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Climate Analytics at McKinsey

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We help answer our client's climate questions

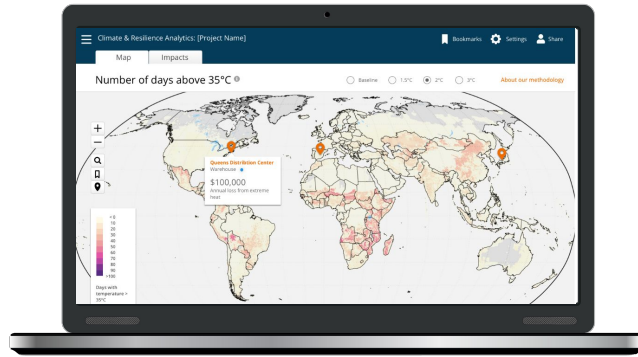
Not exhaustive

Client type	Common client questions	Typical use cases
 Corporates	<ul style="list-style-type: none">• What is my exposure to climate change and weather events?• How can we concretely mitigate my physical risk and improve climate resilience?• Is my supply chain resilient to climate change?• Is my asset resilient to physical climate hazards? What is the climate exposure of its location?• How can we develop my own model for physical climate risk? How do we select the right climate data and scenarios?• Do we have the right skills and competences on climate risks and opportunities?	<p>TCFD reporting and regulatory disclosure</p> <p>Sustainability Disclosure to rapidly assess of risks and opportunities</p> <p>Corporate or supply chain risk assessment</p> <p>Private Equity and investment decisions</p> <p>Infrastructure and capital planning</p> <p>Resilience planning for extreme weather and chronic climate stressors</p>
 Financial institutions	<ul style="list-style-type: none">• What is the value-at-risk for my portfolio – by hazard, asset type, and geography?• How can we stress-test my portfolio? What capabilities do we need to do this in-house?• What opportunities can we capture to support resilience?• How can we include climate risks in underwriting?	
 Public sector	<ul style="list-style-type: none">• What disasters and vulnerabilities is a country/region exposed to and what are potential economic, human, environmental, and social impacts?• How will climate change impact economic growth (e.g., drought impact on GDP)?• What are the most cost-effective adaptation strategies?• How should governments invest in risk reduction instruments (e.g., catastrophe bonds, contingency budgets)?	

Our cutting-edge in-house assets help deliver robust climate hazard exposure assessments, quantified impacts and adaptation pathways

Steps to build climate resilience and supporting assets:

- 1 **Climate hazard exposure assessment** at asset-level for acute and chronic key climate hazards, including probabilistic assessment of some hazards

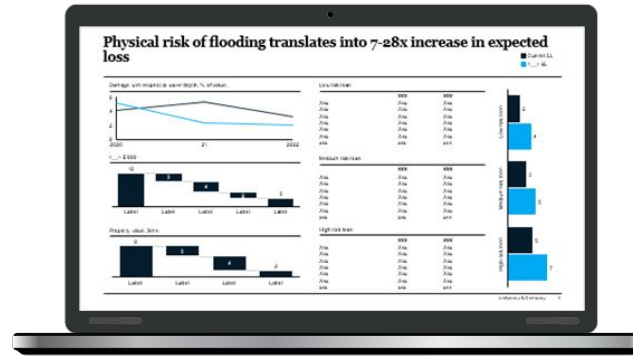


Assets

Global climate hazard maps (e.g., flood, extreme heat, drought, water stress, workability, sea level rise) modelled across multiple climate scenarios and time horizons

Interactive dashboard visualization enabling client-specific footprint and impacts (*In development*)

- 2 **Impact quantification** for 1st order impacts at asset level (e.g., building damage), across supply chain, and 2nd and 3rd order socio-economic impacts (e.g., GDP loss)

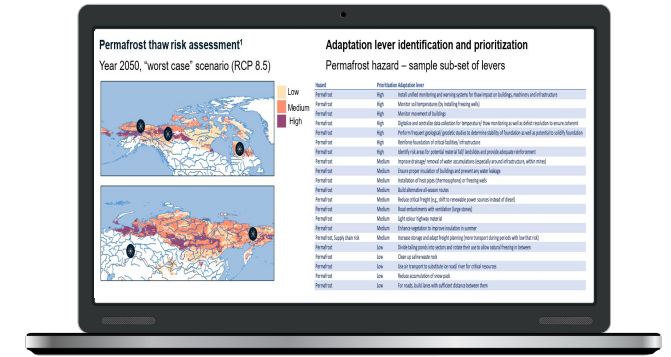


Library of >10,000 damage functions to translate risk into quantified financial value, based on asset value and operational downtime

Economic models for socio-economic impacts, including the labor force, community and wider economy

Industry-specific impacts (e.g., leasing impacts) are co-developed with practice

- 3 **Adaptation and resiliency planning** for asset and sector specific measures to minimize or avoid impacts from climate change



Adaptation lever library to build resilience, protect people and assets, and reduce exposure, prioritized according to cost-benefit analysis and external factors (*In development*)

1: Climate hazard exposure assessment uses best-in-class climate science and in-house expert team

