



**MATCH**

Modelling and assessment of  
contributions to climate change

## **Discussion of outcomes**

**Bonn**

**4 June 2009**

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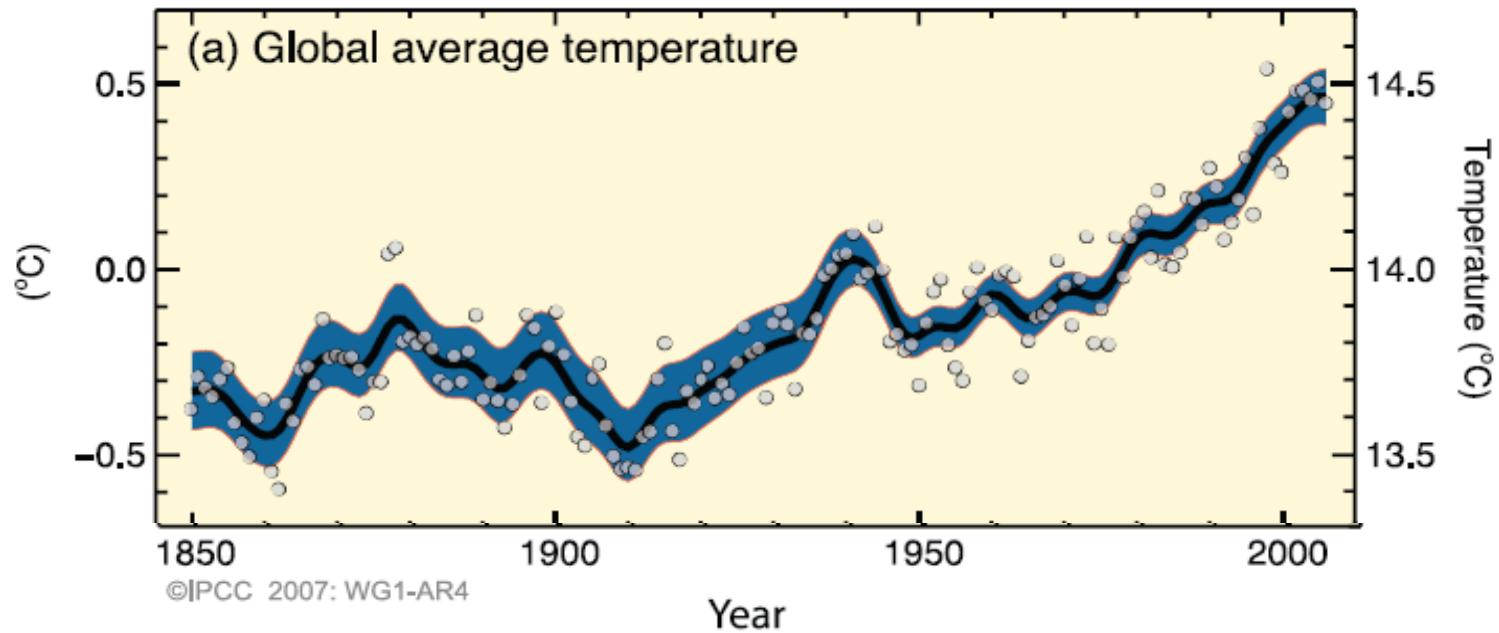


1. National Climate Centre, China. 2. RVIM, Netherlands, 3. CICERO –Oslo, Norway, 4. Met Office Hadley Centre, U.K, 5. University of Michigan, U.S.A, 6. University of California at Irvine, U.S.A, 7. CSIRO Atmospheric Research, Australia, 8. IIT, India, 9. Interministerial Committee on Global Climate Change, Brazil, 10. ECOFYS, Germany

# Main question

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What are the contributions of regions, nations or sectors to man-made climate change?



# MATCH process

## UNFCCC / Kyoto Protocol

- 1997: “Brazilian Proposal”:  
Industrialized countries  
should reduce emissions  
proportional to contribution to  
temperature increase

