

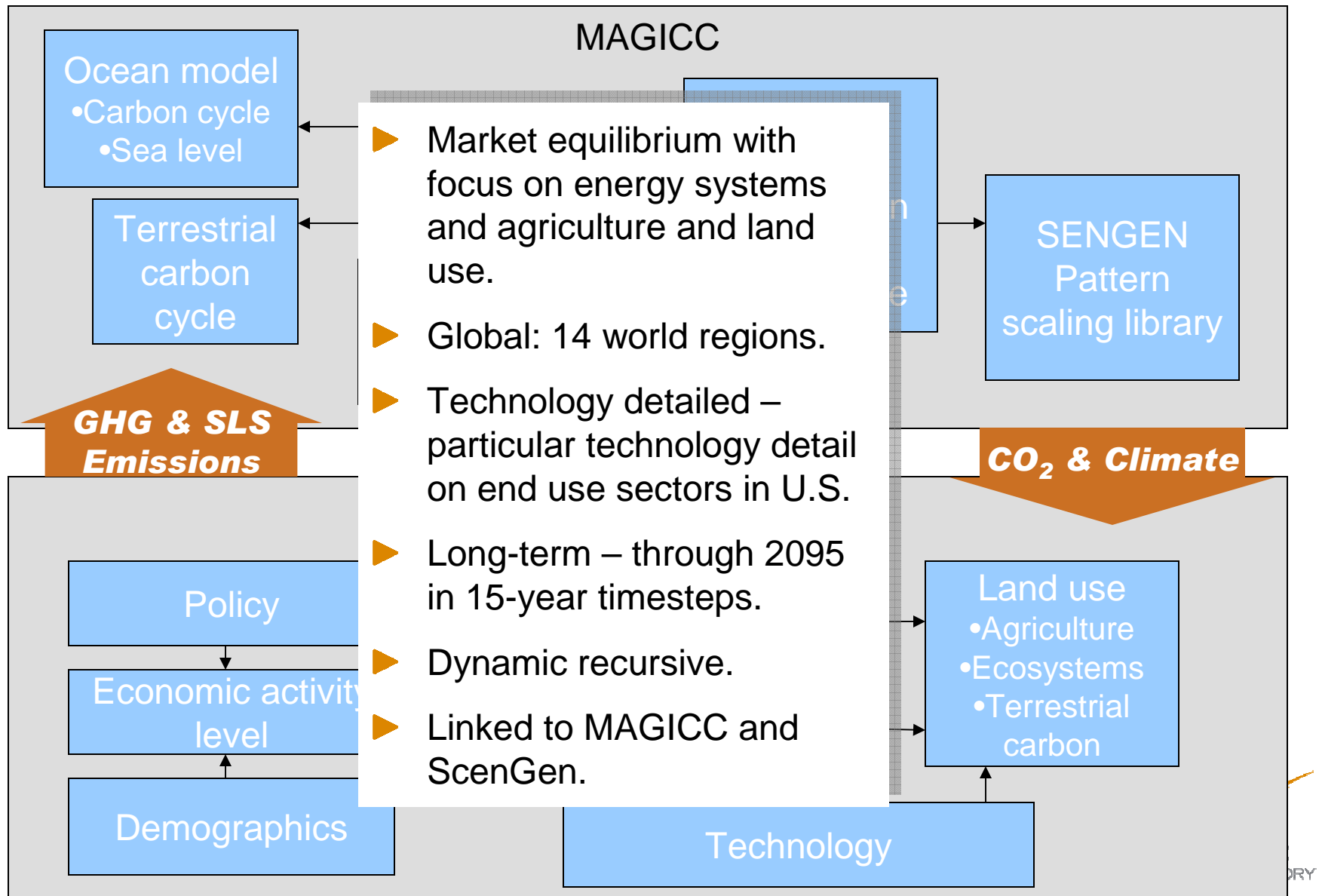
The MiniCAM Integrated Assessment Modeling Framework