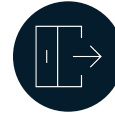


Our approach

Identify high-risk assets or areas by running qualitative and quantitative exposure or resilience assessment across intersections of:

- **Exposure:** severity and likelihood of climate hazards, using various hazard maps
- **Vulnerability:** how heavily an asset type is likely to be impacted or damaged by various climate hazards
- **Criticality of assets:** how heavily operation and finances will be impacted if the asset is offline or damaged

Co-develop with client prioritized list of assets likely to be impacted climate hazards for further quantification and adaptation



Output

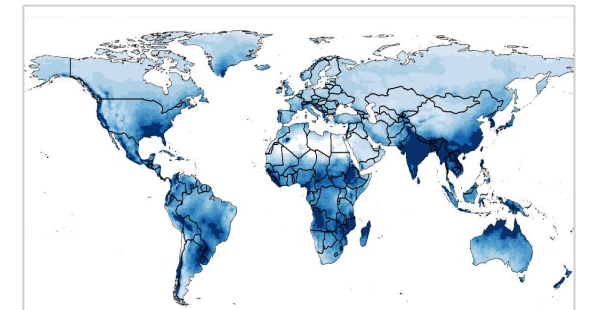
Hazard-specific maps illustrating risk distribution in selected scenarios for selected assets

Risk and resilience indicators for prioritization of vulnerable assets, based on hazard thresholds

Client capability building sessions, led by climate scientists to build scientific understanding










Methodological report to provide transparency on approach and sources, incorporating any custom approaches or analysis

Example hazard map: 98th percentile of precipitation in year 2050 in high physical risk scenario (no mitigation), down-scaled to 25km resolution



1: We conduct exposure assessment across relevant climate hazards

Internal data and modeling capabilities³

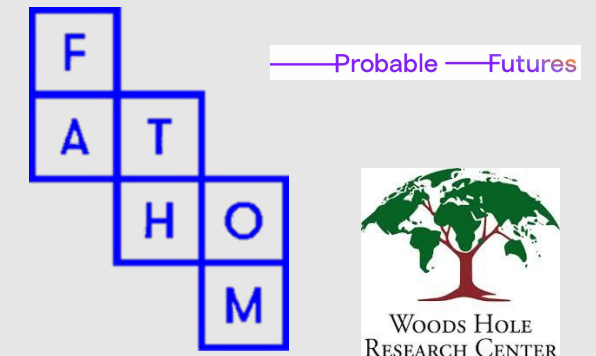
Hazard type	Climate Hazard ¹	Level of granularity	Example metric description
Acute	 River and coastal Flooding	30m globally	Typically 1-in-100 year return periods, expressed as a depth of water ²
	 Extreme heat	9km (Select regions), 25km (global)	Temperature frequency for days above historical 98 th percentile
	 Wildfire	25km (global)	Fire Weather Index (Fire weather conditions)
	 Tropical cyclones (Hurricanes)	10km	Historic and future pathways and intensity; <i>Currently available for US Gulf of Mexico region</i>
	 Extreme precipitation	9km (Select regions), 25km (global)	Extreme rain rate for 99th percentile above the historical threshold
Chronic	 Changes in temperature patterns	9km (Select regions), 25km (global)	Change of freezing, cooling or heating days relative to the historical baseline
	 Water stress	1km	Water withdrawal to water supply ratio
	 Drought	25km	Number of years with drought
	 Sea level rise	100km	Change in depth and frequency of coastal flooding events relative to historical baseline

1. Additional hazards can be included if relevant for client

2. Additional return periods available based on level of risk tolerance required

3. As of June 2023 - Available hazards and granularity continually updated

External partnerships to complement



oikolab

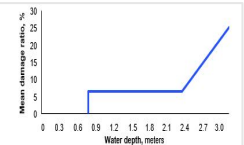


2: We quantify impact across client assets, supply chain and broader community

Climate hazards can create impacts across the following



Our approach

Built assets and operations	<p>Quantify financial impact linked to direct asset damage following an acute climate hazard (e.g., extreme wind) on a variety of asset types (e.g., residential, commercial, industrial)</p> <p>Estimate value-at-risk for a given event or Annual Average Loss (AAL)</p> <p>Use vulnerability functions linking hazard intensity to expected damage</p> <p>For owned assets, calculate AAL from operational downtime, productivity loss, and changes in opex or revenue from climate change</p>	
Across the supply chain	<p>Estimate average annual loss from disruptions to suppliers, customers and logistics hubs or routes:</p> <ul style="list-style-type: none">• Operational downtime of assets in the value chain (e.g., suppliers' facilities)• Loss of productivity due to extreme temperatures (e.g., forced shut-down due to machinery overheating)• Increased OPEX or decreased revenue due to chronic climate hazards (e.g., agricultural yield decrease)	
Communities and economy	<p>Calculate impacts to livability and workability (e.g., heat stress on outdoor labor)</p> <p>Estimate impact of climate hazards on life, livelihood, and other socio-economic variables (e.g., GDP, population exposed, jobs at risk)</p> <p>Customize metrics to address unique use cases (e.g., health metrics)</p> <p>Available at city, state, country and regional levels of granularity</p>	