2002

## MATCH

Modelling and assessment of  
contributions to climate change

- Ad-hoc group
- Initiated by Brazil and UK

2007

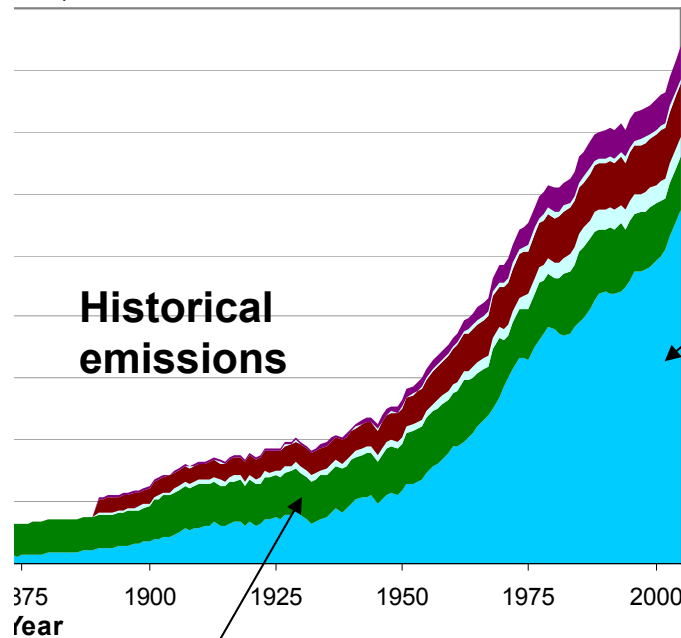
- |                  |   |
|------------------|---|
| 31 October 2007: | Submission of the final report to SBSTA   |
| December 2007:   | In-session special side event at SBSTA 27 to present the work to UNFCCC delegations |
| 7 March 2008:    | Countries submit their views on the matter  |
| June 2008:       | Official consideration by SBSTA 28  |

# MATCH results

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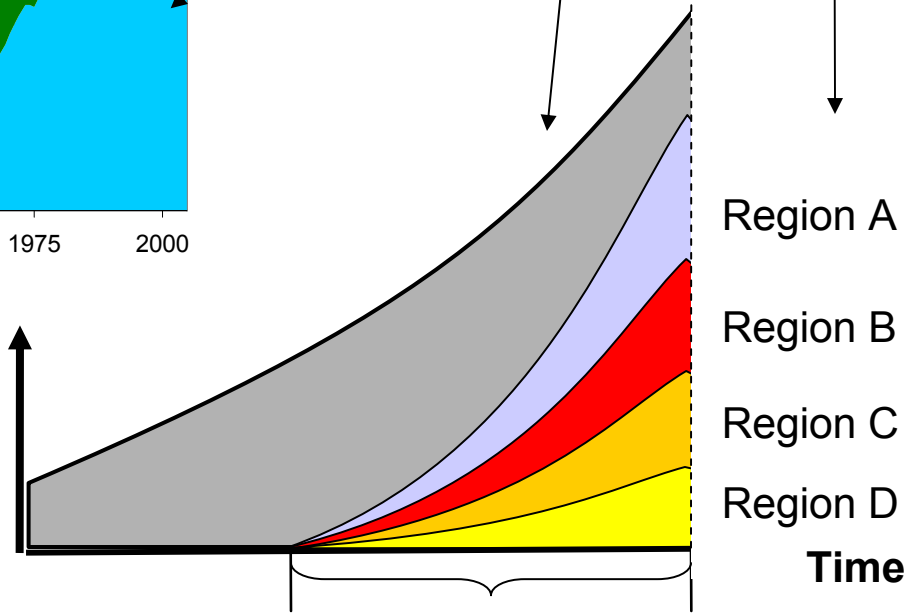
- **Publication of four joint journal articles**
- **Capacity building** and exchanges also enabled scientific participation of scientists from many countries
- **Historic country level emission datasets** of greenhouse gases stretching back to the 18th century and **datasets** showing a range of typical attribution results (soon on [www.match-info.net](http://www.match-info.net))
- **On-line models** enabling user experiments with different options were stimulated by MATCH.
  - Java Climate Model ([www.climate.be/jcm](http://www.climate.be/jcm))
  - FAIR model ([www.mnp.nl/fair](http://www.mnp.nl/fair))
  - CAIT tool ([cait.wri.org](http://cait.wri.org))

