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# The Economics of Fossil Fuels in a World on Fire

Ms. Tzeporah Berman  
Chair, Fossil Fuel Non-Proliferation Treaty Initiative, Canada



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## Introduction

Extreme weather, fires and floods sweeping the globe  
Intergovernmental Panel on Climate Change shows us that we'll face considerably more, both economic and ecological damages and lives lost if we don't mitigate climate change and act quickly

**We have to face the crisis head on**

Environmental issues — Economic issues

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## Climate Change

Climate change is humanity's **BIGGEST THREAT**

More people are now forced to leave their homes because of environmental disasters than war



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### Climate Change

**We need to recognize that climate change is changing policy and investment around the world and having serious economic impacts**

Dramatic increase in refugees  <b>65 million</b> people a year	Estimate of total climate migrants  <b>200 million</b> by 2050
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### Droughts and Flooding

Droughts and flooding have **REVERSED PROGRESS ON GLOBAL HUNGER** and driven food shortages and malnutrition to 10-year highs

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### Disasters

A disaster related to a weather, climate or water hazard occurred **every day** on average over the past 50 years

The number of disasters has increased by a factor of five over the 50-year period

**Related 70% increase in greenhouse gas emissions**

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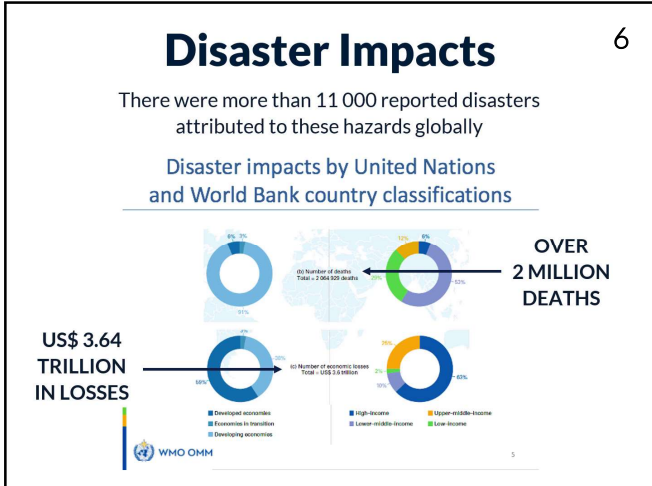
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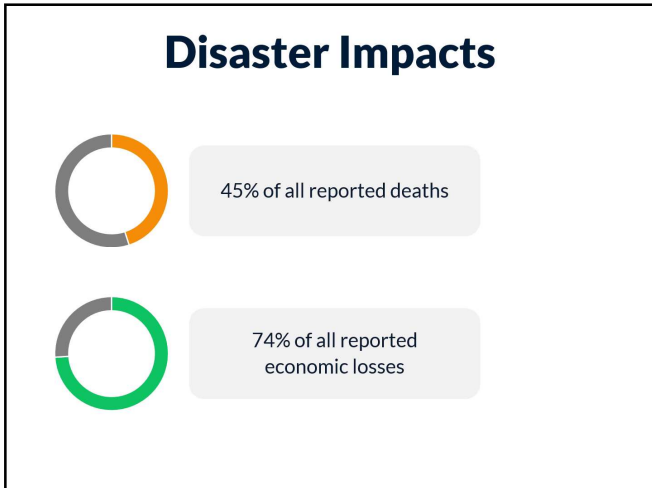
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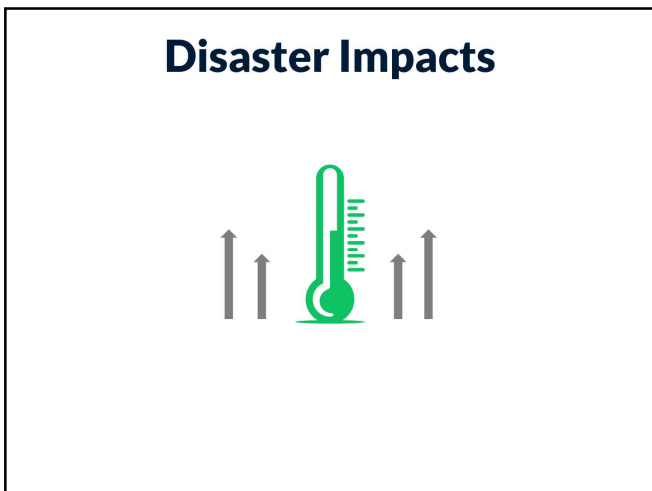
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## Disasters: Cost Estimate 7



