MOODY'S ANALYTICS

MODEL OVERVIEW

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# EDF-X Climate Impact At a Glance

The impact of global warming is a challenge for all interested in assessing the long-term sustainability of companies. Companies that fail to adapt to a changing climate and the associated policy responses may struggle to remain profitable. EDF-X Climate Impact is a scenario-based tool quantifying how a company could respond to climate change. It considers both the physical impact from global warming and the cost of transitioning to a low-carbon economy given a company's operations and supply chains.

EDF-X Climate Impact includes the projected impact on a company's financial statements and credit risk. For any company with a financial statement, we produce 30-year projections for a standard set of industry scenarios, using a fixed set of assumptions.

To help users quickly interpret company results, we provide a summary of the methodology and describe core assumptions below.

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## How should I use EDF-X Climate Impact?

EDF-X Climate Impact uses scenario driven techniques – an essential tool for risk managers – to estimate changes in company performance and assist lenders in various ways:

- Identify New Borrowers:

  Lenders can target firms that require the capital needed to transition to a less carbon-intensive future. The projected financial statements quantify how borrower performance could change under different policy responses and if the debt required is affordable.

  Portfolio managers rebalancing to reduce their exposure to negative climate events need to choose new positions carefully. EDF-X Climate Impact can help their search for companies that reduce climate associated risks while meeting their other mandates.

- Make Lending Decisions:

  Lenders are now positioned to consider the impact of climate change during the credit decisioning process. They can structure deals to reduce risk by, for example, shortening the loan life for companies that are more impacted or have higher levels of uncertainty associated with their performance.

  Where capital planning includes the impact of climate change (for example via regulation), lenders can calculate marginal costs for the new business based on a chosen scenario, helping make decisions to optimize scarce capital resources.

- Monitor and Report on Portfolio Performance:

  Monitoring current positions and reporting capital costs is the cornerstone of modern risk management. Portfolio managers can now quantify the impact of climate change under multiple scenarios and actively manage associated risks.

  Regulators are starting to ask companies to consider climate change when reporting risk. Portfolio managers can easily aggregate and report results from the granular climate-impacted performance estimates. Further, lenders can choose to use our risk assessments – or take the estimated financial statements and run their own models.

- Interact with Borrowers:

  Good lenders are trusted advisors, creating a lasting relationship with their corporate borrowers. Lenders provide financial advice and help borrowers understand how to grow their businesses and deal with a challenging marketplace.

  Climate change and the impact of different policy responses may affect companies worldwide. Climate-impacted financial statements provide both parties an understanding of potential impacts in a language everyone understands – financial statement. Projected financials will spark discussion about the unique challenges faced by a borrower, changes required to operating and business models, and potential financing needs.

## What outputs are produced?

EDF-X Climate Impact projects the outputs shown in Figure 1 over 30 years for each climate scenario:

**Figure 1:** EDF-X Climate Impact Outputs

| Earnings | Asset Values | Financial Statements | Credit Risk |
|---|---|---|---|
| Estimated impact on sales and operating costs | Estimated impact of the market value given future earnings | Estimated impact on financial statements | Estimated probability of default based on future earnings and changes in asset value |
| Used to understand the impact of climate change on the profitability of a company's current business model | Used to understand the impact of climate change on a company's future worth relative to its current market value | Used to understand the impact of climate change on the company's financial health and resilience | Used to understand the impact on a company's ability to stay current on debt obligations |

All outputs are available via the EDF-X API and are visualized in company specific reports. Example outputs are shown in Figure 2, Table 1 and Table 2.

