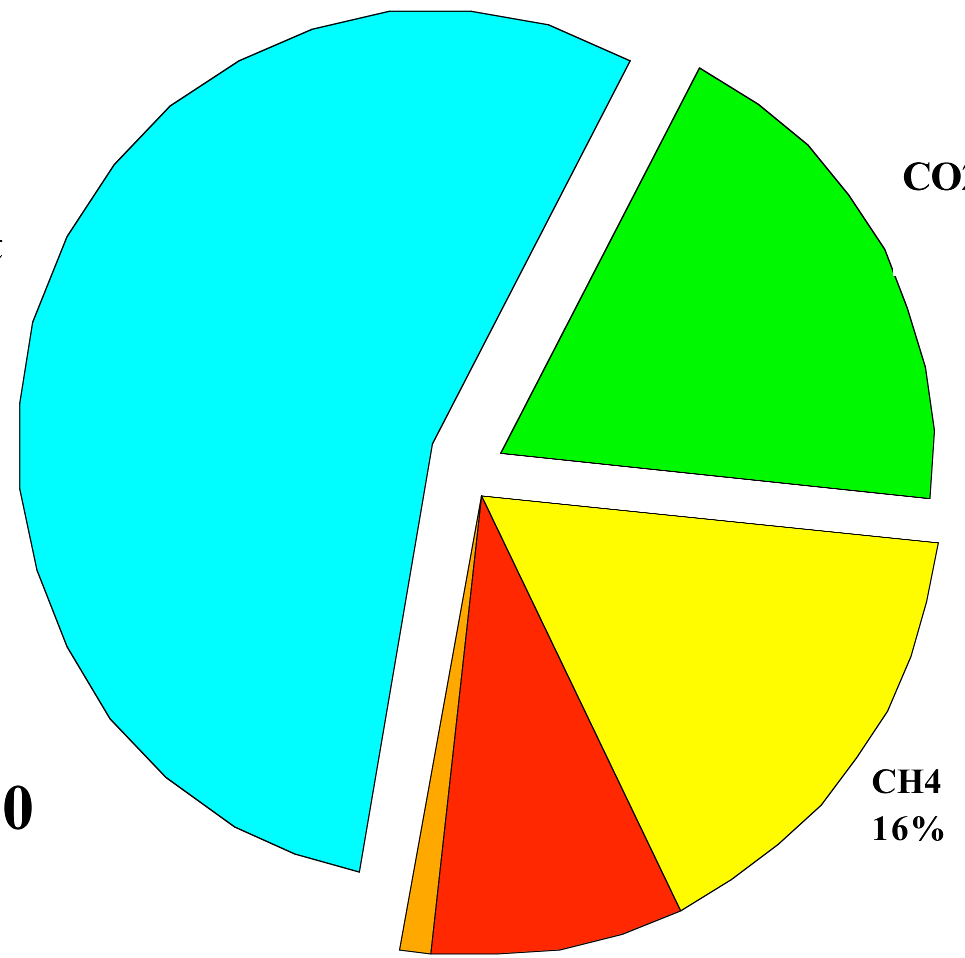
Overview

- Communicating to (with) policymakers
- Example in dealing with comprehensiveness and uncertainty
  - Emissions from Forestry & Agriculture and the panorama of policy choices

Perspective # 1

2000 Global Net GHG Emissions



Total .11,000 MMTCE

Source: EMF21, USEPA

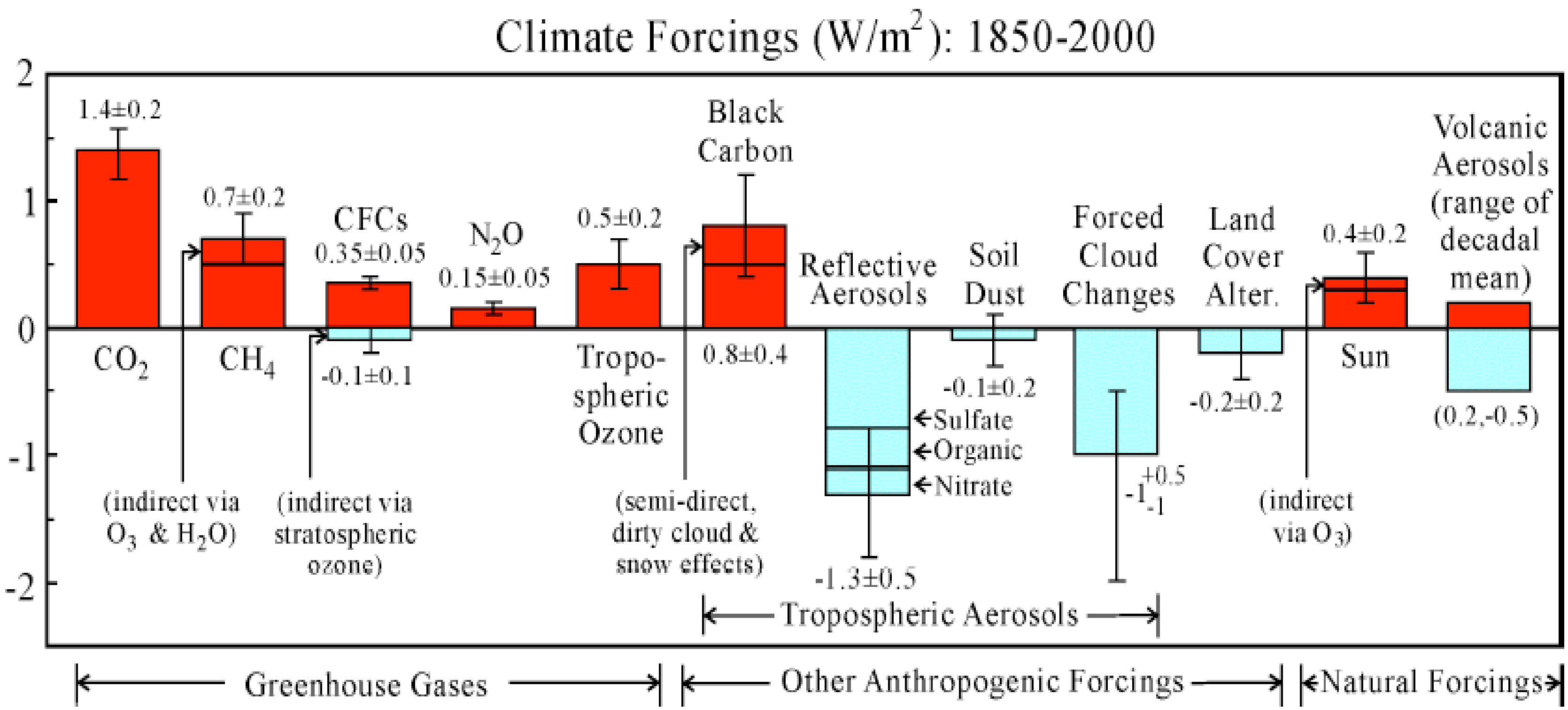
Perspective # 2: Process based mitigation policies