Leon Clarke



Assessing Economic Impacts of Greenhouse
Gas Mitigation

October 2, 2008

MiniCAM Integrated Assessment Model



Exploring Technology: Overview of Current CCTP Scenarios

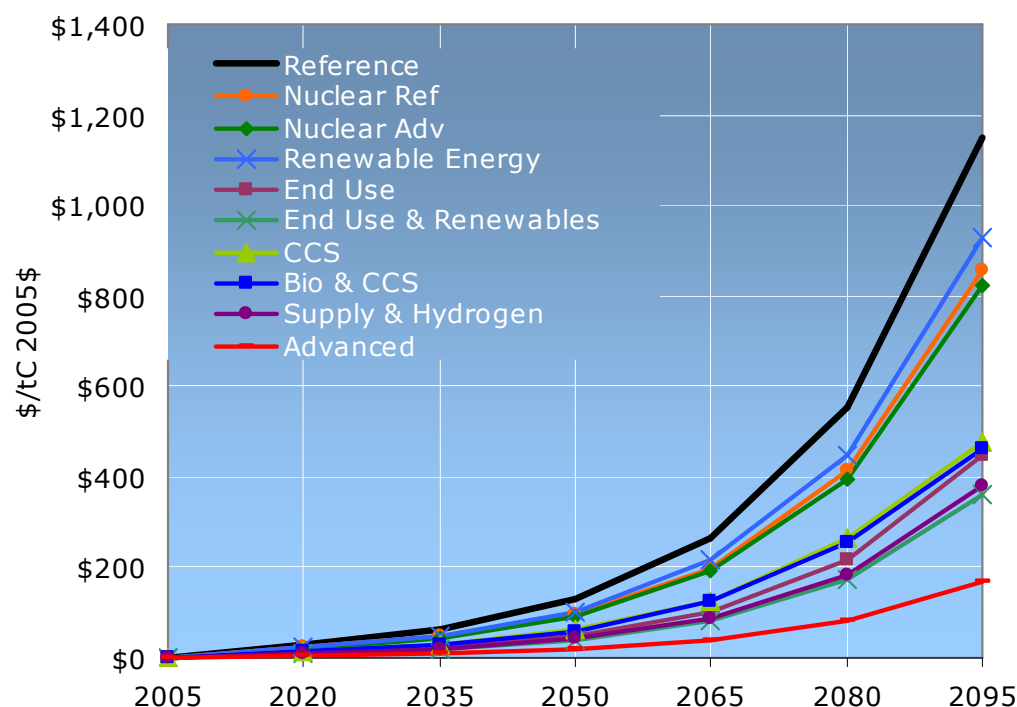
| | Reference | Nuclear Reference | Nuclear Advanced | CCS | Bio and CCS | Renewables | End Use | End Use & Renewables | Hydrogen & Supply | Advanced |
|------------------------------------|----------------|-------------------|------------------|----------------|----------------|----------------|----------------|----------------------|-------------------|----------|
| Transportation: Electric Vehicles | Reference | Reference | Reference | Reference | Reference | Reference | Advanced | Advanced | Reference | Advanced |
| Transportation: Fuel Cell Vehicles | Reference | Reference | Reference | Reference | Reference | Reference | Advanced | Advanced | Advanced | Advanced |
| Transportation: Other | Reference | Reference | Reference | Reference | Reference | Reference | Advanced | Advanced | Reference | Advanced |
| Buildings | Reference | Reference | Reference | Reference | Reference | Reference | Advanced | Advanced | Reference | Advanced |
| Industry | Reference | Reference | Reference | Reference | Reference | Reference | Advanced | Advanced | Reference | Advanced |
| Electricity and Hydrogen CCS | No CCS | No CCS | No CCS | Advanced | Advanced | No CCS | No CCS | No CCS | Advanced | Advanced |
| Dedicated Energy Crops | Reference | Reference | Reference | Reference | Advanced | Advanced | Reference | Advanced | Advanced | Advanced |
| Hydrogen Production | Reference | Reference | Reference | Reference | Reference | Reference | Reference | Reference | Advanced | Advanced |
| Wind Power | Reference | Reference | Reference | Reference | Reference | Advanced | Reference | Advanced | Advanced | Advanced |
| Solar Power | Reference | Reference | Reference | Reference | Reference | Advanced | Reference | Advanced | Advanced | Advanced |
| Nuclear Fission | No New Nuclear | Reference | Advanced | No New Nuclear | No New Nuclear | No New Nuclear | No New Nuclear | No New Nuclear | Advanced | Advanced |
| Geothermal | Reference | Reference | Reference | Reference | Reference | Advanced | Reference | Advanced | Advanced | Advanced |

The scenarios are constructed to explore the implications of a wide range of possible combinations of technological advances.

The Importance of Technology Choice

Varying technology assumptions demonstrates that technology is among the determining factors of mitigation costs.

Uncertainty in costs among models can often be traced to technology assumptions.



Total Discounted Policy Cost 2005 through 2095

| | | |
|----------------------|------|-----------------|
| Reference | 0.22 | trillion 2005\$ |
| Nuclear Ref | 0.16 | trillion 2005\$ |
| Nuclear Adv | 0.15 | trillion 2005\$ |
| Renewable Energy | 0.17 | trillion 2005\$ |
| End Use | 0.04 | trillion 2005\$ |
| End Use & Renewables | 0.03 | trillion 2005\$ |
| CCS | 0.10 | trillion 2005\$ |
| Bio & CCS | 0.10 | trillion 2005\$ |
| Supply & Hydrogen | 0.05 | trillion 2005\$ |
| Advanced | 0.01 | trillion 2005\$ |

