DEVELOPING CLIMATE RISK DISCLOSURE PRACTICES FOR THE STATE OF CALIFORNIA

The California Climate-Related Risk Disclosure Advisory Group

Alicia Seiger, Co-Chair
Kate Gordon, Former Co-Chair*

*Kate Gordon served as Co-Chair until June 2021, when she joined the Biden-Harris Administration.

Credit: bennymarty

The views, analyses, and conclusions expressed in this report reflect the work of the California Climate-Related Risk Disclosure Advisory Group, and do not necessarily reflect the views of the organizations the Advisory Group members belong to, or of the Government of California. Reference to any products, services, websites, organizations, or enterprises, or the use of any organization, trade, firm, or corporation name is for informational purposes only and does not constitute endorsement, recommendation, or favoring by the Advisory Group or the Office of the Governor. Although State of California personnel advised on aspects of this project, this report was solely authored by the Advisory Group and is not intended to represent the views of the State.

DEVELOPING CLIMATE RISK DISCLOSURE PRACTICES FOR **THE STATE OF CALIFORNIA**

The California Climate-Related Risk Disclosure Advisory Group

Alicia Seiger, Co-Chair

Kate Gordon, Former Co-Chair*

Thomas Heller, Editor

Andreína Mesalles, Associate Editor & Program Manager

Stephen Moch, Associate Editor

We are particularly grateful for the additional feedback, research and writing support provided by Maya Granit, the Stanford team (Isabella Castrodale, Melissa Zhang and Katie Taflan Cerneka), Stanford Law School's Climate Risk Disclosure Law and Policy Lab students (David Liou, Jesse Lazarus, Lea Hirshi, Lillian Childress, Ruying Gao and Veena Katragadda) and experts Curtis Ravenel and Ilmi Granoff.

**Kate Gordon served as Co-Chair until June 2021, when she joined the Biden-Harris Administration.*

TABLE OF **CONTENTS**

EXECUTIVE SUMMARY

Climate change presents financial risks and opportunities for the State of California. The state's economy will continue to be disrupted by wildfires, droughts, other climate-influenced physical events and more broadly by the transition to carbon neutrality. Such disruptions will have significant effects on the Government of California's expenditures and on the value of financial assets held by Californians, including savings held in public pension systems. At the same time, investment opportunities are being created by resilience efforts and the emergence of new technologies related to climate change mitigation and carbon removal.

Climate-related risk disclosures are critical components of the needed response to climate change. The financial risks posed by climate change cannot be adequately managed unless they can be properly measured and disclosed. Similarly, seizing financial opportunities requires an understanding of value at risk. It follows that California's climate strategy requires a concerted effort to introduce a new generation of data-driven climate-related risk assessment and management processes.

This report builds upon California's leadership and pursuit of climate goals. In 2020, Governor Newsom called for this external Advisory Group on Climate Risk Disclosure to build the state's capability to assess and manage climate risk. The request was linked to Governor Newsom's Executive Order, signed in 2019, calling for the Department of Finance to collaborate with the state pensions to build a "Climate Investment Framework." This framework was developed to align portfolio investment with the state's climate leadership and to facilitate the alignment of direct expenditures by the state's main agencies with the state's climate goals.

California has taken other steps toward climate risk management in the real economy. Through the state's Scoping Plan and the Just Transition Roadmap, California has set ambitious targets to reduce greenhouse gas emissions to 40 percent below 1990 levels by 2030 and laid out a structure to ensure the protection of vulnerable populations. Furthermore, the state has a suite of strategies in place to manage physical risk and improve resilience in its expenditures. These strategies include the State Adaptation Strategy, the Integrated Climate Adaptation and Resiliency Program (ICARP), and the California Climate Change Assessments.

The state's three largest pensions have also increased their climate ambition during the last five years. Both CalPERS and CalSTRS published a Task Force on Climate-related Financial Disclosures (TCFD) report in 2019. UC Investments announced its portfolios "fossil free" in 2020. In the spring of 2021, CalSTRS played a pivotal role in the vote that led to place three climate-competent members on Exxon's Board of Directors. Both CalPERS and CalSTRS have pledged to achieve net zero greenhouse gas emissions by 2050.