Global GHG Emissions for 2000 in MMTCE

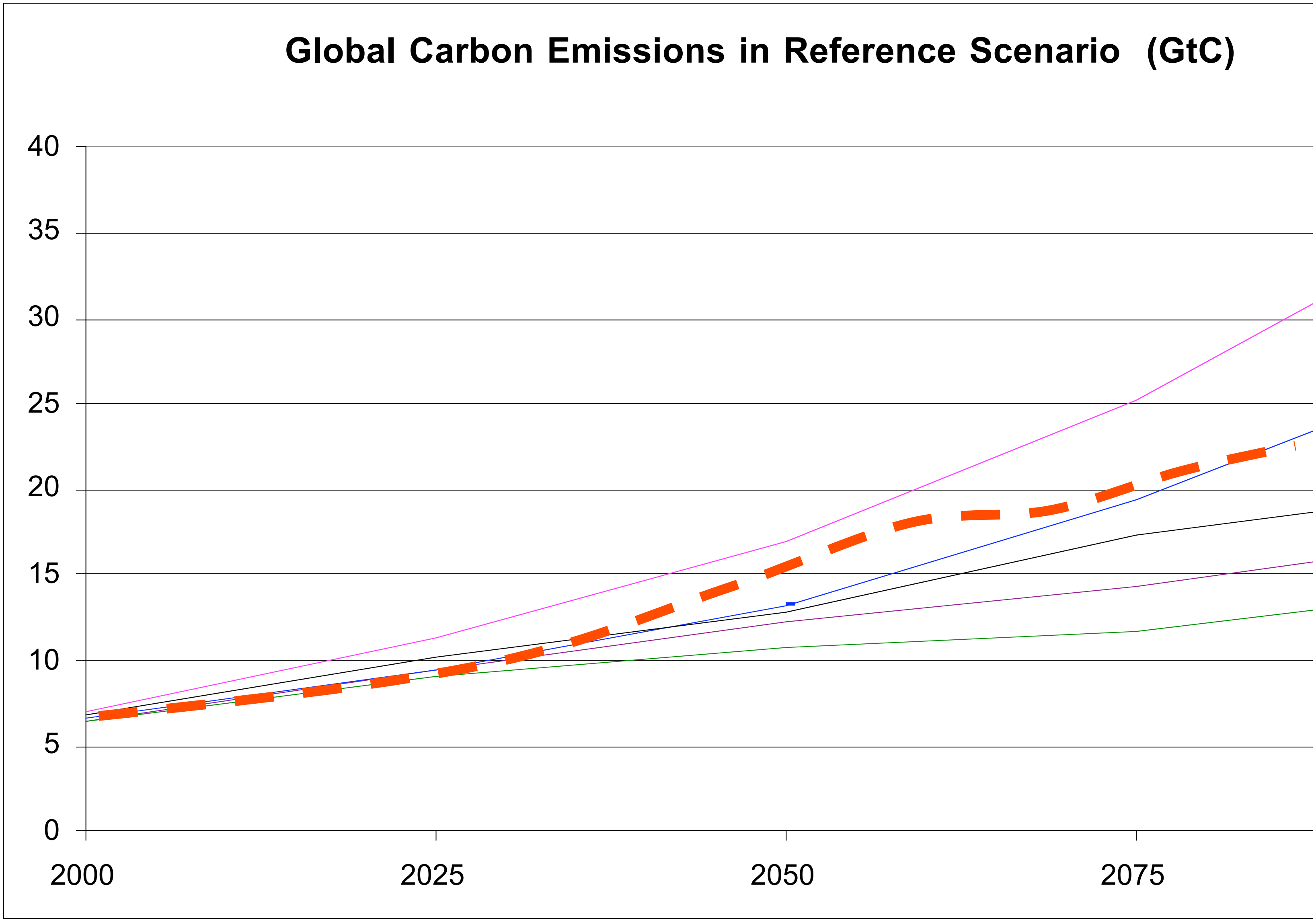
Sectors	Sub-sectors	CO2	Methane	N2O	F-gases
	Coal	2,218	123		
ENERGY	Nat Gas	1,309	244		
6843	Petroleum Syst	2,857	17		
60%	Stationary/Mobile Sources		16	59	
	LUCF (net)	2,081			
LUCF	Soils			656	
AGRICULTURE	Biomass		134	51	
3691	Enteric Fermentation		476		
33%	Manure Management		61	55	
	Rice		177		
	Cement	226			
	Adipic & Nitric Acid Prd			60	
INDUSTRY	HFCs				26
408	PFCs				29
4%	SF6				15
	Substitution of ODS				52
WASTE	Landfills		213		
388	Wastewater		154	21	
3%					
TOTAL GHG	11,330	8,691	1,615	902	122
		77%	14%	8%	1%

Sources: EPA, EMF21, CDIAC

Perspective # 2: Radiative Forcing by Species/Process

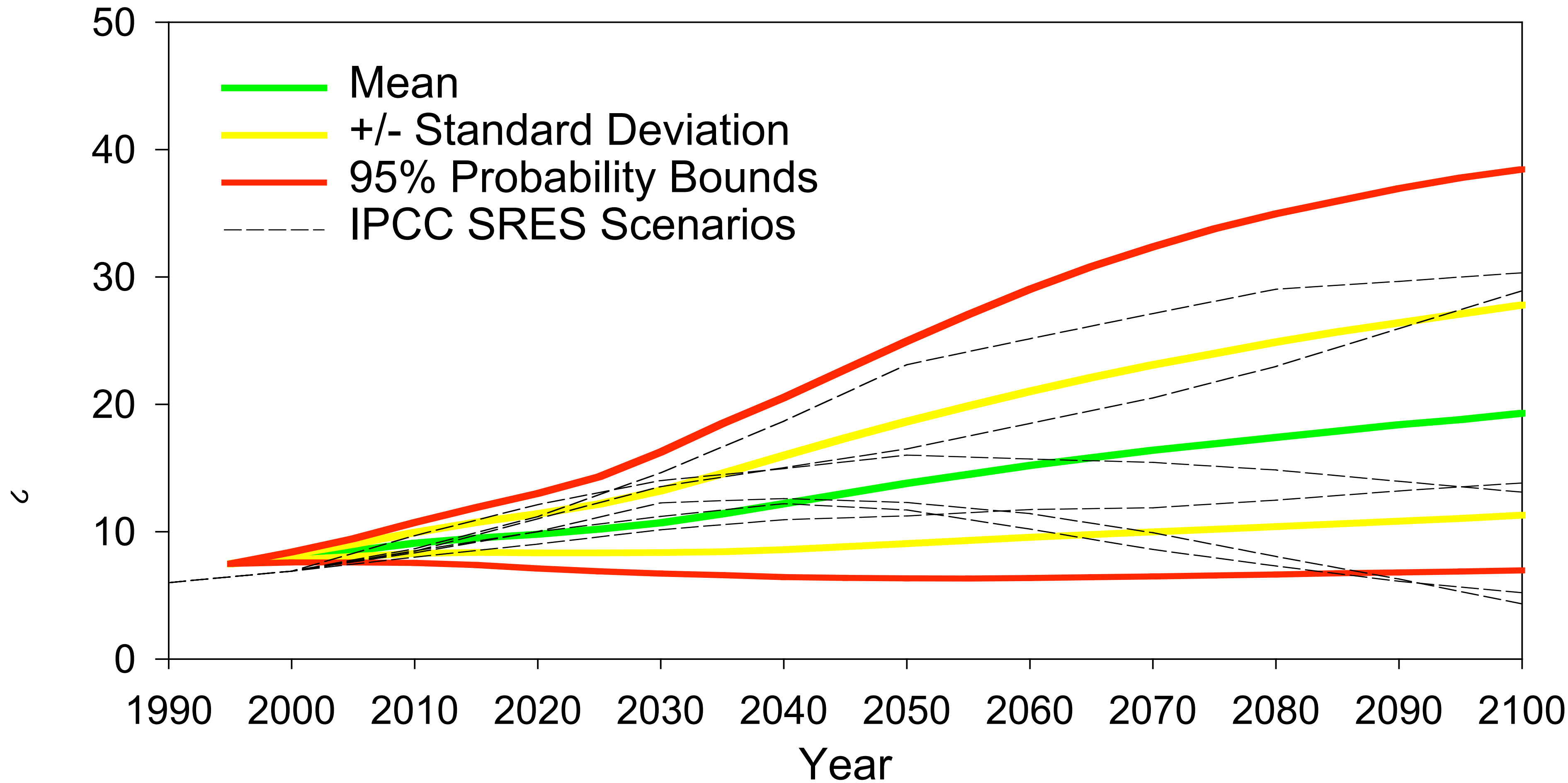


Hansen (2001)


Global Carbon Emissions in Reference Scenario (GtC)
40
35
30
25
20
15
10
5
0
2000
2025
2050
2075

Global CO_2 Emissions

Range of model results ≠ uncertainty



Source: J. Reilly, MIT

"If integrated assessment were perfect, would policymakers listen?"

