

Introduction to Climate Value-at-Risk

**Methodologies and Tools to Evaluate the Financial Impact of
Climate-Related Risks and Opportunities**

November 2019

Carbon Delta estimates the effect of climate change on a company's bottom line

POLICY RISKS



2019 South Africa Carbon Tax

Minerals Council SA says the carbon tax could wipe out 6,000+ mining jobs each year

Eskom's carbon tax liability is projected to be approximately R11.5 billion per year from 2023

TECH OPPORTUNITIES



California – Clean Energy and Pollution Act – 50% Renewables by 2030

Sunrun (Solar Installer):
1000% revenue growth

RWE (German Utility):
Analyst-Revision -22.6%

PHYSICAL RISKS

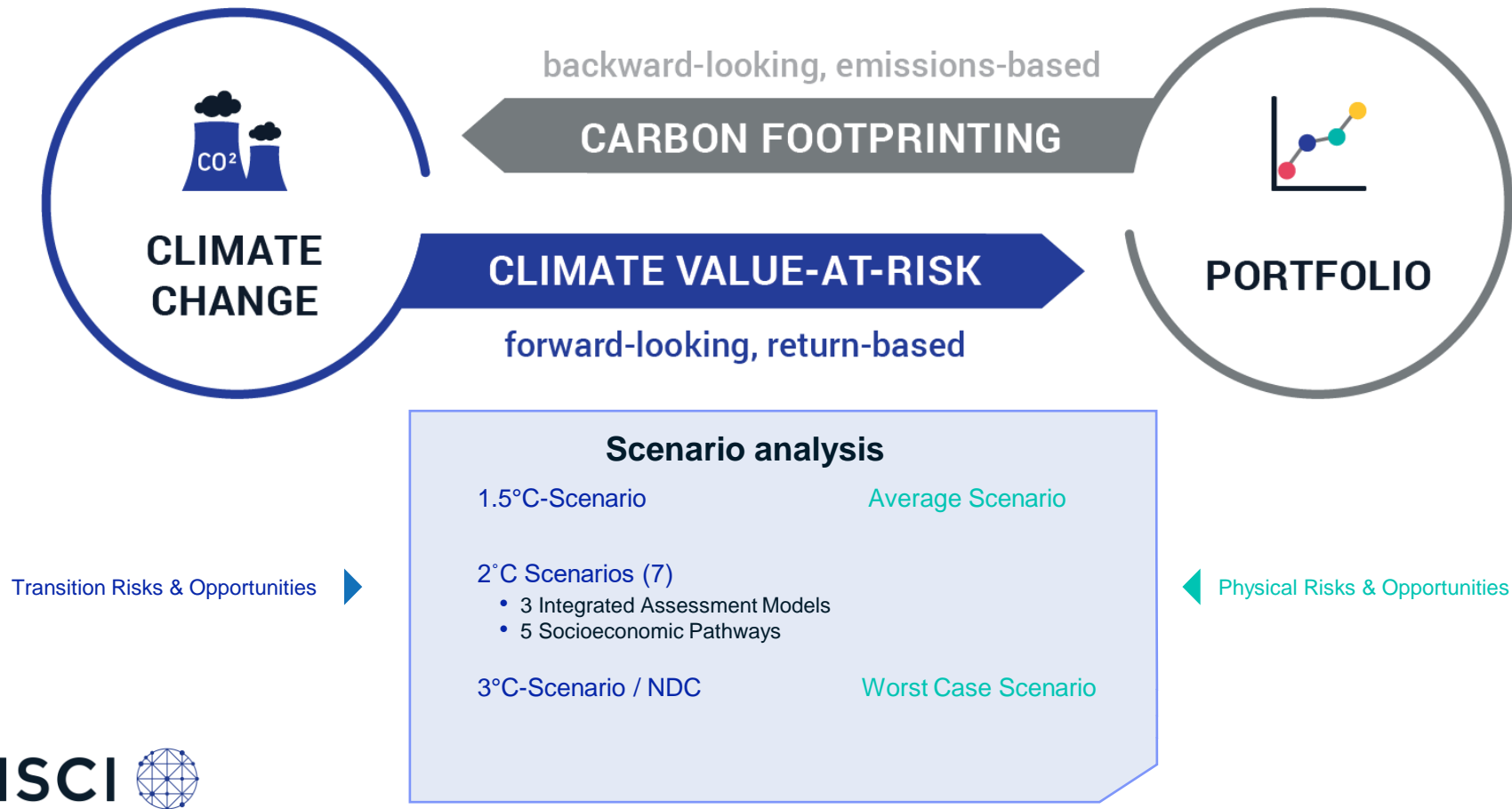


2015 South Indian floods

Ford Motor Co., BMW AG and Renault SA halted production at their factories

TVS Motor Co.'s stock price dropped 4.9 per cent, saying rainfall adversely affected production and sales.

