

# Providing a Framework for Moving to a Low C World

## *Contribution to* New Activity Discussion

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3. Uncertainty ( $T_d + B_u$ ) and risk of exceeding T target

4. Monitor compliance: targets/pledges + sustainability

5. Linking 'negotiation worlds'

6. Suggestion for a new activity

References

## 2. Orientation – how ideas developed

# Dealing with Uncertainty in GHG Inventories in an Emissions Constrained World

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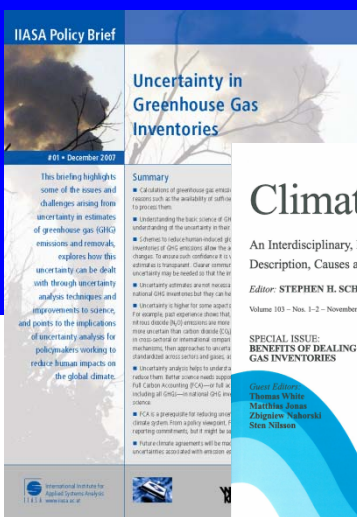
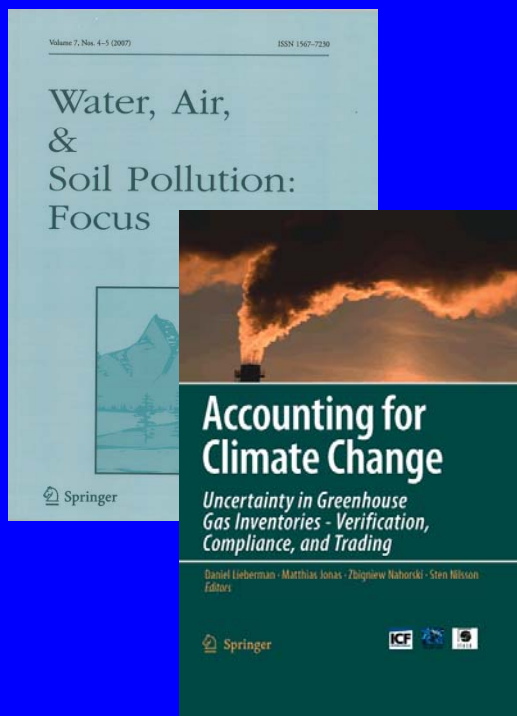
# 2. Orientation – how ideas developed

## International Workshops on Uncertainty in GHG Inventories:

**2004**  
**(Warsaw, PL)**

**2007**  
**(Laxenburg, AT)**

**2010**  
**(Lviv, UA)**



**Book**  
**(2011)**

## 2. Orientation – how ideas developed

Diagnostics of the C Cycle

Vulnerabilities of the C Cycle

Low C Pathways

### Research Priorities

Global C monitoring system ..... 1, 2, 5

Global and regional budgets (cont.);  
attributing variability and trends to drivers ..... 1, 2, 5

Magnitude of the C-climate feedback

Pathways to climate stabilization;  
uncertainties ..... 1, 2, 4, 6

*Establishing global synthesis efforts* ..... 3

*Communicating science and policy* ..... 3

### Suggested for new Activity:

1. Merging diagnostic (Bu) and prognostic (Td) uncertainty

2. Target/sustainability monitoring

3. Linking 'negotiation worlds'

4. Learning (change in uncertainty)

5. Spatial disconnect between production and consumption

6. Robust pathways

## 2. Orientation – how ideas developed

Our motivation at the time of the 3<sup>rd</sup> Unc WS:

1. To put uncertainties that are associated with accounting emissions for compliance purposes into a wider quantitative context
  - Legacy of the 2<sup>nd</sup> Uncertainty WS
2. To bring a long-term emissions-temperature-uncertainty issue (here: 2 °C) to the here and now
  - to emission targets on the near-term time scale
  - to emission targets on the national scale

## 2. Orientation – adjusted for the 11<sup>th</sup> GCP SSCM

Moving to a Low-C World in 2050 – timely issues:

### 1. Introduce uncertainty: Bu and Td

*Ultimately: put costs on uncertainty ... (robustness later)*

### 2. Monitor compliance: targets/pledges & sustainability

*Convey the 'big picture' beyond the UNFCCC ...*

### 3. Do this for different 'negotiation worlds'

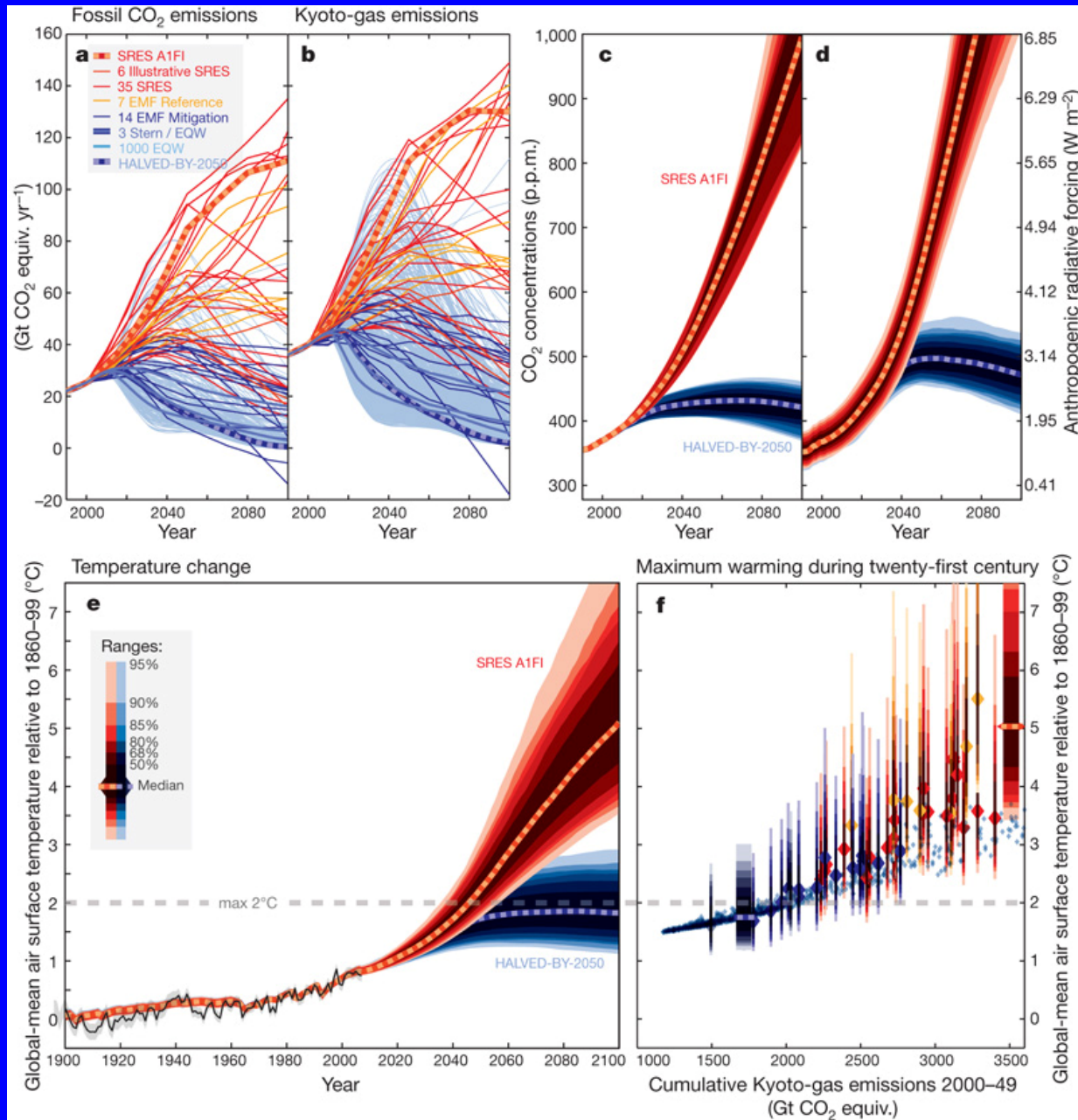
*Emissions per capita (prod now, cons later?)*

*Emissions per GDP*

*'Biomass draw' (LU, emissions, ...?) per capita (other norm?)*

...

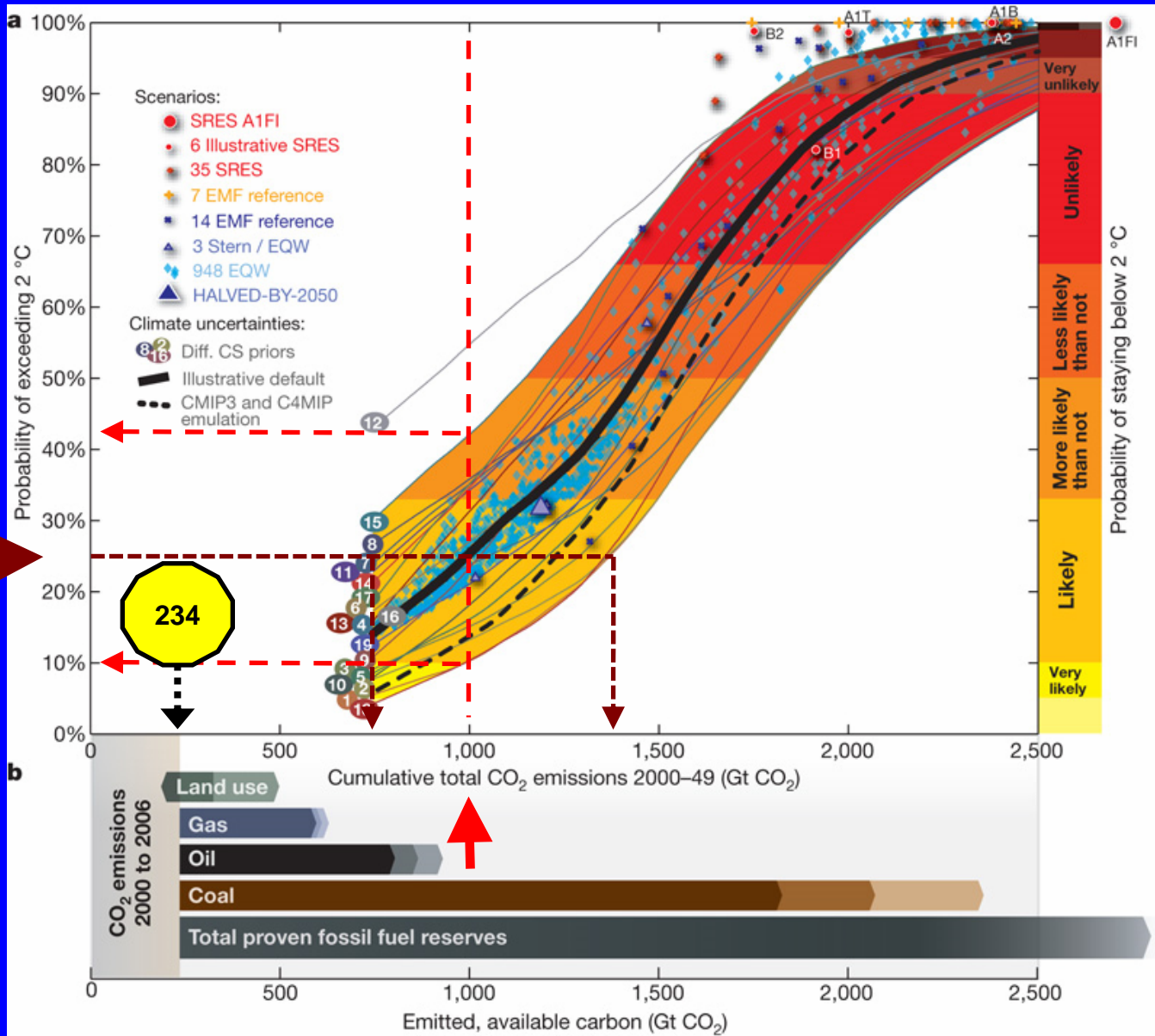
# 3. Uncertainty – emissions-constrained world



