

Global Climate Decisions Under Uncertainty

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MERGE: a model for evaluating regional and global effects of greenhouse gas reductions

Reduced form representation of:

- the domestic and international economy
- energy-related emissions of greenhouse gases
- non-energy emissions of ghg's
- global climate change

This DUU model is based on 30,000 constraints, 2700 nonlinear, nonzero entries. Not easy to solve.

For details, see: www.stanford.edu/group/MERGE

Figure 1. Global and regional population

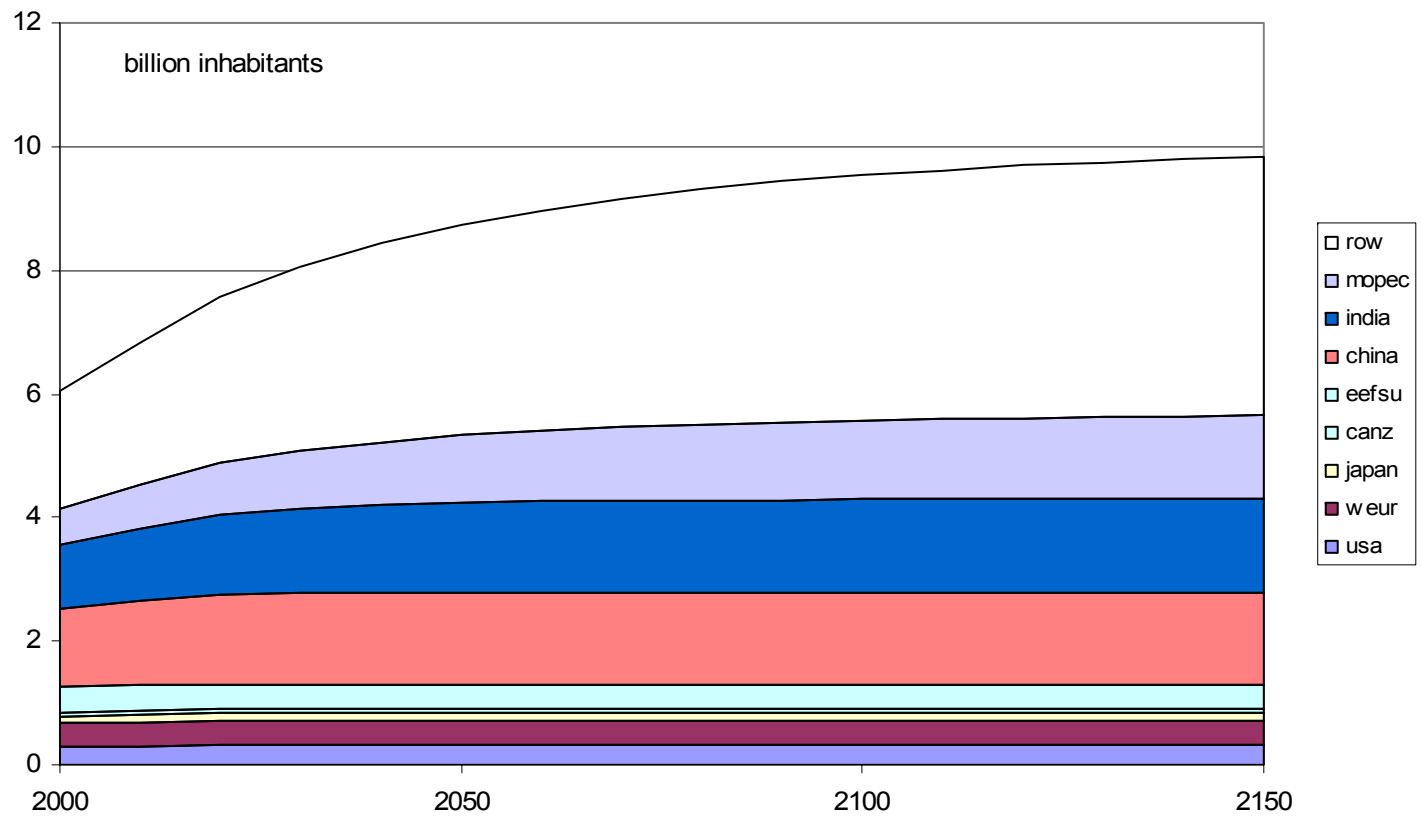
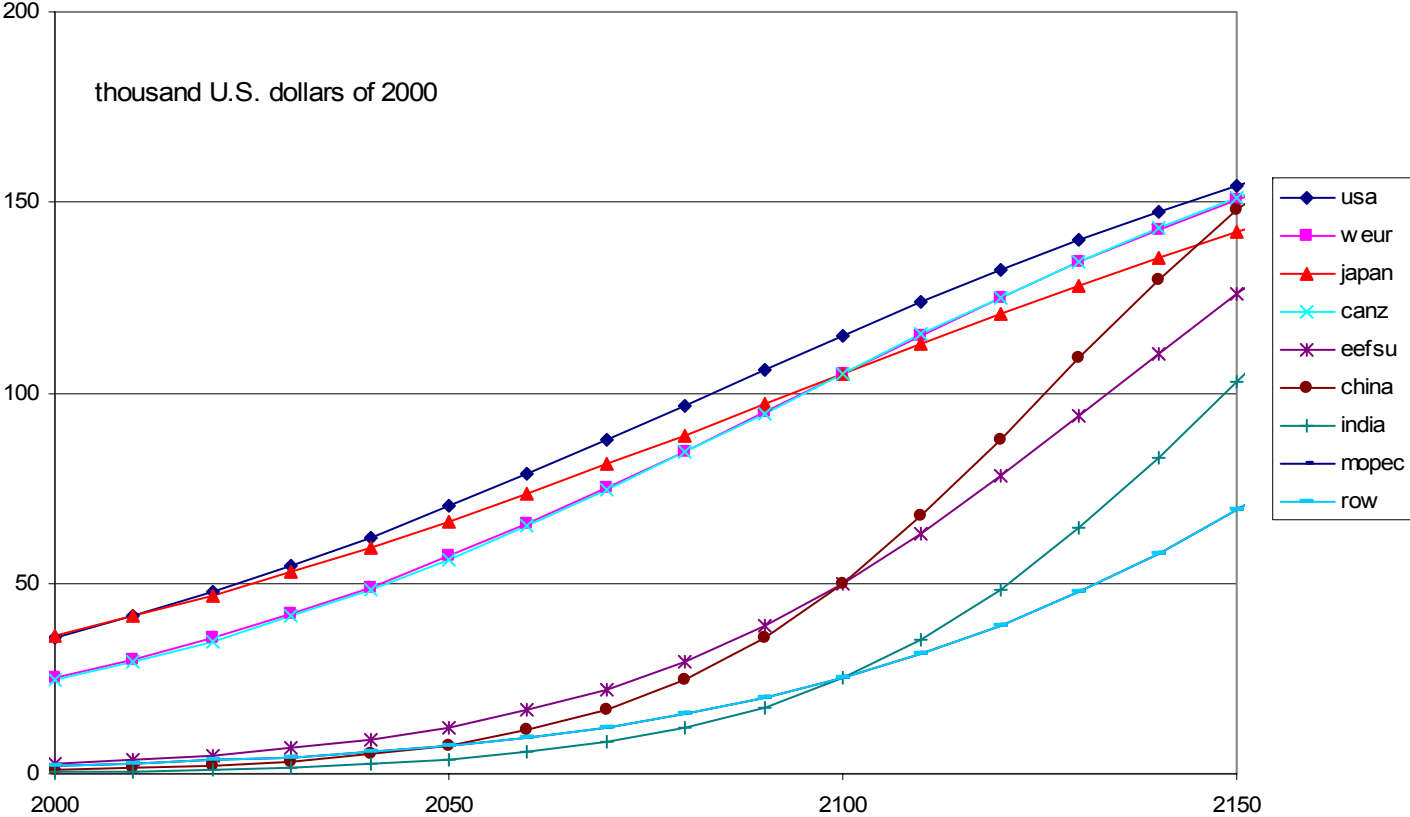


Figure 2. Projections of GDP per capita - at market exchange rates



Climate sensitivity: equilibrium mean global temperature change associated with a doubling of global carbon concentrations from preindustrial level of 275 ppmv.

