

# Climate policy risk

## Oil industry response and financial outcomes

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 Bergen, 4 January 2017

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# Climate policy risk

## Oil industry response and financial outcomes

- Climate policy risk
  - Definition and demarcation
  - Market/price implications
- Oil industry response
  - Short term adjustment
  - Strategic re-direction
- Financial outcomes
  - Sketch of a research project



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# Climate policy risk

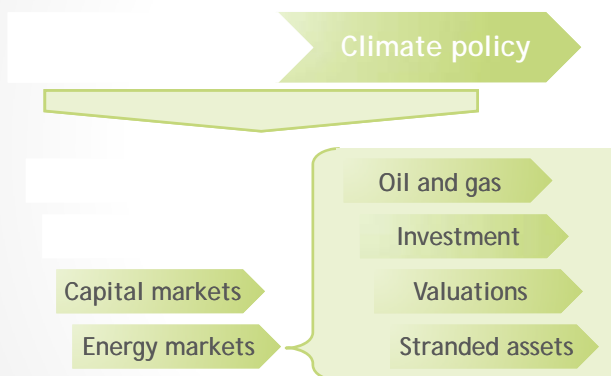
Physical risks and transition risks



Tol, R. J. (2009). The economic effects of climate change. *JEL* 23 (2), 29-51.  
Heal, G. (2017). The economics of the climate. *Journal of Economic Literature* 55 (2), 1046-1033.  
Mohn, Klaus (2017). The gravity of status quo: A review of IEA's World Energy Outlook. *Economics of Energy and Environmental Policy* (forthcoming).

# Climate policy risk

Market, price and valuation impact



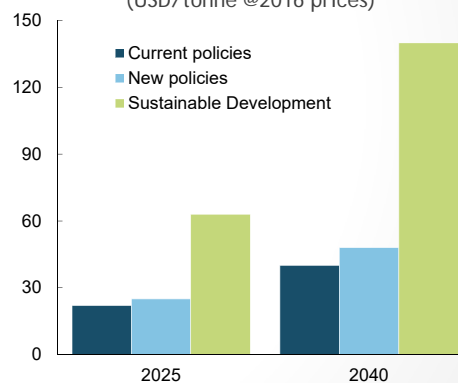
Tol, R. J. (2009). The economic effects of climate change. *JEL* 23 (2), 29-51.  
Heal, G. (2017). The economics of the climate. *Journal of Economic Literature* 55 (2), 1046-1033.  
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## Climate policy risk

### Market and price implications

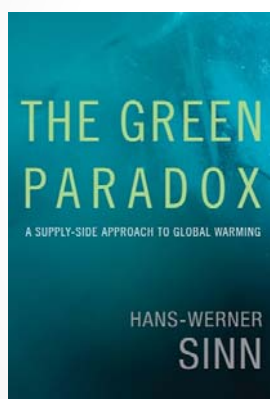
- Externality correction
  - Capturing the social cost of carbon
  - Global quota versus national tax
- Focus on demand-side measures
  - Higher prices for consumers
  - Lower prices for producers

EU CO<sub>2</sub> price assumptions by IEA scenario  
(USD/tonne @2016 prices)



## Oil industry response

### The green paradox: Distortion of original policy intent



- Climate policies as announced expropriation
- Evidence
  - Opec strategy change 2014
  - Shale oil expansion
  - Exploration policies

# Oil industry response

## The green paradox: Emerging call for supply-side policies



Sinn, Hans Werner (2012). *The Green Paradox*: MIT Press, Boston MA, USA.  
 Harstad, Bård (2012). Buy coal! A case for supply-side environmental policy. *Journal of Political Economy* 120 (1), 77-115.  
 Ploeg, Rick van der, and Cees Withagen (2015). Global warming and the green paradox: A Review of adverse effects of climate policies. *Review of Environmental Economics and Policy* 9 (2), 285-303.  
 Fæhn, Taran, Hagem, Cathrine, Lindholt, Lars, Maaland, Ståle and Knut E. Rosendahl (2017). Climate policies in a fossil fuel producing country: Demand vs supply-side policies. *The Energy Journal* 38 (1), 77-102.  
 Lazarus, Michael, Erickson, Peter, and Kevin Tempest (2016). Supply-side climate policy: The road less taken. *Working Paper 2015-13*, Stockholm Environmental Institute.

