COALMOD-World

Impacts on Global Coal Trade under Alternative Coal Transition Scenarios

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COALMOD-World Model
A Representation of the Global Coal Value Chain

Supply → Global Steam Coal Market → Demand

Coal Infrastructure

Graph: $/t vs. Q
COALMOD-World Model: A unique and established quantitative framework

Single-period trade model (2010)

Multi-period global model (2012)

Climate scenarios (2013)

Multi-period global model (2015)

Supply side policies (2016)

Market power in the Atlantic (2012)

Export and production taxes (2015)

Assuming perfect competition:

Other forms of market power:
Overview of world steam coal market: supply, demand, trade

Major producers in 2015
- China (2,970 Mt)
- United States (690 Mt)
- India (590 Mt)
- Indonesia (450 Mt)

World production 5,835 Mt

Major consumers in 2015
- China (3,140 Mt)
- India (750 Mt)
- United States (630 Mt)
- World consumption 5,850 Mt

Seaborne Trade: 880 Mt (15%)

Source: IEA (2016b)
Coal Transitions Project: Climate Scenarios focusing on Coal Demand

<table>
<thead>
<tr>
<th>Reference Scenario (NDC):</th>
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<tr>
<td>- Coal consumption based on IEA Coal Information 2012</td>
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<tr>
<td>- Growth rates of coal demand derived from WEO 2016 New Policy Scenario</td>
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<tr>
<td>+ Partial equilibrium on regional level due to overarching consistent quantitative framework</td>
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<td>+ Incorporating NDC policies in different countries/regions</td>
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<th>450 ppm Scenario (2° C):</th>
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<td>- Coal consumption based on IEA Coal Information 2012 and growth rates derived from WEO 2016 450 ppm scenario (consistent with the 2° C target)</td>
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<td>- Note that the IEA assumes strong use of CCS (430 GW of power plants using CCS in 2040)</td>
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<th>Enhanced Coal Transition Scenario (ECT):</th>
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<td>- Enhanced information on national transition scenarios from the project country teams</td>
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<tr>
<td>- Based on NDC scenario</td>
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<td>+ Better reflection of drivers of coal transition on country level</td>
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<th>Enhanced Coal Transition Scenario 2 (ECT 2):</th>
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<td>- As ECT, except for India and China</td>
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<tr>
<td>+ Adequate reflection of drivers of coal transition on country level</td>
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COALMOD Results: Global Coal Consumption by Scenario

Alternative Coal Transition Scenarios: COALMOD-World
UNFCCC Side Event "Coal Transition" November 15, 2017
COALMOD-World Results: Trade Flows in ECT vs. 2 C° Scenario

Ongoing trend: the shift to Asia and especially India

Total trade
- ECT 795 Mtpa
- 2 C° 632 Mtpa
COALMOD-World Results: Trade Flows in ECT vs. 2°C Scenario

High-cost suppliers (to Asia) increasingly lose market share, even more so in lower-demand 2°C climate scenario.

2040

Total trade

- ECT 740 Mtpa
- 2°C 429 Mtpa
In climate-friendly scenarios, investments compensate for mine mortality and remove transport bottlenecks.

Even in a NDC world such as in the ECT scenario, investment needs can be considerably reduced compared to the reference case.
A Detailed Look at India

Consumption in India by scenario

- NCD
- 2° C
- ECT

Mtpa

2020 2025 2030 2035 2040 2045 2050
India’s expansions plans for its domestic coal production are adding uncertainty for exporters to India.

In addition, Indian coal companies are looking for coal production capacities outside of India (cf. Adani investment in Australia).
Investments in Key Exporting Countries to India

Risk of asset stranding may arise quickly

<table>
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<tr>
<th>Country</th>
<th>NDC</th>
<th>ECT</th>
<th>2°C</th>
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<tbody>
<tr>
<td>Indonesia</td>
<td>5600</td>
<td>5400</td>
<td>5200</td>
</tr>
<tr>
<td>South Africa</td>
<td>7000</td>
<td>7000</td>
<td>6800</td>
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</tbody>
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- Export capacity
- Production capacity
- Transport capacity
- Domestic transport capacity

Million USD
Diversification of Trade Flows: Varying Exposure to Demand Changes

Exports by Australia in 2030

- NDC
- 2° C
- ECT

Exports by South Africa in 2030

- NDC
- 2° C
- ECT
Shift to Asia – in particular India – in all scenarios. China remains the largest coal consumer in all scenarios.
International coordination of coal transition required, but importantly on national policies that tackle coal consumption at the domestic levels (in China, India, ...)

- India imports
- China imports
- International seaborne trade (except China & India imports)
- Domestic supply (except China & India)
- India domestic supply
- China domestic supply
Conclusions

• Global coal market modeling shows that there is a broad range of possible futures that are NDC-compatible
• Additional policies are needed to close the gap between NDC/ECT and 2°C scenarios
• Governments need to take into account that stakeholders might oppose – even low-ambitious – climate policies because of the fear of losing market shares and foregoing revenues from reserves and capacities (asset stranding)
  • In particular in South Africa, but also Australia, Indonesia, ...
  • Overcapacity from high investments and rising concentration on market → Pressure on prices and revenues → Transition policies should address this “revenue gap”
Insights from a Global Coal Model

Thank you very much for your attention!

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References