Meinshausen *et al.*  
(2009: Fig. 2)



# 3. Uncertainty – emissions-constrained world



Meinshausen *et al.* (2009: Fig. 3)

# 3. Uncertainty – emissions-constrained world

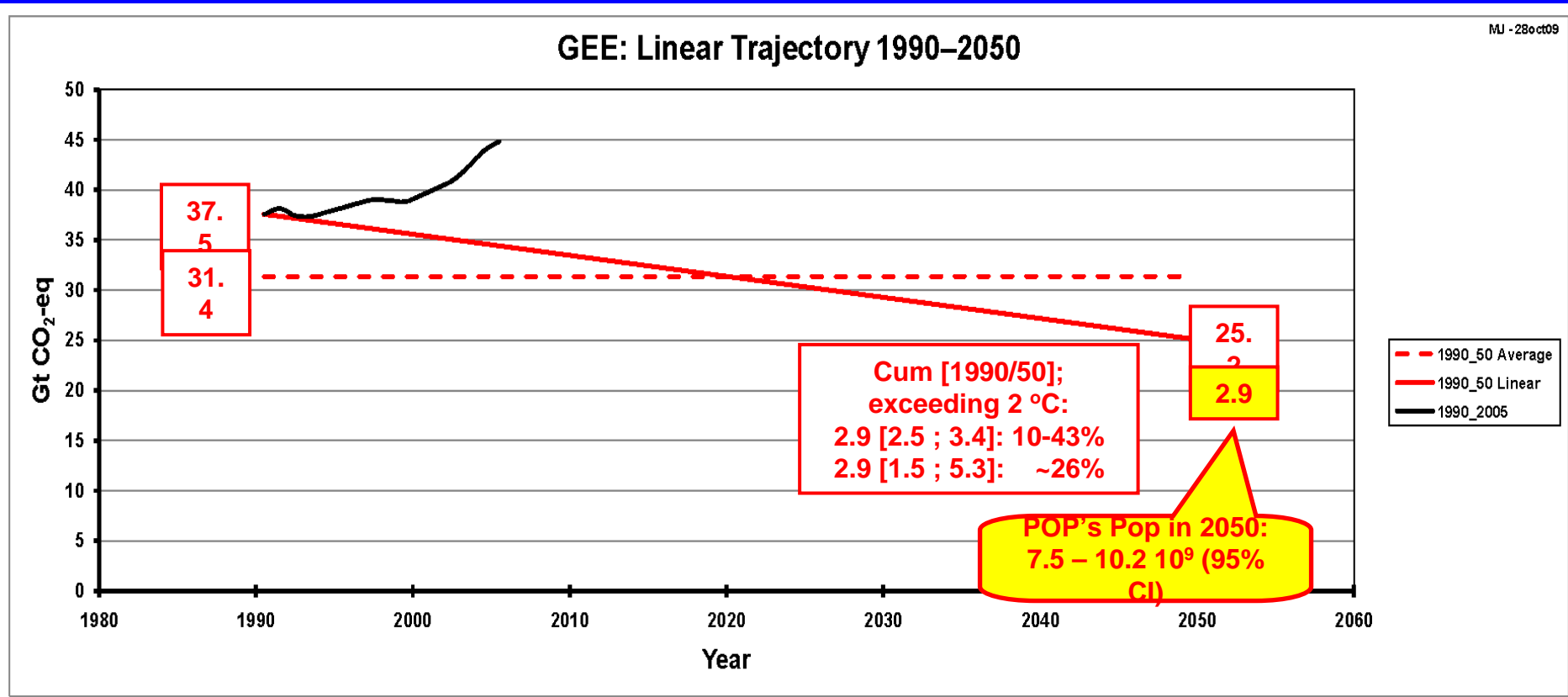
## Probability of exceeding 2 °C:

← Figures & Tables index

Indicator	Emissions	Probability of exceeding 2 °C <sup>‡</sup>	
		Range	Illustrative default case <sup>‡</sup>
Cumulative total CO <sub>2</sub> emission 2000-49	886 Gt CO <sub>2</sub>	8-37%	20%
	1,000 Gt CO <sub>2</sub> ←	10-42%	25% ←
	1,158 Gt CO <sub>2</sub>	16-51%	33%
	1,437 Gt CO <sub>2</sub>	29-70%	50%
Cumulative Kyoto-gas emissions 2000-49	1,356 Gt CO <sub>2</sub> equiv.	8-37%	20%
	1,500 Gt CO <sub>2</sub> equiv. ←	10-43%	26% ←
	1,678 Gt CO <sub>2</sub> equiv.	15-51%	33%
	2,000 Gt CO <sub>2</sub> equiv.	29-70%	50%
2050 Kyoto-gas emissions	10 Gt CO <sub>2</sub> equiv. yr <sup>-1</sup>	6-32%	16%
	(Halved 1990) 18 Gt CO <sub>2</sub> equiv. yr <sup>-1</sup>	12-45%	29%
	(Halved 2000) 20 Gt CO <sub>2</sub> equiv. yr <sup>-1</sup>	15-49%	32%
	36 Gt CO <sub>2</sub> equiv. yr <sup>-1</sup>	39-82%	64%
2020 Kyoto-gas emissions	30 Gt CO <sub>2</sub> equiv. yr <sup>-1</sup>	(8-38%) <sup>‡</sup>	(21%) <sup>‡</sup>
	35 Gt CO <sub>2</sub> equiv. yr <sup>-1</sup>	(13-46%) <sup>‡</sup>	(29%) <sup>‡</sup>
	40 Gt CO <sub>2</sub> equiv. yr <sup>-1</sup>	(19-56%) <sup>‡</sup>	(37%) <sup>‡</sup>
	50 Gt CO <sub>2</sub> equiv. yr <sup>-1</sup>	(53-87%) <sup>‡</sup>	(74%) <sup>‡</sup>

