Columbia Law School | COLUMBIA CLIMATE SCHOOL
SABIN CENTER FOR CLIMATE CHANGE LAW

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Submitted via Banking_Climate_Guidance@dfs.ny.gov

Adrienne A. Harris
Superintendent
New York State Department of Financial Services
1 State Street
New York, NY 10004-1511

Re: Proposed Guidance for New York State Regulated Banking and Mortgage Institutions Relating to Management of Material Financial Risks from Climate Change, December 2022

Dear Superintendent Harris,

Columbia Law School's Sabin Center for Climate Change Law ("Sabin Center") respectfully submits these comments to the New York State Department of Financial Services ("DFS") in response to its request for public feedback on its proposal entitled "Proposed Guidance for New York State Regulated Banking and Mortgage Institutions Relating to Management of Material Financial Risks from Climate Change" ("Proposed Guidance").[1]

The Sabin Center is an academic think tank at Columbia Law School that develops legal strategies to fight climate change. The Sabin Center trains students and lawyers in the practice of climate change law and provides the public with resources on key topics in climate law and regulation. It is affiliated with the Columbia Climate School, an interdisciplinary academic hub designed to advance new areas of climate inquiry, research, and impact across Columbia University.

There is overwhelming scientific consensus on the fundamental reality of climate change: human activities are increasing atmospheric greenhouse gas ("GHG") concentrations, which is causing global average temperatures to rise. In a 2021 report, the Intergovernmental Panel on Climate Change ("IPCC") concluded that "[i]t is unequivocal that human influence has warmed

[1] New York State Department of Financial Services ("DFS"), *Public Feedback on the Proposed Guidance for New York State Regulated Banking and Mortgage Institutions Relating to Management of Material Financial Risks from Climate Change*, https://perma.cc/CQ4N-VAWB (last visited Mar. 10, 2023) [hereinafter "DFS Proposed Guidance"].

the atmosphere, ocean and land."[2] The IPCC found that "[e]ach of the last four decades has been successively warmer than any decade that preceded it since 1850."[3] The extent of future temperature increases will depend, in large part, on future GHG emissions. However, "warming above 2 degrees Celsius is "very likely" unless emissions decline rapidly prior to 2050.[4] Rising temperatures are already increasing the frequency and severity of many types of weather extremes, such as heatwaves and floods, and contributing to sea-level rise and other slow-onset phenomena.[5]

Numerous studies confirm that climate change poses significant financial risks to corporate entities, the federal government's budget, and the financial system more generally.[6] Recently, the White House Council of Economic Advisers and Office of Management and Budget released a White Paper on the consideration and integration of climate risks into macroeconomic forecasting in relation to the presidential budget.[7] The White Paper recognized the importance of incorporating climate risk considerations into presidential macroeconomic forecasts, specifically, on how physical climate risks could affect longer-run gross domestic product ("GDP") growth, with GDP growth, in turn, affecting federal revenues and spending.[8] In its 2021 report on Climate-Related Financial Risk, the Financial Stability Oversight Council ("FSOC") noted that "[t]he intensity and frequency of extreme weather and climate-related disaster events are increasing and already imposing substantial economic costs."[9] The FSOC recognized that, as the magnitude of climate hazards and associated costs increases in coming years, so too will risks to the financial system.[10] Thus, according to the FSOC, "climate-related financial risks are an emerging threat to the financial stability of the United States."[11] The Climate-Related Market Risk Subcommittee of the Commodity Futures Trading Commission ("CFTC") has similarly concluded that climate-related risks "are already impacting, or are anticipated to impact, nearly every facet of the U.S. economy."[12]

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2 Intergovernmental Panel on Climate Change ("IPCC"), *Summary for Policymakers, in* CLIMATE CHANGE 2021: THE PHYSICAL SCIENCE BASIS. CONTRIBUTION OF WORKING GROUP I TO THE SIXTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE 4 (V. Masson-Delmotte et al., eds, 2021).

3 *Id*. at 5.

4 *Id*. at 13-15.

5 *Id*. at 15.

6 *See* FINANCIAL STABILITY OVERSIGHT COUNCIL, REPORT ON CLIMATE-RELATED FINANCIAL RISK (2021), https://perma.cc/6V34-EU4F; COMMODITY FUTURES TRADING COMMISSION CLIMATE-RELATED MARKET RISK SUBCOMMITTEE OF THE MARKET RISK ADVISORY COMMITTEE, MANAGING CLIMATE RISK IN THE U.S. FINANCIAL SYSTEM (2020), https://perma.cc/6RHX-XTW7; BOARD OF GOVERNORS OF THE FEDERAL RESERVE SYSTEM, FINANCIAL STABILITY REPORT (2020), https://perma.cc/2VWA-67LV.

7 WHITE HOUSE COUNCIL OF ECONOMIC ADVISERS & OFFICE OF MANAGEMENT AND BUDGET, WHITE PAPER ON METHODOLOGIES AND CONSIDERATIONS FOR INTEGRATING THE PHYSICAL AND TRANSITION RISKS OF CLIMATE CHANGE INTO MACROECONOMIC FORECASTING FOR THE PRESIDENT'S BUDGET (2023), https://perma.cc/2ZZP-Q68H.