■ The climate innovation



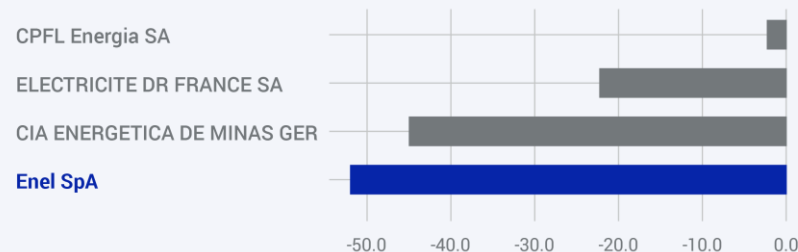
What is Climate Value at Risk (CVaR)?

- Climate VaR aims to assess the potential financial sensitivity to climate risks and opportunities, i.e. what would be the potential financial impact of different climate scenarios (1.5°, 2°, 3° of warming)?
- Estimates of net-present-value impact of climate change on the security pricing
- An aggregate Climate VaR can be broken down into:
 - *Policy* (transition risks)
 - *Technology opportunities* (transition opportunities)
 - *Physical risks & opportunities*
- Asset classes covered: *listed equities, fixed income, real estate assets*

Aggregated Climate VaR

*2°C mid-range & average
physical climate risk scenarios*

The bar chart illustrates how Enel SpA compares to its market peers in terms of the aggregated Climate Value-at-Risk. The Aggregated CVaR combines the Policy CVaR, the Technology CVaR, and the Physical CVaR into an overall Climate Value-at-Risk metric.

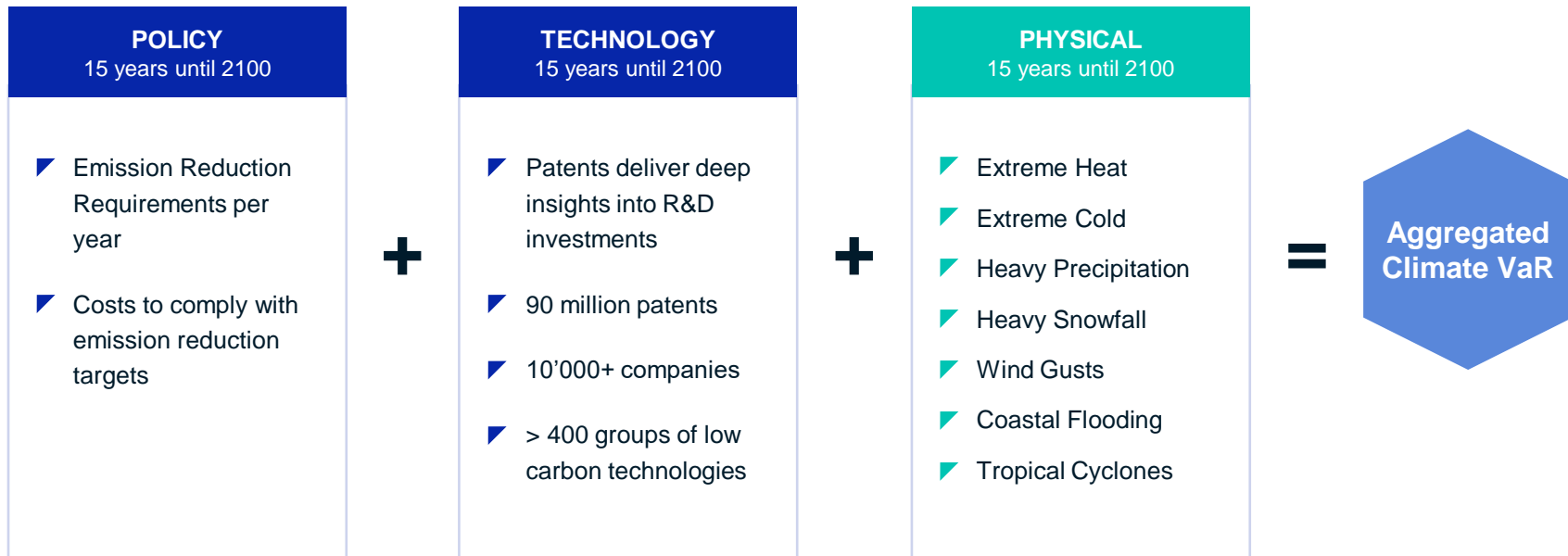


Source: Carbon Delta company report

Climate Value-at-Risk building blocks & risk metrics

Transition Risks & Opportunities

Physical Risks & Opportunities



How is Carbon Delta's CVaR calculated?



