

Cambridge Centre for Risk Studies

2022 ANNUAL RISK SUMMIT

# SYSTEMIC RISKS AND INTERLINKED GLOBAL CHALLENGES

## Plenary Session 3:

Climate Change Risk and Systemic Impacts

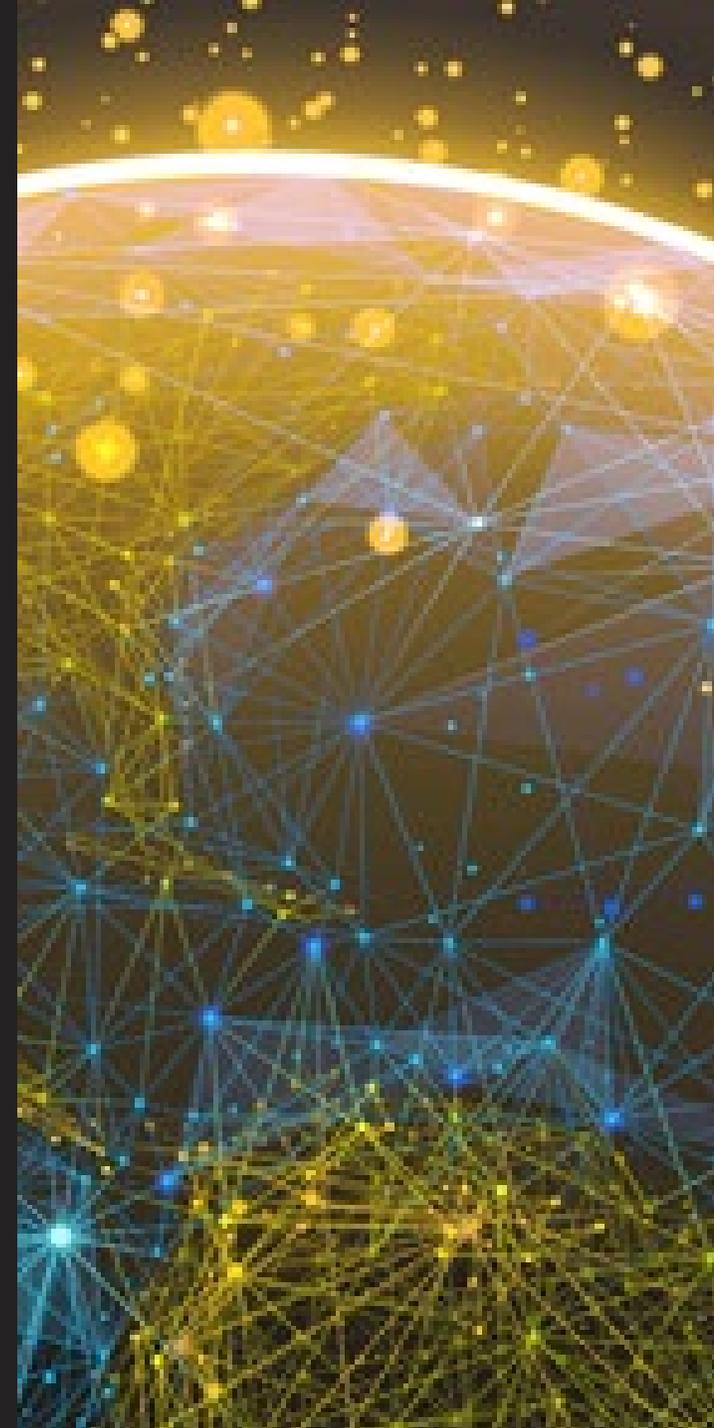
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# Climate Change Risk and Systemic Impacts

**Andrew Coburn**

Chief Scientist, Cambridge Centre for Risk Studies and  
CEO, Risilience

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**Risk Studies**



UNIVERSITY OF  
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Judge Business School



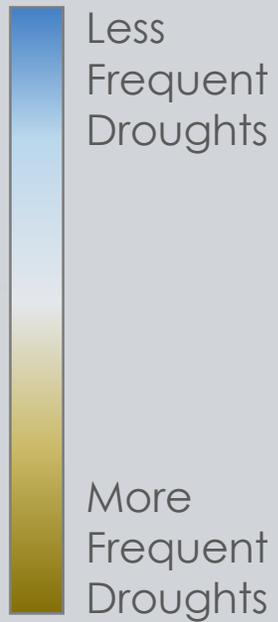
**Risilience**<sup>®</sup>



**Water Rationing Introduced in Santiago, Chile, April 2022**

Mapocho Reservoir

# Changing Patterns of Rainfall with Climate Change



Santiago

Change in Deficit from Seasonal Average Rainfall with a 1-in-10 likelihood per year, from 2000 to 2040

