EFA Session Sustainable Finance
Climate Finance

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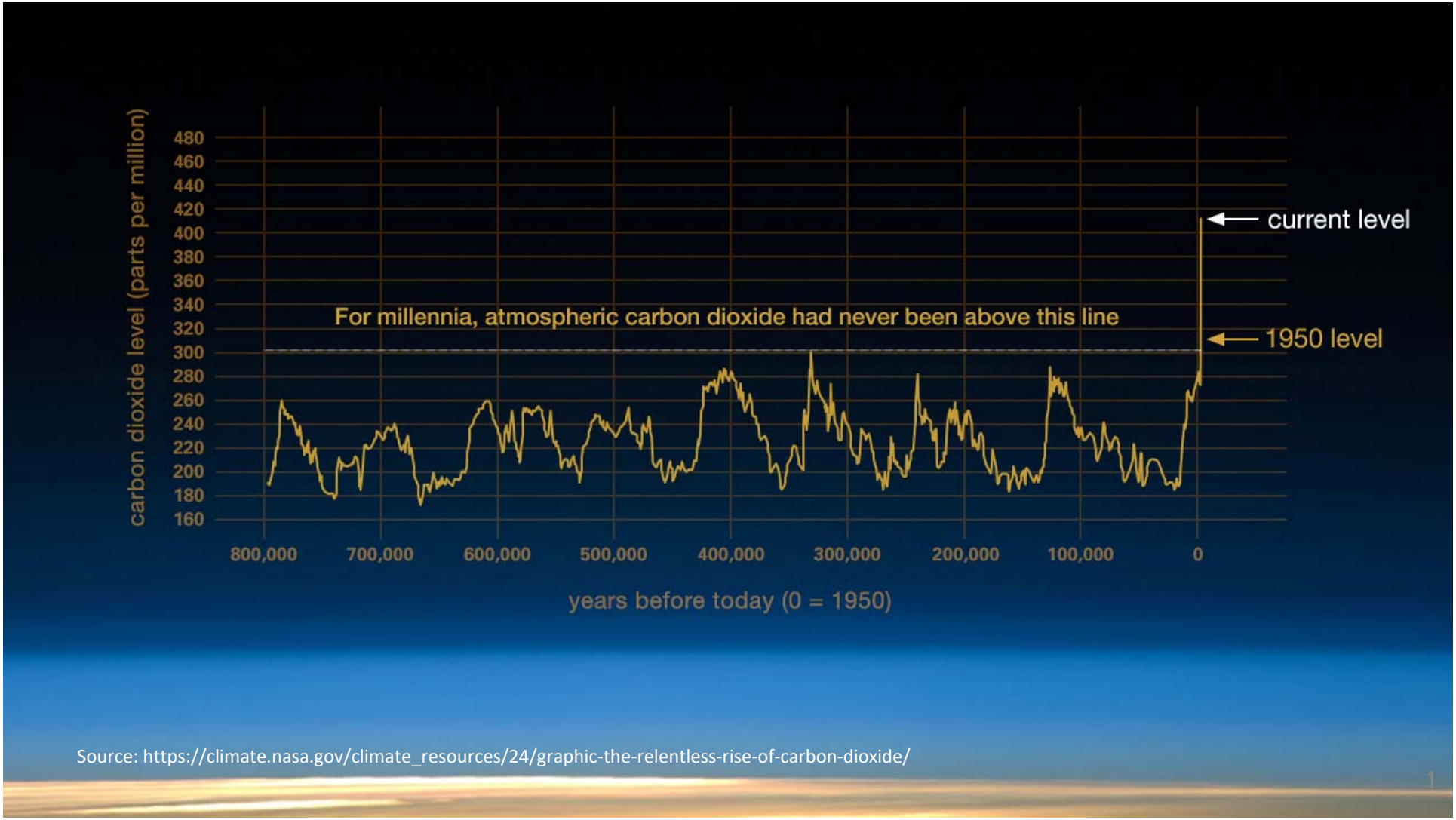
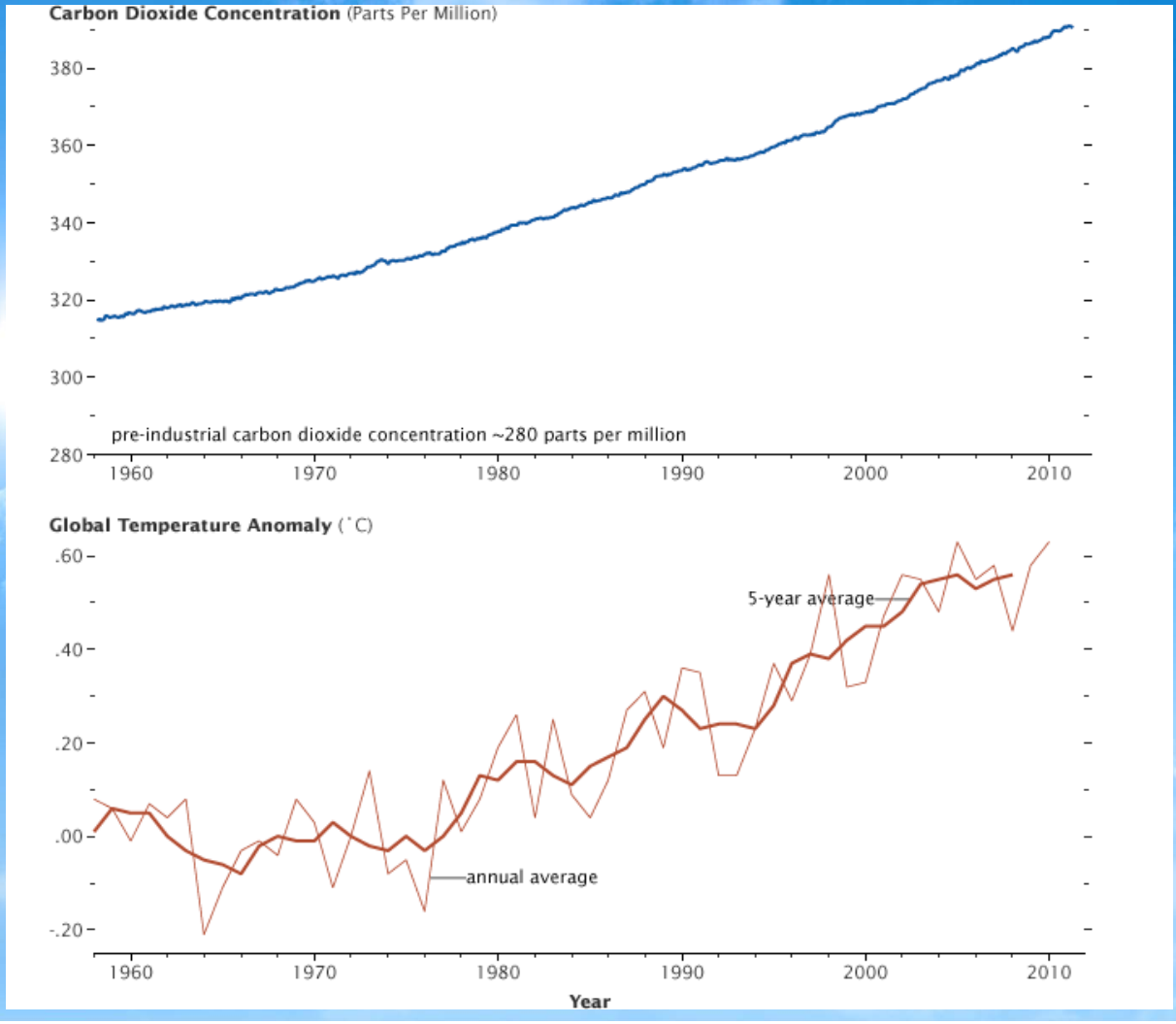


