

COALMOD-World

Impacts on Global Coal Trade under Alternative Coal Transition Scenarios

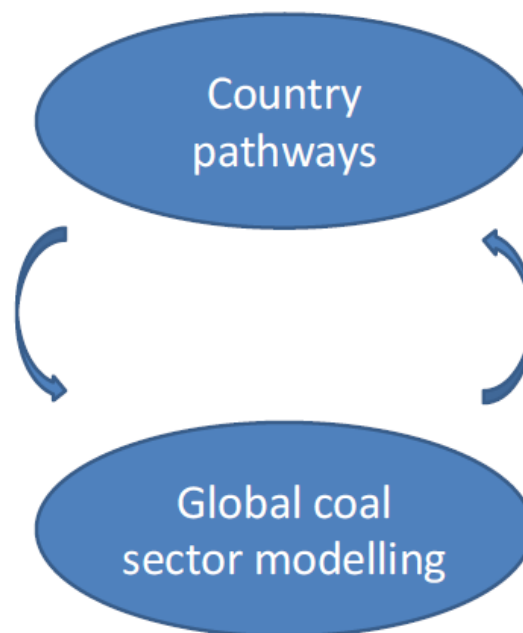
WORK in PROGRESS – FINAL REPORT online in April 2018

Franziska Holz, Ivo Kafemann, Tim Scherwath (DIW Berlin),
Roman Mendelevitch (HU Berlin), Oliver Sartor (IDDRI), Thomas Spencer (TERI)

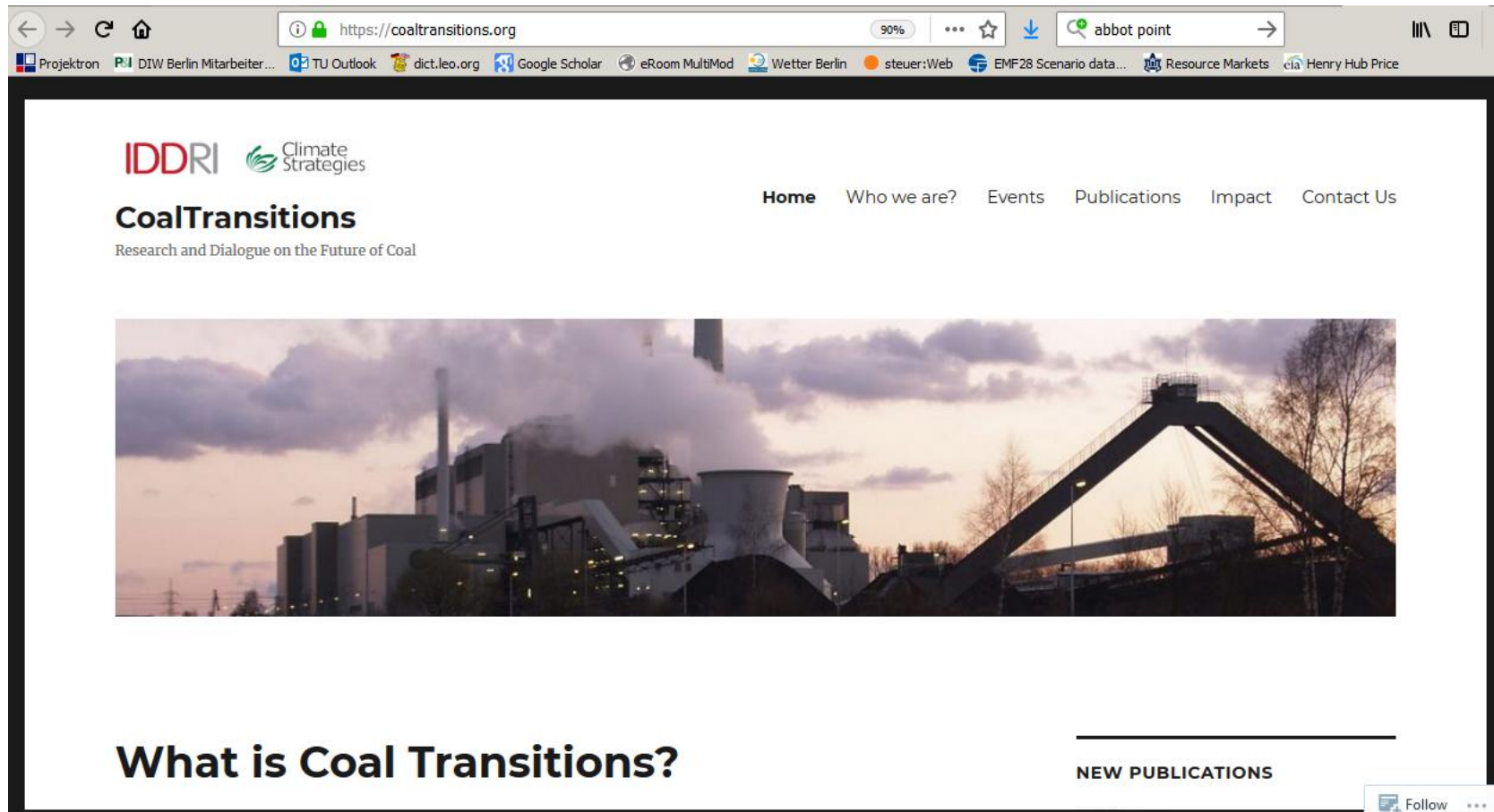
2. Who is participating?

Project Coordinators		
IDDRI	France	
Climate Strategies	UK	
Country Teams		
Indian Institute of Management Ahmedabad	IIMA	
Tsinghua University	China	
Australian National University	Australia	
University of Cape Town, Energy Research Centre	South Africa	
German Institute for Economic Research	Germany	
Institute for Structural Research	Poland	