This report builds upon the framework of the Task Force on Climate-Related Financial Disclosures and focuses on implications for the state's direct expenditures and financial portfolios. In 2017, Financial Stability Board's (FSB's) TCFD published a disclosure framework that has garnered support from organizations representing a total market capitalization exceeding $12 trillion. TCFD is recognized as the primary organizational structure for climate-related risk disclosure nationally and internationally. This report translates the TCFD guidance into a set of recommendations along two pathways. The first pathway is direct expenditures, with a focus on public works, procurement, and other expenditures common to the state's agencies and departments, and which are funded through direct appropriation by the legislature. The second pathway is related to financial asset ownership, with a focus on arms-length, often passive investment common to the state pension funds and, to a lesser extent, the State Treasurer's investment of funds in the state's Pooled Money Investment Account.

In addition to the TCFD framework, this report identifies multiple climate risk methodologies and standards as components of evolving best practice. In Chapter 3, the report incorporates learnings from project-level climate-related risk methodologies into a robust set of disclosure requirements for California-based projects. Project disclosure is currently beyond the scope of TCFD but is crucial for understanding the future operations of state infrastructure. Source methodologies include the Coalition for Climate Resilient Investment's (CCRI's), Physical Climate Risk Assessment Methodology (PCRAM), the EU Green Public Procurement Guidelines (GPP), and the EU Guidelines for Adapting Infrastructure to the Impacts of Climate Change. In Chapter 4, the report builds on previous work, including UN PRI's Guide for Asset Owners and the guidance published by the UK Government's Department for Work and Pensions (DWP), and raises the bar by offering more specific, actionable, and ambitious guidance for California's largest pensions. In so doing, the report attempts to increase the ambition of the state while staying in-line with national and international guidance.

KEY RECOMMENDATIONS

CHAPTER 2: EFFECTIVE DISCLOSURE IN CALIFORNIA'S GOVERNMENT CONTEXT

- **Aligning disclosure with California's climate strategies:** New disclosure standards should align with and support key state climate strategies. The state should further invest in the provision of climate risk data, models, and tools for both private and public California-based organizations.

- **Implementation coordination and resources:** The state should establish a continuing internal process that coordinates disclosure efforts across state organizations and incorporates disclosure in other state processes and policies. The state should also continue to invest in personnel, capabilities, and technical assistance resources to enable the successful implementation of disclosure standards.

CHAPTER 3: CLIMATE RISK DISCLOSURE FOR DIRECT EXPENDITURES

- **Guiding principles:** A classification system should be developed for direct expenditures based on potential materiality of climate risk, and the granularity of climate risk disclosure required of transacting counterparties should be appropriate to their size and expertise. These requirements should include technical assistance to ensure equitable access, incorporate just transition and

equitable and inclusive economy considerations, and evolve in line with emerging best practices.

- **Corporate disclosure:** All relevant counterparties transacting with the state should provide a corporate disclosure document in-line with TCFD and surpass minimum standards relating to climate change.
- **Project disclosure:** Counterparties should disclose relevant project-level physical and transition climate risk as part of their bids using methodologies prescribed by the state and aligned with emerging best practices.
- **Consistent data and scenarios:** The state should further expand its provision of transition and physical climate risk data and specify the physical and transition scenarios to be used for consistent climate risk analytics and disclosure.