# Calculation choices



**Choice 1: Indicator**  
Cumulative emissions or temperature increase?

**Choice 4: Future emissions**



Temperature increase

**Choice 3: Sectors and gases**

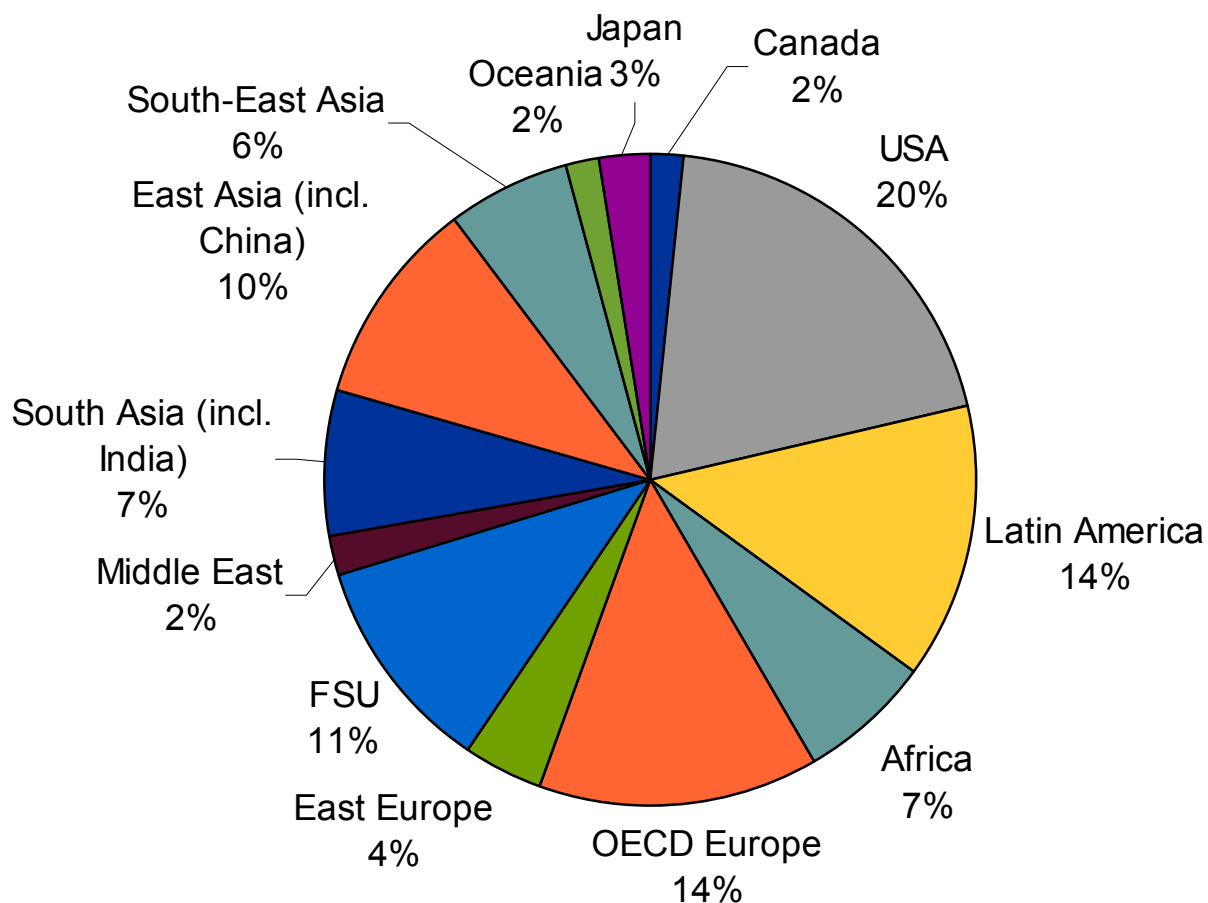
**Choice 2: Start date**

Attribution start date, e.g. 1900

Attribution Today period

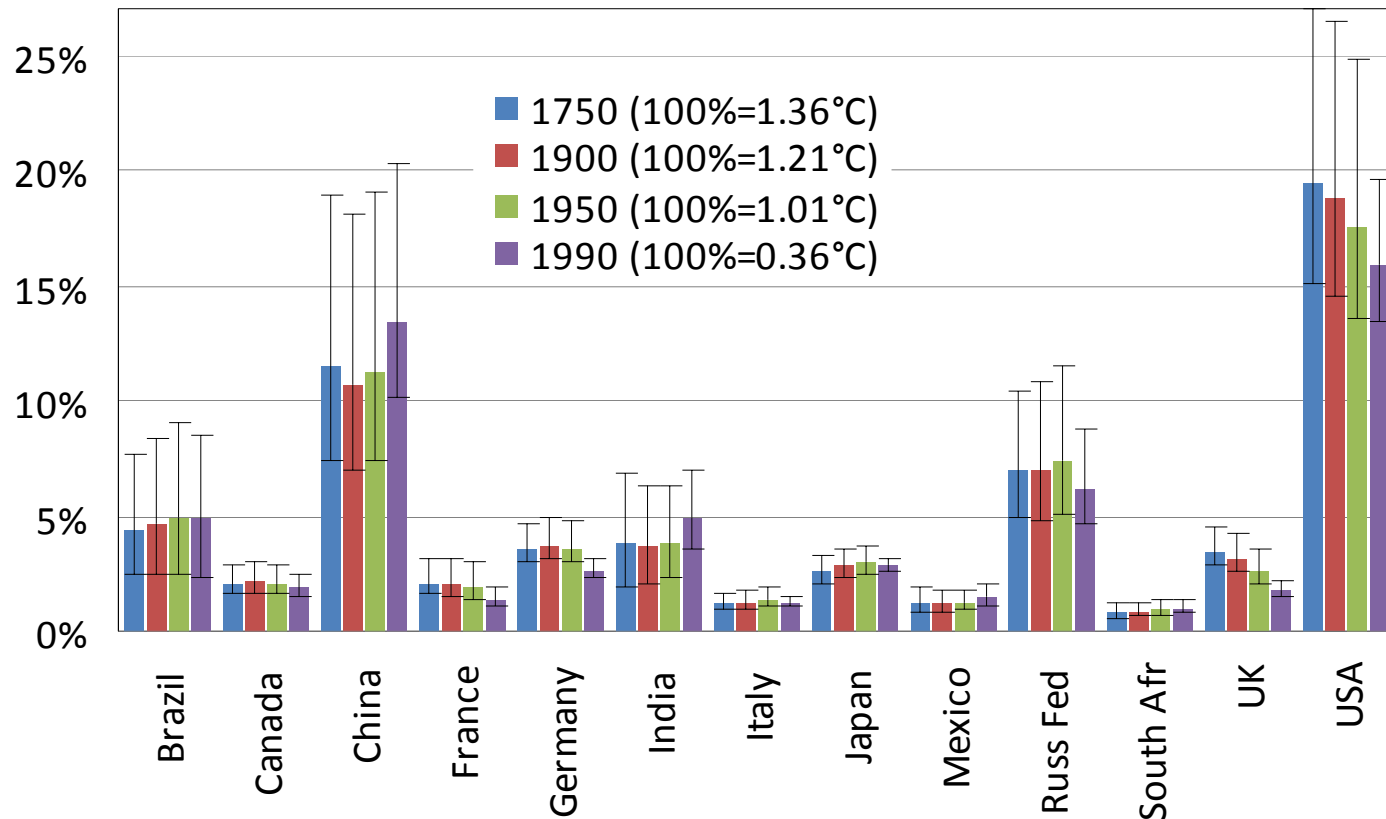
Region A  
Region B  
Region C  
Region D  
Time