Funded by the KR Foundation

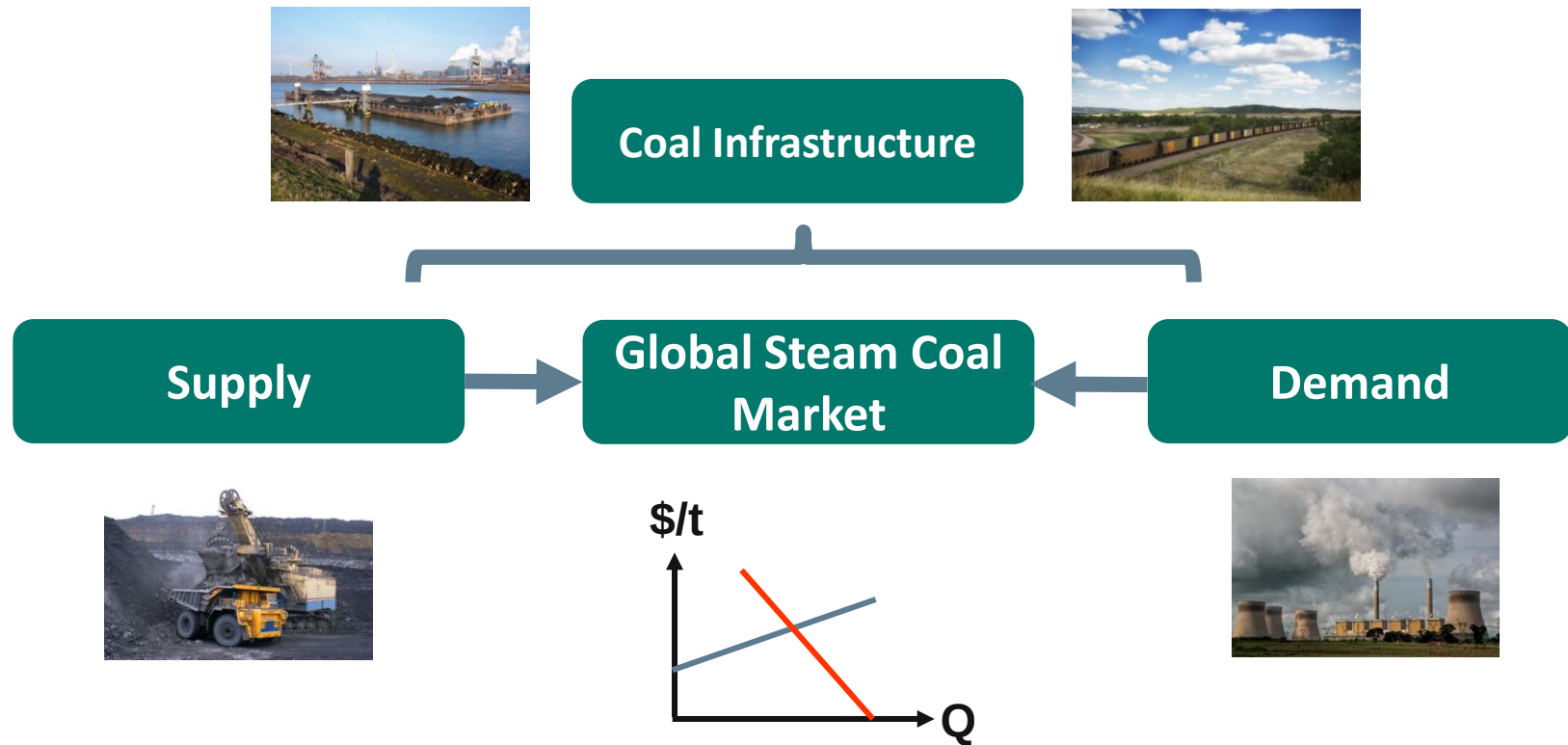


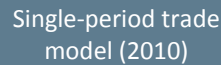
Find updated information and publications on the website
[www.coaltransitions.org](https://coaltransitions.org)



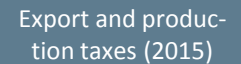
COALMOD-World Model

A Representation of the Global Coal Value Chain

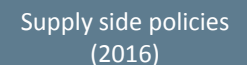
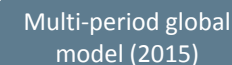


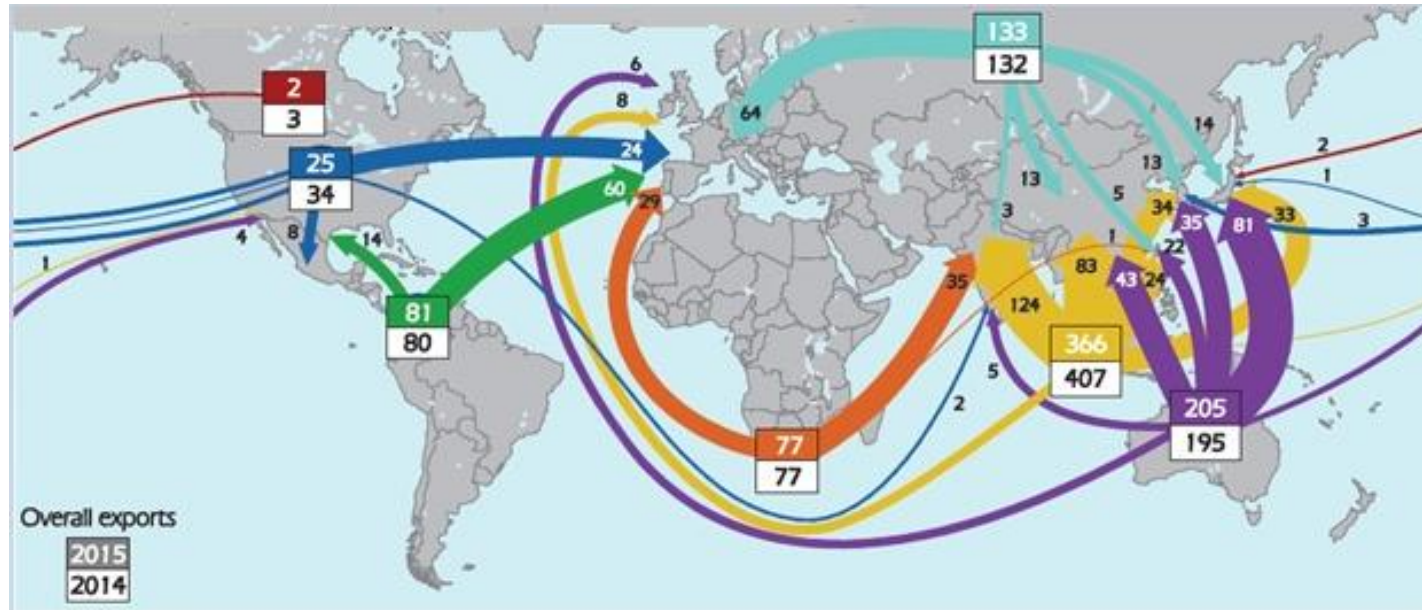


Market power in the Atlantic (2012)



Multi-period global model (2012)





Source: IEA (2016b)

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 (2017)

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

Top-
Down

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)