**In the US, climate disasters cost \$750 billion in the last 5 years\***

\*Cost estimated as of 2022

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## Economic Damage 8

	Temperature rise scenario, by mid-century			
	Well below 2°C increase <i>Paris target</i>	2.0°C increase	2.6°C increase	3.2°C increase <i>Severe case</i>
<i>Simulating for economic loss impacts from rising temperatures in % GDP, relative to a world without climate change (0°C)</i>				
World	-4.2%	-11.0%	-13.9%	-18.1%
OECD	-3.1%	-7.6%	-8.1%	-10.6%
North America	-3.1%	-6.9%	-7.4%	-9.5%
South America	-4.1%	-10.8%	-13.0%	-17.0%
Europe	-2.8%	-7.7%	-8.0%	-10.5%
Middle East & Africa	4.7%	14.0%	21.5%	27.6%
Asia	-5.5%	-14.9%	-20.4%	-26.5%
Advanced Asia	-3.3%	-9.5%	-11.7%	-15.4%
ASEAN	-4.2%	-17.0%	-29.0%	-37.4%
Oceania	-4.3%	-11.2%	-12.3%	-16.3%

Significant economic damage **will occur**, even with the fulfilment of pledges and targets on climate change

**8-12 T** in losses  
per year



Source: The economics of climate change: no action not an option / Swiss Re Institute

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## Health 9

**Air pollution from burning fossil fuels was responsible for about 1 in 5 deaths worldwide in 2018, the equivalent of 8 million people**



The costs to our health from fossil-fuel-generated air pollution and climate change surpass **\$820 billion** in health costs each year

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### The Vicious Cycle of Debt and Climate Crisis 10

↑ Impacts of climate change

↑ Public Debt

Countries suffering from the worst impacts of climate change have contributed very little to it, yet they are facing more expensive borrowing costs because of their climate vulnerabilities

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### The Vicious Cycle of Debt and Climate Crisis

↑ Impacts of climate change

↑ Public Debt

Countries that have accumulated unsustainable debt levels have reduced fiscal space and opportunities to invest in adaptation and mitigation, as well as to recover from loss and damage from increasingly severe climate extreme events, slow onset events and environmental hazards

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### The Vicious Cycle of Debt and Climate Crisis

↑ Impacts of climate change

↑ Public Debt

Even before the Covid-19 outbreak, countries in the global south were facing an unfurling debt crisis, which has been fuelled by the economic impacts of the pandemic

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### The Vicious Cycle of Debt and Climate Crisis



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### The Vicious Cycle of Debt and Climate Crisis



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### The Vicious Cycle of Debt and Climate Crisis

**We know that climate change is resulting in the need for expensive adaptation and disaster response, at the same time it is increasing debt but the ability of countries to pay debt is decreasing and global economic instability is increasing**

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### Three Products

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Dramatic increase in extreme weather

**OIL**      **GAS**      **COAL**

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### Warming Projections

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The world came together to commit to acting with urgency to put in place the policies and finance to mitigate climate, to give the next generation a fighting chance

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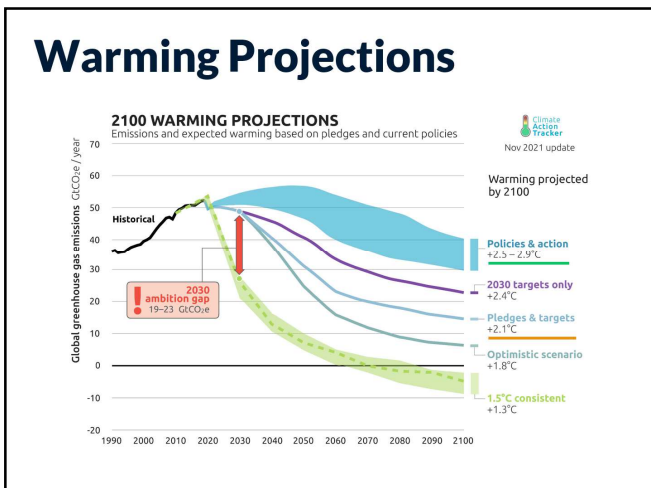
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### Production Gap Report 13

The amount of fossil fuels that we are producing

The embedded carbon in the fossil fuels

Projections of what we will produce in the coming decades

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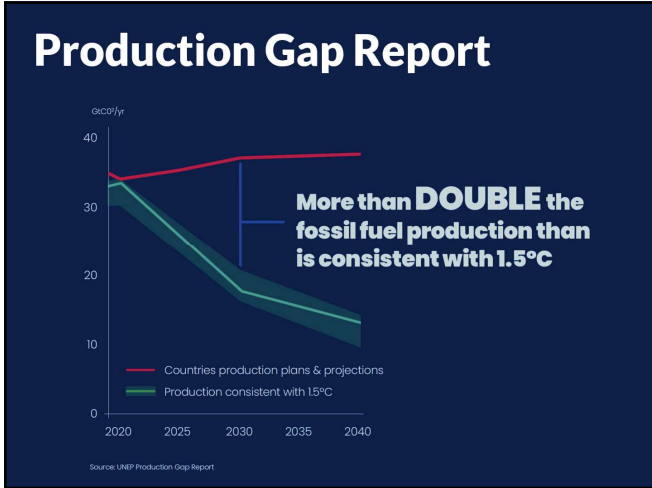
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### Carbon Budget 14