8 *Id*. at 2.

9 FINANCIAL STABILITY OVERSIGHT COUNCIL, *supra* note 6, at 10.

10 *Id*.

11 *Id*.

12 COMMODITY FUTURES TRADING COMMISSION CLIMATE-RELATED MARKET RISK SUBCOMMITTEE OF THE MARKET RISK ADVISORY COMMITTEE, *supra* note 6, at 11 & 28.

The Sabin Center supports the Proposed Guidance as a valuable step in DFS' effort to ensure its regulated institutions integrate climate-related financial risks into their risk management frameworks. In light of the urgency of the climate crisis, the timeline for implementation of the Proposed Guidance should be expeditious and concrete. The comments that follow highlight DFS' legal mandate and authority to regulate climate-related financial risk, in support of the Proposed Guidance, and offer information on existing climate tools and data that regulated institutions may use to evaluate climate-related risks to their business and community operations.

A. Comments on Proposed Guidance "Part I: Introduction, Paragraphs 1-4 (Clarification)"

DFS has broad statutory authority to regulate New York State financial institutions, which includes the regulation of climate-related financial risk.

The regulation of climate-related financial risk, as advocated by the Proposed Guidance, directly advances DFS' policy goals and fits easily within DFS' well-established scope of authority as provided by statute, and in accordance with recent caselaw that outlines the breadth of deference to DFS in its mandate to protect the public interest and to ensure the health and safety of the New York State financial and banking systems.

DFS derives its authority primarily from New York State's Financial Services Law ("FSL"), with bolstering from the Banking Law and Insurance Law of New York.[13] The FSL provides that "the declared policy of the state is that the business of all banking organizations must be supervised and regulated through [DFS] in such manner as to insure the safe and sound conduct of such business, to conserve their assets, [...] and thus to maintain public confidence in such business and protect the public interest and the interests of depositors, creditors, shareholders, and stockholders."[14] In addition, DFS' mission statement provides that the agency seeks to "build an equitable, transparent, and resilient financial system that benefits individuals and supports business. […] [DFS is] responsible for empowering consumers and protecting them from financial harm; ensuring the health of the entities we regulate; driving economic growth in New York through responsible innovation; and preserving the stability of the global financial system."[15]

Legal authority is vested in the Superintendent, who "possess[es] the rights, powers, and duties in connection with financial services and protection."[16] Under Section 301(b) of the FSL, the Superintendent has the "power to conduct investigations, research, studies and analyses of matters affecting the interests of consumers of financial products and services."[17] Of particular relevance to DFS' efforts to require climate-related financial risk disclosures is Section 301(c) (1), which reads as follows: "taking such actions as the superintendent deems necessary to educate and

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13 N.Y. FIN. SERV. § 301 (a) (McKinney).
14 *Id*. § 102; *see also* N.Y. BANKING § 10 (McKinney).
15 DFS, *Oversight*, https://perma.cc/MXW6-C3QX (last visited Mar. 10, 2023).
16 N.Y. FIN. SERV. § 202 (a) (McKinney).
17 *Id*. § 301(b).

protect users of financial products and services."[18] Section 301(c) (1) thereby provides a consumer protection mandate that covers a broad range of permissible actions by DFS, and the Proposed Guidance clearly outlines the dangers posed directly to customers of financial institutions by climate change.[19] Without proper disclosure and risk assessment, management, and mitigation efforts, financial institutions cannot adequately warn their users of, or respond to, these risks. Harm to users could manifest in the form of increased premiums on insurance, the wholesale unavailability of insurance, and the lowering of property values, among other ills.[20] Should DFS seek to require climate-related financial risk disclosures, authority may also be found within the scope of Section 301(c) (1) in seeking to "protect users of financial products and services."[21]

The language in the Proposed Guidance is consistent with this authority and overarching mandate. The Proposed Guidance's recommendations to incorporate climate-related financial risk into risk assessment and scenario analysis strategies ensure the safety and soundness of New York State's banking and financial services industries,[22] and encourage the productive operation of these institutions in the state.[23]

In reviewing DFS rulemaking, courts in New York State will employ the test articulated in *Independent Insurance Agents & Brokers of New York, Inc. v. New York State Department of Financial Services* ("*Independent Insurance Agents*"),[24] which delineates the factors that must be considered when determining whether an agency exceeded the scope of its delegated authority. These factors include: (1) if the agency did more than balance costs and benefits according to preexisting guidelines, and instead made value judgments entailing difficult and complex choices between broad policy goals to resolve social problems; (2) if the agency "wrote on a clean slate," rather than merely filling in details of a broad policy, thus creating its own comprehensive set of rules without the benefit of legislative guidance; (3) if the legislature has unsuccessfully tried to reach agreement on the issue, which would indicate that the matter is a policy consideration for the elected body to resolve; and (4) if the agency failed to use special expertise or competence in the field to develop the challenged regulation.[25]

Applying that test, the breadth of DFS' authority to regulate the New York State financial sector was affirmed in *Independent Insurance Agents*, as well as in *New York State Land Title Association, Inc. v. New York State Department of Financial Services* ("*NYSLTAI*").[26] The criteria

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18 N.Y. FIN. SERV. § 301 (c) (1) (McKinney) (emphasis added).