**Impact
Modelling**



**Cost / Green Profit
Calculation**



**Security
Valuation**



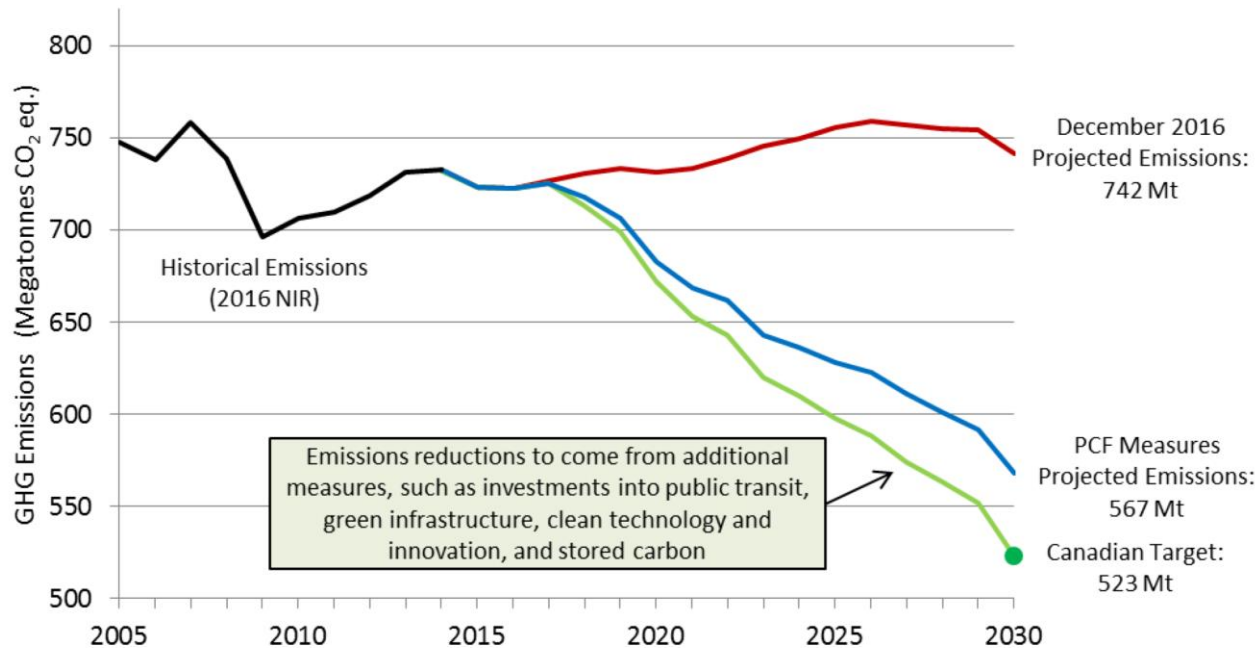
**Portfolio
Level**

CLIMATE-STRESSED ASSET VALUATION

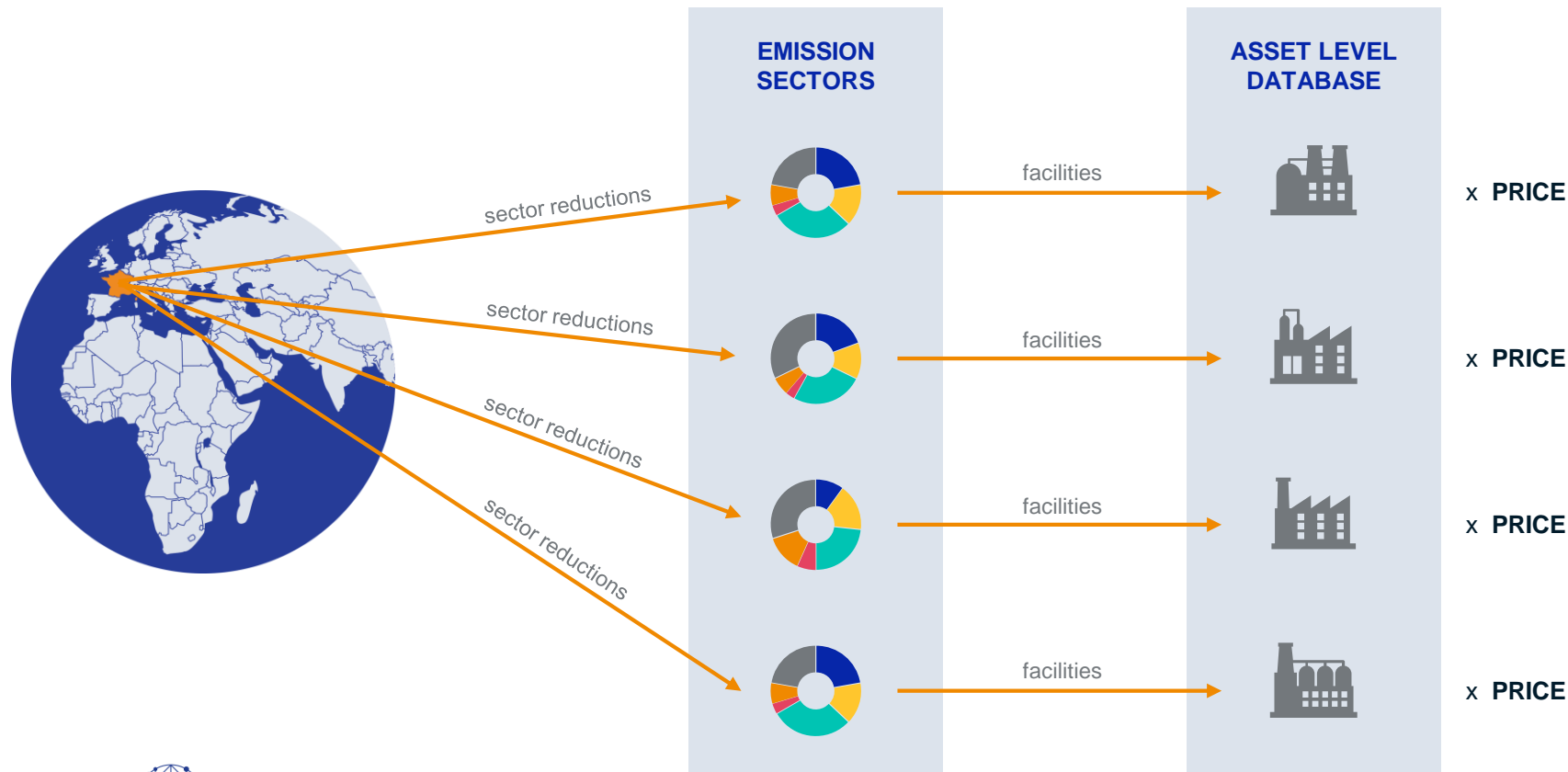
Nationally Determined Contributions (NDCs)



