



**The Abdus Salam
International Centre for Theoretical Physics**



1986-7

**WCRP and ICTP Interpreting Climate Change Simulations: Capacity
Building for Developing Nations Seminar**

26 - 30 November 2007

**Regional Climate Science: Why (& How) to Do it?
Roundtable “motivator”.**

Ann Henderson-Sellers
*World Climate Research Programme
Geneva
Switzerland*

Regional Climate Science: Why (& How) to Do it? Roundtable “motivator”

Dr A. Henderson-Sellers Executive Director,
World Climate Research Programme

WCRP 
World Climate Research Programme



ICSU

Millions of Jobs at Risk

- 'Warming is taking place even faster than the models predicted,' says World Meteorological Organisation (WMO) Secretary-General Michel Jarraud.



http://www.straitstimes.com/Latest+News/World/STISStory_176278.html

Regional Climate for Real Decisions

Reg. climate is for decision making & makers so:

1. who are the climate decision makers?
2. who cares if they make bad/ poor decisions?

I ask Climate science: who cares what we know?

Regional Climate for Real Decisions

Reg. climate is for decision making & makers so:

1. **Climate decision makers – media/politicians**

2. who cares if they make bad/ poor decisions?

I ask Climate science: who cares what we know?



Regional Climate for Real Decisions

Reg. climate is for decision making & makers so:

1. who are the climate decision makers?

2. **Poor decisions, who cares? – those affected**

I ask Climate science: who cares what we know?



(AFP PHOTO)



Regional Climate for Real Decisions

Reg. climate is for decision making & makers so:

1. who are the climate decision makers?
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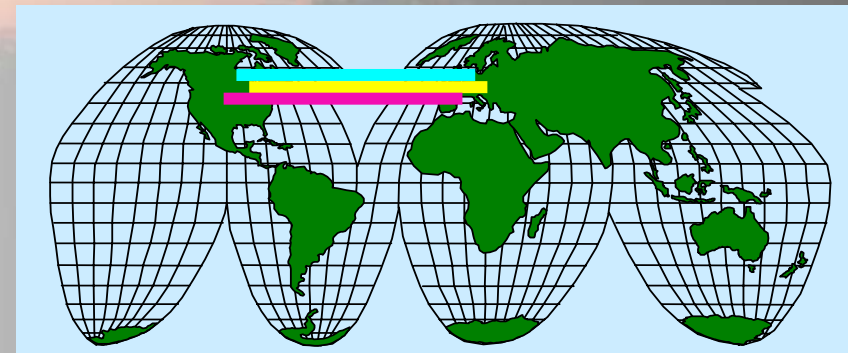
I ask Climate science: who cares what we know?

We, the people, all of us. We are all affected every time society has to pick up the pieces of a poor climate decision. All of us!



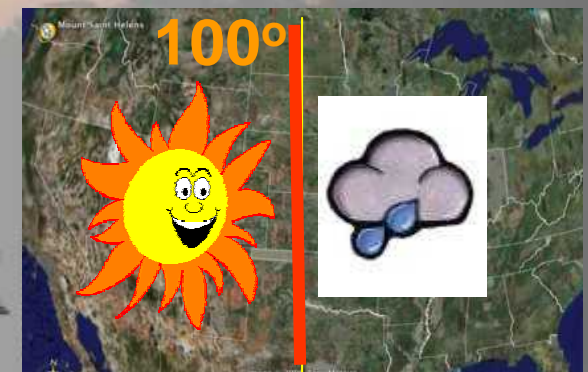
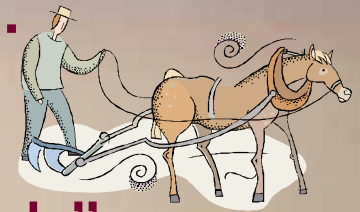
Bad Climate Decisions 200AD

- Climate decisions misled by a model:
 - Ptolemy's (2nd century) *clima* or parallel bands sharing climate was still accepted & used in the fifteenth century
- European colonization of N. America disproved it:
 - French and British confused by very severe winters colonists suffered in Nova Scotia - latitude of N. France
 - Colonists in Virginia dismayed by destruction of silk cultures in the first (very bad) winter
 - British gave up attempts to settle Newfoundland in early 17th century despite it being on the same parallel as south England



Bad Climate Decisions 1850AD

- After American Civil War land pressure encouraged politicians' & news editors' claims:
 - challenge desert plains west of 100°W meridian
- The “garden myth” of climate was born:
 - planting crops & trees increases rainfall
- Settlers believed “rain follows the plough”
- Until 1880s when rainfall dropped to an all-time low & farms in west Kansas & Nebraska were abandoned



Bad Climate Decisions: Future

“We look to the environment for the food and fuel, and the medicines and materials, that our societies depend on. We look to it as a realm of beauty, and of spiritual sustenance. But let us not be deceived, when we look at a clear blue sky, into thinking all is well. All is not well. Science tells us that if we do not take the right action now, climate change will bring havoc, even within our lifetime.”

Kofi Annan,
Secretary
General UN,
Opening Address
to the World
Summit on
Sustainable
Development,
Johannesburg,02

Bad Climate Decisions: Future



“Much more must also be done by governments, business and civil society. The world needs a more coherent system of international environmental governance. We need to invest more in green technologies and smarter policies.” UN SG Ban Ki-moon, 2/2/07



Mass Media & Climate Decisions

Today, target is decision making & makers. I ask:

1. who are the climate decision makers?
2. who cares if they make bad/ poor decisions?

Climate science: who cares?

Mass Media & Climate Decisions

Today, target is decision making & makers. I ask:

1. **Climate decision influencers – mass media**

2. who cares if they make bad/poor decisions?

Climate science: who cares?

Independent Saturday 11 Feb 2006



Mass Media & Climate Decisions

Today, target is decision making & makers. I ask:

1. who are the climate decision makers?
2. **Poor decisions, who cares? – viewers/readers**

Climate science: who cares?



Mass Media & Climate Decisions

Today, target is decision making & makers. I ask:

1. who are the climate decision makers?
2. who cares if they make bad/ poor decisions?

Climate science: who cares?

We, the people, all of us. We are all affected every time society fails to sort out the full truth of poor mass media coverage. All of us!



*Greenland's ice
is melting*

EL PAIS

EDITADO POR DIARIO EL PAIS, SOCIEDAD LIMITADA

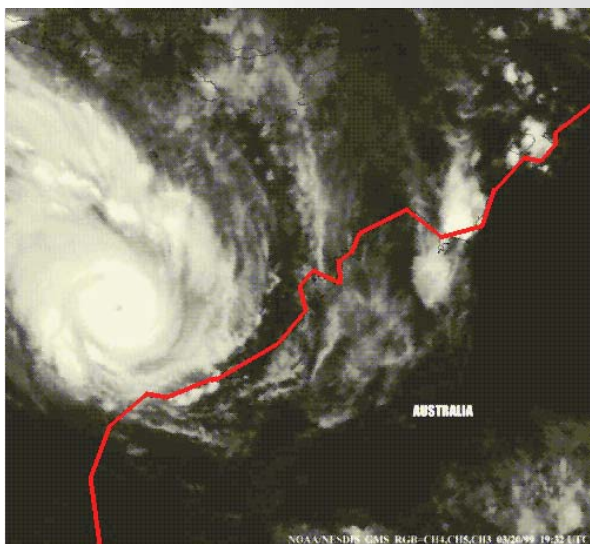
As the Arctic ice retreats, the old
Great Game begins to boil over

Media as Climate Mediator

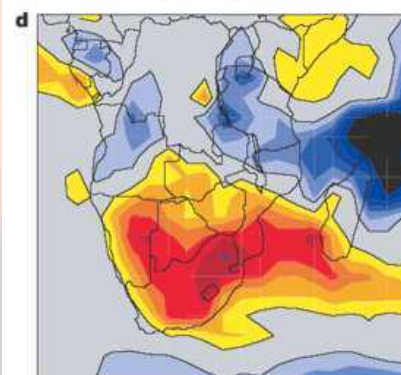
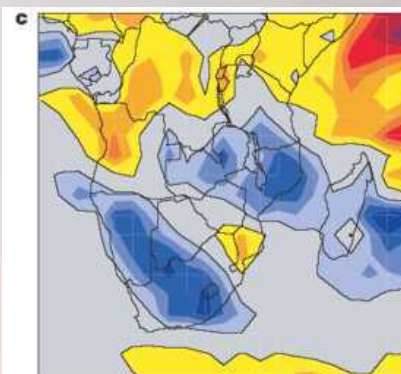
For every
PhD there
is not an
equal and
opposite
PhD

- The most powerful force for change in modern society
- About ideas and debate as well as people and events
- In business to make money
- Seeking the largest audience
- Today, more about entertainment than information

Media as Climate Mediator



Cyclone Hit



Climate Culture Clash

Guardian Unlimited network

- The most powerful force for change in modern society.
- About ideas & debate as well as people and events
- In business to make money
- Seeking the largest audience
- Today, more about entertainment than information



Climate Culture Clash

- Climatologists do:
 - detail, data and method
 - objective and careful research
 - teamwork and shared credit
 - incremental progress
 - qualified views
 - peer consultation

- Journalists want:
 - application: what it means to people
 - emotion and drama
 - heroes, not teams
 - ‘breakthroughs’ (hot news)
 - controversy/conflict
 - clear comment NOW!

Political Climate Decisions

Today, target is decision making & makers. I ask:

1. who are the climate decision makers?
2. who cares if they make bad/ poor decisions?

I ask Climate science: who cares what we know?

Political Climate Decisions

Today, target is decision making & makers. I ask:

1. **Climate decision makers – national leaders**

2. who cares if they make bad/poor decisions?

I ask Climate science: who cares what we know?



Political Climate Decisions

Today, target is decision making & makers. I ask:

1. who are the climate decision makers?

2. Poor decisions, who cares? – those affected

I ask Climate science: who cares what we know?