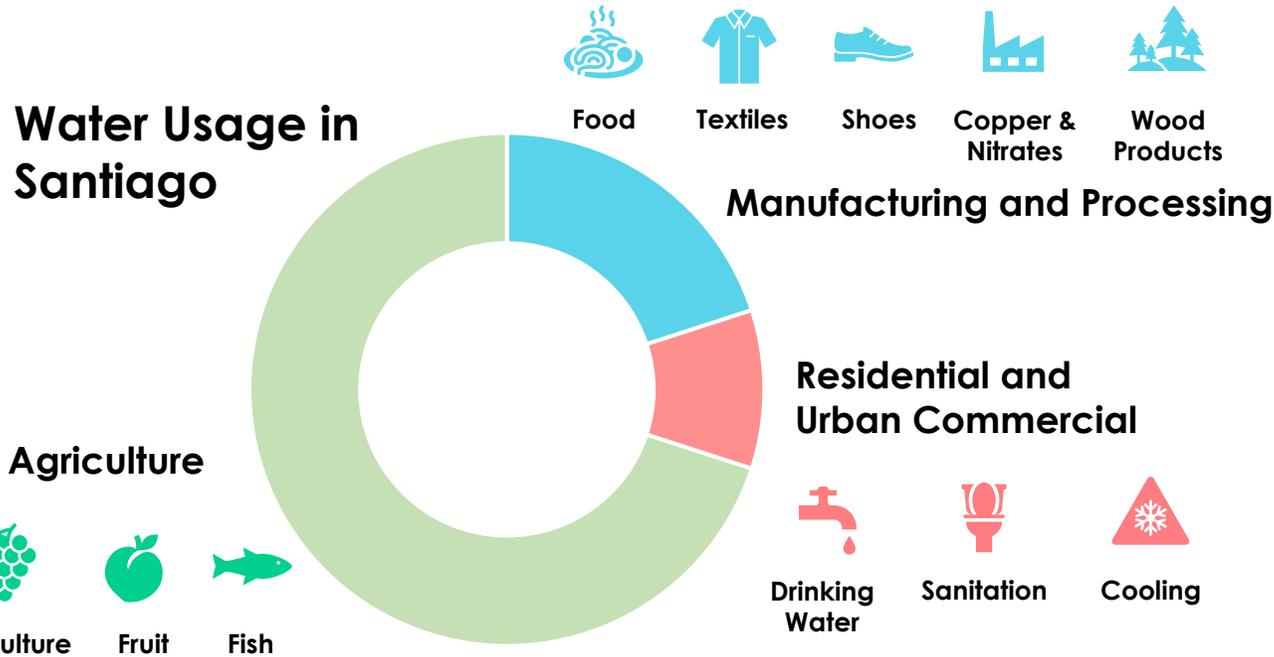
# Santiago

- Home to 6.8 million people
- Capital city and economic engine of Chile
- Santiago Metropolitan Region accounts for half of Chile's \$352 Bn GDP
  - Chile's GDP is now larger than Portugal and Greece
- Well-educated workforce, major universities, and hub of the largest corporations of Latin America
- Centre of food processing; textiles, shoes and clothes; chemical processing, wood processing



# Water Shortages are Cramping Santiago's Economic Growth

## Water Usage in Santiago



Water shortages are causing short-time working in clothing factories in Santiago

- Water shortages could cause 10s of Billions of lost GDP for Chile
- Individual businesses suffering reduced output

# Water Disputes Throughout Latin America



Chile: **New regulations** passed by Senate to **appropriate water rights** from being private and permanent to 20- or 30-year renewable concessions, classing water as a national good for public use.



Puebla, Mexico: A private **water-bottling plant forced to cease operations** after a four-month-long blockade by 'Peoples' Front for Water Defence' (Frente de Pueblos en Defensa del Agua)



Baja California, Mexico: **Cancellation of a US company's brewing project** after a referendum prompted by local community's concerns over water scarcity



Mexico: **Revoked water use permits** by National Water Commission (Comisión Nacional del Agua: CONAGUA) for five European and US manufacturing and agribusiness companies after public protests

