

Big Data for Assessing Corporate Green Innovation



Building Competence. Crossing Borders.

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Outline

- Why is Innovation important?
- How can we measure Green Innovation with Patents?
- How green are Exxon Mobil and Chevron? – A Case Study
- Summary of our findings
- Questions

Why is Innovation important?

- What is innovation?
 - Product, service, business model, or strategy that's both novel and useful.
 - Can be disruptive innovations or incremental changes.
- Why is innovation important?
 - It is the cornerstone of sustained economic growth and prosperity.
 - Allows the products and services to evolve.
 - Gives a competitive advantage.



Source: <https://alcorfund.com/wp-content/uploads/2020/09/Technical-Innovation.png>

Why Climate Change requires Innovation?

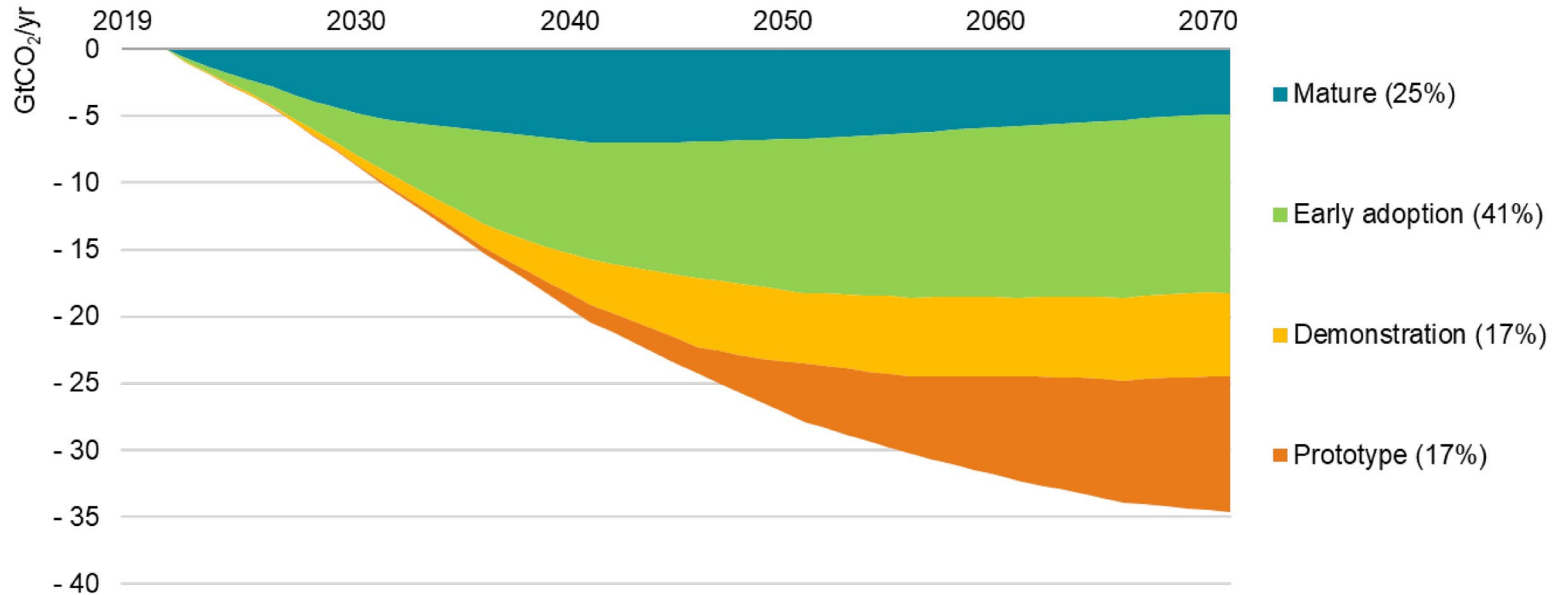
- The effects are happening now, are irreversible on the timescale of people alive today, and will worsen in the decades to come.¹
- Reached a tipping point at which the effects might not be reversible.²
- Short-term decarbonization achievable with available technologies, but almost half of required reductions by 2050 will call for technologies not yet on the market.³

¹ <https://climate.nasa.gov/effects/>

² <https://ec.europa.eu/research-and-innovation/en/horizon-magazine/tipping-points-lead-irreversible-shifts-climate-experts>

³ <https://www.imf.org/en/Publications/fandd/issues/2021/09/bezos-earth-fund-climate-change-innovation-levin#:~:text=Three%20innovation%20opportunities%20alone%E2%80%94direct,reductions%20between%202030%20and%202050>

