CARBON DELTA Methodologies Overview

Carbon Delta is a climate change risk analytics firm that quantifies investment risks for more than 25,000 companies along numerous climate change scenarios. With our Climate Value-at-Risk (Climate VaR™) model, we aim to empower financial institutions with the tools necessary to protect assets from the worst effects resulting from climate change and also help identify new and unforeseen investment opportunities in the low carbon field.

This document provides readers with insights into the methodologies that Carbon Delta employs to assess climate change risks and opportunities within corporations.

TRANSITION AND PHYSICAL RISKS

Climate change risks can be placed into two broad categories commonly used in market practice for how environmental threats, and efforts to address them, can create financial risks:

TRANSITION RISKS

Risks which arise from efforts to address environmental change, including but not limited to abrupt or disorderly introduction of public policies, technological changes, shifts in investor sentiment and disruptive business model innovation.

PHYSICAL RISKS

Risks which arise from the impact of climatic (i.e. extreme weather) or geologic (i.e. seismic) events or widespread changes in ecosystem equilibria, such as soil quality or marine ecology. As the Financial Stability Board notes, they can be event-driven ('acute') or longer-term in nature ('chronic').

The following pages explain how Carbon Delta models both transition and physical climate risks within the Climate VaR™ model. The last page of this document provides a table of definitions related to Carbon Delta's methodologies and this documentation.

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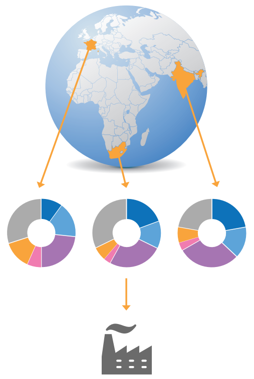
Transition Risks

POLICY RISKS

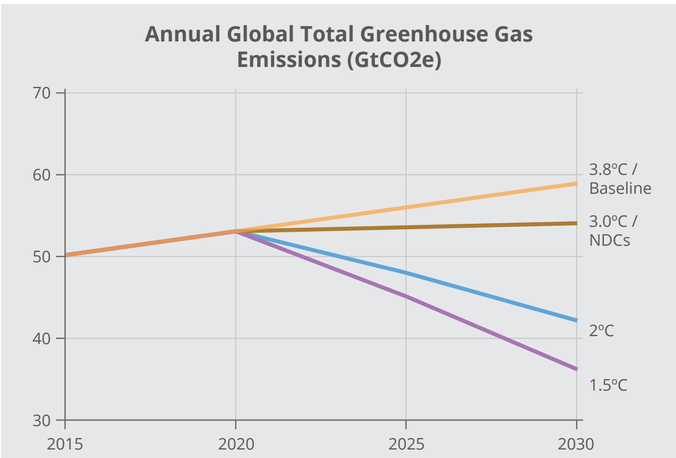
Carbon Delta calculates risks from expected policies aimed at addressing climate change. The modeling begins with the quantification of country level emission reduction targets embedded within policies that have been proposed within the Nationally Determined Contributions (NDCs) of the Paris Agreement. Country emission reduction targets are then transferred into sector level targets based on details within the NDCs as well as recently proposed regulations. Using Carbon Delta's installation database for intra-sector company comparison, sector emission reduction targets are then assigned to each company facility, giving Carbon Delta insights into the GHG emission constraints for facilities owned and operated by thousands of companies.



COST CALCULATION

To calculate the costs associated with reaching emission reduction targets, Carbon Delta uses technology and policy based price estimates available from Integrated Assessment Models (IAMs). Carbon Delta relies specifically on country and region specific carbon reduction prices from the model REMIND operated by the Potsdam Institute for Climate Impact Research (PIK), indicating the price per tCO2e required to reach 2030 emission targets in regions and countries across the globe. Carbon Delta's formula for calculating the costs associated with reaching an emission reduction target is straightforward:

TOTAL COST = REQUIRED GHG REDUCTION AMOUNT x PRICE



Source: The UNEP Emissions Gap Report 2017 and Carbon Delta

Multiplying a company's greenhouse gas (GHG) reduction requirement by the price estimates yield the company costs associated with reaching a defined GHG reduction target in each sector and country where a company generates GHGs.

