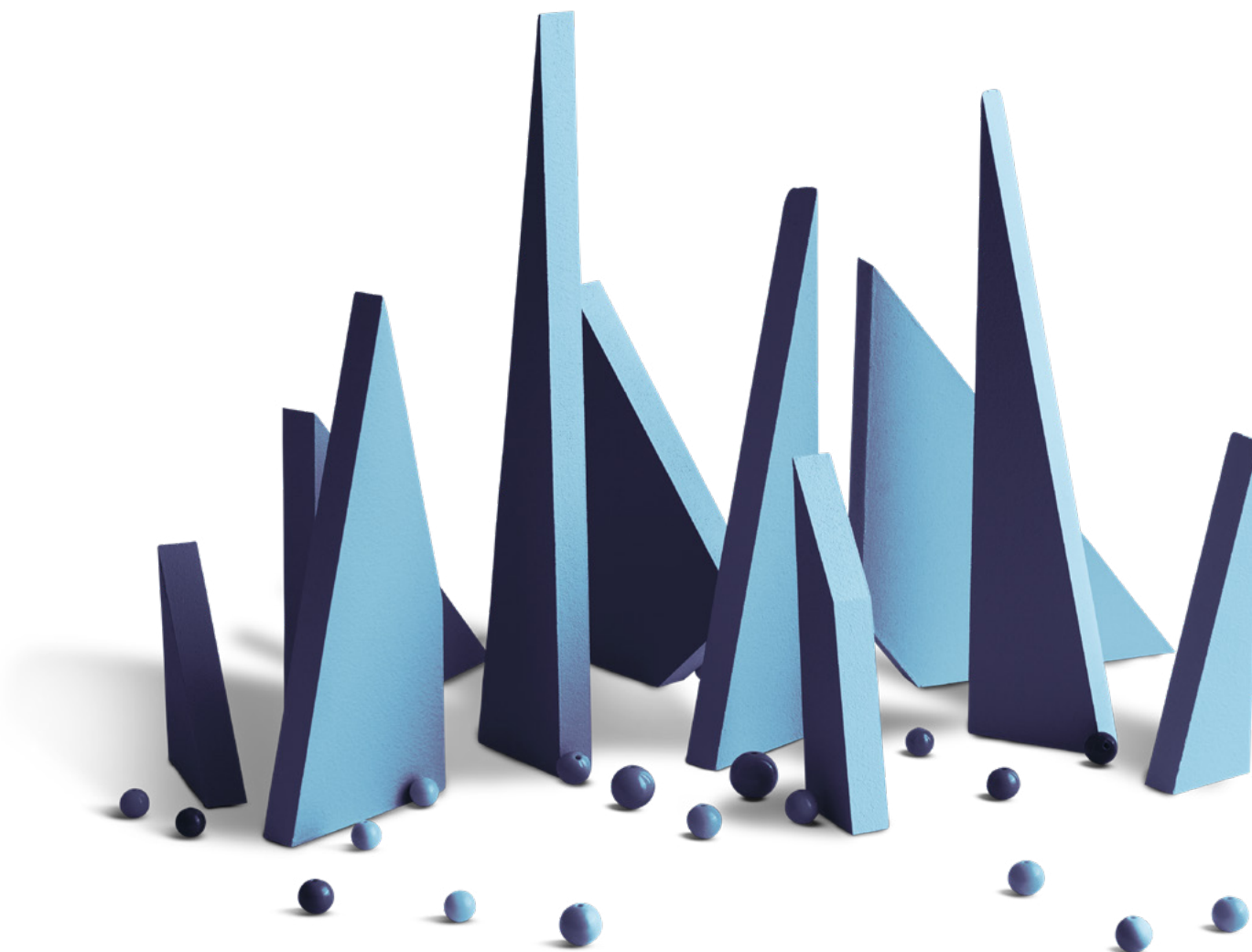McKinsey
& Company

Data and Analytics Innovations to Address Emerging Challenges in Credit Portfolio Management

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About IACPM

The IACPM is an industry association established to further the practice of credit exposure management by providing an active forum for its member institutions to exchange ideas on topics of common interest. The Association represents its members before regulatoryand administrative bodies in the US and internationally, holds bi-annual conferences and regional meetings, conducts research on the credit portfolio management field, and works with other organizations on issues of mutual interest relating to the measurement and management of portfolio risk. Currently, there are over 135 financial institutions based in 29 countries that are members of the IACPM. More information is available at: www.iacpm.org.