19 DFS Proposed Guidance, *supra* note 1, at Part II, Paragraphs 11-16.

20 *Id*. at Part II, Paragraph 13.

21 N.Y. FIN. SERV. § 301 (c) (1) (McKinney).

22 *Id*. § 102.

23 *Id*.

24 Indep. Ins. Agents & Brokers of New York, Inc. v. New York State Dep't of Fin. Servs., 39 N.Y.3d 56, 200 N.E.3d 537 (2022).

25 *Id*. at 549.

26 New York State Land Title Ass'n, Inc. v. New York State Dep't of Fin. Servs., 169 A.D.3d 18, 92 N.Y.S.3d 49 (2019).

applied in *Independent Insurance Agents* and *NYSLTAI* offer a framework within which the Proposed Guidance can be understood as a proper exercise of DFS authority. In both decisions, the state courts confirmed that DFS may use its statutory mandate to impose new requirements on financial institutions in order to protect consumers[27] and the public interest.[28] Notably, the financial risks caused by climate change are not categorically distinct from other types of risk already regulated by DFS. As with other forms of systemic market risk, climate-related financial risks threaten transaction and market integrity and increase the risk for market volatility, manipulation, and fraudulent practices. The stability of the New York State banking and financial system is thus directly affected by the physical and transition risks arising from climate change. The management and mitigation of these physical and transition risks contemplated in the Proposed Guidance is crucial to the fulfillment of DFS' mandate to regulate systemic risk.

Importantly, the Proposed Guidance aligns squarely with the goals and mission statement of DFS as provided in Sections 102 and 301 of the FSL. By regulating climate-related financial risk, and by recommending that Regulated Organizations integrate climate risk considerations in their respective policies, risk assessments, and scenario analyses (as applicable), DFS fulfills its mandate to build a resilient, responsive financial system. This mandate is bolstered by caselaw that clearly affirms the agency's mission to safeguard and strengthen New York State's financial institutions, and confirms DFS' authority to regulate covered financial institutions and to foster long-term institutional stability.[29]

As DFS shares overlapping supervisory authority with other state and federal agencies, the alignment of the Proposed Guidance with similar risk-management regulatory efforts is well-advised.

DFS exercises supervisory and oversight authority over a number of banking, financial, and insurance entities, which include, but are not limited to: banks that do not have a national charter from the Office of the Comptroller of the Currency ("OCC"); domestic representative offices; foreign agencies, branches, or representative offices; trust companies; consumer credit reporting agencies; credit unions; licensed lenders; mortgage bankers, brokers, and loan originators and servicers; money service businesses, such as money transmitters, cryptocurrency exchanges serving New York residents or operating within the state; admitted insurance companies; and insurance brokers.[30]

Paragraph 4, Part I of the Proposed Guidance specifies that it applies to New York State-regulated banking organizations, New York State-licensed branches and agencies of foreign

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27 *Indep. Ins. Agents*, 200 N.E.3d at 549.

28 *New York State Land Title Ass'n, Inc.*, 169 A.D.3d 18 at 31, 34.

29 *Indep. Ins. Agents*, 200 N.E.3d at 549; *see also* Brantley v. Mun. Credit Union, No. 19 CIV. 10994 (KPF), 2021 WL 981334 (S.D.N.Y. Mar. 16, 2021) (reiterated the wide latitude of discretion conferred by Section 301 of the Financial Services Law).

30 *See* N.Y. FIN. SERV. § 104 (a) (4) (McKinney). *See also* DFS, *Institution Definitions and Descriptions*, https://perma.cc/6F59-PSWG (last visited Mar. 10, 2023) [hereinafter "DFS – Institutions"].

banking organizations and New York State-regulated mortgage bankers and mortgage servicers—collectively known as Regulated Organizations. There is some agency overlap in the supervision of these organizations. For example, state-licensed branches and agencies of foreign banking organizations are also subject to supervision by the Federal Reserve Board.[31] State-regulated banking organizations, also known as commercial banks, may be categorized as community, regional, or national banks, and thereby may be subject to different additional oversight.[32] National banks are under the regulation and supervision of the OCC, an independent bureau of the Department of the Treasury,[33] while community and regional banks are also subject to Federal Reserve Board supervision.[34] State-licensed banks may choose to join the Federal Reserve System, though this is not required. State-licensed banks that choose not to join the Federal Reserve System are primarily regulated by the Federal Deposit Insurance Corporation ("FDIC").[35]

This shared regulatory and supervisory authority indicates value in aligning the Proposed Guidance with other recommendations or guidance from federal agencies, such as the Federal Reserve Board's draft Principles for Climate-Related Financial Risk Management for Large Financial Institutions ("Federal Reserve Draft Principles"),[36] the OCC's draft Principles for Climate-Related Financial Risk for Large Banks ("OCC Draft Principles"),[37] and the FDIC's draft Statement of Principles for Climate-Related Financial Risk Management for Large Financial Institutions ("FDIC Draft Principles").[38] Importantly, the Proposed Guidance, Federal Reserve Draft Principles, OCC Draft Principles, and FDIC Draft Principles all aim to foster the same policy goals: the promotion of risk assessment frameworks that effectively integrate climate-related financial risk. This consistent incorporation by financial regulators of climate-related financial risk management in their respective guidance and/or principles embodies their shared interest in ensuring that all aspects of the U.S. financial system (from small stakeholders to large institutions) adopt resilient banking practices. Aligning the provisions of the Proposed Guidance with draft Principles of the Federal Reserve, OCC, and FDIC is a sensible regulatory strategy that will reduce compliance burdens and promote the effective standardization of climate-related financial risk management.