Source: https://climate.nasa.gov/climate_resources/24/graphic-the-relentless-rise-of-carbon-dioxide/



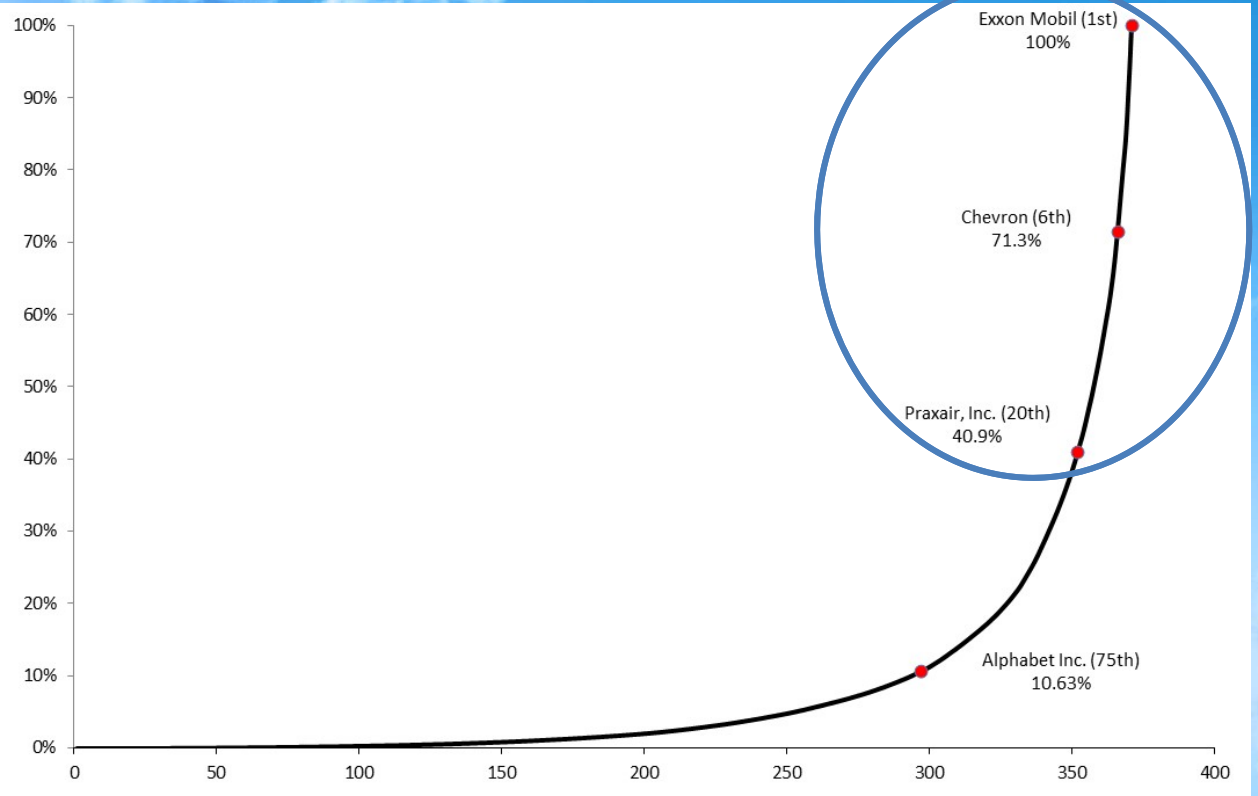
Source: https://earthobservatory.nasa.gov/features/CarbonCycle/page5.php