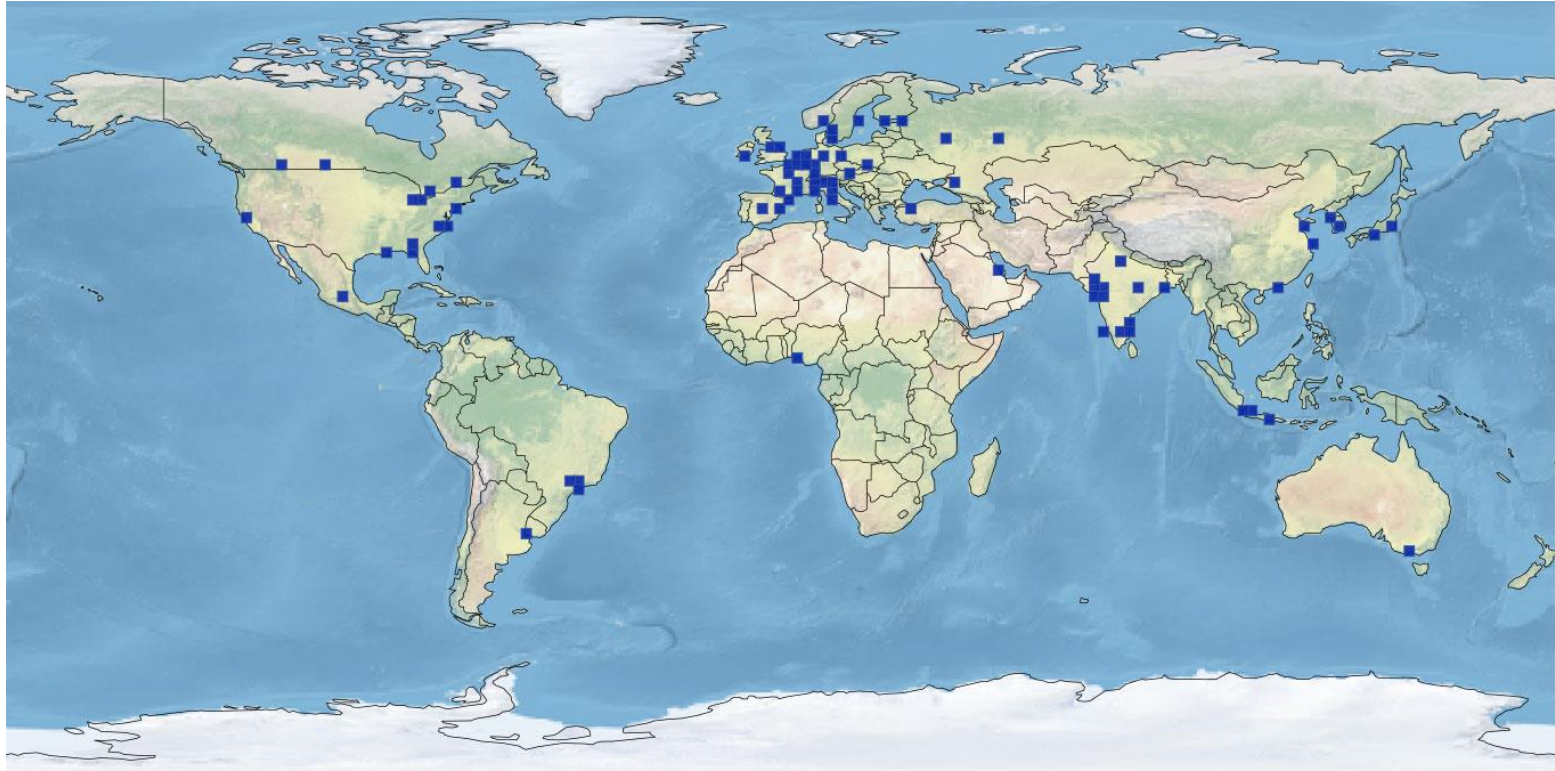
Pathway to Canada's 2030 target



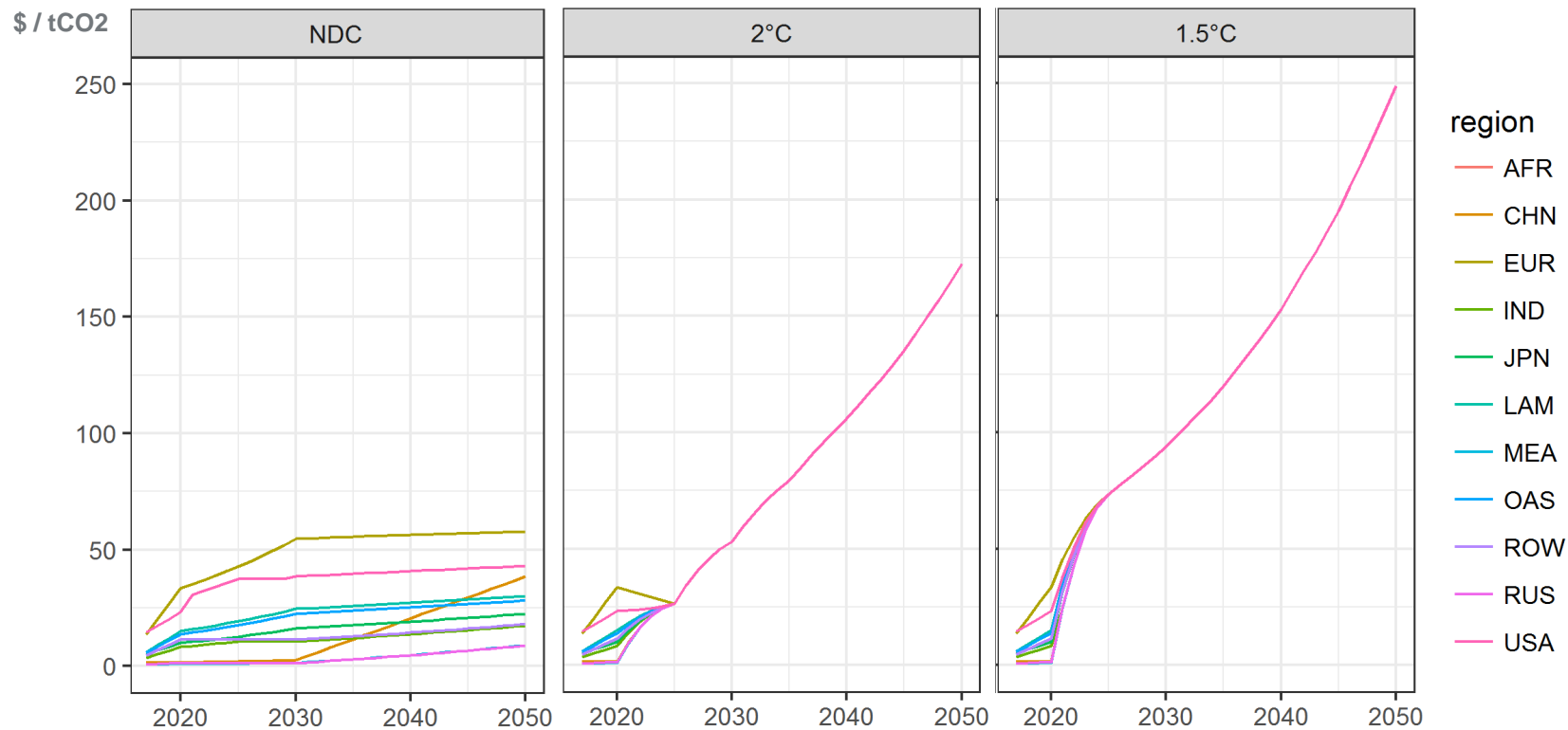