**Figure 2:** Example Company Level Projections of Earnings, Asset Value and Credit Risk

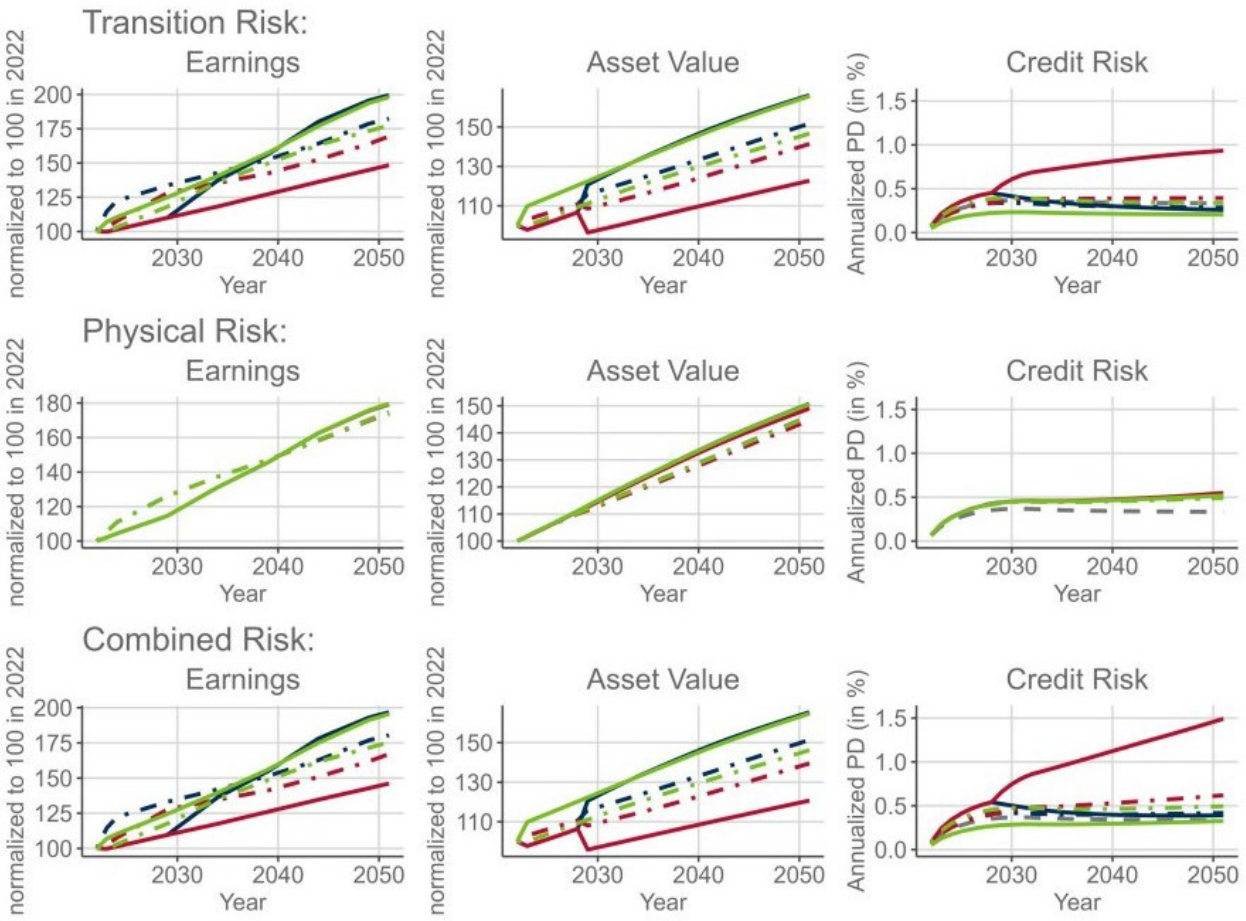


Table 1: Example Company-Level Balance Sheet Projection

| | | Orderly: Below 2°C | | | Disorderly: Delayed Transition | | | Hot House: Current Policies | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Latest | 2030 | 2040 | 2050 | 2030 | 2040 | 2050 | 2030 | 2040 | 2050 |
| - Cash and Marketable Securities | 65637 | 90536 | 127490 | 172689 | 90315 | 127788 | 174714 | 90315 | 126893 | 171094 |
| - Total Accounts Receivable | 26424 | 33739 | 43114 | 52975 | 33656 | 43216 | 53602 | 33656 | 42910 | 52481 |
| - Total Inventory | 155699 | 198802 | 254041 | 312145 | 198313 | 254642 | 315842 | 198313 | 252841 | 309234 |
| Total Current Assets | 378024 | 489402 | 637186 | 798961 | 488201 | 638689 | 808405 | 488201 | 634180 | 791525 |
| Total Fixed Assets | 98668 | 125935 | 160900 | 197657 | 125683 | 161229 | 199787 | 125683 | 160252 | 196011 |
| Total Intangible Assets | 1334 | 1703 | 2175 | 2672 | 1699 | 2180 | 2701 | 1699 | 2167 | 2650 |
| *Total Assets* | *476693* | *615996* | *799444* | *998625* | *614536* | *801283* | *1010236* | *614536* | *795778* | *989515* |
| - Notes Payable | NA | 5827 | 7562 | 9446 | 5813 | 7579 | 9556 | 5813 | 7527 | 9360 |
| - Debt Current Maturities | NA | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| - Short-Term Debt | 4509 | 5827 | 7562 | 9446 | 5813 | 7579 | 9556 | 5813 | 7527 | 9360 |
| - Total Accounts Payable | 30452 | 38882 | 49686 | 61050 | 38787 | 49803 | 61773 | 38787 | 49451 | 60481 |
| Total Current Liabilities | 258392 | 329993 | 421802 | 518429 | 329183 | 422798 | 524569 | 329183 | 419810 | 513596 |
| Total Long-Term Debt | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Non-Current Liabilities | 26773 | 34185 | 43683 | 53674 | 34101 | 43787 | 54310 | 34101 | 43477 | 53174 |