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Financial institutions have made significant progress in using new data and techniques for credit portfolio management
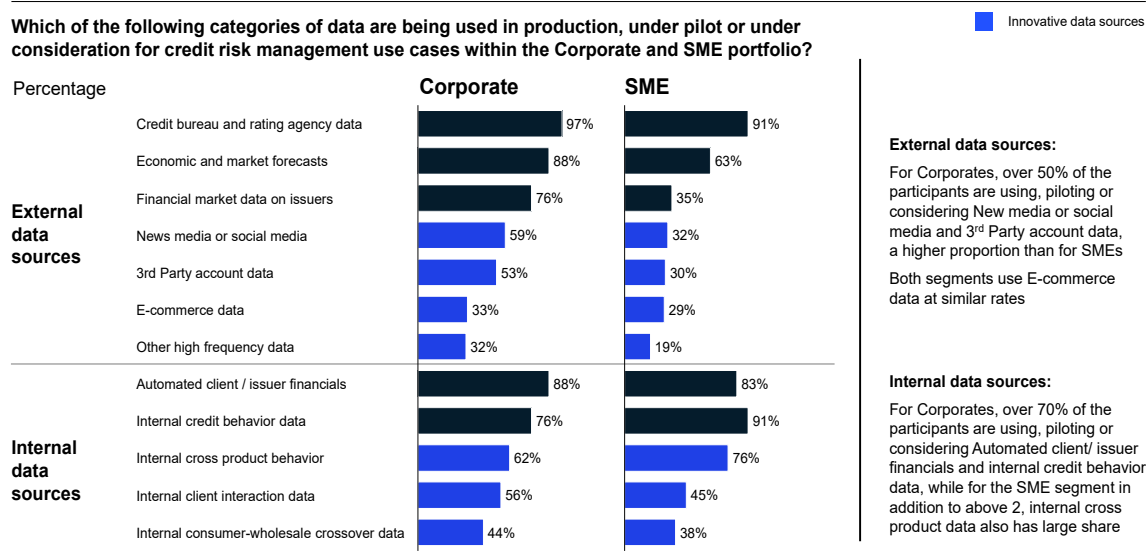
A survey of financial institutions shows firms made significant progress in using new data and techniques for credit portfolio management, but that challenges remain around technology, talent, and integration of new use cases like climate/ESG risk. In recent years, many financial institutions have increased their adoption of data and new technologies to manage credit portfolios. McKinsey and the International Association of Credit Portfolio Managers (IACPM) surveyed 44 financial institutions globally on latest developments in data and analytics for credit portfolio management. The objectives of the survey were to understand the use of traditional and alternative data sources for credit risk information, how financial institutions use analytical approaches across portfolio segments, and to inform the path forward to incorporate next-generation data and analytics across Small and Medium Enterprises (SME), Corporate and Commercial Real Estate (CRE) portfolios.

More than 60% of respondents said that in the past two years they have increased their use of new types of data and deployment of advanced analytical techniques like machine learning for advanced credit portfolio management. An even larger portion of respondents (>75%) expect these trends to continue over the next two years.

As they look to deploy new analytics, companies are obtaining data from sources like automated client financials, internal credit behavior data and cross-product data from internal sources, credit bureau, economic forecasts and news data from external providers. This includes alternative data as well, for example, in the corporate portfolio, more than half of respondents are currently using, piloting, or considering news media, social media, or 3rd party account data. Relative to these sources, fewer banks are using internal cross-portfolio data on consumer-to-wholesale cross-over accounts, with 44% banks evaluating whether to use this for their corporate portfolio and 38% for their SME portfolio.

Exhibit 1

Innovative external data sources are more used for Corporate segment while SME segment uses more innovative internal data sources
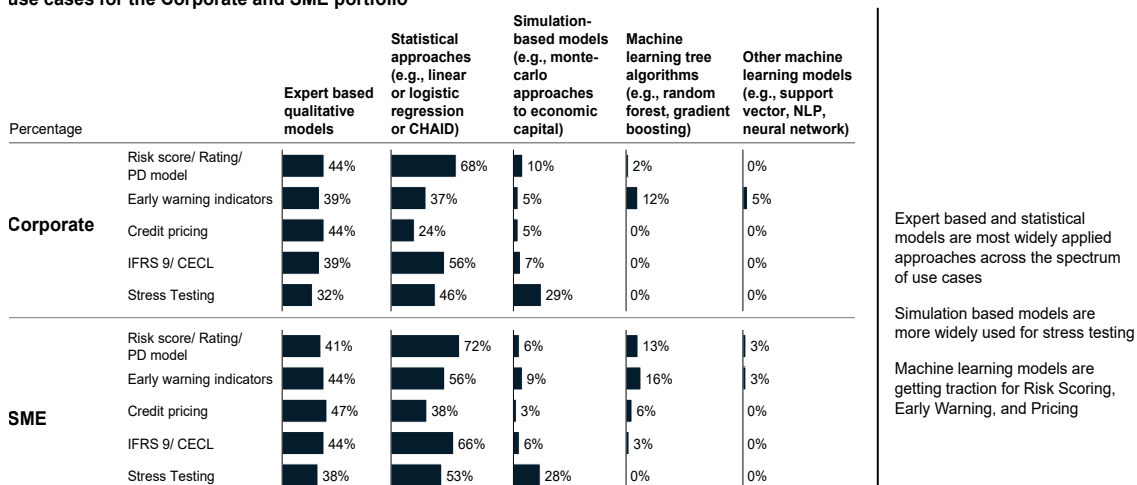

Which of the following categories of data are being used in production, under pilot or under consideration for credit risk management use cases within the Corporate and SME portfolio?