United Nations Framework Convention on Climate Change

aims to stabilize greenhouse gas emissions

stabilise g'house

“...at a level that would prevent dangerous anthropogenic interference with the climate system.”

Political Climate Decisions

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1. who are the climate decision makers?
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I ask Climate science: who cares what we know?

We, the people, all of us. We are all affected if the UN fails to follow through on its agreed climate convention goals.

WCRP
World Climate Research Programme



ICSU
International Council for Science

Climate Science & Politics

- Science is a low-order issue in politics
- Funding science mean less funds for other priorities
- Scientists and politicians seldom meet
- Total mismatch in timeframes
- Science has low electoral impact
- Science is based on facts: politics on emotions
- They speak different languages



Climate Science & Politics

- Climatologists need
 - detail and method
 - independence and objectivity
 - focus on the future
 - to “look at these data”
 - speak about their science, not possible consequences
 - careers to remain apolitical
 - and regular funding
- Pollies want:
 - application: what it means to voters
 - personal political advantage / emotion
 - advice on today’s issue
 - just the headlines, not all the data
 - forewarning of controversy
 - science to support politics
 - cost/benefits

IPCC Assessment: TAR '01; FAR '07

- Mitigation* WG Summary for Policymakers :
“known technological options could achieve a broad range of atmospheric CO₂ stabilization levels...over the next 100 years or more” *Metz *et al.*, 2001
- But Wigley *et al.*, 2001 say cf. 12 TW now
Stabilization at 550-350 ppmv CO₂ requires emission-free power by 2050 of 15-30 TW
while Hoffert *et al.*, 2002 say:
“sources able to produce 100-300% of world consumption w'out g'house emissions **do not**



energy
elephant

exist”

are climate reports honest?

Climate Decision Advocates

Today, target is decision making & makers. I ask:

1. who are the climate decision makers?
2. who cares if they make bad/ poor decisions?

I ask Climate science: who cares what we know?

Climate Decision Advocates

Today, target is decision making & makers. I ask:

1. Climate decision advisers – ‘climatologists’

2. who cares if they make bad/poor decisions?

I ask Climate science: who cares what we know?



In the streets: Sydneyites protest at Australia's refusal to ratify Kyoto.

Climate Decision Advocates

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Climate Decision Advocates

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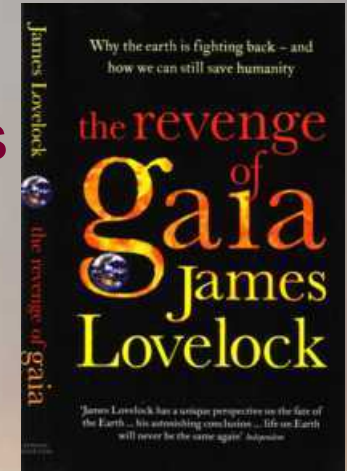
I ask Climate science: who cares what we know?

We, the people, all of us. We are all affected every time society repatriates or repairs as the result of climate decisions.



'Climatologists': Who are We?

Kenneth Hare said in 1978, “you hardly heard the word professionally in the 1940s. It was a layman’s word. Climatologists were the halt and the lame ... in the British service you actually had to be medically disabled in order to get into the climatological division



...It was clearly not the age of climate. Now it is. It’s the respectable thing to do ...”.

So - climatic determinism?

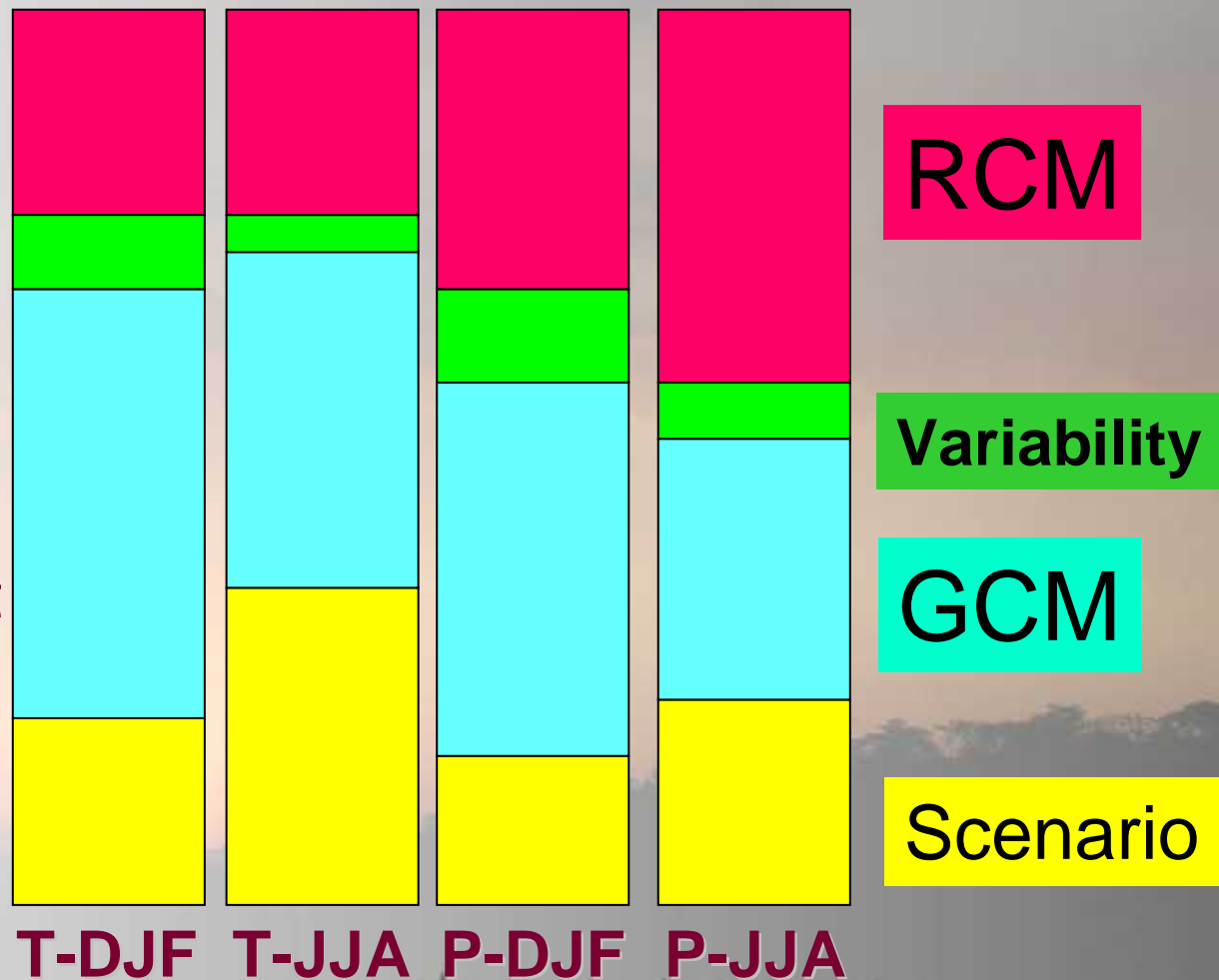
Griffith Taylor wrote (*in Geography in the twentieth century, 1951*): “The best economic programme for a country to follow has in some part been determined by nature and will be modified by natural and human processes.”



Sources of Regional Uncertainty

Temperature (T) and precipitation (P) changes (2071-2100 minus 1961-1990) for Europe from ensemble of PRUDENCE simulations. NB. The scenario range is about half of the full IPCC range and GCM range not the full IPCC range.

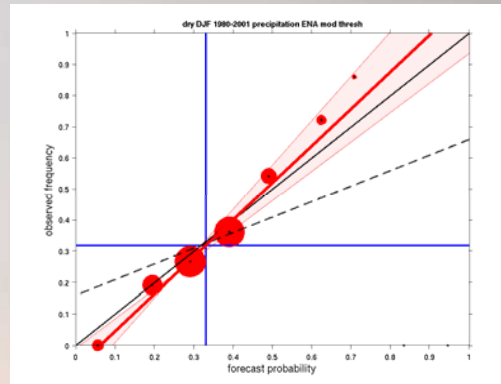
after Deque et al. (2005) & Giorgi 2007



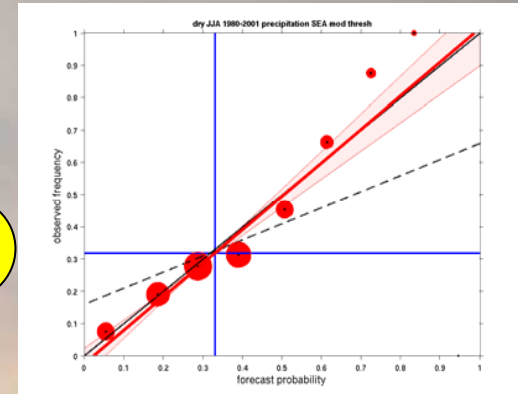
Reliability of Precip. Predictions

- Why are precipⁿ forecasts good in some regions e.g NE USA but unreliable in other regions e.g. India?
- Almost certainly result of common systematic errors in regional modes of variability over all models