**COAL**

**OIL**

**GAS**

510 GtCO<sub>2</sub>

**1.5°C  
CARBON  
BUDGET**  
540 GtCO<sub>2</sub>

**OIL and GAS  
alone blow the  
carbon budget**

Source: Oil Change International

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### Carbon Budget

For decades climate policy has been designed based on a theory that we can reduce demand for fossil fuels, increase the price of carbon and the market - turbocharged by alternatives such as wind and solar that are now cheaper than fossil fuels - will respond by constraining supply



**But that's not happening**  
**Not fast enough to keep us safe**

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### The Risk of Climate Disruption

The world is on track for heating above 4°C by 2100, and higher thereafter

The Paris pledges are consistent with heating above 3°C by 2100, and higher thereafter

**IPCC has said that the world has a decade to take decisive action:**

- To limit warming to 1.5°C requires emission reductions of 45% by 2030, and "net zero" emissions by 2050
- To limit warming to 2°C requires emission reductions of 25% by 2030, and "net zero" by 2070

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### The Risk of Climate Disruption

In 2018 the remaining carbon budget for 1.5°C is around 580 gigatonnes of CO<sub>2</sub>

The world is emitting around 50Gt per year, so the 580Gt limit will be exceeded by 2030 in the absence of major emission reductions

**Climate change, like nuclear weapons, is an existential threat**

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**Growing Recognition** 16

In 2021 we began to see a growing recognition about these challenges and the roles fossil fuels play in **threatening not only our economy but the very stability of our planet**

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**Growing Recognition**

**“This report must sound a death knell for coal and fossil fuels, before they destroy our planet.”**

UN SECRETARY-GENERAL ON THE IPCC REPORT

**“There is no need for investment in new fossil fuel supply in our net zero pathway.”**

THE INTERNATIONAL ENERGY AGENCY

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**Carbon Tracker** 17

Data and research-based think tank

2810 GtCO<sub>2</sub>

495

2315 GtCO<sub>2</sub>

Total carbon budget for 50% chance of success of staying below 1.5°C of global warming

CO<sub>2</sub> emitted by the fossil fuel industry up to end 2019

Carbon budget left from beginning of 2020

At current rate of 43.1 GtCO<sub>2</sub>/year the 1.5°C carbon budget is exhausted in 11.5 years.

2020 2021 2022 2023  
2024 2025 2026 2027  
2028 2029 2030 2031

EXHAUSTED

What are the implications for the industry and the drivers for the low-carbon energy transition?

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### Financial Regulation

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“The carbon budget renders ‘the vast majority of reserves “stranded” – oil, gas and coal that will literally unburnable’  
The abrupt transition to a low-carbon future is ‘a financial stability risk’.”

MARK CARNEY, GOVERNOR OF THE BANK OF ENGLAND, 2015

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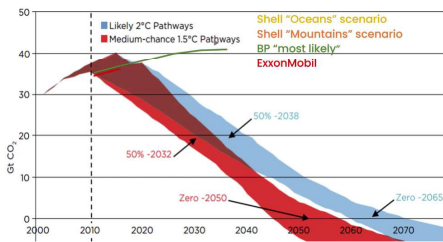
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### Fossil Fuel Companies Plan for Climate Failure

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Range of IPCC emissions scenarios (from all sources) consistent with Paris goals



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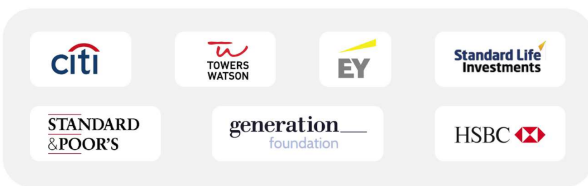
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### Banks and Rating Agencies Write on Stranded Assets

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“Carbon Tracker has changed the financial language of climate change.”

theguardian



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**Carbon Tracker Report** 21

**25%**

Of fixed fossil fuel assets at risk as the world decarbonises and electrifies

Carbon Tracker Source: 2020 Vision, Carbon Tracker (2019)



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**Stranded Assets** 22

**\$900bn** worth of fossil fuel infrastructure risks becoming stranded assets



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**Climate Financial Crisis** 23