# Example 1: Regional contributions



Global temperature increase in 2000 caused by emissions of CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O, including forestry beginning in 1890

# Example 2: Contribution by country for various start dates



# Key findings

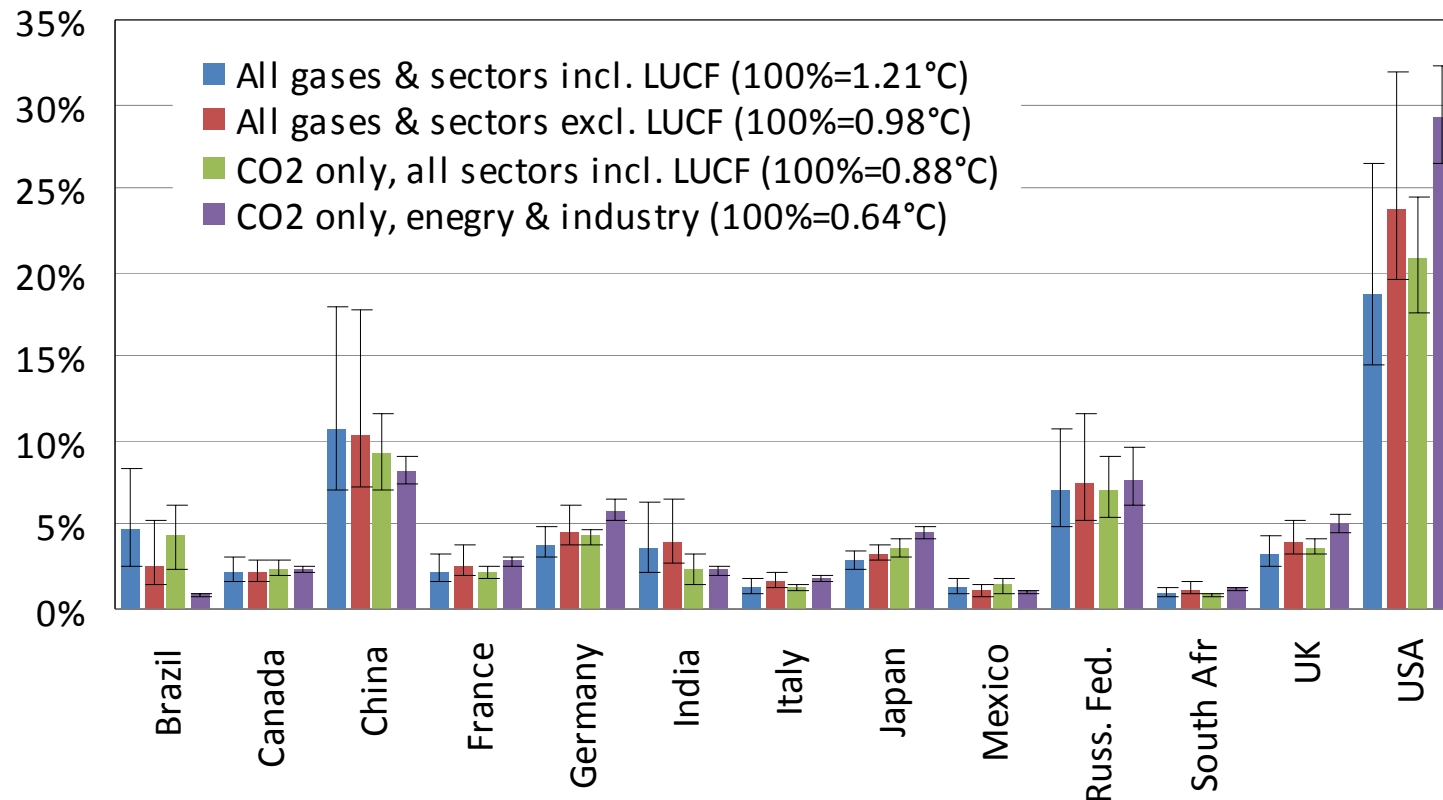
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- Country and sector level contributions for different choices: indicator, start date, sectors and future emissions (also electronically)
- Important factors to take into account using the data
  - Uncertainty of historical emissions
  - Choice of the start date
  - Including or excluding LUCF or CH<sub>4</sub> and N<sub>2</sub>O
- Less important factors to take into account using the data
  - Uncertainty of different simple climate system models
  - Choice between “cumulative emissions” and “temperature increase” for long timeframes