CHAPTER 4: CLIMATE RISK DISCLOSURE FOR FINANCIAL PORTFOLIOS

- **Guiding principles:** Given their position at the top of the capital supply chain, asset owners should use multiple and appropriate strategies to solicit climate-related information from, and impose climate-related criteria on, the third parties with which they transact. These third parties include companies, project developers, asset managers and consultants, and their earnest participation is central to enabling disclosure at the asset owner level. Asset owners may phase-in recommendations based on strategic priorities and the guidance of state governance bodies.
- **Governance:** Asset owners should disclose their boards' and organizations' processes, policies, and capabilities to assess and manage climate risk. Asset owners should also move beyond current practice and disclose verification and accountability measures for climate-related data.
- **Strategy:** Asset owners should use scenario analysis to assess physical and transition risks in their portfolios and disclose the methodologies used for these analyses. Based on this scenario analysis, asset owners should disclose how actual and potential climate-related impacts affect their fund's strategy and financial planning over the short, medium, and long term. This effort should include issuing a credible transition plan.
- **Risk management:** Asset owners should disclose how they identify, assess, and manage climate-related risks. These disclosures should include their approach to physical risk management and their engagement processes with third parties.
- **Metrics and targets:** Asset owners should disclose metrics for transition and physical risk, offsets, green and transition finance, and social equity. Asset owners should disclose targets for emissions and investment in transition and green finance.
- **State Treasurer's Office (STO):** The STO should request information from counterparties about whether they have coherent, time-bound, specific, and attainable goals for climate-related risks and opportunities, and whether the counterparty's risk-disclosures align with the recommendations of the TCFD.

IMPLEMENTATION CONSIDERATIONS

Establishing the recommendations outlined in this report would require a concerted and well-resourced effort involving multiple public institutions. The AG

acknowledges that the State of California faces competing spending priorities. Allocating resources to improve management of climate-related risks, however, can be justified by the rapidly growing financial impacts that the state is experiencing as a result of increasing frequency and severity of extreme heat, drought, fires and floods.

Challenges to implementing this report's recommendations fall into four general categories: data, methodologies, customization, and capabilities. Climate-related data is an evolving field, and building repositories of decision-useful information will require focus and resources. The methodologies used to assess climate-related metrics and impacts are nascent and evolving, requiring the state to navigate uncertainty and continually process new information. The state's agencies and pension funds have a myriad of processes that would be affected by implementation of these recommendations. Methodologies might need to be customized, which would make it difficult to quickly implement and scale new practices. And finally, implementing these changes requires the development of new capabilities and expertise within state organizations. A continuous collaboration across state entities, in partnership with external actors, will be crucial to successfully implementing climate-related risk disclose requirements across the state.

WHAT THIS REPORT IS AND WHAT THIS REPORT IS NOT

This report provides expert insights into best practices for the translation of TCFD and other climate risk disclosure methodologies to the state context. The report does not recommend new policy or create a separate California standard. Climate-related risks and opportunities have become ubiquitous factors across state functions. This report focuses on state functions and decision making that incorporate substantial climate-related risk, specifically in expenditure projects and state pension investments. Additional efforts are needed to understand the impact of climate risk on existing state infrastructure. Furthermore, the report acknowledges the role of SEC guidance in the disclosure efforts of public companies and does not propose recommendations that conflict with that guidance.

LIST OF
ACRONYMS AND ABBREVIATIONS

AB	Assembly Bill
ACCA	Association of Chartered Certified Accountants
AG	Climate-Related Risk Disclosure Advisory Group
CARB	California Air Resources Board
CalHFA	California Housing Finance Agency
CalPERS	California Public Employees' Retirement System
CalSTRS	California State Teachers' Retirement System
CEA	California Earthquake Authority
CEQA	California Environmental Quality Act
CCRI	Coalition for Climate Resilient Investment
CDI	California Department of Insurance
CFTC	Commodity Future Trading Commission
COP26	26th UN Climate Change Conference of the Parties
CRCC	Climate Risk Coordination Committee
DDQ	Due Diligence Questionnaire
DWP	Department for Work and Pensions
EBRD	European Bank for Reconstruction and Development
EC	European Commission
EIB	European Investment Bank
ESIF	European Structural and Investment Funds
ESG	Environmental, Social, and Governance
EU	European Union
EVIC	Enterprise Value Including Cash
eVTOL	Electric Vertical Take-off and Landing
FAIR	Fair Access to Insurance Rates Plan
FSB	Financial Stability Board
GAAP	Generally Accepted Accounting Principles
GHG	Greenhouse Gas
GPP	Green Public Procurement Program
iBank	Infrastructure and Economic Development Bank
ICAP	Investor Climate Action Plan
ICARP	Integrated Climate Adaptation and Resiliency Program
ICMA	International Capital Market Association
IEA	International Energy Agency
IFRS	International Financial Reporting Standards
IIRC	International Integrated Reporting Council
IPCC	Intergovernmental Panel on Climate Change
JASPERS	Joint Assistance to Support Projects in European Regions
KPI	Key Performance Indicator
LOCA	Localized Constructed Analogs
LWDA	Labor and Workforce Development Agency
NAIC	National Association of Insurance Commissioners
NCA	National Climate Assessment
NGFS	Network for Greening the Financial System
NYSCRF	New York State Common Retirement Fund

