Overview of Model Results: Latin America

KATE CALVIN

Tuesday, October 2, 2012
BASELINE RESULTS
Note: GDP is measured in PPP terms for POLES and in MER for all other models.
Socioeconomics: Latin America

Scenario 1a: Baseline

GDP per Capita

GDP per Capita Growth Rate

Note: GDP is measured in PPP terms for POLES and in MER for all other models.
Final Energy: Latin America

Scenario 1a: Baseline

Final Energy

Final Energy per Capita

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Scenario 1a: Baseline

Final Energy by Sector: 2005

- Transportation
- Residential and Commercial
- Industry
Final Energy: Latin America

Scenario 1a: Baseline

Final Energy by Sector: 2020

- Transportation
- Residential and Commercial
- Industry

Data sources: COPPE-BRAZIL, GCAM, iPETS, MEG4C, Phoenix, POLES, TIAM-World.
Final Energy: Latin America

Scenario 1a: Baseline

Final Energy by Sector: 2050

- Transportation
- Residential and Commercial
- Industry

EJ/yr

COPPE-BRAZIL
GCAM
iPETS
MEG4C
Phoenix
POLES
TIAM-World
Final Energy: Latin America

Scenario 1a: Baseline

Final Energy by Sector: 2100

- Transportation
- Residential and Commercial
- Industry
Scenario 1a: Baseline

Final Energy by Fuel: 2005
Final Energy: Latin America

Scenario 1a: Baseline

Final Energy by Fuel: 2020

- Other
- Hydrogen
- Heat
- Electricity
- Biomass
- Liquids
- Liquids
- Coal

EJ/yr
Scenario 1a: Baseline

Final Energy by Fuel: 2050

- EJ/yr

COPPE-BRAZIL
GCAM
iPETS
MEG4C
Phoenix
POLES
TIAM-World

- Other
- Hydrogen
- Heat
- Electricity
- Biomass
- Liquids
- Gases
- Coal
Scenario 1a: Baseline

Final Energy by Fuel: 2100

- COPEC-BRAZIL
- GCAM
- iPETS
- MEG4C
- Phoenix
- POLES
- TIAM-World

- Other
- Hydrogen
- Heat
- Electricity
- Biomass
- Liquids
- Gases
- Coal
Electricity: Latin America

Scenario 1a: Baseline

**Electricity**

- COPPE-BRAZIL
- GCAM
- iPETS
- MEG4C
- Phoenix
- POLES
- TIAM-World

**Electricity per Capita**

- COPPE-BRAZIL
- GCAM
- iPETS
- MEG4C
- Phoenix
- POLES
- TIAM-World
Electricity: Latin America

Scenario 1a: Baseline

Electricity by Fuel: 2005

Chart showing electricity production by fuel type and model for 2005.
Electricity: Latin America

Scenario 1a: Baseline

Electricity by Fuel: 2020

- Other
- Ocean
- Wind
- Solar
- Hydro
- Nuclear
- Biomass\|w/ CCS
- Biomass\|w/o CCS
- Oil\|w/ CCS
- Oil\|w/o CCS
- Gas\|w/ CCS
- Gas\|w/o CCS
- Coal\|w/ CCS
- Coal\|w/o CCS
Electricity: Latin America

Scenario 1a: Baseline

Electricity by Fuel: 2050

EJ/yr

Other
Ocean
Wind
Solar
Hydro
Nuclear
Biomass\w/ CCS
Biomass\w/o CCS
Oil\w/ CCS
Oil\w/o CCS
Coal\w/ CCS
Coal\w/o CCS