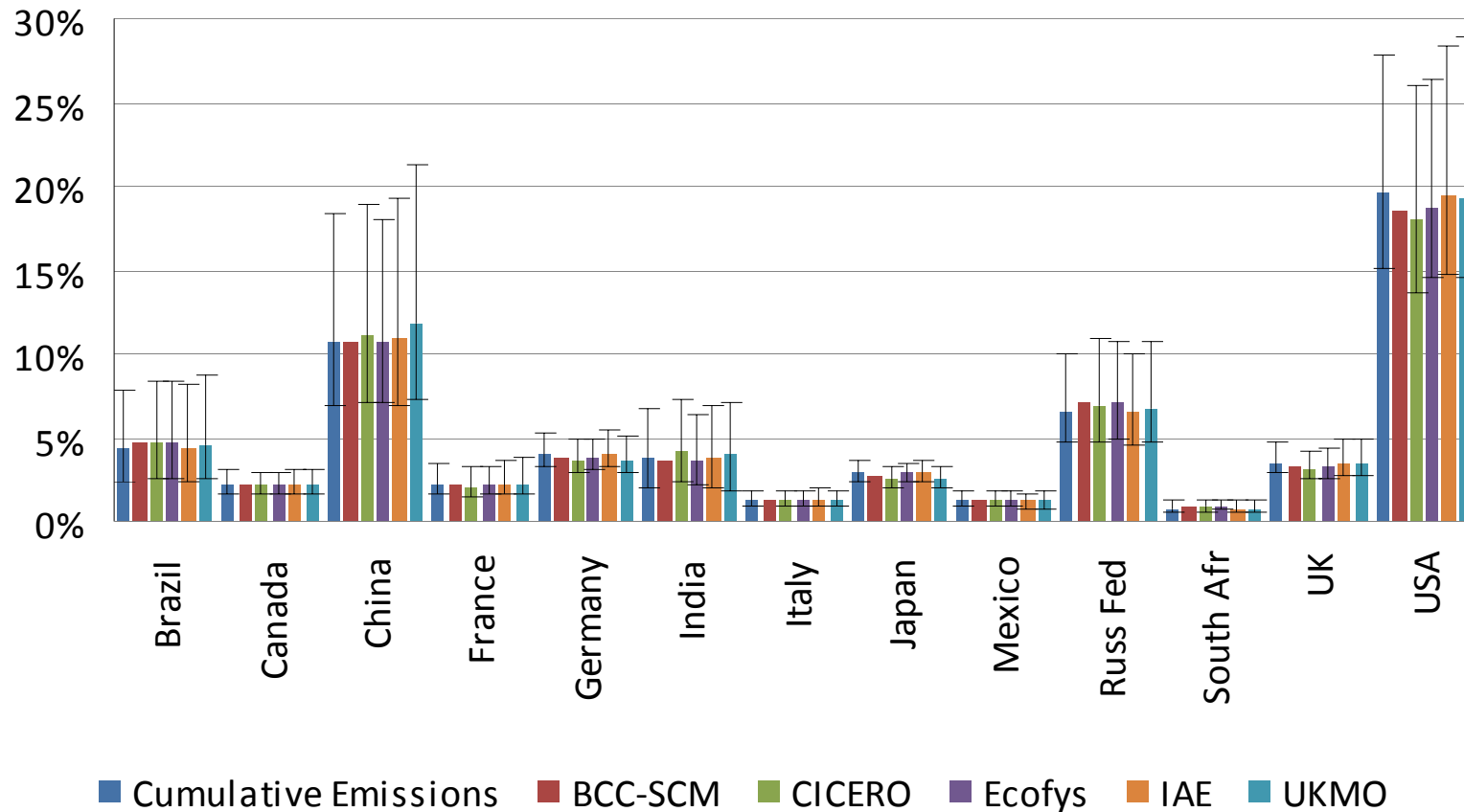
**END**

# Choice 3: Sectors and gases



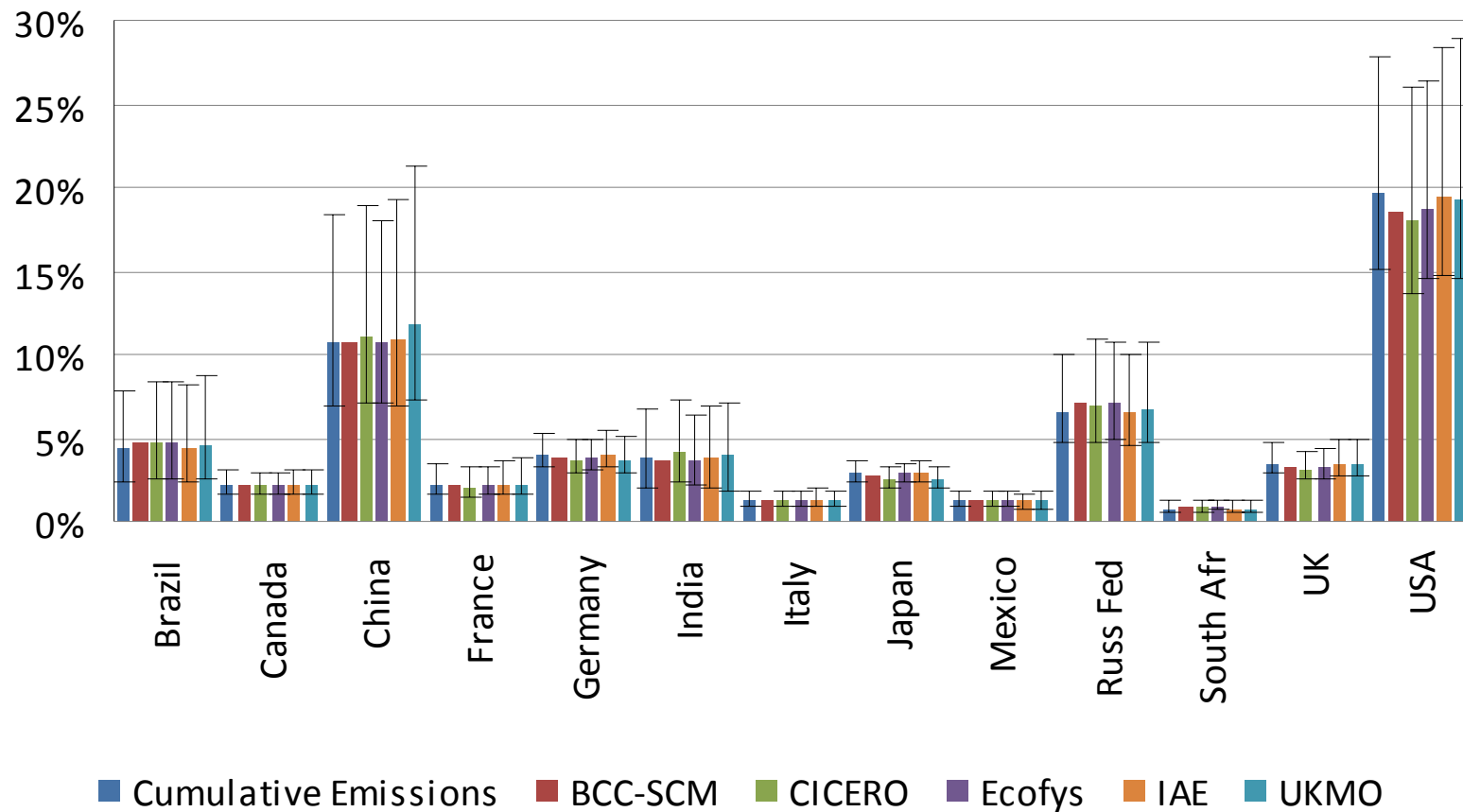
- Large difference: high emissions from deforestation and/or from CH<sub>4</sub> and N<sub>2</sub>O, e.g. Brazil, China and India.
- Uncertainty smaller for the case of CO<sub>2</sub> from energy and industry only

# 5 models show similar outcomes



**Contribution to temperature increase in 2005 of emissions from 1900 to 2005 of CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O including LUCF**