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31 DFS – Institutions, *supra* note 30.

32 *Id*.

33 Office of the Comptroller of the Currency ("OCC"), *About Us*, https://perma.cc/W8TZ-PG3U (last visited Mar. 10, 2023).

34 Board of Governors of the Federal Reserve System, *Supervision and Regulation*, https://perma.cc/NLZ4-PK6V (last visited Mar. 10, 2023).

35 Federal Deposit Insurance Corporation, *About FDIC – What We Do*, https://perma.cc/46B9-MRJM (last visited Mar. 10, 2023).

36 Federal Reserve System, Principles for Climate-Related Financial Risk Management for Large Financial Institutions, 87 Fed. Reg. 75267 (Dec. 8, 2022) [hereinafter "Federal Reserve Draft Principles"].

37 OCC, Principles for Climate-Related Financial Risk Management for Large Banks, https://perma.cc/BVW6-T3DU (last visited Mar. 10, 2023) [hereinafter "OCC Draft Principles"].

38 Federal Deposit Insurance Corporation, Statement of Principles for Climate- Related Financial Risk Management for Large Financial Institutions, 87 Fed. Reg. 19507 (Apr. 4, 2022) [hereinafter "FDIC Draft Principles"].

Significantly, the Proposed Guidance also covers institutions that may not be regulated by federal agencies. The Federal Reserve Draft Principles, OCC Draft Principles, and FDIC Draft Principles are all intended for the largest financial institutions, specifically, those with over $100 billion in total consolidated assets.[39] The Proposed Guidance thus fills an important gap, consistent with DFS' objectives to protect the public interest[40] and promulgate regulations that are "responsive to the needs of the banking industry and to the needs of the state's consumers and residents,"[41] by providing smaller institutions with tailored recommendations to address climate-related financial risk considerations within their respective contexts.

Through the Proposed Guidance, state-regulated banks that are not members of the Federal Reserve system or are not under the supervision of the OCC, or have total assets less than the amount contemplated by the agencies' Draft Principles, benefit from insights on how to manage climate-related financial risk and to conduct scenario analyses that are appropriate to the size of their assets. For example, banks located in New York State with less than ten branches may be particularly vulnerable to climate-related financial risk, as community banks and savings associations tied to narrower geographies may face exposure to certain climate risks that larger financial institutions with greater geographic diversity do not.[42] Failure to properly manage such types of risk can have devastating effects on the local communities these institutions serve.

Ultimately, the Proposed Guidance is laudable for taking notice of the urgent need to support smaller financial institutions as they navigate the management of climate-related financial risk. And the Proposed Guidance gives life to DFS principles of inclusion and equity by ensuring that a fuller range of financial institutions serving smaller communities and businesses are armed with the tools and data needed to foster resilience in the financial system.

B. Comments on Proposed Guidance "Part IV.C – Risk Management Process, IV. D – Data Aggregation and Reporting, and IV.E - Scenario Analysis (Clarification)"

Downscaled Climate Models Exist to Support Regulated Organizations' Risk Assessments and Scenario Analyses

We take this opportunity to highlight that downscaled climate models, data, and tools are available for use by Regulated Organizations. Parts IV.C, IV.D, and IV.E of the Proposed Guidance focus on the risk management process, data aggregation, reporting, and scenario analysis tools that Regulated Organizations may use to assess climate-related financial risk. The Proposed Guidance places emphasis on identifying, measuring, monitoring, and controlling risk.[43] As the impacts of climate change are largely measurable from a scientific perspective, it may be helpful

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39 *See* Federal Reserve Draft Principles, 87 Fed. Reg. 75268; OCC Draft Principles, *supra* note 37, Paragraph 4, FDIC Draft Principles, 87 Fed. Reg. 19507.

40 N.Y. FIN. SERV. § 102 (McKinney).

41 *Id*. § 301 (emphasis supplied).

42 Ceres, *Financing A Net Zero Economy: The Consequences of Physical Climate Risks for Banks*, https://perma.cc/QDL2-LQ94 (last visited Mar. 16, 2023).]

43 DFS Proposed Guidance, *supra* note 1, Part IV.C.

for Regulated Organizations to understand relevant climate modeling concepts, and the tools and data available to assess the impact of climate hazards on their businesses. An understanding of climate modeling may help Regulated Organizations to develop effective scenario analysis procedures, and accurately anticipate the types of climate risks they are vulnerable to, now and in the future.