100 firms account for 71% of global industrial carbon emissions!

Source: CDP Carbon Majors Report 2017, Examples

Cumulative distribution of CO2 emissions (S&P 500, 2016)

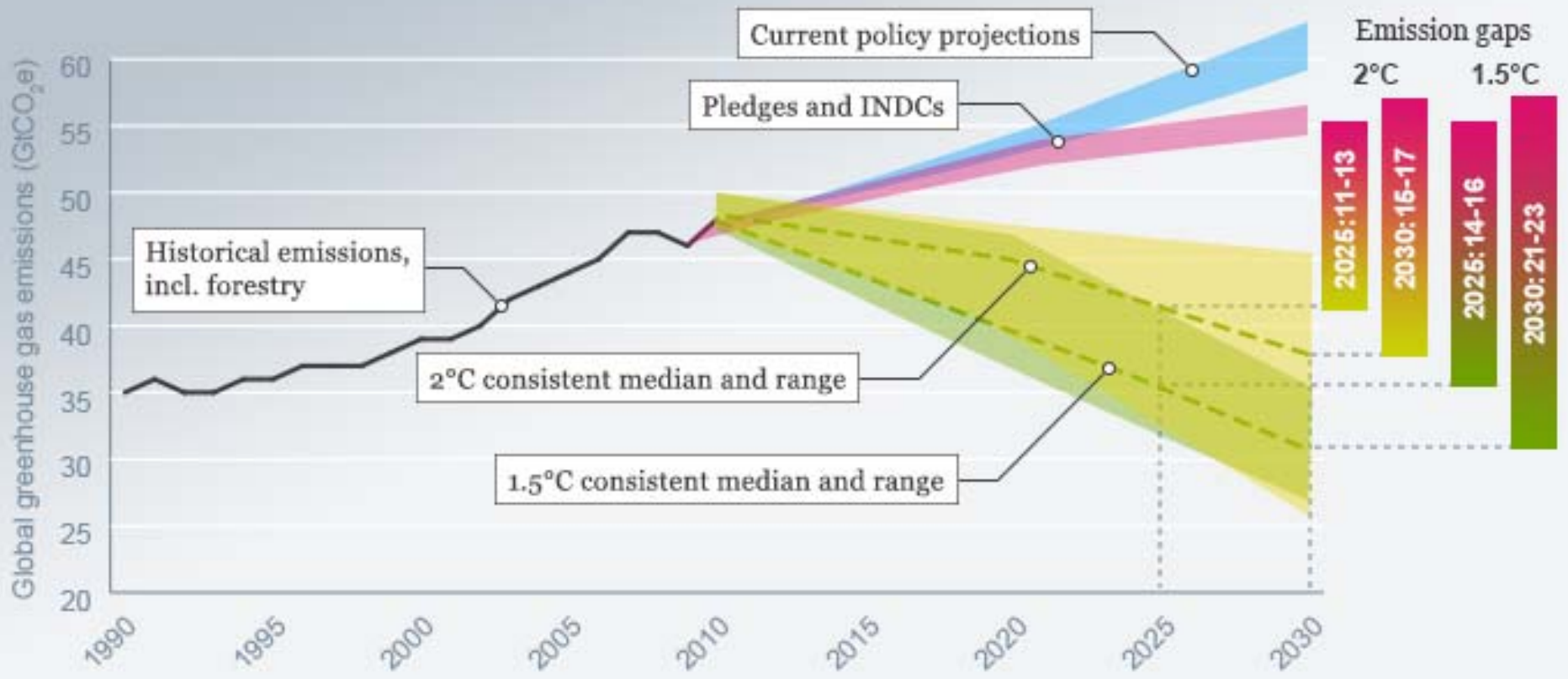
All firms with emissions data in CDP



Top 20

Source: Ilhan, Sautner, and Vilkov (2019)

Global greenhouse gas emissions



Source: climateactiontracker.org | 1 October 2015

Paris Agreement 2015 (COP 21)

Article 2

1. This Agreement, in enhancing the implementation of the Convention, including its objective, aims to strengthen the global response to the threat of climate change, in the context of sustainable development and efforts to eradicate poverty, including by:

(a) Holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change;

(b) Increasing the ability to adapt to the adverse impacts of climate change and foster climate resilience and low greenhouse gas emissions development, in a manner that does not threaten food production; and

(c) Making finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development.