NZAOA	Net-Zero Asset Owners Alliance
OPR	Office of Planning and Research
PCAF	Partnership for Carbon Accounting Financials
PCRAM	Physical Climate Risk Assessment Methodology
PRI	Principles for Responsible Investment
P-ROCC	Physical Risks of Climate Change Framework
RCP	Representative Concentration Pathway
RFP	Request for Proposals
RFQ	Request for Qualifications
SASB	Sustainability Accounting Standards Board
SB	Senate Bill
SCIF	State Compensation Insurance Fund
SEC	Securities and Exchange Commission
SIF	Sustainable Insurance Forum
STO	State Treasurer's Office
TCFD	Task Force on Climate-Related Financial Disclosures
TSVCM	Taskforce on Scaling Voluntary Carbon Markets
VOC	Volatile Organic Compound
VRF	Value Reporting Foundation
WACI	Weighted Average Carbon Intensity

FOREWORD

Alicia Seiger, Co-Chair
California Climate-Related Risk Disclosure Advisory Group

California is changing. Extreme drought, heat, raging wildfires, and unhealthy air have become the new normal. California's economy is also on the move, with regions historically dependent on carbon-intensive industries feeling economic and political pressure to transition. Agricultural regions, as a result of the physical impacts of a changing climate, are struggling under increasingly scarce water availability and sweltering temperatures. There is also tremendous climate-related opportunity across the state. California's companies, investors, and entrepreneurs are developing many of the innovative technologies that will drive a carbon-neutral economy.

The COVID-19 pandemic laid bare the costs of delay and unpreparedness, as well as the difficulties of collective action, the local impacts of global threats, and the inequitable distribution of suffering on poor and marginalized communities. At the same time, the pandemic upended workplace and employment patterns in ways that promise to transform local and state economies for years to come. Taken together, the future of California's physical and economic environment does not look like the past.

This report – a first of its kind – aims to better prepare the State of California for the road ahead by using the Task Force on Climate-Related Financial Disclosures (TCFD) framework to translate climate risks into financial terms and anticipate possible implications for taxpayer dollars and pension portfolios. Climate risk disclosure is a rapidly evolving field, and this report dives into the frontier of national and international best practice. It also charts new territory, offering deeply considered guidance in the face of uncertainties and open questions. It is meant to serve as a roadmap, not only for the State of California, but also for other governments and investors.

Building on his 2019 Executive Order calling for the state to better align direct spending with its climate goals, Governor Gavin Newsom requested an external Advisory Group (AG) to further advance the state's leadership on measuring and managing climate risk and opportunity. It was my privilege to co-chair the AG. With their deep expertise in state and local government, infrastructure, economics, finance, accounting, banking, business, insurance, and investment portfolio management, AG members tackled their work with curiosity and gusto.

From the outset, the AG's discussions highlighted the challenges of its assignment. These challenges stem from three factors. First, California plays a myriad of diverse roles, and in nearly all of them, the state is already facing the impacts of rising climate risk and the opportunities of a transition to a carbon-neutral society. The state will be confronting climate change as a factor in its decision making across its roles as a purchaser of goods and services, a builder and owner of public works, an investor and a borrower, an insurer of first or last resort, and as a legislator and regulator of orderly and equitable social change. The AG could not tackle all of the state's roles at once.

To confront this first challenge, the AG picked two roles that were particularly relevant and timely – the state as a purchaser and as an investor. The AG's focus on direct expenditures (in Chapter 3) breaks new ground and was a logical point of entry, given the scale of state purchasing power and the economic impacts of wildfire, drought, and floods on state infrastructure. The AG's guidance in Chapter 3 ties directly to questions that will arise in response to new federal infrastructure funding.