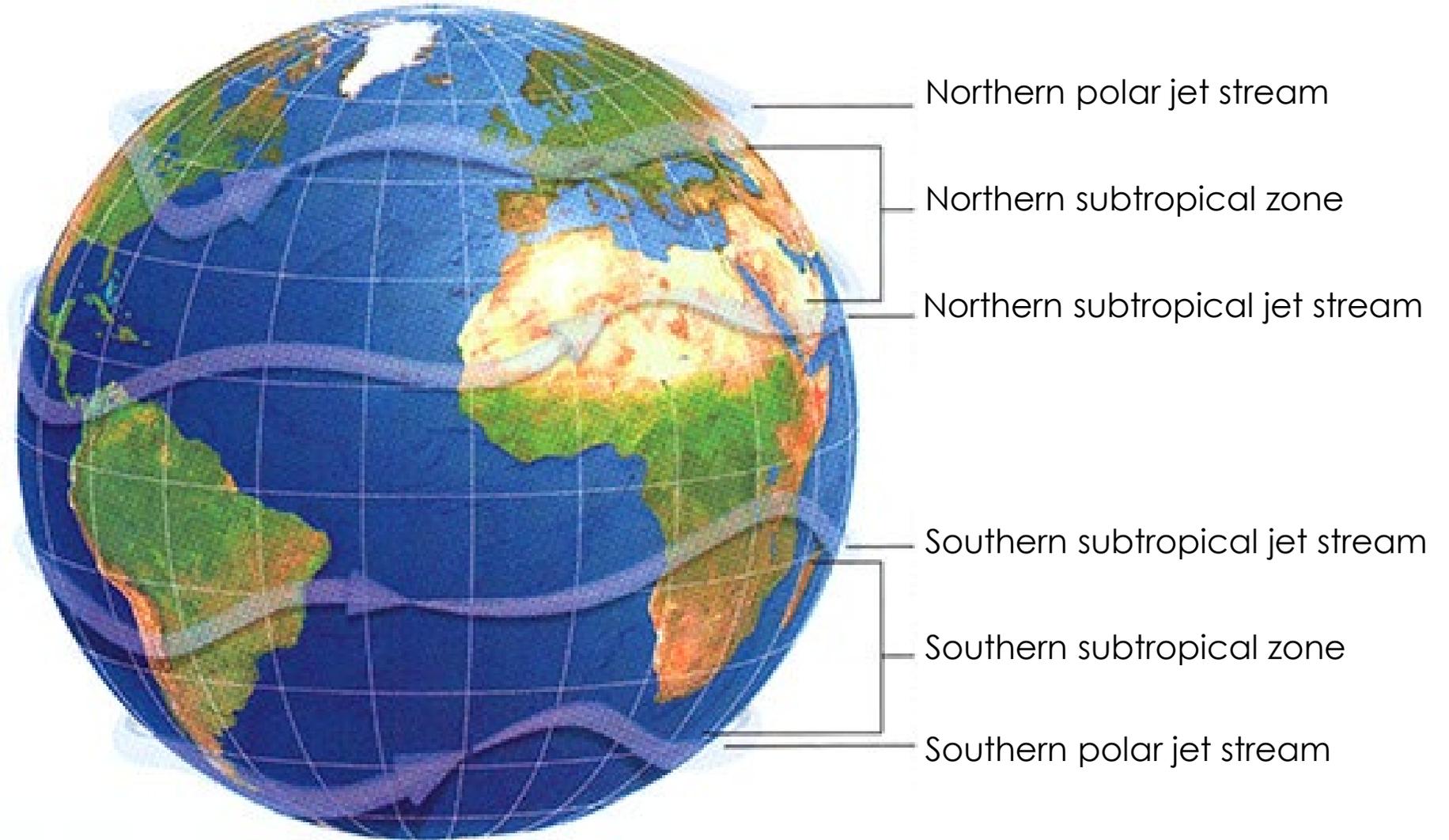


Peru: **Development project cancellations** after Las Bambas blockades and take-over attempts against companies operating water-intensive businesses - 65% of social conflicts focused on environmental issues, with water pollution a major trigger



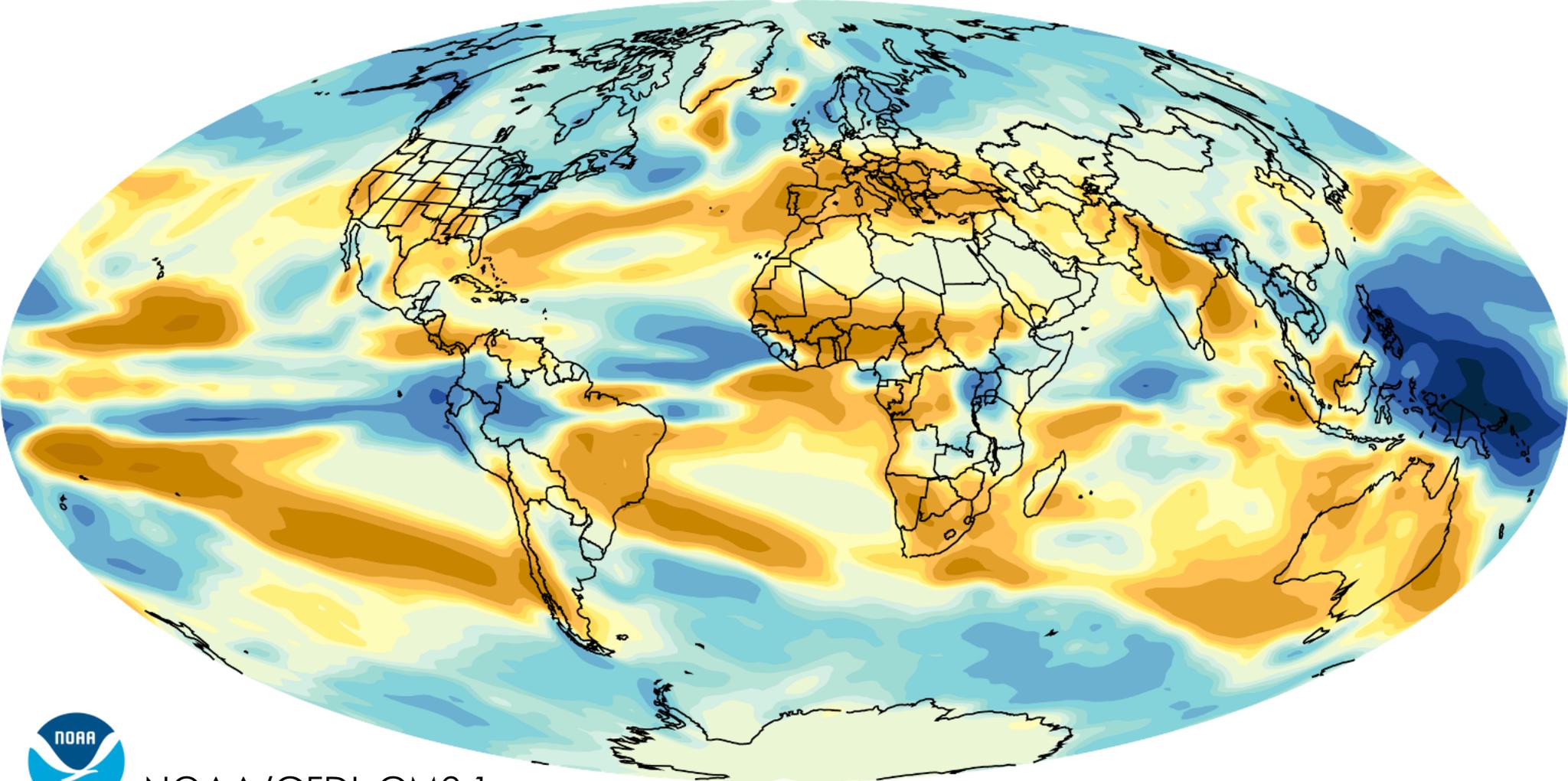
Ecuador: **Closure of potentially-polluting major projects** near population centres ordered by Sucumbios department municipal court after protests by indigenous organizations about access to clean water

# Systemic Destabilizing of the Weather Systems with Global Warming



# Changes in Rainfall Patterns

Average change by 2100  
Inches of liquid water per year



NOAA/GFDL CM2.1

# Not Just Chile...

## California

BAY AREA

### California slips into its worst mega-drought in 1,200 years

Kurtis Alexander  
Feb. 14, 2022 | Updated: May 12, 2022 9:03 a.m.