This section describes the use of climate models to generate knowledge of climate hazards. Modeling allows researchers to simulate and understand interactions between climate variables using physically-based representations of the climate system in numerical form. Through models, scientists can explore the effect of changes to external factors, like atmospheric GHG concentrations, on specific climate variables (e.g., surface temperatures) and the types of hazards associated with such GHG-induced effects (e.g., changes in rainfall patterns). Developing an understanding of the type of climate hazards present (e.g., in a given region, affecting a specific company) is a critical first step in assessing potential impacts of climate change. Using climate hazard data, companies can evaluate potential climate-related risks to their assets, operations, work force, and supply chains.

Research shows that past model predictions (e.g., of global average temperatures) have been highly accurate. One way to assess model accuracy is to compare previous model projections made years or decades ago to actual climate observations—a process referred to as "hindcasting." One recent study used hindcasting to assess the performance of climate model projections published between 1970 and 2007.[44] The authors found that the climate models were "skillful in predicting subsequent GMST [global mean surface temperature] changes, with most models examined showing warming consistent with observations" and that there was "no evidence that the climate models […] systematically overestimated or underestimated warming over their projection period."[45] Another study analyzed global temperature and sea-level data over the past several decades and compared those records with projections published in the IPCC's Third and Fourth Assessment Reports. The analysis showed that "global temperature continues to increase in good agreement with the best estimates of the IPCC, especially if we account for the effects of short-term variability due to the El Niño/Southern Oscillation, volcanic activity, and solar variability."[46]

Each component of the climate system—or a combination of components—can be represented by models of varying degrees of complexity.[47] There are three classes of climate models:

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44 Zeke Hausfather, et al., *Evaluating the Performance of Past Climate Model Projections*, 47 GEOPHYSICAL RES. LETTERS 1 (2020).

45 *Id*. at 1, 7-8.

46 Stefan Rahmstorf, et al., *Comparing climate projections to observations up to 2011*, 7 ENVTL. RES. LETTERS 4 (2012).

47 *Id*.

1. Energy balance models, which are the oldest and simplest type of climate model, estimate changes in the climate system from an analysis of the Earth's energy budget (i.e., the balance of energy entering and leaving the Earth).[48]

2. Intermediate complexity models, which are similar to energy balance models but incorporate the effect of changes in the Earth's land, oceans, and ice features on the climate.[49] Intermediate complexity models are used to project changes in climate over long time scales and large spatial scales.[50]

3. Comprehensive climate models (General Circulation Models and full Earth System Models), which are more sophisticated than energy balance and intermediate complexity models.[51] General Circulation Models are based on physical laws that describe the fully-coupled dynamics of the atmosphere and ocean, expressed through mathematical equations.[52] Earth System Models, also referred to as coupled carbon-cycle climate models, are similar to General Circulation Models but also incorporate the dynamics of the land surface, vegetation, the carbon cycle, and other elements of the climate system.[53] Both General Circulation Models and Earth System Models are built upon the fundamental laws of physics or the empirical relationships established from observations and, when possible, are constrained by fundamental conservation laws.[54]

There are more than forty scientific institutions worldwide that develop climate models.[55] In order to facilitate comparison of model results across these institutions, the Coupled Model Intercomparison Project ("CMIP") serves as a framework for climate model experiments, allowing scientists to compare and assess climate models in a systematic way.[56] The most recent, sixth phase of CMIP model runs ("CMIP6") provided many different types of simulations that were evaluated by the IPCC's Sixth Assessment Report. As part of CMIP6, there are twenty-two specialized experiments—called Model Intercomparison Projects ("MIPs")—which prescribe standardized experiment designs, time periods, output variables or observational reference dates to better facilitate the direct comparison of climate models.[57]

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48 Lauren Harper, *What are climate models and how accurate are they?* STATE OF THE PLANET BLOG (May 18, 2018), https://perma.cc/3QJ6-Q2UR.

49 *Id*.

50 *Id*.

51 *Id*.

52 Yang Chen, et al., *Future Increases in Arctic Lightning and Fire Risk for Permafrost Carbon*, 11 NAT. CLIMATE CHANGE 404, 215 (2021).

53 *Id*.

54 *Id.*

55 Zeke Hausfather, *CMIP6: The next generation of climate models explained*, CARBON BRIEF (Dec. 2, 2019, 8:00 AM), https://perma.cc/F69B-R3U6.

56 Zeke Hausfather, *Q&A: How do climate models work?* CARBON BRIEF, https://perma.cc/8LVD-HZ4Y (Jan. 15, 2018, 8:30 AM).

57 Chen, et al., *supra* note 52, at 182.

General circulation models generally divide the world up into grids in order to perform calculations. A typical model might have a grid cell size of sixty miles or more for one side of the cell, resulting in coarse-resolution projections that cover large geographic areas. These projections may not be sufficiently granular to enable companies to fully assess the impacts of climate change on specific assets and operations. Downscaling the output from global climate models to finer spatial scales can partially bridge this information gap. There are two main approaches to downscaling:

1. Dynamical downscaling uses higher spatial resolution regional climate models to directly simulate regional climate processes and regional responses to global change.[58] The regional models usually cover a selected domain (such as the continental United States) and receive information from more coarsely resolved general circulation models at the boundaries of the regional domain.

