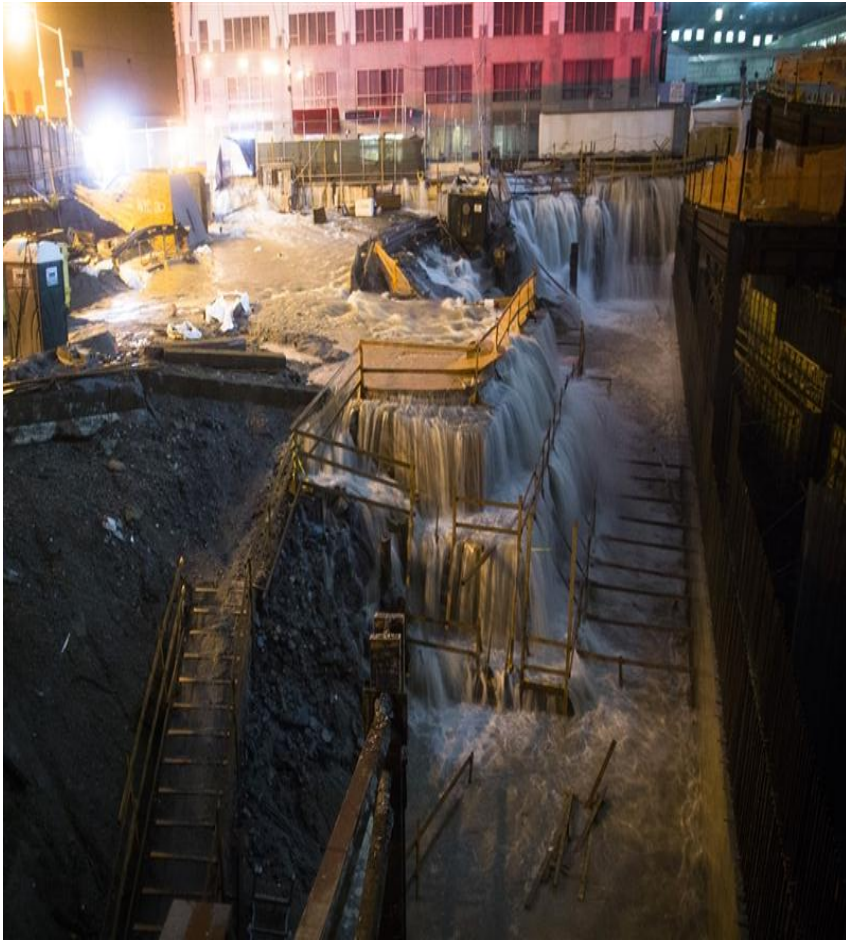
# Europe in Bloom: a living façade at the EEA



# European Environment Agency, Copenhagen. 1993-

- An “independent” Agency of the European Communities, legally independent from the EU Commission, EU Parliament, and EU Council of Ministers.
- We produce nothing but data, information, & knowledge on Environment & on Health for policymakers and the public.
- [www.eea.europa.eu](http://www.eea.europa.eu)

Only some of these images are from the film "Day After Tomorrow".