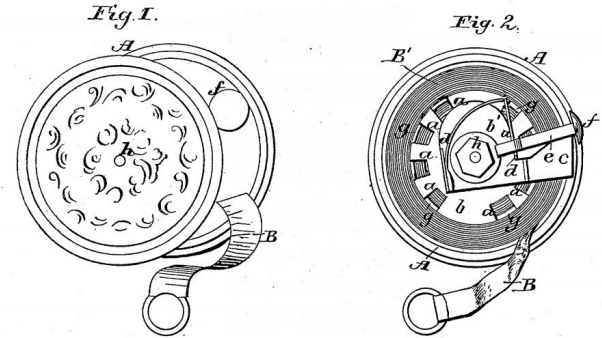
Innovation for CO₂ reduction – Energy Sector



Source: Energy Technology Perspectives 2020, IEA

How can we measure Innovation?

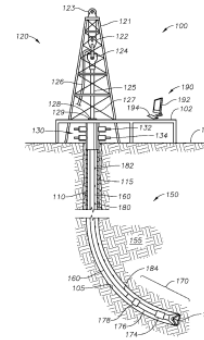
- Innovation is hard to measure.
- In tech companies the innovation can be proxied by the number of patents.
- What are patents?
 - Patent is an exclusive right granted for an invention.
 - Information must be disclosed to the public in a patent application.
 - Patents are openly available and can be searched via Google Patents.



Source: <https://tf-cmsv2-smithsonianmag-media.s3.amazonaws.com/filer/a2/c3/a2c37160-aaed-48e0-9cd5-9bed86fc2d07/tapemeasure.jpg>

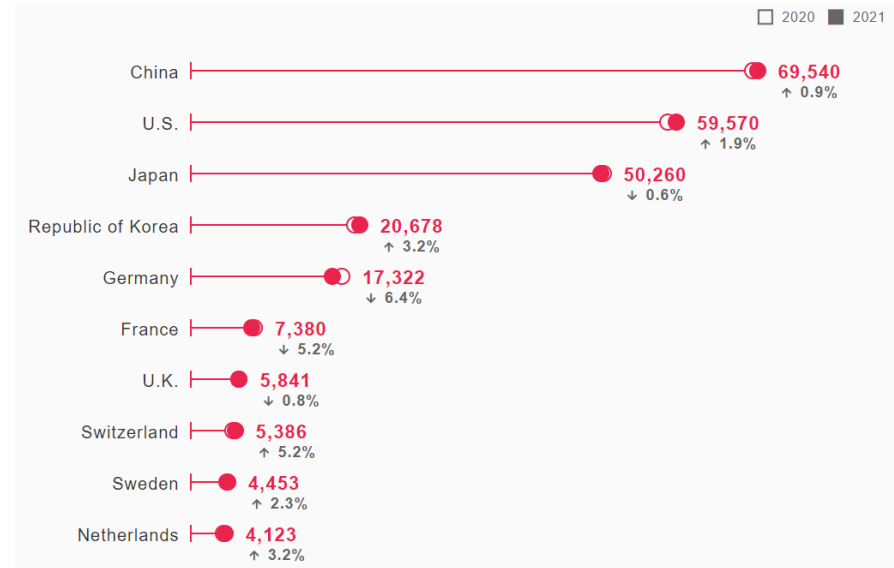
What is in a patent?

- Title
 - Telemetry for Wireless Electro-Acoustical Transmission of Data Along a Wellbore
- Inventors
 - Mark M. Disko et. al.
- Abstract, Claim, Description
- Citations
- Classification
 - E21B47/16
 - Means for transmitting measuring-signals or control signals from the well to the surface ...
 - E21B47/14



Top 10 Countries

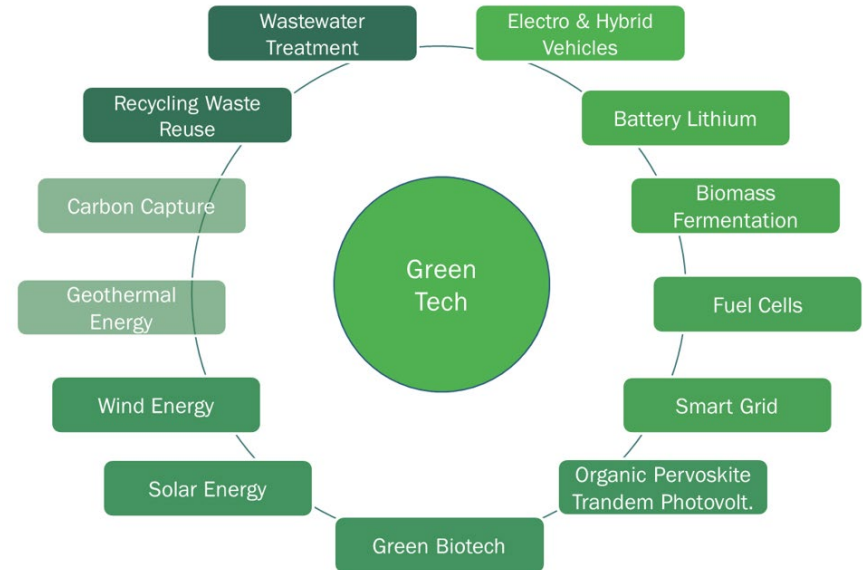
- Around 277'500 PCT international applications filed in 2021.
- Uptrend of 0.9% compared to 2020.
- Most applications from China.
- Top 10 countries accounted for 88.1% of total applications in 2021.