2. Statistical downscaling uses historically-based statistical relationships between the large-scale and local-scale climate to estimate future changes in local climate from large-scale general circulation model projections.[59]

Downscaling climate models can reveal useful information about an entity's exposure to acute and slow-onset climate changes. Information regarding where climate hazards are likely to be felt may allow a company to assess which of its physical assets, operations, and portfolio are located in areas known to be vulnerable to climate hazards. Such an assessment may enable the company to better understand the nature and extent of any climate-related vulnerabilities. Companies can use climate models that produce a probabilistic assessment[60] of hazards within a given area to identify risks to assets in the affected region.[61]

Downscaled climate projections have been published by various governmental and academic institutions:

- The Department of Energy, National Aeronautics and Space Administration, and National Oceanic and Atmospheric Administration have jointly published zip-code-level temperature projections and county-level precipitation and sea level projections.[62]

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58 Aristita Busuioc, *Empirical-statistical downscaling: Nonlinear statistical downscaling*, OXFORD RESEARCH ENCYCLOPEDIA OF CLIMATE SCIENCE (2021).

59 *Id*. at 1.

60 Probabilistic assessments indicate areas where, for example, models show a higher chance of above or below average temperatures or precipitation. *See* National Oceanic and Atmospheric Admnistration, *Climate Models*, CLIMATE DATA PRIMER, https://perma.cc/HL6K-33Y4 (last visited Mar. 20, 2023).

61 *See, e.g.,* ISIMIP, *The Inter-Sectoral Impact Model Intercomparison Project*, https://perma.cc/UV5D-PBXQ (last visited Mar. 20, 2023). Utilizing climate model output at a more granular level than the model itself operates—i.e., downscaled data—requires an acknowledgment that the local risk of exposure to an extreme event may differ from what the model predicts at a larger scale.

62 *See Energy Data Gallery*, U.S. CLIMATE RESILIENCE TOOLKIT, https://toolkit.climate.gov/topics/energy/energy-data-gallery (last updated Sept. 24, 2019).

- The U.S. Geological Survey has partnered with the College of Earth, Ocean, and Atmospheric Sciences at Oregon State University to develop a "Regional Climate Change Viewer" that includes downscaled projections for over 60 climate variables, including air temperature and precipitation.[63]
- The Bureau of Reclamation has partnered with multiple universities and non-governmental organizations to develop downscaled projections for temperature and precipitation at the watershed level. The projections are designed to enable assessment of climate change impacts on watershed hydrology, ecosystems, and water and energy demand across the U.S.[64]
- The Geospatial Innovation Facility at the University of California at Berkeley has developed Cal-Adapt, a web-based tool that provides projections for several climate variables, including temperature and precipitation, under two climate change scenarios on a 3.5 × 3.5-mile spatial grid.[65]
- The Climate Impact Lab has developed the Global Downscaled Projections for Climate Impacts Research, a globally downscaled version of temperature and precipitation from the most recent CMIP6 projections, with a resolution of approximately 15 miles.[66]
- The Department of the Interior and National Oceanic and Atmospheric Administration have developed a Climate Mapping for Resilience and Adaptation assessment tool, which integrates information from across the federal government to help people assess their local exposure to climate-related hazards.[67]

A particular focus of climate research has been to identify climate change responses that are robust across a wide range of different climate models, that are interpretable in terms of basic, well-understood physics (such as the decrease in snowpack associated with human-caused warming), and that have reliable multi-decadal observational records.

As noted above, scientists can assess how well a climate model functions by comparing its outputs to observational data. However, observational data may sometimes be incomplete, or unavailable. Modeling climate impacts at fine geographic scales (e.g., regionally or locally) can result in additional sources of uncertainty due to downscaling or bias correction.[68] Researchers can

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63 U.S. Geological Survey, *Regional Climate Change Viewer*, https://perma.cc/6FR9-5GBQ (last visited Mar. 20, 2023).

64 U.S. Bureau of Reclamation et al., *Downscaled CMIP3 and CMIP5 Climate and Hydrology Projections*, https://gdo-dcp.ucllnl.org/downscaled_cmip_projections/#Welcome (last visited Mar. 20, 2023).

65 CAL-ADAPT, *About Cal-Adapt*, https://cal-adapt.org/about/ (last visited Mar. 20, 2023).

66 Climate Impact Lab, Introducing Our New Global Downscaled Projections for Climate Impact Research, https://impactlab.org/news-insights/introducing-our-new-global-downscaled-projections-for-climate-impacts-research/ (last visited Mar. 20, 2023).

67 Climate Mapping for Resilience and Adaptation, *About CMRA*, https://perma.cc/GK7W-A9SB (last visited Mar. 20, 2023).

68 Bias correction refers to the correction of projected raw, daily global circulation model output using the differences in the mean and variability between general circulation models and observations over a set

address these uncertainties by articulating the nature and extent to which local climate predictions may differ from regional predictions modeled at a larger scale. Assume, for example, that researchers want to study the future climate impacts on a particular city in North America. While regional modeling may suggest that North America will experience an increase in average surface temperatures, an individual city may experience more or less warming than the average for the continent. This variation can be investigated by analyzing regional-scale climate processes and factors such as land use, aerosol concentrations, and small-scale natural variability in the area of interest. Uncertainties in the observational data can also be studied and may influence attribution of observed climate changes and/or impacts to specific causal factors. For example, the IPCC states that the scarcity of temperature recording stations can explain the overall low confidence in changes in surface air temperatures in the Antarctic region.[69]