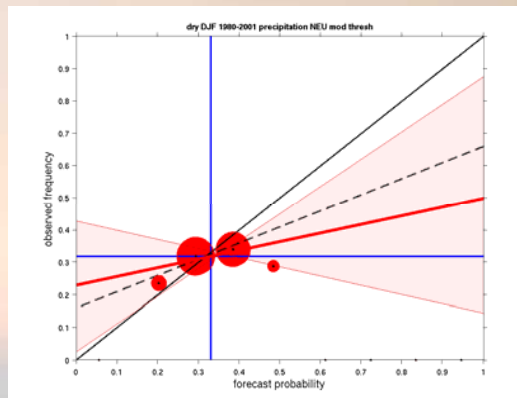
Eastern North America dry DJF



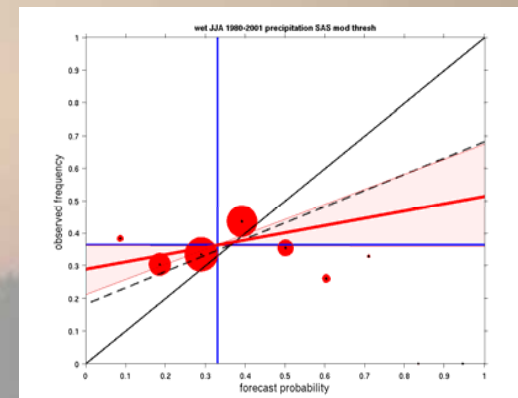
Southeast Asia dry JJA



Northern Europe dry DJF



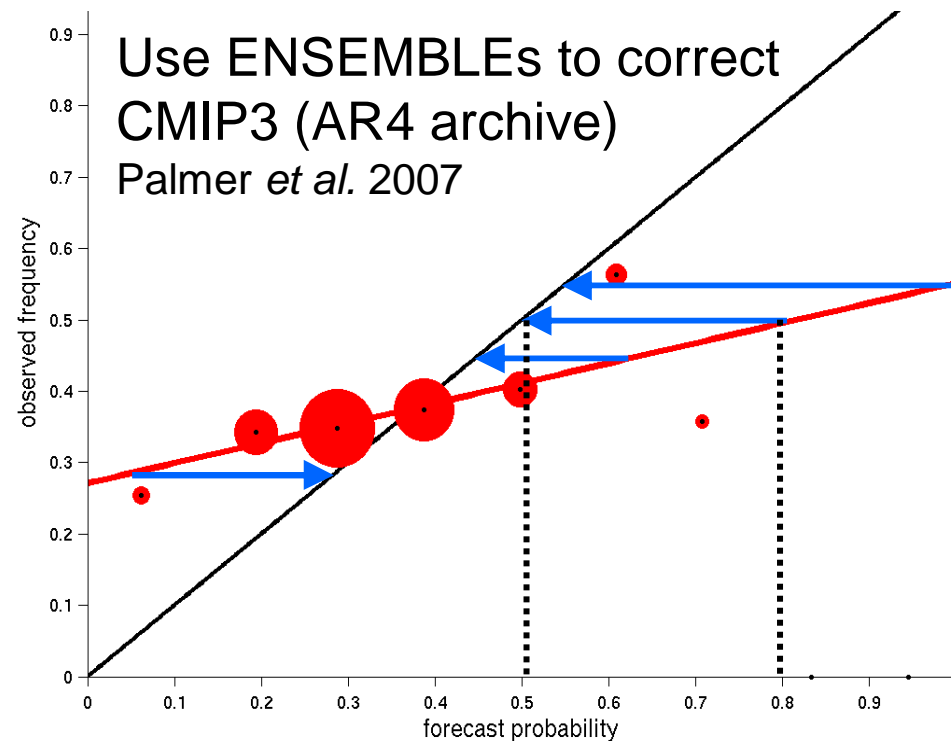
Indian Monsoon wet JJA



Reliability of multi-model seasonal precip for 'Giorgi' regions

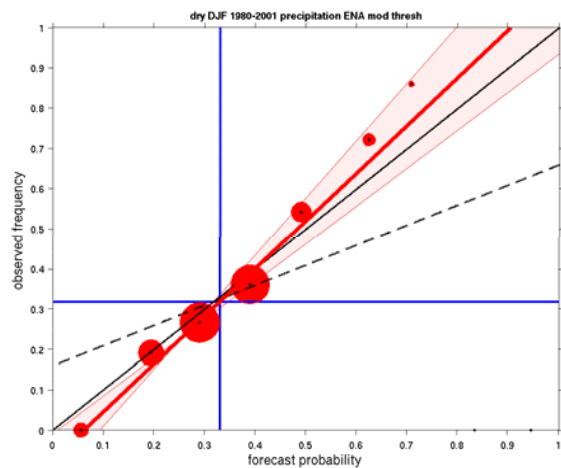
Reliability of Precip. Predictions

Calibrating Probabilistic Forecasts

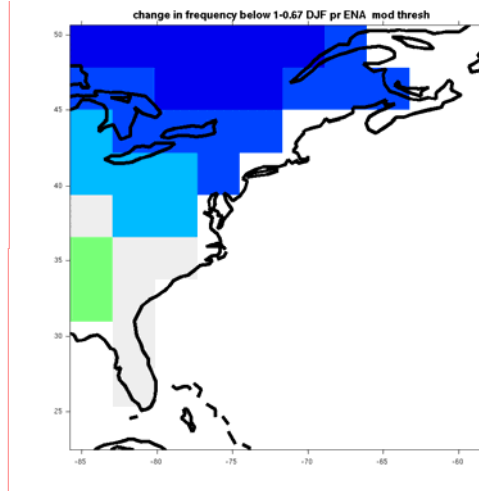


East N. America cf. Indian Area

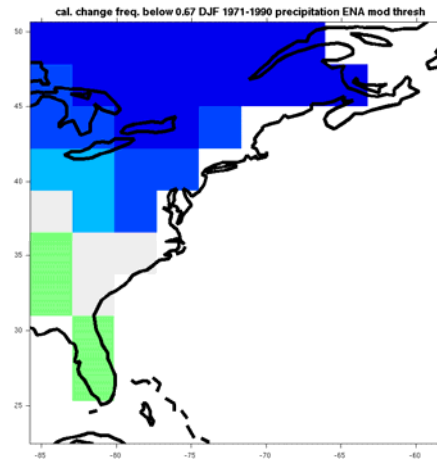
East North America: Dry DJF



DEMETER
Reliability



AR4 Uncalibrated



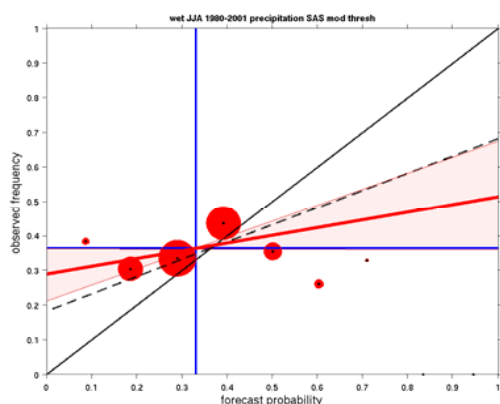
AR4 Calibrated



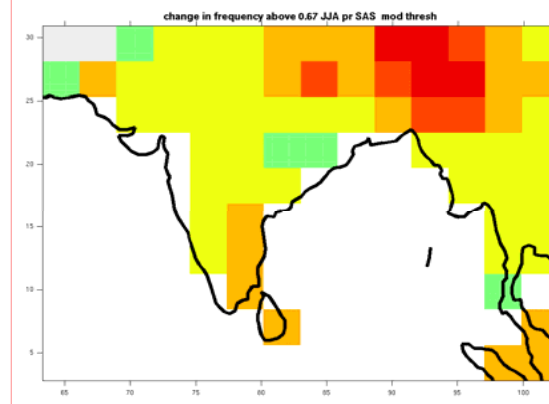
**NARCCAP's use of RegCMs ? OK for Mississippi floods 1993
e.g. Arritt et al., 2007 but models differ & mean still best**

East N. America cf. Indian Area

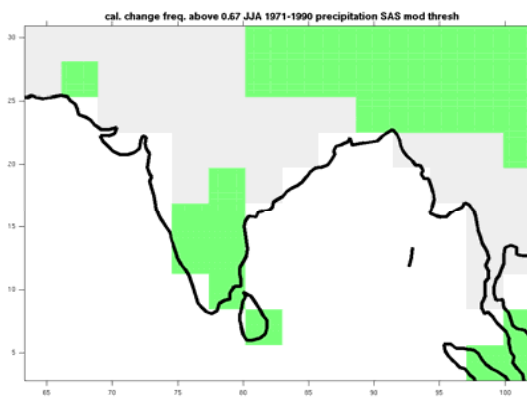
Indian area: Wet JJA



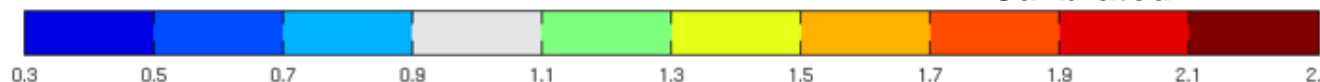
DEMETER
Reliability



AR4 Uncalibrated



AR4 Calibrated



NARCCAP's use of RegCMs ? OK for Mississippi floods 1993
e.g. Arritt et al., 2007 but models differ & mean still best

Monsoon with PRECIS suspect
e.g. Rupa Kumar et al. 2007 SES Conf, Aug 07

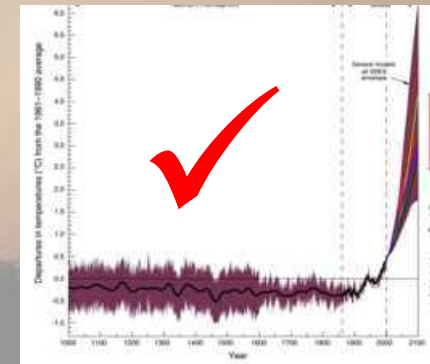


Peoples' Perception of Science

❖ Is climate research honest? *

- Climate 'judged' by 'hockey stick' debate?
- "There is a concerted effort to undermine the IPCC: Some believe that if they bring down Mike Mann, they can bring down the IPCC," says Ben Santer
- Or by other disciplines' failings: Hwang (stem cells), Schon (physics), Parijs (biology)
- Claims lobbying of/muzzling by gov^{ns}
- Hansen v. NASA; Milly v. NOAA
- Withholding results: >10% medics (Nature 435, 727, 2005)