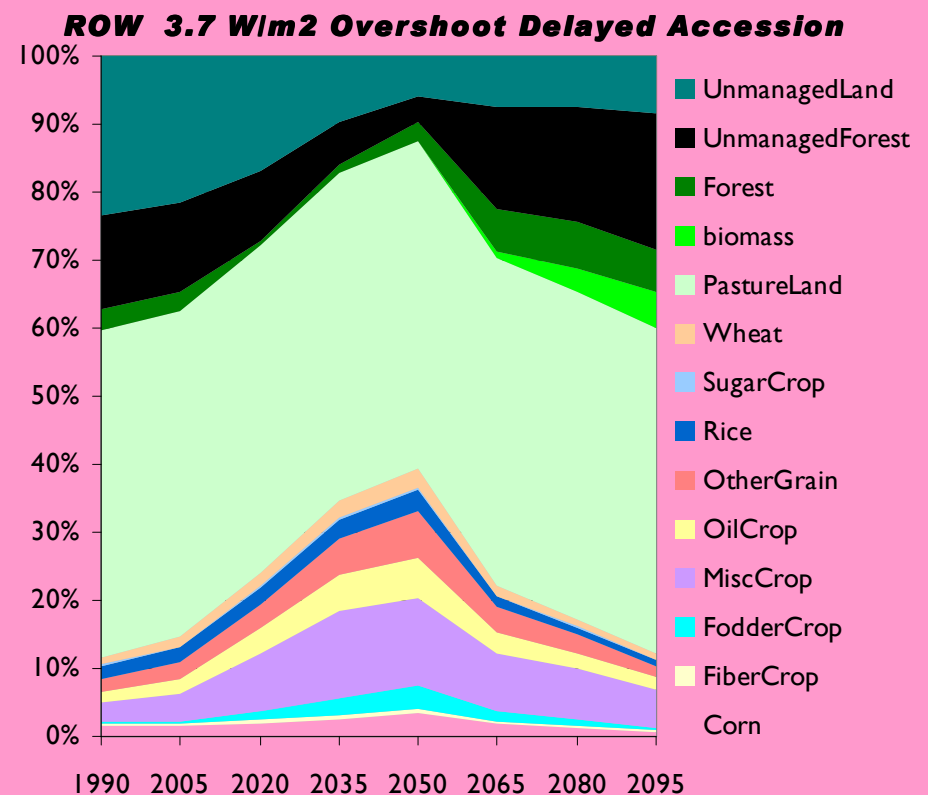
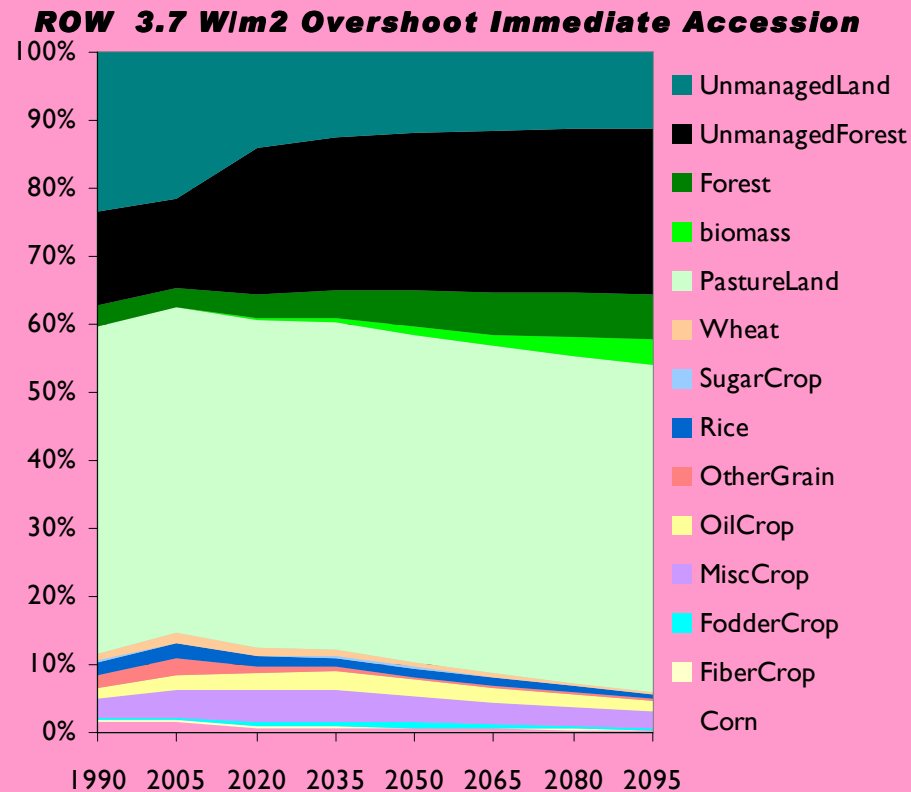
Note that these costs assume comprehensive international action and allocations of permits among countries so that the U.S. neither buys nor sells permits.

Draft Results

Pacific Northwest
NATIONAL LABORATORY

Integrated Assessment Models: Economic Impacts from the Earth-Human System Interaction

Land Use in Three Regions: 550 CO₂-e (Kyoto Gases) with Overshoot to 2100



Pricing carbon in land substantially lowers the costs of mitigation.

Limited sectoral coverage can have adverse economic and physical effects

Draft Results