Innovative data sources

Percentage		Corporate	SME
External data sources	Credit bureau and rating agency data	97%	91%
	Economic and market forecasts	88%	63%
	Financial market data on issuers	76%	35%
	News media or social media	59%	32%
	3rd Party account data	53%	30%
	E-commerce data	33%	29%
	Other high frequency data	32%	19%
Internal data sources	Automated client / issuer financials	88%	83%
	Internal credit behavior data	76%	91%
	Internal cross product behavior	62%	76%
	Internal client interaction data	56%	45%
	Internal consumer-wholesale crossover data	44%	38%

External data sources:

For Corporates, over 50% of the participants are using, piloting or considering New media or social media or 3rd Party account data, a higher proportion than for SMEs

Both segments use E-commerce data at similar rates

Internal data sources:

For Corporates, over 70% of the participants are using, piloting or considering Automated client/ issuer financials and internal credit behavior data, while for the SME segment in addition to above 2, internal cross product data also has large share

Given segment characteristics, implementation of data intensive, new techniques like machine learning are focused on specific asset classes and specific use cases. Adoption of machine learning models is higher in SME segments than large corporates for a good reason. In SME portfolios these models have found their use in credit scoring, early warning signal development, and credit pricing. In corporate asset classes, however, their usage is largely confined to early warning indicator development.

Exhibit 2

Machine learning models are primarily gaining traction for Risk Scoring of SMEs and Early Warning across the board

What methodologies are being "used in production", "validated" or "in pilot" for each of the listed use cases for the Corporate and SME portfolio

Percentage		Expert based qualitative models	Statistical approaches (e.g., linear or logistic regression or CHAID)	Simulation-based models (e.g., monte-carlo approaches to economic capital)	Machine learning tree algorithms (e.g., random forest, gradient boosting)	Other machine learning models (e.g., support vector, NLP, neural network)
Corporate	Risk score/ Rating/ PD model	44%	68%	10%	2%	0%
	Early warning indicators	39%	37%	5%	12%	5%
	Credit pricing	44%	24%	5%	0%	0%
	IFRS 9/ CECL	39%	56%	7%	0%	0%
	Stress Testing	32%	46%	29%	0%	0%
SME	Risk score/ Rating/ PD model	41%	72%	6%	13%	3%
	Early warning indicators	44%	56%	9%	16%	3%
	Credit pricing	47%	38%	3%	6%	0%
	IFRS 9/ CECL	44%	66%	6%	3%	0%
	Stress Testing	38%	53%	28%	0%	0%

Expert based and statistical models are most widely applied approaches across the spectrum of use cases

Simulation based models are more widely used for stress testing

Machine learning models are getting traction for Risk Scoring, Early Warning, and Pricing

Source: McKinsey/IACPM Survey on data and analytics innovations in Credit Portfolio Management – October 2021
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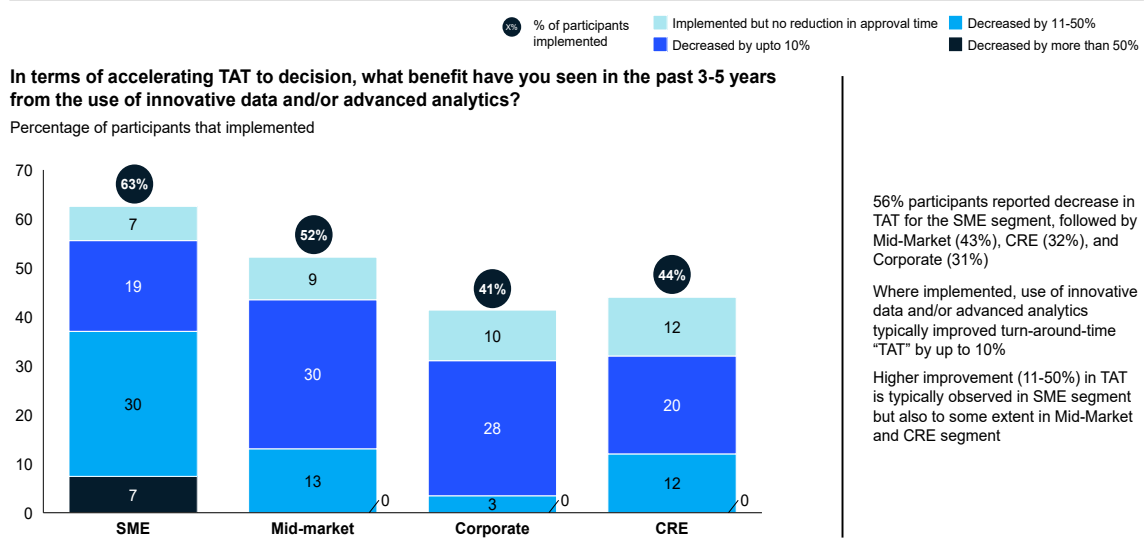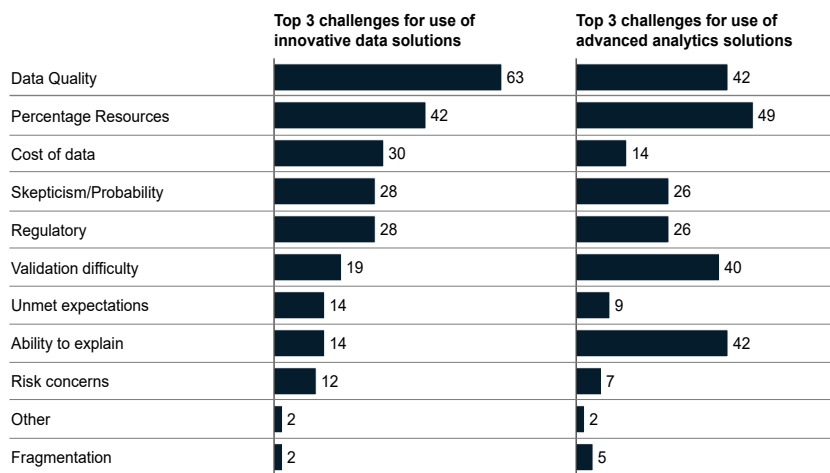
Banks that have fully automated decisions for a majority of the portfolio (>50%) are still relatively rare (~11% for SME portfolios and ~4% for mid-market).