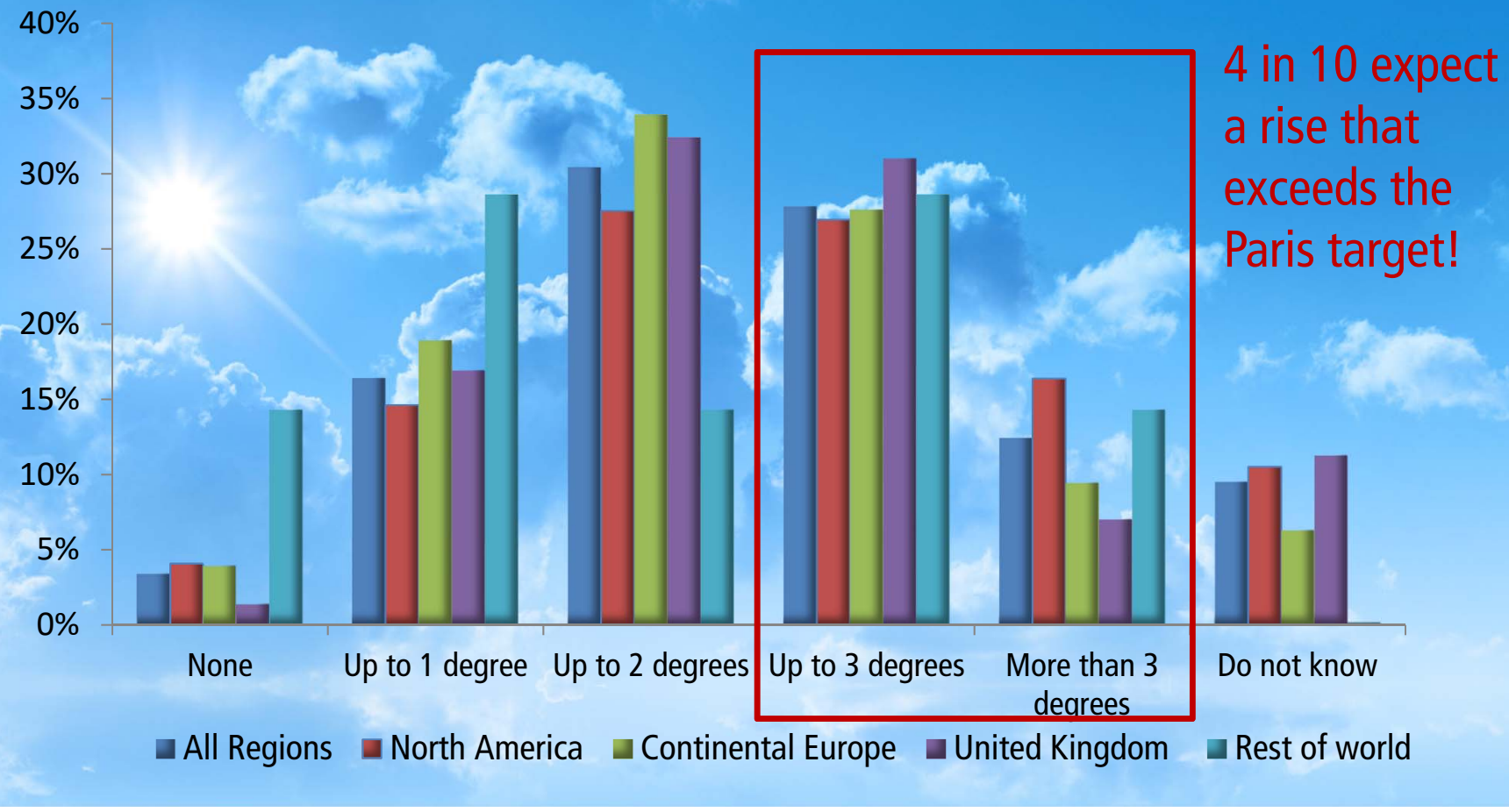
A brief look at some current work

- **Climate risks and institutional investing**
  - **Krueger, Sautner, and Starks (RFS, 2019)**
- Climate risks and financial markets
  - Ilhan, Sautner, and Vilkov (WP, 2019)
- Climate risks and corporate disclosure
  - Ilhan, Krueger, Sautner, and Starks (WP, 2019)

This paper

- Survey of a broad base of institutional investors
- Elicit these investors' views and actions related to climate risks
- 439 respondents
  - Global respondent group
  - 1/3 hold executive-level positions
  - 48 from institutions with >$100bn in AuM