COPPE-BRAZIL
GCAM
iPETS
MEG4C
Phoenix
POLES
TIAM-World
Scenario 1a: Baseline

Refined Liquids by Fuel: 2005

COPPE-BRAZIL
GCAM
iPETS
MEG4C
Phoenix
POLES
TIAM-World

EJ/yr

Other
Biofuels
Fossil Synfuels
Petroleum Products
Refined Liquids: Latin America

Scenario 1a: Baseline

Refined Liquids by Fuel: 2020

EJ/yr

COPPE-BRAZIL
GCAM
iPETS
MEG4C
Phoenix
POLES
TIAM-World

Other
Biofuels
Fossil Synfuels
Petroleum Products
Refined Liquids: Latin America

Scenario 1a: Baseline

Refined Liquids by Fuel: 2050

![Bar chart showing refined liquids by fuel for different models: COPPE-BRAZIL, GCAM, iPETS, MEG4C, Phoenix, POLES, TIAM-World. The chart compares EJ/yr for other, biofuels, fossil synfuels, and petroleum products.](chart-url)
Scenario 1a: Baseline

Refined Liquids by Fuel: 2100

- COPPE-BRAZIL
- GCAM
- iPETS
- MEG4C
- Phoenix
- POLES
- TIAM-World

Legend:
- Other
- Biofuels
- Fossil Synfuels
- Petroleum Products
Scenario 1a: Baseline

Primary Energy by Fuel: 2005

- COPPE-BRAZIL
- GCAM
- iPETS
- MEG4C
- Phoenix
- POLES
- TIAM-World

- Other
- Secondary Energy Trade
- Ocean
- Wind
- Solar
- Hydro
- Nuclear
- Biomass w/ CCS
- Biomass w/o CCS
- Oil w/ CCS
- Oil w/o CCS
- Gas w/ CCS
- Gas w/o CCS
- Coal w/ CCS
- Coal w/o CCS
Primary Energy: Latin America

Scenario 1a: Baseline

Primary Energy by Fuel: 2020

- COPPE-BRAZIL
- GCAM
- iPETS
- MEG4C
- Phoenix
- POLES
- TIAM-World

EJ/yr

- Other
- Secondary Energy Trade
- Ocean
- Wind
- Solar
- Hydro
- Nuclear
- Biomass|w/ CCS
- Biomass|w/o CCS
- Oil|w/ CCS
- Oil|w/o CCS
- Gas|w/ CCS
- Gas|w/o CCS
- Coal|w/ CCS
- Coal|w/o CCS
Primary Energy: Latin America

Scenario 1a: Baseline

Primary Energy by Fuel: 2050

- Other
- Secondary Energy Trade
- Ocean
- Wind
- Solar
- Hydro
- Nuclear
- Biomass with CCS
- Biomass without CCS
- Oil with CCS
- Oil without CCS
- Gas with CCS
- Gas without CCS
- Coal with CCS
- Coal without CCS
Primary Energy: Latin America

Scenario 1a: Baseline

Primary Energy by Fuel: 2100

- Other
- Secondary Energy Trade
- Ocean
- Wind
- Solar
- Hydro
- Nuclear
- Biomass\(\text{w/ CCS}\)
- Biomass\(\text{w/o CCS}\)
- Oil\(\text{w/ CCS}\)
- Oil\(\text{w/o CCS}\)
- Gas\(\text{w/ CCS}\)
- Gas\(\text{w/o CCS}\)
- Coal\(\text{w/ CCS}\)
- Coal\(\text{w/o CCS}\)
Emissions: Latin America

Scenario 1a: Baseline

Fossil Fuel & Industrial CO₂

Total CO₂
Trade: Latin America

Scenario 1a: Baseline

Net Exports: Coal

Net Exports: Gas
Trade: Latin America

Scenario 1a: Baseline

Net Exports: Oil

Net Exports: Bioenergy
World Context: Latin America

Scenario 1a: Baseline

Population

GDP

Note: GDP is measured in PPP terms for POLES and in MER for all other models.
World Context: Latin America

Scenario 1a: Baseline

Primary Energy

- COPPE-BRAZIL
- GCAM
- iPETS
- MEG4C
- Phoenix
- POLES
- TIAM-World

CO₂ Emissions

- COPPE-BRAZIL
- GCAM
- iPETS
- MEG4C
- Phoenix
- POLES
- TIAM-World

Note: I am using fossil fuel & industrial CO₂ for iPETS and total CO₂ for all other models.
Indicators: Latin America