However – specifically for SME portfolios ~30% of respondents reported that they have automated > 30% of their decisions. In addition, in the SME space, respondents report a significant benefit in turnaround time (TAT), with 37% participants reporting a > 10% decrease in TAT.

The benefits of new data and analytics in mid-market, corporate and CRE space has not translated to reduction in turnaround time to such an extent – Only 13%, 3%, and 12% of banks that have automated some of their credit decisions across mid-market, corporate, and CRE portfolios respectively have seen > 10% decrease in turnaround time.

Exhibit 3

Where implemented, use of innovative data and/or advanced analytics significantly improved turn-around-time for SMEs

(X%) % of participants implemented	■ Implemented but no reduction in approval time ■ Decreased by 11-50%
	■ Decreased by upto 10% ■ Decreased by more than 50%

In terms of accelerating TAT to decision, what benefit have you seen in the past 3-5 years from the use of innovative data and/or advanced analytics?

Percentage of participants that implemented

56% participants reported decrease in TAT for the SME segment, followed by Mid-Market (43%), CRE (32%), and Corporate (31%)

Where implemented, use of innovative data and/or advanced analytics typically improved turn-around-time "TAT" by up to 10%

Higher improvement (11-50%) in TAT is typically observed in SME segment but also to some extent in Mid-Market and CRE segment

At the same time, the deployment of machine learning and other analytical techniques has brought several challenges to the forefront. Survey respondents noted various barriers to increased adoption of innovative data solutions and advanced analytical methods in credit portfolio management. This includes data quality assessment, talent availability, and difficulty in validating and explaining new techniques.

Exhibit 4

Data quality assessment and talent management are the top challenges for use of both advanced analytics and innovative data solution

Currently, what are the major challenges faced by your firm that constrain the use of innovative data or advanced analytics (e.g., machine learning and AI)?

	Top 3 challenges for use of innovative data solutions	Top 3 challenges for use of advanced analytics solutions
Data Quality	63	42
Percentage Resources	42	49
Cost of data	30	14
Skepticism/Probability	28	26
Regulatory	28	26
Validation difficulty	19	40
Unmet expectations	14	9
Ability to explain	14	42
Risk concerns	12	7
Other	2	2
Fragmentation	2	5

Major challenges for use of advanced analytics solutions are:

- Attract, retain and develop resources
- Ability to explain
- Data quality
- Validation

While for using innovative data, key challenge in data quality assessment and talent

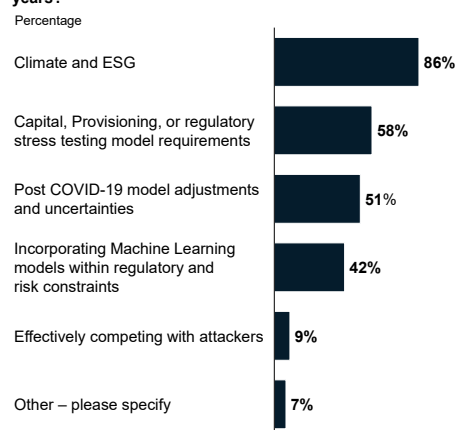# Climate and ESG Risks are emerging as the next biggest Challenge for Credit Portfolio Management

Every survey participant was asked about the biggest challenges facing credit risk and portfolio management analytics in the next two to three years. Notable challenges included capital, provisioning, or regulatory stress testing model requirements (58%), challenges posed by post-COVID-19 model uncertainties (51%) and incorporating machine learning models within regulatory and risk constraints (42%).

However, an overwhelming majority (86%) cited climate risk and ESG as the next big challenge.