| *Total Liabilities* | *285166* | *364178* | *465485* | *572104* | *363283* | *466585* | *578879* | *363283* | *463286* | *566770* |
| Retained Earnings | NA | 620732 | 1394097 | 2360203 | 620574 | 1393551 | 2365028 | 620944 | 1393173 | 2353577 |
| *Net Worth* | *191527* | *251818* | *333959* | *426521* | *251253* | *334698* | *431357* | *251253* | *332491* | *422745* |

* Constant Currency, JPY; Unit: Thousands

Table 2: Example Company-Level Income Statement Projection

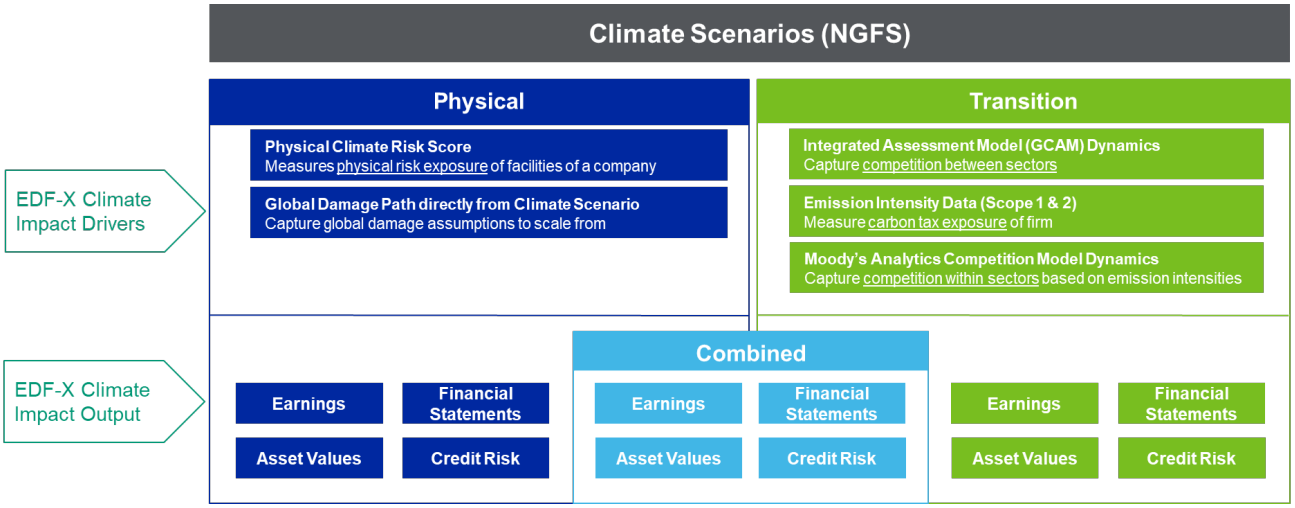
| | | Orderly: Below 2°C | | | Disorderly: Delayed Transition | | | Hot House: Current Policies | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Latest | 2030 | 2040 | 2050 | 2030 | 2040 | 2050 | 2030 | 2040 | 2050 |
| Net Sales | 898848 | 1147681 | 1466577 | 1802006 | 1144859 | 1470043 | 1823353 | 1144859 | 1459645 | 1785201 |
| Total Cost Of Goods Sold | 491270 | 629818 | 804581 | 988376 | 628460 | 806621 | 1000105 | 628014 | 800568 | 979035 |
| Gross Income | 407578 | 517863 | 661997 | 813630 | 516399 | 663422 | 823248 | 516845 | 659077 | 806166 |
| Total Amortization And Depreciation | NA | 26197 | 33669 | 41498 | 26149 | 33733 | 41888 | 26149 | 33539 | 41173 |
| Total Operating Expenses | NA | 388834 | 496788 | 610284 | 388239 | 498255 | 617632 | 387281 | 493896 | 604155 |
| *Total Operating Profit* | *103968* | *129496* | *165664* | *203779* | *128862* | *165852* | *206261* | *129565* | *165181* | *202011* |
| Finance Costs | 11493 | 2121 | 2769 | 3470 | 2116 | 2775 | 3505 | 2116 | 2757 | 3440 |
| Profit Before Taxes And Extrao. Exp. | 97359 | 127375 | 162895 | 200309 | 126746 | 163077 | 202756 | 127448 | 162425 | 198571 |
| Current Income Tax Expenses | 28977 | 37903 | 48472 | 59605 | 37715 | 48526 | 60333 | 37924 | 48332 | 59088 |
| Total Extraordinary Items | 22 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Net Income* | *68403* | *89473* | *114423* | *140704* | *89031* | *114551* | *142423* | *89524* | *114093* | *139483* |