Maybe

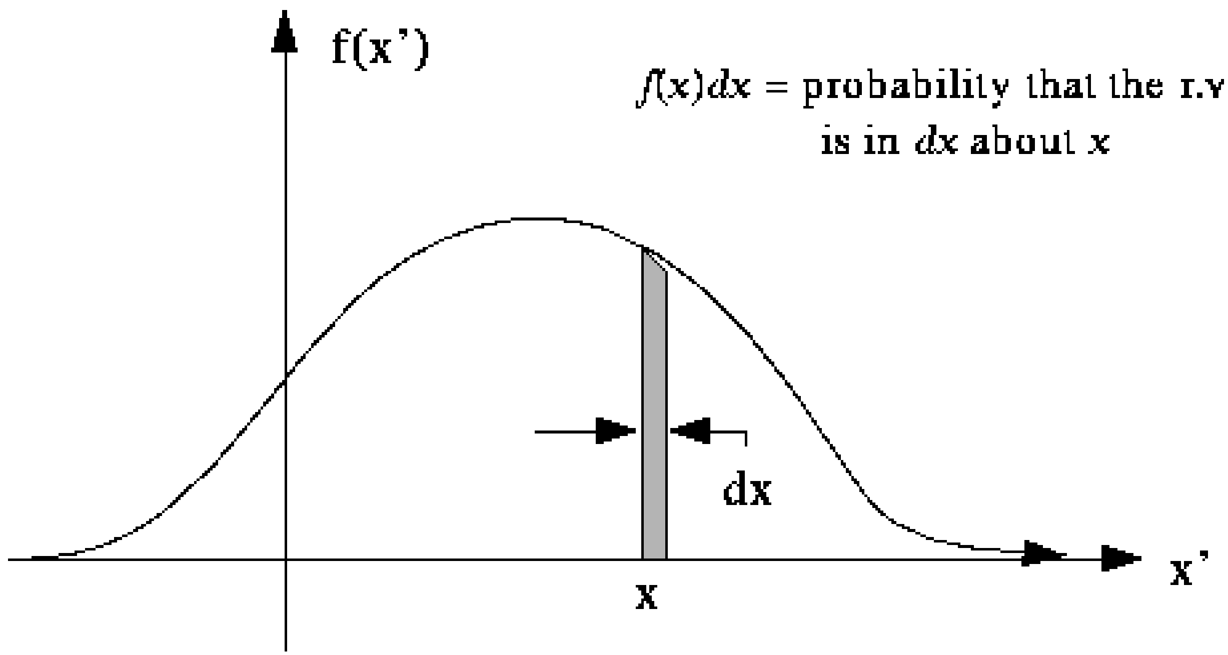


Figure 4. Typical Probability Distribution Function (*pdf*)

Figure from Computational Science Education Project, http://csep1.phy.ornl.gov/

Economic Potential for Agricultural Non-CO2 Greenhouse Gas Mitigation: An Investigation in the United States

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Departments of Geosciences and Economics
Hamburg University

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ROLES OF U.S. AG & FORESTRY

- A carbon or GHG sequestering sink
- Offsetting net GHG emissions
- Operating in a mitigating world
- **EMISSION REDUCERS**
  - Ag and forestry emit **70% of N_2O**
  - Ag and forestry emit **50% of CH_4**
  - Ag and forestry emit **20% of CO_2**

MODELING APPROACH

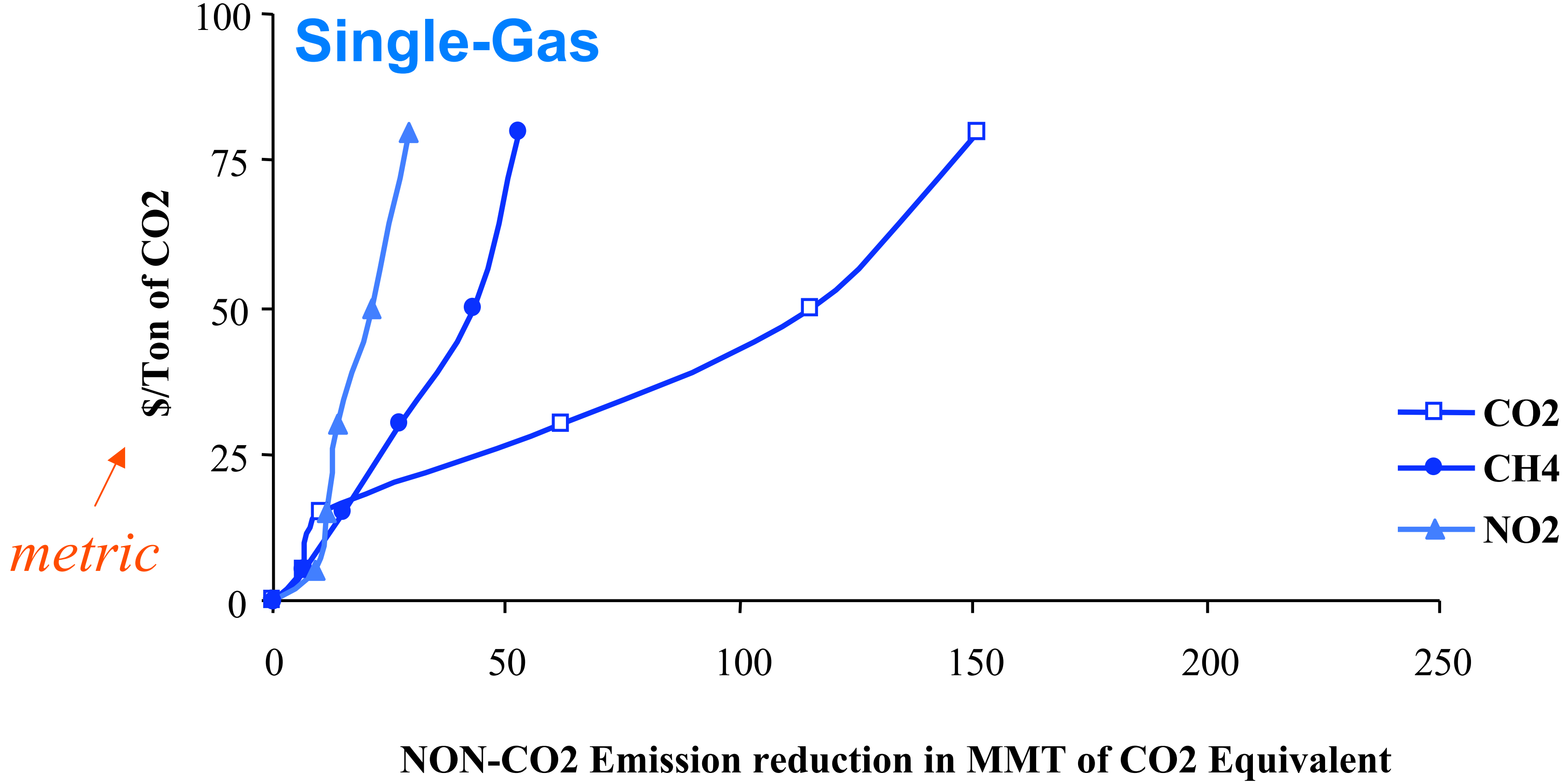
- 100 year forest and agriculture model - FASOMGHG
- Covers GHG mitigation activities in U.S. regions (across 11 regions and 63 U.S. Sub-State regions), 28 foreign regions for 8 commodities, plus world market for other commodities.
- Simulates 100 years in decade time steps.
- Depicts sector linkage mainly through land transfers.

