GCAM (JGCRI/PNNL)

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Tsukuba, Japan

Pacific Northwest
NATIONAL LABORATORY

Proudly Operated by Battelle Since 1965

Key Design Characteristics

- ***Participating Model:*** GCAM (Global Change Assessment Model)
- ***Model Type:*** Integrated Assessment Model (IAM), using MAGICC as its atmosphere and climate model
- ***Participating Modelers:*** Ben Bond-Lamberty, Kate Calvin, Leon Clarke, Jae Edmonds, Sonny Kim, Page Kyle, Allison Thomson, Marshall Wise
- ***Time Step:*** 15 years
- ***Time Frame:*** 1990 to 2095
- ***Solution Type:*** Dynamic Recursive
- ***Equilibrium Type:*** Market Equilibrium
- ***Underlying Computing Framework:*** C++

Inputs and Outputs

- **Key inputs**
  - ***Demographics:*** population by region
  - ***Economic:*** labor productivity, price and income elasticities.
  - ***Resources:*** Depletable resources by grade (e.g. fossil fuels and uranium); renewable resources by grade (e.g. wind, solar).
  - ***Technology:*** Technology representations of production, transformation and use technologies.
- **Key outputs**
  - ***Economic:*** GDP, World energy and agriculture prices (oil, gas, coal, wheat, rice, etc.)
  - ***Energy:*** Production, transformation, end use, and trade.
  - ***Agriculture:*** Production, consumption, trade, and land use.
  - ***Emissions:*** CO_2 emissions by source, non-CO_2 emissions (CH_4, N_2O, etc.), short-lived species emissions (S, BC, OC, CO, NMVOC, etc.).
  - ***Climate:*** GHG concentrations, climate change, sea level.

Regional Scope & Other Detail

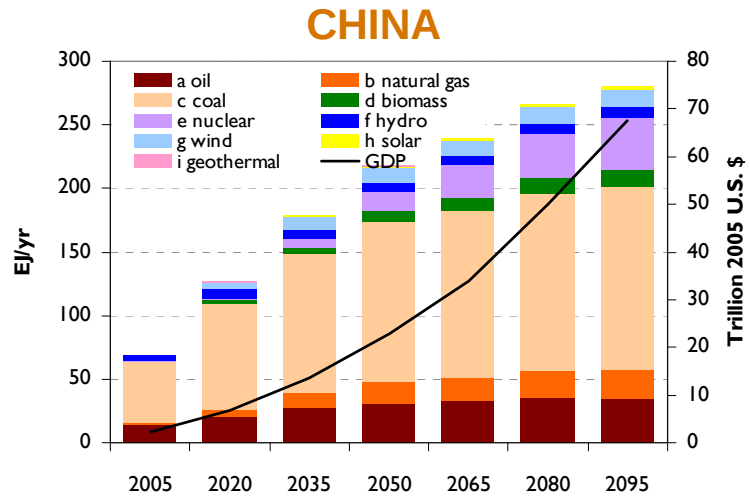
Regional Details:

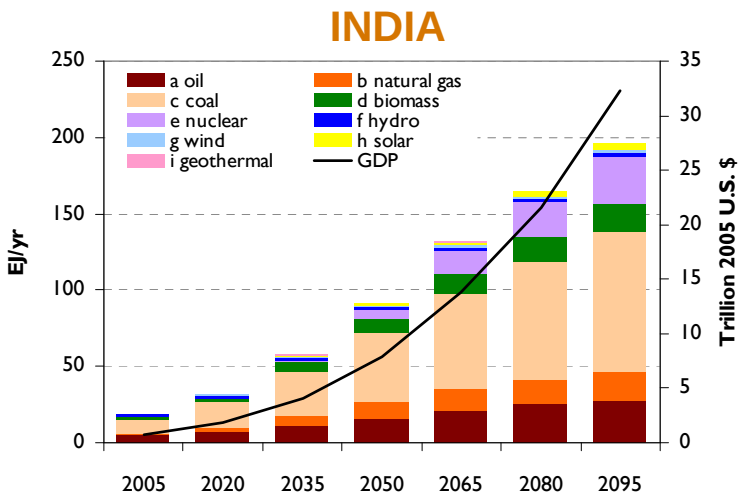
- ***Regional Scope:*** Global
- ***Number of Sub-Regions:*** 14
- ***Asian Regions:*** China, India, Japan, Southeast Asia, South Korea, (Russian Federation)