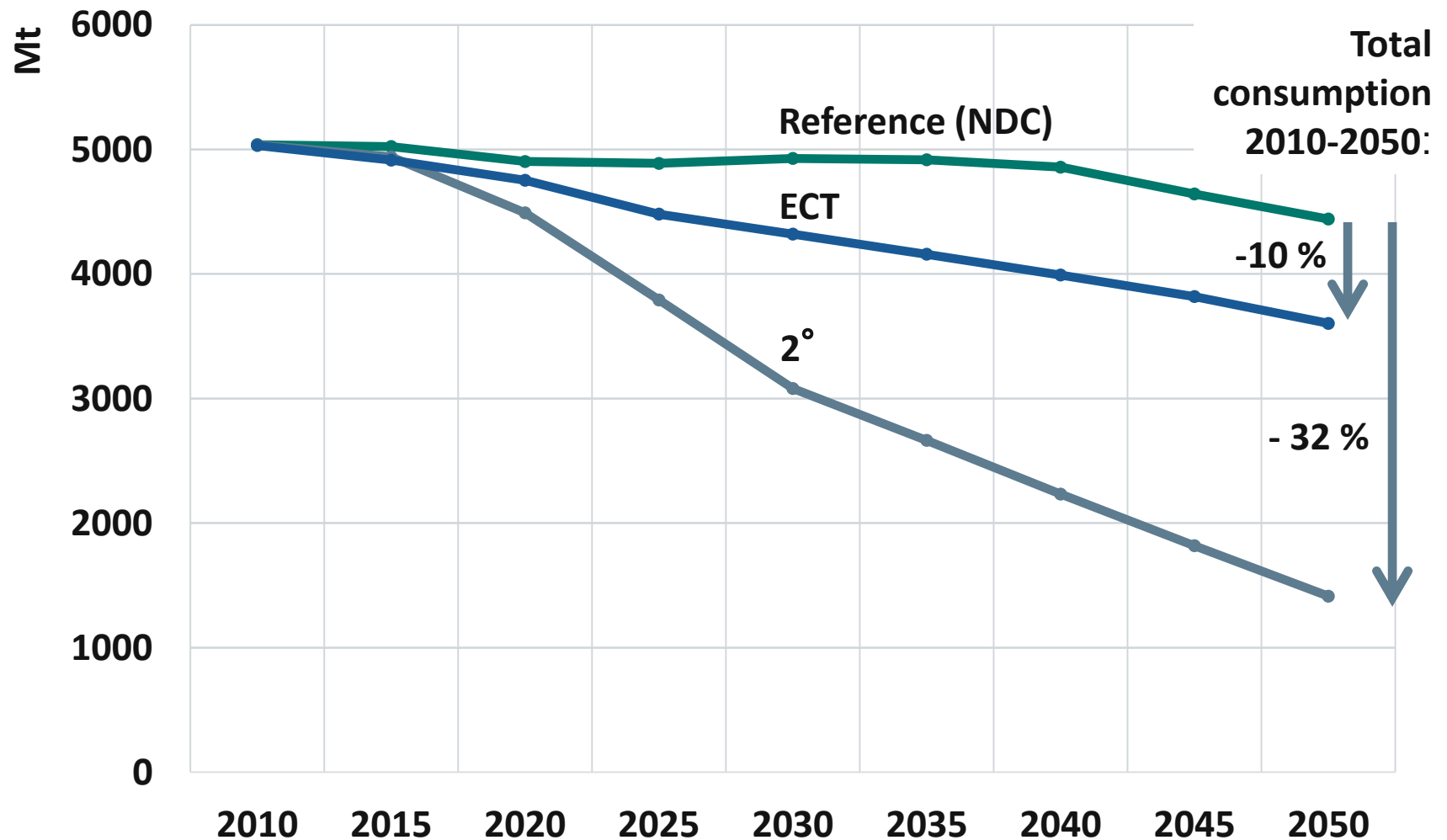
Enhanced Coal Transition Scenario 2 (ECT 2):

- As ECT, except for India (less ambitious with higher reference demand) and China (more ambitious with lower reference demand)

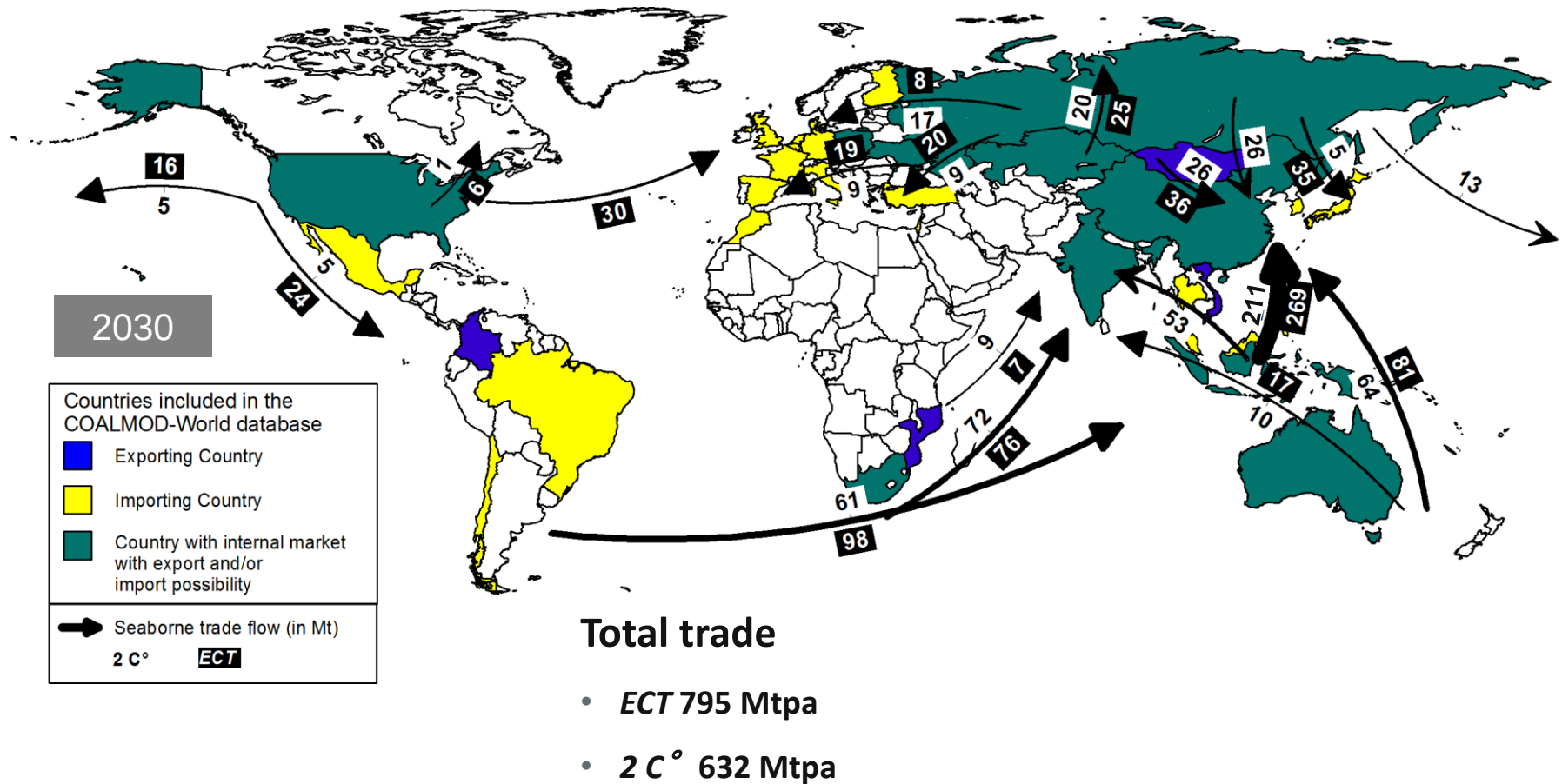
Bottom
-up

Enhanced Supply Side Scenario (ESS):