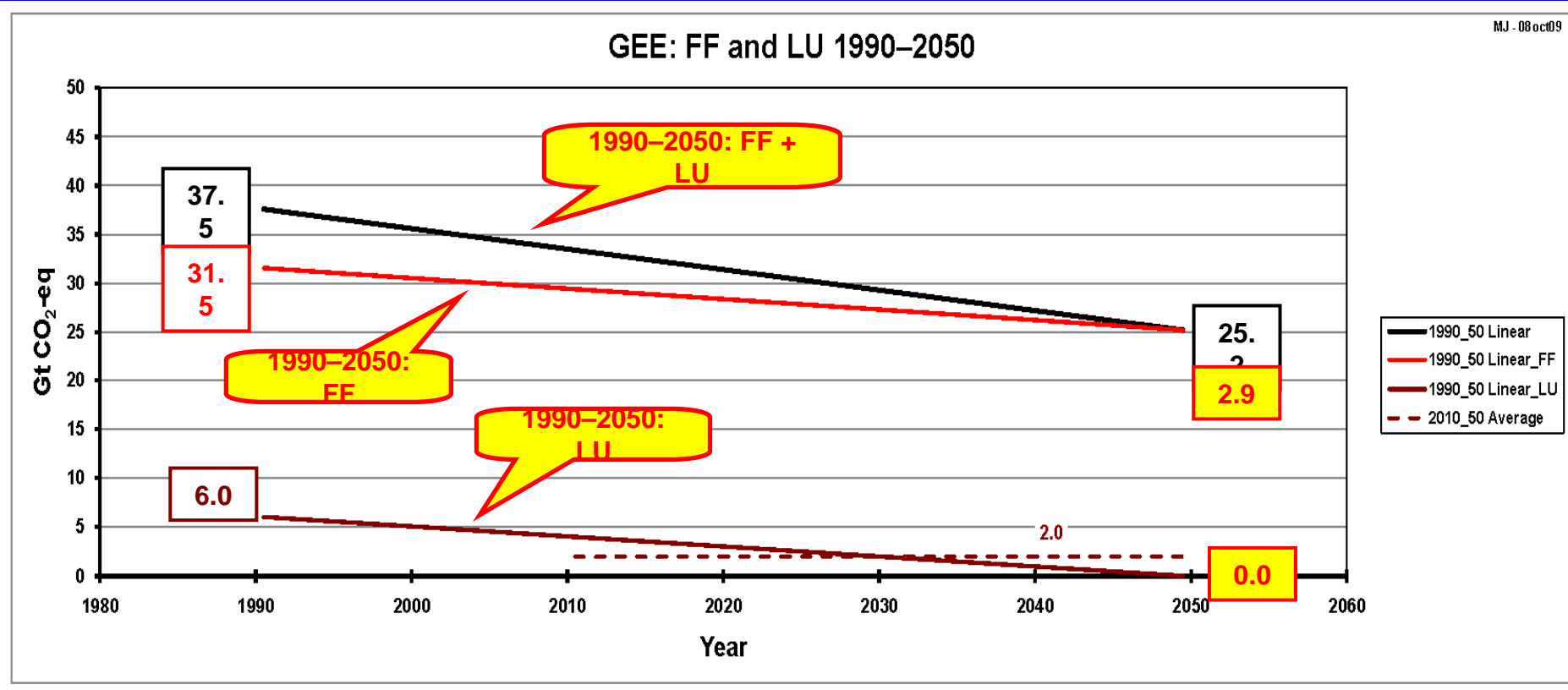
# 3. Uncertainty – emissions-constrained world