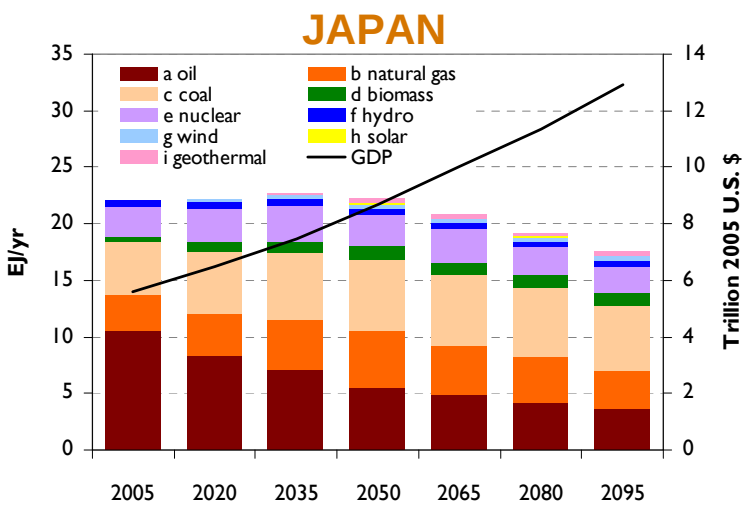
Other Details:

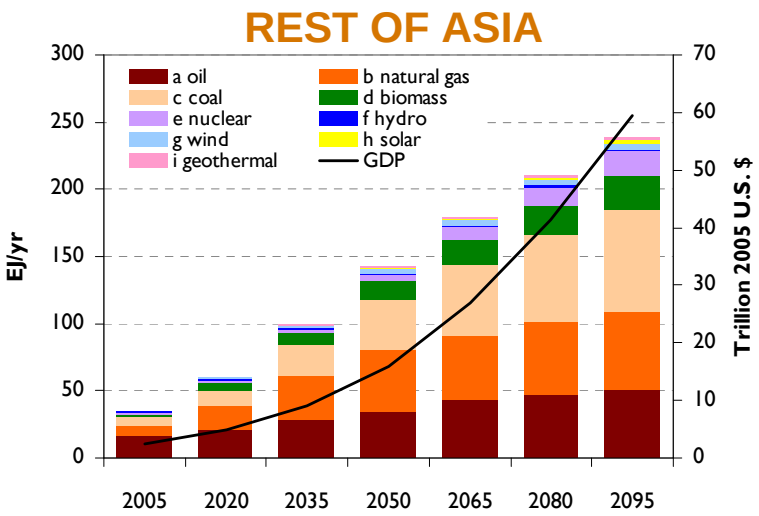
- ***Energy Demand Sectors:*** Industry, Transportation, Buildings
- ***Energy Supply Sectors:*** Fossil Energy Production, Electricity Generation, Hydrogen Production, Agricultural Production
- ***Other Sectors:*** Endogenous agriculture, land-use and land cover, terrestrial carbon cycle.