FASOMGHG REGIONS

FASOMGHG MITIGATION OPTIONS

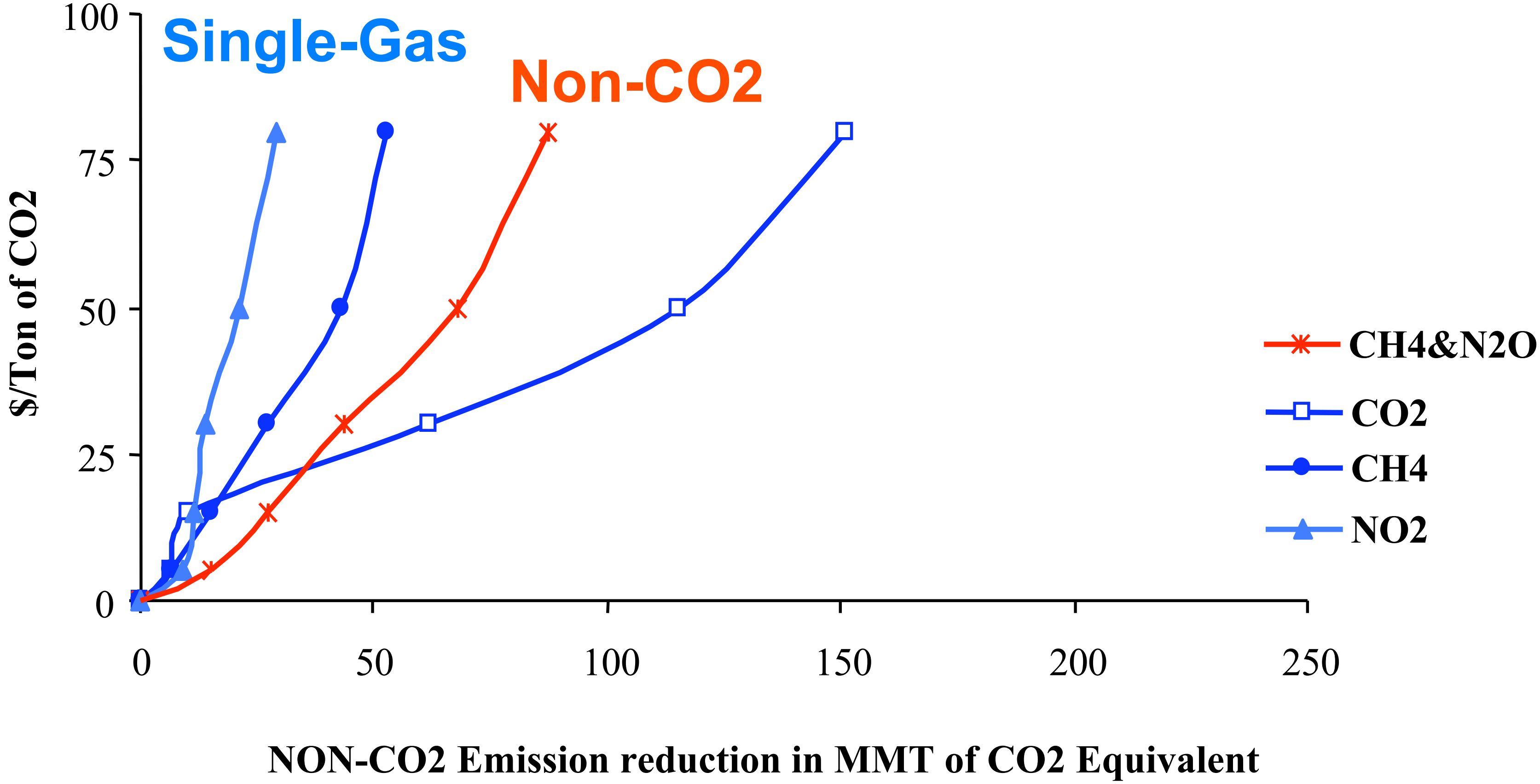
Strategy	Basic Nature	CO_2	CH_4	N_2O
Crop Mix Alteration	Emis, Seq	X		X
Crop Fertilization Alteration	Emis, Seq	X		X
Crop Input Alteration	Emission	X		X
Crop Tillage Alteration	Emission	X		X
Grassland Conversion	Sequestration	X		
Irrigated /Dry land Mix	Emission	X		X
Biofuel Production	Offset	X	X	X
Afforestation	Sequestration	X		
Existing timberland	Sequestration	X		
Deforestation	Emission	X		
Stocker/Feedlot mix	Emission		X	
Enteric fermentation	Emission		X	
Livestock Herd Size	Emission		X	X
Livestock System Change	Emission		X	X
Manure Management	Emission		X	X
Rice Acreage	Emission	X	X	X