## GEE: Linear Trajectory 1990–2050

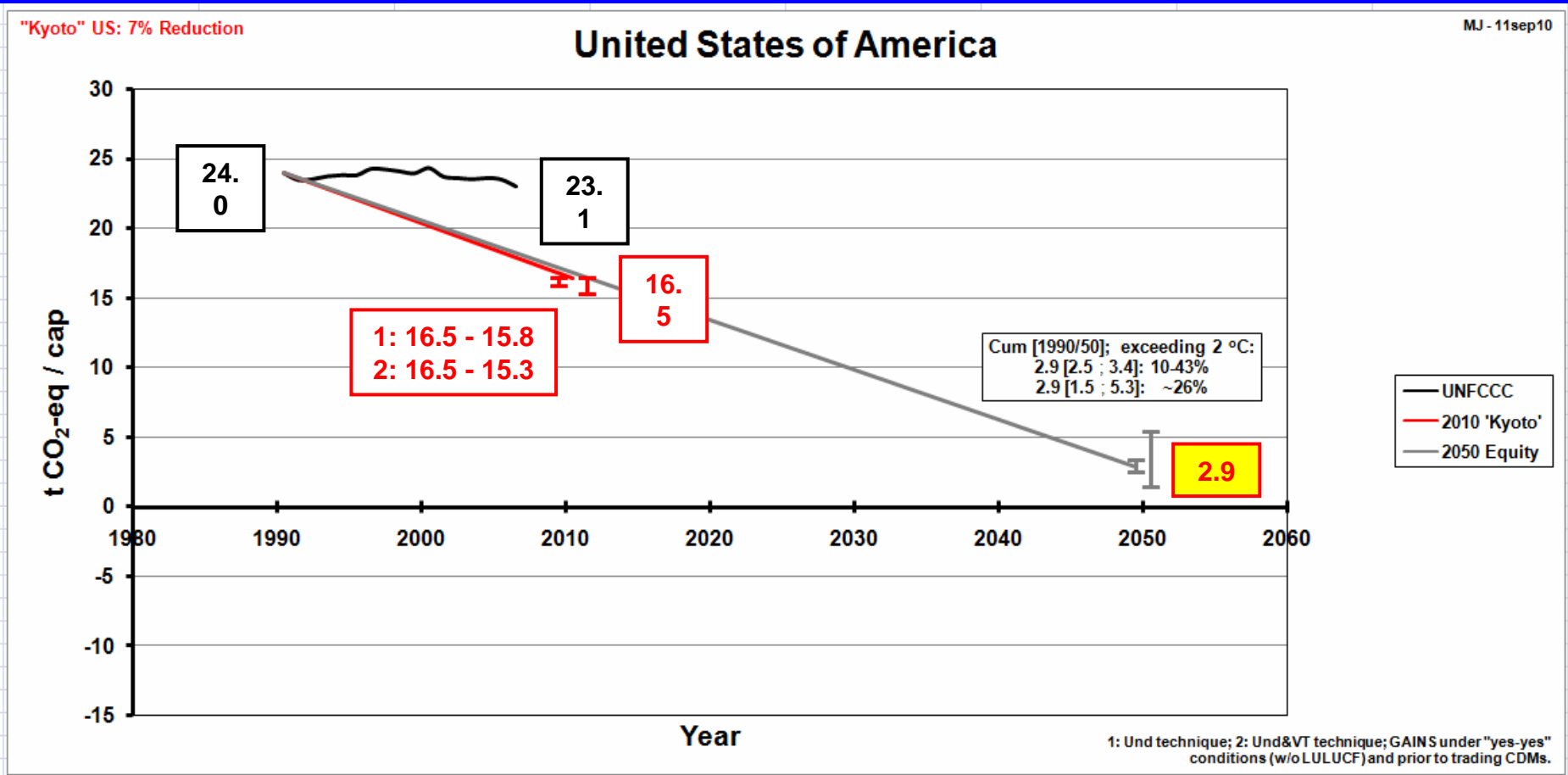


# 3. Uncertainty – emissions-constrained world

## GEE: Linear Trajectories 1990–2050 for FF and LU

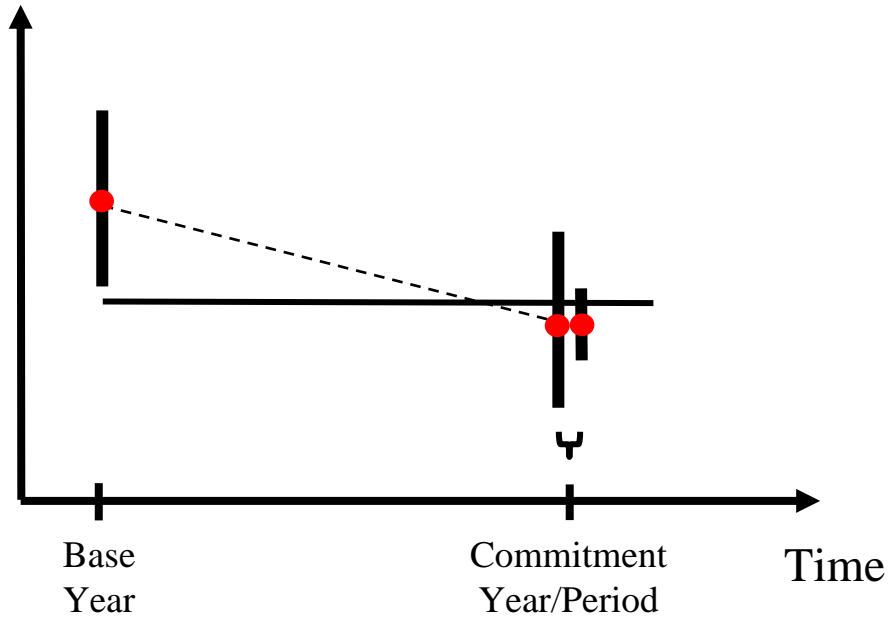


# 4. Monitor compliance: targets + pledges



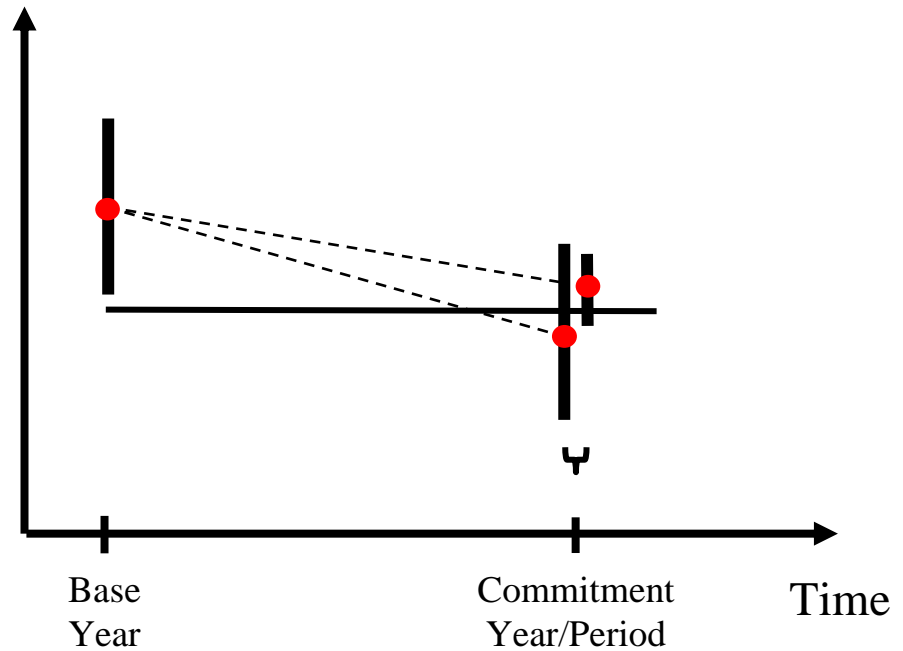
# 3. Not forgotten: Bu Uncertainty

Net GHG Emissions



Uncertainty matters ...  
it can be priced!