Scenario 1a: Baseline

Energy Intensity vs GDP per Capita

Note: GDP is measured in PPP terms for POLES and in MER for all other models.
Indicators: Latin America

Scenario 1a: Baseline

Carbon Intensity vs GDP per Capita

Note: GDP is measured in PPP terms for POLES and in MER for all other models. Total CO₂ emissions are used for TIAM-World. Fossil fuel & industrial emissions are used for all other models.
Carbon Prices

- Scenario 2a
- Scenario 2b
- Scenario 2c
Electricity: Latin America

Scenario 1a: Baseline

Electricity by Fuel: 2050
Electricity: Latin America

Scenario 2a: $10/tCO₂

Electricity by Fuel: 2050

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<th>Scenario</th>
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<th>iPETS</th>
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Electricity by Fuel: 2050

Scenario 2b: $30/tCO₂
Electricity: Latin America

**Scenario 2c: $50/tCO₂**

**Electricity by Fuel: 2050**

![Bar graph showing electricity generation by fuel type for different models: COPPE-BRAZIL, GCAM, iPETS, MEG4C, Phoenix, POLES, TIAM-World. The graph compares the contribution of various sources like Other, Ocean, Wind, Solar, Hydro, Nuclear, Biomass with and without CCS, Oil with and without CCS, Gas with and without CCS, and Coal with and without CCS.](image-url)
Primary Energy: Latin America

Scenario 1a: Baseline

Primary Energy by Fuel: 2050

[Bar chart showing primary energy by fuel for different models (COPPE-BRAZIL, GCAM, iPETS, MEG4C, Phoenix, POLES, TIAM-World) for the year 2050. The chart includes categories such as Other, Secondary Energy Trade, Ocean, Wind, Solar, Hydro, Nuclear, Biomass with and without CCS, Oil with and without CCS, Gas with and without CCS, Coal with and without CCS.]
Scenario 2a: $10/tCO_2

Primary Energy by Fuel: 2050
Scenario 2b: $30/tCO₂

Primary Energy by Fuel: 2050

- **EJ/yr**
- **Other**
- **Secondary Energy Trade**
- **Ocean**
- **Wind**
- **Solar**
- **Hydro**
- **Nuclear**
- **Biomass|w/ CCS**
- **Biomass|w/o CCS**
- **Oil|w/ CCS**
- **Oil|w/o CCS**
- **Gas|w/ CCS**
- **Gas|w/o CCS**
- **Coal|w/ CCS**
- **Coal|w/o CCS**
Primary Energy: Latin America

Scenario 2c: $50/tCO₂

Primary Energy by Fuel: 2050

- Other
- Secondary Energy Trade
- Ocean
- Wind
- Solar
- Hydro
- Nuclear
- Biomass|w/ CCS
- Biomass|w/o CCS
- Oil|w/ CCS
- Oil|w/o CCS
- Gas|w/ CCS
- Gas|w/o CCS
- Coal|w/ CCS
- Coal|w/o CCS