US National
Academy of
Sciences 22
June 2006



* 2006: Nature 23 Feb, 891-7; EOS 7 Feb, 63

United Nations' Climate Confusion

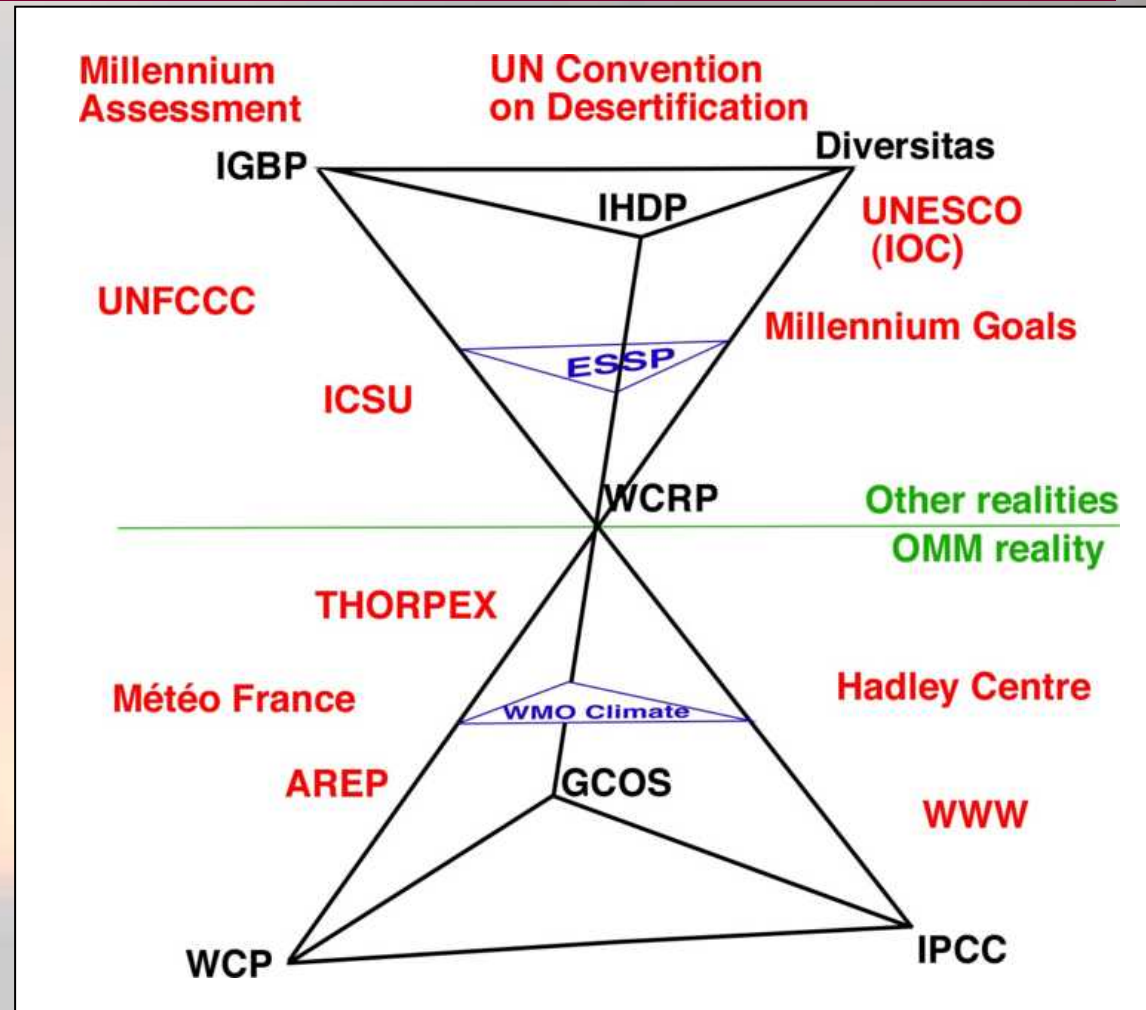
The 2007 IPCC report, compiled by several hundred climate scientists, has unequivocally concluded that our climate is warming rapidly, and that we are now at least 90% certain that this is mostly due to human activities. The amount of carbon dioxide in our atmosphere now far exceeds the natural range of the past 650,000 years, and it is rising very quickly due to human activity. If this trend is not halted soon, many millions of people will be at risk from extreme events such as heat waves, drought, floods and storms, our coasts and cities will be threatened by rising sea levels, and many ecosystems, plants and animal species will be in serious danger of extinction.

The next round of focused negotiations for a new global climate treaty (within the 1992 UNFCCC process) needs to begin in December 2007 and be completed by 2009. The prime goal of this new regime must be to limit global warming to no more than 2 °C above the pre-industrial temperature, a limit that has already been formally adopted by the European Union and a number of other countries. Based on current scientific understanding, this requires that global greenhouse gas emissions need to be reduced by at least 50% below their 1990 levels by the year 2050. In the long run, greenhouse gas concentrations need to be stabilized at a level well below 450 ppm (parts per million); measured in CO₂-equivalent concentration). In order to stay below 2 °C, global emissions must peak and decline in the next 10 to 15 years, so there is no time to lose.

As scientists, we urge the negotiators to reach an agreement that takes these targets as a minimum requirement for a fair and effective global climate agreement.

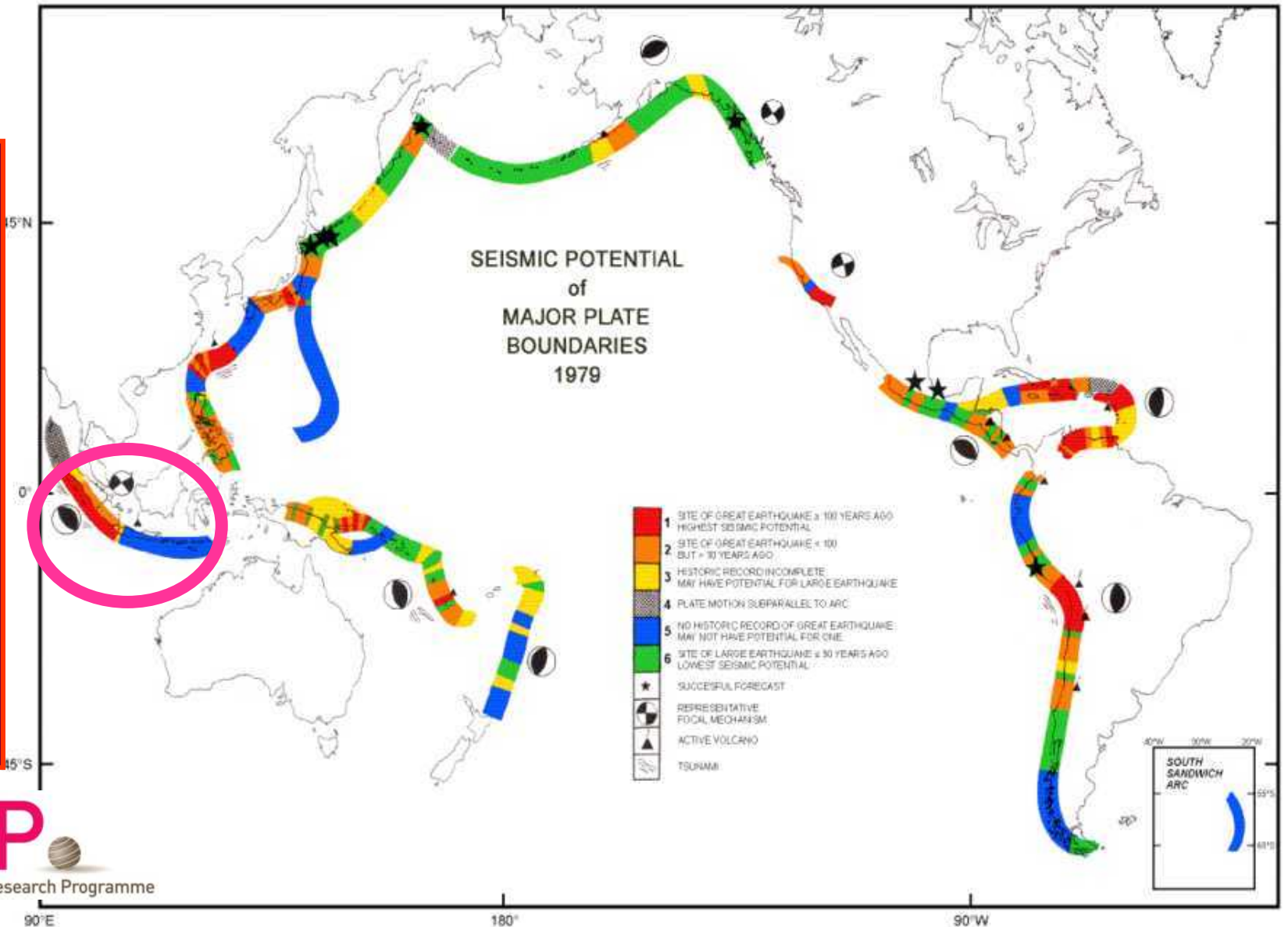
United Nations' Climate Confusion

- What is a FLA?
Four Letter Acronym
- How to 'swim' in UN acronyms soup (watch for sharks!)
- Who in UN says what?



Not Only Climate Science Ignored

2004
Boxing
Day
tsunami
area
said to
be high
danger
zone in
1979



Not Only Climate Science Ignored

- Developed nations reduced CFC use by 99% since 1987 BUT some replacements are also O₃ depleting
- Global Env. Fund has initiated 120 projects post 1991 avoiding 1.2 billion tonnes CO₂ BUT economic growth in West has offset all this mitigation
- Exports aid LDCs' economic growth BUT a 'cheap' bag of salad greens in UK costs 20-50 litres water in Kenya

Climate and Energy

Today, target is decision making & makers. I ask:

1. who are the climate decision makers?
2. who cares if they make bad/ poor decisions?

Climate science: who cares what we know?

Climate and Energy

Today, target is decision making & makers. I ask:

1. **Climate decision makers – energy lobbyists**

2. who cares if they make bad/ poor decisions?

Climate science: who cares what we know?



International Council for Science

Climate and Energy

Today, target is decision making & makers. I ask:

1. who are the climate decision makers?
2. **Climate decisions, who cares? – oil industry**

Climate science: who cares what we know?



Climate and Energy

Today, target is decision making & makers. I ask:

1. who are the climate decision makers?
2. who cares if they make bad/ poor decisions?

