Tools for Analyzing GHG Mitigation Policy Costs—The EPPA CGE Framework

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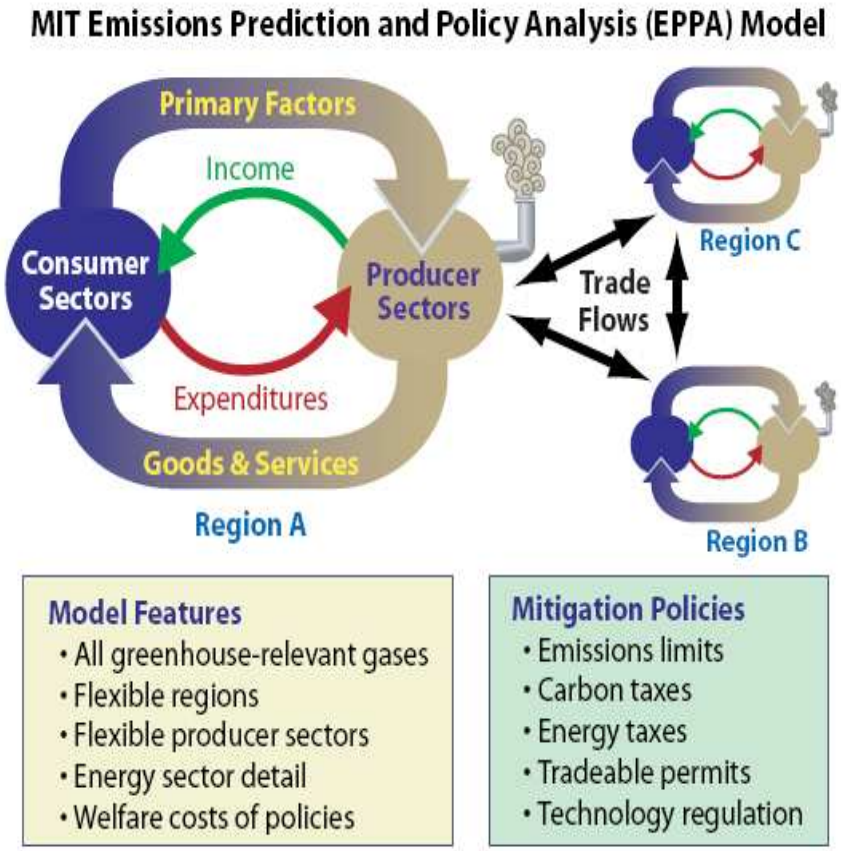
Emissions Prediction and Policy Analysis (EPPA) Model.

- Computable General Equilibrium (CGE) model of world economy with regional/sectoral detail.
- Fully treats demand/supply, capital/investment, macroeconomy/trade implications of growth, policies, alternative technologies



Report # 125 @ http://web.mit.edu/globalchange/www/reports.html#pubs

EPPA: Detailed Energy Sector in Global Economy Model

Country or Region

Developed

- United States (USA)
- Canada (CAN)
- Japan (JPN)
- European Union+ (EUR)
- Australia/N.Zealand (ANZ)
- Former Soviet Union (FSU)
- Eastern Europe (EET)

Developing

- India (IND)
- China (CHN)
- Indonesia (IDZ)
- Higher Inc. East Asia (ASI)
- Mexico (MEX)
- Centr. & S. America (LAM)
- Middle East (MES)
- Africa (AFR)
- Rest of World (ROW)

Sectors

Demand Sectors

- Services (SERV)
- Energy-Intensive (EINT)
- Other Industries (OTHR)
- Commercial Transp. (TRAN)
- Household Transp. (HTRN)
  - *Multiple technologies*
- Hunting and Fishing
- Wildlife Viewing in Reserves
- Other Wildlife Viewing
- Health Services/Air Pollution

Fuels Supply

- Coal (COAL)
- Crude Oil (OIL)
- Refined Oil (ROIL)
  - *Multiple Fuels*
  - *Multiple Refinery Processes*
- Natural Gas (GAS)
- Oil from Shale (SYNO)
- Synthetic Gas (SYNG)
- Liquids from Biomass (B-OIL)

Electricity Generation

- Fossil (ELEC)
- Hydro (HYDR)
- Nuclear (NUCL)
- Solar and Wind (SOLW)
- Biomass (BIOM)
- Coal with CCS
- Adv. gas without CCS
- Gas with CCS

Agriculture

- Crops
- Livestock
- Forest products
- Food Processing

Factors

- Capital
- Labor

Energy Resources

- Crude Oil
- Natural Gas
- Coal
- Oil Shale
- Oil Sands
- Nuclear
- Hydro
- Wind/Solar

Land

- Cropland
- Pastureland
- Managed Forest
- Non-Reserved Natural Forest
- Reserved Natural Forest
- Natural Grassland

