



# **Big Data for Assessing Corporate Green Innovation**



**Building Competence. Crossing Borders.** 

David Jaggi david.jaggi@zhaw.ch

#### **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.<sup>1</sup>
- Reached a tipping point at which the effects might not be reversible.<sup>2</sup>
- Short-term decarbonization achievable with available technologies, but almost half of required reductions by 2050 will call for technologies not yet on the market.<sup>3</sup>

levin#:~:text=Three%20innovation%20opportunities%20alone%E2%80%94direct,reductions%20between%202030%20and%202050

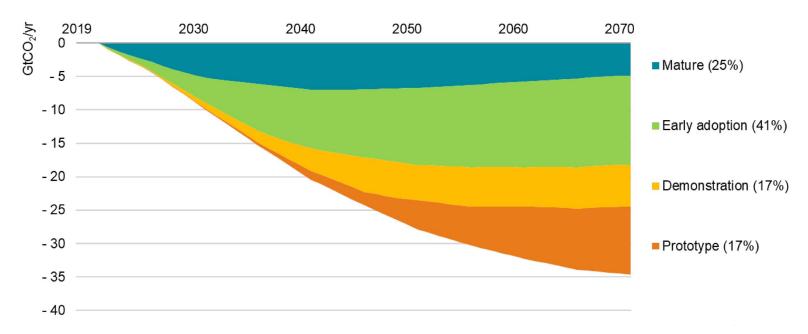


<sup>&</sup>lt;sup>1</sup> https://climate.nasa.gov/effects/

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

<sup>&</sup>lt;sup>3</sup> https://www.imf.org/en/Publications/fandd/issues/2021/09/bezos-earth-fund-climate-change-innovation-

# Innovation for CO<sub>2</sub> reduction – Energy Sector

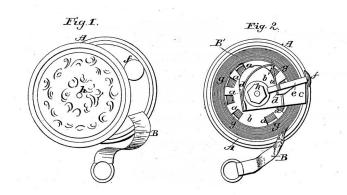


Source: Energy Technology Perspectives 2020, IEA



#### 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

Management and Law

### 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



(19) United States

(12) Patent Application Publication (10) Pub. No.: US 2015/0292319 A1
Disko et al. (43) Pub. Date: Oct. 15, 2015

(54) TELEMETRY FOR WIRELESS ELECTRO-ACOUSTICAL TRANSMISSION OF DATA ALONG A WELLBORE (71) Applicant: EXXON-MOBIL UPSTREAM

ALONG A WELLBORE (51) Int. Cl.

EXXON-MOBIL UPSTREAM (52) U.S. CL

(TMC)

(TMC)

E218 47/76 (2006.01) (52) U.S. CL. E218 47/76 (2013.01)

(72) Inventors: Mark M, Disko, Glen Gardner, NJ (US); Timothy L, Morrow, Humble, TX (US); Max Deffenbaugh, Fulsher, TX (US); Katie M, Walker, Milford, NJ (US); Scott W, Clawson, Califlon, NJ (US); Henry Alan Wolf, Morris Plains, NJ (US)

(21) Appl. No.: 14/434,734 (22) PCT Filed: Dec. 18, 2013 (86) PCT No.: PCT/US2013/076269

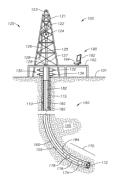
§ 371 (c)(1), (2) Date: Apr. 9, 2015 Related U.S. Application Data

(60) Provisional application No. 61/739,414, filed on Dec. 19, 2012. A system for downhole telemetry is provided lorein. The system employs a series of communications nodes spaced damp and the down of the down of the system complex is a series of the system of the system of the system of the between once or more someting table sheet of a subbetween once or more someting rathe sheet of a subbetween once or more someting rathe system of surface. The communications nodes employ electris-counties asking the substance body at high data transmission rates. A medical of transmission face is not provided medical or transmission face in the system of the provided for the system of th

nodes situated along a tubular body and a specially configured

network to accomplish a wireless transmission of data along the wellborn using accoustic energy.