**Bloomberg  
Businessweek**

**IT'S GLOBAL  
WARMING,  
STUPID**

p8

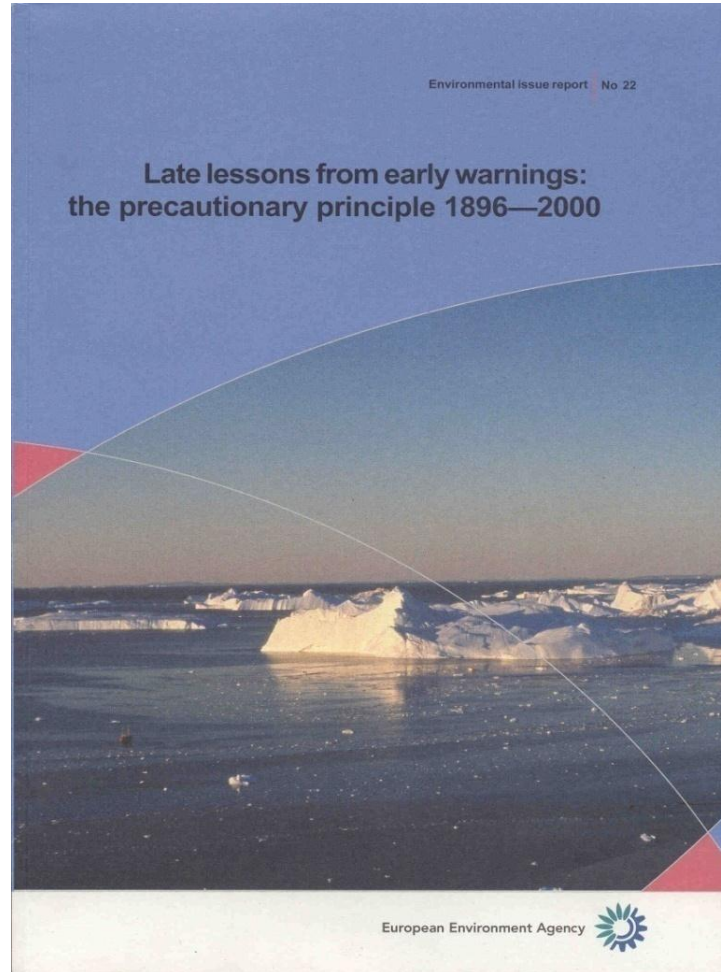


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# Homo Sapiens (Stupidus?) as Slow Learners ? EEA, 2001



**Vol 2 2013**



# Some general “Late Lessons” .....

- Avoid “**misplaced certainty**” about “**safety**”: display scientific humility, not hubris
- Acknowledge **Ignorance** (“nescience”), as well as **uncertainties**, in technology appraisals
- Account for **real world** conditions
- Make more use of **lay, local, & multi-disciplinary knowledge**
- Ensure **regulatory independence**
- Promote **robust, diverse, adaptable technologies** so as to minimise surprises and maximise innovation
- Avoid “paralysis by analysis”: **use the Precautionary Principle on “reasonable grounds for concern”**.

*See “Twelve Late Lessons”, from EEA, 2001.*

# Asbestos: the Early Warning, 1898

“the evil effects of asbestos have also instigated a microscopic examination...clearly revealed was the sharp glass-like jagged nature of the particles, and when they are allowed to rise and to remain suspended in the air of the room in any quantity **the effects have been found to be injurious as might have been expected**” (Lucy Deane, Factory Inspector ,1898, EEA “Late Lessons from Early Warnings”, 2001, p11)