The results of individual studies are typically expressed in terms of calibrated uncertainty and likelihood language. For example, the IPCC's Sixth Assessment Report uses calibrated language to consistently evaluate and communicate uncertainties.[70] This methodology assigns qualitative expressions of confidence—such as *very low, low, medium, high,* and *very high*—based on the robustness of evidence for a finding and uses quantitative expressions—such as *virtually certain* (99-100% probability)—to describe the likelihood of a finding.[71] For example, the IPCC report states that "observed increases in areas burned by wildfires have been attributed to human-induced climate change in some regions (*medium* to *high confidence*)."[72] Language of this kind is used to manage uncertainties in a rigorous, systematic way.[73] As in any scientific endeavor, some uncertainties are unavoidable, but researchers can frame results at an appropriate scale and use language that clearly communicates the extent to which modeling and observations produce results with a high level of confidence. Such techniques allow companies to effectively use model outputs to assess climate-related risks to their assets and operations. The case studies included below further demonstrate this point.

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reference period. *See* Ed Hawkins et al., *Calibration and bias correction of climate projections for crop modelling: An idealised case study over Europe. Agricultural and Forest Meteorology*, 170 AGRICULTURAL & FOREST METEOROLOGY 19 (2013).

69 Nathaniel L. Bindoff, et al., *Detection and Attribution of Climate Change: from Global to Regional, in* CLIMATE CHANGE 2013: THE PHYSICAL SCIENCE BASIS. CONTRIBUTION OF WORKING GROUP 1 TO THE FIFTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE (T.F. Stocker et al. eds., 2013).

70 Hans Pörtner, et al., *Technical Summary, in* CLIMATE CHANGE 2022: IMPACTS, ADAPTATION AND VULNERABILITY. WORKING GROUP II CONTRIBUTION TO THE IPCC SIXTH ASSESSMENT REPORT (Hans-Otto Pörtner et al. eds., 2022).

71 *Id.* at 4.

72 G.C. Hegerl, et al., *Understanding and Attributing Climate Change*, *in* CLIMATE CHANGE 2007: THE PHYSICAL SCIENCE BASIS. CONTRIBUTION OF WORKING GROUP I TO THE FOURTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE SPM-8 (S. Solomon et al., eds., 2007).

73 *See* Elisabeth A. Lloyd et al., *Climate Scientists Set the Bar of Proof Too High*, 165 CLIMATIC CHANGE 55 (2021) ("[C]limate scientists have set themselves a higher level of proof in order to make a scientific claim than law courts ask for in civil litigation in the USA, the UK, and virtually all common law countries.").

Companies Use Downscaled Climate Models to Assess Climate-Related Financial Risk

The case studies below highlight how companies can and do make use of the data and analytical techniques highlighted in these comments to assess climate hazards, evaluate potential impacts on their assets, operations, and supply chains, and communicate useful information about their exposure to physical climate related risks.

A 2021 report from the United Nations Environment Programme Finance Initiative ("UNEP FI") illustrates the range of data and analytical techniques available to assess climate hazards; evaluate potential impacts on assets, operations, and supply chains; and communicate useful information about exposure to physical climate-related risks.

The report, titled *The Climate Risk Landscape* ("Landscape Report") surveyed various climate risk assessment tools used by financial institutions to evaluate and disclose physical and transition risks associated with climate change.[74] The Landscape Report reviews nineteen commercially-available tools for assessing physical climate risk and eighteen commercially available transition risk assessment tools.[75] With respect to the former, the Landscape Report finds that existing tools can be used to evaluate acute risks associated with extreme weather events, flooding, wildfires, and landslides, as well as chronic risks associated slow onset climate change impacts, such as sea level rise.[76] The Landscape Report further notes existing tools are "being constantly updated to allow for more granular analysis that takes into account a broader, more plausible set of scenarios," and enables financial institutions to "provide consistent and market-ready disclosures."[77] According to the Landscape Report, physical risk data is becoming easier to access in formats that are "easily usable by financial institutions."[78]

Following release of the 2021 Landscape Report, UNEP FI ran a pilot program in which forty-eight global banks and investors were given an opportunity to learn about, and trial, twelve commercially available climate risk assessment tools.[79] The tools modeled impacts under several RCP scenarios.

The program participants included TD Asset Management Inc. ("TDAM"), which manages $434 billion in assets on behalf of 3 million investors.[80] TDAM trialed emissions analysis, climate scenario alignment analysis, transition risk analysis, and physical risk analysis tools made

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74 PAUL SMITH, UNEP FI, THE CLIMATE RISK LANDSCAPE: A COMPREHENSIVE OVERVIEW OF CLIMATE RISK ASSESSMENT METHODOLOGIES (2021), https://www.unepfi.org/publications/banking-publications/the-climate-risk-landscape/.

75 *Id*. at 15 & 29.

76 *Id*. at 32.

77 *Id*. at 35 & 37.

78 *Id*. at 37.

79 DAVID CARLIN & ALEXANDER STOPP, UNEP FI, THE CLIMATE RISK TOOL LANDSCAPE: 2022 SUPPLEMENT (2022), https://www.unepfi.org/publications/the-climate-risk-tool-landscape-2022-supplement/.