ECONOMIC POTENTIAL



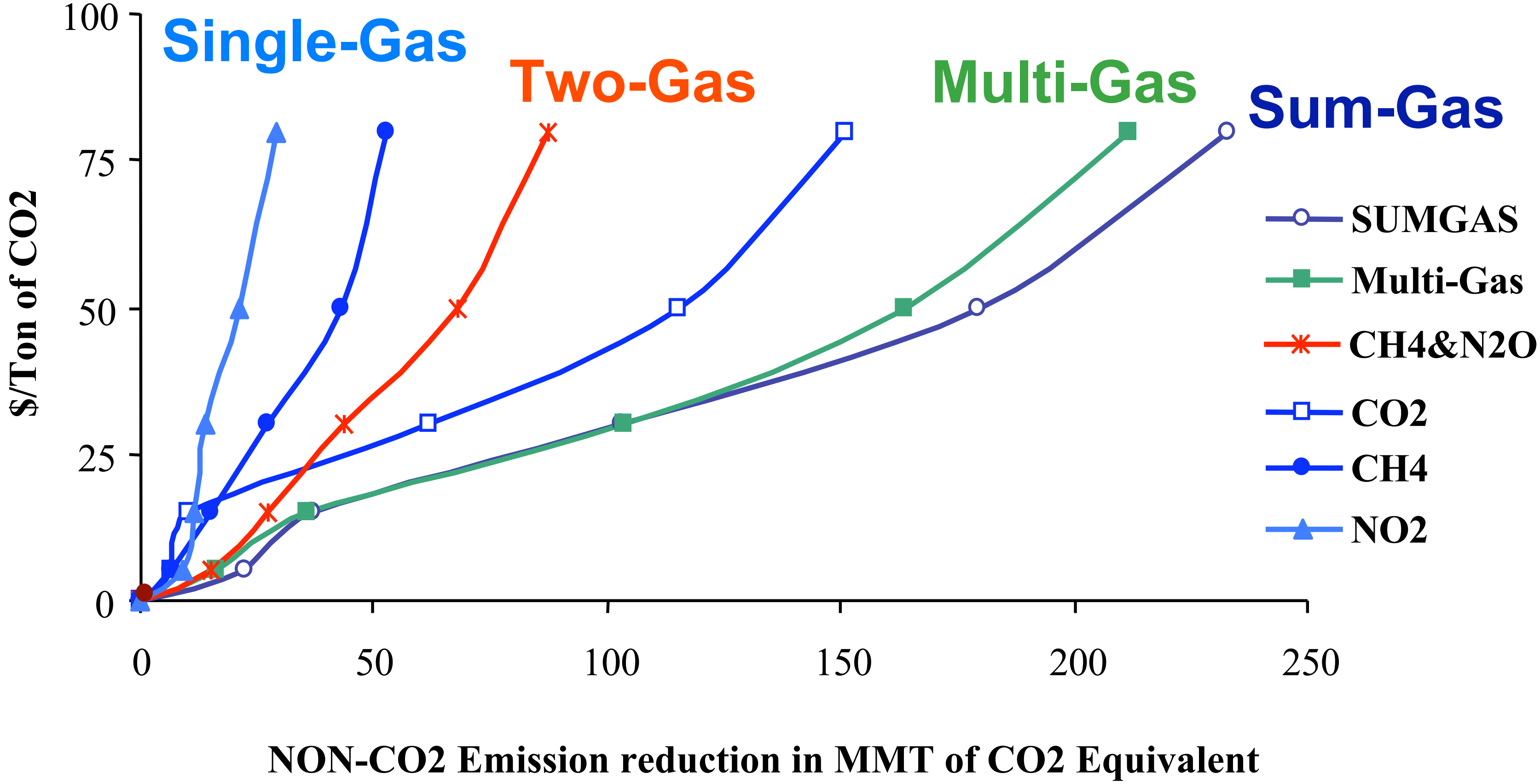
Economic potential: **Mitigation potential when crediting each gas separately**

ECONOMIC POTENTIAL



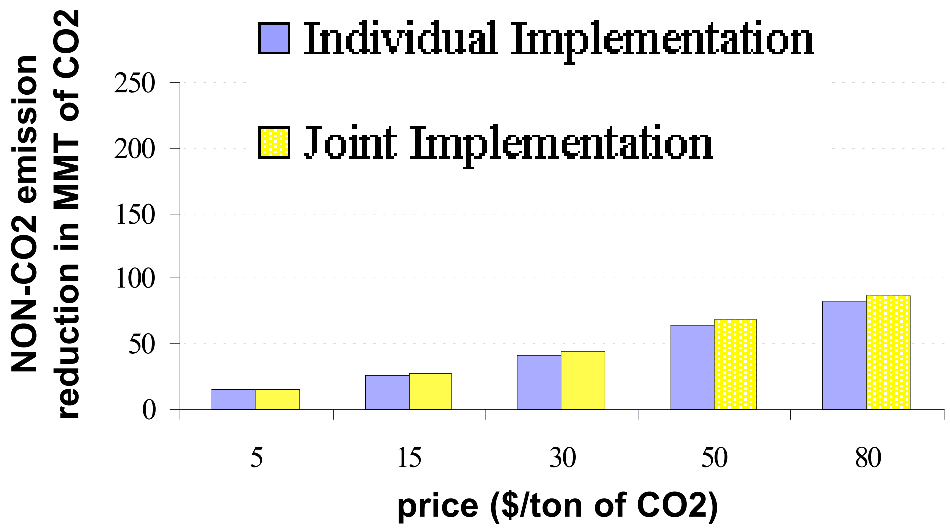
Economic potential: **Mitigation potential based on combination strategies**

