

Economic Cost of Global Warming

Unions for Jobs and the Environment
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Sources of Costs of Global Warming	Historical Evidence	Predictions
Rise in sea level	Rise of one foot over century	Rise of 13 inches by 2100
Extreme weather events (storms, coastal storm surges, tornadoes, hurricanes)	No evidence of increase	Little agreement among models
Spread of tropical disease	Controlled by Public Health	Expansion aided by warming
Heavy rainfall events	More heavy rainfall events	Very likely
Damage to agriculture	Faster growth in productivity	Faster growth up to 3.5 deg F, slower growth at higher temps
Summer drying and drought risk	In a few areas	Likely over most mid-latitude continental interiors
Floods	No increase	Likely
Deaths from heat waves	Likely – mixed trends by region	Very likely, but offset by warmer winters
Endangered species	Loss not related to climate	Most species able to migrate
Catastrophic events (THC and WAIS ice shelf)	No change in ocean current which warms North Atlantic	Shutdown of current not shown by coupled models, but not impossible
	Antarctic ice shelf stable	Major loss of ice and accelerated sea level rise very unlikely.

Source: IPCC, Working Group I 2001

The Economics of Climate Change (Nordhaus Study)

- ➡ Looked at the costs of a 3.8 degree F (2.5 °C) temperature rise over the period 1995 to 2105.
- ➡ Concludes that “... the impacts from global warming are likely to be quite modest over the next century ...”
- ➡ Damages for US Japan, Russia and China are essentially zero. Europe, India and many low-income regions, by contrast, appear vulnerable to significant damages. Canada will have slight benefit.
- ➡ Results are in line with other studies.
- ➡ Recommends action to offset warming based on “optimal path” which weighs costs and benefits.
- ➡ Proposes a carbon tax rising from \$10 per ton now to about \$30 in 2050 and \$70 in 2100..

Source: Nordhaus and Boyer, Roll the DICE Again: Economic Models of Global Warming, 1999.

Economic Impact of Climate Change on the US Of Moderate Warming (3.8 °F) By Sector

Sector	Cost (+) or Benefit (-) (billions of 1990 dollars)
Agriculture	\$ 4
Sea Level	6
Energy, timber, water resources	0
Health, water quality, human life	1
Human amenity, recreation	-17
Migration, species loss	?
Human settlements	6
Extreme and catastrophic events	25
Total	\$28
% of GNP	+ 0.5%

Source: Nordhaus and Boyer, Roll the DICE Again: Economic Models of Global Warming, 1999.
 Note: Other studies: Tol 1.5%; Fankhauser 1.3%; Cline 1.1%; Nordhaus 1.0%; Mendelsohn -0.1%
 (Nordhaus has lowered his estimate from his previous study)

World Economic Impact of Climate Change
As a share of Production
With Moderate Warming (3.8 °F)

Country	Loss (+) Gain (-)	
	Without Catastrophe	With Possibility of Catastrophe
Russia	-1.60%	-0.7%
China	-0.3%	0.2%
United States	0.01%	0.5%
Japan	.05%	0.5%
Eastern Europe	0.2%	0.7%
Low Income	1.55%	2.6%
OECD Europe	0.9 %	2.8%
Africa	3.52%	3.9%
India	2.66%	4.9%
Average	0.8%	1.9%

Note: Catastrophe is a climate event that would reduce income by 20% indefinitely – similar to the great depression

Emissions and Temperature Result of a Carbon Tax To Reduce Greenhouse Gas Emissions

Policy		Carbon Tax	Emissions	Temp. Result
Business as usual	2015	0	7	
	2105	0	13	3.8
Optimal (Nordhaus)	2015	\$13	7	
	2105	\$67	12	3.6
Kyoto Protocol	2015	\$85		
	2105	\$300		3.7
Limit to doubling of CO ₂	2015	\$6	7	
	2105	\$268	9	3.6
Limit to 1990 emissions	2015	\$90	6	
	2105	\$679	6	2.9
Limit Temperature rise to 4.5 °F	2015	\$19	7	
	2105	\$732	5	3.3