Overview of Policy Risk Methodology



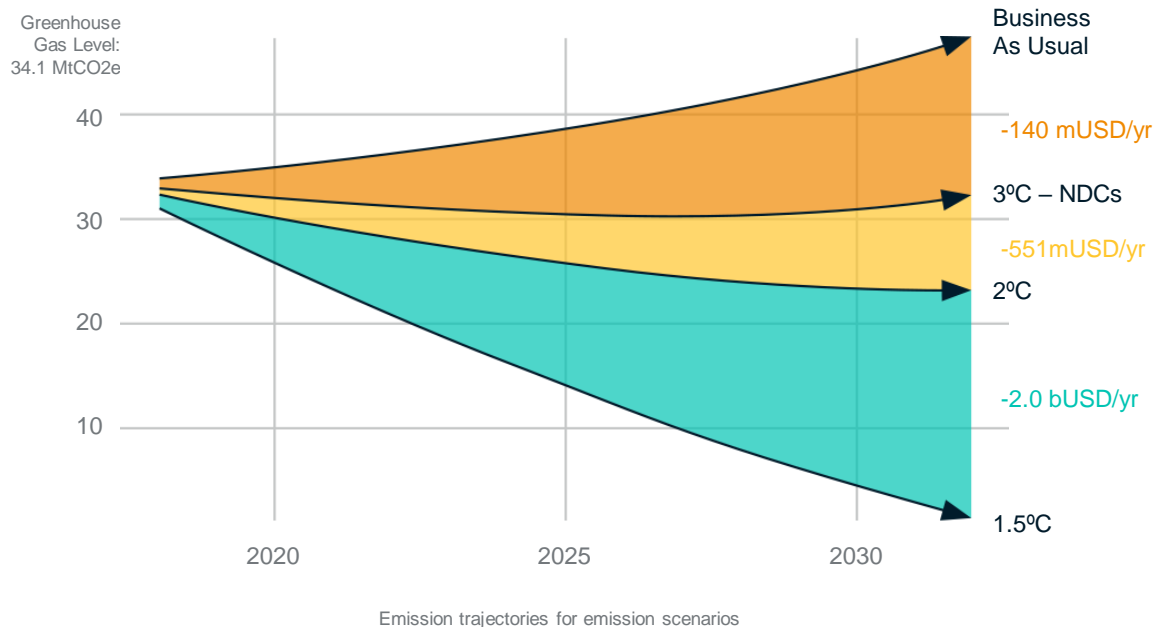
Aggregation Across Company Facilities



Calculate Cost Impact