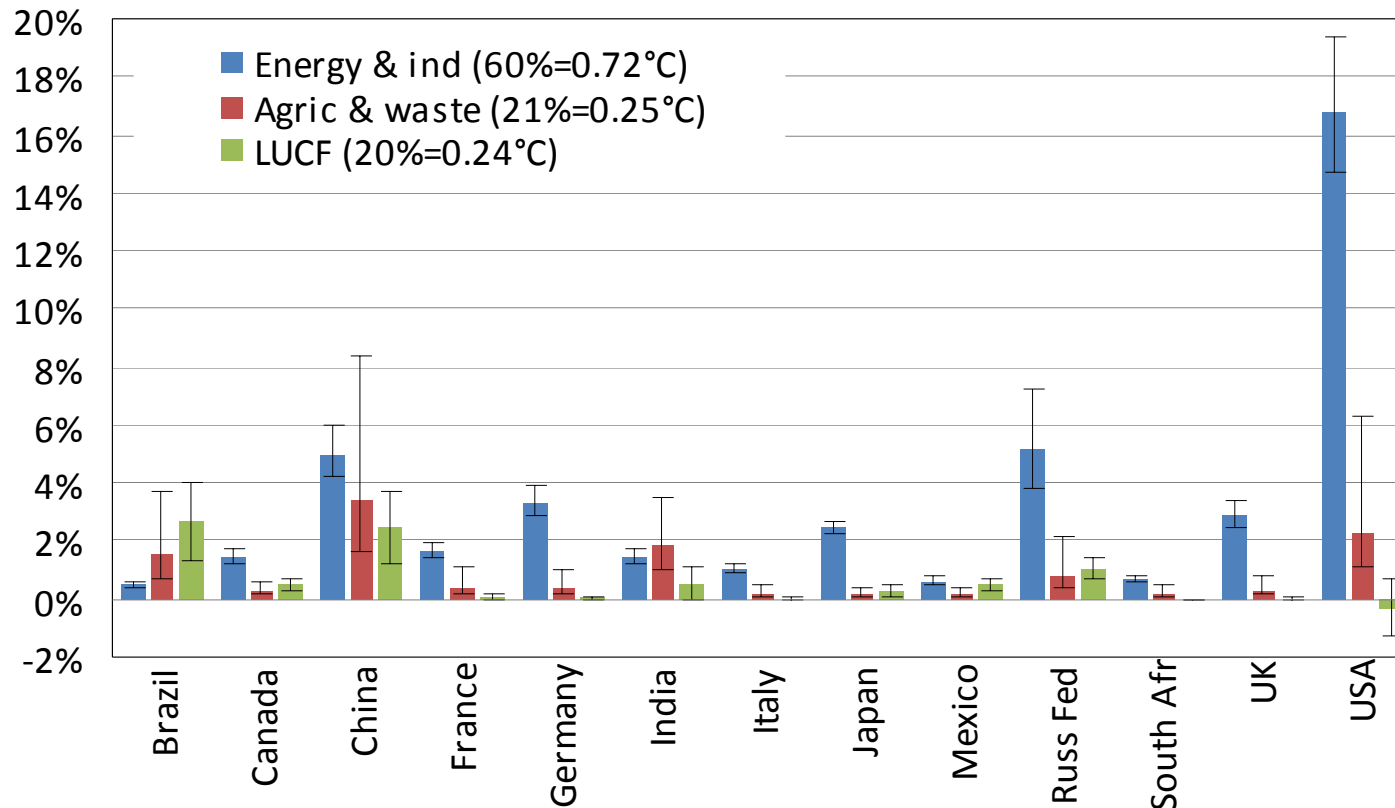
# Choice 1: Cumulative emissions vs. temperature from 5 models



