

Post-Kyoto climate targets

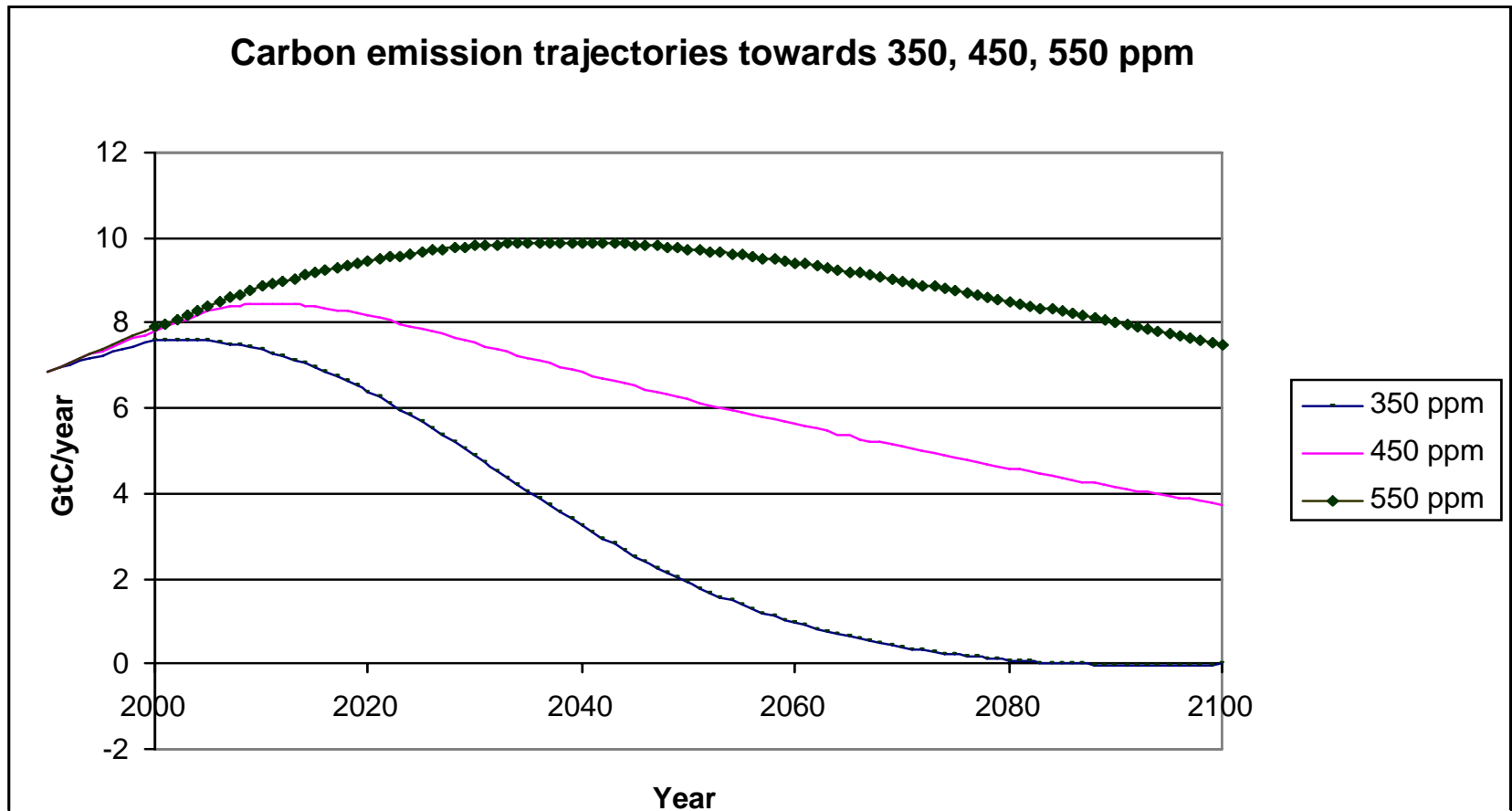
Policies and implications for biofuels

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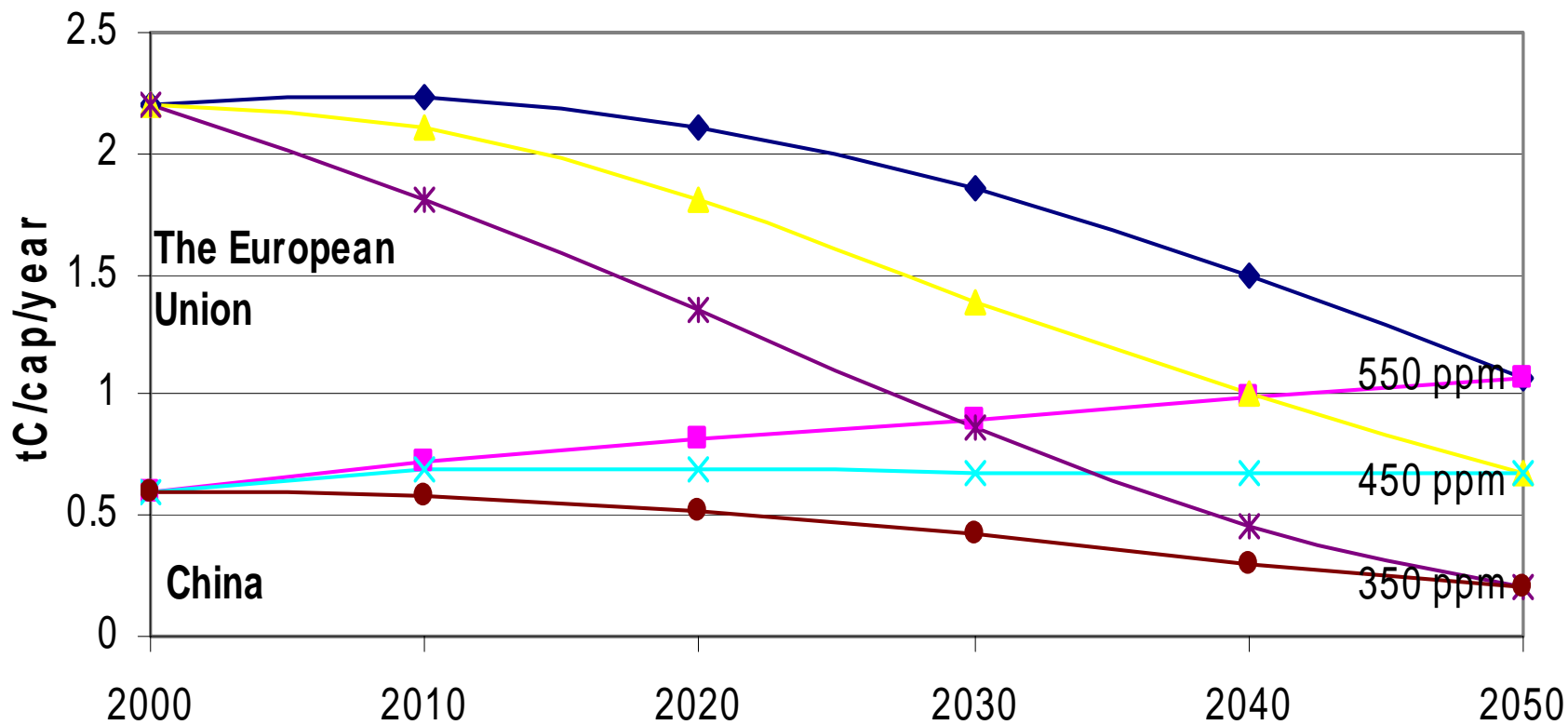
The Kyoto Protocol

- OECD countries + Russia/Ukraine have taken on targets
- Overall targets weak because of hot air in Russia and Ukraine
- Individual countries far from meeting their targets
- USA and Australia refused to ratify
- More than a hundred countries have ratified
- Negotiations for 2nd commitment period to start soon

Aim is to stabilize atmospheric concentration - *not* the emissions!