Climate science: who cares what we know?

We, the energy consumers, all of us. We are affected by socio-economics linked to many poor climate decisions. All of us!



Elephant in the Room



Stages of Addiction

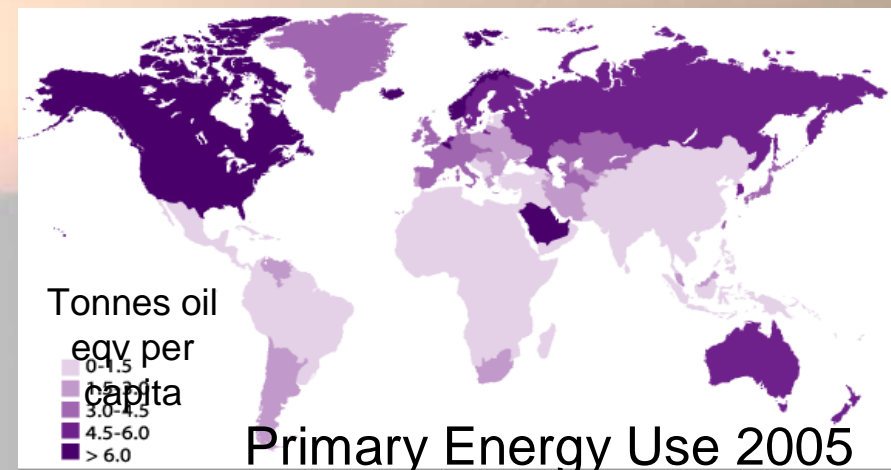
- tolerance
- withdrawal response
- relief on reinstatement
- compulsion
- narrow behaviours
- salience
- re-instatement

Symptoms of Addiction

- reduced effect for same energy
- disagreeable feelings at removal
- pleasure when energy returned
- craving for energy
- energy dependent behaviour
- increased priority for energy
- rapid return to energy dependence after abstinence

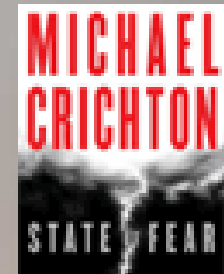
Spencer (1990)

**Global power consumption
~ 12 TW (85% fossil-fuel)**



Media & Pollies “Fuel” Debate

- **Media chases risks, controversy & balance**
 - But there is not always equal & opposite science
- **Fiction exploits science in ‘thrillers’**
 - ‘Day after Tomorrow’ movie (May 2004)



scenarios...news.nationalgeographic.com/news/2004/05/0518_040518_dayafter.html

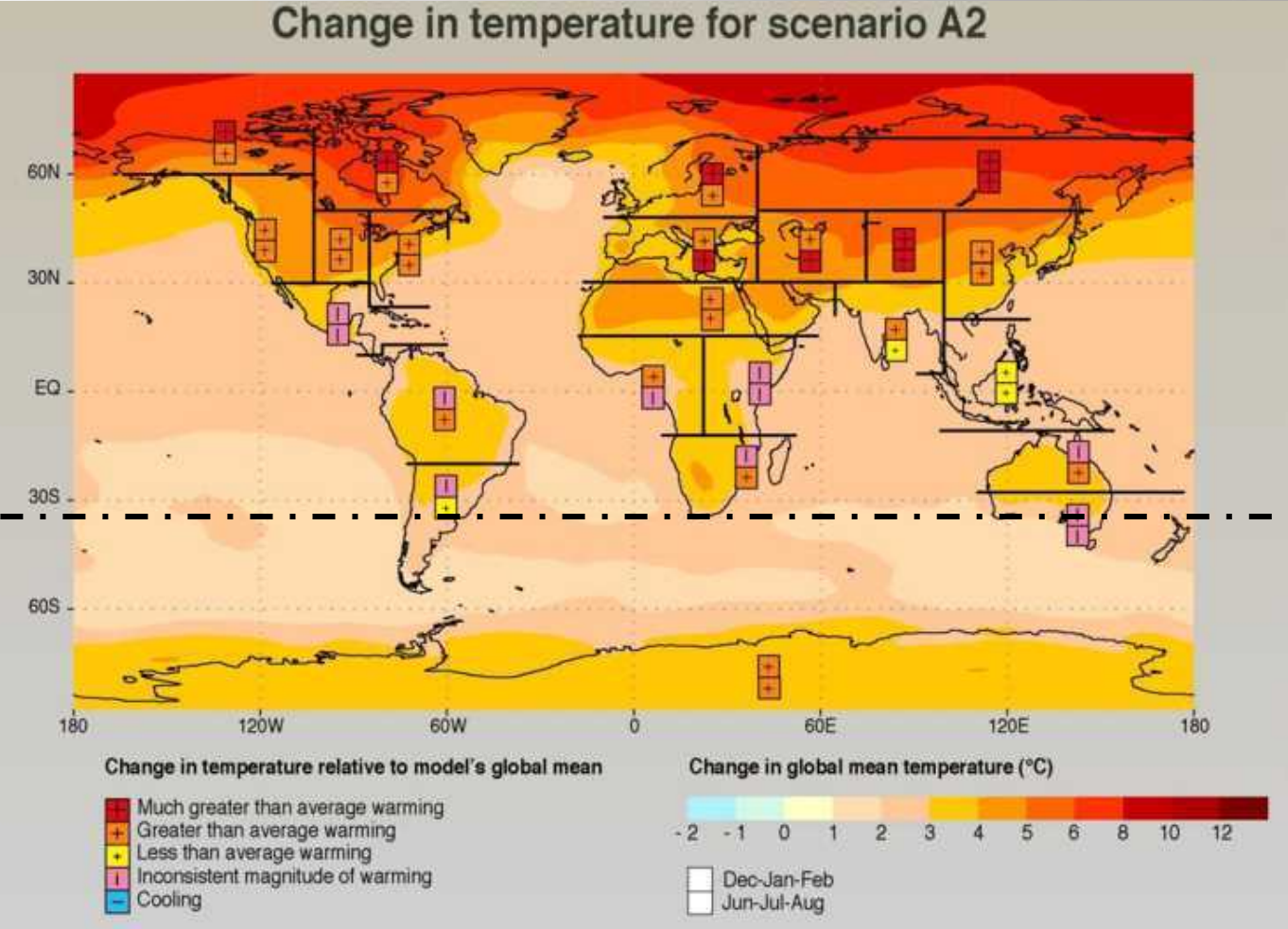
- **Crichton’s ‘State of Fear’ novel (Dec 04) e.g. p 425**
What Michael Crichton got wrong www.earthinstitute.columbia.edu

- ❖ **Public consciousness & political agendas need such airings to work through issues**

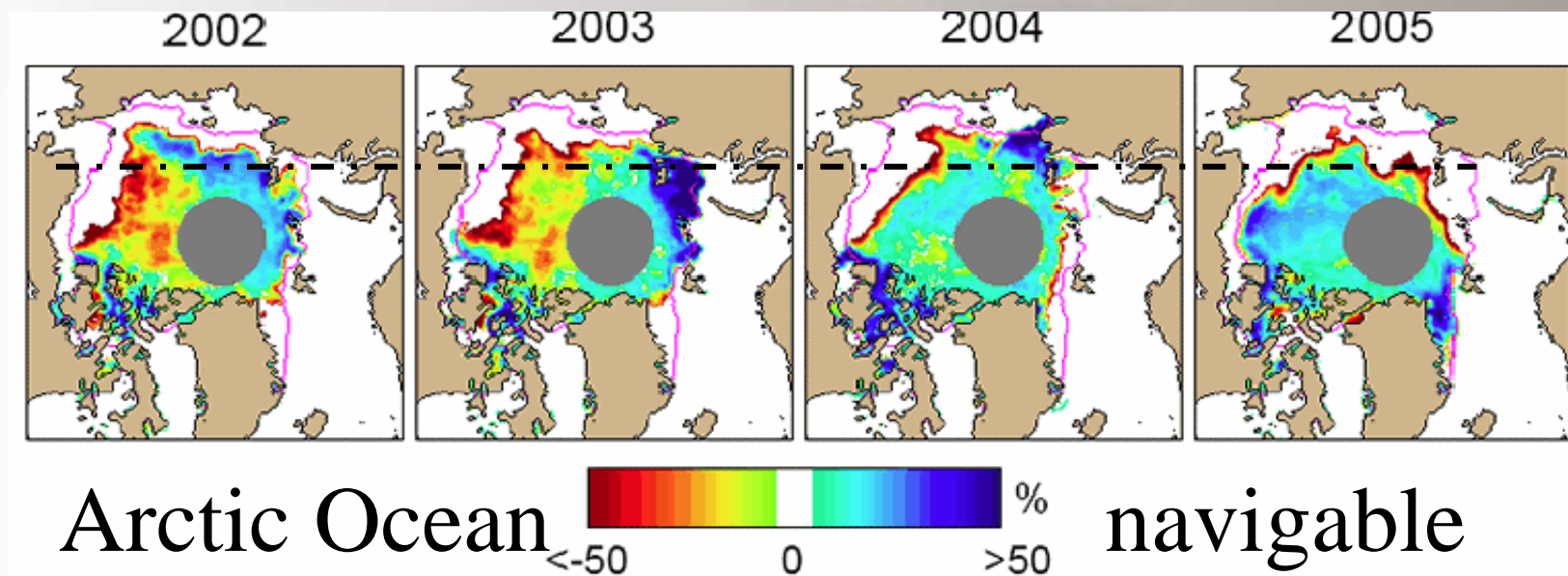
- ❖ Pentagon warned about ‘extreme & sudden’ climate events 2003 **“Imagine the Unthinkable”**