1 of 2

A family walks over cracked mud last August near Lake Oroville's shore, as water levels remain low because of continuing drought conditions.  
Ethan Swope/Associated Press 2021

## Italy

Green | Weather & Science

### Worst Drought in 70 Years Threatens Northern Italy's Food, Power

Hydroelectric reservoir levels are at historic lows and towns are bracing for shortages of drinking water.



Boats on the exposed bed of the Po in Caltto, Italy, on June 17. *Photographer: Francesca Volpi/Bloomberg*

By Marco Bertacche  
18 June 2022, 05:00 BST

## Spain

FEBRUARY 15, 2022

### Drought Depletes a Reservoir in Spain, Revealing a Ghost Village

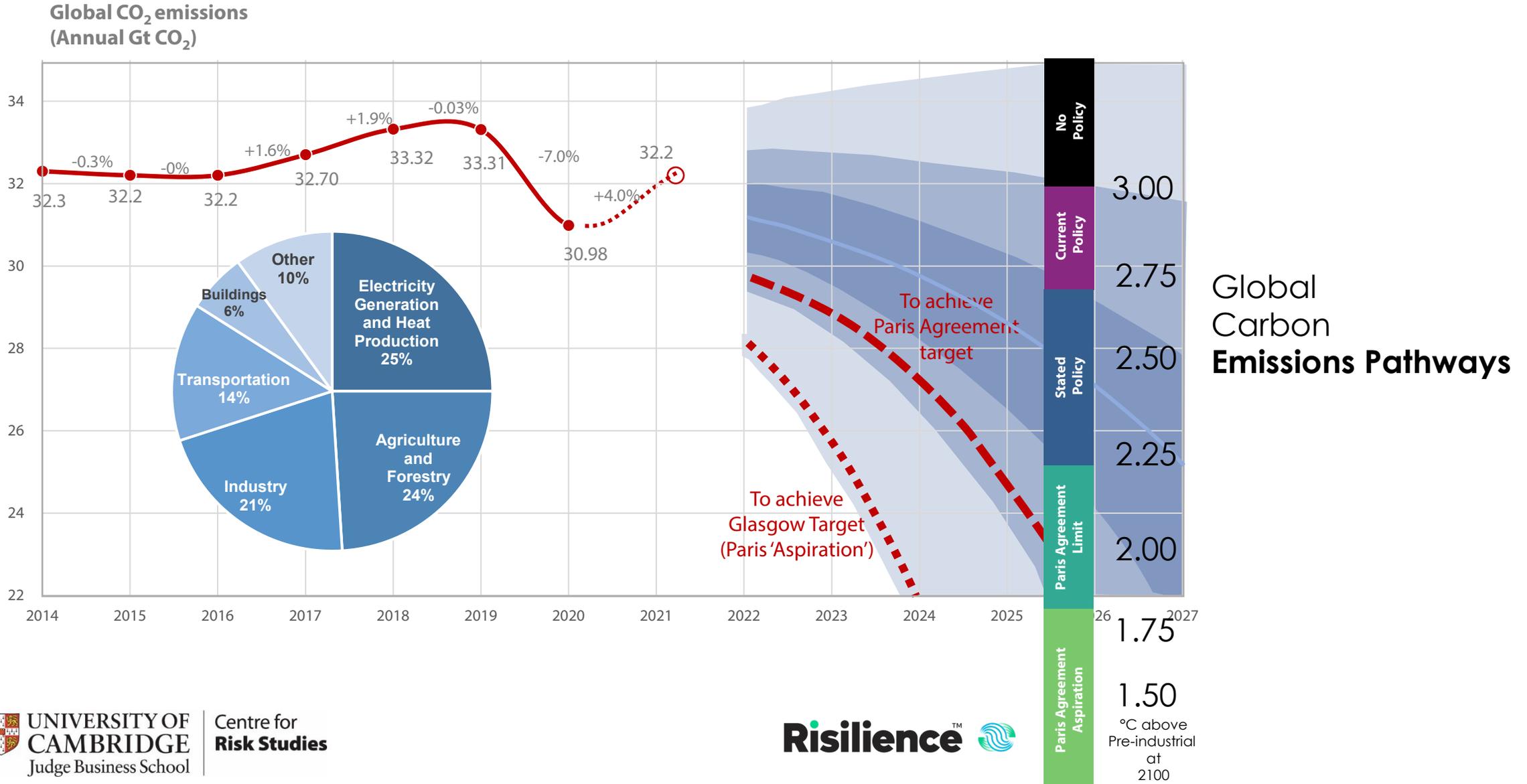


The ghost village of Aceredo, Spain. [ESTEVOAEI VIA WIKIPEDIA](#)

The 1992 opening of the Alto Lindoso Dam on the border of Spain and Portugal flooded the town of Aceredo, Spain. Now, as an ongoing drought drains the reservoir, a ghost village is re-emerging from the receding waters.