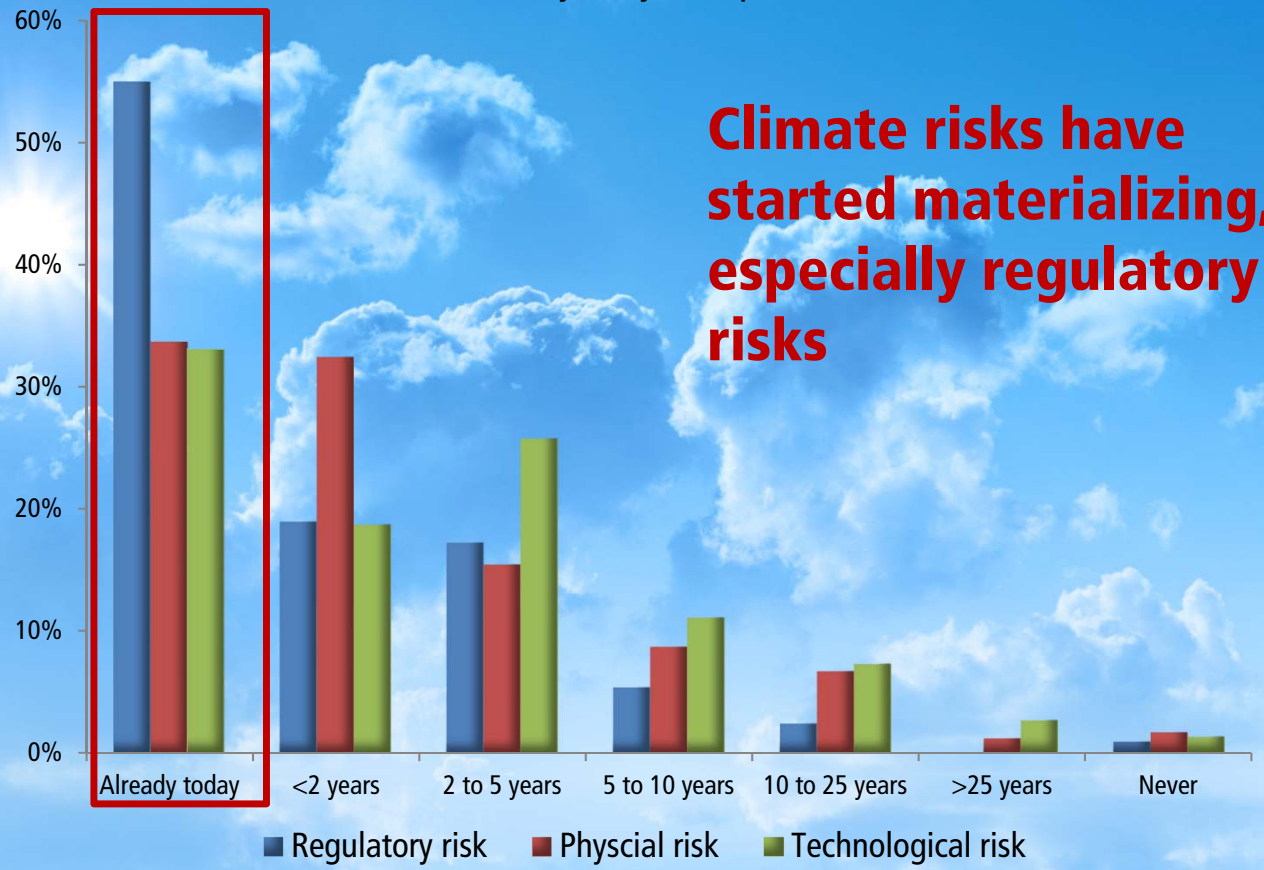
Investors' climate expectations



4 in 10 expect a rise that exceeds the Paris target!

Climate-risk horizon

Over what time horizons, if any, do you expect these risks to materialize?