Net GHG Emissions



# 4. Monitor compliance: targets + pledges

2005 – 2020:

Con: 17% Red; Opt: 17% Red

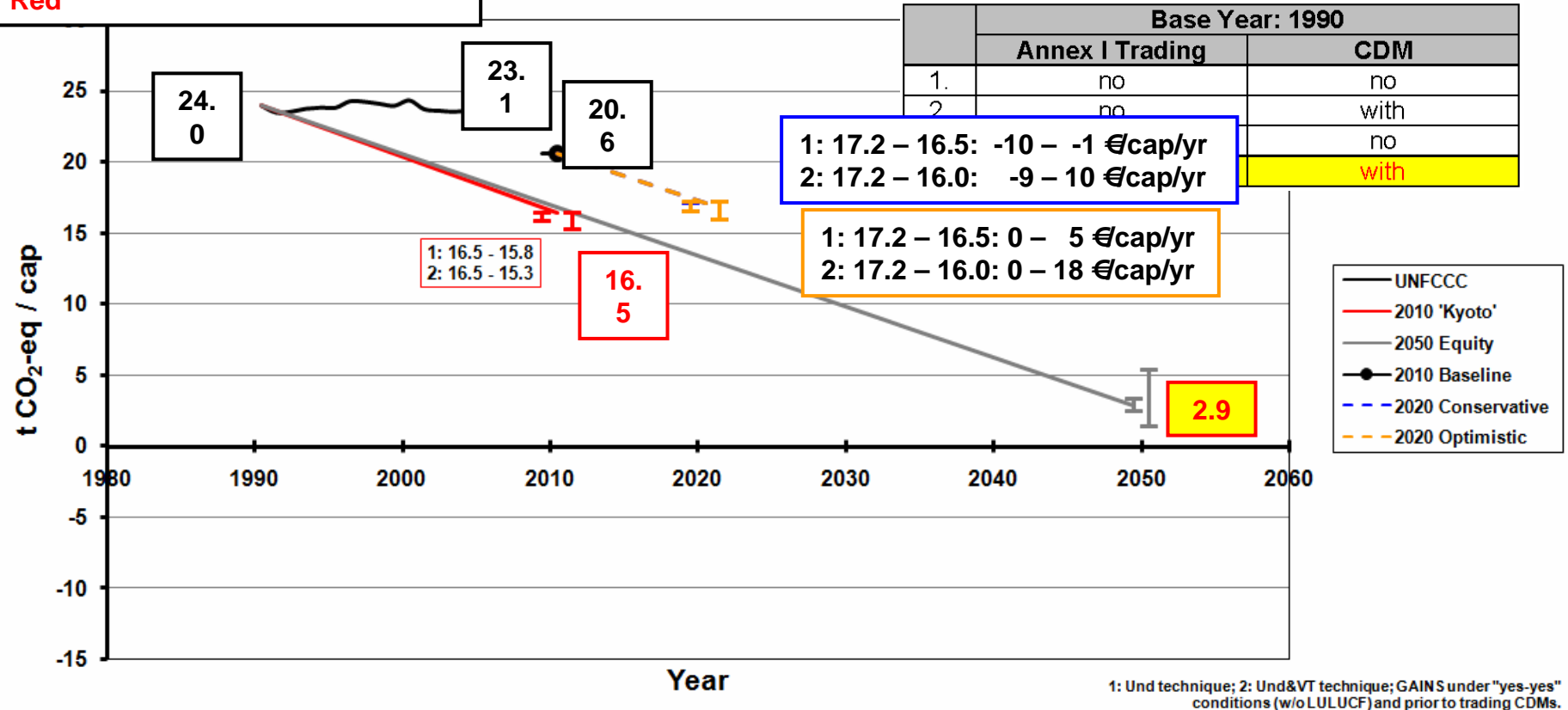
Relative to 1990:

Em: 3.9% Red; Per-cap: 30.1%

Red

## United States of America

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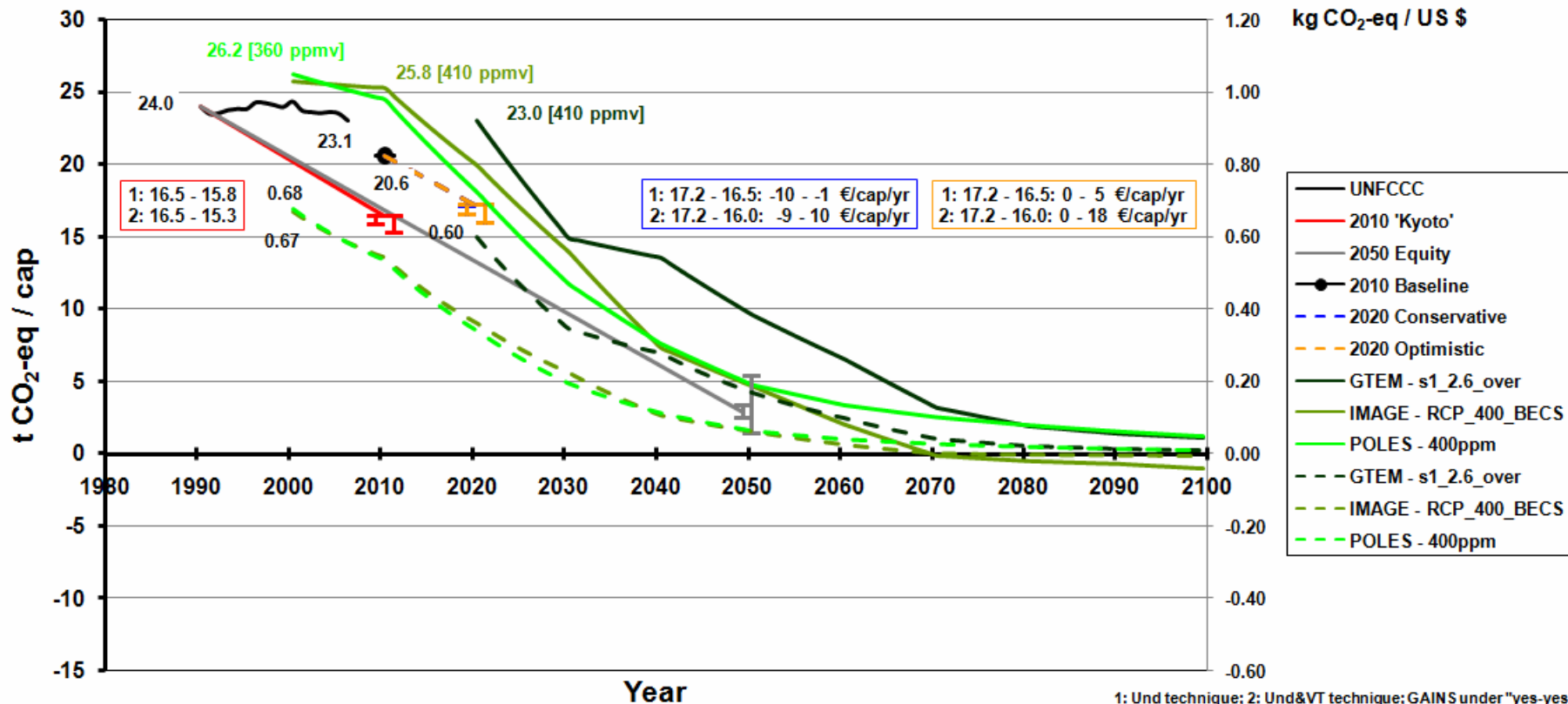