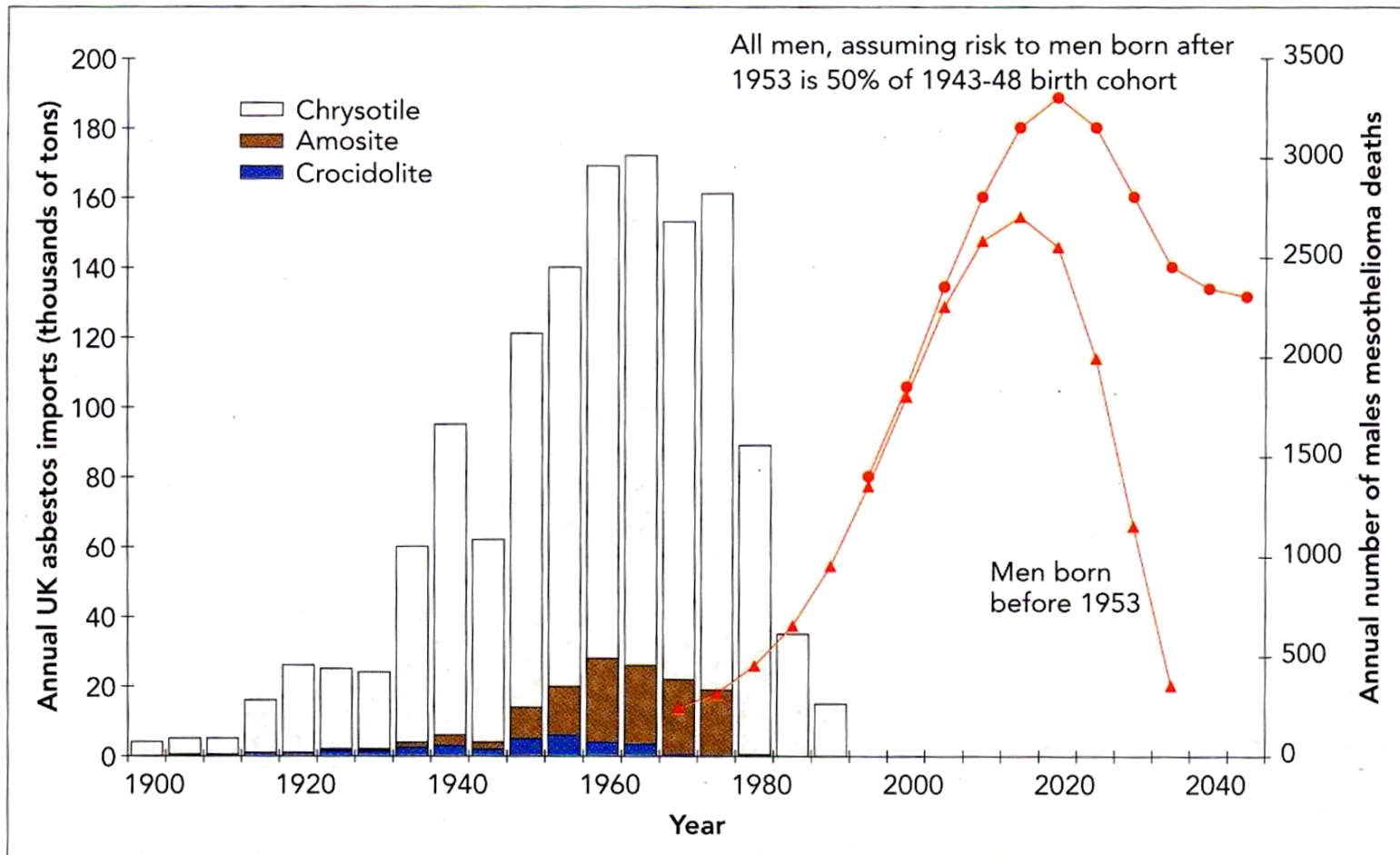
# The “Authoritative but unsubstantiated Assertion” on Asbestos, 1906.

*“One hears, generally speaking, that considerable trouble is now taken to prevent the inhalation of the asbestos dust so that the disease is not so likely to occur as heretofore”.*

*Dr Murray, evidence to UK Government Inquiry into Industrial Diseases.*

# Predicted Asbestos Deaths

UK asbestos imports and predicted mesothelioma deaths



# Some Costs of inaction: Asbestos

- 2000-2035: **400b euro** in costs to society-EU **cancers only**
- Asbestos Removal..? Billions...
- Near collapse of Lloyds Insurance via US asbestos compensation cases
- **Dutch ban in 1965 instead of in 1993?:** would have saved 34k deaths and 41 b gldrs; from the total of 56k deaths ,61 b gldrs. 1969-2030.  
*(Hearings ,1999, in Late Lessons vol 1, EEA, 2001).*

# Asbestos: banned in the EU but Use/Harm in Asia is now increasing..

*“Japan’s epidemic has only just begun.. as asbestos disease and mortality increased, the official denials of the asbestos hazard wore ever thinner, as thin as the pleura of the lungs which had so easily been penetrated by deadly asbestos fibres”.*