Source: <https://www.wipo.int/edocs/infogdocs/en/ipfactsandfigures/>

What is Green Innovation?

- Patents on green tech can be used as a proxy for green innovation.
- The share of green patents of a company can be measured.
- Additionally, we can measure the share of controversial patents in a portfolio.



Quelle: BAK Economics, IGE

Source: <https://rea.bak-economics.com/leistungen/green-technologies>

Case Study – How green is oil?

Exxon Mobil

- Sector: Energy
- Industry: Oil & Gas Integrated
- FT Employees: 63'000
- Market Cap: USD 350 bn.



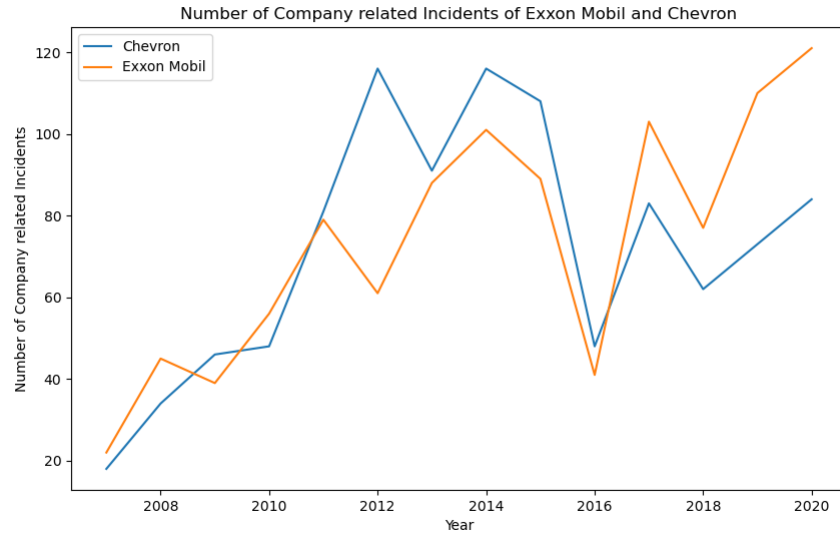
Chevron

- Sector: Energy
- Industry: Oil & Gas Integrated
- FT Employees: 42'595
- Market Cap: USD 253 bn.

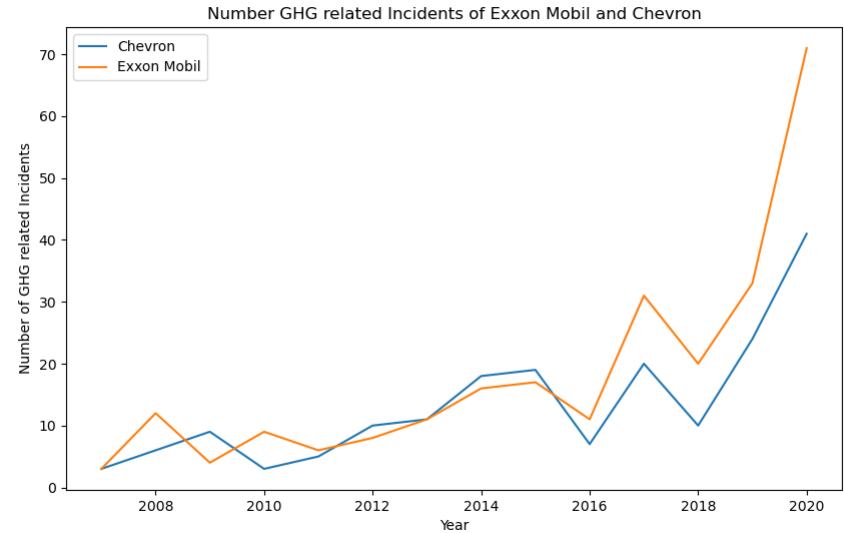


How is the Public Perception of the Companies?