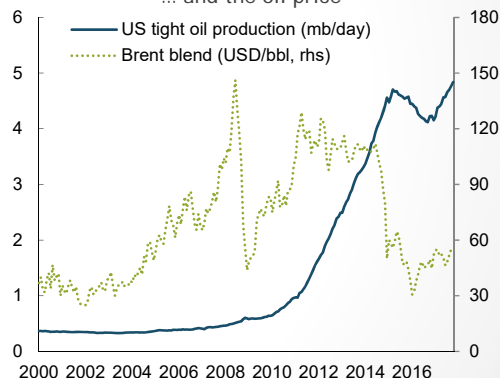
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# Oil industry response

## Short-term reaction: Speed up production, push policies, buy time

- Front-load production
  - More myopic investment behaviour
  - Aversion to long-term projects
  - Focus on oil, and esp shale oil
- Bend the business framework
  - Community outreach
  - Energy analysis and dialogue
  - Stakeholder engagement

The emergence of shale oil...  
... and the oil price



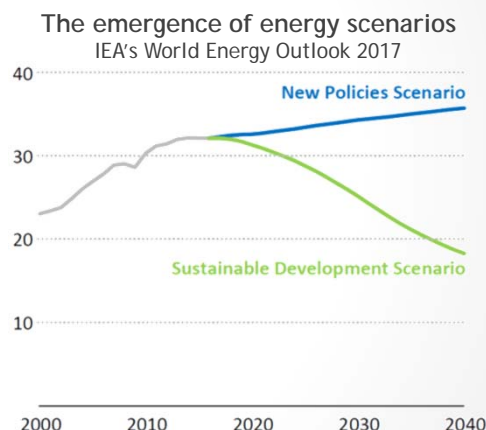
Alquist, R. and J. D. Guenette (2014). A blessing in disguise: The implications of high global oil prices for the North American market. *Energy Policy* 64 (C), 49-57.  
 Bjørnland, Hilde C., Frode M. Nordvik, and Maximilian Rohrer (2017). Supply flexibility in the shale patch: Evidence from North Dakota. *CAMP Working Paper 2/2017*. BI Norwegian Business School.  
 Economou, A., Agnolucci, P., Fattouh, B., and V. de Lipsis (2017). A structural model of the world oil market. *OIES Paper 75*, Oxford Institute for Energy Studies.  
 Smith, James L. and Thomas K. Lee (2017). The price elasticity of US shale oil reserves. *Energy Economics* 67, 121-135.