**“Wall Street’s \$22 Trillion Carbon Time Bomb.”**

Bloomberg Green

Propping up coal, oil, and gas companies risks triggering a 2008-like climate financial crisis



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## Cost of Capital

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Fossil fuel companies having a harder time, costing twice as much, to access money to build their fossil fuel projects

**Cost of capital for fossil fuels doubled in the last decade, it's dropped for renewables**

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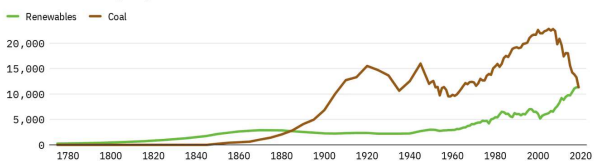
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## Dropping Cost of Renewables

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US renewable energy consumption surpassed coal for the first time in 130 years in 2019

US energy consumption from coal and renewables, in trillions of British Thermal Units (Btu)



1 Btu is approximately equal to the energy released by burning a match.  
Source: EIA

ENERGYMONITOR

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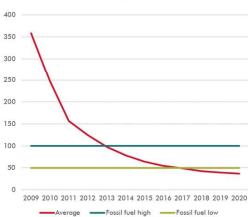
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## Renewable Costs Keep Falling

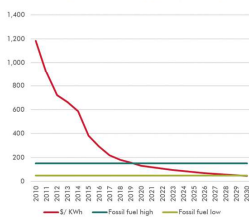
New solar and wind projects are increasingly undercutting even the cheapest and least sustainable of existing coal fire powered plants

Solar Prices (\$/MWh)



Source: Lazard

Battery Prices (\$/MWh)



Source: BNEF

Replacing coal fire plants would cut costs by \$32 billion per year and reduce annual CO<sub>2</sub> emissions by around 3Gt of CO<sub>2</sub>

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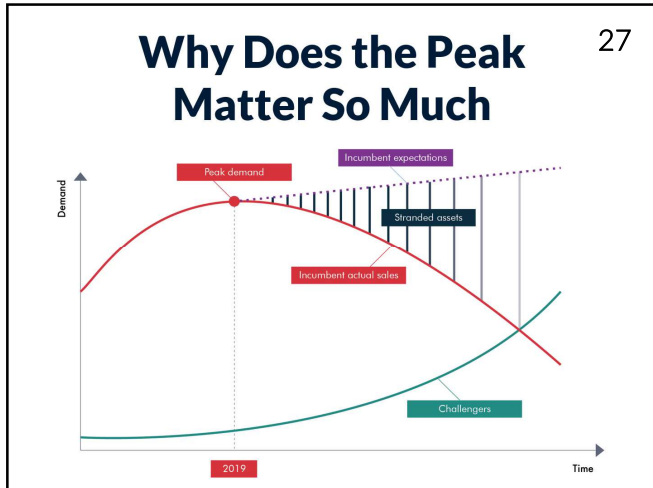
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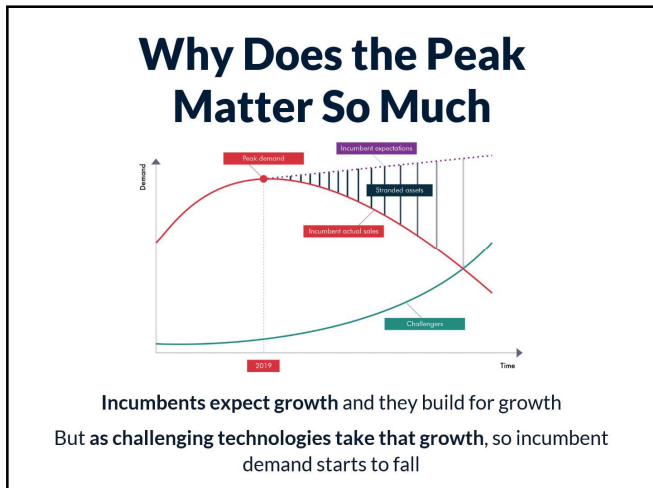
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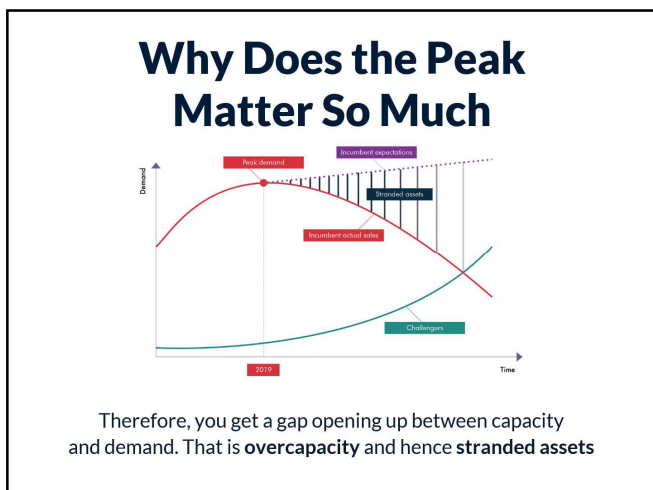
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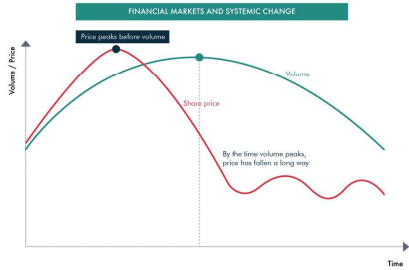
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## How Equity Markets React at the Peak: Theory 28