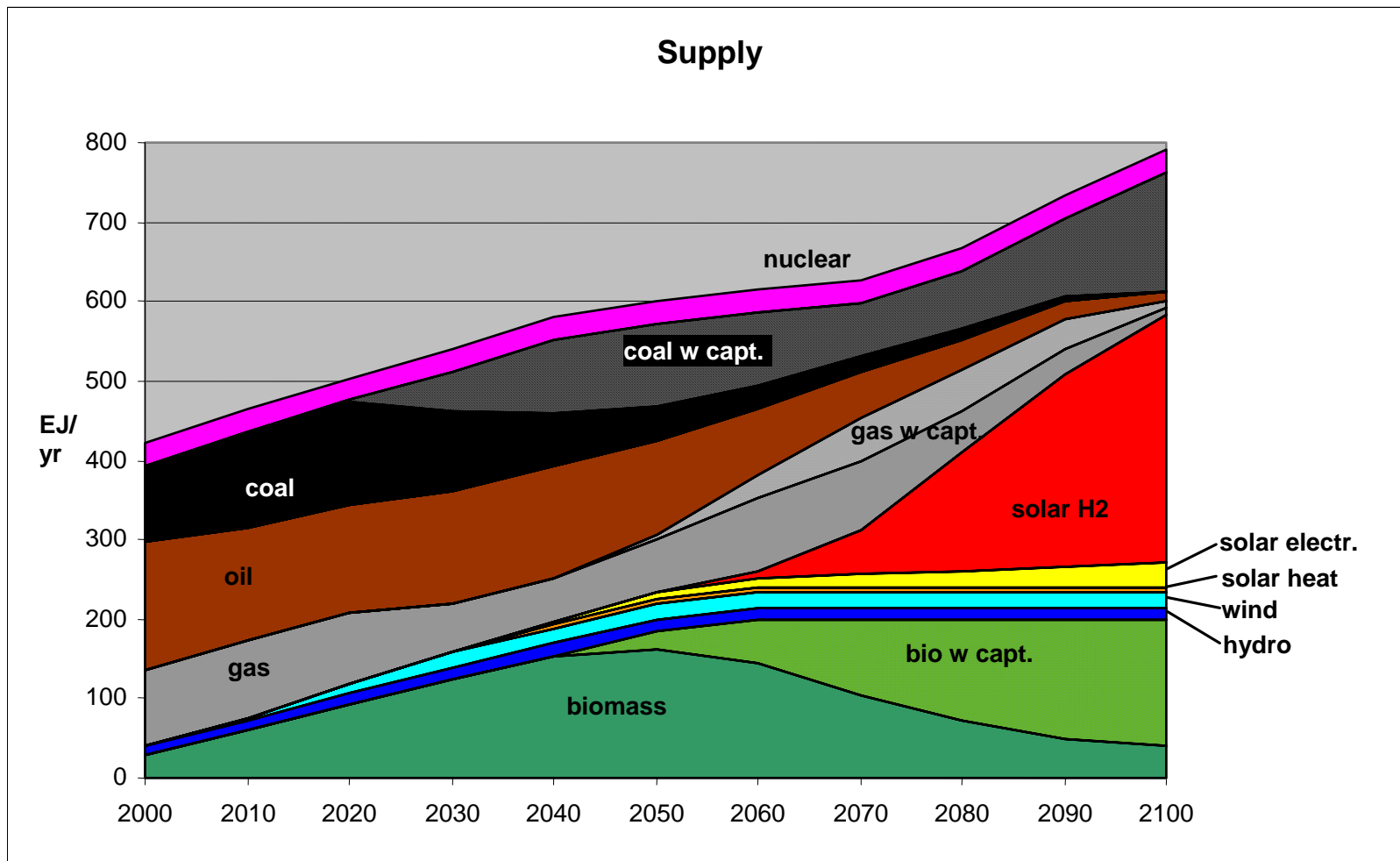
Per capita emissions under contraction and convergence by 2050



Key issues

- EU continued leadership
- USA
- Developing countries

CO₂-concentration 350 ppm



Results from the GET model. Azar *et al*, 2005, *Climatic Change*

Prospects for biofuels?

Key problems for biofuels

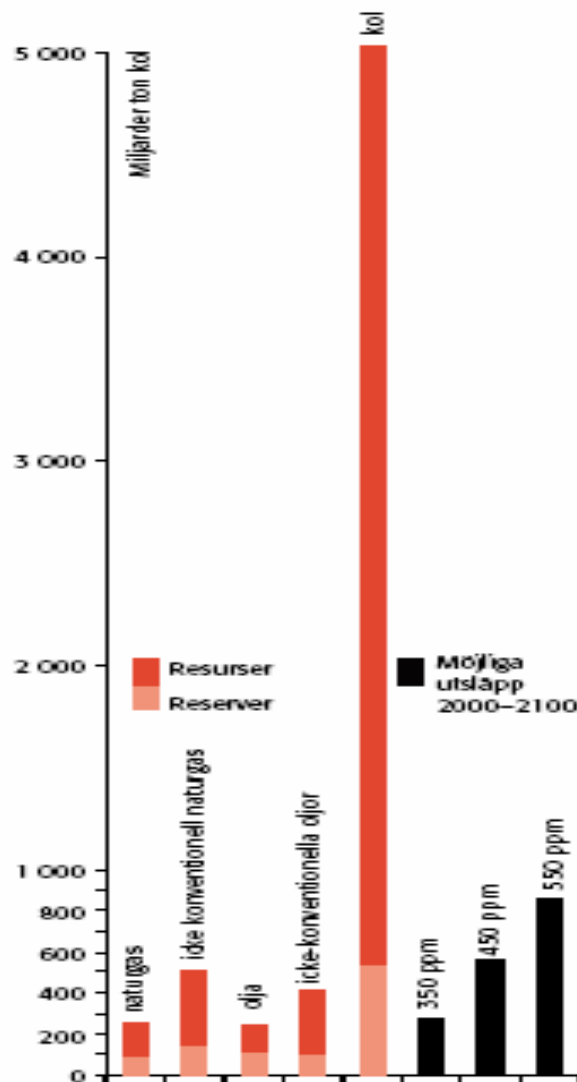
Costs, availability and conversion efficiency
in a systems perspective