# 5. Linking 'negotiation worlds'

"Kyoto" US: 7% Reduction

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## United States of America



1: Und technique; 2: Und&VT technique; GAINS under "yes-yes" conditions (w/o LULUCF) and prior to trading CDMs.

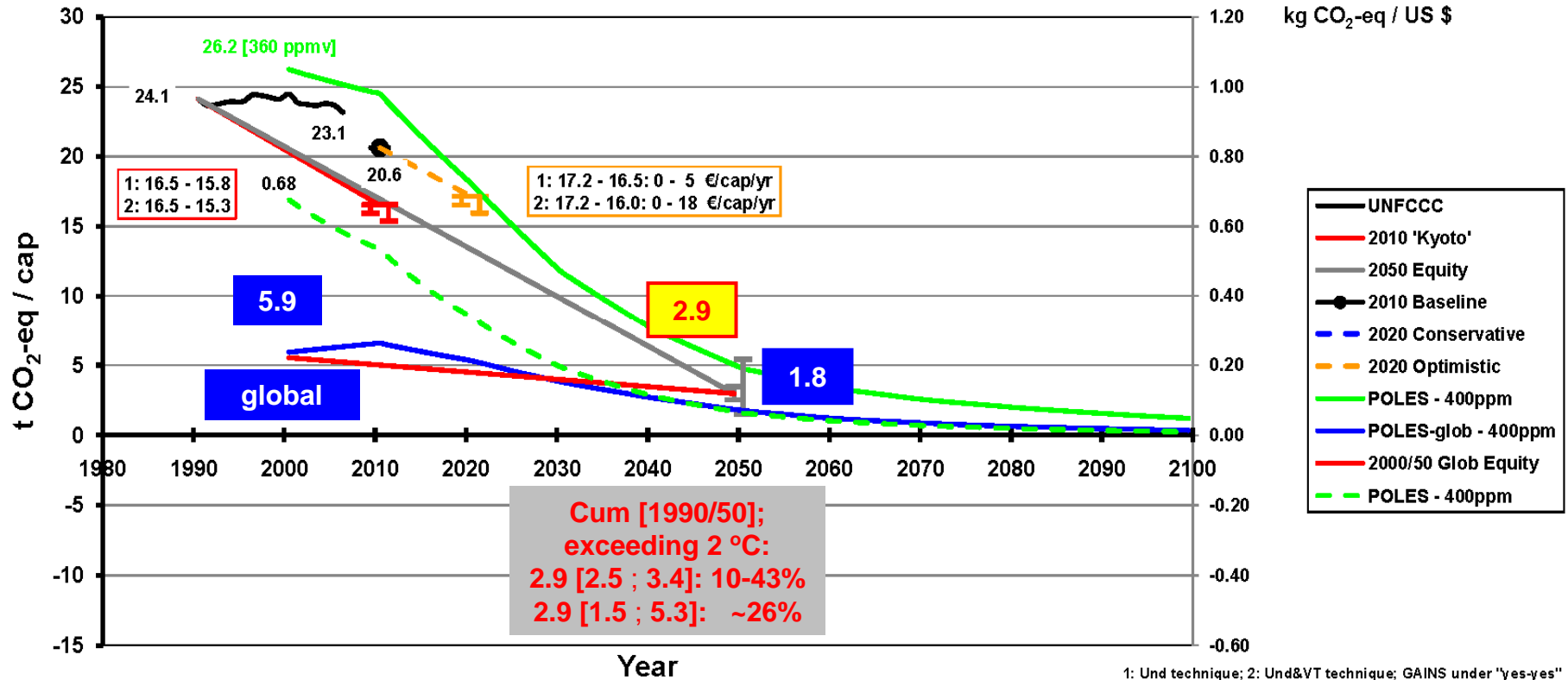


# 5. Linking 'negotiation worlds'

"Kyoto" US: 7% Reduction

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## United States of America



1: Und technique; 2: Und&VT technique; GAINS under 'yes-yes' conditions (w/o LULUCF) and prior to trading CDMs.