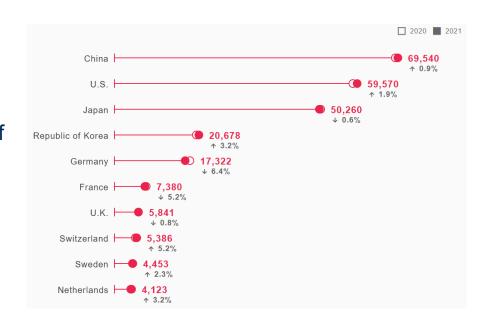
Publication Classification





### **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.

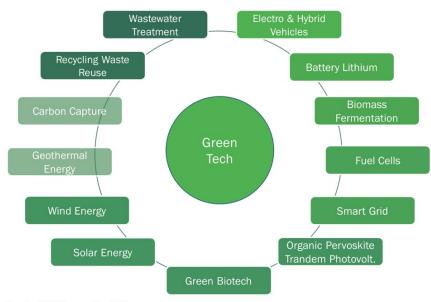


Source: https://www.wipo.int/edocs/infogdocs/en/ipfactsandfigures/



#### 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

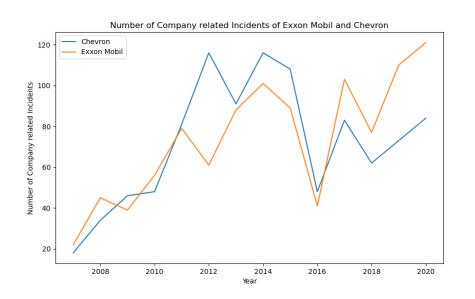
- Sector: Energy
- Industry: Oil & Gas Integrated
- FT Employees: 42'595
- Market Cap: USD 253 bn.



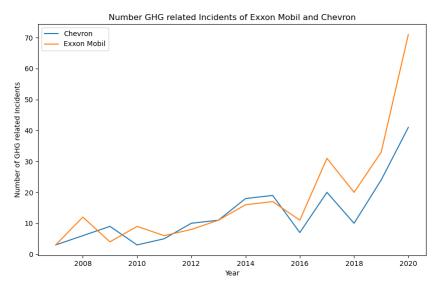


# **How is the Public Perception of the Companies?**

#### Company ESG related Incidents



#### Greenhouse Gas related Incidents

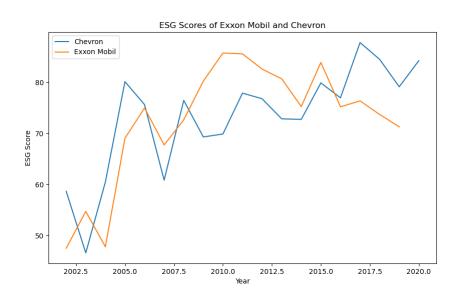


Source: RepRisk via WRDS

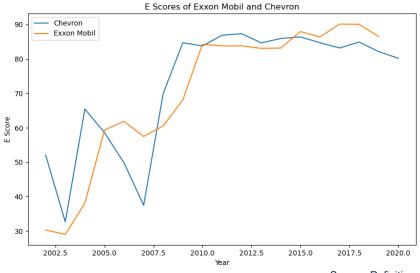


# What does ESG say?

#### **ESG-Composite-Scores**



#### **Environmental-Scores**

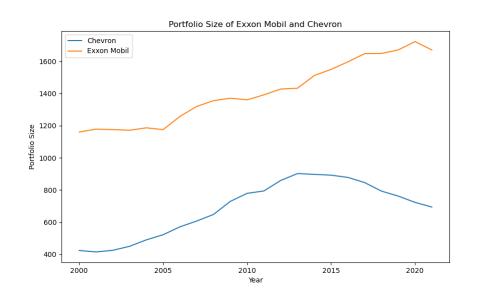


Source: Refinitiv

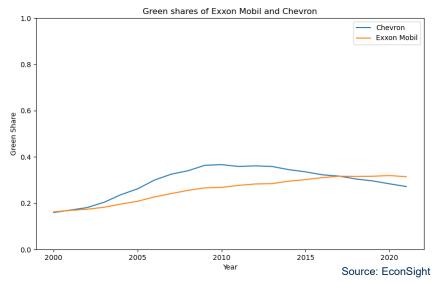


# **Different story for the patents?**

#### Portfolio Size



#### **Green Share of Patents**





### **Research Supports our Case Study**

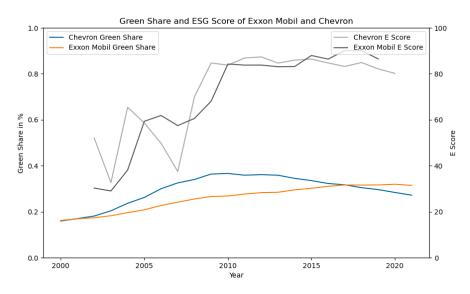
- Li, Trencher and Asuka (2022) support our findings.<sup>1</sup>
- Looked into three dimensions
  - keyword use in annual reports (discourse)
  - business strategies (pledges and actions)
  - production, expenditures and earnings for fossil fuels along with investments in clean energy (investments)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



<sup>&</sup>lt;sup>1</sup> 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 ONE17(2): e0263596. https://doi.org/10.1371/journal.pone.0263596

### Summary

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



15

<sup>2</sup> Li, Trencher, Asuka (2022)

**Zh** School of **aw** Management and Law

<sup>&</sup>lt;sup>1</sup> 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