with Carbon Prices



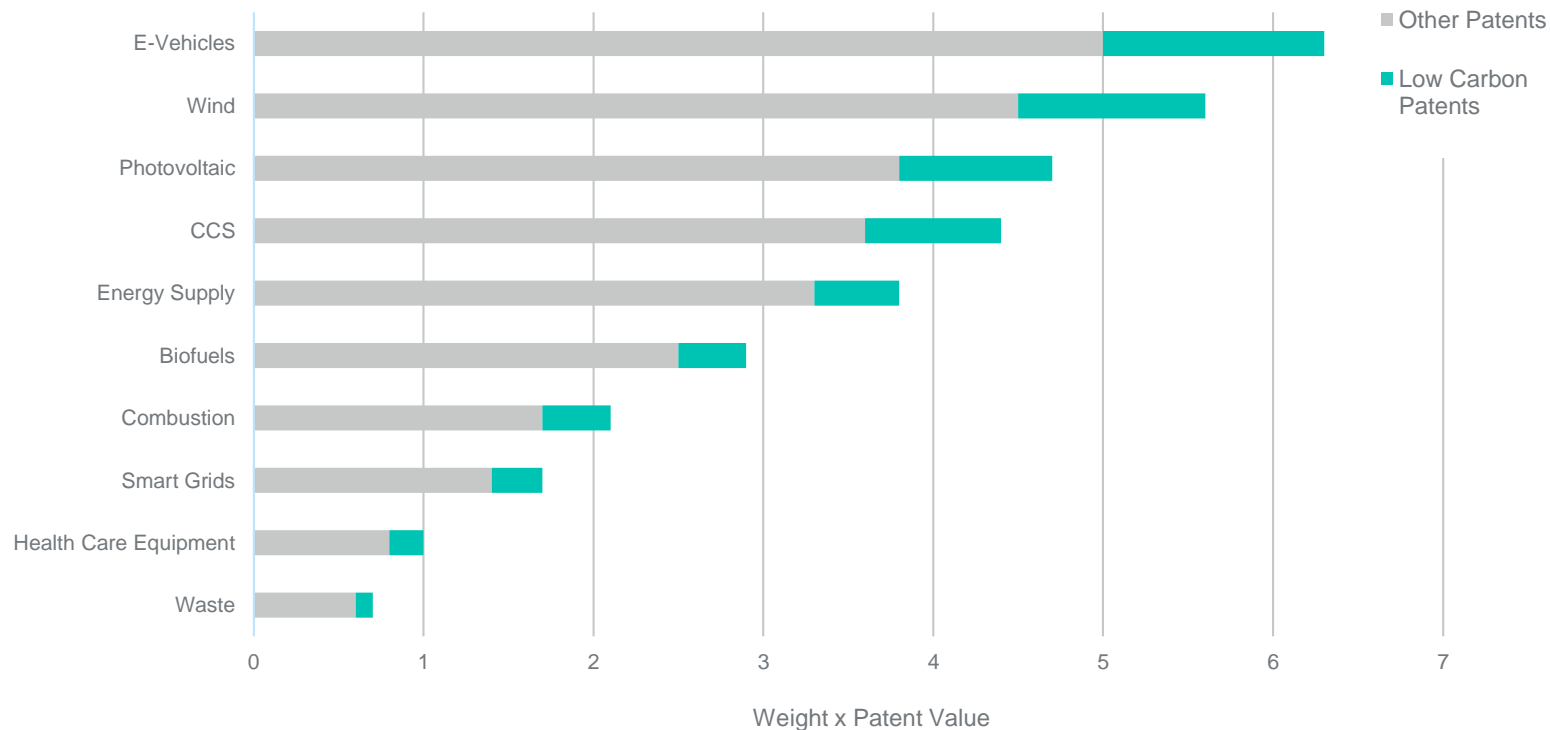
Company-level Scenario Analysis



On a company level,
we calculate:

- Current emission level
- Annual emission levels 15 years into the future
- Emission reduction requirements per year
- Costs to comply with emission reduction targets each year under BAU, 3C, 2C and 1.5C scenarios

Tech Opportunity: Sector Breakdown of Patents



Overview of Physical Risk Methodology



$$\text{EXPECTED COST} = \text{VULNERABILITY} \times \text{HAZARD} \times \text{EXPOSURE}$$

■ Hazard: Extreme Weather Types

Extreme heat and cold



Re-analysis

Heavy precipitation and snowfall



Re-analysis

Wind gusts



Re-analysis

Wildfires



*Re-analysis,
development
in progress*

Coastal flooding



Climate models

Tropical cyclones



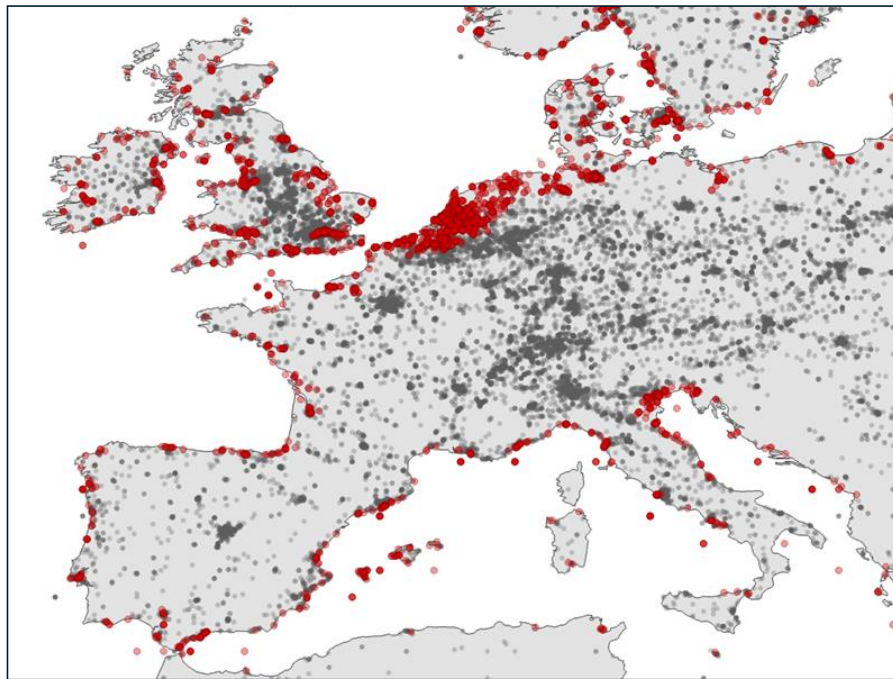
*Probabilistic model –
Climada*

Fluvial flooding



*Climate models,
development
in progress*

Exposure: Asset Level Database



Example: European locations within MSCI ACWI and exposure to coastal flooding

- Asset location database with global coverage
- Growing number of enterprise assets (>500k assets)
- Data is obtained from
 - Company analysis
 - Crawling data
 - Industry databases

Use cases



Regulatory
Compliance

CSR and
TCFD reporting



Risk
Management

Shareholder
engagement



2°C
Alignment

Sectoral &
regional over- and
underweights



New Financial
Products

Green Technology
Opportunities
for Alpha Creation

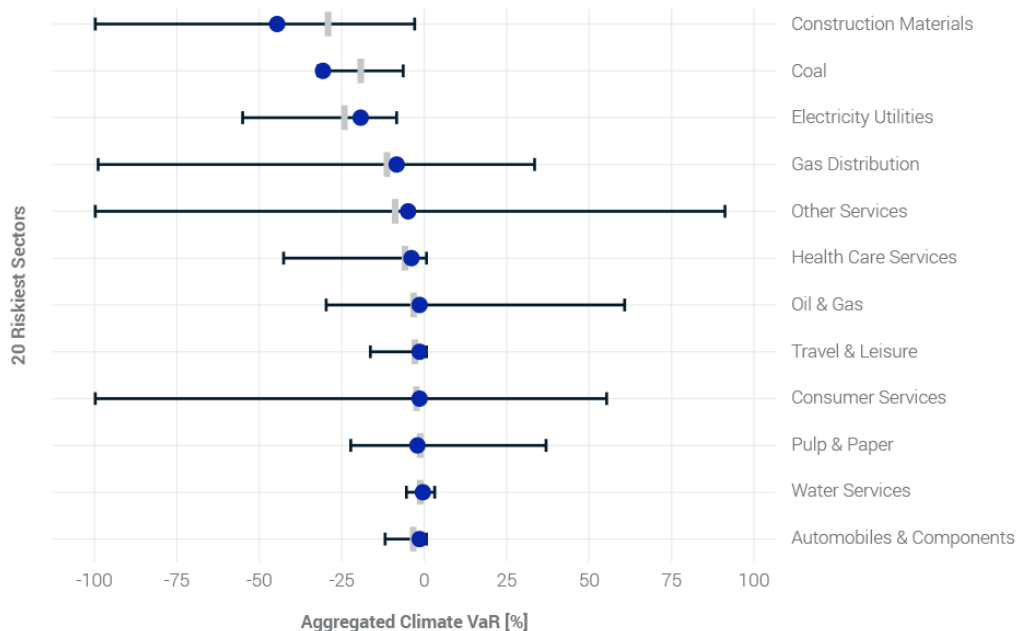
Carbon Delta's existing clients

Carbon Delta has worked with the below organizations to measure and manage climate risk



Which industries are most affected by climate risks?