Equity markets discount future expected profits  
 When they see a turning point they therefore derate stocks and sectors  
 And by the time volume has peaked, price is already down a long way




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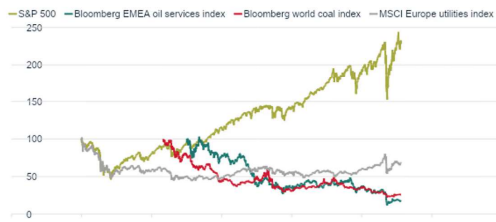
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## How Equity Markets React in Practise: They Fall



Energy sector as a share of the S&P500 Index

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## Investors Exit Dying Sectors 2010-2020



Energy sector as a share of the S&P500 Index

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## Overview: Big Oil and Gas Companies

Big Oil and Gas Companies Are Vulnerable

**In Long-term Decline**



Institute for Energy Economics and Financial Analysis  
IEEFA.org

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## Overview: Big Oil and Gas Companies

Oil & Gas companies have **underperformed the market** for a decade

Financially, the oil and gas sector has been a bust, despite a production boom

The energy sector is shrinking

Today, oil & gas companies are in **extremis**

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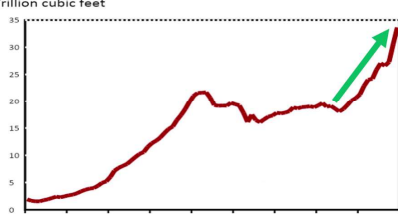
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## The U.S. Oil and Gas Sector

### U.S. Dry Natural Gas Production

Trillion cubic feet



The "fracking boom" sent U.S. gas production to all-time highs...

Source: U.S. Energy Information Administration

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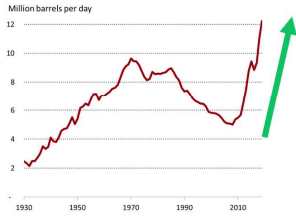




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### The U.S. Oil and Gas Sector

#### U.S. Field Production of Crude Oil



...and propelled the U.S. to become the world's top oil and gas producer

Source: U.S. Energy Information Administration

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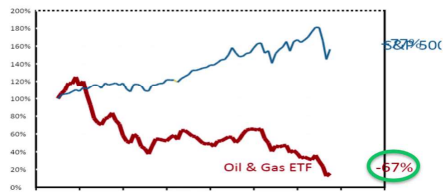
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### The U.S. Oil and Gas Sector

#### Stock Market Performance, S&P 500 vs. Oil and Gas



Yet, the U.S. oil and gas sector has performed terribly in the stock market

Source: Yahoo Finance, ETF ticker symbol: XOP

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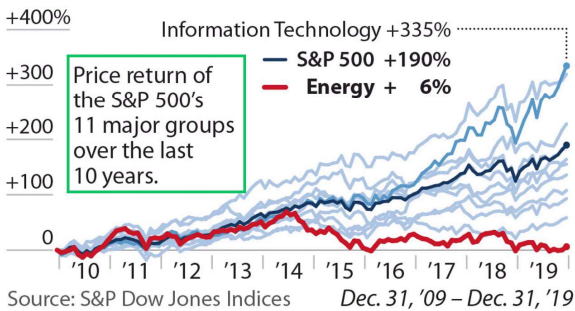
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### Energy Sector

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#### Energy: S&P's Worst Sector Over 10 Years