The reservoir is currently at 15 percent capacity, low enough to reveal

# How Fast Will the World Reduce its Emissions to Address Climate Change?



# Dimensions of Business Risk



**Regulation  
&  
Taxation**

Policy Risk



**Sustainable  
Consumers  
of the Future**

Market Risk



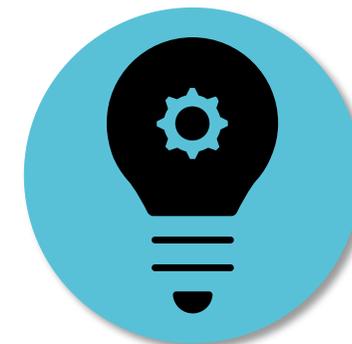
**Investors  
&  
Finance**

Reputation Risk



**Litigation  
&  
Penalization**

Liability Risk



**Disruptive  
New**

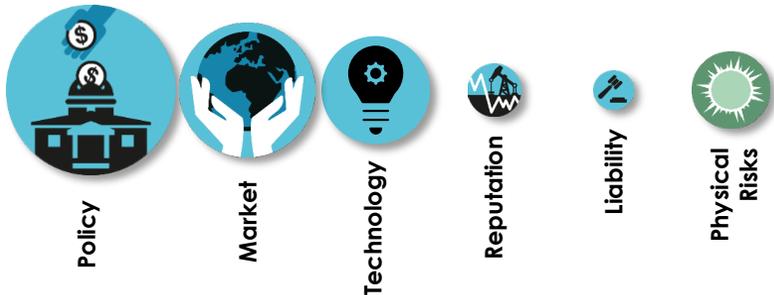
Technology Risk

# How Does Climate Risk Affect a Typical Consumer Business?



## Impact if No Adaptation Next 5 Years

Causes of Loss to Company Earnings



Impact From Different Scenarios of How Aggressively the World Tackles Climate Change in Next Five Years



### Expected Loss

**3-10%** of earnings value loss over next five years

1-in-10 Chance of 5-20% loss  
1-in-100 Chance of 15-35% loss

## How Does Climate Impact the Business?

- Increased cost from carbon tax
- Reduced revenues  
Changes in consumer preferences leads to loss of market share against more sustainable competitors
- Impairment write-offs  
on old technology retired before end of economic lifespan
- Increased cost of capital
- Fines, litigation, and liability costs

### Raw Material Supply Impacted by Climate Change



### Key Facilities - Operational Disruption from Extreme Weather



## What Actions are Companies Taking?

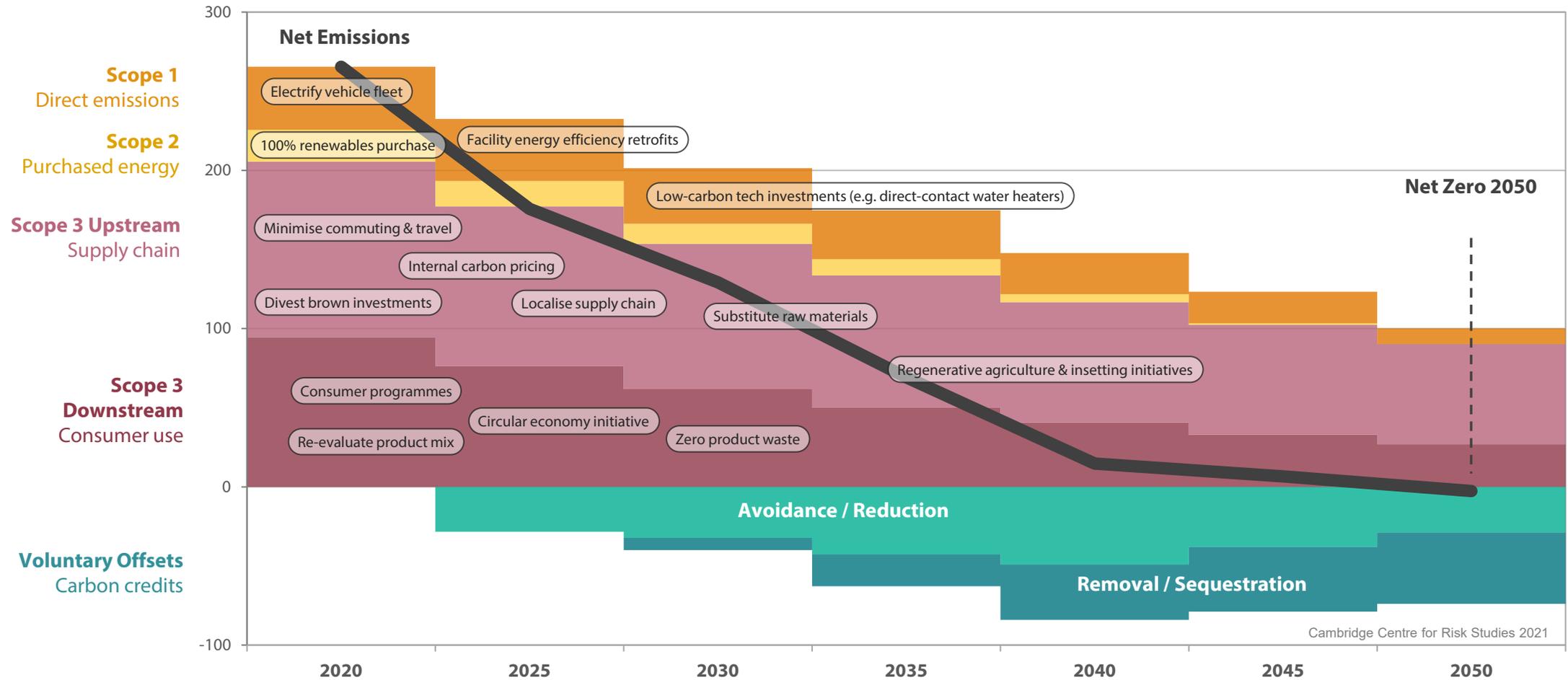
- Investments in lower-emission operations
- Restructuring portfolio of products and services
- Mergers, acquisitions and divestments
- Restructuring supply chains
- Substitution of raw materials
- Renewable energy supplies
- Realigning management incentives, shadow carbon pricing