- Near term competition with oil and other fossil fuels (2000-2040)
- Long term competition with hydrogen from solar or fossil fuels with carbon capture (beyond 2030/40)

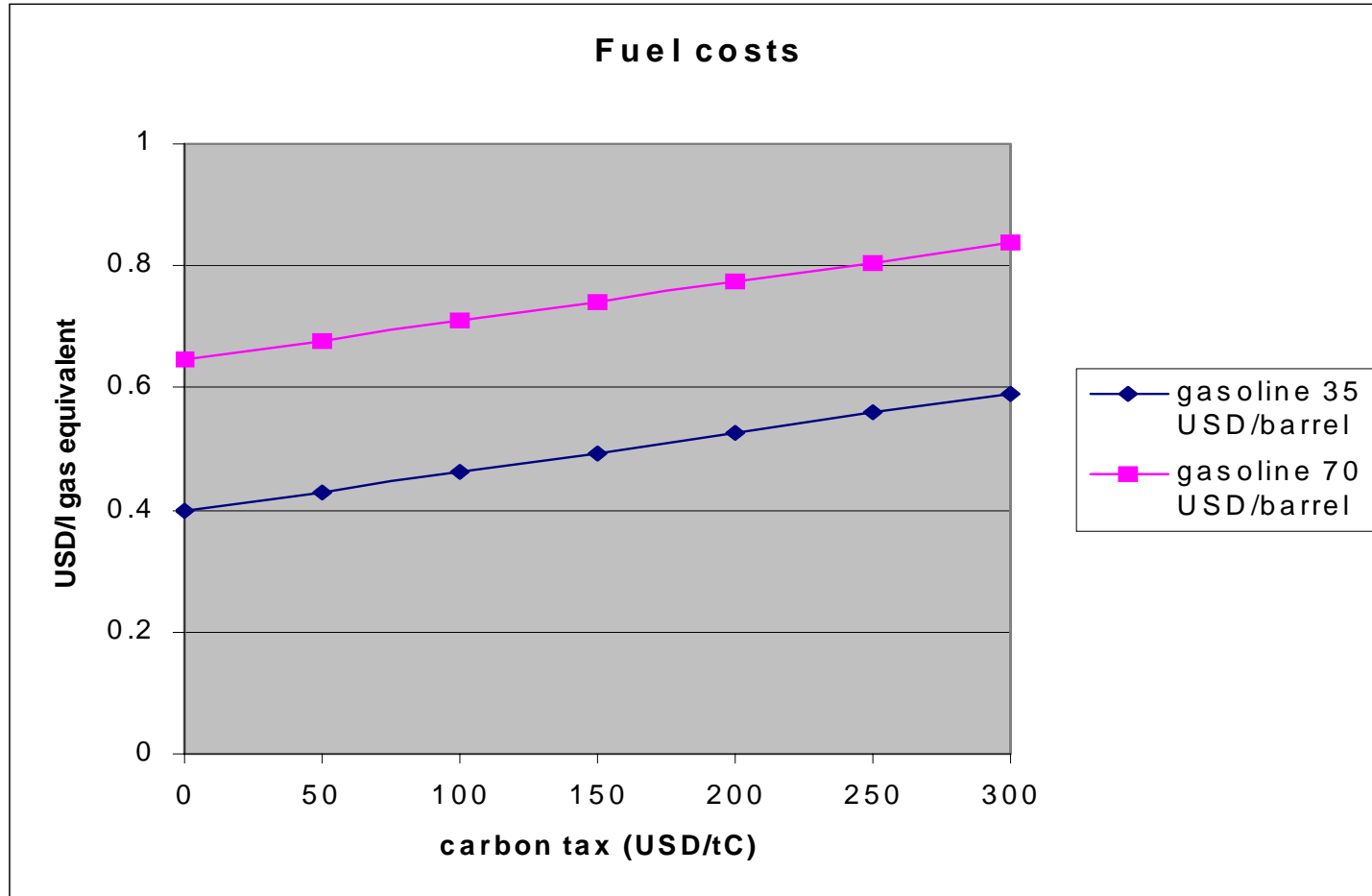
1. Lack of fossil fuels will not stabilize the climate