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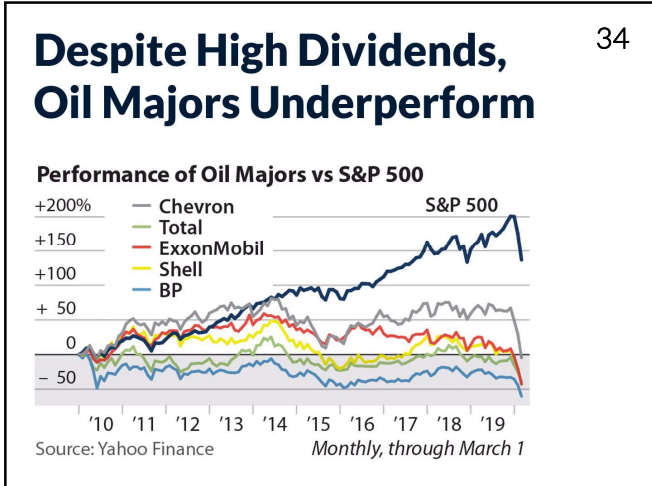
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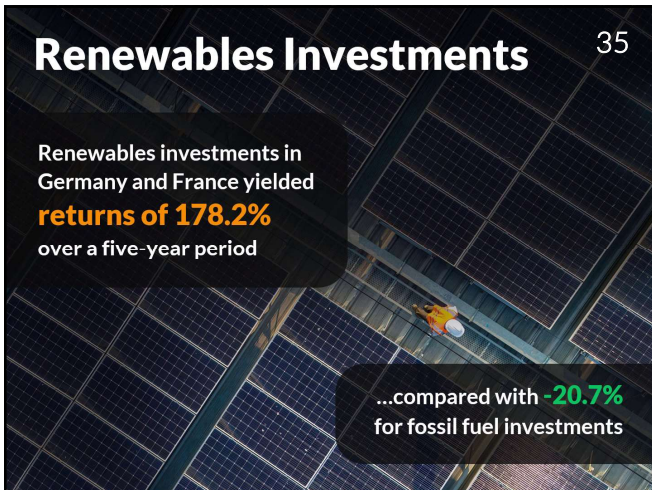
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### Key Messages

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The **energy transition** is accelerating, driving lower future **demand for oil and gas**

This **significantly impacts the fiscal sustainability** of producing countries – public O&G revenues are halved

CarbonTracker's Report **identifies the most vulnerable petrostates**, and quantify the % of total government revenues at risk

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# Global Impact of O&G Demand Fall

Governments face a \$13tn revenue shortfall vs. expectations

**Lower demand**

- Lower volumes and lower prices
- Lower government revenues

Price impact dominates – an orderly transition minimises further revenue loss

CTI's least-cost methodology used to model upstream oil and gas (2021-2040)

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# Petrostates' Vulnerability

Highly-dependent countries with high shortfall are most at risk

Countries' vulnerability is a function of:

- Dependence on O&G revenues
- % O&G revenue shortfall in a low-carbon scenario

= total revenue impact

Some vulnerable countries are highly populous (Nigeria, Algeria, Angola)

Some also have low human development levels

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# “Emerging Petrostates” Fall Short of Hopes

Some countries planning significant O&G development

Most find revenues < half of expectations, some fail completely

Highlights the need for a low-carbon development pathway

Relevant to fiscal decision-making now

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### Energy Transition

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#### The Big Picture

#### The energy transition is accelerating

- Growing policy ambition on climate change - physical impacts disproportionately impact developing nations
- Rapidly falling renewables costs
- Better air quality, etc.

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### Energy Transition

#### The Big Picture

#### Lower demand for oil and gas will impact fiscal sustainability for producer countries

- Diversification will be challenging
- No “one-size fits all” solution
- This analysis attempts to identify most vulnerable to help focus efforts
- Mitigation actions will need to start now, rather than waiting for steeper declines

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### Summary from Carbon Tracker

“We know demand will weaken as the policy response to the climate crisis and deployment of new technologies accelerates. For companies to effectively manage this transition, they must resist the temptation to invest heavily on short-term price signals. Failure to acknowledge the sea change risks wasting huge amounts of capital, delivering sub-par returns to investors, and locking-in emissions that take the world beyond Paris goals.”

MIKE COFFIN, HEAD OF OIL & GAS CARBON TRACKER

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### Summary from Carbon Tracker

Oil demand and pricing are currently rebounding, triggering calls for significantly increased investment into new oil - a narrative at odds with the immediate global production reductions required within most "well below 2°C" scenarios

Short-term demand growth would see even greater reductions required subsequently to keep the goals of the Paris Agreement alive. Policy action is likely to strengthen post-COP26, while the rapid adoption of EVs will potentially further weaken demand

Companies basing sanctioning decisions on bullish short-term signals thus risk significant over-investment, seriously impacting shareholder value. It wouldn't be the first time that the industry has fallen into this trap

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### Dropping Demand for Fossil Fuels