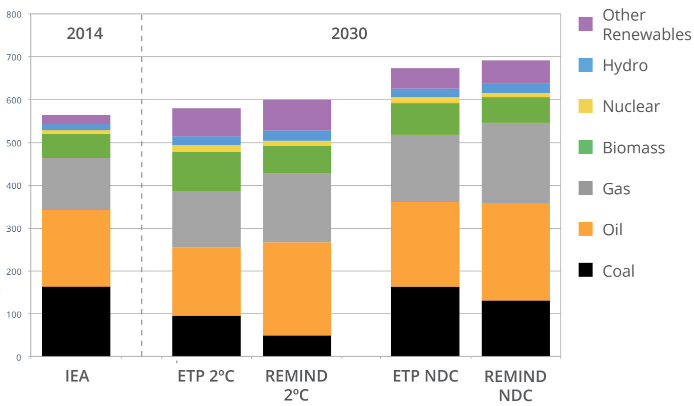
Carbon Delta's model currently analyzes three transition risk scenarios, each integrating carbon reduction price trajectories from respective IAM scenarios:

- **3°C Scenario / NDCs**: Cost of implementing proposed climate change regulations in 191 countries
- **2°C Scenario**: Cost if emission limitations for a 2°C goal are implemented
- **1.5°C Scenario**: Cost if emission limitations for a 1.5°C goal are implemented

TECHNOLOGY MIX

By incorporating the price estimates calculated by REMIND, Carbon Delta's analysis estimates the financial risks associated with the transition towards a global technology mix that has been determined by PIK's model.

The chart to the right highlights similarities and differences between the technology projections computed by PIK's REMIND model and the technology mix in the NDC and 2°C scenarios of the International Energy Agency's (IEA) Energy Technology Perspectives (ETP) model. REMIND projects faster growth of renewables in the power sector, while the ETP 2°C scenario foresees a higher substitution of oil with biomass.



Global 2030 Energy Mix Scenarios - IEA ETP vs. PIK REMIND

Physical Risks

EXTREME WEATHER RISKS

Physical climate risk scenarios define possible climate consequences as a result of increased levels of GHG emissions. They describe changes in global temperatures, precipitation levels, extreme weather events such as storms, snowfall, wildfires, etc. Using the past 35 years of observed extreme weather to set a historical baseline, Carbon Delta brings current and future extreme weather developments into perspective for the coming 15 years.

Current physical climate scenarios currently modeled by Carbon Delta include:

- **Extreme Weather**: Cost of extreme weather events relating to temperature changes (extreme heat and cold), extreme precipitation, extreme snowfall and wind patterns.

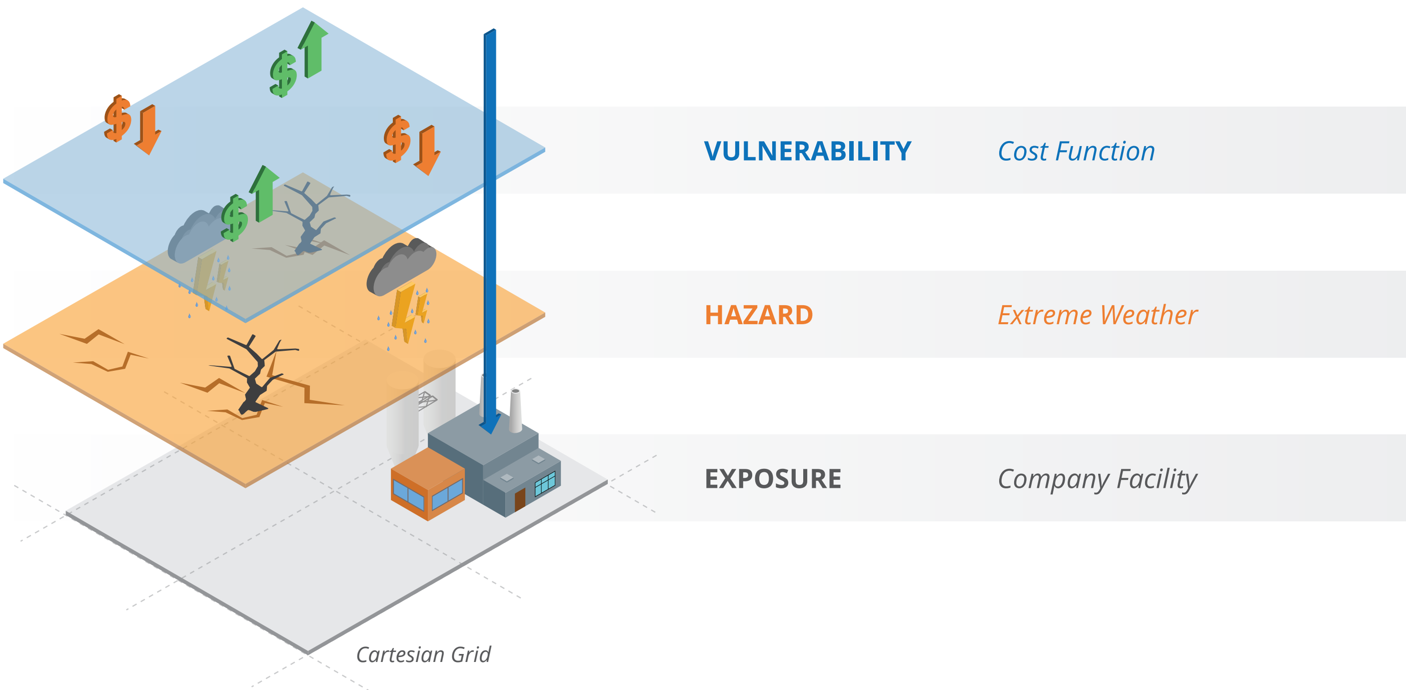
Physical climate impacts vary greatly depending on geographical positioning. This is why Carbon Delta employs global gridded data for assessing physical risks. To model high-resolution spatial distributions of extreme weather impacts across the globe, Carbon Delta has produced a 0.5° x 0.5° Cartesian grid whereby hazard data is overlaid. The coverage is global, reaching across all land covered area, and the grid cell width in mid-latitudes is around 15km, which reasonably resolves most cities.