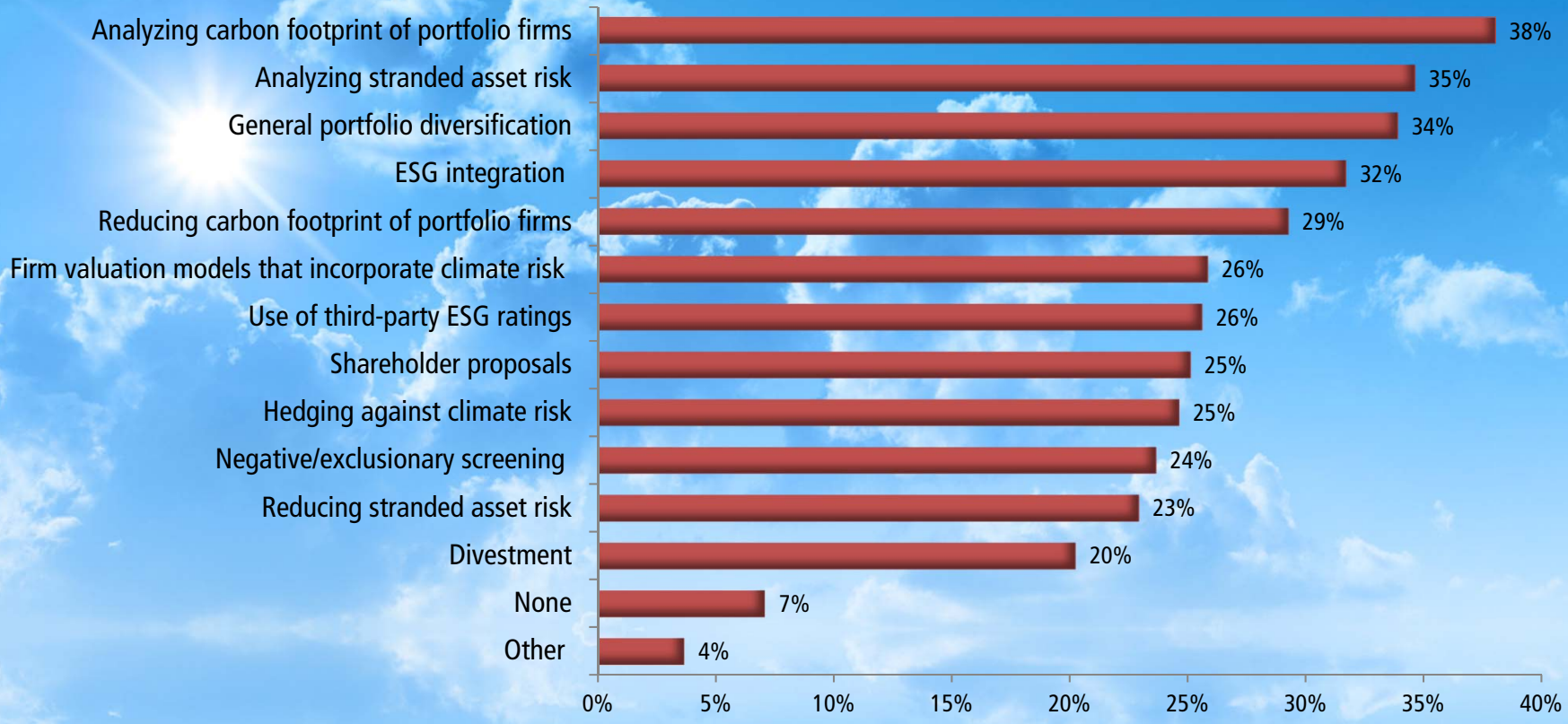


Climate risks have started materializing, especially regulatory risks

Investor motivations to incorporate climate risks into investment process

THESE ARE NOT MUTUALLY EXCLUSIVE

Approaches taken to incorporate climate risk management in the investment process



Cross-sectional analysis

More risk-management approaches by investors:

- Who view climate risks as more material
- With medium or long-term investment horizons
- Who manage a higher proportion of their portfolios under ESG principles

Perceptions of climate-risk pricing

Oil and traditional automotive most overvalued

Industry	Mean score	STD	Relative industry misvaluation	Percentage with score of +2 (much too high)	Percentage with score of -2 (much too low)	Mean Score (Confident respondents)
	(1)	(2)	(3)	(4)	(5)	(6)
Oil	0.52	1.03	37%	17%	3%	0.59
Automotive (traditional)	0.48	0.94	25%	14%	2%	0.53
Electric utilities	0.47	0.91	25%	13%	3%	0.48
Information Technology	0.47	0.98	23%	16%	3%	0.50
Insurance	0.46	0.91	21%	14%	1%	0.39
Natural gas	0.44	0.91	17%	11%	2%	0.51
Coastal real estate	0.43	0.96	13%	14%	3%	0.43
Gas utilities	0.40	0.94	6%	11%	4%	0.38
Transportation	0.40	0.92	4%	12%	3%	0.37
….						
Mean (Across All Industries)	0.38			12%	3%	0.41

Mean valuation score > 0
--> Valuations are somewhat too high, but overvaluation seems modest

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This paper

- Shows that climate policy uncertainty is priced in the option market.
- Increased regulation needed to meet the Paris Agreement.
  - Climate policy uncertainty likely most severe for firms with large carbon emissions.
- Political/regulatory uncertainty affects asset prices (Pastor and Veronesi 2012; Kelly, Pastor, and Veronesi 2016; Koijen, Philipson, and Uhlig 2016).

Option-Market Variables

- Implied Volatility Slope (*SlopeD*)
- Model-free implied Skewness (*MFIS*)
- Variance Risk Premium (*VRP*)

Carbon emissions

- Scope 1 carbon emissions data from CDP.
  - Direct emissions from production
- Reporting to CDP is voluntary, so need to account for potential selection bias.
- CDP data widely used by institutional investors and ESG data providers.