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- "Exxon Mobil Exits: The Dow Drops Its Oldest Member"
- "Oxford announces historic commitment to fossil fuel divestment"
- "Nations Must Drop Fossil Fuels, Fast, World Energy Body Warns"
- "Fracking Firms Fail, Rewarding Executives and Raising Climate Fears"
- "Over 100 oil and gas companies went bankrupt in 2020"
- "Five Years Out of Oil, the RBF Isn't Looking Back"
- "Harvard University Will Stop Investing In Fossil Fuels After Years Of Public Pressure"
- "New Study Shows Oil, Coal and Gas Investments Drove Over \$19 Billion in Losses for Major Pension Funds"

**Fossil fuels are a losing bet for our climate, communities, and economy**

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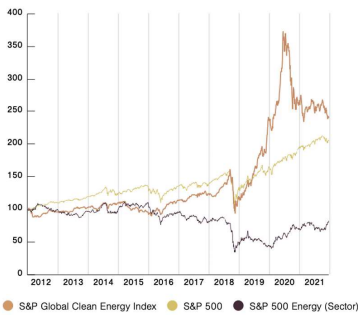
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### Renewable Energy Sector

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RENEWABLES VS FOSSILS IN THE MARKET  
Comparison of stock market gains for the clean energy sector, fossil fuel sector, and the overall stock market, per S&P indices.



Renewable energy sector returns outpacing overall market, fossil fuels

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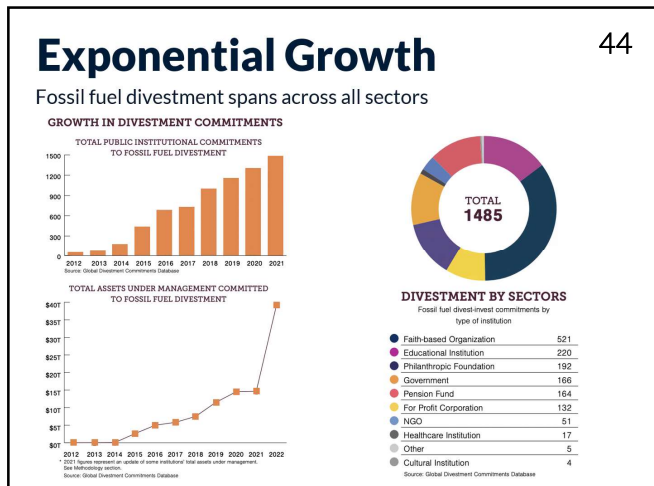
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### Engagement vs. Divestment

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It is far more important, if the investors want to see change, for those investors to engage with companies that they invest in rather than move their money out to fossil fuels

Oil and gas companies claim that they are addressing climate change

**We are not going to see these fossil fuel incumbents designing their own demise**

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### Engagement vs. Divestment

Big Oil only spent **1%** of its combined budget on green energy schemes in 2018

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### Engagement vs. Divestment

When these companies say that they are working on solutions, they mean solutions that will continue to support fossil fuel consumption and development

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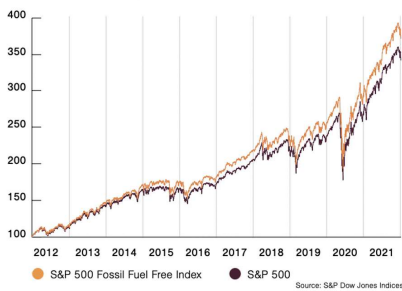
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### Fossil-Free Funds vs. Market Index

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FOSSIL-FREE FUNDS VS. MARKET INDEX  
The S&P 500 market benchmark index vs. the S&P Fossil Free index



Fossil fuels underperform overall market, Fossil Free funds outperform

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### Divesting Works

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Study finds ditching fossil stocks lowers corporate footprints

**Research from the University of Augsburg found that over a four-year period, divested firms reduced their carbon emissions, while non-divested firm emissions grew by 10%**

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**Clean Energy Boosted** 48

Businesses have a tremendous responsibility and opportunity to impact climate change by addressing what kind of power they use and buy

Companies have been buying renewable energy for decades

In 2021, corporate procurement of clean energy topped **30 GIGAWATTS**

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**Clean Energy Boosted**

Total capacity Amazon has under contract: almost 14 GW

In 2021, corporate procurement of clean energy topped **30 GIGAWATTS**

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**Clean Energy Boosted**

RE100: a global initiative of companies committed to 100% renewable energy, pledging to offset all their electricity demand

**363 TWh** of power a year

Cost savings from fixed-price renewable power

Corporate renewable energy targets are a more powerful incentive

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**Clean Energy Boosted**

RE100: a global initiative of companies committed to 100% renewable energy, pledging to offset all their electricity demand

**363 TWh** of power a year



**Growing corporate presence in power markets will boost clean energy**

NATHANIEL BULLARD - BLOOMBERG.COM

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**Clean Energy Boosted**

**EMPLOYEE RETENTION**

**amazon** Faced a climate walkout

By taking steps to address climate change, companies are adding value to their brand, or they risk losing brand value