Given the advanced posture of the state's pensions, the breadth and volume of their assets under management, and the well-documented precedent on which the AG could build, the state's role as an investor was another logical place to start. The AGs guidance for financial portoflios (in Chapter 4) ties directly to active discussions at the federal level, specifically the U.S. Securities and Exchange Commission's (SEC's) ongoing consultation and rulemaking process on climate risk and President Biden's May 2021 Executive Order Climate-Related Risk Disclosure.[1] Even within these two pathways, the application of disclosure is somewhat different across the specific government entities involved and the roles in which they are engaged.

1 https://www.whitehouse.gov/briefing-room/presidential-actions/2021/05/20/executive-order-on-climate-related-financial-risk/

The AG confronted a second challenge in that California is governed through a rich and complex network of agencies and institutions, operating through specialized processes, that tackle difficult and sensitive decisions to which climate concerns are relevant. Adding climate considerations to this array of established procedures is a challenge and will call for political judgments about adjusting to changing conditions, without disrupting a system already taxed for time and resources and with attention to a just, equitable, and inclusive transition.

And finally, the AG had to wrestle with the fact that climate policy generally, and the place of climate risk disclosure within that policy specifically, are very much works-in-progress. There are some areas of widely agreed good practice and other issues that are yet to be well-formulated let alone to have reached consensus. Unsettled areas include the pursuit of best practices for scenario analysis and transition plans. Questions about the treatment of offsets and definitions for green and transition investments are also evolving. Perhaps the thorniest open question is: What exactly should a receiving entity do with climate-related information that is disclosed?

In light of these obstacles, this report is conscious of, and was shaped to fit, an emerging landscape that recognizes how far California has come, where the state might go now, and where future leaders will likely need to travel as they learn more from deeper analysis and experience.

CHAPTER 1:
MANAGING CLIMATE RISK IN THE STATE OF CALIFORNIA – AN INTRODUCTION

California is facing an economic transition, driven in part by the realities of climate change. The state is experiencing increasingly frequent – and increasingly severe – climate impacts, including record heat waves, raging wildfires, and seemingly interminable drought. At the same time, key regions of the state that have historically depended on jobs and tax revenue from carbon-intensive industries, like oil production and refining, are feeling pressure from a global market that is slowly but inexorably transitioning toward carbon neutrality. These climate-related risks can give rise to economic opportunities, such as proactive investment in emerging technologies for climate resilience, and carbon emission reduction and removal. But understanding the risks, and accurately evaluating the opportunities, requires a new level of assessment and management of climate-related risks and opportunities.

As the world's fifth largest economy, California directly expends taxpayer dollars on state infrastructure and industries that are affected by the changing climate. Its pension funds, together managing roughly $1 trillion, are portfolio investors in global markets that are themselves reacting to a changing climate and to the policies and technology shifts that come with the growing recognition of the urgency of climate action. Currently, the market does not adequately price the economic risks and opportunities that result from increasing physical climate impacts, or from the shift to a decarbonized economy. As a global leader on climate policy and cutting-edge technology adoption, and a state committed to protecting its taxpayers and communities from foreseeable economic harm, California has a responsibility to accelerate data-driven management of climate risks.

Governor Gavin Newsom stepped up to this challenge with a 2019 Executive Order calling for the state's transportation and government services agencies to better align direct spending with the state's climate goals, and for the Department of Finance, which oversees the state budget, to work directly with the state's three largest pensions (California Public Employees' Retirement System, California State Teachers' Retirement System, and the University of California Retirement System) to identify a "Climate Investment Framework" better aligning portfolio investments with California's climate leadership. In 2021, the governor's office took the additional step of establishing an external Climate-Related Risk Disclosure Advisory Group (AG) to further advance the state's leadership on measuring and managing climate risk and opportunity.