For each climate sensitivity, there is a different *thermal inertia lag* required for consistency with current level of 370 ppmv and mean global temperature increase of 0.5-1.0° C.

Gary Yohe guidelines for EMF 22 Uncertainty Subgroup

Probabilities of alternative climate sensitivities:

1.5° C	25%
3°	45%
5°	15%
8°	15%

Resolution of uncertainties in 2040

Max mean global temperature increase: 4° C (or less)

Figure 3. Global carbon emissions
with alternative climate sensitivities

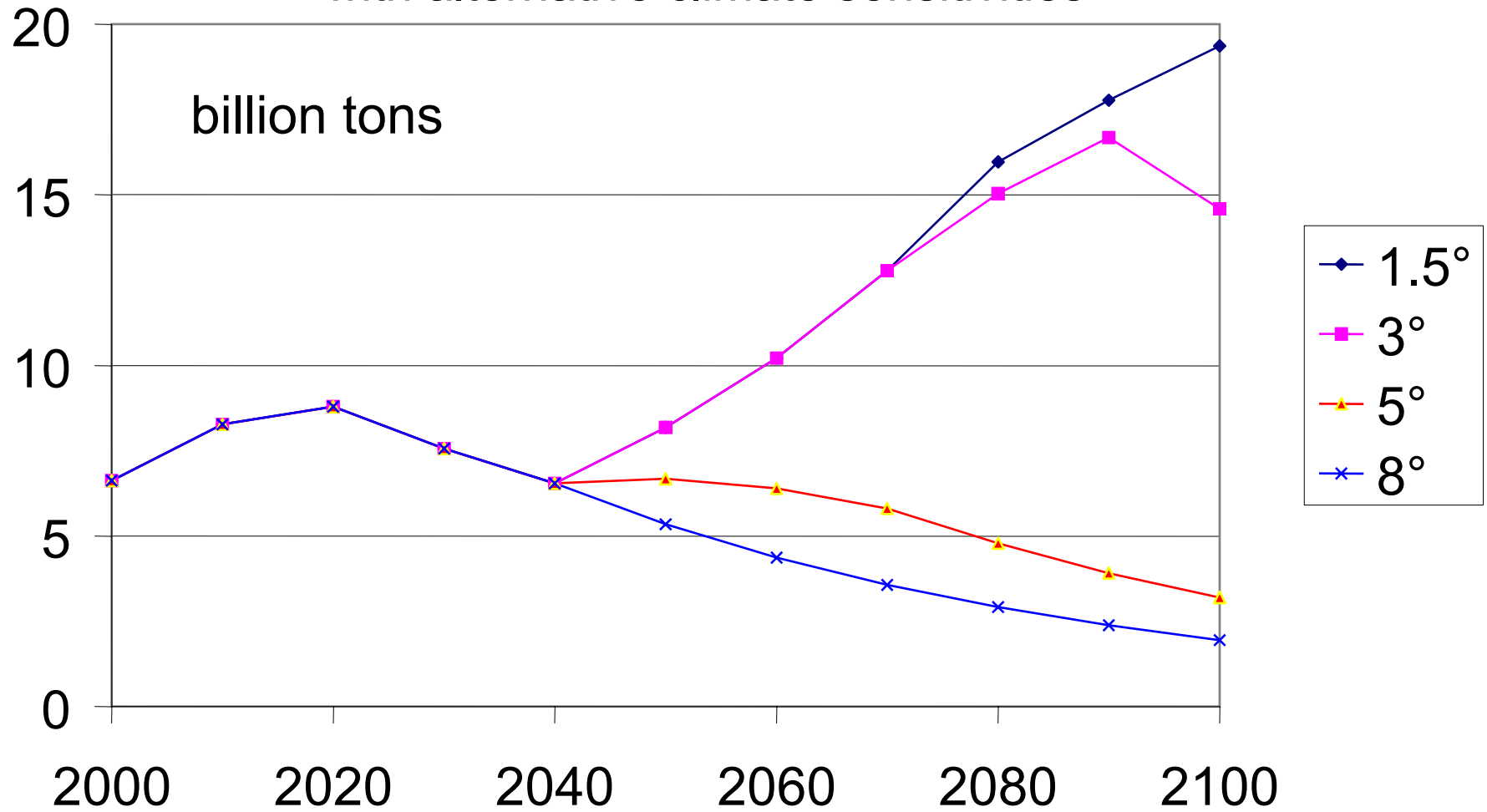


Figure 4. Global carbon price

with alternative climate sensitivities

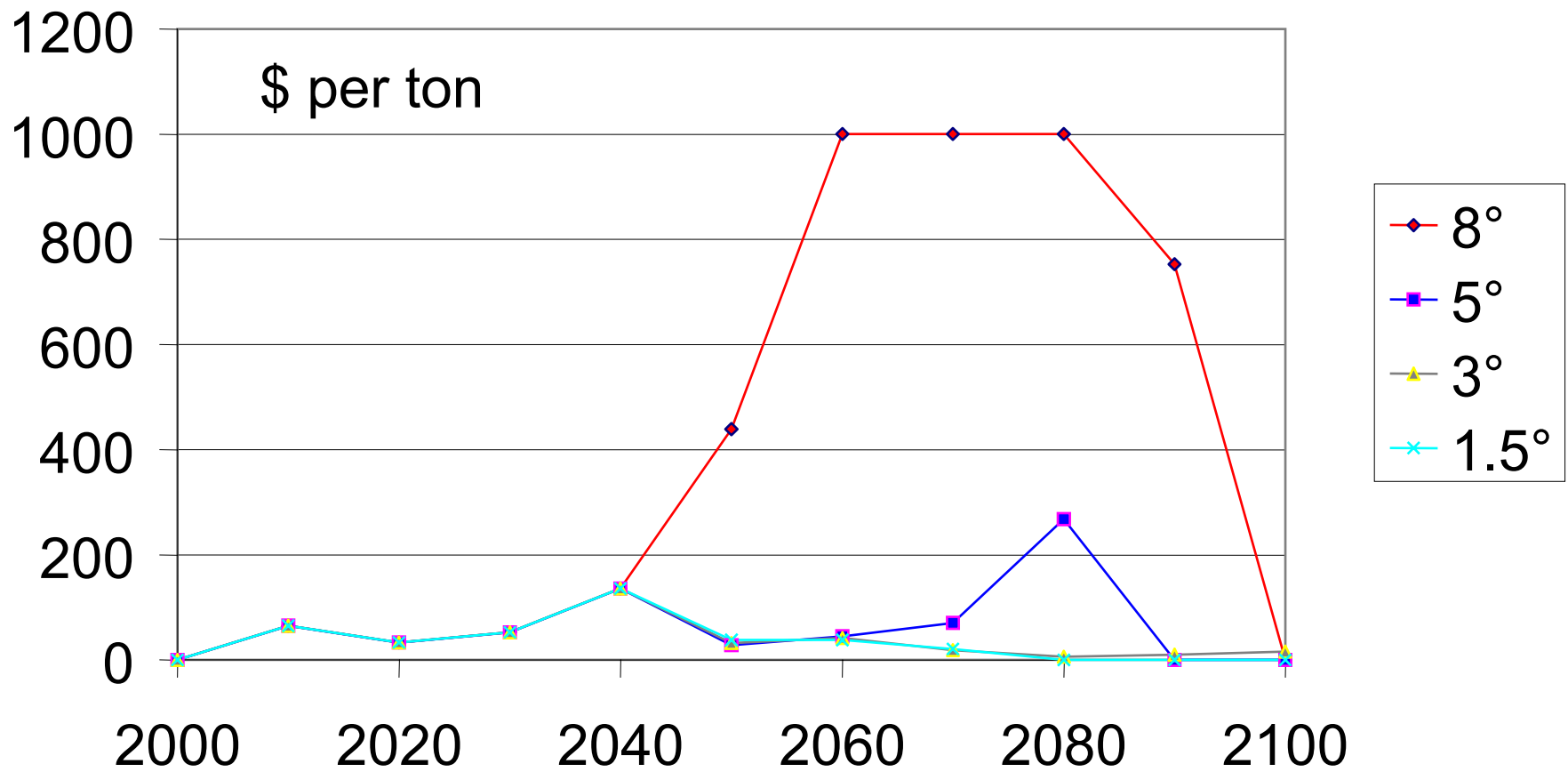
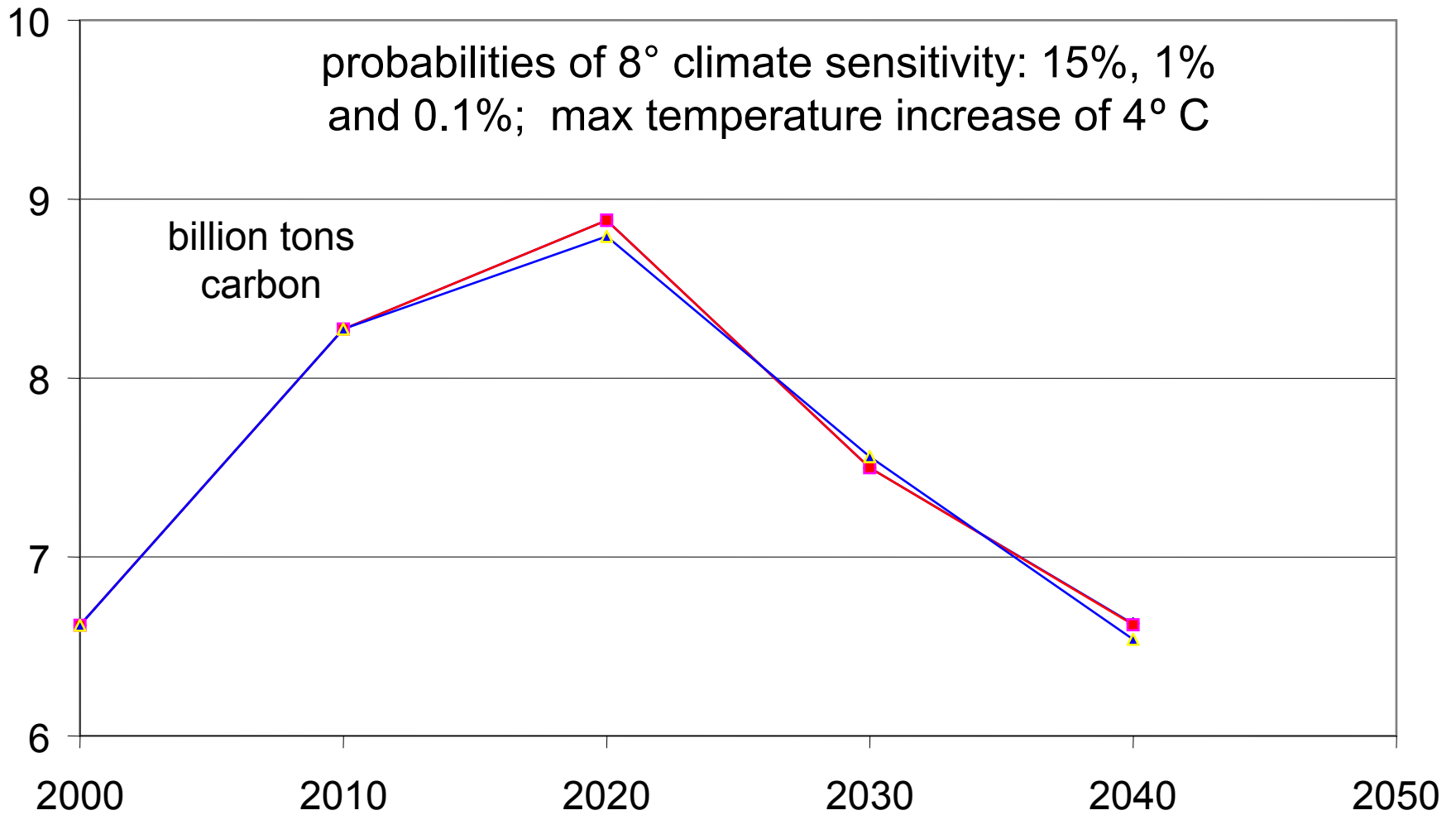


Figure 5. Global carbon emissions



Significance of extreme climate sensitivity of 8°:

- Probabilities don't affect the near-term decisions. Solution is virtually a minimax result. (That is, we maximize utility under the worst possible state of world.)
- Could avoid this if a fixed temperature ceiling were replaced by an approach based on expected disutility of high temperatures.