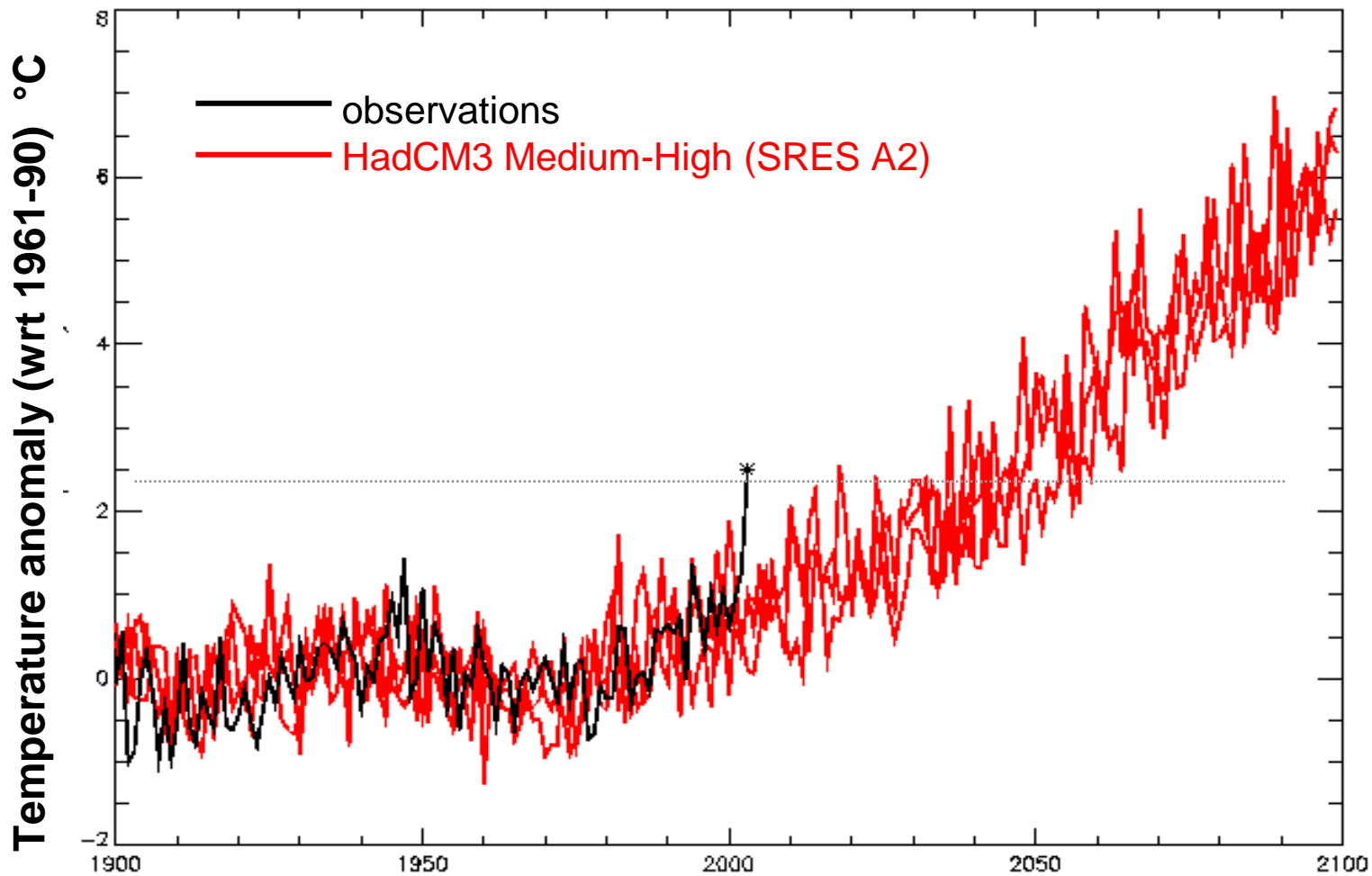
Does Anyone Win as it Warms?



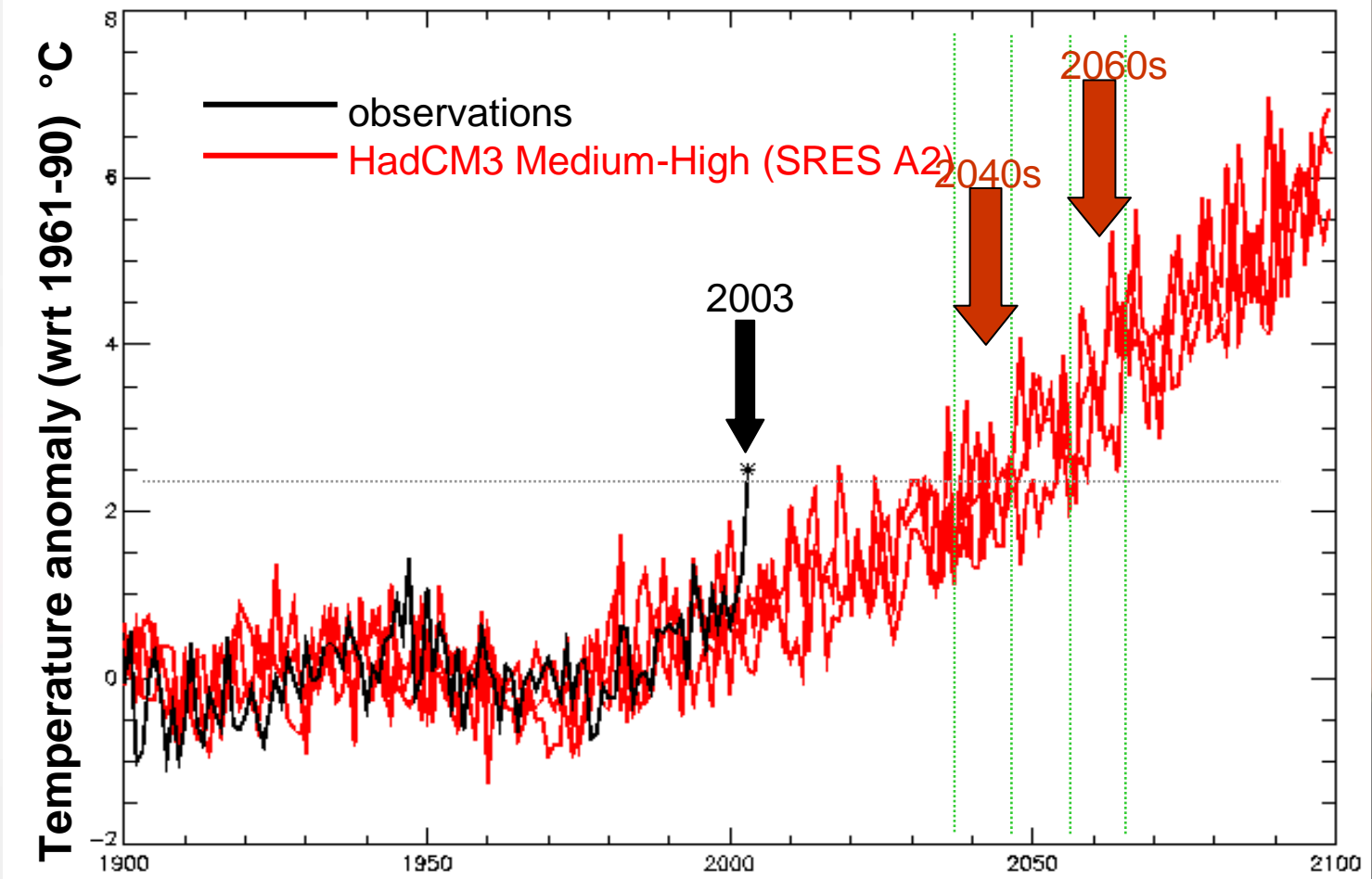
Does Anyone Win as it Warms?



Does Anyone Win as it Warms?

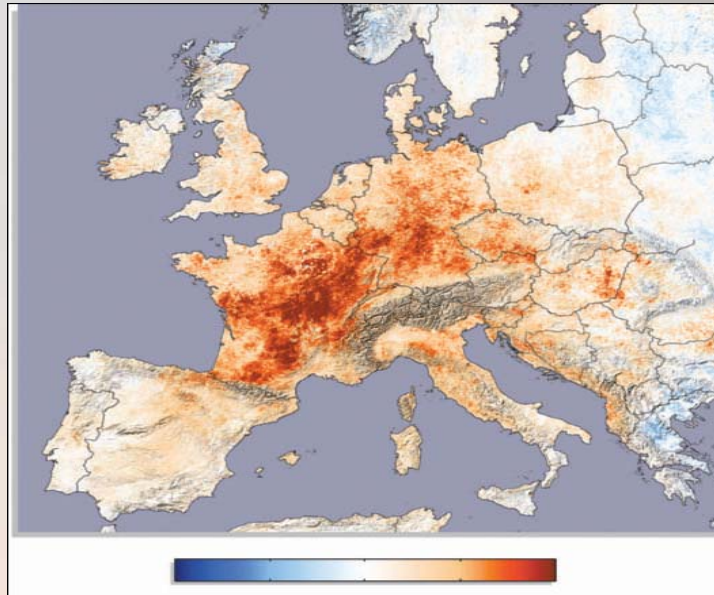


Does Anyone Win as it Warms?



Europe 2003: normal 2040, cool by 2060

Does Anyone Win as it Warms?