### Typical Investments in Net Zero Commitment

**1-4%** of annual earnings

# Net Zero Planner

Company Emissions (Mt CO<sub>2</sub>e)



# Climate Reporting and Regulation

## Annual Reports



## Sustainability Reports



## Net-Zero Roadmaps



## TCFD & Climate Impact Reports



## SEC Form 10-K Filings



SEC  
Climate  
Disclosure  
Rulings



European  
Corporate  
Sustainability  
Reporting  
Directive

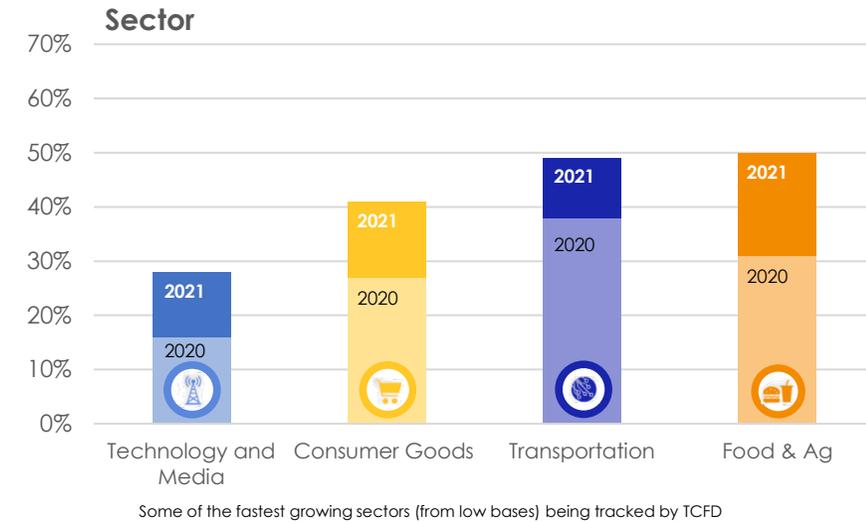
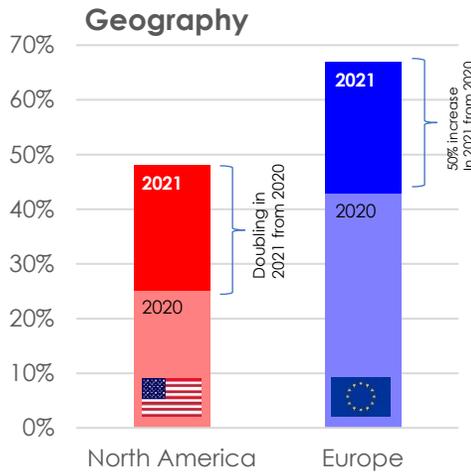
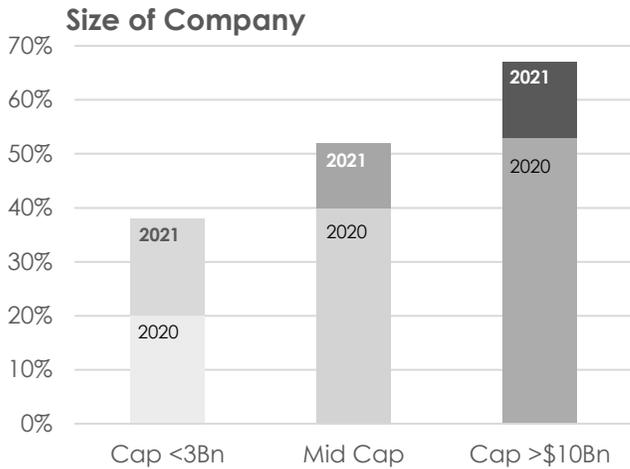