Company ESG related Incidents



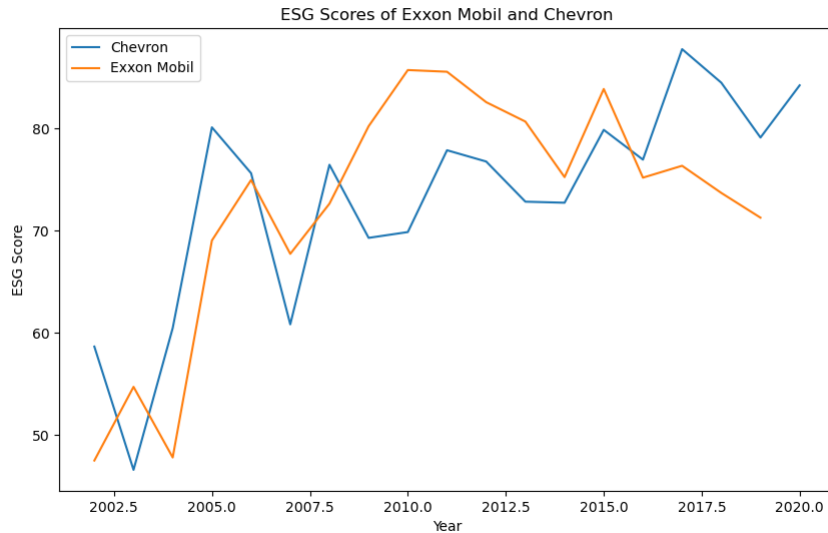
Greenhouse Gas related Incidents



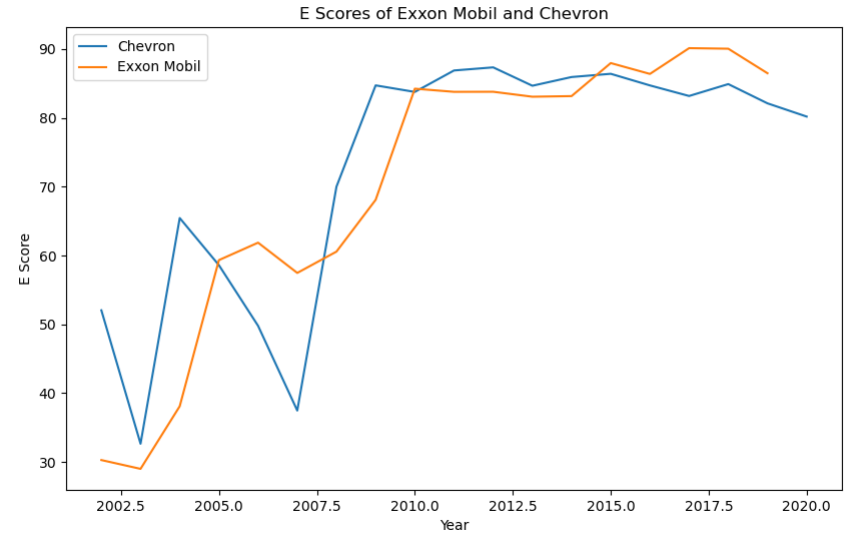
Source: RepRisk via WRDS

What does ESG say?