80 TD Asset Management, *About Us*, https://perma.cc/8AR9-AXPN (last visited Mar. 20, 2023).

available by Institutional Shareholder Services ("ISS") ESG.[81] We focus here on the physical risk analysis tool, which TDAM used to "measure[ ] the potential financial impact of the six most costly natural climate hazards such as floods, droughts or wildfires on the value of" a global equity portfolio that held 195 securities from over thirty countries.[82] TDAM's analysis showed that physical climate risks are projected to result in a 1.6 percent and 2.8 percent change in portfolio value by 2050 under the most likely and worst-case RCP scenarios, respectively, and that "80% of the climate value-at-risk of the portfolio can be attributed to just 30 securities."[83] TDAM also used the ISS ESG tool to evaluate the financial risks posed by specific climate impacts and found that wildfires and heat stress presented the greatest risk to its portfolio.[84]

Another participant in the pilot program was Intesa Sanpaolo, an Italian bank that serves 13.5 million customers and has €341 billion in assets under management.[85] Intesa Sanpaolo worked with Risk Management Solutions, Inc. ("RMS"), which has developed over 300 catastrophe risk models that can be used to assess "how frequently a given location can be expected to be impacted" by a particular hazard (e.g., flooding in excess of six feet), as well as "the frequency and severity of the economic impact caused by" the hazard.[86] RMS used the models to quantify the flood risk of a sample of Intesa Sanpaolo's mortgage portfolio in regions throughout Italy under RCP6.0 and RCP8.5.[87] Using RMS data, Intesa Sanpaolo calculated the impact on Loss Given Default and the Probability of Default to range from five to thirty-nine percent of the initial values.[88] Intesa Sanpaolo further estimated, under RCP8.5, the average annual loss would increase fifty percent over the baseline in the provinces of Rome and Naples by 2040.[89]

A third pilot program participant was Desjardins Group, a financial cooperative with over seven million members and customers, and over $397 billion in assets.[90] Desjardins partnered with The Climate Service ("TCS"), which used its Climanomics platform to evaluate physical and transition risks across fifty of Dejardins' real assets.[91] The Climanomics platform models absolute climate risk, measured in millions of USD and relative climate risk, reported as percent of asset value.[92] The analysis of Dejardins' assets revealed that fluvial flooding is the greatest physical risk to the assets under both RCP4.5 and RCP8.5 scenarios.[93] Drought was identified as the second

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81 CARLIN & STOPP, *supra* note 79, at 38-39.
82 *Id*. at 39.
83 *Id*. at 42.
84 *Id*. at 43.
85 Intesa Sanpaolo, *Business*, *About Us*, https://group.intesasanpaolo.com/en/about-us/business (last visited Mar. 20, 2023).
86 CARLIN & STOPP, *supra* note 79, at 26 & 62.
87 *Id*. at 64.
88 CARLIN & STOPP, *supra* note 79, at 66.
89 *Id*. at 65.
90 Desjardins Group, *Quick facts about Desjardins*, https://perma.cc/7HHX-XPXQ (last visited Mar. 20, 2023).
91 CARLIN & STOPP, *supra* note 79, at 80.
92 *Id*.
93 *Id*. at 84.

greatest physical risk to the assets.[94] Desjardins was able to conduct asset-level risk analyses. For example, the analysis showed that a dairy farm located northeast of Montreal, Canada, would "face a modeled average annual loss (MAAL) of 6.7% to 8.5% for RCP4.5 and RCP8.5, respectively."[95] The analysis further showed that "[t]he highest risks faced are from temperature extremes, followed to a lesser degree by fluvial flooding and drought at both RCP4.5 and RCP8.5 scenarios. The largest difference among the two is temperature extremes representing a 5.7% MAAL in RCP8.5 and 3.9% MAAL in RCP4.5."[96]

Using the methods described above, companies can assess the physical risks they face from flooding, drought, and other climate change impacts. And as UNEP FI has noted, climate risk assessment methodologies are advancing rapidly, and new tools continue to become available.[97] UNEP FI predicts that physical risk models will continue to improve and provide increasingly "granular" data that will "allow [ ] more accurate risk analysis."[98]

C. Conclusion

As the IPCC has recognized, it is "unequivocal" that human activities are warming the planet, leading to "widespread and rapid changes" that pose significant economic and other risks.[99] The Sabin Center supports DFS' Proposed Guidance as aligned with the agency's statutory mandate and goals to safeguard the financial system, and as particularly meaningful advice to financial institutions not already subject to Federal Reserve, OCC, and FDIC Draft Principles. In all, the Proposed Guidance adds to a robust and rapidly-growing framework that supports the financial sector in addressing the impacts of climate-related financial risk, protecting the integrity of the financial markets, and building resilient businesses that can withstand climate risks for the benefit of consumers and the banking public.

Sincerely,

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94 CARLIN & STOPP, *supra* note 79, at 84.
95 *Id*. at 85.
96 *Id*. at 85.
97 *Id*. at 8; SMITH, *supra* note 74, at 35.
98 SMITH, *supra* note 74, at 37.
99 IPCC, *supra* note 2, at 4.