Effect of climate policy uncertainty

Dependent Variable:	*SlopeD 30*	*SlopeD 30*	*SlopeD 30*	*SlopeD 30* With non-disclosers	*SlopeD 30* High carbon-intensity ind.	*SlopeD 30* Low carbon-intensity ind.	*SlopeD 30*	*MFIS 30*	*VRP 30*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Log(Scope 1 Industry/MV)	0.008***	0.007***	0.007***		0.024***	-0.004*		-0.006**	0.002***
	(4.18)	(3.52)	(4.04)		(3.64)	(-1.68)		(-2.00)	(3.80)
Log(Scope 1 Industry/MV All)				0.005**					
				(2.53)					
Log(Scope 1 Firm/MV)							0.008***		
							(3.88)		
Model	Heckman	Heckman	OLS	OLS	Heckman	Heckman	Heckman	Heckman	Heckman
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-Quarter Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quarter Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Level	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm	Firm
Frequency	Monthly	Annual	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly	Monthly
Obs.	18,664	1,771	18,664	27,800	4,969	13,695	18,664	18,664	18,664
adj. R-sq.			0.131	0.136					

Effect of attention to global warming

Dependent Variable:	*SlopeD 30*	*SlopeD 30*	*SlopeD 30*	*SlopeD 30*
	High-emission industries	Low-emission industries	High-emission industries	Low-emission industries
	(1)	(2)	(3)	(4)
Log(Scope 1 Industry/MV) x SVI Climate Change High	0.014**	-0.001		
	(2.11)	(-0.22)		
Log(Scope 1 Industry/MV) x SVI Climate Change			0.040*	-0.000
			(1.85)	(-0.01)
Log(Scope 1 Industry/MV)	0.020***	-0.004*	0.009	-0.004
	(3.18)	(-1.65)	(0.89)	(-0.98)
SVI Climate Change High	-0.090**	-0.001		
	(-2.11)	(-0.14)		
SVI Climate Change			-0.245*	0.023
			(-1.84)	(1.27)
Model	Heckman	Heckman	Heckman	Heckman
Controls	Yes	Yes	Yes	Yes
Year-Quarter Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
Quarter Fixed Effects	Yes	Yes	Yes	Yes
Level	Firm	Firm	Firm	Firms
Frequency	Monthly	Monthly	Monthly	Monthly
Obs.	4,969	13,695	4,969	13,695

Other Results

- Event Study for Trump Election
  - Cost of option protection for carbon-intense firms declines after Trump Election.
- Firm-level Uncertainty (Hassan et al., 2019)
  - Fewer questions about environmental risks and uncertainty by analysts at conference calls at carbon-intense firms.

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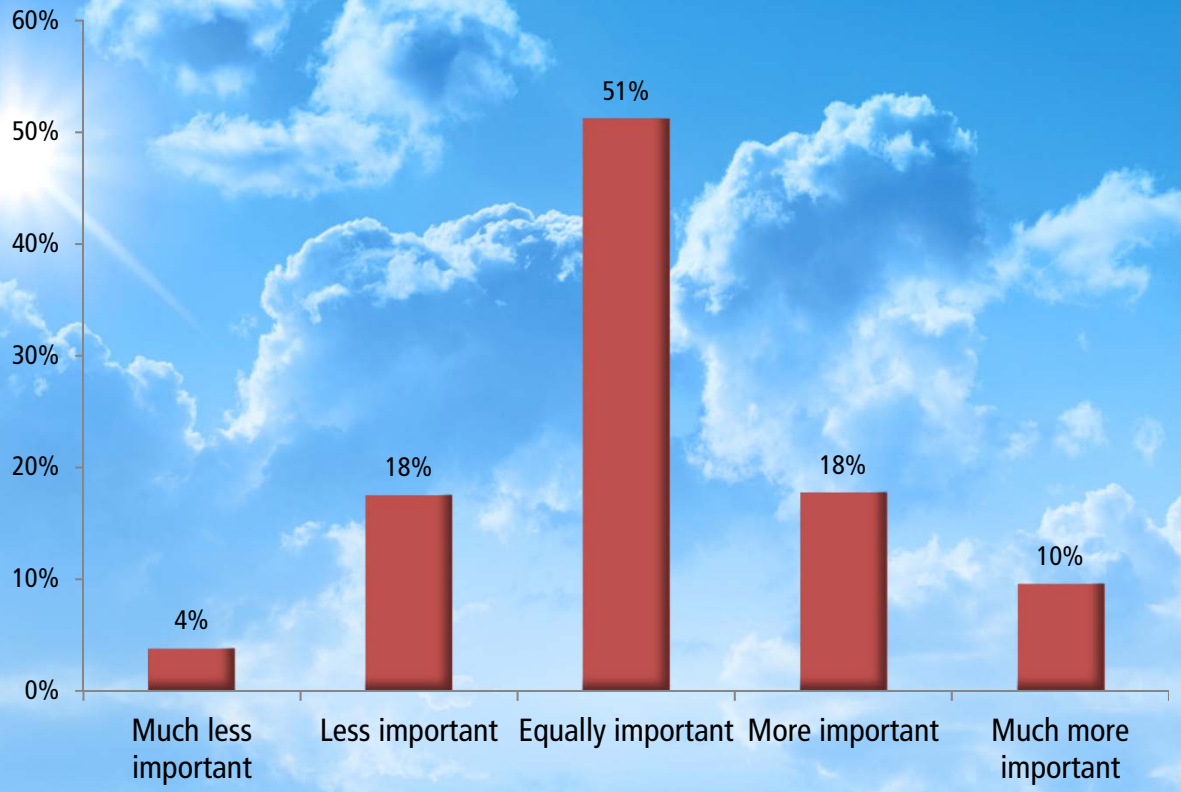
- **Climate risks and corporate disclosure**
  - **Ilhan, Krueger, Sautner, and Starks (WP, 2019)**