Dr M Harada (Minimata expert), Preface, **“Killing the Future: Asbestos Use in Asia”**, L Kazan-Allen, Int. Ban Asbestos Sec., London, 2007

# **The real costs of Asbestos were mainly paid by victims, insurance co's, and taxpayers...**

- The “external” or social costs of asbestos (eg costs of harm, contamination, and safe removal) were never internalised into the market price of asbestos.....
- which meant that innovation on substitutes was stifled by “cheap” asbestos.....
- and research/treatment/removal costs were paid mainly by taxpayers: a breach of the “polluter pays “ principle

# Remember that Exposures & Harms spread: producers, users, bystanders, families, the public.

- Asbestos **users** (eg insulators) were more at risk than asbestos **producers**.....
- It was therefore a “stupid mistake” (Julian Peto, 1998) to focus studies on factory workers ,not users.
- Many mesothelioma deaths are **domestic** (washing overalls, children of asbestos workers, Newhouse ,1965) and **environmental** (living near mines and factories).



# Curb the “ignorant expert”

*“It would be ludicrous to outlaw this valuable and often irreplaceable material...asbestos can save more lives than it could possibly endanger”.*

“The Lancet”, 1967, 17 June, p 1311/2.

.....And use multi disciplinary scientific advisers

# Where are we now with Nanofibres compared to the History of Asbestos?

- We are at about “1918” .....
- Because, like then with asbestos, we have a few suggestive pathological nano cases; some animal evidence of mesothelioma –like effects of nanofibres; and insurance company concern;
- But we also have today’s knowledge from cellular biology, and from the history of asbestos..
- And, unlike in 1918, we have an EU Code of Practice on Nano with 7 principles, including the **precautionary principle**.

“Carbon nanotubes in mice show  
asbestos-like pathogenicity”, Nature,  
May, 2008

*“Our data demonstrate that asbestos-like pathogenic behaviour associated with nanotubes conforms to a structure/activity relationship based on length to which asbestos and other pathogenic fibres belong”.....*

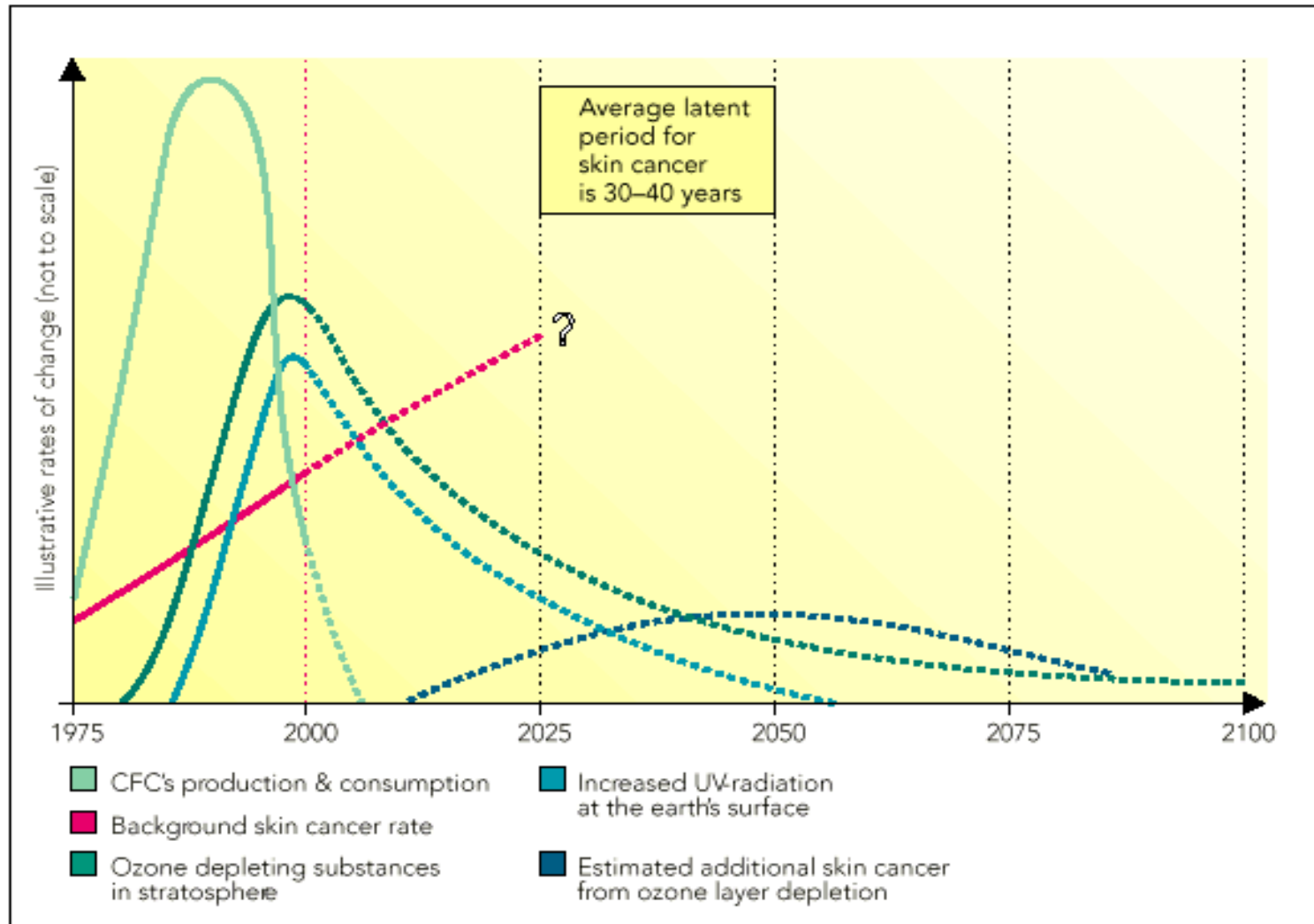
*...Our results suggest the need for **further research and great caution before introducing such products into the market** if long term harm is to be avoided”.*