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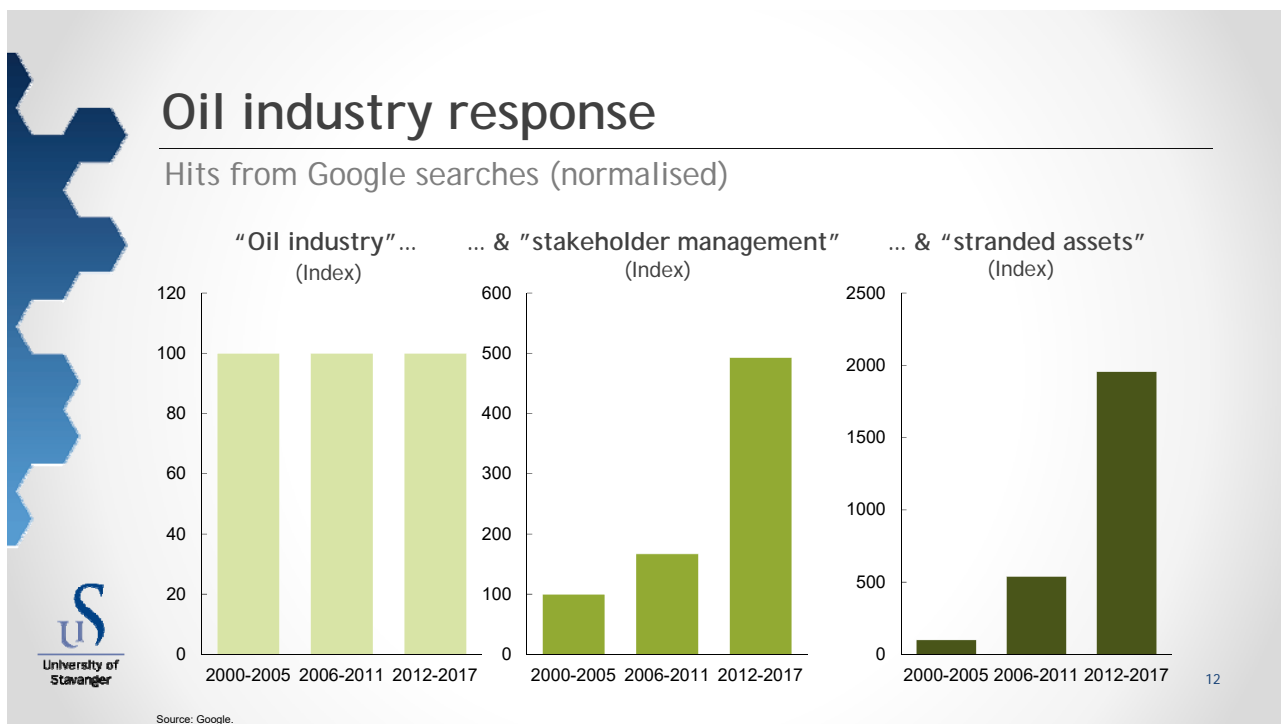
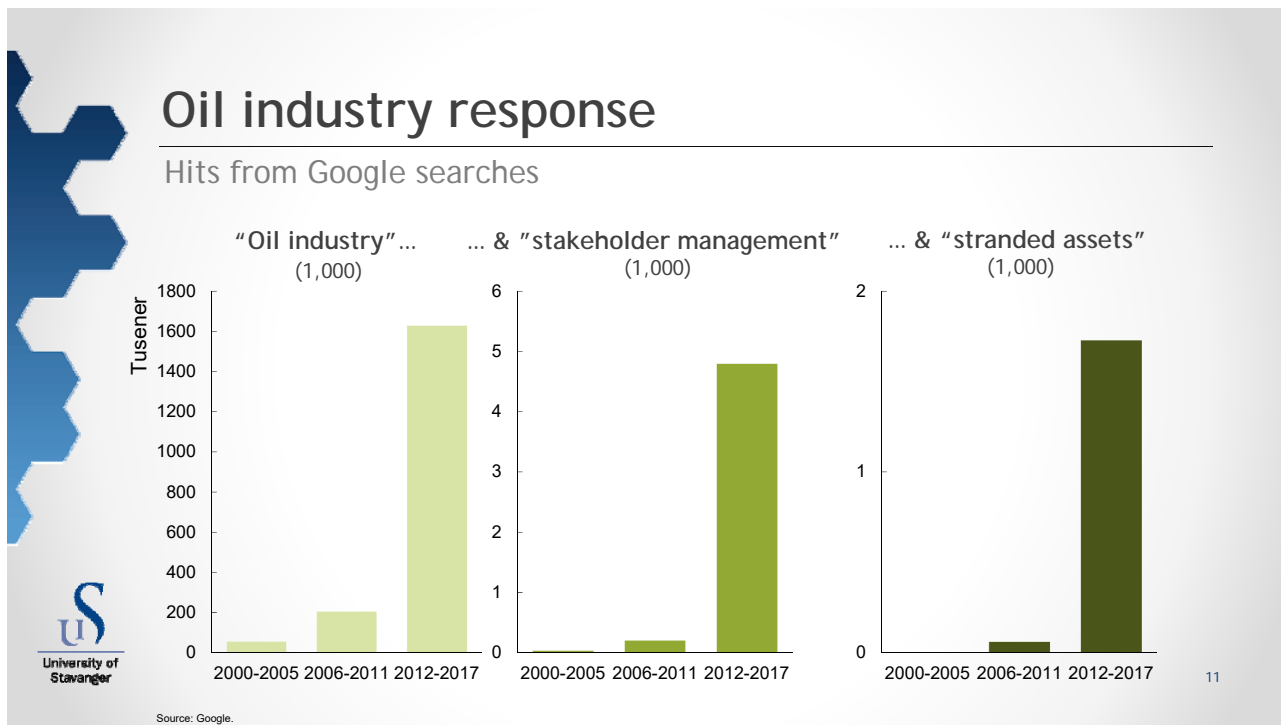
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The emergence of energy scenarios  
Major Oil companies engage





# Oil industry response

Climate risk exposure: demand outlook and price uncertainty

**Institutional Investor**  
**BP, Shell Put Oil Ahead of Earth, ESG Group Warns Investors**  
 Oil giants focus excessively on fossil fuel production, a green advocacy group concluded, and urged investors to demand clear plans for controlling climate change.