EJ/yr
Emissions: Latin America

Scenario 1a: Baseline

Fossil Fuel & Industrial CO₂

Total CO₂

MtCO₂/yr

2005 2020 2035 2050 2065 2080 2095

2005 2020 2035 2050 2065 2080 2095

COPPE-BRAZIL
GCAM
iPETS
MEG4C
Phoenix
POLES
TIAM-World

Emissions: Latin America
Emissions: Latin America

Scenario 2a: $10/tCO₂

Fossil Fuel & Industrial CO₂

Total CO₂
Emissions: Latin America

Scenario 2b: $30/tCO₂

Fossil Fuel & Industrial CO₂

Total CO₂

MtCO₂/yr

2005 2020 2035 2050 2065 2080 2095

MtCO₂/yr

2005 2020 2035 2050 2065 2080 2095

-8000 -6000 -4000 -2000 0 2000 4000 6000 8000

-8000 -6000 -4000 -2000 0 2000 4000 6000 8000

COPPE-BRAZIL
GCAM
iPETS
MEG4C
Phoenix
POLES
TIAM-World
Emissions: Latin America

Scenario 2c: $50/tCO₂

Fossil Fuel & Industrial CO₂

Total CO₂
MAC Curves: Latin America

2020

Fossil Fuel & Industrial CO$_2$

Total CO$_2$

% Reduction in Emissions

% Reduction in Emissions

2005$/CO_{2}$
MAC Curves: Latin America

2050

Fossil Fuel & Industrial CO₂

Total CO₂

% Reduction in Emissions
MAC Curves: Latin America

Fossil Fuel & Industrial CO₂

Total CO₂

2005$/CO₂

% Reduction in Emissions

% Reduction in Emissions

COPPE-BRAZIL
GCAM
iPETS
MEG4C
Phoenix
POLES
TIAM-World
Policy Cost: Latin America

Scenario 2a: $10/tCO₂

Note: Uses area under MAC for GCAM and POLES, consumption loss for iPETS and Phoenix, and GDP loss for TIAM-World
Policy Cost: Latin America

Scenario 2a: $10/tCO₂

Note: Uses area under MAC for GCAM and POLES, consumption loss for iPETS and Phoenix, and GDP loss for TIAM-World
Policy Cost: Latin America

Scenario 2b: $30/tCO₂

Absolute

% of GDP

Note: Uses area under MAC for GCAM and POLES, consumption loss for iPETS and Phoenix, and GDP loss for TIAM-World
Policy Cost: Latin America

Scenario 2c: $50/tCO₂

Absolute

% of GDP

Note: Uses area under MAC for GCAM and POLES, consumption loss for iPETS and Phoenix, and GDP loss for TIAM-World
Climate: Global

**Scenario 1a: Baseline**

**CO₂ Concentration**

ppmv

- COPPE-BRAZIL
- GCAM
- iPETS
- MEG4C
- Phoenix
- POLES
- TIAM-World

**Global Mean Temperature Rise**

degrees C

- COPPE-BRAZIL
- GCAM
- iPETS
- MEG4C
- Phoenix
- POLES
- TIAM-World
Climate: Global

Scenario 2a: $10/tCO_{2}$

**CO₂ Concentration**

ppmv

- COPPE-BRAZIL
- GCAM
- iPETS
- MEG4C
- Phoenix
- POLES
- TIAM-World

**Global Mean Temperature Rise**

degrees C

- COPPE-BRAZIL
- GCAM
- iPETS
- MEG4C
- Phoenix
- POLES
- TIAM-World
Scenario 2b: $30/tCO_2

**CO₂ Concentration**

**Global Mean Temperature Rise**

Climate: Global

- COPPE-BRAZIL
- GCAM
- iPETS
- MEG4C
- Phoenix
- POLES
- TIAM-World
Scenario 2c: $50/tCO_2

**CO₂ Concentration**

**Global Mean Temperature Rise**
Emissions Mitigation: Latin America

Scenario 2a: $10/tCO₂

Fossil fuel & industrial CO₂

- COPPE-BRAZIL
- GCAM
- iPETS
- MEG4C
- Phoenix
- POLES
- TIAM-World

Total CO₂

- COPPE-BRAZIL
- GCAM
- iPETS
- MEG4C
- Phoenix
- POLES
- TIAM-World

Mitigation in LAM vs Mitigation in World
Emissions Mitigation: Latin America

Scenario 2b: $30/tCO₂

Fossil fuel & industrial CO₂

Total CO₂

Mitigation in LAM vs Mitigation in World for various models:
- COPPE-BRAZIL
- GCAM
- iPETS
- MEG4C
- Phoenix
- POLES
- TIAM-World

The graphs show the percentage of mitigation in Latin America (LAM) compared to the world for each model under Scenario 2b.
Emissions Mitigation: Latin America

Scenario 2c: $50/tCO₂

Fossil fuel & industrial CO₂

- COPPE-BRAZIL
- GCAM
- iPETS
- MEG4C
- Phoenix
- POLES
- TIAM-World

Total CO₂

- COPPE-BRAZIL
- GCAM
- iPETS
- MEG4C
- Phoenix
- POLES
- TIAM-World