Asian Baselines



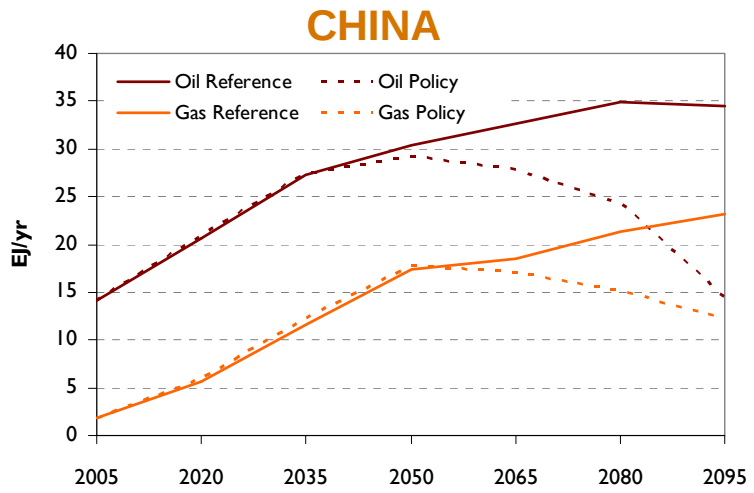


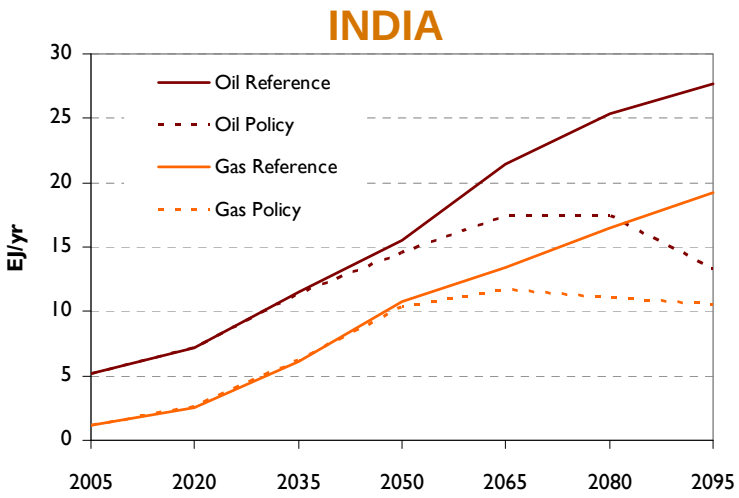


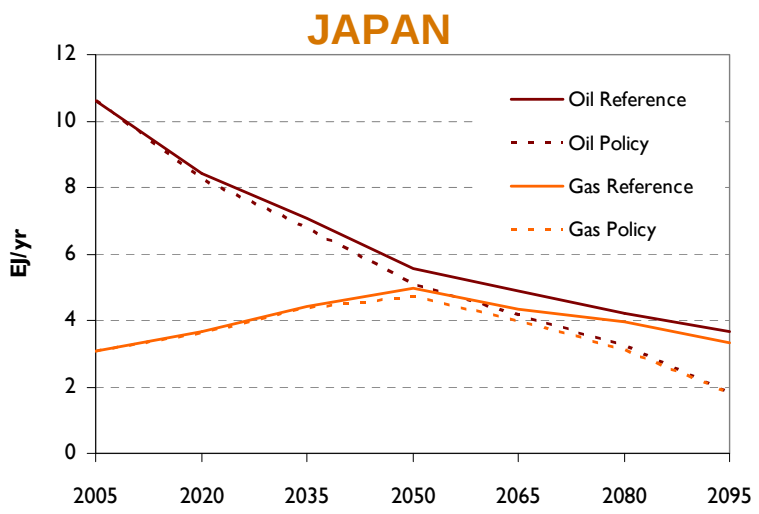


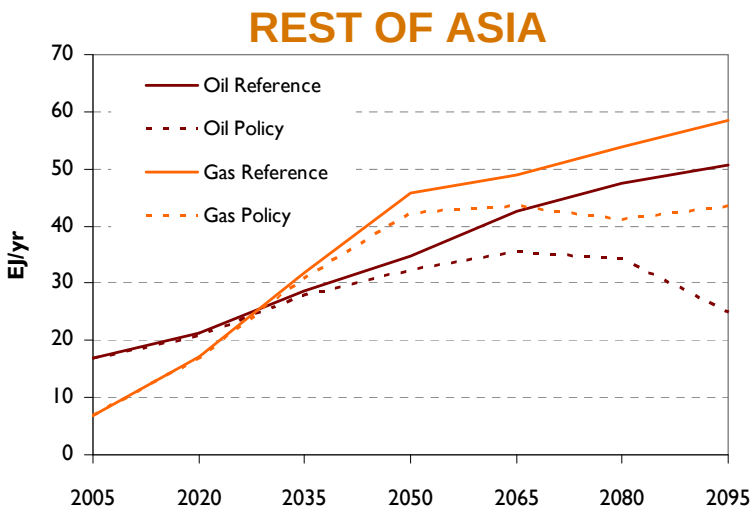
Source: EMF22 Reference Scenario

Energy Security







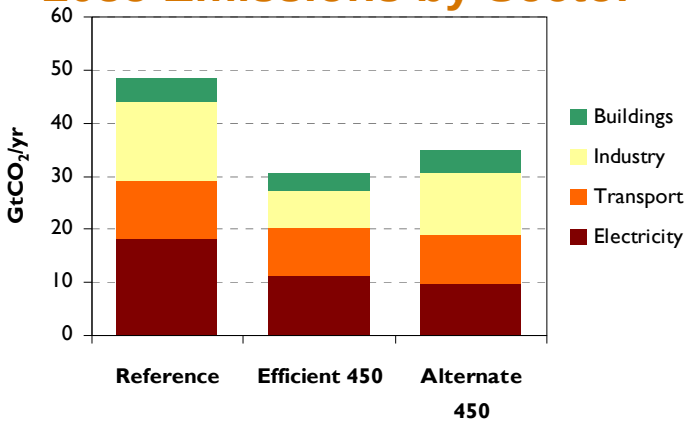


Source: EMF22 Reference & Immediate Accession 3.7 W/m^2 Overshoot Scenario

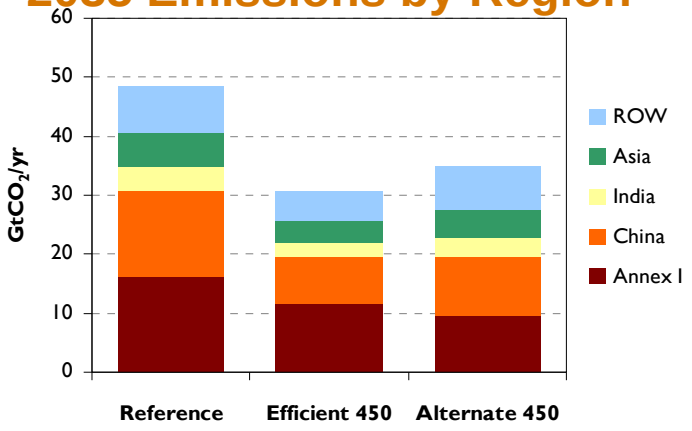
Alternative Policy Environments

POLICY	REGIONS
Economy-Wide CO2 Constraint	Annex I
Power Sector Carbon Intensity	Africa, China, India, Latin America, Korea, Middle East, Southeast Asia
CAFE Standard	China, India, Latin America, Korea, Middle East, Southeast Asia
Biofuels Target	China, India, Latin America, Korea, Southeast Asia
Industry Carbon Constraint	China, Korea
Policy-Based Crediting	Africa, China, India, Latin America, Korea, Middle East, Southeast Asia