COMPETITIVE vs. ECONOMIC POTENTIAL

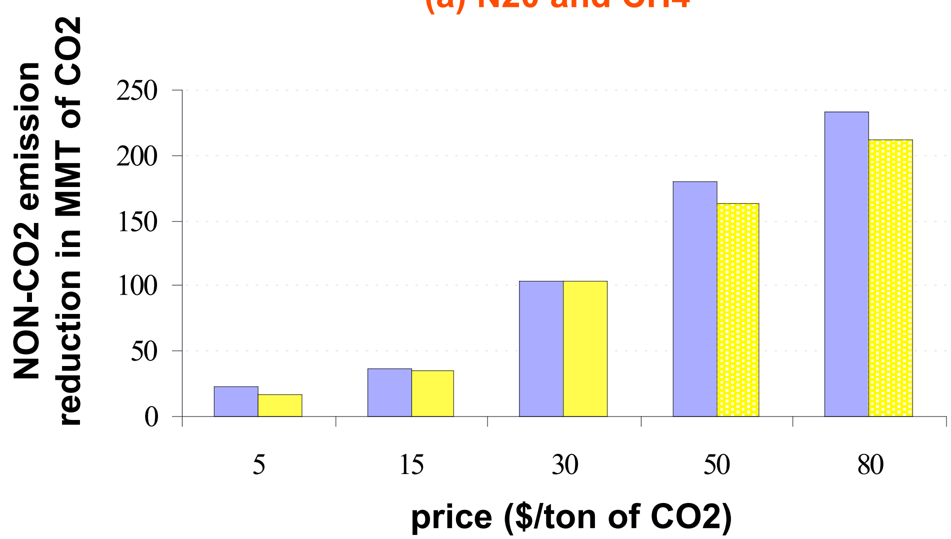


Results do not add up due to competition and complementarity

INDIVIDUAL vs. MULTIGAS IMPLEMENTATION



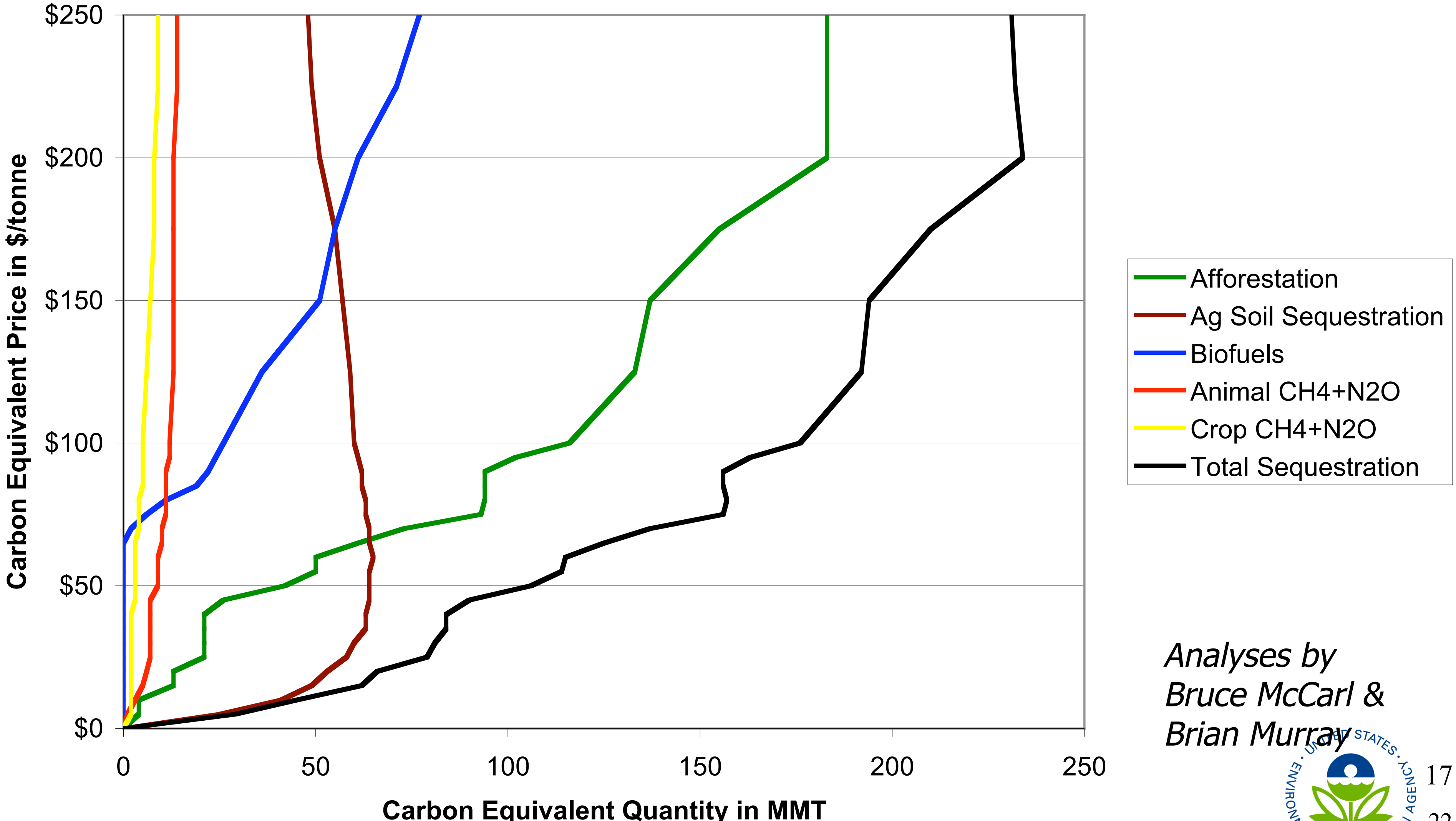
(a) N20 and CH4



(b) AllGas

- **Joint implementation achieves more quantity reduction at the same price => interaction effects**
- **Individual implementation overstates reduction => land competition**

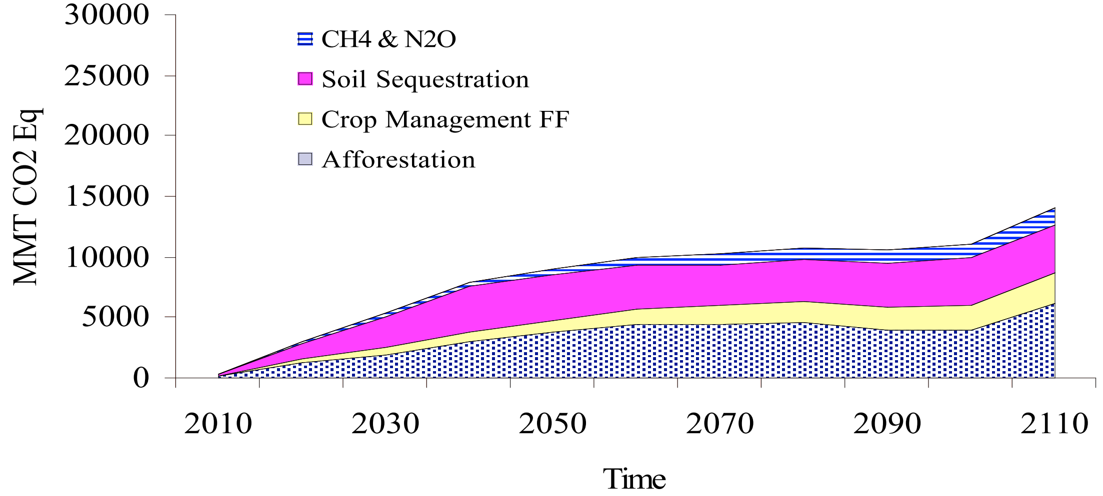
Agricultural and Forest Carbon Equivalent GHG Mitigation by Strategy (Annual Avg. - 2000-2030) **old results**