Exhibit 5

86% of the participants believe that Climate and ESG is the next biggest challenge for credit assessment

What are the biggest challenges facing credit risk and credit portfolio management analytics in the next 2-3 years?
Percentage

Climate and ESG	**86%**
Capital, Provisioning, or regulatory stress testing model requirements	**58%**
Post COVID-19 model adjustments and uncertainties	**51%**
Incorporating Machine Learning models within regulatory and risk constraints	**42%**
Effectively competing with attackers	**9%**
Other – please specify	**7%**

For incorporating the impact of climate risk are you using existing loss models with climate shock applied to input variables? Or are you developing new loss models to assess it?
Percentage

- Not yet exploring **33%**
- Using existing models **35%**
- Developing new loss models **33%**
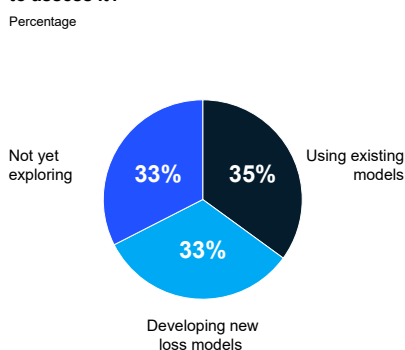
86% of the participants believe climate and ESG is the next biggest challenge for credit assessment, followed by COVID-19 adjustments, capital and regulatory exercise, and using machine learning models

One third of the participants plan to use existing credit models to translate the climate impact to credit risk and another one third of the participants plan to develop new loss models for climate assessment

ESG risks are comprised of environmental risks arising from operations and consumption of the output (i.e., services, products) of the organization, social risks arising from how the organization treats people, including employees, customers, and the communities in which it operates, and governance risks arising from poor practices in the organization's interactions with its shareholders, board, and management. These risk factors may have a positive or negative impact on the financial performance or solvency of an entity, sovereign or individual.
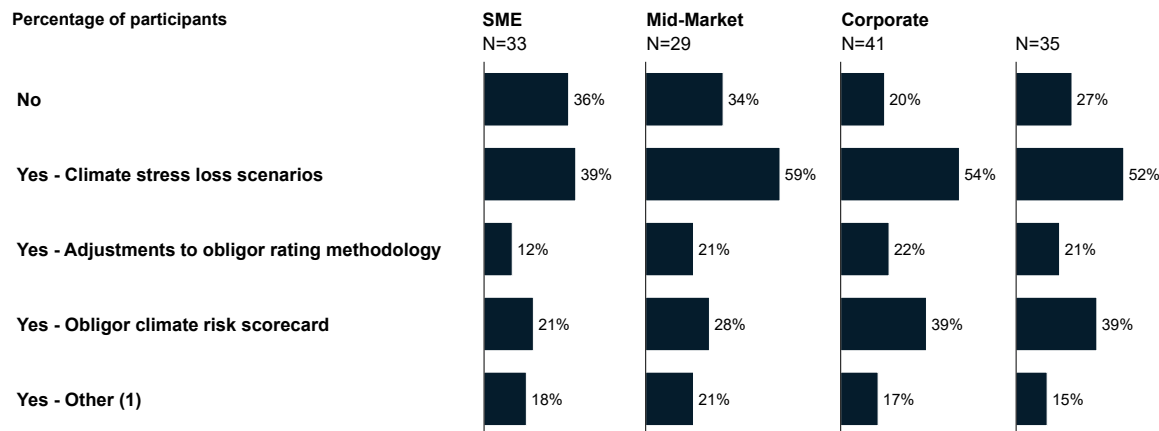
Within this overall taxonomy, climate risk falls within the category of environmental risk, and is associated with both direct and indirect impact of physical hazards associated with climate change (e.g., both direct damages caused by hazards like flood/wildfire/hurricane, potential increase in insurance premium in expectation of increased severity of such hazards, and impact on living standards in a community due to increased frequency of such hazards) and the policy, technology and regulatory risk inherent in transitioning away from an economy overly reliant on Green House Gas (GHG) producing activities.

Many financial institutions are now assessing the exposure of their portfolio to climate risk, either due to regulatory requirement, or to test the hypotheses that hurricanes, floods, blizzards, tornados, wildfires, and other natural hazards can inflict billions of damages across loan portfolios in any given year.

Exhibit 6

> 50% of participants have implemented/or are planning to implement climate stress loss analyses in mid-market, corporate, or CRE space

Have you implemented or are planning to implement in the next 12 months any changes to the credit assessment/ adjudication and monitoring models to capture the impact of climate change? (transition and physical risks)

Percentage of participants

	SME N=33	Mid-Market N=29	Corporate N=41	N=35
No	36%	34%	20%	27%
Yes - Climate stress loss scenarios	39%	59%	54%	52%
Yes - Adjustments to obligor rating methodology	12%	21%	22%	21%
Yes - Obligor climate risk scorecard	21%	28%	39%	39%
Yes - Other (1)	18%	21%	17%	15%

1: E.g., Adjustments to obligor rating methodology and climate stress loss scenarios, but beyond 12 months. Bucketing of risks (geography, industry, property type segments).