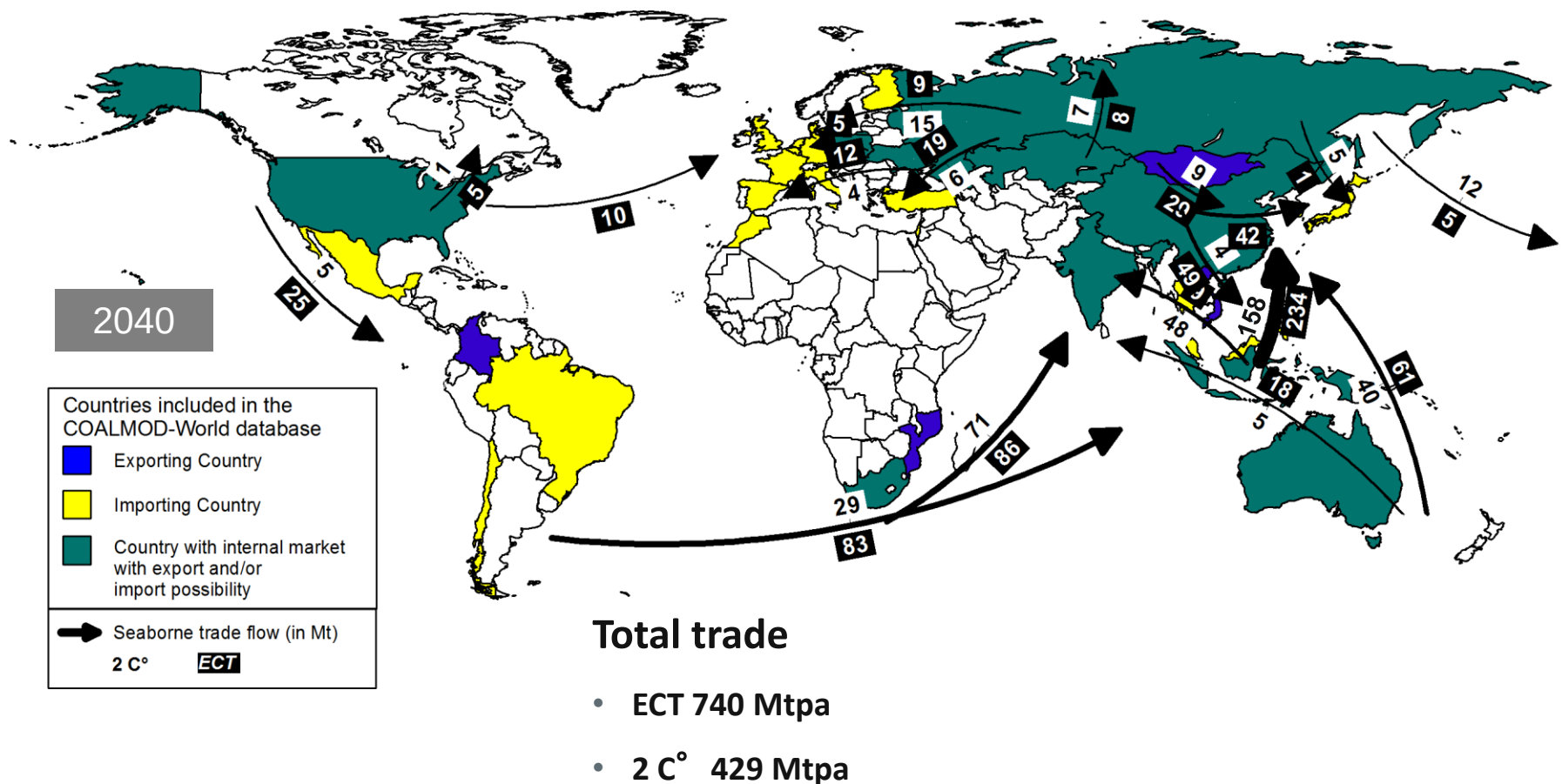
- As ECT 2 and exogenously assuming realization of the Indian-owned Adani mine in Queensland (Australia) with dedicated exports to India



Ongoing trend: the shift to Asia and especially India



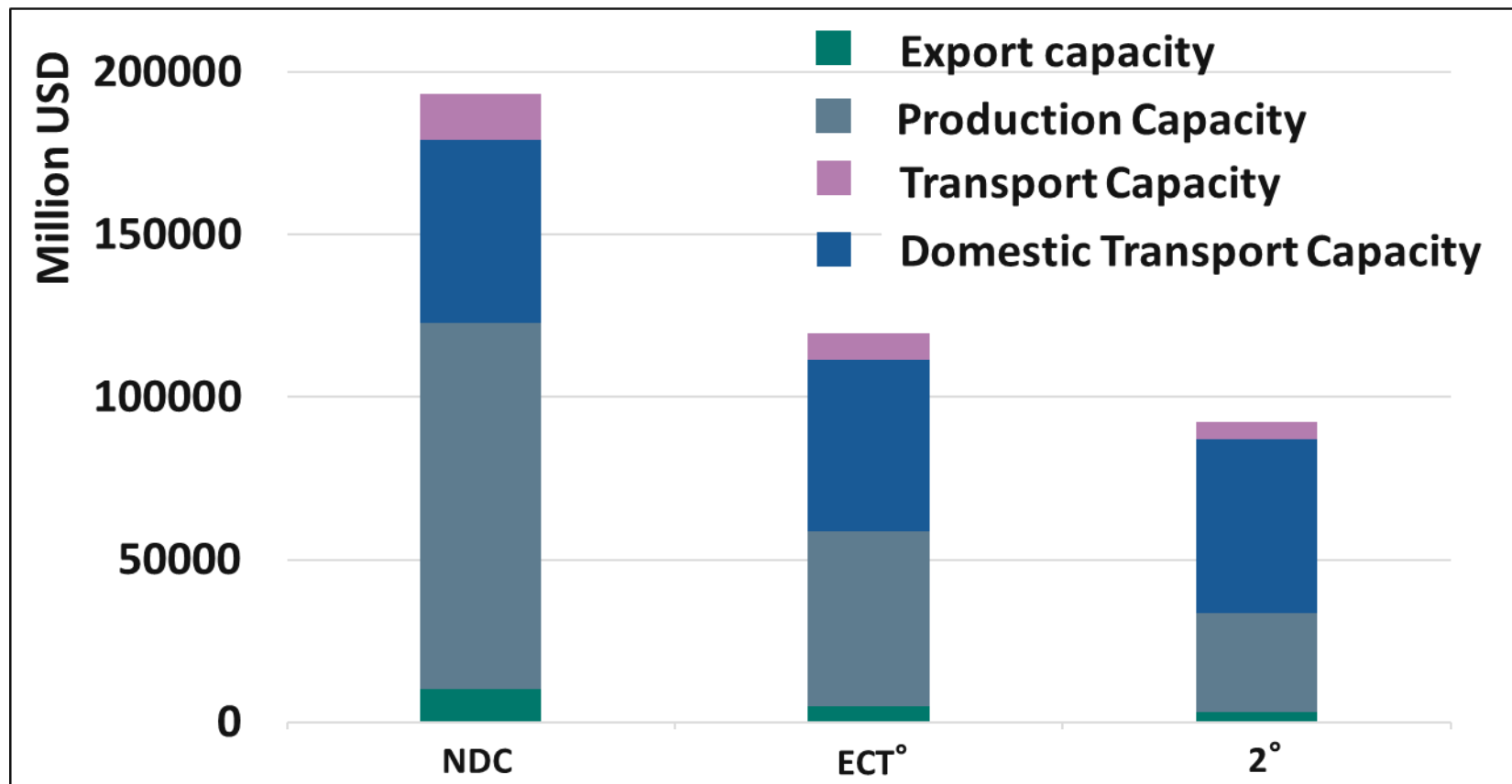
High-cost suppliers (to Asia) increasingly lose market share, even more so in lower-demand 2° C climate scenario.