*Poland C., Donaldson K., et al, MRC ,Edinburgh*

# Costs of Inaction-PCBs-and relevance to REACH regs,

- 15b euros over 1971-2018 for costs of PCB soil/site remediation; excludes health/ecosystem damage.
- Costs of REACH-2-4b euro over 10 years
- 7- 4 x benefit/cost ratio if REACH prevents 1 “PCB” over next decades..this is likely because..
- 30k untested *existing* substances: and 75% of 2k *new* substances are classified “hazardous”

# CFCs Chapter: Skin Cancer and Time Lags



“Useful truths” take years to be  
“generally received”.

*“You will see that the Opinion of this **mischievous Effect from Lead** is at least 60 years old; and you will observe with concern **how long a useful truth may be known and exist, before it is generally received and practiced on**”.*

*Benjamin Franklin, 1818, quoted in “**Lead makes the Mind Give Way**”, the leaded petrol story, EEA, Late Lessons, Nov., 2011.*

# An Early Warning about leaded petrol, 1925.

- 1924 c.15 leaded petrol production workers are strait jacketed and die of lead poisoning
- 1925 Yandell Henderson, chair Medical Research Board, US Aviation Service:

***“it seems likely that the development of lead poisoning will come on so insidiously that leaded gasoline will be in nearly universal use...before the public and the government awaken to the situation”***

***(EEA, Late Lessons ,2013)***

# “Early Warning” scientist reprimanded

- US researcher Charles Monnett reprimanded for leaking US Government emails to green campaign groups about the climate change risks to polar bears...
- ..but cleared of scientific misconduct..
- New Scientist Oct 6<sup>th</sup> 2012.