# 4. Not forgotten: Monitor sustainability

## Make a difference between LU:

IPCC WG I (2007: Tab. 7.1)

(in Gt C yr <sup>-1</sup> )	1980s		1990s		2000–2005c
	TAR	TAR revised <sup>a</sup>	TAR	AR4	AR4
Atmospheric Increase <sup>b</sup>	3.3 ± 0.1	3.3 ± 0.1	3.2 ± 0.1	3.2 ± 0.1	4.1 ± 0.1
Emissions (fossil + cement) <sup>c</sup>	5.4 ± 0.3	5.4 ± 0.3	6.4 ± 0.4	6.4 ± 0.4	7.2 ± 0.3
Net ocean-to-atmosphere flux <sup>d</sup>	-1.9 ± 0.6	-1.8 ± 0.8	-1.7 ± 0.5	-2.2 ± 0.4	-2.2 ± 0.5
Net land-to-atmosphere flux <sup>e</sup>	-0.2 ± 0.7	-0.3 ± 0.9	-1.4 ± 0.7	-1.0 ± 0.6	-0.9 ± 0.6
<i>Partitioned as follows</i>					
Land use change flux	1.7 (0.6 to 2.5)	1.4 (0.4 to 2.3)	n.a.	1.6 (0.5 to 2.7)	n.a.
Residual terrestrial sink	-1.9 (-3.8 to -0.3)	-1.7 (-3.4 to 0.2)	n.a.	-2.6 (-4.3 to -0.9)	n.a.

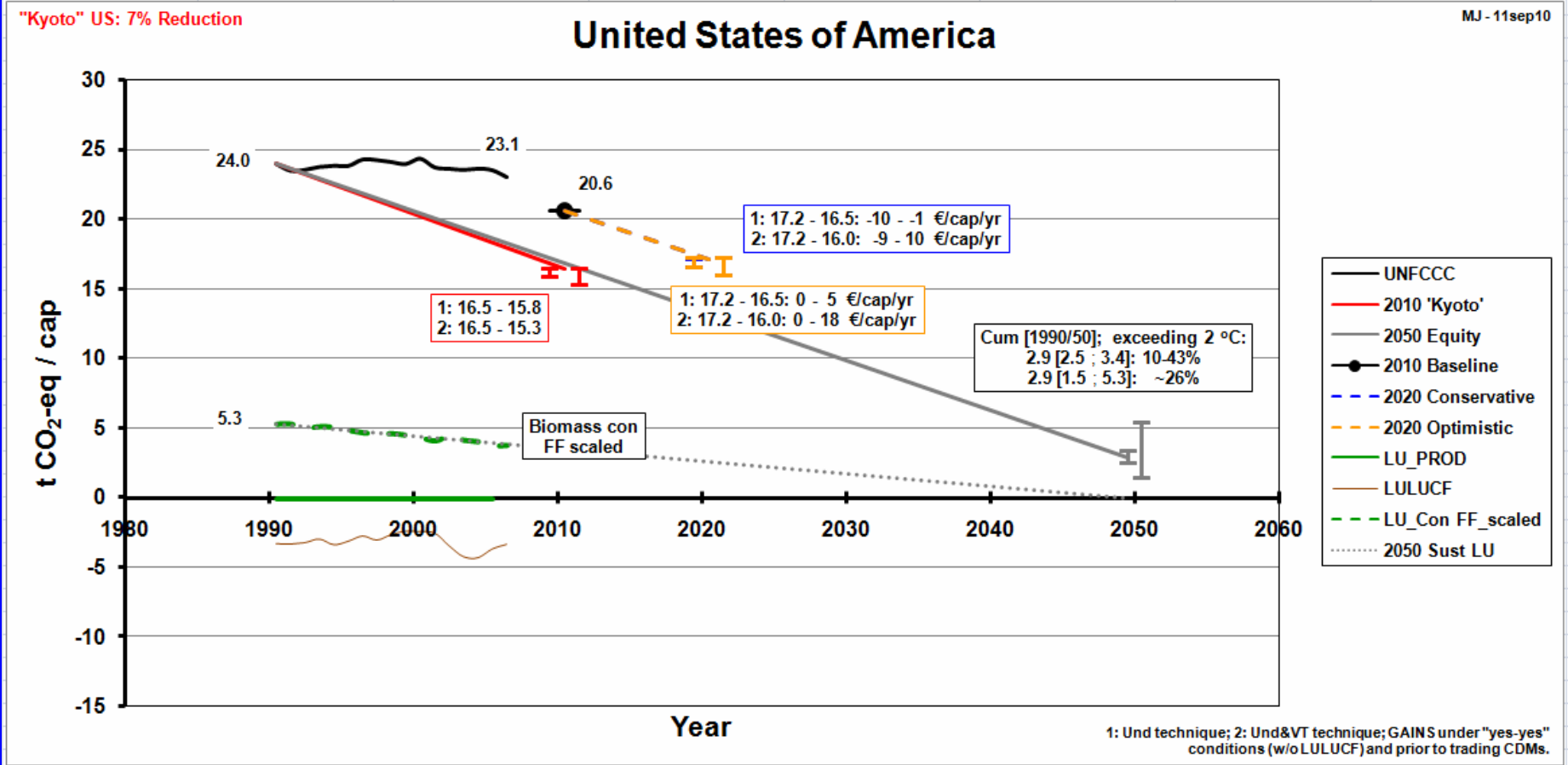
$$\text{Atm. Inc.} + \text{FF} - \text{Ocean Uptake} = \text{Net Terr. Uptake}$$

## ... and LULUCF:

Afforestation, reforestation, deforestation  
 Forest management, cropland management,  
 grazing land management, revegetation

# 4. Not forgotten: Monitor sustainability

## LULUCF vs LU production vs LU consumption:



## 6. Suggestion of a new activity on a

### Monitoring Framework for Moving to a Low Carbon World

which can be defined either narrowly or broadly:

	Narrowly (~ 1 yr)
<b>Introduces + merges uncertainty</b>	... aim at specific funders (e.g., the Austrian Climate Research Programme; open call: 15 Sept. 2011)
<b>Monitors compliance</b>	
<b>Links 'negotiation worlds'</b>	
<b>Resolves the spatial disconnect</b>	
<b>Grasps learning</b>	
<b>Identifies robust pathways</b>	

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