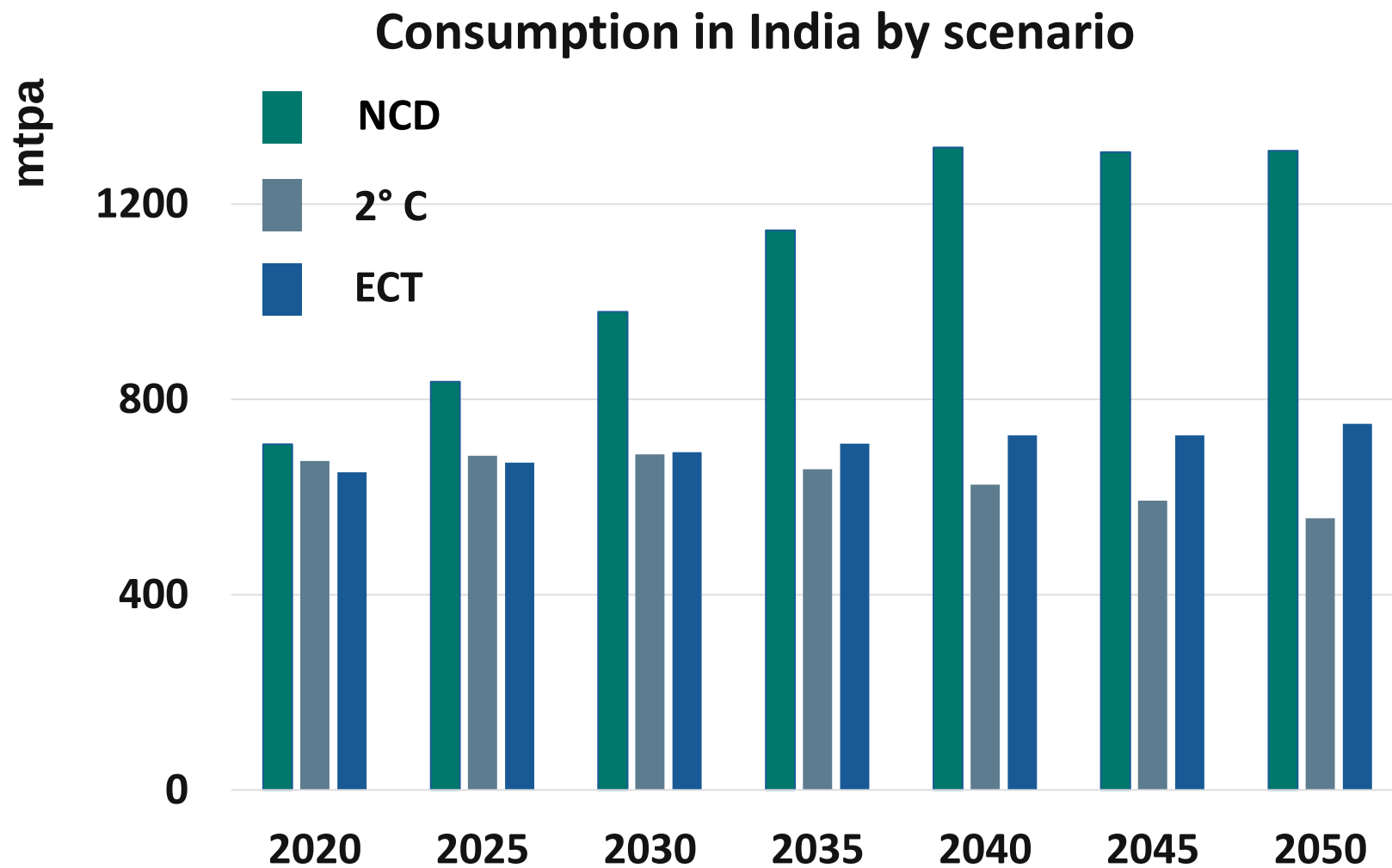
COALMOD-World Results: Investments in the Coal Value Chain

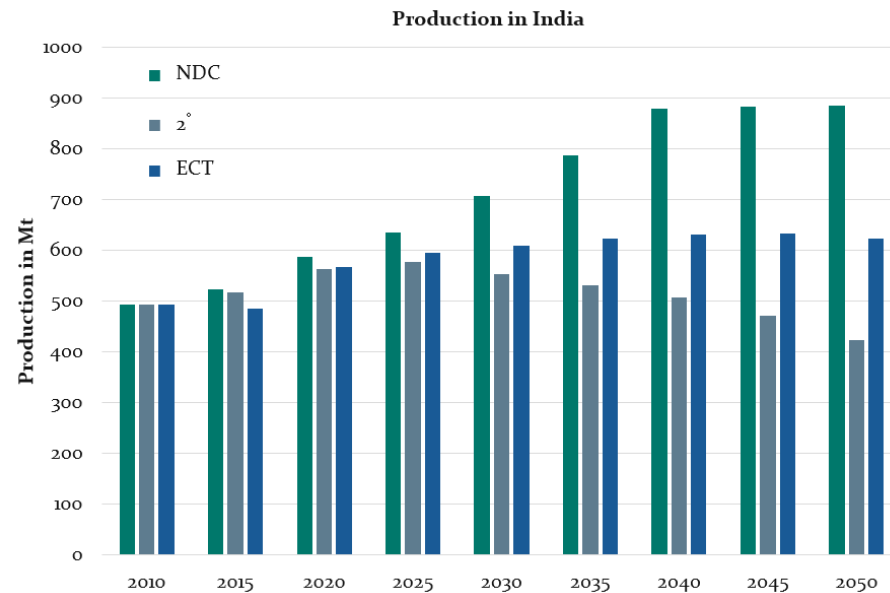
In climate-friendly scenarios, investments compensate for mine mortality and remove transport bottlenecks.