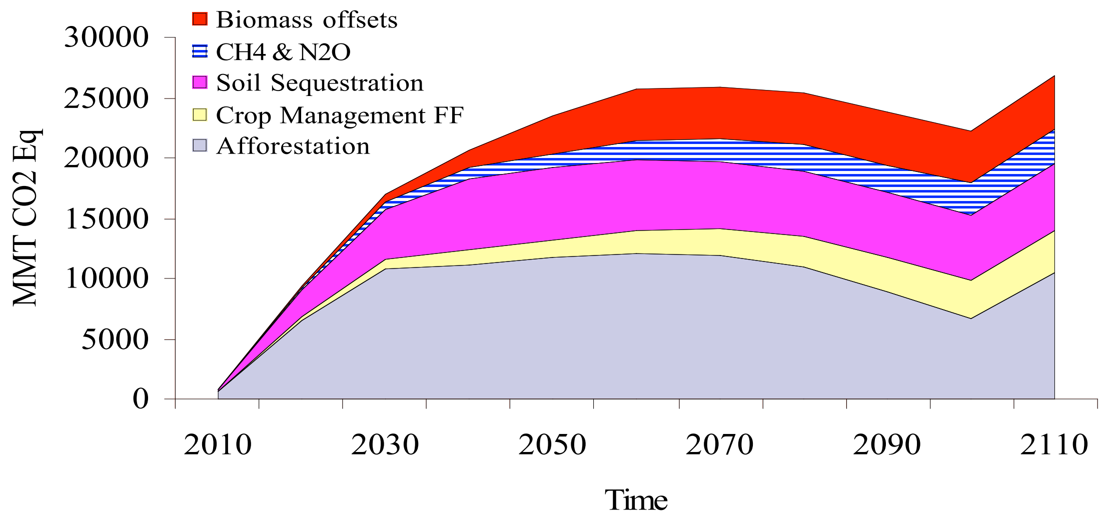
Analyses by Bruce McCarl & Brian Murray

DYNAMICS OF GHG MITIGATION

Multi-Gas



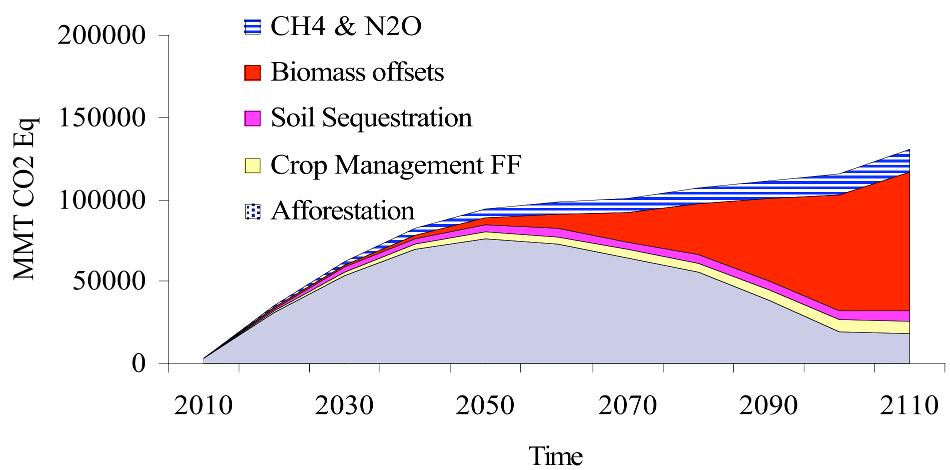
(a) at $5/ton of CO2



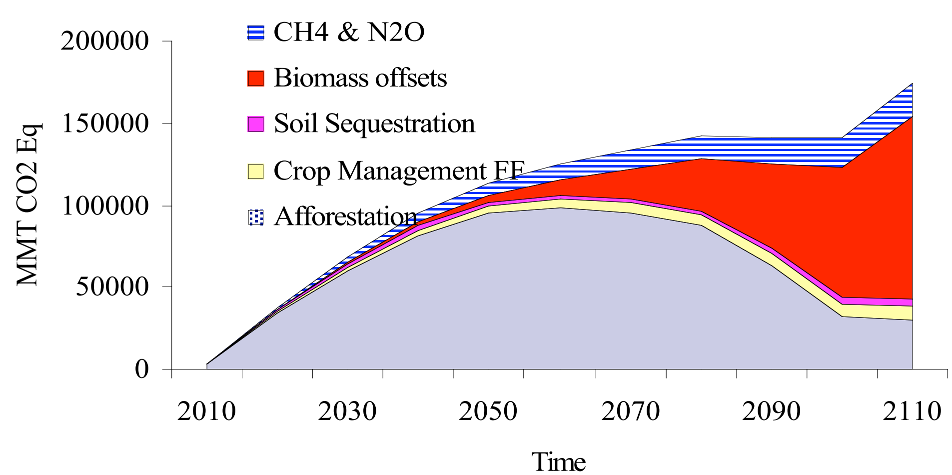
(b) at $15/ton of CO2

DYNAMIC OF GHG MITIGATION

Multi-Gas



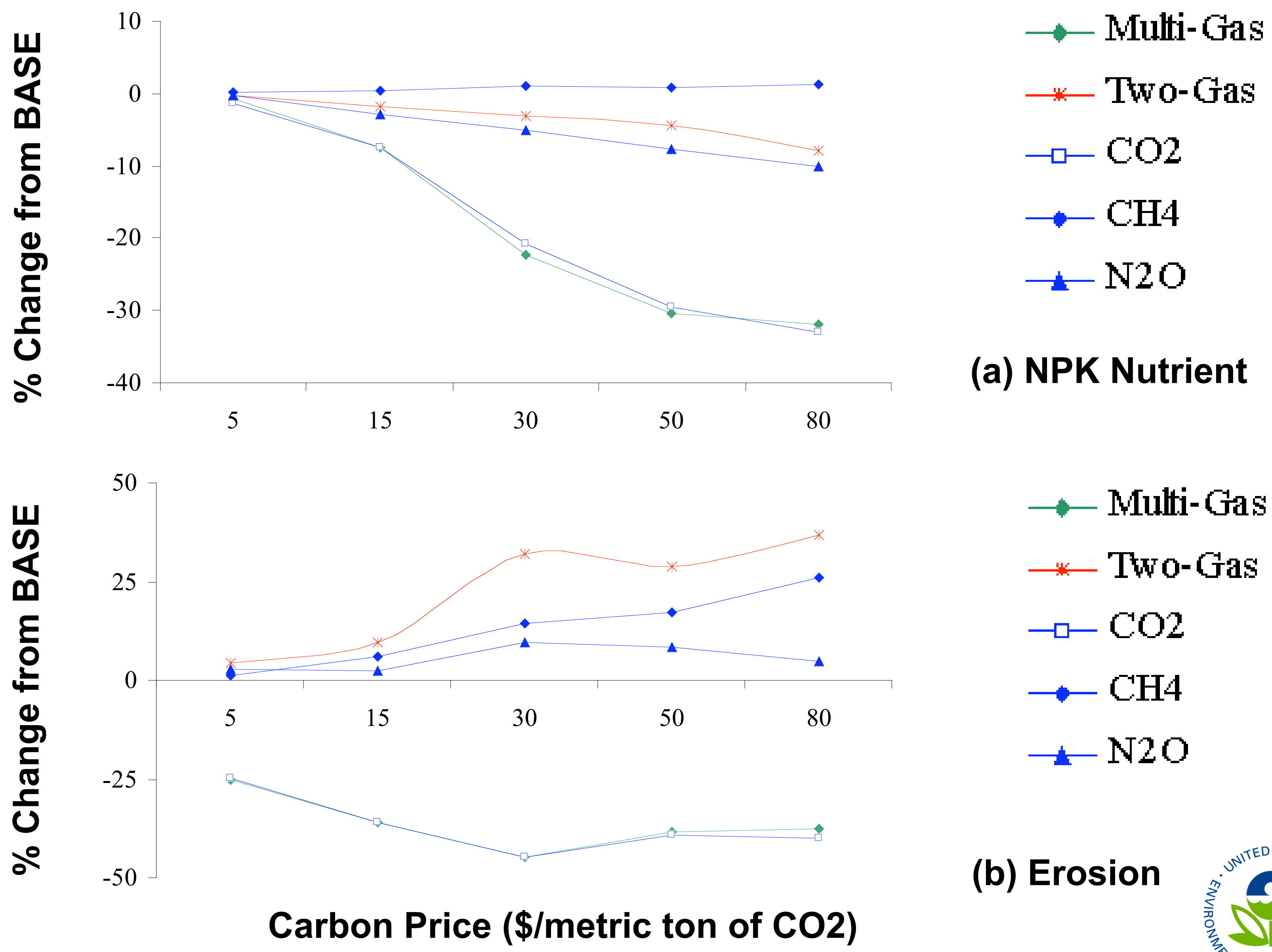
(c) at $50/ton of CO2



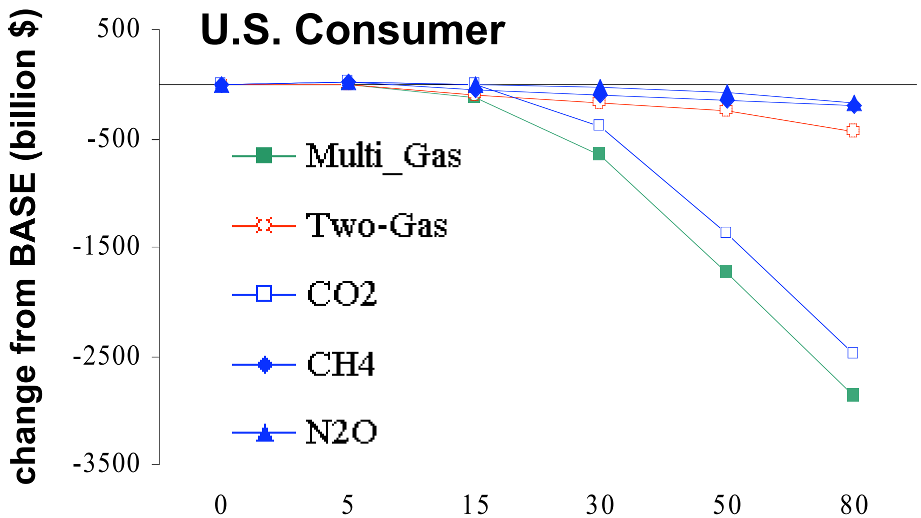
(d) $80/ton of CO2

Sequestration saturates
Biofuels and non CO2 grow in long run
Biofuel dominates at high price