**NEWS in ENGLISH.no**  
**Oil Fund turns 'climate activist'**  
 Risk assessments already being made by Norway's huge sovereign wealth fund known as the Oil Fund may now help reverse climate change. The fund's chief, Vigor Stengedal, and Norwegian Prime Minister Erna Solberg played key roles at French President Emmanuel Macron's "One Planet Summit" in Paris this week, with Stengedal talking about how investors can assess companies better regarding their ultimate risk, their own emissions and being more open about their climate strategies.

**FT FINANCIAL TIMES**  
**ExxonMobil bows to shareholder pressure on climate**  
 World's biggest listed oil group to assess impact on profits of anti-warming policies  
 Ed Crooks in New York  
 4 HOURS AGO  
 ExxonMobil, the world's largest listed oil and gas group, will start publishing reports on the possible impact of climate policies on its business, bowing to investor demands for improved disclosure of the risks it faces.  
 The decision is the biggest success so far for investors who have been pushing companies to do more to acknowledge the threat they face from climate change and from policies that curb greenhouse gas emissions.

Joe McGrath, October 25, 2017

EXXON

# Oil industry response

Strategic re-direction: Repositioning, readjustment, diversification

- **Repositioning**
  - Fossil fuel portfolio
- **Readjustment**
  - Focus on CO<sub>2</sub> intensity
  - Energy efficiency
  - Cost efficiency
  - New KPIs
- **Diversification**
  - Natural gas
  - Power generation
  - New renewable energy

**STATOIL'S CLIMATE ROADMAP**  
 Creating a low carbon advantage

**AN INDUSTRY LEADER IN CARBON EFFICIENCY**  
 We will reduce the carbon intensity of our operations as a key element of our commitment to the Paris Agreement.

**CARBON EFFICIENT OIL AND GAS PRODUCER**  
 CO<sub>2</sub> intensity (kg oil equivalent per barrel)

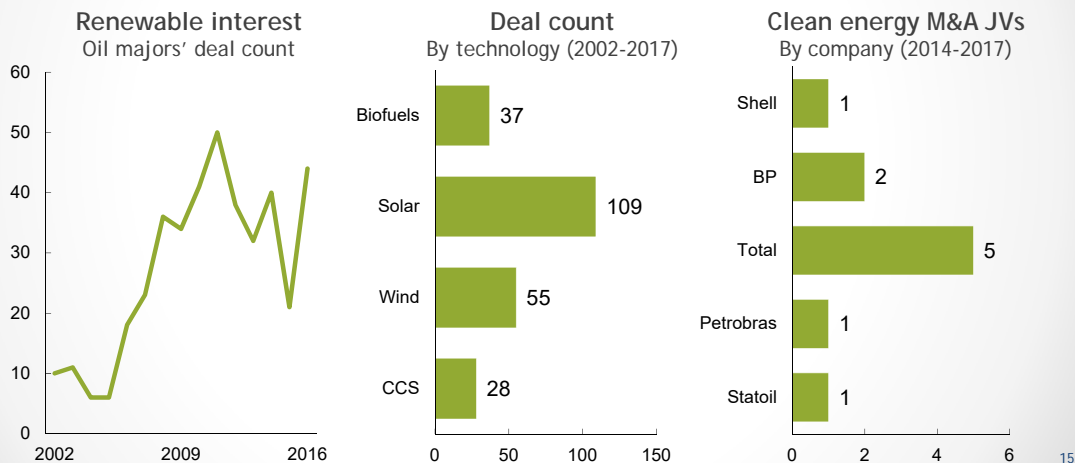
Year	Statoil	Industry Average
2012	18	19
2013	17	18
2014	16	17
2015	15	16
2016	14	15

The Climate Roadmap is a plan... and an invitation... to work with us to help shape the future of energy.

