Impacts on Global Coal Trade under Alternative Coal Transition Scenarios

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The Coal Transitions Project

2. Who is participating?

<table>
<thead>
<tr>
<th>Project Coordinators</th>
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<tr>
<td>IDDRI</td>
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<td>France</td>
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<td>IDDRI</td>
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<table>
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<tr>
<th>Country Teams</th>
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<tbody>
<tr>
<td>Indian Institute of Management Ahmedabad</td>
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<tr>
<td>IIMA</td>
</tr>
<tr>
<td>Tsinghua University</td>
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<tr>
<td>China</td>
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<tr>
<td>Australian National University</td>
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<tr>
<td>Australia</td>
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<tr>
<td>University of Cape Town, Energy Research Centre</td>
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<tr>
<td>South Africa</td>
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<tr>
<td>German Institute for Economic Research</td>
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<td>Germany</td>
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<tr>
<td>Institute for Structural Research</td>
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<td>Poland</td>
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Country pathways

Global coal sector modelling
The Coal Transitions Project

Find updated information and publications on the website www.coaltransitions.org
COALMOD-World Model
A Representation of the Global Coal Value Chain

Coal Infrastructure

Supply → Global Steam Coal Market → Demand

$/t vs. Q

Supply
Global Steam Coal Market
Demand
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)

Other forms of market power:

Assuming perfect competition:
The Global Steam Coal Market

Overview of world steam coal market: supply, demand, trade

<table>
<thead>
<tr>
<th>Major producers in 2015</th>
<th>Major consumers in 2015</th>
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<tbody>
<tr>
<td>China (2,970 Mt)</td>
<td>China (3,140 Mt)</td>
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<tr>
<td>United States (690 Mt)</td>
<td>India (750 Mt)</td>
</tr>
<tr>
<td>India (590 Mt)</td>
<td>United States (630 Mt)</td>
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<tr>
<td>Indonesia (450 Mt)</td>
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**World production 5,835 Mt**

**World consumption 5,850 Mt**

**Seaborne Trade: 880 Mt (15%)**

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

### Reference Scenario (NDC):
- Coal consumption based on IEA Coal Information 2012
- Growth rates of coal demand derived from IEA (2016a) WEO 2016 New Policy Scenario
- Partial equilibrium on regional level due to overarching consistent quantitative framework
- Incorporating NDC policies in different countries/regions

### 450 ppm Scenario (2°C):
- Coal consumption based on IEA Coal Information 2012 and growth rates derived from WEO 2016 450 ppm scenario (consistent with the 2°C target)
- Note that IEA (2016a) assumes strong use of CCS (430 GW CCS-power plants in 2040)

### Enhanced Coal Transition Scenario (ECT):
- Enhanced information on national transition scenarios from the project country teams
- Based on NDC scenario, except with lower demand in China, India, USA, and South Africa (after 2030)

### Enhanced Coal Transition Scenario 2 (ECT 2):
- As ECT, except for India (less ambitious with higher reference demand) and China (more ambitious with lower reference demand)

### Enhanced Supply Side Scenario (ESS):
- As ECT 2 and exogenously assuming realization of the Indian-owned Adani mine in Queensland (Australia) with dedicated exports to India
COALMOD Results: Global Coal Consumption by Scenario

Reference (NDC)

ECT

2°

Total consumption 2010-2050:

-10%

-32%
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

Countries included in the COALMOD-World database:
- Exporting Country
- Importing Country
- Country with internal market with export and/or import possibility

Seaborne trade flow (in Mt)

ECT

2030
High-cost suppliers (to Asia) increasingly loose market share, even more so in lower-demand 2°C climate scenario.

**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.
Consumption in India by scenario

mtpa

- NCD
- 2°C
- ECT

2020 2025 2030 2035 2040 2045 2050

Alternative Coal Transition Scenarios: COALMOD-World
Strommarkttreffen "Kohleausstieg" 12. Januar 2018
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)
Risk of asset stranding may arise quickly

![Bar chart showing investments in key exporting countries to India.](chart.png)
Diversification of Trade Flows: Varying Exposure to Demand Changes

Exports by Australia in 2030

Exports by South Africa in 2030
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, …)
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° 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, ...
  - 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