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**Fossil Fuel Subsidies** 49

Fossil fuel subsidies total \$11 million a minute

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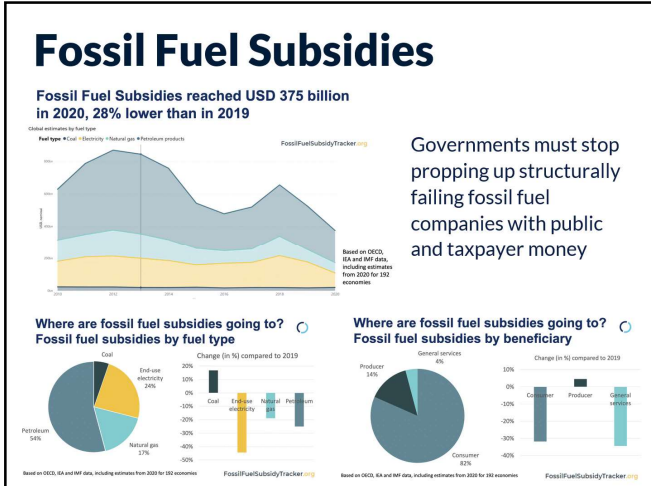
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## Fossil Fuel Non-Proliferation Treaty Initiative

**FOSSIL FUEL NON-PROLIFERATION TREATY**

Markets cannot do this alone  
Every company and country wants to be the last barrel sold

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## Fossil Fuel Non-Proliferation Treaty: Three Pillars <sup>51</sup>

- Non-proliferation**  
Preventing proliferation by ending all new exploration and production
- Global disarmament**  
Phasing out existing production in line with 1.5C
- Peaceful transition**  
Fast-tracking real solutions through scaled up access to renewable energy and a just transition for every worker, community and country

Source: Peter Newell & Andrew Simms (2020) Towards a fossil fuel non-proliferation treaty, Climate Policy, 20:8, 1043-1054.

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## Functions of a Fossil Fuel Treaty

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Strengthen demands on governments by setting obligations and global norms on:

- Ending all exploration and expansion
- Phasing-out fossil fuel supply

Strengthen transparency and accountability

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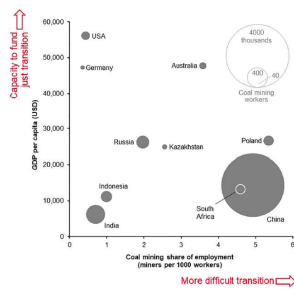
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## Functions of a Fossil Fuel Treaty

Fast-tracking the just transition through support for developing countries for:

- The energy transition
- Economic diversification
- Just transition for workers & communities




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## Functions of a Fossil Fuel Treaty

LESS stranded assets LESS economic instability

Having an international agreement on fossil fuels could:

- Create obligations and set global norms around the need to end expansion and phase out fossil fuels
- Ensure greater transparency around fossil fuels reserves and production plans
- Disrupt business as usual and increase risks, costs and uncertainty even for those countries that aren't members to the treaty
- Facilitate knowledge transfer between countries
- And provide support for a global just transition for those countries and communities that need it

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### The Risks of Delay

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**Further delay tackling fossil fuel supply presents major risks:**

- It makes the inevitable transition harder
- It creates stranded assets and risks financial turmoil
- It increases risks to workers and communities
- It delays the expansion of renewable energy
- It delays economic diversification into more sustainable sectors
- It consolidates powerful pro-fossil fuel political constituencies
- It increases risk of technical, economic, legal and political lock-in
- It increases the risk of dangerous geo-engineering
- It risks warming well above 1.5 and 2°C

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### Nobel Laureates

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101 Nobel laureates call for global fossil fuel non-proliferation treaty




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### Passed Motions

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Los Angeles first city in the US to endorse the Fossil Fuel Non-Proliferation Treaty

Barcelona just endorsed a treaty to end fossil fuels

Sydney unanimously endorses the Fossil Fuel Non-Proliferation Treaty

Vancouver first city in the world to endorse the Fossil Fuel Non-Proliferation Treaty

Toronto Endorses Fossil Fuel Non-Proliferation Treaty

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**Fossil Fuel Free Future** 56

**170+ nationally elected officials from more than 33 countries**

**PARLIAMENTARIANS' CALL FOR A FOSSIL FUEL FREE FUTURE**

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**Call for Fossil Fuel Non-Proliferation Treaty** 57

**Thousands of scientists, academics call for fossil fuel non-proliferation treaty**

Technological change      Financial change

Policy change

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**Scale of Change** 58

We are capable of enormous change in our lifetimes

No internet → →

No cell phone → →

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