Carbon Delta works closely with the Potsdam Institute for Climate Impact Research to define the hazard datasets and vulnerability functions used in the Climate VaR™ model.

COST CALCULATION

To quantify potential physical risks, Carbon Delta applies a formula used in most hazard models within the insurance industry, which can be represented as follows:

EXPECTED COST = VULNERABILITY x HAZARD x EXPOSURE



Carbon Delta's physical risk methodology is not only applicable for extreme weather scenario modelling, as outlined above. Additional climate datasets will be added to the Climate VaR™ model in early 2018, computing other physical risks, such as water run-off, wildfires, a tendency indicator for convective events, and fluvial and coastal flooding (from rivers and sea level rise). Carbon Delta and PIK are currently refining and calibrating a wealth of physical climate change data together.

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DEFINITIONS RELATED TO CARBON DELTA'S METHODOLOGIES

Name	Definition
Greenhouse Gas (GHG)	A GHG is a gas in an atmosphere that absorbs and emits radiation within the thermal infrared range. This process is the fundamental cause of the greenhouse effect.
tCO2e	CO2e is the shorthand for carbon dioxide equivalents. It is the standard unit in carbon accounting to quantify greenhouse gas emissions, emissions reductions and carbon credits. It is expressed in tonnes and written as tCO2e.
Nationally Determined Contributions (NDCs)	NDCs are the primary means for governments to internationally communicate the steps they will take to address climate change in their own countries. NDCs reflect each country's ambition for reducing emissions, taking into account its domestic circumstances and capabilities.
Financial Stability Board (FSB)	The Financial Stability Board is an international body that monitors and makes recommendations about the global financial system. It was established after the 2009 G20 London summit in April 2009 as a successor to the Financial Stability Forum.
Integrated Assessment Model (IAM)	Integrated assessment models aim to generate useful information for policy making, by analyzing various scenarios for future pathways. They integrate knowledge from two or more domains into a single framework, for example coupling representations of global the economic, energy and climate systems.
Representative Concentration Pathways (RCPs)	RCPs are four greenhouse gas concentration (not emissions) trajectories adopted by the IPCC for its fifth Assessment Report (AR5) in 2014.The pathways are used for climate modeling and research. They describe four possible climate futures, all of which are considered possible depending on how much greenhouse gases are emitted in the years to come.
Exposure (sometimes also called Inventory)	The presence of people, livelihoods, species or ecosystems, environmental functions, services, and resources, infrastructure, or economic, social, or cultural assets in places and settings that could be adversely affected.
Vulnerability (sometimes also called Sensitivity or Susceptibility)	The propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts and elements including sensitivity or susceptibility to harm and lack of capacity to cope and adapt.
Hazard (sometimes also called Impact)	The potential for consequences where something of value is at stake and where the outcome is uncertain, recognizing the diversity of values. Risk is often represented as probability of occurrence of hazardous events or trends multiplied by the impacts if these events or trends occur. Risk results from the interaction of vulnerability, exposure, and hazard (see Figure SPM.1). In this report, the term risk is used primarily to refer to the risks of climate-change impacts.

IN ASSOCIATION WITH

PIK

Climate-KIC

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