* Constant Currency, JPY; Unit: Thousands

## How are EDF-X Climate Impact metrics produced?

Our approach evaluates how global warming and different policy responses could impact a company's financial performance and credit risk. We use standard industry assumptions and tools while also incorporating our own assessments and expectations.

Figure 3: Model Overview




The main steps of our methodology include:

1. Climate Scenarios:

   We start by using the Phase 3 scenarios from the Network for Greening the Financial System (NGFS). A summary of these scenarios can be found below.

2. Physical Risk Estimates:

   To evaluate the impact of physical risk on earnings, we take two steps:

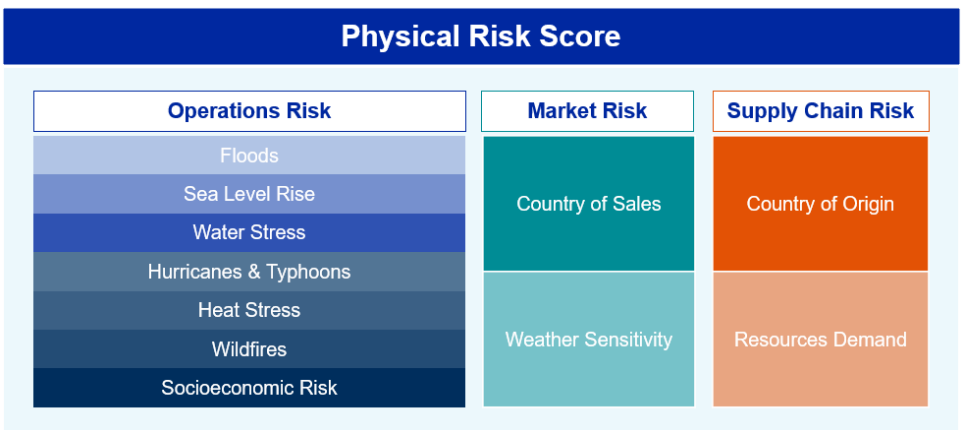
   a. First, we assess a company's exposure to physical risks related to global warming based on the location of its production facilities and physical assets. We produce a relative physical risk score between 0 (good) and 100 (bad), where a higher score indicates a greater exposure.

      The Physical Risk Score comprises weighted information of three sub-components:

      i) Operations Risk (70%), ii) Market Risk (15%), and iii) Supply Chain Risk (15%). The factors included in these components are shown in Figure 4. If we do not have a score for a given company, we use country-level estimates.

   b. Second, we estimate future earnings impact based on the global damage paths given in the climate scenarios using a Damage Exposure Model that takes the company score as input.

Figure 4: Factors included in the Physical Risk Score



Consequently, the company-specific drivers for Physical Risk are an assessment of the exposure based on the location of the company's assets and operations.