# False reassurance by quake experts gets them manslaughter verdict

- 6 seismologists and a civil servant “falsely reassured” people of L’ Aquila that major Earthquake would not happen.
- Week later 300 killed in the quake.
- A local “Early Warning” scientist’s views were dismissed by experts

# “Misplaced certainty in Safety”

- **BSE, UK: “*Dissident scientists tended to be treated with derision*” & Government main aim was to *re-assure the public* that beef presented no risk  
*(Phillips BSE Inquiry 2000)***
- **“Misplaced certainty about absence of harm played key role in delaying preventive actions”**

*Late Lessons from Early Warnings, EEA ,2001*

# EEA Early Warning on Possible Cancer Hazards of Mobile Phones, 2007

“Over the last two years the epidemiological evidence of possible cancer risk ***amongst the 10 year plus mobile phone user group***, has got stronger. It is now also supported by ***preliminary scientific reports on the damaging effect to cells of RF and ELF exposures***. This is a **cause for concern**, given the widespread and generally rising exposure of the public, especially children, to RF from mobile phone technology”.

*(Jacquie McGlade, Executive Director ,EEA, September 2007).*

# The “Perils of the Precis?” where text is not reflected in the summary...

## The Abstract (Precis)

“Since 2001 **extensive research** has been conducted.. **no health effect has been consistently demonstrated** at exposure limits below the limits of ICNIRP

## But on p28 of Text..

..for “less than 10 years” exposure ....(and)

“For **longer term use, data are sparse**, since only some recent studies have reasonably large numbers of long term users. **Any conclusion therefore is uncertain and tentative**”.

“in particular for **acoustic neuroma** some data indicate that an association with RF fields from mobile telephony is possible.. there is **limited evidence of a weak association**.”

”

# Mobile phones and Head Cancer: the evidence now? (2012)

- International Agency for Research On Cancer/WHO, 2011 : radiation from mobile phones is a 2B “possible” carcinogen risk for head cancer based on human studies
- Italian Supreme Court, Oct, 2012, awards occupational disease benefit to man with relevant head cancer after 12 years of c. 5 hours a day of mobile phone use.
- Evidence still only tentative, but stronger than 2007, and enough to justify exposure reductions.

# Prof. Needleman On Consistency of research results from complex biology...

”Consistency in nature does not require that all, or even a majority of studies find the same effect. **If all studies of lead showed the same relationship between variables, one would be startled, perhaps justifiably suspicious**”

*Needlemann (1995) "Making Models of Real World events: the use and abuse of Inference", Neurotoxicology and Teratology, vol 17, no. 3.*

# Is “Negative” Evidence really Non-Positive Evidence?

**“No evidence of Harm” is not the same as  
“evidence of no harm” .....**

Because no **relevant** research is available: or because of the limitations on what *could* be known with existing methods, under conditions of biological & ecological complexity and multi-causality.

# What is the “Knowledge/Ignorance Ratio” & Research Focus?

- The K/I ratio is **high** (much Knowledge, little Ignorance) for **Asbestos**, after 111 years of research since first “Early Warning” in 1898...
- But the K/I is **low** (little Knowledge, much Ignorance) for most **Chemicals, Nanotech, GMOs, EMF/RF, ....**
- Partly because there has been much more Research Expenditure into **Technological Applications** than on **Hazards** eg currently 10-20x more publicly funded research on **Nano, GMOs, & EMF** applications than on their hazards.

*See Nano, GMOs, EMF, and “Knowledge into Action?” chapters in “Late Lessons”, vol 2, EEA, Jan 2013.*



# Research: how much spent on products and on protecting People/Environments?

EU Public Research 2002-2013	Products	Protection
Nanotechnology	5 billion	112 million (2%)
Biotechnology	3.5billion	203 million (8%)
Information Communications Technology/EMF	12.7 billion	9 million (0.01%)

# EU Research on Products and Protection (Health & Environment)

	Products	Protection
EU Research 2002-2013	70 billion	465 million (0.7%)

# On Biases in Producing Scientific Evidence..

- Methodological
- **Funding**
- **Intellectual**

# Funding Biases..

- See the Vatican and its seeking of scientists who would contradict Galileo.