**Difference between cumulative emissions and temperature small for long time horizons**

**Modelling and assessment of contributions to climate change**

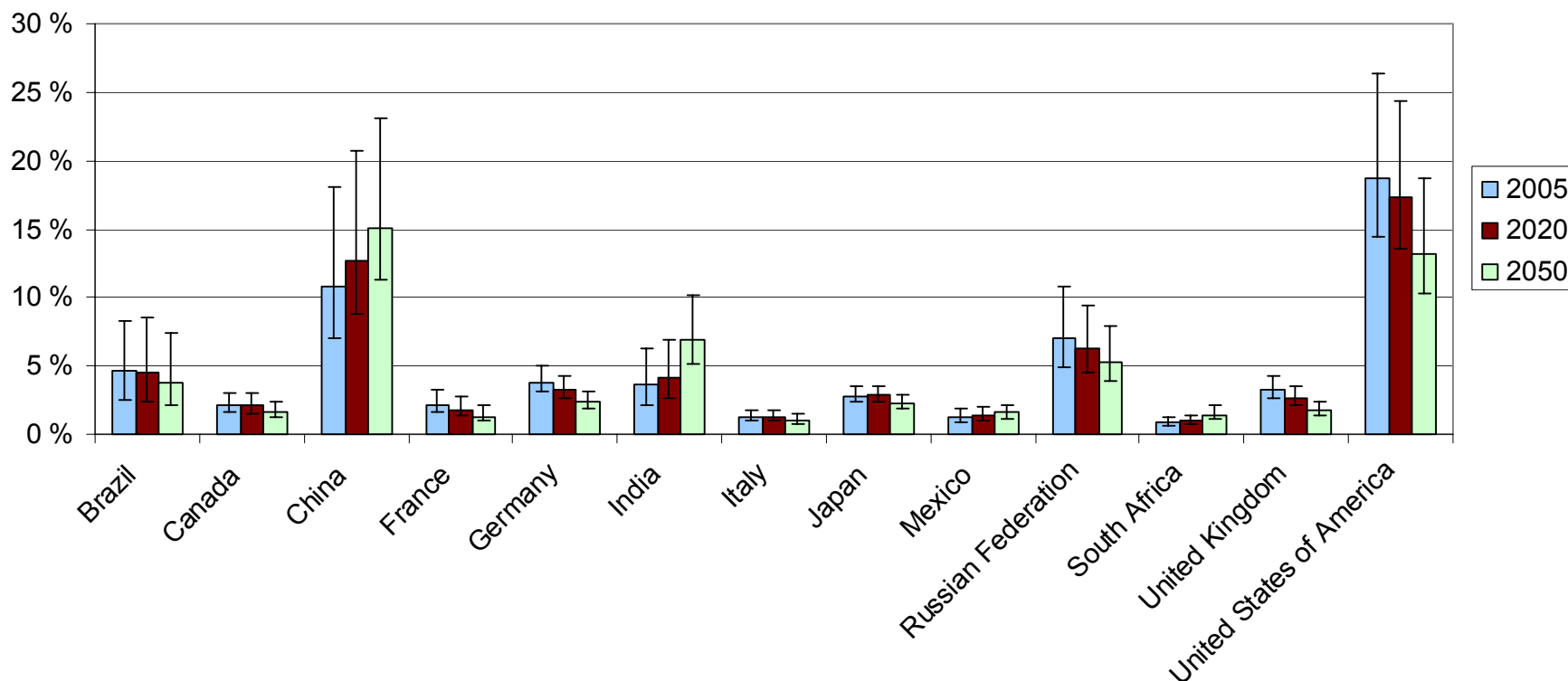
# Contribution by sector



- Energy and industry largest for most countries, except for Brazil
- CO<sub>2</sub> is the dominant gas for most countries, except India, where the contribution of methane to current temperature is higher

# Choice 4: Future emissions

Emission start year 1900. Scenario A1B including LUCF



- For industrialized countries contributions decline
- For developing countries contributions increase, exception Brazil

# SBSTA 17 (Oct 2002)

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- **Work should be continued by the scientific community**, in particular to improve the robustness of the preliminary results and to explore the uncertainty and sensitivity
- Be of a standard consistent with the practices of **peer-reviewed published science**.
- The process should be **inclusive, open and transparent**.
- **Capacity building**: strongly encouraged Parties and institutions to facilitate capacity-building in developing countries, including by hosting scientists from developing countries
- Invited the **scientific community**, including IGBP, WCRP, IHDP and IPCC to provide information on how they could contribute
- Encouraged scientists to **undertake further work**, to make the results of their **work publicly available** and to report progress at SBSTA 20, June 2004 (side event).
- SBSTA decided to **review the progress** at its 23<sup>rd</sup> session (Nov 2005).

# Timeline

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- May 2006: SBSTA 26 renewed mandate and agreed on timeline
- 31 October 2007: Submission of the final report to SBSTA
- December 2007: In-session special side event at SBSTA 27 to present the work to UNFCCC delegations
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- 7 March 2008: Countries submit their views on the matter
- June 2008: Official consideration by SBSTA 28 or soon thereafter



# MATCH process

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## Scientific coordination committee

Guoquan Hu	National Climate Center, China
Michel den Elzen	RIVM, Netherlands
Jan Fuglestad (Co-chair)	CICERO, Center for International Climate and Environmental Research - Oslo, Norway
Jason Lowe	Met Office, Hadley Centre for Climate Prediction and Research, UK
Joyce Penner (Co-chair)	University of Michigan, USA
Michael Prather	University of California at Irvine, USA
Cathy Trudinger	CSIRO Atmospheric Research, Australia
Murari Lal	IIT, India
José Domingos Gonzalez Miguez	Interministerial Committee on Global Climate Change, Brazil
Niklas Höhne (secretary)	Ecofys, Germany



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**Modelling and assessment of contributions to climate change**

# MATCH process

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- Assess methods for **calculating the contribution of different emission sources** (e.g. regional, national or sectoral) to climate change
- Provide clear **guidance on the implications** of the use of the different scientific methods, models, and methodological choices
- **Where scientific arguments allow, recommend** one method/model/choice
- **Expert meetings**, workshops and a coordinated modelling exercise
- Prepare **papers** to be published in peer reviewed scientific journals
- **Open and transparent**, [www.match-info.net](http://www.match-info.net)
- **Scientific coordination committee**
- **Funds for developing country experts** (provided by Norway, Germany and UK)
- **Support unit** Ecofys (funded by UK)