3. Transition Risk Estimates:

   To evaluate the impact of transition risk on earnings, we take two steps:

   a. First, we use the Global Change Assessment Model (GCAM) to evaluate how different industries evolve in a competitive economy given carbon prices developments, regulations, and shifts in consumer demand.

   b. Second, we consider how a company will compete within its sector given its current emissions. Scope 1 and 2 emission intensities drive a company's competitive position within a sector. We use two normalized indicators to capture these intensities and compare them to the industry average. This information is used as an input as we model the competitive dynamics of sector. This step outputs the future impact on a company's earning, sales, costs and quantities of goods sold.

   Consequently, the company specific drivers for Transition Risk are the evolution of industries under the scenarios based on GCAM assumptions and Scope 1 and 2 emissions, along with the competitive dynamics of a company within its industry.

4. Financial Statement Projections:

   Our methodology projects financial statements, by combining the latest annual reported values with outputs from the Transition Risk and Physical Risk Estimation steps.

   For Physical Risk, we take the estimated future earnings impact as an input and assume that 50% of this impact are damages to fixed assets, leading to write-offs and capital expenditure to replace the fixed assets, and the other 50% result in higher operating expenses to cope with physical risk events.

   For Transition Risk, our method takes the projected impact on future earnings, sales and the quantity of goods produced. We use this to produce projected annual changes to operating profits, sales and fixed assets, relative the current position.

   We define a set of expected company dynamics that, together with the projected assumptions, produce full financial statements. A summary of the dynamics and assumptions used for transition risk are:

   - Fixed assets and intangibles: Projected changes in quantity of goods produced drives changes in fixed assets and intangibles. We assume that the ratio of fixed assets to quantity is constant, so when quantities fall, we need to liquidate fixed assets. A 50% discount is applied to reflect the scarcity of potential buyers. We use an analogous approach for intangibles.
   - Operating Margin: We calculate a sustainable operating margin starting point using the past 5 years, where available. This reduces the impact of short-lived business conditions and provides a more balanced view. To this we add the projected change on operating profits, passing on only half the costs to achieve net zero to customers and consider the sales of discounted fixed assets described above. Finally, we smooth the results so there are no large jumps.
   - Working Capital: We assume the structure of working capital (Accounts Receivable + Inventories – Accounts Payable) remains constant over the projections and scales with changes in sales.
   - Depreciation and Amortization: We assume that the percentage of both depreciation and amortization remain constant in the projection and derive them from the latest financial statement.
   - Cash Management and Financing Dynamics: We assume the current value of debt to assets represents a company's financing strategy and hold this ratio constant unless the company runs short of cash and needs additional financing. Companies need cash for operations, so we assume it cannot get lower than the minimum of the latest value or 4% of projected sales. If sufficient cash is available companies pay dividends. We assume a dividend cap of 25% of net income. We cap cash so it is proportional to sales growth, with excesses paid out to equity holders and to payback debt. This stops cash from growing unreasonably in the projections.

   To calculate the Combined Risk, our method first adds the Physical and Transition financial impacts together, then uses the same dynamics described above to determine the impact on the other financial statement items.

5. Asset Value Paths:

   We derive asset value paths using the risk impacted expected earning paths from the previous steps via a discounted cash flow method. To calculate the asset value paths under Combined Risk we first combine the impact of physical and transition risks on Expected Earning paths.

6. Credit Risk Estimates:

   We use our EDF model to estimate the probability of default based on asset value and associated asset volatility paths.

## Climate Related Terminology

### Emissions

The Greenhouse Gas Protocol created three types of greenhouse gas emission. These are known as scopes and defined as follows:

- Scope 1 emissions: This includes all direct greenhouse gas emissions that occur from sources that are owned or controlled by a company. Examples of Scope 1 emissions include emissions from combustion in owned or controlled boilers, furnaces, vehicles, and other equipment.
- Scope 2 emissions: This includes all indirect greenhouse gas emissions that are a result of the generation of purchased electricity, heat or steam consumed by a company. These emissions occur at the facility where the electricity, heat or steam is generated, but they are considered indirect emissions for the company that is purchasing and using the energy.
- Scope 3 emissions: This includes all other indirect greenhouse gas emissions that occur in a company's value chain. These emissions occur because of the company's activities, but they are generated by sources that are not owned or controlled by the company. Examples of Scope 3 emissions include emissions from purchased goods and services, transportation and distribution, waste generated in operations, and employee commuting.