Output

Financial impact quantified from direct asset damage for each asset

Direct asset damage quantified for electric grid and transportation infrastructure

Financial impact quantified from business interruption

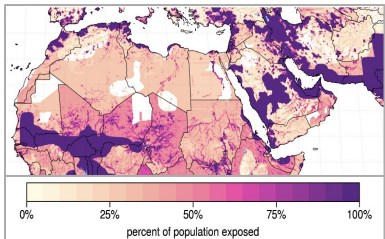
Portfolio level estimates of total value at risk

Summarized financial impact across supply chain from acute event (e.g., extreme storm) or chronic hazards (e.g., changes in land suitability)

Identify supply chain 'hot spots' or 'choke points' to prioritize for resilience

Quantified impacts based on metrics of interest

Example output:
Population exposure in Africa



As of August 2022 - Capabilities continue to be updated

3: We help build an actionable adaptation roadmap to address priority climate impacts and opportunities



Our approach

Evaluate potential **options to improve climate resilience** or their impacts, in all the relevant steps of the value-chain (e.g., protect own assets, increase resilience of supply)

Develop prioritization criteria with clients to apply appropriate lens of criticality and importance

Craft **high-level roadmap**, potentially including adaptive pathways to adjust next steps based on evolving climate reality

Identify, coordinate and manage **execution of capital projects** and investments for resilience building

Define and accelerate **resilience-related financial products** or business ventures



Output

Adaptation roadmap outlining potential interventions and relative prioritization

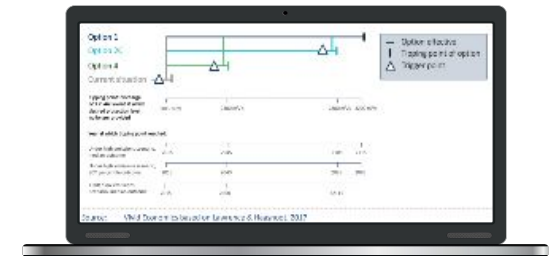
Methodological report to inform any relevant disclosure requirements (e.g., TCFD reporting)

Capital investment plan and financing strategy for resilience capital investments (e.g., asset hardening)

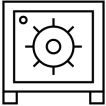

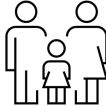
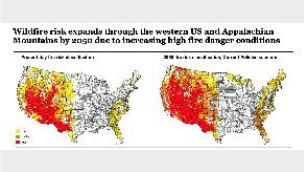
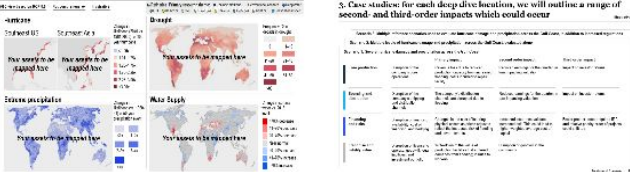
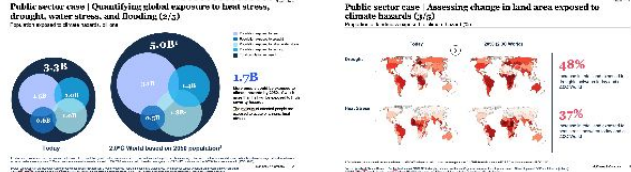
Adaptation technology investment strategy or business plan

Insurance strategy and execution support to de-risk and prepare for high volume events

Example adaptation plan
Roadmap with adaptive pathways and triggers to respond to changing climate reality



Our work is relevant to clients across all sectors, and covers both climate risk and resilience analysis and management strategies

Select client work	Public sector:		
Example	 Banking: climate risk scenario analysis	 Mining: physical risk assessment for TCFD report	 assessment of vulnerable populations
Objective	Conduct portfolio heatmapping and pilot stress test to assess exposure to climate risk	Help client identify most exposed assets and conduct deep-dives on those, quantifying full Value-at-Risk (VaR)	Create a 5-km resolution global dataset to identify the most vulnerable populations from physical climate risks
Approach	<p>Identified most critical hazards and quantified hazard level over time for real estate, C&I, and other portfolios</p> <p>Assessed impact to property values and asset income</p> <p>Developed climate-driven stress tests to evaluate changes in expected losses</p>	<p>Creating heatmaps of assets and hazards, to understand key sensitivities</p> <p>Sizing indicative VaR across full portfolio in 3 scenarios</p> <p>Conducting granular analyses on key assets including supply chain impacts</p>	<p>Analyzed terabytes of data to map how heat stress, drought, and flooding will change and affect populations over next three decades</p> <p>Developed resiliency metrics to enable a large NGO to track mobilization efforts</p>
Impact	 <p>Enabled client to conduct climate stress tests regularly and begin incorporating climate risk into high-level loan decisions</p>	 <p>Building cross-portfolio VaR view and detailed assessment on priority assets will enable client to formulate robust risk management strategy</p>	 <p>Identified 3B+ people at risk in 2050 under a 2°C warming scenario, enabling NGO to generate new resiliency projects targeting high-risk areas</p>