CVaR spread by primary sectors of activity

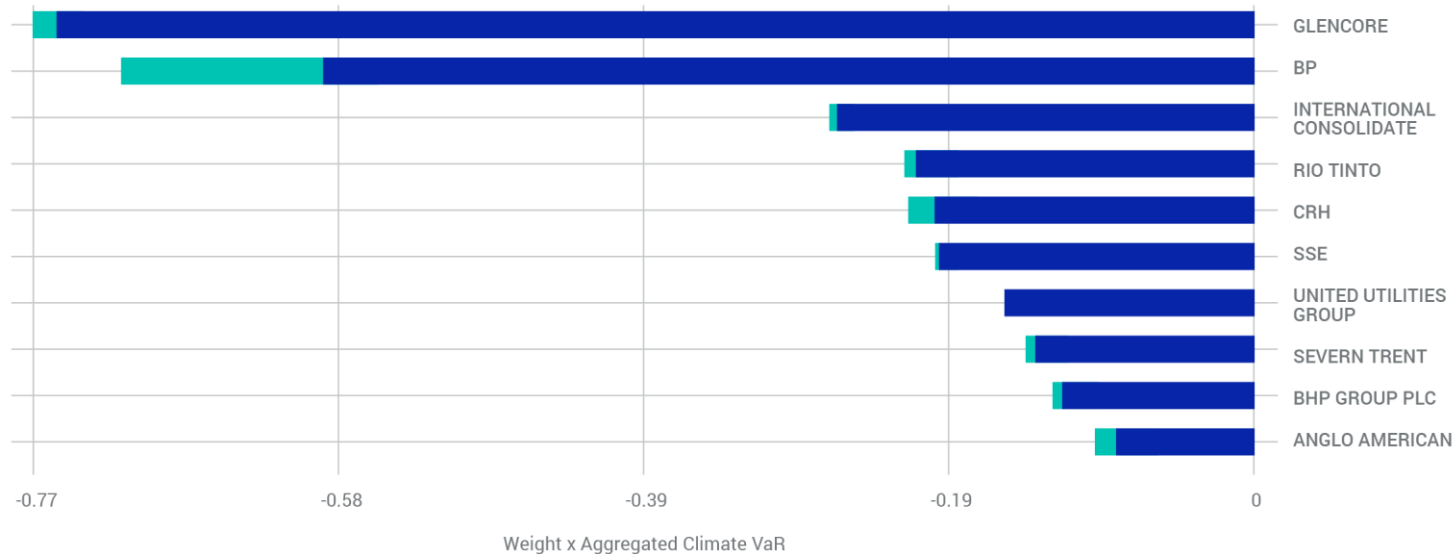


Optimize the Climate VaR of a portfolio

- Weighted Average aggregated CVaR in sector
- Arithmetic Average aggregated CVaR in sector
- Spread between the highest and lowest aggregated CVaR in each sector

Climate Risk Contribution

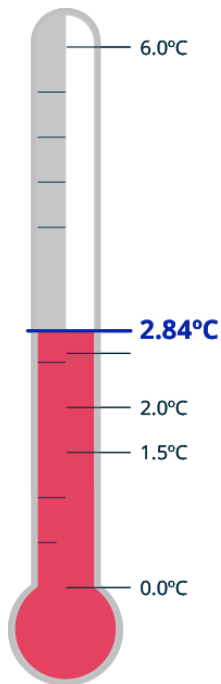
Portfolio CVaR contribution by security



● Transition risks ● Physical risks

How aligned is a sample portfolio with the Paris Climate Target?

Portfolio Warming Potential



Top 5 High-Warming Potential Securities

Security	Weight	Warming Potential
CANOPY GROWTH CORP	0.03%	6.00°C
HeidelbergCement AG	0.03%	6.00°C
LafargeHolcim Ltd	0.06%	6.00°C
Melco Crown Entertainment Ltd	0.02%	6.00°C
CNMC Health PLC	0.01%	6.00°C

Top 5 Low-Warming Potential Securities

Security	Weight	Warming Potential
Xerox Corp	0.02%	1.30°C
Tokyo Electron Ltd	0.06%	1.30°C
Smith & Nephew PLC	0.04%	1.30°C
Skyworks Solutions Inc	0.04%	1.30°C
Seagate Technology PLC	0.03%	1.30°C