Banks that have started climate stress testing are now considering whether to build new credit models or, to tailor existing ones for stress testing. Respondents were evenly split into thirds, saying they are developing new loss models, using current models, or are not yet exploring. In addition, analyses on climate stress loss scenarios were more concentrated on mid-market, corporate, and CRE portfolios (>50% of banks for each), with fewer banks (<40%) conducting these analyses on SME portfolios.

EMEA institutions are further advanced in developing internal models to assess climate risk with majority developing models internally or subscribing to vendor models. North American institutions are in the middle and APAC respondents are the least advanced,

Addressing Climate Risk will require a coherent framework

Our survey indicates that portfolio managers have only recently started to consider how climate and ESG risks affect risk identification and risk measurement, including obligor credit ratings. They now need new tools and processes for climate stress loss analyses, climate scenario analyses, and need to evaluate how climate risk assessment can be integrated with existing credit processes.

Based on discussions with survey participants as well as our extensive work with banks, there are several important factors to consider about the material impacts of climate risk on credit:

- **Climate Risk is typically concentrated in "pockets"**
  We found both physical and transition risks lie in very targeted areas of the portfolio. To identify the pockets with a high concentration of climate risk impact, financial institutions need to perform a detailed heatmapping to focus their efforts on prioritized hazards for each of the high-risk portfolios. For example, it is commonly observed that most of the credit impact (~70-80% of incremental impact) for real estate related asset classes come from 10-20% of the obligors in the portfolio. This understanding is also reflected in the priorities identified by survey respondents:

Sample survey responses related to heatmapping approach:

"… (We use…climate) in Risk Acceptance Criteria and   Industry Risk Assessment"

"… (Climate is used in) Bucketing of risks (geography, industry, property type segments)"

- **The average credit impact can be moderate in the near term, but there is likely to be a high degree of obligor-level variability**
  We found that even in industries exposed to high physical and transition risk, the aggregate/average impact to the portfolio can be moderate. For example, in a portfolio of upstream oil and gas companies, the median impact might be an approximately 7% reduction in EBITDA. However, the difference between borrowers with maximum and minimum impact can be stark. In this example of upstream oil and gas industry, there are several companies with up to a 40% negative impact on EBITDA, while others experience a positive impact on EBITDA in some scenarios due to reallocation of demand of oil and gas. Financial institutions have started evaluating these impacts and plan to explore them further, indicating there is still a long way to go:

Sample survey responses related to counterparty level climate risk assessment:

"Climate Risk Taxonomy and analysis on carbon intensity are used as an input to our internal client ratings for large companies"

"Exploration of climate factors as risk drivers in PD model is a priority"

"…Adjustments to obligor rating methodology and climate loss scenarios, but beyond 12 months"

- **For industries exposed to physical hazards, most risk is in knock-on impacts, not through direct damages**
  The near-term credit impact of direct damages is typically covered through insurance in industries like real estate (both commercial and retail). However, the knock-on effects can dwarf direct impacts, and any assessment of material risk drivers would include requirement of higher insurance payment and impact on the asset due to deterioration in living standards in the community, even though the property itself might not be damaged.

- **Unmanaged climate risk can have a tangible impact on returns and economic profit**
  Comprehensive capital analysis and review (CCAR), European Central Bank (ECB) mandated stress tests or regulatory capital driven methodologies might not be appropriate for climate risk assessment. These are focused on capital risks and can underestimate credit impact on single obligors. Climate risk assessment requires understanding of returns from new climate-oriented businesses, and obligor specific scenario analyses – not done well, the impact can be high. At one North American bank, we identified a 35% potential erosion of profits by 2030 in the absence of action on key pockets of climate risk exposure.

- **Before addressing and mitigating climate risk, financial institutions must address several barriers related to capabilities, data, and analytics**
  First, financial institutions need internal alignment on their climate ambitions and aspirations to gain stakeholders' buy-in and collaborate with relevant board committees. Financial institutions must also acquire technical capabilities and education by familiarizing themselves with climate science-related topics, risk assessment methodologies, and the complex design choices related to net-zero targets and its impact on credit assessment. As many existing risk assessment tools were not built for the requirements of climate assessment, financial institutions will need an open architecture that can support new requirements for data quality, standardization, and collection. Finally, to capture and address the holistic impact of climate risk on the portfolio, financial institutions need to increase their focus on interdisciplinary skills and mobilization across credit, front-line, and model risk management.

  A starting point to overcome these barriers, would be to make significant progress in two important climate risk assessment approaches (i) Climate Scenario Analyses and (ii) Integration of climate into credit processes. Evaluation of data sources that can be used in scenario analyses and credit assessment and analytics that help in providing transparency around impact of potential climate risk will also help financial institutions in understanding the evolving data and vendor landscape.

i. Scenario Analyses to start climate risk assessment journey

Scenario analyses helps financial institutions understand and quantify pockets of climate risk exposure. Outputs from scenario analyses can include portfolio expected loss range under different transition and physical risk climate scenarios in short, medium and long term. Typically, it would also augment the financial institution understanding of climate drivers and transmission channels and how they interact with obligor level credit risk factors.