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



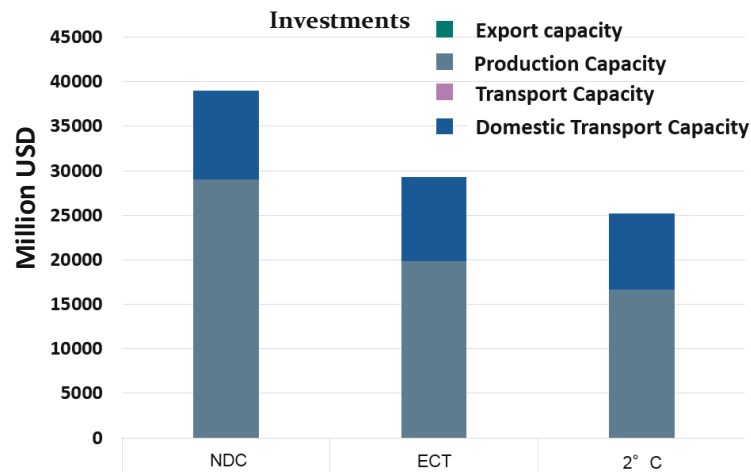
A Detailed Look at India





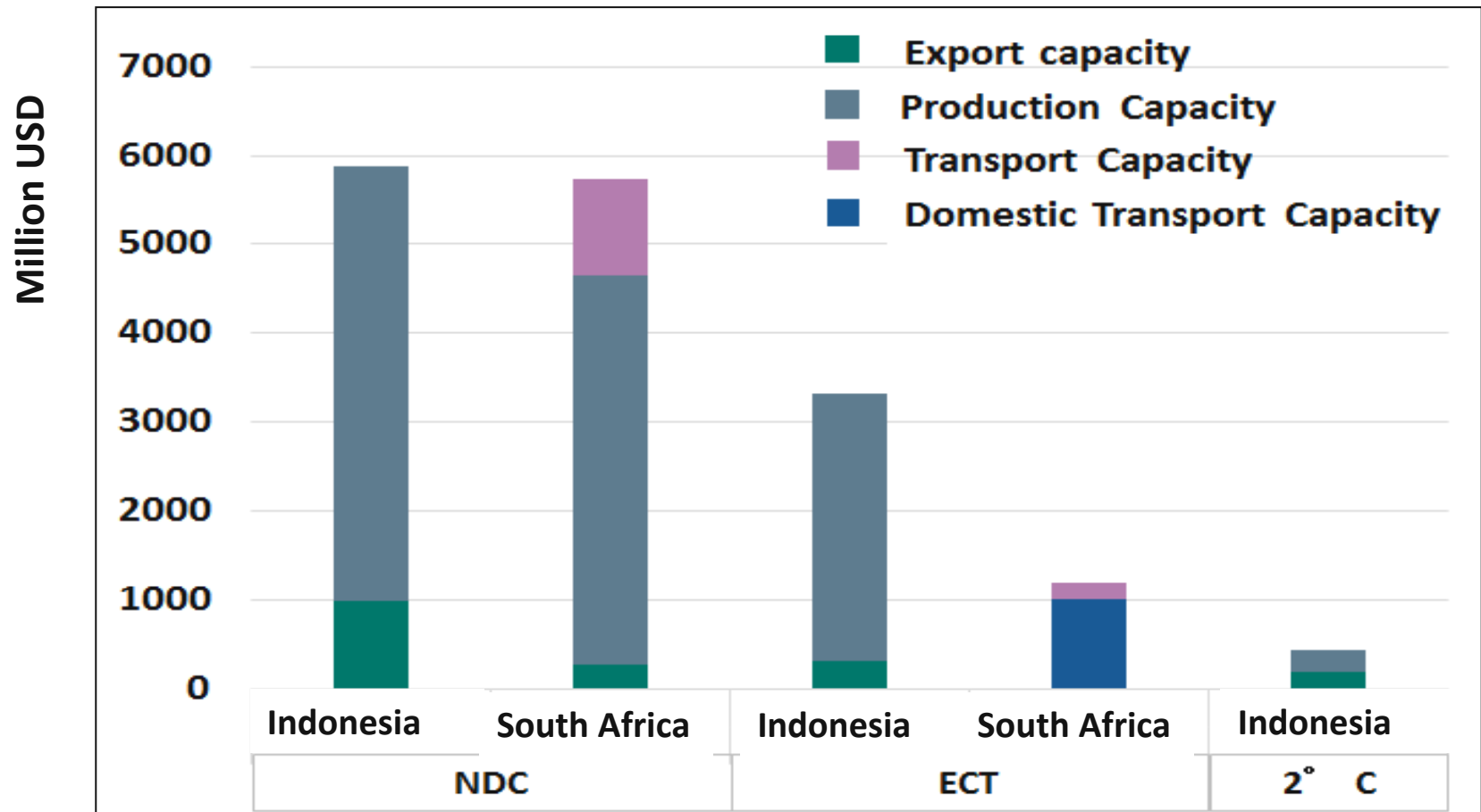
India's expansions plans for its domestic coal production are adding uncertainty for exporters to India

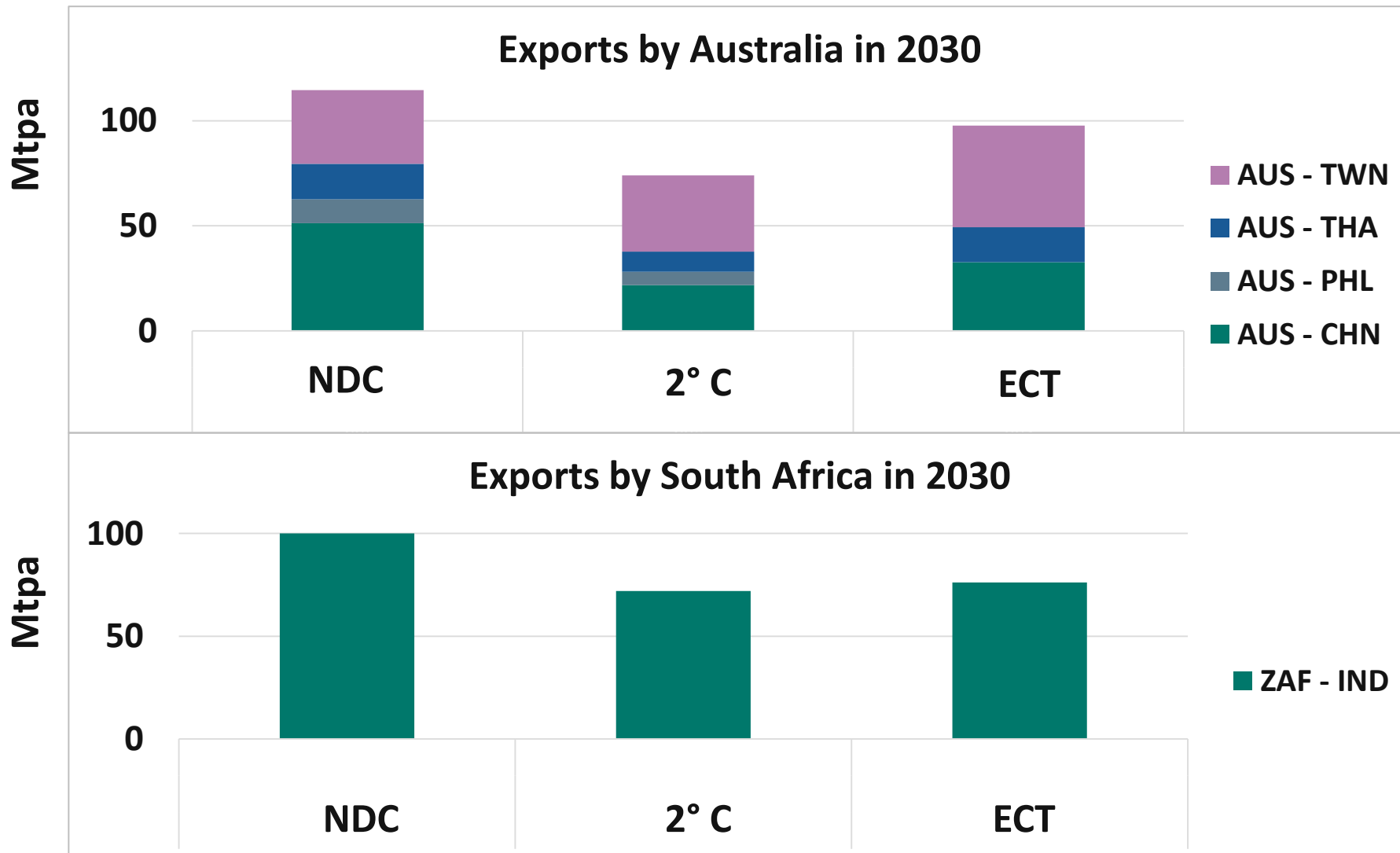
In addition, Indian coal companies are looking for coal production capacities outside of India (cf. Adani investment in Australia)