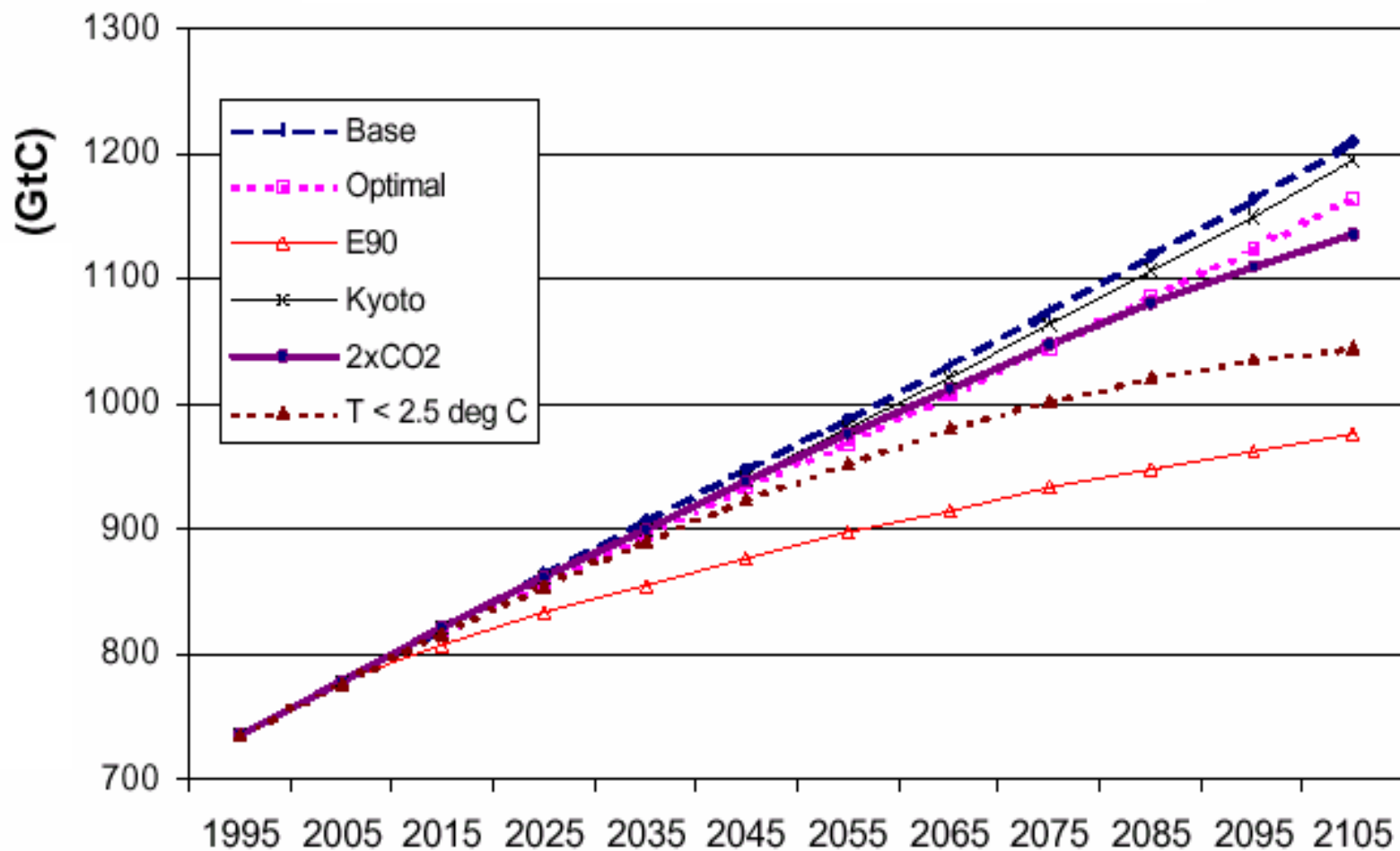
Source: Nordhaus and Boyer, Roll the DICE Again: Economic Models of Global Warming, 1999.

**Abatement Cost and Environmental Benefit
Of Reducing Greenhouse Gas Emissions
(billions of 1990 dollars)**

Policy	Abatement Cost	Environmental Benefit
Optimal	\$90	\$280
Kyoto Protocol	\$220	\$95
Limit to doubling of CO ₂	\$1370	\$680
Limit to 1990 emissions	\$4,500	\$1,500
Limit Temperature to 4.5 °F	\$3,600	\$1,140