*(See "Rivals", M. White for examples of personal controversies between scientists)*

- See histories of Asbestos, Lead, Pharmaceuticals , Tobacco, BPA, Mobile phones...

where source of funding of the research strongly influences nature of the results

# Intellectual Bias in the Beef Hormones case at WTO.....2008.

“The European Communities alleges that the Panel disregarded its "most important objection **that Drs. Boisseau and Boobis, who participated in the drafting of JECFA reports, could not be independent and impartial because they were asked to evaluate the risk assessments that were "very critical of the JECFA reports"**”.

The European Communities observes that as "co-authors" of the JECFA reports, these experts "cannot be considered to be independent and impartial in these circumstances, **because this would amount to asking them to review and criticise reports that are their own doing"**”.

*Source: p27, para 65 World Trade Organization, WT/DS320/AB/R, "United States-Continued Suspension of Obligations in the EC-Hormones Dispute", (16 October 2008)*

**Evaluating Evidence: Sources of Divergent Risk Assessments**  
**Conclusions from EEA workshop. May 28/9, 2008 on Mobile Phones,**  
**BPA, Power lines, Pesticides Spray Drift.**

- **Institutional:** Constitution/Mandate/Membership of Scientific Review Committee; Qs to address; Paradigms?
- **Evidence accepted for review?**
- **Weights given to Evidence Reviewed?**
- **How are overall judgements on quality and strengths of evidence made?**
- **Are options for action & consequences of inaction considered?**

***Most of these scientific judgements are intransparent.***

# Sufficient evidence for action?

“The Case for Action”

“.... we must surely ask what is involved in our decision... it almost inevitably leads us to introduce ***differential standards*** before we convict.”

Bradford Hill. “Environment and Disease: Association or Causation?”  
1965

# Bradford Hill on different Strengths of Evidence for different cases

- ***“relatively slight evidence”*** enough to justify pregnancy pill ban
- ***“fair evidence”*** needed to reduce/eliminate exposure to an effective but probable carcinogenic oil at work
- ***“Very strong evidence”*** needed to justify for government restrictions on personal smoking, fuel use, or diets.

*Bradford Hill, The Environment & Disease: Association or Causation?”, Proc Roy. Soc Med ,1965, 58, 295-300.*



# Some Strengths of Scientific Evidence....

- **Beyond all reasonable doubt** (scientific causality & criminal law)
- **Reasonable certainty** (Int.Panel Climate Change , 2007)
- **Balance of probabilities/evidence** (IPCC,2001; civil law)
- **Strong possibility** (IARC on ELF ,2002; on RF 2011)
- **Reasonable grounds for concern**(EU Communication on PP)
- **Scientific suspicion of risk** (Swedish Chemicals Law,1975)
- **“Pertinent information”** (WTO SPS justifying member state actions to protect health  
.....which are appropriate for different purposes, depending mainly on the costs of being wrong in acting/not acting

**The “appropriate “ strength of evidence  
for precautionary action is an Ethical  
choice, not a Scientific issue**

*Who benefits, and who gains, from **being wrong** in acting, or not acting, early enough to prevent harm?*