Social Accounting Matrix (SAM) and I/O basis for CGE model

		INTERMEDIATE USE by Production Sectors				FINAL USE				OUT-PUT
		1	2	...j...	n	Private Consump.	Government Consumption	Investment	Export	
Domestic Production	1	A				B				C
	2									
	:									
	i									
	:									
	n									
Imports	1	D				E				F
	2									
	:									
	i									
	:									
	n									
Value added:	-labor	G				H				I
	-capital									
	- natural resources									
INPUT		J								

Full I/O structure means lifecycle GHG implications of technologies capture; carbon emissions associated with investment/capital for e.g. nuclear power

Expanded SAM—Household "production" sector, leisure, land & interaction of mitigation and adaptation

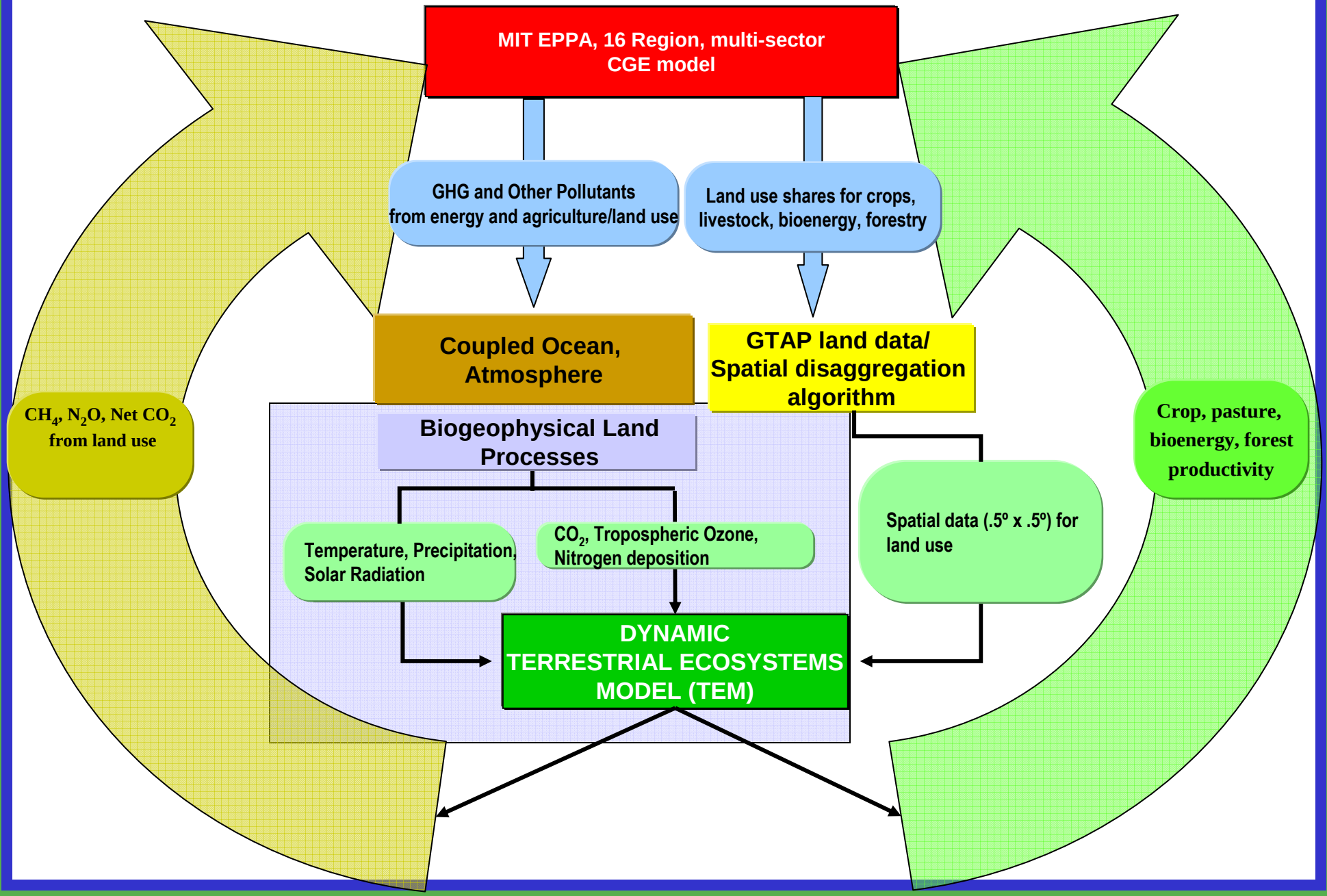
		INTERMEDIATE USE by Production Sectors				***Household Services***		FINAL USE				OUT-
		1	2	...j...	n	***Mitigation of Pollution Health Effects***	***Labor-Leisure Choice***	Private consum.	Gov't consum.	Invest.	Export	PUT
Domestic Production	1	A						B				C
	2											
	:											
	i											
	:											
	Medical Services for Health Pollution					***Medical Services***		***Health Services***				
	n											
Imports	1	D						E				F
	2											
	:											
	i											
	:											
	n											
Leisure							***Leisure***	***Leisure***				
Value added:	-labor	G				***Labor***	***Labor***	***Labor***				
	-capital							H				
	- natural resources											
INPUT		J										