This paper

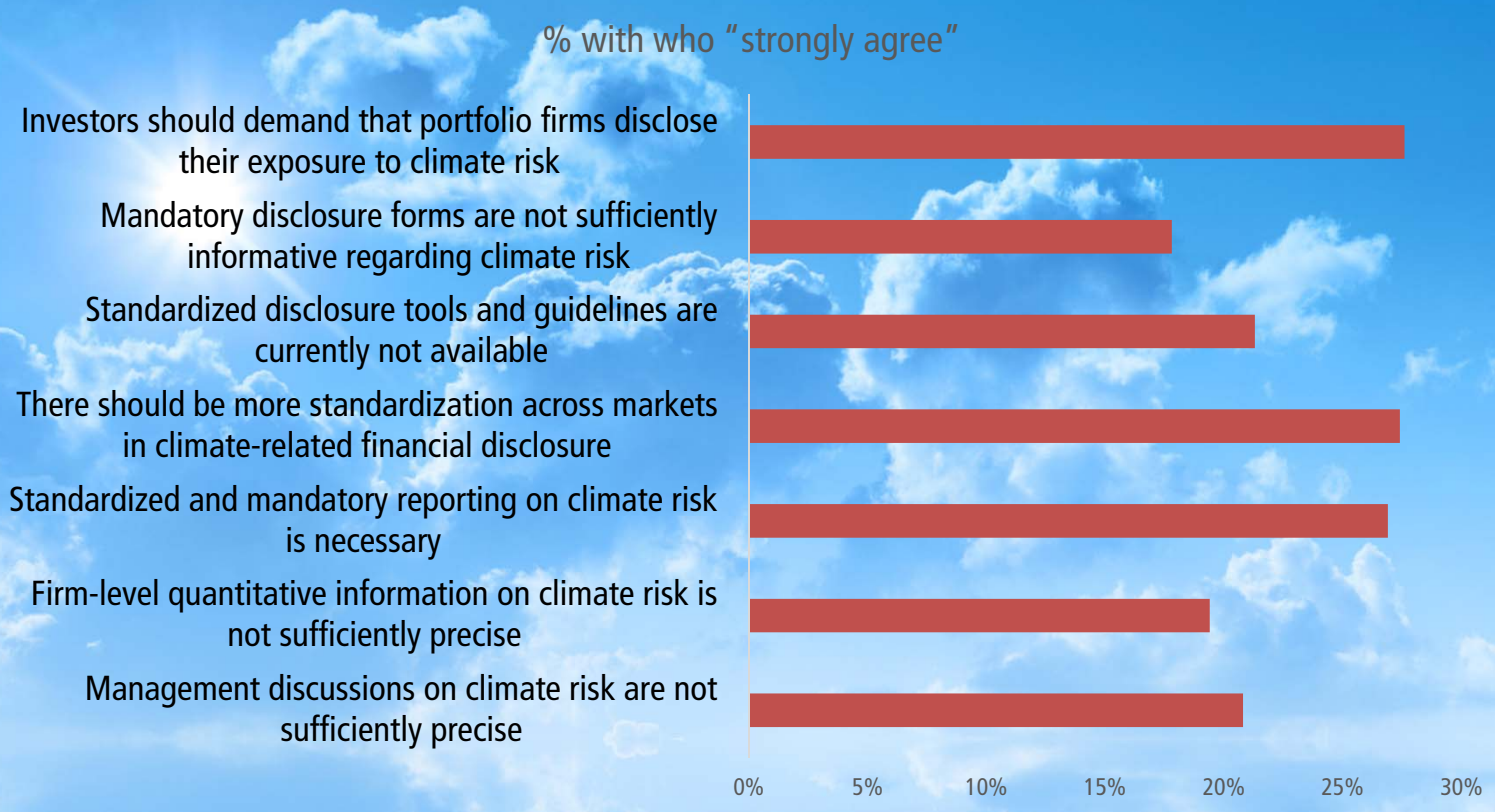
- Surveys institutional investors about climate-related disclosures by firms.
- High-quality information on climate risks needed for investment decisions and correct pricing of climate risks.
- Disclosure on climate risks essential for regulatory efforts to protect financial stability (Goldstein and Yang 2017).

Importance of climate risk disclosure

Compared to reporting on financial information



Quality of climate risk disclosure



Climate risk disclosure and mispricing

- Respondents who believe that reporting is lacking see more mispricing in current equity valuations.
- Consistent with theory.
  - Daniel, Litterman, and Wagner (2017).
- Consistent with Michael R. Bloomberg, Chair of the TCFD
  - *" Increasing transparency makes markets more efficient, and economies more stable and resilient."*