Bøhm, Marit F. and Klaus Mohn (2017). Agentteori, atferdsfinans og oljeinvesteringer. *Samfunnsøkonomen* 6/2017, 26-38.  
 Helm, Dieter (2017). *Burnout: The end-game for fossil fuels*. Yale University Press.  
 Statoil (2017). Statoil's Climate Roadmap. Creating a low carbon advantage (<https://www.statoil.com/content/dam/statoil/image/how-and-why/climate/AS-climate-roadmap.pdf>).

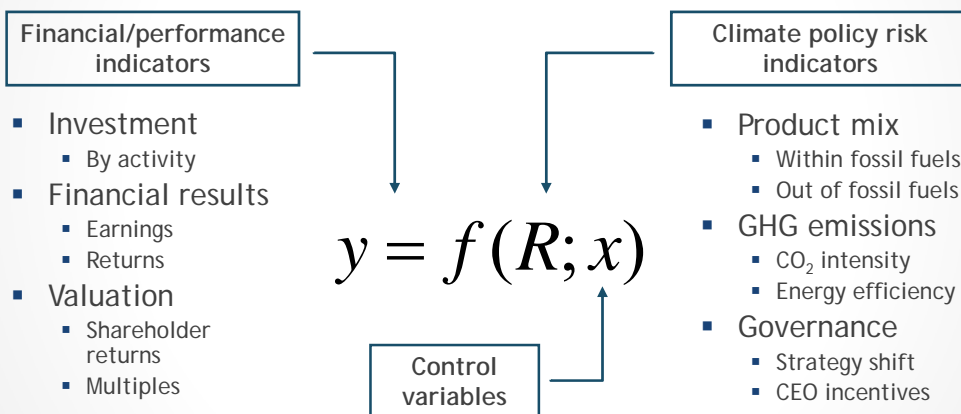
# Oil industry response

Strategic re-direction: Repositioning, readjustment, diversification



# Financial outcomes

Outline of an empirical research framework



Damodaran, Aswath (2012). *Investment Valuation. Tools and techniques for determining the value of any asset.* Wiley  
 Mohn, Klaus (2008). *Investment behaviour in the oil and gas industry: Essays in empirical petroleum economics.* PhD Thesis 51, University of Stavanger.



## Financial outcomes: Investment

Example: Tobin's q with heterogeneous capital expenditure

- LHS: Investment rates by activity (maturity)
  - Oil, natural gas, renewables
  - (exploration, development, acquisitions)
- RHS: market value to replacement value ( $q$ )
  - Control variables ( $x$ )
  - Dummies and residual

$$\left(\frac{I}{K}\right)_{ijt} = \alpha + \beta q_{it} + \gamma_i x_{it} + \eta_i + \zeta_j + \nu_t + \varepsilon_{it}$$

## Financial outcomes: Valuation

Assessment of valuation relevance and impact

- LHS: Valuation multiples ( $V$ )
  - Ratio of value indicator to value driver
  - (P/E; P/BV; EV/Sales; EV/DACF)
- RHS: Climate risk indicators ( $R$ )
  - Product and activity mix
  - CO<sub>2</sub> emissions (intensity)
  - Energy efficiency
  - Renewables

$$V_{it} = \alpha + \beta R_{it} + \gamma_i x_{it} + \eta_i + \nu_t + \varepsilon_{it}$$

## Financial outcomes: Returns

The price of climate risk: Fama/French multifactor model of returns

- LHS: Stock market returns

- Change in share price...
- ... plus dividends

$$r_{it} = \alpha + \sum_j \beta_{ij} r_{jt} + \gamma_i x_{it} + \eta_i + \nu_t + \varepsilon_{it}$$

- RHS: Risk factors

- Market risk
- Company size
- Growth factor
- Climate risk ...

$$r_{jt} = r_t^m - r_t^f, \quad j=1$$

$$r_{jt} = r_{Ht} - r_{Lt}, \quad j=2, \dots, J$$

## Climate policy risk: Figures in the making

Potential data sources

- Accounting data
  - Product mix
  - Revenue, cost and capex
  - Cash flow and earnings
- Financial reporting
  - Text analysis (SEC 10K, 20F)
- Indices and rankings
  - Stock market sustainability indices
  - Sustainability rankings
- Survey data
  - e.g., Carbon Disclosure Project

Climate-related financial disclosures  
Core elements (not mandatory)