2. The entire oil reserve can be used!

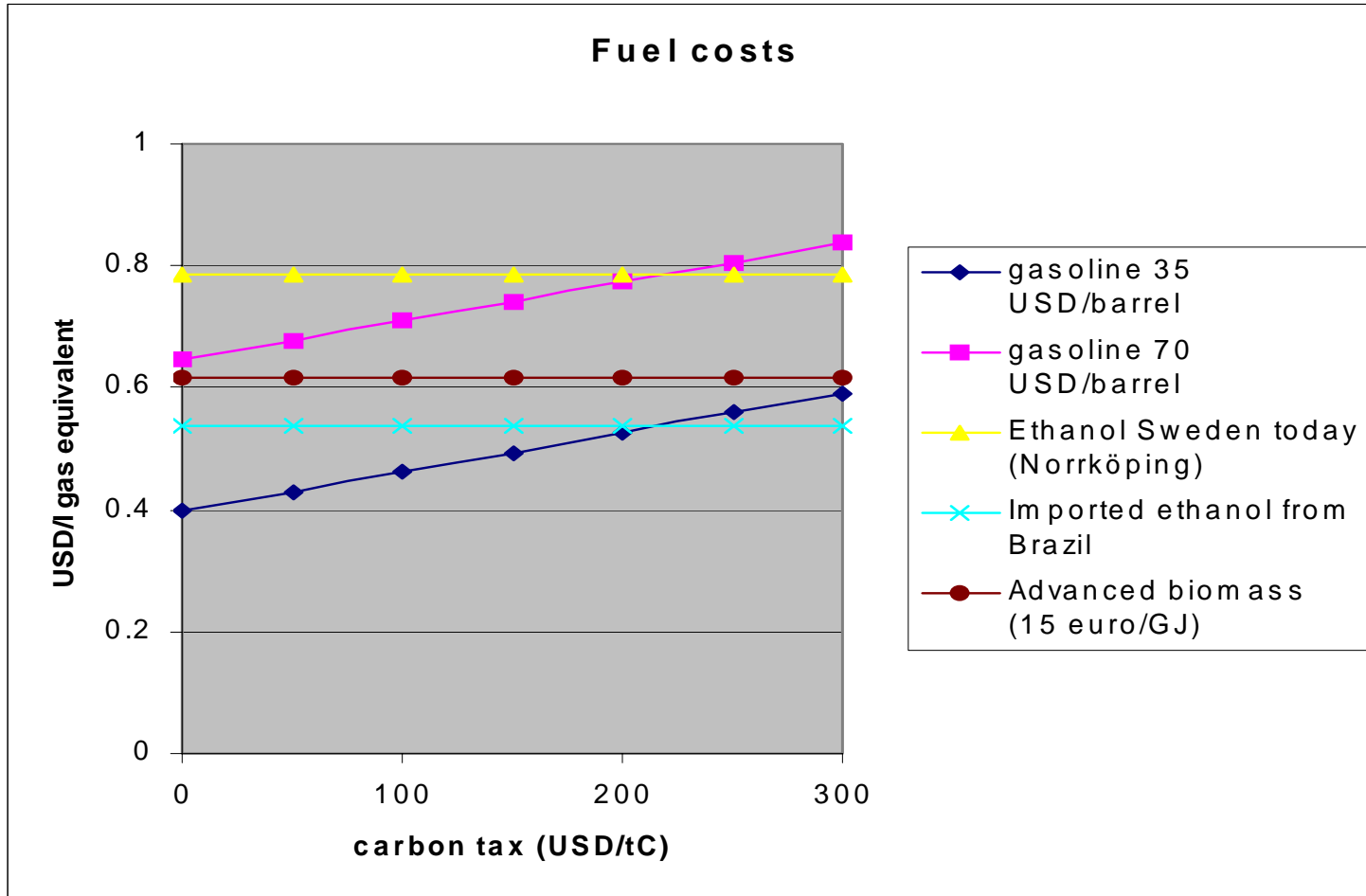
3. Where use the oil if not in the transport sector?