California takes these steps in a broader global market context. Over the last decade, long-term risk managers at re-insurance firms, pensions, and endowments have been

increasingly aware of the clear financial risks inherent in the growing climate crisis. In its foundational 2017 report, the Financial Stability Board (FSB) Task Force on Climate-Related Financial Disclosure (TCFD) laid out a clear framework on how to translate what had been mostly a scientific and policy discussion into the language of risk management. The TCFD framework highlights the fiscal impacts of climate change in two major categories: **transition risk** (the risk of industries and governments not repositioning for the transition to a carbon-neutral economy, and the potential for stranded assets and other failed investments as a result), and **physical risk** (the risk to place-based assets, including basic infrastructure, like roads and power grids, from climate-driven events, like fire and floods). The TCFD framework also highlights the flip side of these risks: the opportunities inherent in thinking ahead about investments in more resilient systems and technologies.

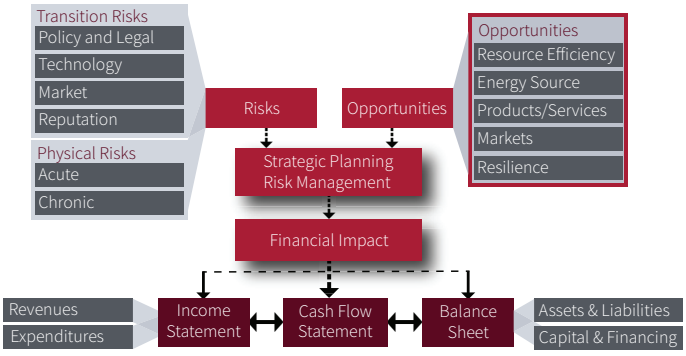


Figure 1: Task Force on Climate-Related Financial Disclosures (TCFD), Final Report, 2017: "Climate-Related Risks, Opportunities, and Financial Impact"

Policymakers and long-term investors have increasingly coalesced around the TCFD framework as a starting point for thinking about specific physical and transition risks. At their June 2021 meeting, the leaders of the G7 countries called for countries to move toward "mandatory climate-related financial disclosures that provide consistent and decision-useful information for market participants," and specifically recommended TCFD as a framework for this work. Meanwhile, the broader financial sector, including financial supervisors from a number of countries around the world, has begun to take serious note of both transitions and physical climate risks faced by asset owners and investors, and of the opportunities for innovation and economic growth inherent in the transition to a carbon-neutral economy and the adaptation of physical assets. As BlackRock Chairman Larry Fink wrote in his 2020 annual letter to CEOs, "The evidence on climate risk is compelling investors to reassess core assumptions about modern finance."

Put simply, global market actors are stepping forward to argue that not considering climate risk in investments and asset management is fiscally irresponsible, and ignores the clear science outlining predictable risks that economies face in the next several decades.

This is not a theoretical issue for California. State offices and agencies already have a clear sense of how up-front investment in resilience measures can reduce impacts to the state budget, as well as to communities and industries. For example, the devastating wildfire seasons over the past four years have put in stark focus the urgent need for California to take a proactive approach to the physical risks associated with a changing climate. The resulting bankruptcy of the state's largest utility, and the loss of life and economic vitality in the Town of Paradise, are examples of the types of human and economic losses and impacts the state faces if government does not adequately assess, manage, and mitigate these risks. Similarly, although not directly attributable to climate change, the job losses and economic devastation of some of California's northern forested communities due to the decline of the timber industry, and the lack of investment into more sustainable and resilient economic development strategies in those counties, provide a useful example of the potential long-term consequences of economic transitions.

Disclosure in context: national and international policies and practices. The TCFD framework lays out a strong foundation for thinking about risk measurement and management, as well as corporate strategy and governance, and recommends climate risk disclosure as an important tool to accomplish this goal. Climate-related financial disclosure refers to the disclosure by companies, insurers, asset owners, and managers of (1) the risks and opportunities that climate change present to a company's financial position today and in the future, and (2) the management strategies, including governance and processes, pursued to account for and respond to those risks and opportunities. It is important to note that disclosure is not an end in its own right. Instead, disclosure provides information that enables better decision making by investors and companies, which in turn enhances their ability to drive strategic objectives.

Such disclosure is a critical step in the State of California's approach to climate risk management. By requiring disclosure from companies and investment firms with which the state engages, California can be more equipped to assess the risk of programs, projects, and investments. Agencies can make decisions with greater transparency on asset pricing, comparative alternatives, and long-term risk management plans. Climate risk disclosure also requires risk-focused engagement from potential partners and allows for more optimal comparison of options when considering climate risk-mitigation strategies for any particular asset or investment.