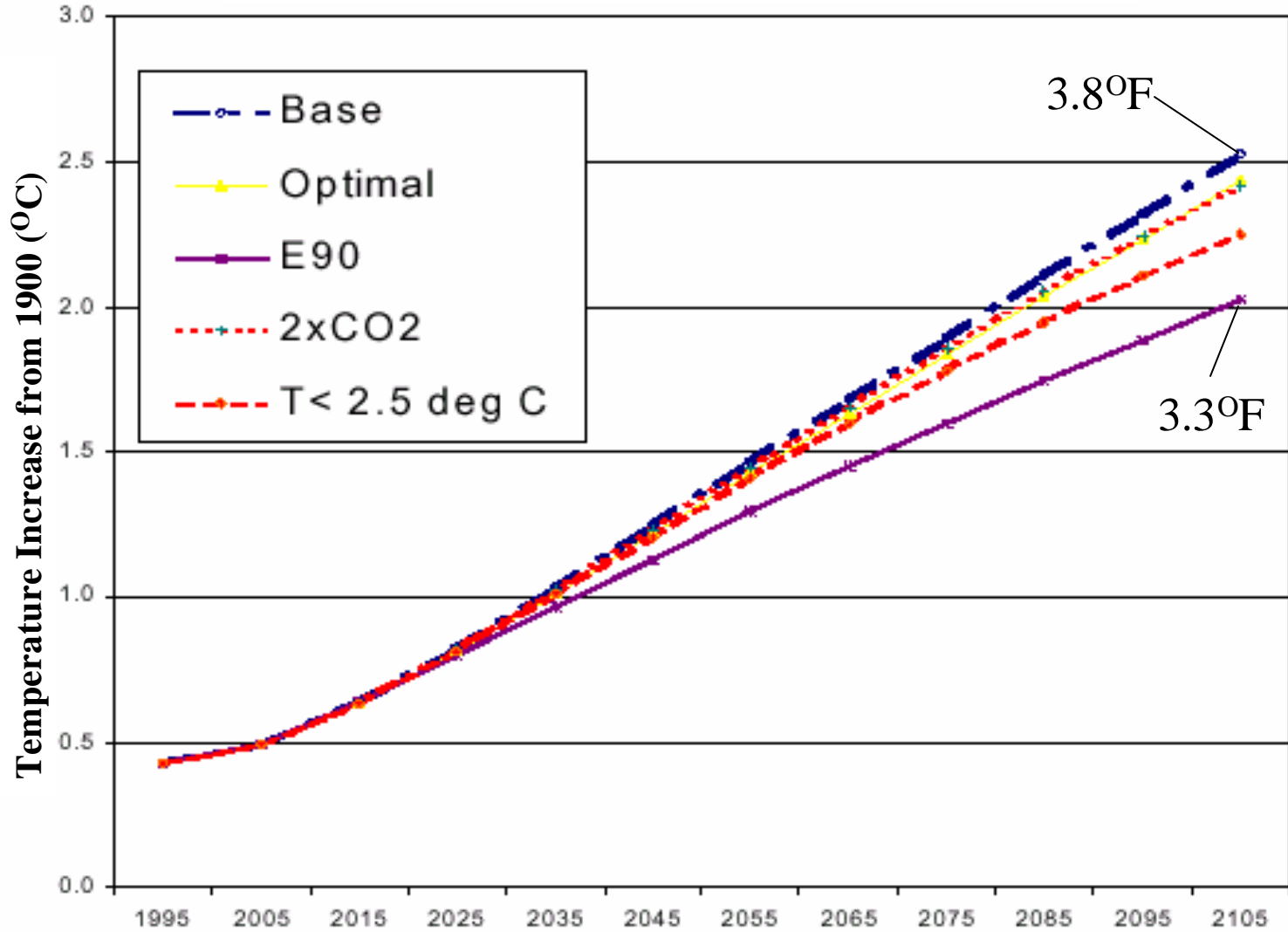
Source: Nordhaus and Boyer, Roll the DICE Again: Economic Models of Global Warming, 1999.

Cumulative Emissions of CO2



Source: Nordhaus and Boyer, Roll the DICE Again: Economic Models of Global Warming, 1999.

Global Mean Temperature from 1900 °C



Source: Nordhaus and Boyer, Roll the DICE Again: Economic Models of Global Warming, 1999.

Problems With The Kyoto Protocol

- Arbitrary assignment of emission reductions
- Does not have an emissions target, concentration target, or consider costs and benefits of policy.
- Exemption of developing countries where emissions are growing most rapidly
- Very costly in the near term. Longer term cost varies according the proposals for emission trading
- Very slight global mean temperature reduction

Source: Nordhaus and Boyer, Roll the DICE Again: Economic Models of Global Warming, 1999.

Summary of the effect of Kyoto Protocol On World Economy

US and other Industrialized Countries

- Energy prices rise
- Price rises and shifting demands create recession and slower income growth.
- Production moves to developing countries.
- Worker buying power eroded by higher prices

➤ Developing Countries

- Exports to industrial countries hurt by recession
- Oil surplus causes world oil price to decline adding to developing country cost advantage
- Energy use increases in developing countries

Conclusions

- The Kyoto Protocol as an inefficient and costly attempt to address global warming.
- Estimates of damage from moderate global warming are generally low.
- Low-cost geo-engineering solutions such as encourage algae growth in oceans and distributing reflective particles in the upper atmosphere should be explored.