2035 Emissions by Sector



2035 Emissions by Region



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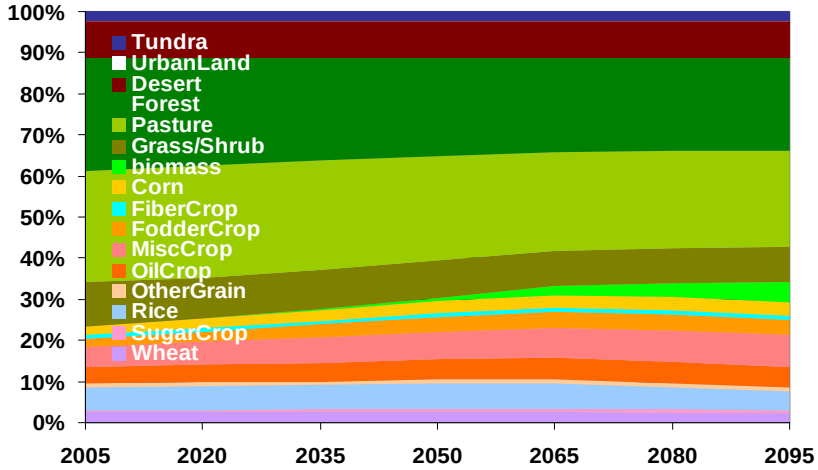
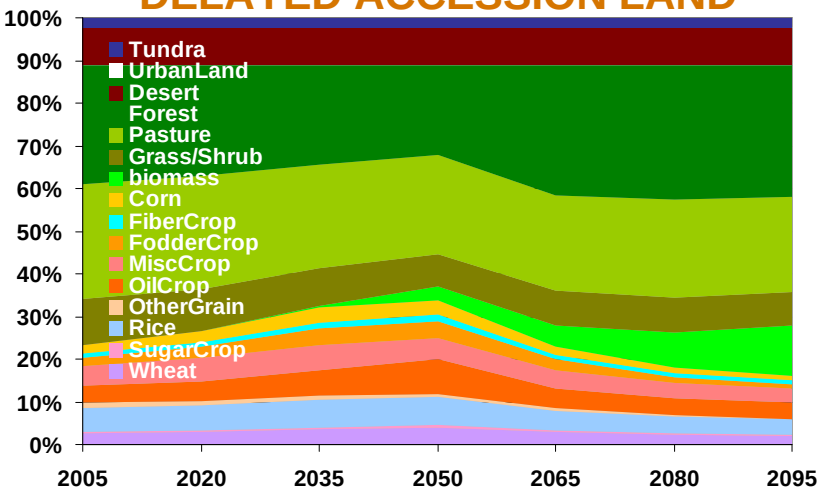
Source: Collaboration with the Pew Center

Land Use Leakage in Asia

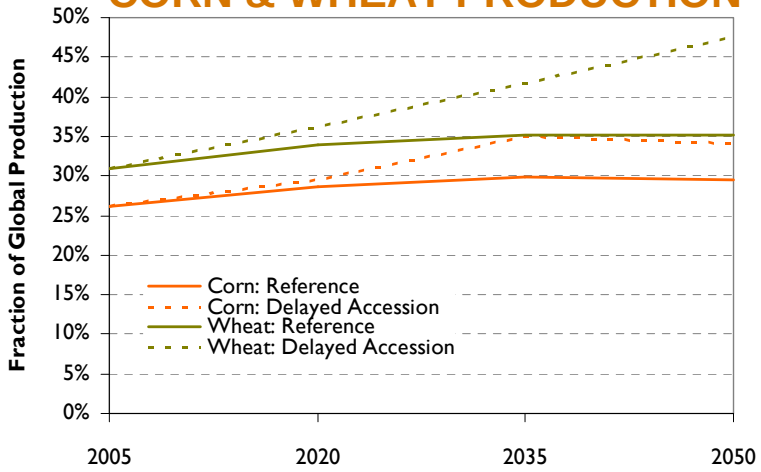
REFERENCE LAND



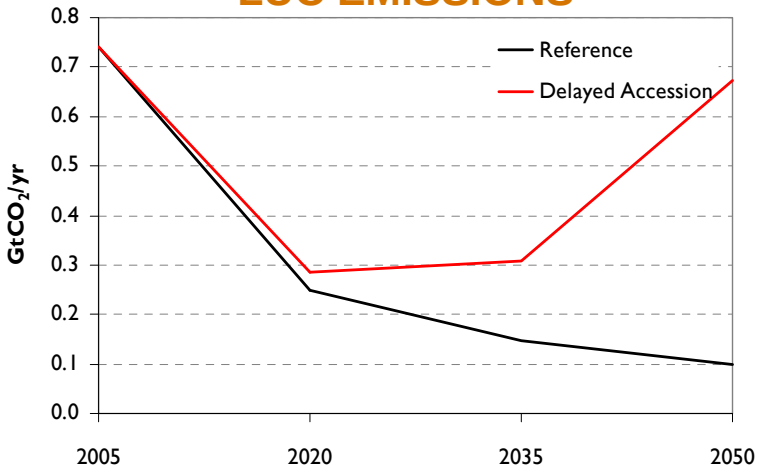
DELAYED ACCESSION LAND



CORN & WHEAT PRODUCTION



LUC EMISSIONS



Source: EMF22 Reference & Delayed Accession 3.7 W/m^2 Overshoot Scenario

Note: Asia includes China, India, Korea, and Southeast Asia