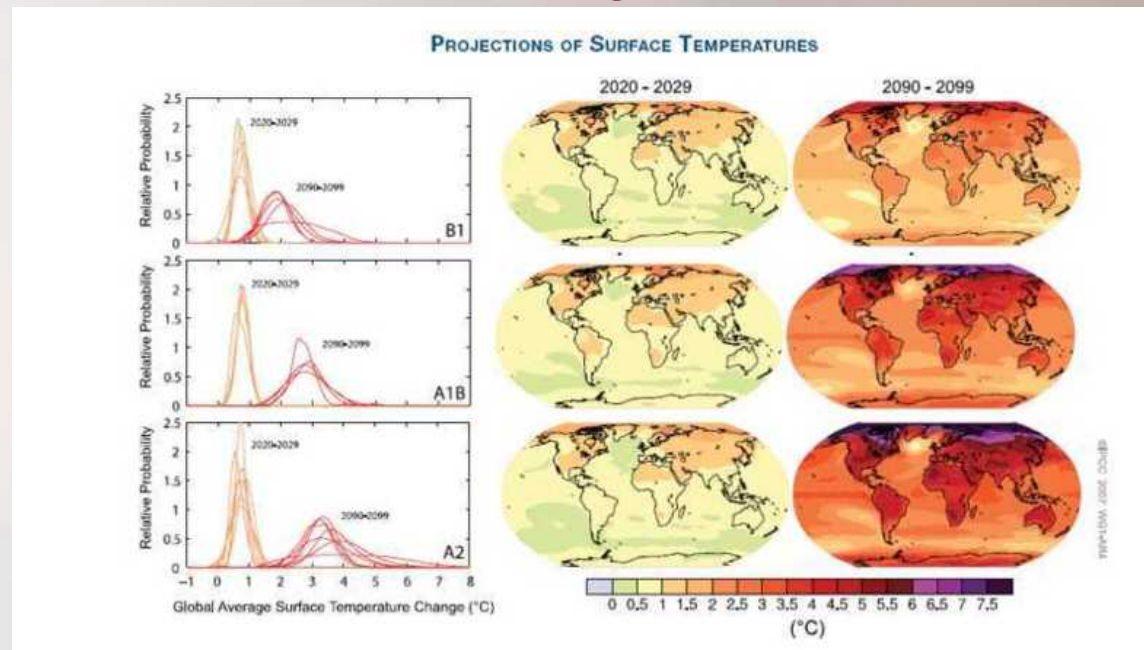
Europe Aug 03

Heat wave killed 30,000 & cost €1.3 billion

Nobel for Climate Change



- IPCC and Al Gore (Jr) “.. for their efforts to build up and disseminate greater knowledge about man-made climate change, and to lay the foundations for measures that are needed to counteract such change”

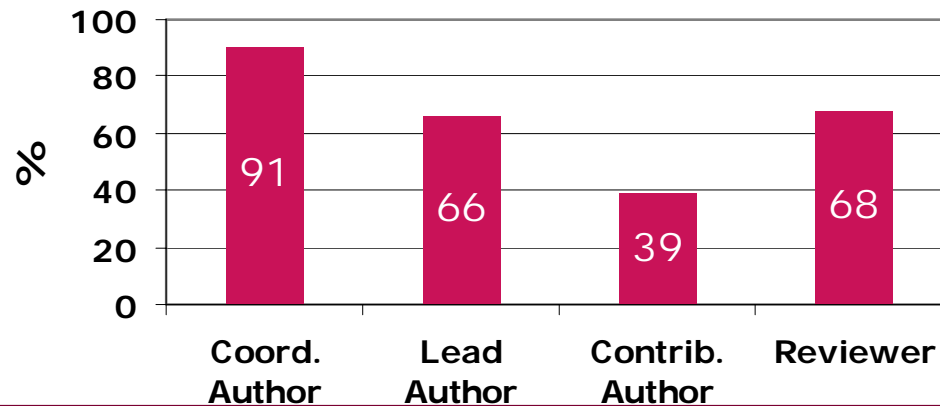


Nobel for Climate Change



- IPCC AR4 CMIP3 archive: > 1050 users, 260 pubs
 - WCRP is mainstay of WG1 (science) plus input WG2 & 3
 - ESSP-WCRP Side Event at SBSTA-26, May 2007

WCRP % in IPCC WG1



WCRP *central* to IPCC AR4: 75% of over 100 figures in WG1 Chapter 8-11 are CMIP3 based as are 4 of 7 in SPM

Menaces climatiques, menaces pour la paix



Al Gore voulait être président des Etats-Unis. Il sera Prix Nobel de la paix. KEYSTONE

Post AR4 Action Call for Policy

BUT Climate change research entered a new regime with the IPCC AR4.

Climate change researchers can no longer hide behind the need to improve models/observations. Answers are being demanded faster, & at higher resolutions than, research can deliver. It is essential the climate change research community be transparent & honest about what it can/not deliver & how (if ever) current inadequacies can be resolved.

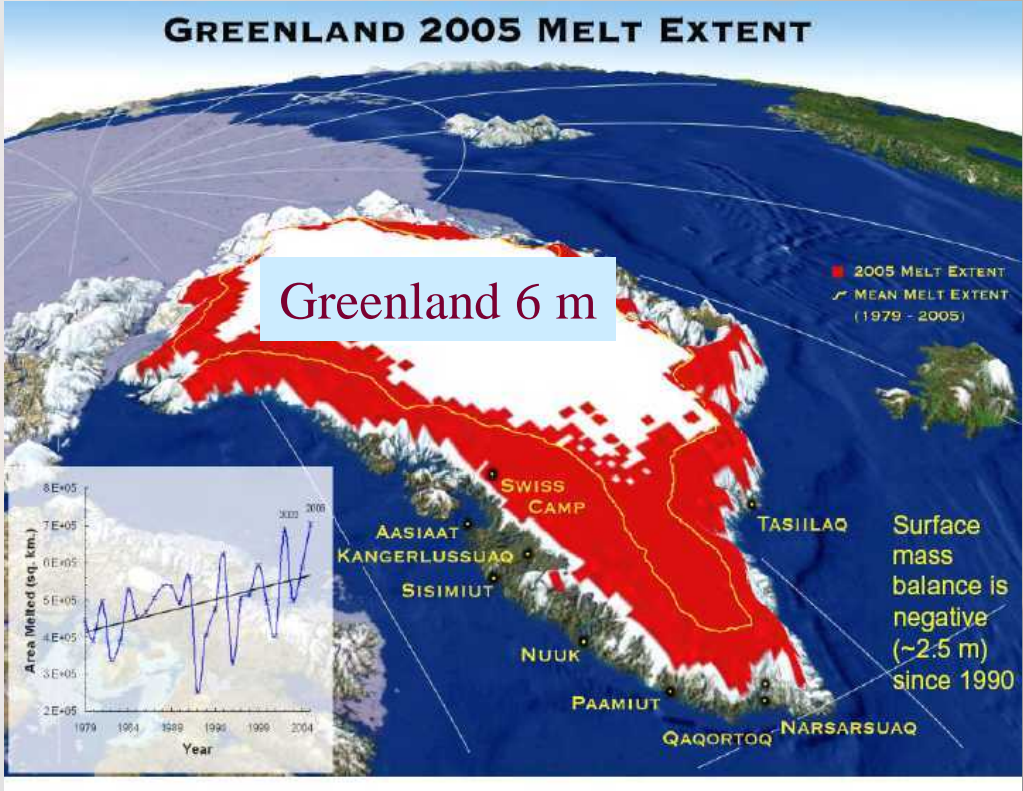
Priorities for climate change research from workshop survey:

Policy

- unlikely to be either complete or even constitute a unanimous list. These represent gaps that clearly have a detrimental impact on our current understanding and on our ability to move adequately fast to combat the consequences of greenhouse warming.

- Assess whether we are heading into a danger-zone and how fast/where.
- Provide pathway options to obtain thresholds like the 2°C limit goal of the EU.
- Examine policy-driven questions to learn to understand how others see the world and what scientists need to do to help resolve such non-science priorities.
- Conduct rolling reassessment building on what works, discarding what is weaker and revisiting with governments and stakeholders their priority needs.
- Establish metrics of transient change *impacts* to detect and monitor the most likely (best predicted) changes of importance for rapid adaptation response.
- Assist in determining what adaptation measures are needed.
- Achieve understanding of the carbon-cycle & stabilizing emissions levels of GHG.
- Increase confidence in the relationship between stabilizing emission and temperature rise (and check we are not drawing inappropriate conclusions)

Sea-level Rise: Speed Kills Wins



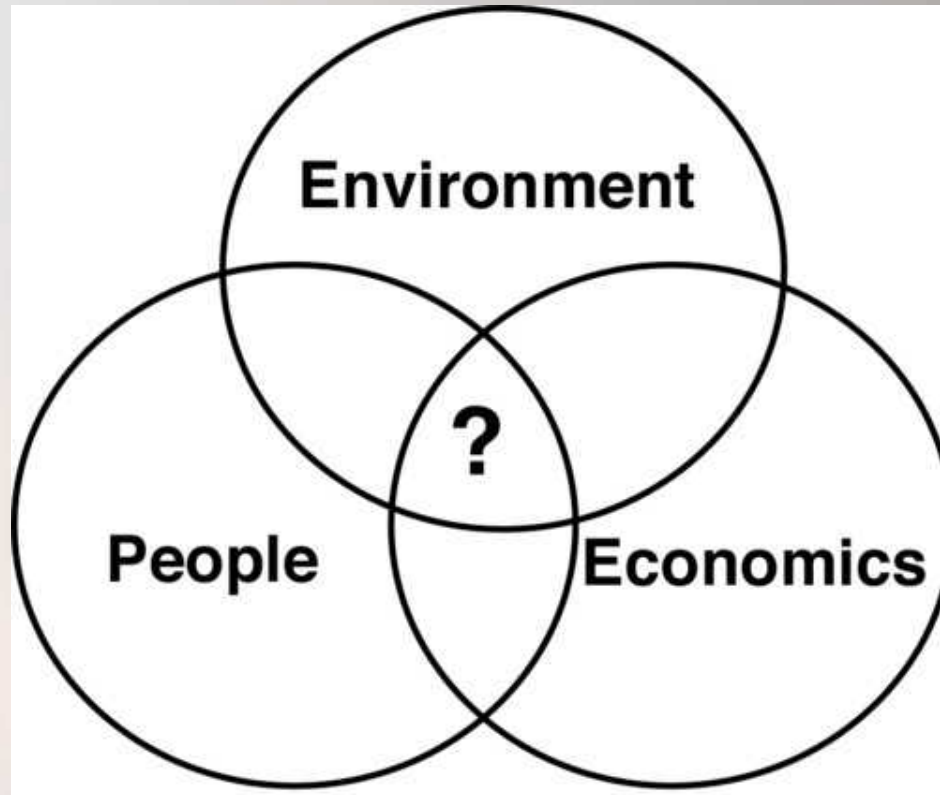
- 1/2 world's population live within 60 km of coasts
- By 2040 > 3/4 of us will live on or close to coasts

Global Climate & Energy Addicts



Become anti-energy activist

Can we limit our usage?