BANK OF ENGLAND  
PRUDENTIAL REGULATION  
AUTHORITY



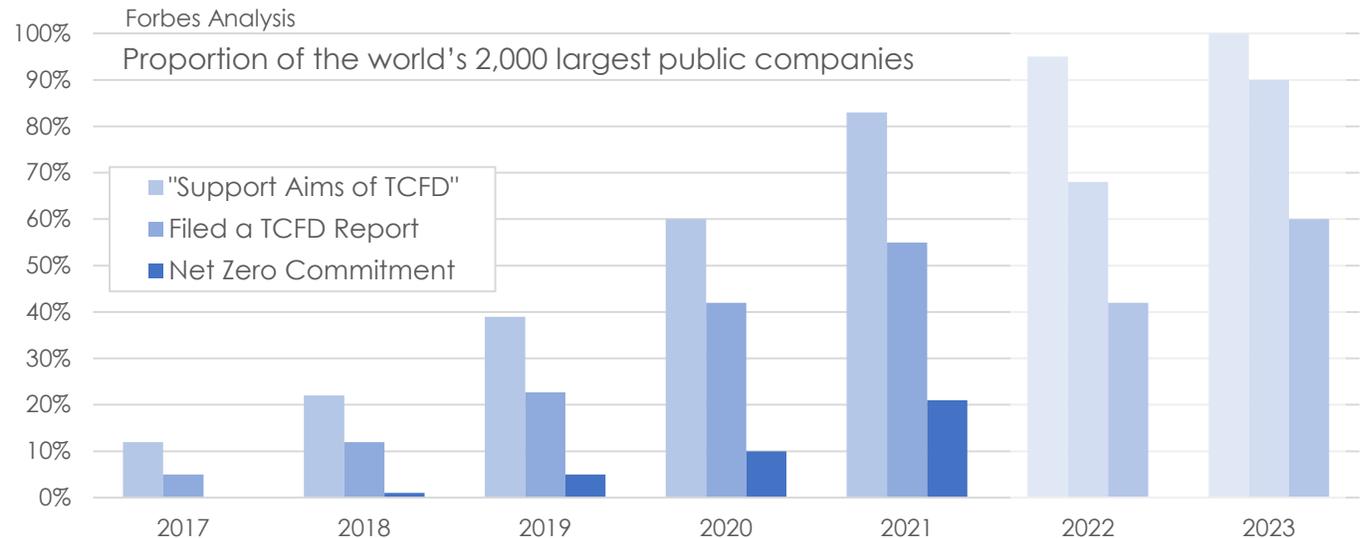
# Increasing Pressure for Voluntary Climate-Related Disclosures

**Growth in the Past 12 Months** - Companies submitting TCFD report identifying 'Risks and Opportunities' in their 'Strategy' Submission



Dec 2021 Publication of Status of the Taskforce on Climate Related Financial Disclosures (TCFD)

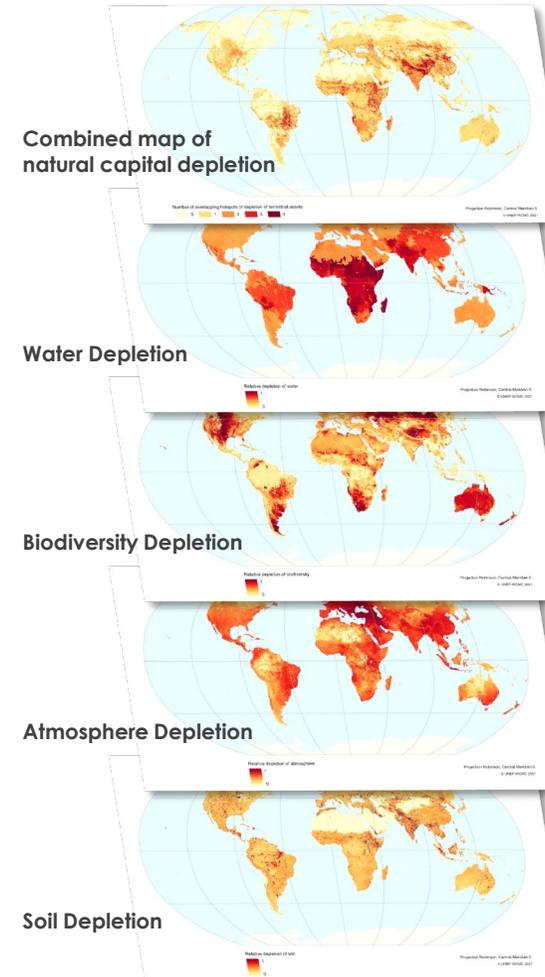
- Market survey information shows that there is rapid growth in companies reporting their climate change risk
- 2021 reporting of TCFD and publishing Net Zero plans increased significantly from previous years
- Boosted by regulators in major jurisdictions signalling that reporting will become mandatory



# Beyond Climate – to Natural Capital Risk

- We are developing an application for a company to assess their risk from Taskforce on Nature-related Financial Disclosures (TNFD)
- This will utilize the same digital twin base model for a company
- This will incorporate the recommendations of the TNFD Taskforce and conform to their requirements and objectives

## Global geography of natural capital depletion



## Raw material dependencies and impact drivers on natural capital

e.g. large-scale rainfed Palm Oil crops

Impacts	Materiality
Water use	V High
Terrestrial ecosystem use	V High
Freshwater ecosystem use	V High
Marine ecosystem use	N/A
Other resource use	Low
GHG emissions	High
Water pollutants	High
Soil pollutants	Medium
Ecosystem Services	Materiality
Direct physical input	
Fibres & materials	Medium
Ground water	V High
Surface water	V High
Enables production	
Pollination	High
Soil quality	High
Water quality	High