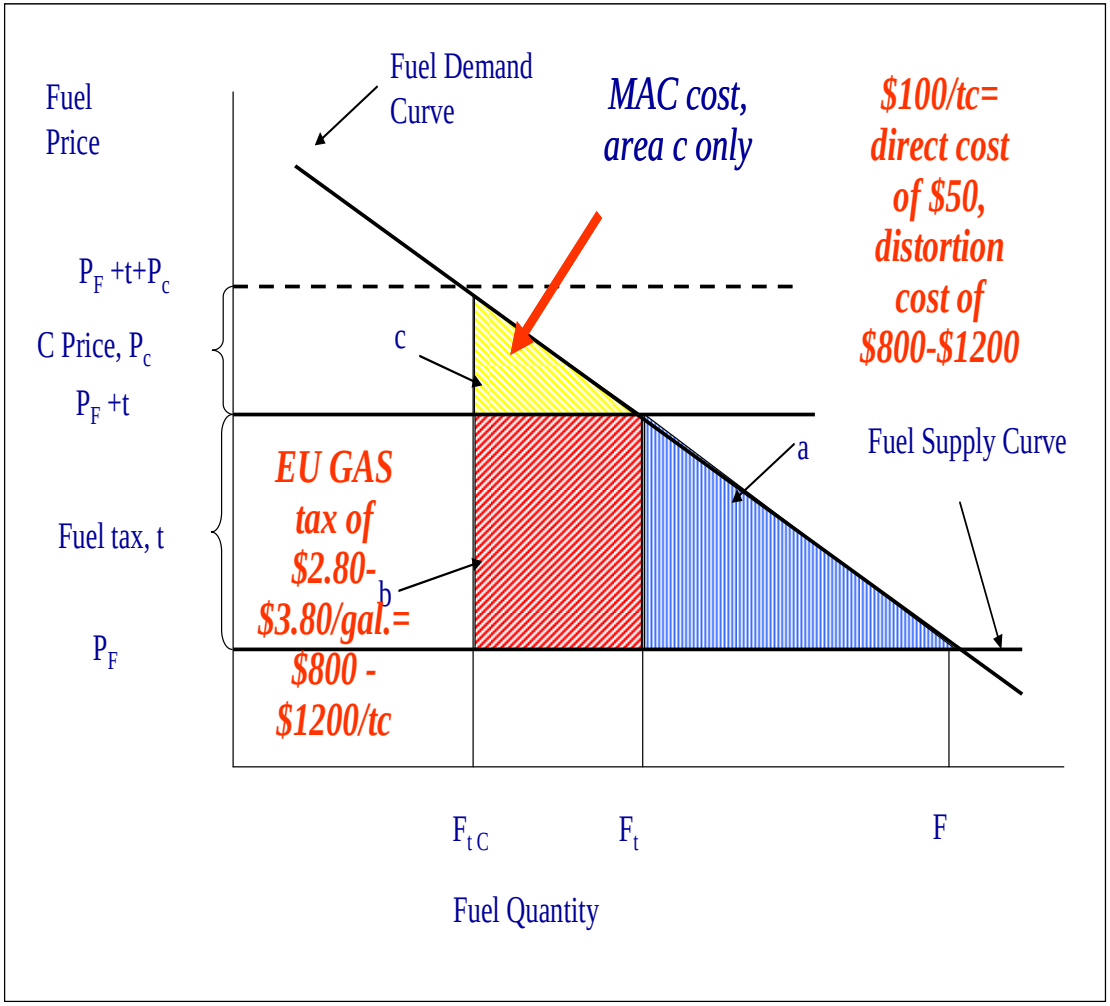
Land for crops, pasture, forestry — productivity affected by environmental change.

Unmanaged land, recreation use, degradation of "quality"

Added components are in bold italic.

Interaction of Mitigation and Adaptation through land/biofuels





CGE and Economic Costs

Distortions (e.g. fuel, labor, capital taxation) and terms of trade changes mean that the CO_2 price can be an unreliable guide to the macroeconomic cost of a policy.

Aggravate existing distortions—fuel taxes.

Remove/reduce existing distortions—revenue used to reduce capital/labor taxes.

Terms of trade effects—depends on export/import status as it changes with policy