Assume we'll be helped?

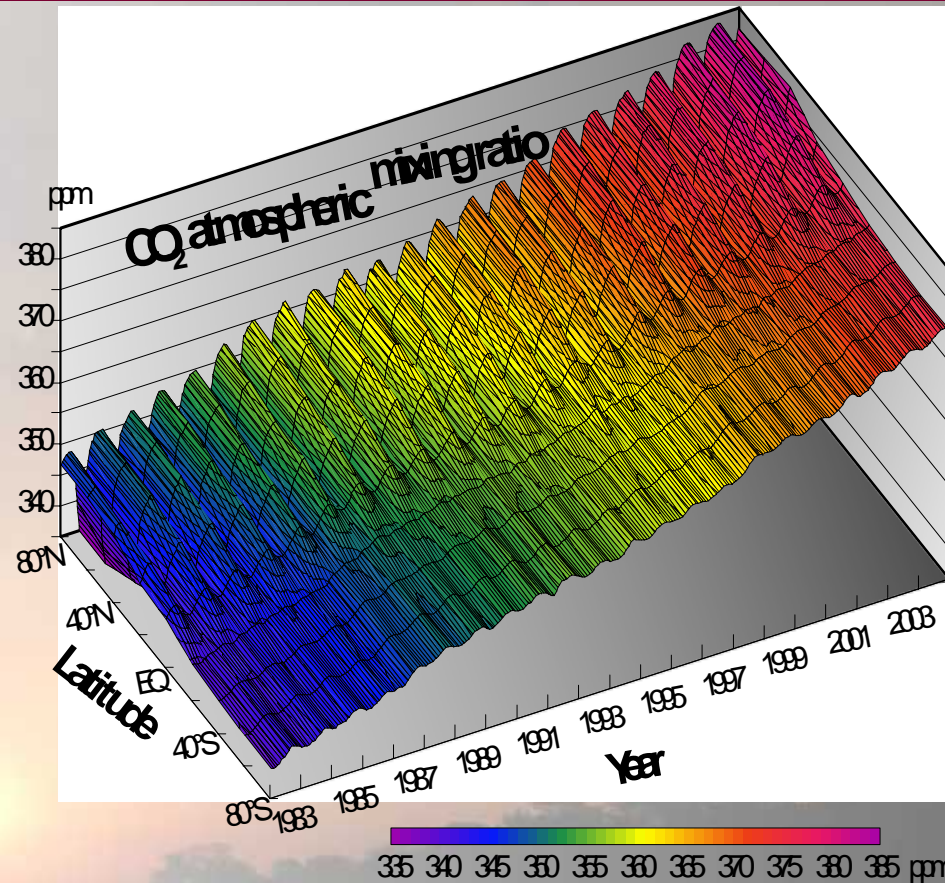
Lie awaiting the tech fix?



WCRP
World Climate Research Programme



Global Climate & Energy Addicts



What to do about the energy elephant?

Just Another 'Crisis' Talk?

Now take personal responsibility



There are solutions we can achieve:

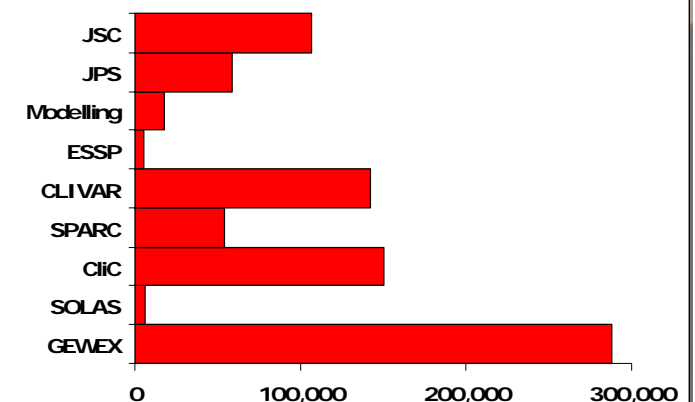
1. Empower politicians to fix up the UN i.e:

- Ensure its specialized agencies work better
- Reduce the power of World Bank and IMF

2. take personal responsibility


- inform yourself & your group
- reduce your energy addiction

WCRP CO₂ Emissions in kg (2005)



Just Another 'Crisis' Talk?

Now take personal responsibility



Q. How many light bulbs does it take to save the planet?

A. Just the one, says the International Energy Agency

By Andy McSmith

The simple use of current technology could have a dramatic impact on global warming, if only we would adopt it. The low-energy light bulb - like the one shown here - and other efficient lighting systems could prevent a cumulative total of 16 billion tons of carbon from being added

to the world's atmosphere over the next 25 years, according to a report by the International Energy Agency.

The agency said it would not need any technology that is not already widely available and - far from costing money - it would save more than £1,000m. The light used for homes and offices is a major cause of climate change and also

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Monday 3 July 2006

NEWSPAPER OF THE YEAR
THE INDEPENDENT



ICSU
International Council for Science

Creating Public Good Wealth

- 9 March 2006 advert in the *Hamburger Abendblatt* from Dr Jochem Marotzke, Head Max Planck Institute for Meteorology:
 - “Human activities have already demonstrably changed global climate... greater changes coming
 - Some future consequences cannot now be prevented: so human society will have to adapt
 - Others changes may be prevented.....Everyday measures can contribute to climate protection”
- A “climate game” paid for this advertisement

Creating Public Good Wealth

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NEWS & VIEWS

1 June 2006, Nature 441, 583

Max-Planck-Institut für Meteorologie
Max Planck Institute for Meteorology

Professor Jochem Marotzke, Geschäftsführender Direktor des Max-Planck-Instituts für Meteorologie in Hamburg:

„Der Mensch hat das globale Klima bereits nachweislich geändert und weitere, wesentlich größere Änderungen sind für dieses Jahrhundert zu erwarten. Der Ausstoß von CO₂ und anderen Treibhausgasen wird die globalen Erwärmung weiter verstärken. Als Folge müssen wir mit häufigerem Auftreten von Klima- und Wetterextremen über 15.000 Todesfällen allein in Frankreich, werden hä...

Verantwortlich für den Text: Professor Jochem Marotzke, Max-Planck-Institut für Meteorologie, Hamburg. Diese Anzeige wurde durch Spenden finanziert. Studenten der Universität Hamburg nahmen an einem „Klimaspiel“ teil, das die Bereitschaft der Teilnehmer erforschte, eigenes Geld für den Klimaschutz auszugeben. Für weitere Informationen siehe Pressemitteilungen „Gewinn muss nicht klimpern“ auf unserer Homepage www.mpimet.mpg.de sowie unter www.mpg.de auf der Homepage der Max-Planck-Gesellschaft.

alone businesses and entire nations, about the necessity of putting the brakes on the human

Hamburger Abendblatt

or not, we are all involved in the very real game of climate change. It is one of the few games we cannot afford to lose.

Thomas Pfeiffer and Martin A. Nowak are in the Program for Evolutionary Dynamics, Department of Organismic and Evolutionary Biology, and Department of Mathematics, Harvard University, Cambridge, Massachusetts 02138, USA.
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Figure 1 | That ad — and how it was paid for.

Such cooperation between group members can be achieved by changing the rules of the game. For example, if players can punish or reward other players based on their behaviour in the public goods game, a high level of

1. *Hamburger Abendblatt* 20 (9 March 2006).
2. Milinski, M., Semmann, D., Krambeck, H.-J. & Marotzke, J. *Proc. Natl. Acad. Sci. USA* **103**, 3994–3998 (2006).
3. Hardin, G. *Science* **162**, 1243–1248 (1968).
4. Fehr, E. & Gächter, S. *Nature* **415**, 137–140 (2002).
5. Milinski, M. et al. *Nature* **415**, 424–426 (2002).
6. Brandt, H., Hauert, C., Sigmund, K. *Proc. Natl. Acad. Sci.*

Creating Public Good Wealth

- Earth's climate is a public good:
 - Shared by all: individuals benefit from protection by group investment without investing themselves
 - Faces “tragedy of the commons” – over exploitation

Creating Public Good Wealth

- MPI searched for positive responses in games:
 - Group co-operation gains everyone more overall
 - Investment most likely when identities are known
 - Can punish poor performers & reward good ones
- Today good practice could be accomplished by:
 - Household energy usages published locally
 - Climate protection/destruction company rankings
- Earth's climate is a **public good**:
 - Shared by all: individuals benefit from protection by group investment without investing themselves
 - Faces “tragedy of the commons” – over exploitation

Regional Climate for Future Decisions

Regional climate for decision making & makers:

1. who are the climate decision makers?
 2. who cares if they make bad/ poor decisions?
- i.e. Climate science: who cares what we know?

Regional Climate for Future Decisions

Regional climate for *decision making & makers*:

1. **Climate decision makers – media/politicians**
2. who cares if they make bad/ poor decisions?
i.e. Climate science: who cares what we know?



Regional Climate for Future Decisions

Regional climate for decision making & makers:

1. who are the climate decision makers?

2. **Tough economics, who cares? – industry**

i.e. Climate science: who cares what we know?



Regional Climate for Future Decisions

Regional climate for decision making & makers:

1. who are the climate decision makers?
2. who cares if they make bad/ poor decisions?
i.e. Climate science: who cares what we know?

We, the people, all of us. We are all affected every time society has to deal with the results of poor climate decisions & all of us can act!



Regional Climate Risk Immense

- Are you motivated?
- *'Warming is taking place even faster than the models predicted,'* says WMO Secretary-General Michel Jarraud.

- What do you think?
- What can YOU do?
- What responsibilities do you believe regional climate scientists have today?



- *'Warming is taking place even faster than the models predicted,'* WMO Secretary-General Michel Jarraud.

http://www.straitstimes.com/Latest+News/World/STIStory_176278.html