Scenario analyses consists of three major steps:

- **Identify risks across portfolios**
  The first phase is to identify hazards such as floods, hurricanes, or wildfires that are most relevant for the portfolio. In addition to physical hazards, the potential macro-economic impact to different regions (e.g., loss of economic output in counties with high fossil-fuel dependencies), and regional exposure can also feed into the risk identification process. One of the best ways to illustrate this risk is by using a "climate risk heatmap" or an "exposure-at-risk" metric to understand how much of a portfolio is exposed to climate-related vulnerabilities. For example, a financial institution might determine through this exercise that it is exposed to wildfire and coastal flooding due to its geographical concentration in California.

- **Assess impact on obligor financials**
  The next phase is to connect these risks to how they can impact financial ratios (e.g., net operating income, property values for a CRE portfolio), or additional drivers of credit worthiness (e.g., additional sponsor risk for CRE). At this point - It is important to start testing detailed scenario analysis for each portfolio while understanding different climate scenarios and their impact on hazards and macro-economic factors. The transmission mechanism of translating this impact to obligor financials can be complex, and should factor in uninsured damages, business interruption and increased insurance costs among others. Since some of this can't be empirically validated at this stage, financial institutions would also be advised to leave ample room for sensitivity analyses of assumptions.

Exhibit 7

Using a phased framework to develop bespoke scenario impact assessment tool for CRE portfolios
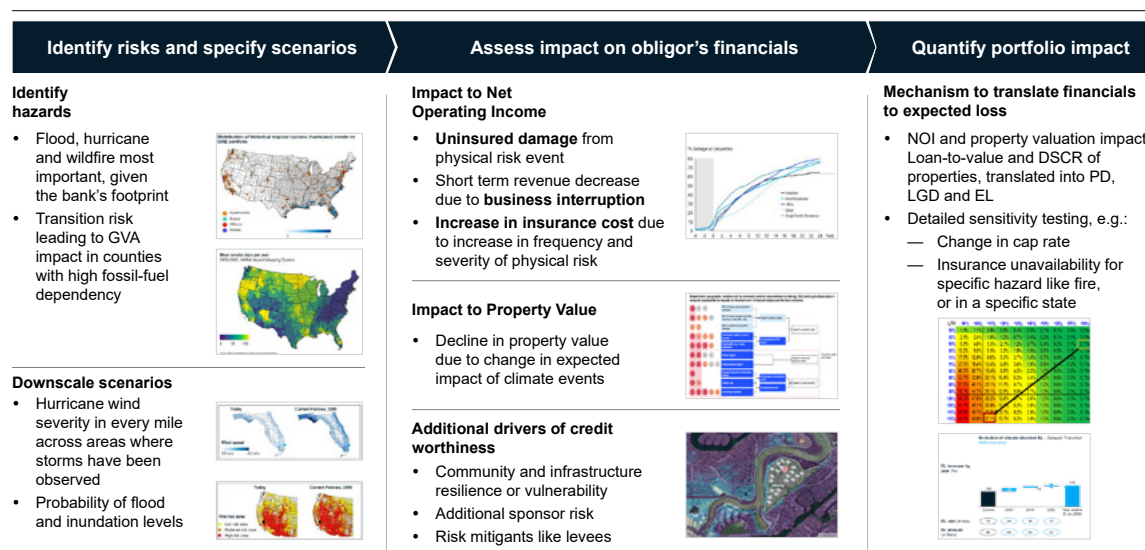
- **Quantify portfolio impact of change in obligor financials**
  The final phase integrates obligor level analysis into credit loss assessment for portfolios. It is important to develop a transparent framework to link changes in obligor financials to changes in credit rating or PD/LGD parameters. We have found that banks in particular can use existing underwriting or loss forecasting models (e.g., CCAR, CECL/IFRS-9, ECB Stress Test) with some modifications to inform this phase.

ii. Integration of climate with credit assessment process

As financial institutions develop their climate risk assessment capability through risk identification and climate scenario analyses, the next level of questions that need to be answered also includes developing an approach to credit decisioning that ensures climate risks are appropriately and sufficiently considered in credit portfolio construction and management. To achieve this, process changes need to be implemented and methodology gaps closed to incorporate climate risk quantitative analysis into the credit adjudication process.

We believe that designing and piloting a climate risk scorecard that uses knowledge gathered during the risk identification and scenario analyses phase will be critical to this effort. For example, a climate risk scorecard for a high priority portfolio like CRE can have the following modules:

- **Module 1: Pre-screening filter**
  This is an Initial heuristic-based assessment of property 's vulnerability to climate risk to identify properties exposed to climate risk require further assessment. Example of severity metrics for physical and transition risk can be Flood inundation depth (property level), Fire risk zone (property level), and % of O&G and utilities related sectors in local GDP (e.g., at the county level in the US) .