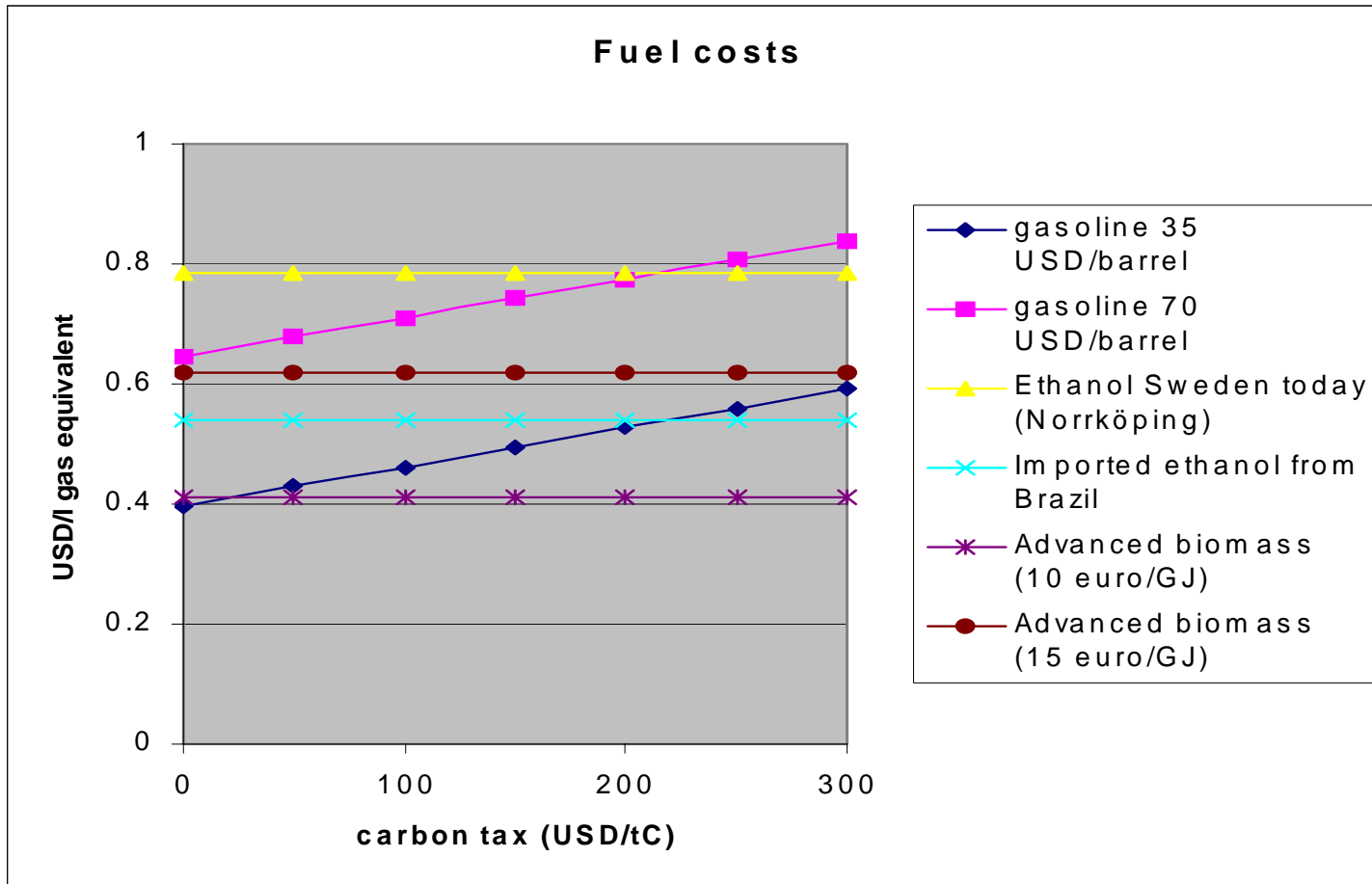
The cost of gasoline and biofuels I



The cost of gasoline and biofuels II

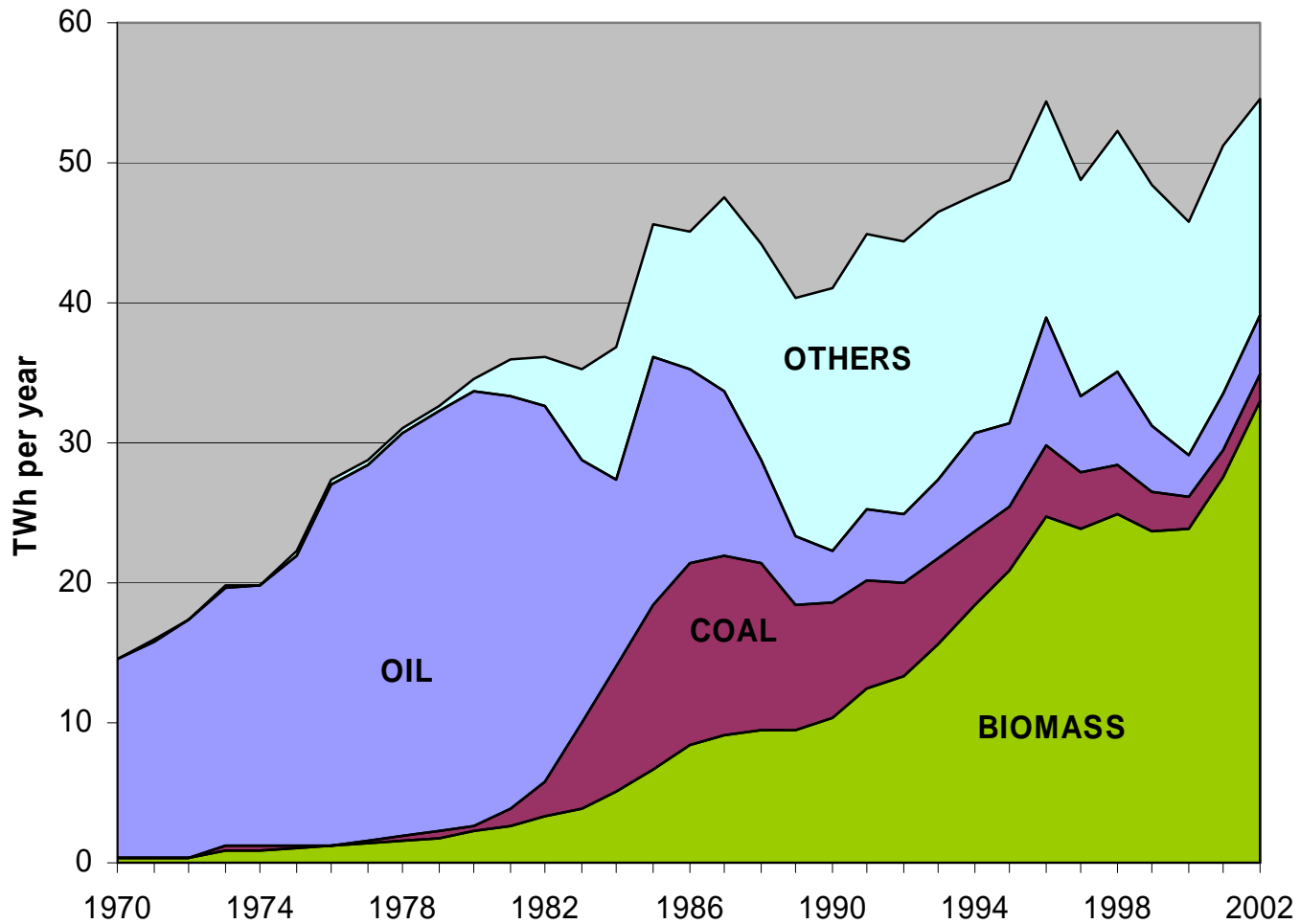


The cost of gasoline and biofuels III



Not even very low cost biofuel might win because of opportunity cost considerations and variable oil price