Investments in Key Exporting Countries to India

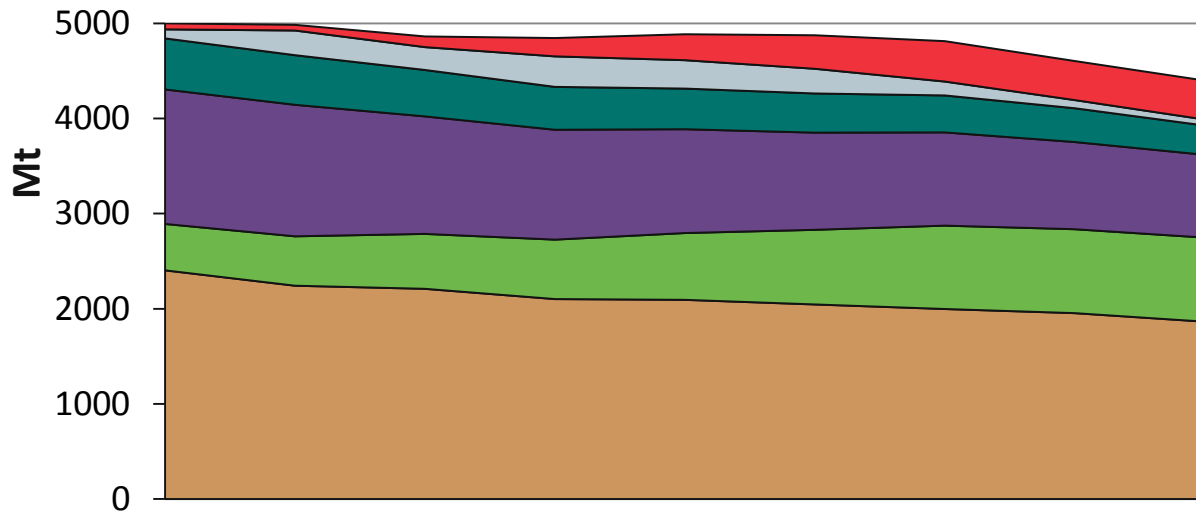
Risk of asset stranding may arise quickly





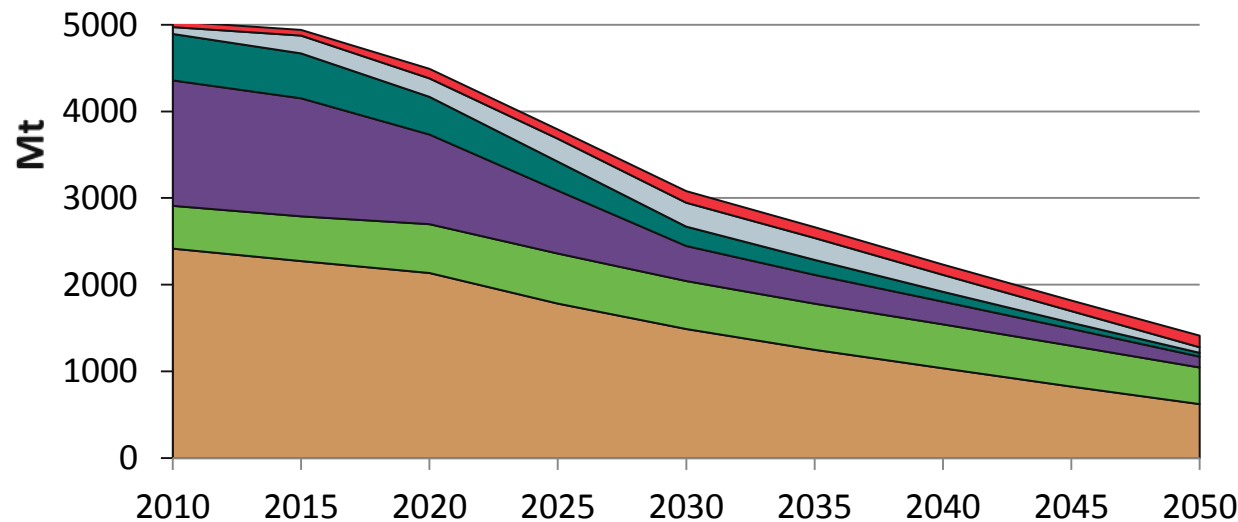
Summarizing COALMOD Results: Reference vs. 2° C Scenario

Reference (NDC)



Shift to Asia – in particular India – in all scenarios.
China remains the largest coal consumer in all scenarios