  The Output is Climate vulnerability classification of the property as Low or High, with only properties identified as 'High' going through the next two modules.

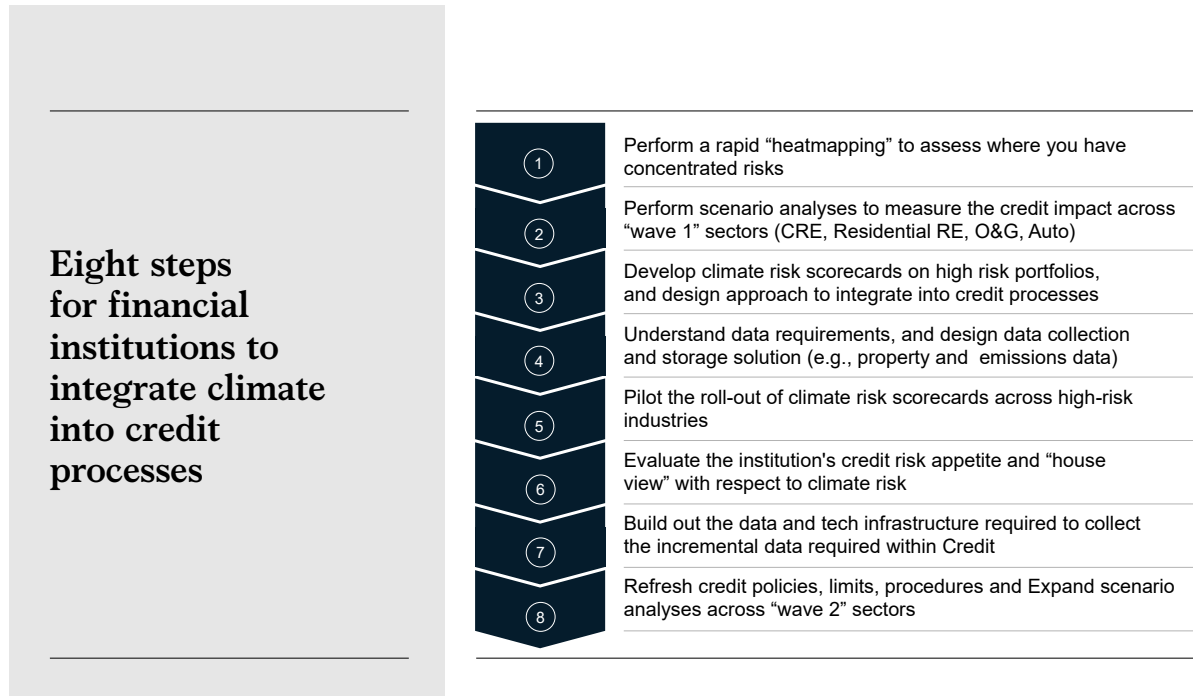- **Module 2: Scenario Analyses Tool**
  This provides a quantitative estimate of change in credit risk under different climate scenarios for obligors that have been flagged as high risk in the previous pre-screening module. The change in credit risk parameters can be reflected in a separate 'climate score'.

- **Module 3: Property-level climate scorecard**
  This module enables qualitative assessment of factors not captured in step 2 to adjust the climate score (through client questionnaire, 1st and 2nd line's assessment). A detail client questionnaire is designed for each sector with graded response options and potential source of information. The output is the adjusted Climate Risk Score.

While practices in climate risk assessment are still very much evolving, we believe it will track the 8-step approach laid out below:

Exhibit 8

Eight steps for financial institutions to integrate climate into credit processes

1. Perform a rapid "heatmapping" to assess where you have concentrated risks
2. Perform scenario analyses to measure the credit impact across "wave 1" sectors (CRE, Residential RE, O&G, Auto)
3. Develop climate risk scorecards on high risk portfolios, and design approach to integrate into credit processes
4. Understand data requirements, and design data collection and storage solution (e.g., property and emissions data)
5. Pilot the roll-out of climate risk scorecards across high-risk industries
6. Evaluate the institution's credit risk appetite and "house view" with respect to climate risk
7. Build out the data and tech infrastructure required to collect the incremental data required within Credit
8. Refresh credit policies, limits, procedures and Expand scenario analyses across "wave 2" sectors

The research summarized in this article has highlighted the benefits and challenges of incorporating new data sources and analytical techniques in the various aspects of credit risk and credit portfolio management. We see great promise which should motivate institutions to maintain and intensify their efforts, as most expect to do over the immediate horizon.

In the specific case of assessing the credit implications of climate risk, indicated as the greatest challenge currently facing practitioners, institutions are rapidly implementing methodologies to do this. The article describes the three most immediate steps in this direction, and the benefits of developing a detailed use-case driven understanding of climate data required as input, the technology infrastructure requirements for storage and processing, the reporting requirement for risk assessment, and the best orchestration model across functions. The lessons learned in implementing data and analytics-driven approaches to address credit risk assessment in the past few years, captured in this survey, inform what credit institutions must do to meet the