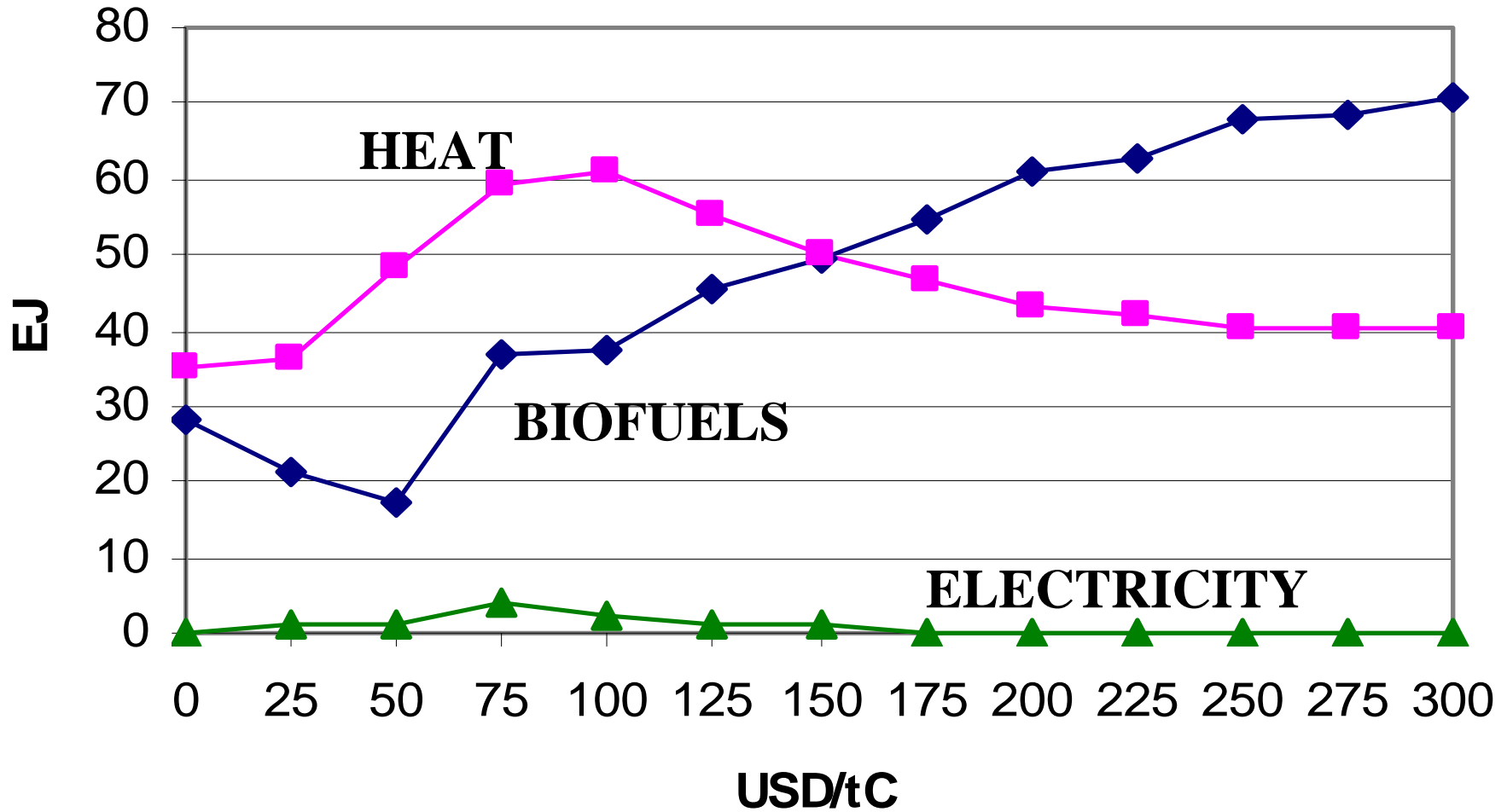
District heating in Sweden



Four "openings" for biofuels

- Geopolitics and availability of oil (beware of competition with liquified fossil fuels though)
- Europe ahead of others (with protection of the energy intensive industries)
- The curious view that all sectors better reduce the emissions by the same percentage number
- Hydrogen and electric battery vehicles too costly, too "unpractical"

Impact of CO2 tax on biomass use, year 2040



Grahn et al, 2005, runs with the BEAP model

What to do?

- Higher price on carbon emissions
- Efficiency standards
- Technology policies (R&D, demonstration, market incentives to bridge the gap between invention and diffusion)

More specifically...

- A Certificate System, tax exemptions, or something similar, *may* lead to prolonged interest in poorly performing biofuels
- ... and come at the expense of learning in more promising system (cellulose based ethanol, synfuels route)
- ... and at the expense of more efficient use of that biomass
- At present, increase invest in learning in a variety of technologies, i.e., R&D, demonstration, prototypes
- .. and rely primarily on efficiency improvements, demand reduction and fuel switching in other sectors (electricity and heating)

And not to forget...

- Agenda building to create acceptance for carbon policies
- International agenda building (to convince other countries to join)