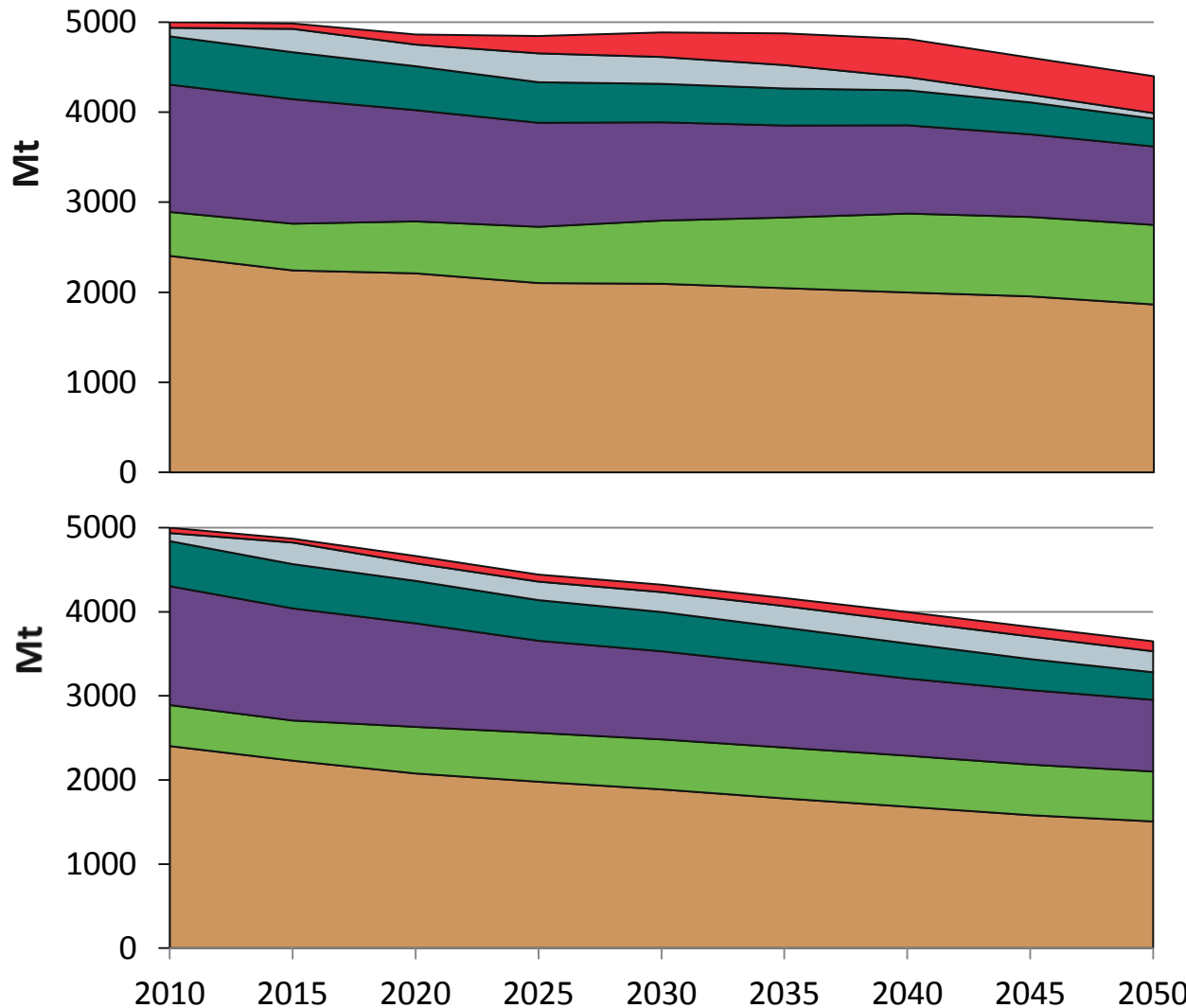
2° C



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

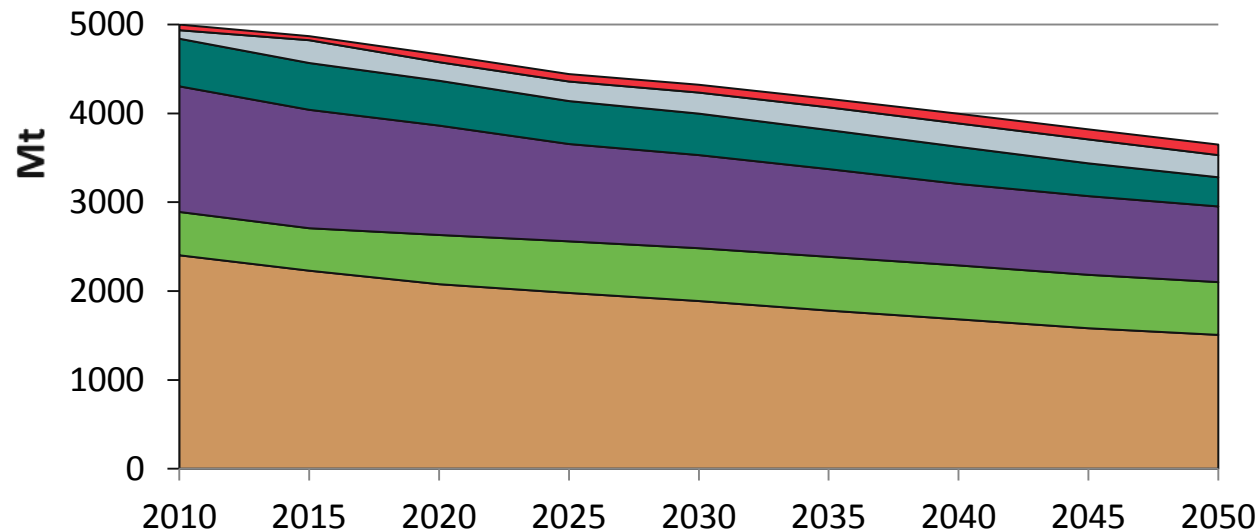
Summarizing COALMOD Results: Reference vs. ECT Scenario

Reference (NDC)



International coordination of coal transition required, but importantly on national policies that tackle coal consumption at the domestic levels (in China, India, ...)

ECT



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

- 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!

Franziska Holz (DIW Berlin)
fholz@diw.de

References

- Haftendorn, Holz, Kemfert, and Hirschhausen (2013): Global Steam Coal Markets until 2030 – Perspectives on Production, Trade, and Consumption under Increasing Carbon Constraints. In: R. Fouquet (Ed.) *“Handbook on Energy and Climate Change”*, 103-122, Edward Elgar Publ.
- Haftendorn, Kemfert, and Holz (2012): What about Coal? Interactions between Climate Policies and the Global Steam Coal Market until 2030. *Energy Policy* 48, 274-283.
- Haftendorn (2012): Evidence of Market Power in the Atlantic Steam Coal Market Using Oligopoly Models with a Competitive Fringe. *DIW Discussion Paper* 1185.
- Haftendorn, Holz, and Hirschhausen (2012): The End of Cheap Coal? A Techno-economic Analysis Until 2030 using the COALMOD-World Model. *FUEL* 102, 305-325.
- Haftendorn and Holz (2010): Modeling and Analysis of the International Steam Coal Trade. *The Energy Journal* 31 (4), 201-225.
- IEA (2012): Coal Information 2012. Coal information. OECD/Paris.
- IEA (2016a): World Energy Outlook 2016. OECD/Paris.
- IEA (2016b): Medium-Term Coal Market Report 2016. OECD/Paris.
- IEA (2017): Coal Information 2017. Coal information. OECD/Paris.
- Holz, Haftendorn, Mendelevitch, and Hirschhausen (2015): COALMOD-World: A Model to Assess International Coal Markets Through 2030. In: M.C. Thurber and R.K. Morse (Eds.) *“Asia and the Global Coal Market”*, Cambridge Univ. Press.
- Mendelevitch (2016): Testing Supply-Side Climate Policies for the Global Steam Coal Market – Can They Curb Coal Consumption?, *DIW DP 1604*.
- Mendelevitch, Holz, Hirschhausen, and Haftendorn (2016): A Model of the International Steam Coal Market (COALMOD-World), *DIW Data Doc* 85.
- Richter, Jotzo, and Mendelevitch (2015): Market Power Rents and Climate Change Mitigation: A Rationale for Coal Taxes?, *DIW DP 1471*.