# The Resilience Research Team



**Tom Harvey**  
VP, Product Management



**Oliver Carpenter**  
Head Environmental Risks Analytics



**Dr Clare Allen**  
Senior Climate Modeller



**Dr Richard Newton**  
Climate Modeller



**Tamara Evan**  
Senior Product Manager



**Dr Jay Jung**  
Corporate Finance



**William Turner**  
Data Scientist



**Dr Tim Summers**  
Senior Data Scientist



**Dr Alexandra Dixon**  
Senior Data Scientist



**Andrew Garraway**  
Climate Change Policy Analysis



**Dr Andy Skelton**  
Ideation and Prototyping



**Jen Copic**  
Lead, Enterprise Risk Analytics



**Jacob Barrett**  
Risk Researcher



**Joshua Jamieson**  
Risk Researcher



**Matthew Hopwood**  
Risk Researcher



**Jen Daffron**  
Lead Client Solutions Europe

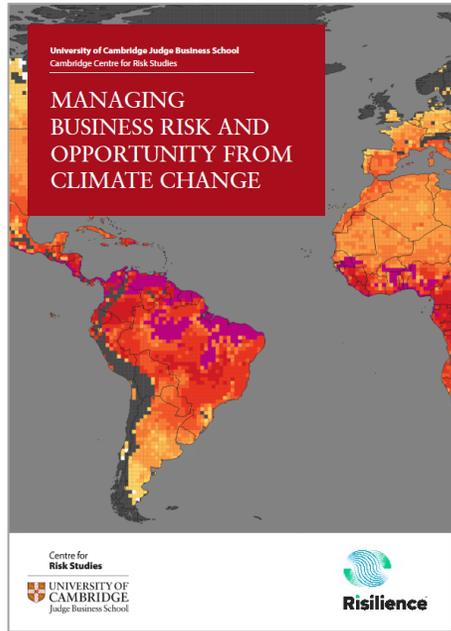


**Matteo Ilardo - CRS**  
Risk Researcher



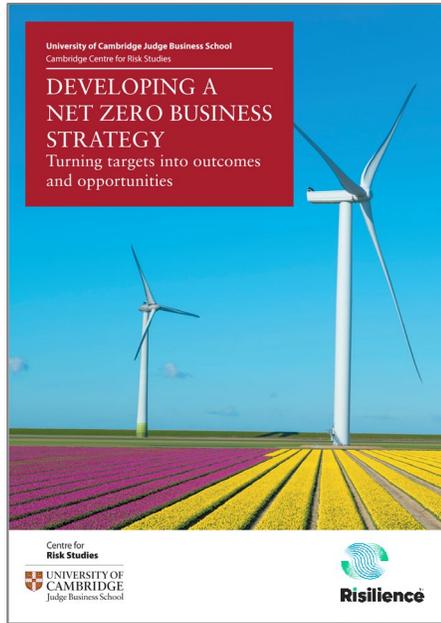
**Gabrielle La Malfa - CRS**  
Risk Researcher

# Managing Business Risk from Climate Change: Our Publication Series



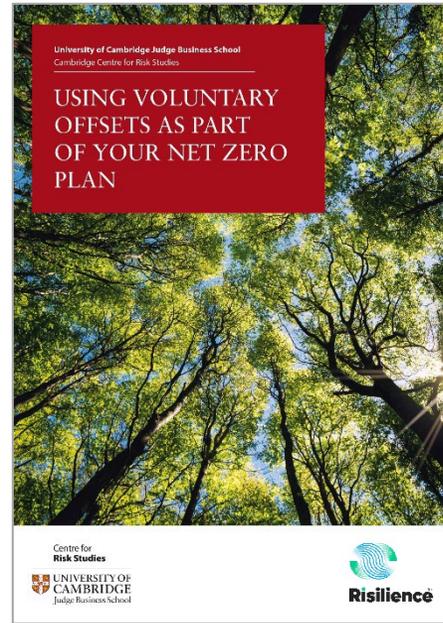
25 August

**Managing Business Risk and Opportunity from Climate Change**



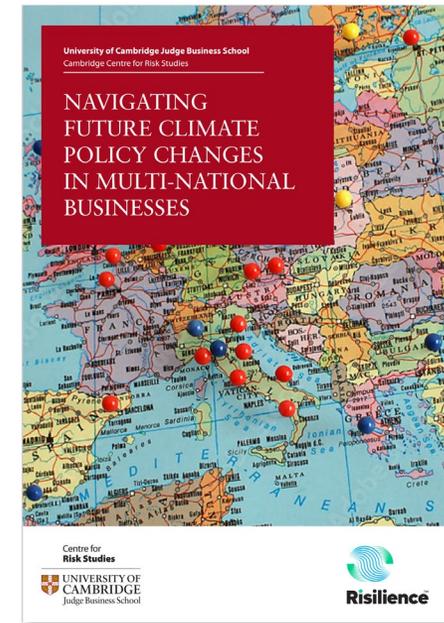
30 September

**Developing a Net Zero Business Strategy**



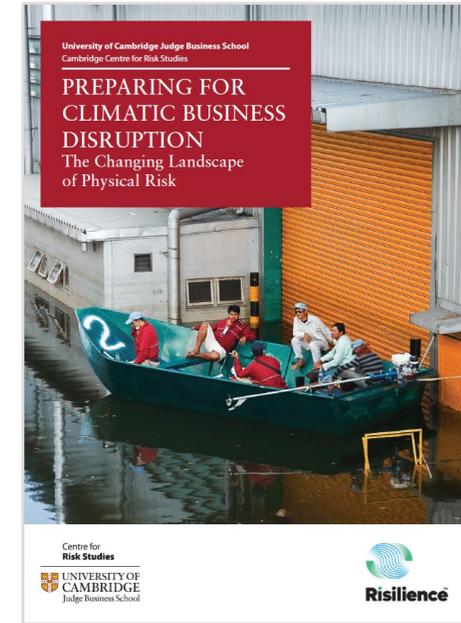
16 December

**Using Voluntary Offsets as Part of Your Net Zero Plan**



20 January 2022

**Navigating Future Climate Policy Changes in Multi-National Businesses**



21 April 2022

**Preparing for Climatic Disruption: The Changing Landscape of Physical Risk**

# Research Agenda to Help Businesses Manage Risk from the Environment



- Understanding social and behavioural change



Trajectories of technological advance and projections of future economics of the environment



Macro-economic changes that will be brought about by Environmental Change



Key performance indicators that align with business transformation needs

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