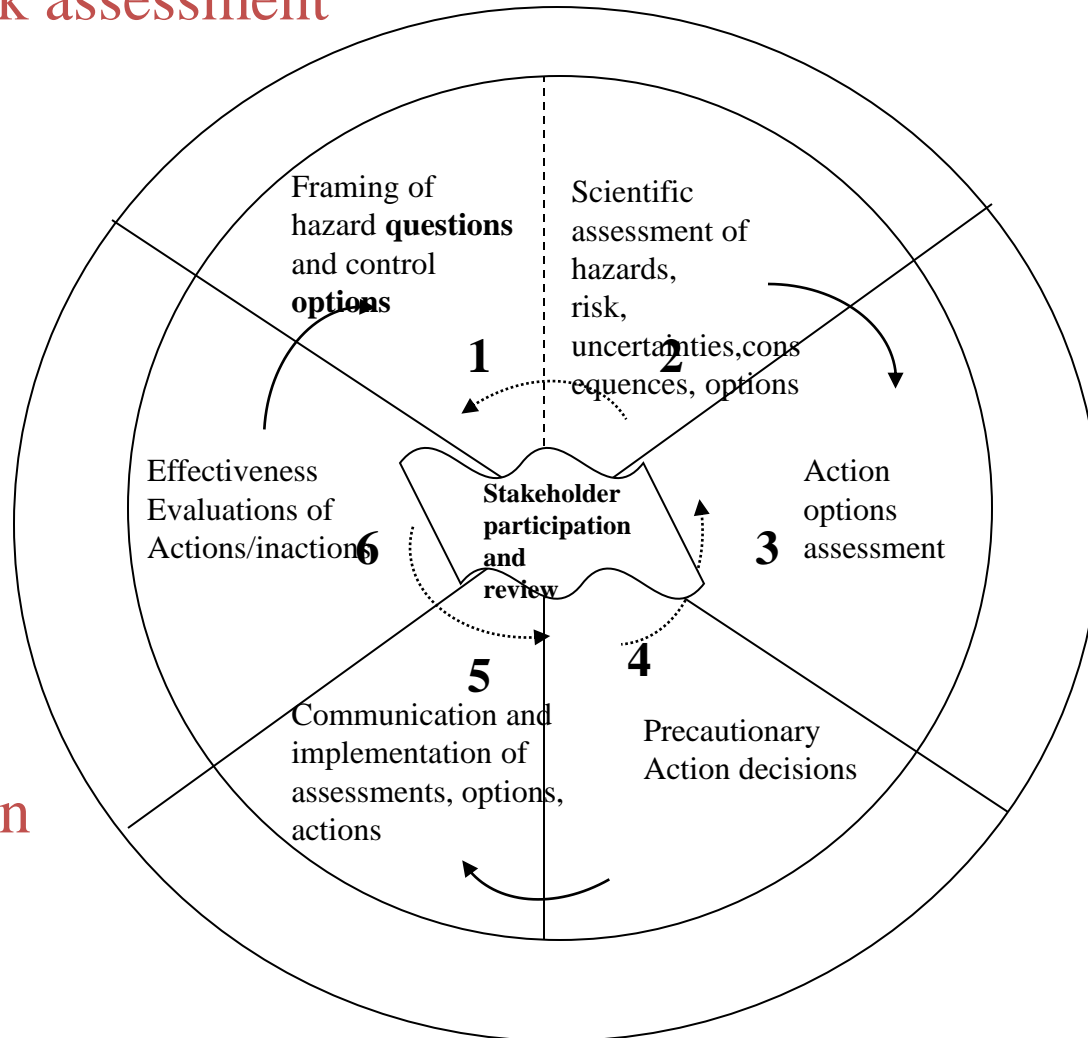
**Short term, specific, economic interests?  
Or the longer term health & wellbeing  
of people and their environments?**

# EEA working definition of the Precautionary Principle

“The PP provides justification for public policy actions in situations of *scientific complexity, uncertainty and ignorance*, where there may be a need to act in order to avoid, or reduce, potentially serious or irreversible *threats* to health or the environment, using *appropriate strengths of scientific evidence*, and taking into account the likely *pros and cons* of proportionate actions and inactions”.

# A Participatory & Precautionary Framework for Risk Analysis.

1+2 Risk assessment



5+6 Risk Communication

3+4 Risk Management

EEA ,based on NRC,(1996) , US Presidential Commission on Risk (1997), UK Royal Commission on Environmental Pollution (1998) , and NAS, "Science and Decisions," 2009

# Early Warnings and Systemic risks in Global Finance: a similar story ..

*“In a global market the signs of **Super-Systemic risk** are multiplied. However..inadequate risk assessments relied on **overly simplistic linear models**..that did not take into account..the non-linear nature of the hazards involved in international financial markets..causing these multiplied **signals to be overlooked**”*

Jacopo Torriti, London School of Economics,  
2012.