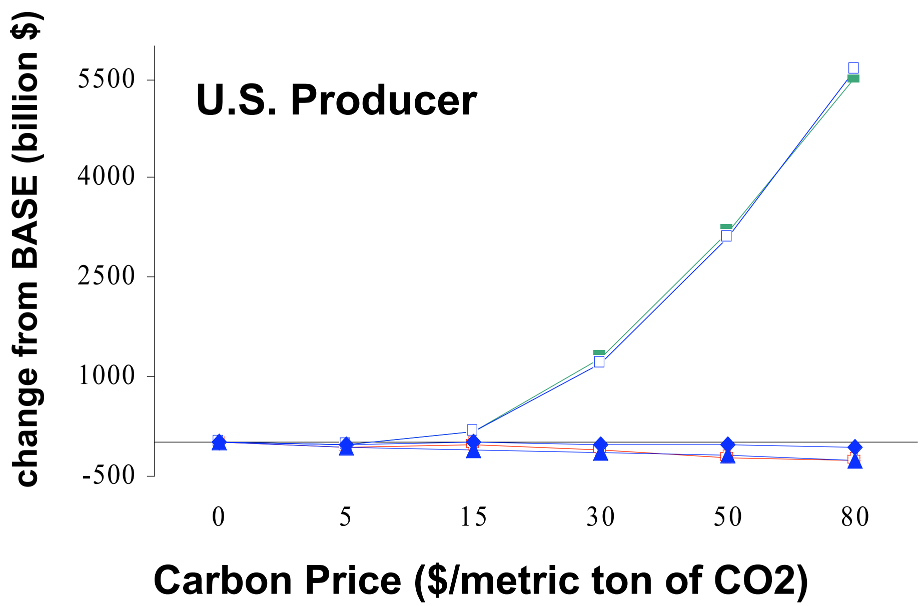
ENVIRONMENTAL IMPACTS

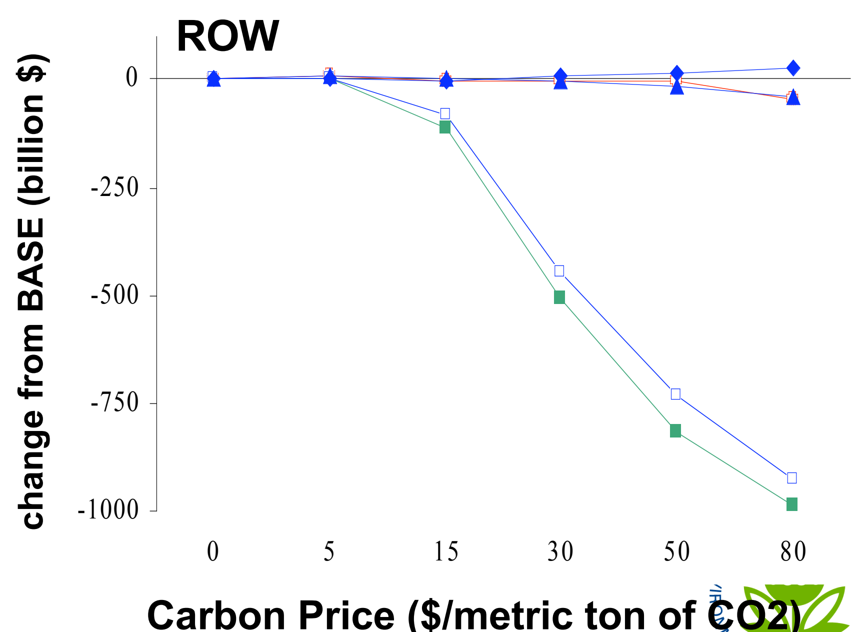


WELFARE IMPACT

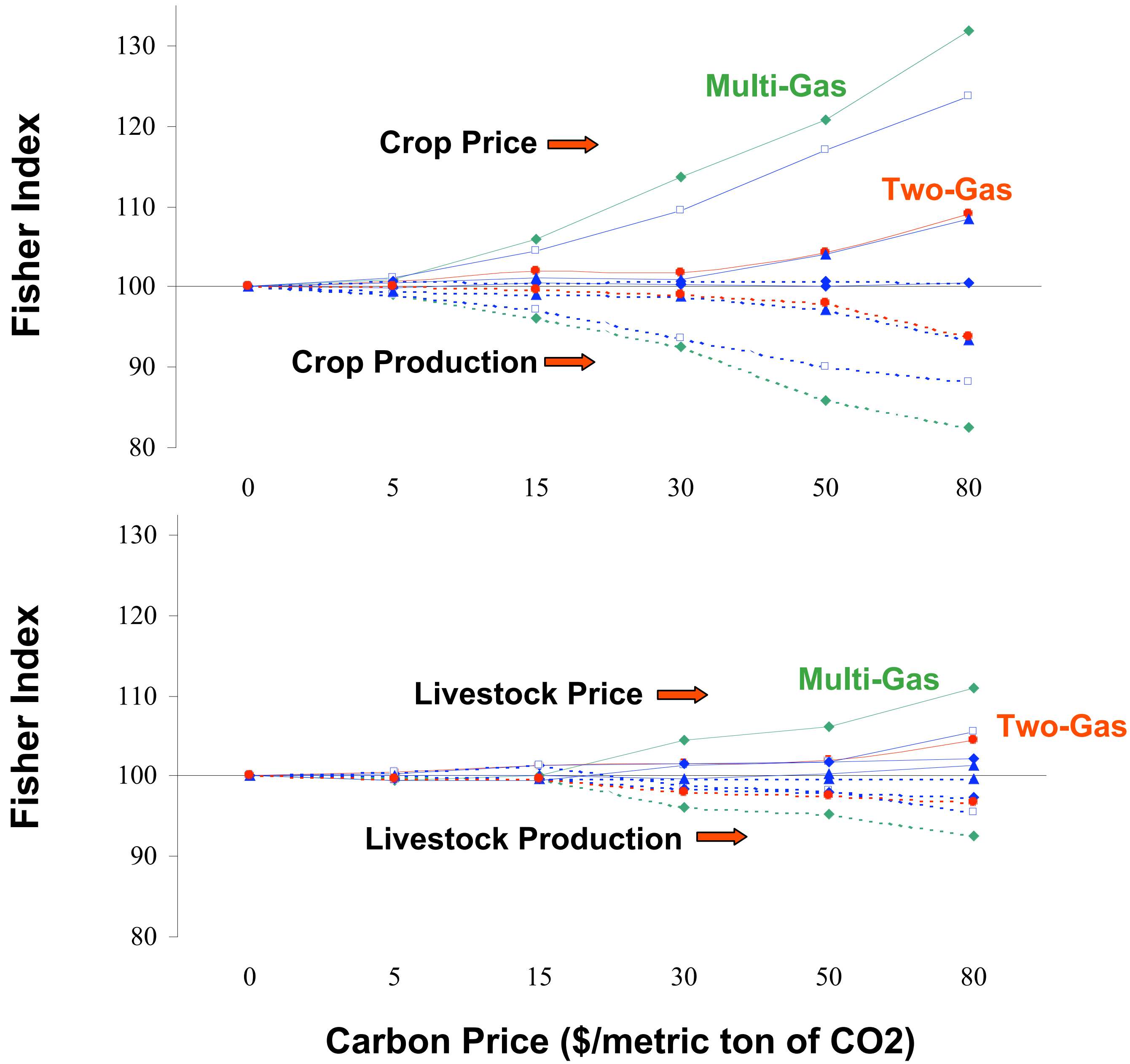


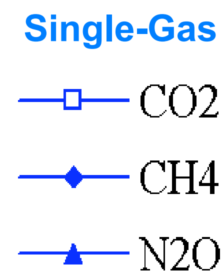
- U.S. Consumers lose
- U.S. Producers gain
- ROW lose





ECONOMIC INDICATORS





- Trade off between emission reduction and agricultural price and production

Contact Information

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