ESG-Composite-Scores



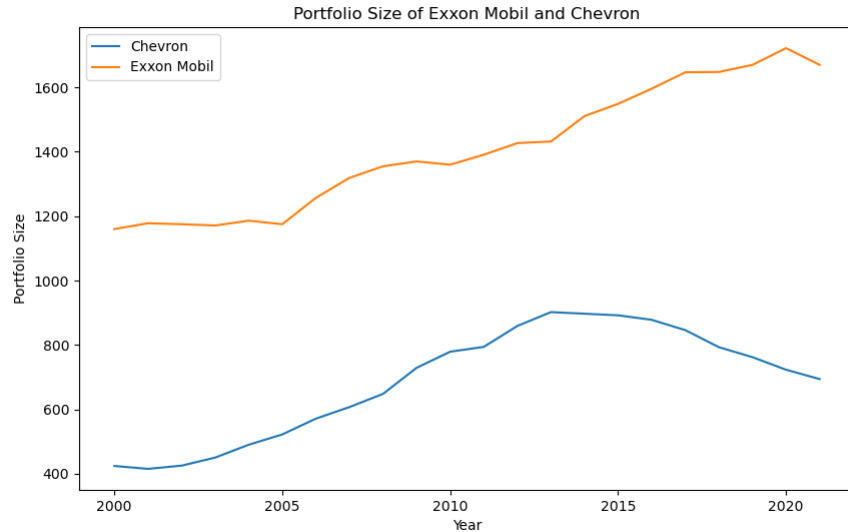
Environmental-Scores



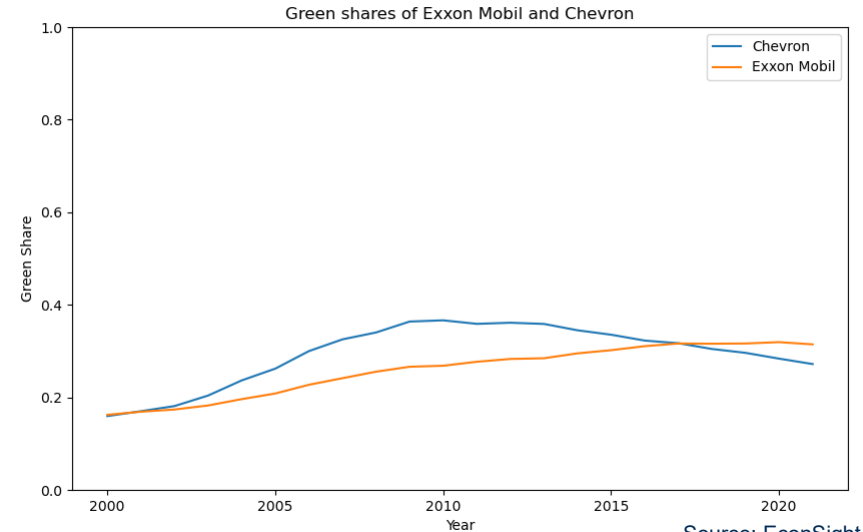
Source: Refinitiv

Different story for the patents?

Portfolio Size



Green Share of Patents



Source: EconSight

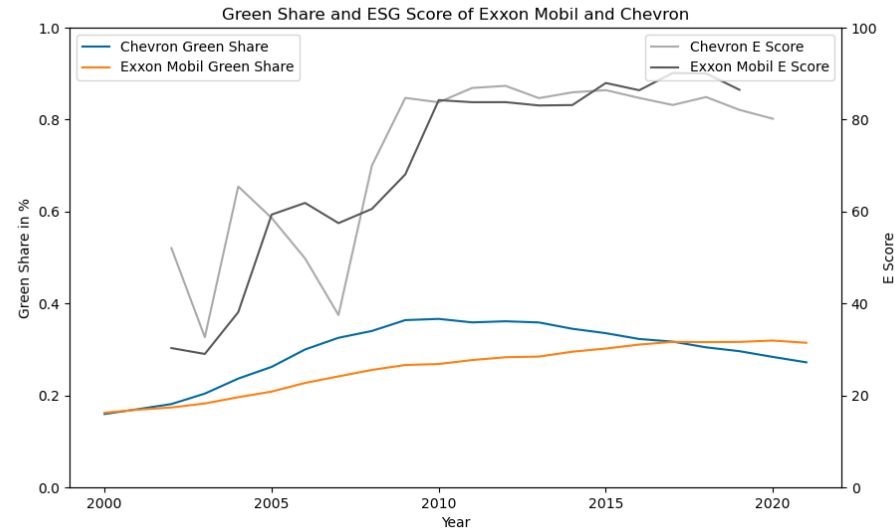
Research Supports our Case Study

- Li, Trencher and Asuka (2022) support our findings.¹
- Looked into three dimensions
 - keyword use in annual reports (discourse)
 - business strategies (pledges and actions)
 - production, expenditures and earnings for fossil fuels along with investments in clean energy (investments)
- Increase in discourse but not followed by actions.
- Business model still depends on fossil fuels.
- Insignificant and opaque spending on clean energy.

¹ Source: Li M, Trencher G, Asuka J (2022) The clean energy claims of BP, Chevron, ExxonMobil and Shell: A mismatch between discourse, actions and investments. PLoS ONE 17(2): e0263596.
<https://doi.org/10.1371/journal.pone.0263596>

Summary

- Assessing the real greenness of a company is difficult.
- Established measures are confusing.¹
- Patents can help with transparency.
- “Until actions and investment behaviour are brought into alignment with discourse, accusations of greenwashing appear well-founded.”²



¹ Berg, Florian and Kölbel, Julian and Rigobon, Roberto, Aggregate Confusion: The Divergence of ESG Ratings (August 15, 2019). Forthcoming Review of Finance, Available at SSRN: <https://ssrn.com/abstract=3438533>

² Li, Trencher, Asuka (2022)

Thank you.