### Integrated Assessment Models

Integrated Assessment Models (IAMs) are tools developed by climate scientists and economists to help evaluate the potential impacts of various economic, social, and environmental policies on climate. These models simulate how changes in different sectors, such as energy production, land use, and transportation, can affect things like greenhouse gas emissions, economic growth, and human welfare.

GCAM is one such model. We use it to estimate the future earnings path of different sectors as the world transitions to a low carbon future. GCAM is an integrated, multi-sector model that explores both human and Earth system dynamics. It has been developed at the Pacific Northwest National Laboratory for over 30 years and is now a freely available community model and documented online.

GCAM has several advantages over other Integrated Assessment Models, including its granular spatial and temporal detail, flexible modeling framework, integration of multiple sectors, and long-term analysis horizon.

## Scenario Narratives

Our methodology draws on the third version of the scenarios developed by the Network for Greening the Financial System (NGFS Phase 3). A description of each of the six scenarios can be found below:

### Net Zero 2050 Scenario

An ambitious scenario that limits global warming to 1.5 °C through stringent climate policies and innovation, reaching net zero CO2 emissions around 2050. Some jurisdictions such as the US, EU and Japan reach net zero for all greenhouse gases by this point. This scenario assumes that ambitious climate policies are introduced immediately. CDR is used to accelerate the decarbonization but kept to the minimum possible and broadly in line with sustainable levels of bioenergy production. Net CO2 emissions reach zero around 2050, giving at least a 50% chance of limiting global warming to below 1.5 °C by the end of the century, with no or low overshoot (< 0.1 °C) of 1.5 °C in earlier years. Physical risks are relatively low, but transition risks are high.

### Below 2˚C Scenario

Gradually increases the stringency of climate policies, giving a 67% chance of limiting global warming to below 2 °C. Assumes that climate policies are introduced immediately and become gradually more stringent, though not as high as the Net Zero 2050 scenario. Carbon Dioxide Removal (CDR) deployment is relatively low. Net zero CO2 emissions are achieved after 2070. Physical and transition risks are both relatively low.

### Divergent Net Zero Scenario

Like the Net Zero 2050 scenario but assumes that climate policies are more stringent in the transportation and buildings sectors. This mimics a situation where the failure to coordinate policy stringency across sectors results in a high burden on consumers, while decarbonization of energy supply and industry is less stringent. Furthermore, the availability of CDR technologies is assumed to be lower than in Net Zero 2050. Emissions are in line with a climate goal giving at least a 50% chance of limiting global warming to below 1.5 °C by the end of the century, with no or low overshoot (<0.1 °C) of 1.5 °C in earlier years. This leads to considerably higher transition risks than Net Zero 2050 but overall, the lowest physical risks of the 6 NGFS scenarios.

### Delayed Transition Scenario

Assumes global annual emissions do not decrease until 2030. Strong policies are then needed to limit warming to below 2 °C. Negative emissions are limited. This scenario assumes new climate policies are not introduced until 2030 and the level of action differs across countries and regions based on currently implemented policies, leading to a 'fossil recovery' out of the economic crisis brought about by COVID-19. The availability of CDR technologies is assumed to be low pushing carbon prices higher than in Net Zero 2050. As a result, emissions exceed the carbon budget temporarily and decline more rapidly than in Well-below 2 °C after 2030 to ensure a 67% chance of limiting global warming to below 2 °C. This leads to both higher transition and physical risks than the Net Zero 2050 and Below 2 °C scenarios.

### Nationally Determined Contributions (NDC) Scenario

This scenario includes all pledged policies even if not yet implemented. This scenario assumes that the moderate and heterogeneous climate ambition reflected in the NDCs at the beginning of 2021 continues over the 21st century (low transition risks). Emissions decline, but still leads to approximately 2.5 °C of warming associated with moderate to severe physical risks. Transition risks are relatively low.

### Current Policies Scenario

Assumes that only currently implemented policies are preserved, leading to high physical risks. Emissions grow until 2080 leading to about 3 °C of warming and severe physical risks. This includes irreversible changes like higher sea level rise. This scenario can help central banks and supervisors consider the long-term physical risks to the economy and financial system if we continue on our current path to a 'hot house world'.

## For More Information

To learn more about EDF-X and other Moody's solutions, contact our experts at clientservices@moodys.com.