Recognizing the imperative of managing both physical and transition risk and the important role of disclosure, Governor Newsom called for a working group to

"develop common climate risk disclosure standards that would be an international template for investors to use in assessing the financial risk associated with climate change."

The AG takes on this task with the clear intention of recommending best practices for climate risk disclosure that are consistent with federal and international standards.

Since the advent of the TCFD in 2017, the movement for climate-related financial disclosure has grown tremendously. More than 1,027 organizations representing a market capitalization of over $12 trillion have signed on as supporters of the TCFD. A group of more than 450 investors with more than $40 trillion in assets under management known as Climate Action 100+ has committed to getting the world's largest corporate greenhouse gas emitters to implement TCFD guidance.

The Network for Greening the Financial System (NGFS) was established in 2017 within the international regulatory community. Since then, it has grown to more than 90 central banks and regulators, including The Bank of England, the European Central Bank, and the Bank of Japan. In the United States, both the Federal Reserve and New York's Department of Financial Services have joined the NGFS. The NGFS has developed regulatory best practices for central banks and bank supervisors to address climate-related risks to banks and the banking system and published climate change scenarios for use in supervision. The Sustainable Insurance Forum (SIF), an international network of insurance regulators founded by California's Insurance Commissioner in 2016, has grown to more than 35 regulators who have developed regulatory best practices to identify, disclose, and manage climate-related financial risks faced by insurers.

In 2017, California's Insurance Commissioner required insurers to identify and disclose their investments in oil, gas, coal, and utilities so that regulators, insurers, consumers, and investors could better evaluate the transition risk faced by insurers' investment portfolios. In 2018, California's Insurance

Commissioner was the first financial regulator in the U.S. and globally to undertake climate risk scenario analysis of insurers' investment portfolios to evaluate climate-related transition risks.

Recently, the Biden-Harris Administration has begun efforts to ensure that U.S. financial regulators are addressing climate-related risks to U.S. financial institutions and the financial system, and are also developing climate risk-related disclosure standards in relation to the federal budget. In May 2021, President Biden issued an Executive Order on Climate-Related Financial Risk calling on his administration to

"advance consistent, clear, intelligible, comparable, and accurate disclosure of climate-related financial risk . . . including both physical and transition risks; act to mitigate that risk and its drivers . . . ."

In 2020, the U.S. Commodity Future Trading Commission (CFTC) concluded in its seminal report, "Managing Climate Risk in the U.S. Financial System," that climate change poses substantial risk to the U.S. financial system and institutions. This report is the first by a U.S. financial regulator to examine comprehensively the climate risks facing the financial system and to make specific recommendations for financial regulators to address these risks. The report's recommendations called for mandatory disclosure of climate-related risks by corporations and financial institutions, building on the TCFD framework. Following this report, the U.S. Securities and Exchange Commission (SEC) in 2021 published a historical request for comment on climate change disclosures.

To date, movement towards mandated disclosure has been led mostly by European entities. France was the first country to mandate climate risk disclosure with Article 173-VI of its "Law on Energy Transition and Green Growth." Other European countries are poised to follow suit. The Bank of England announced in 2019 that it will require all banks and insurers to publicly report on climate-related financial risk. Similar action by the European Central Bank means that all Eurozone countries are now taking a similar direction. Despite the SEC's consultation and other recent actions by the Biden-Harris Administration and other U.S. financial regulators, the U.S. is still behind Europe when it comes to integrating climate-related risks into its financial reporting and decision making. California has the opportunity, given the size and scope of its economy, to continue to lead the U.S. in this space.

Applying TCFD to government decision making. To fulfill the governor's directive to recommend "common climate risk disclosure standards," the AG started with the TCFD framework, which, as noted above, has become the primary organizational structure for most of the climate risk disclosure work happening both federally and internationally.

The framework makes sense as an organizing structure for state-level work. California faces both risks and opportunities similar to those laid out in the TCFD framework. The TCFD guidance for implementation includes general guidance for all sectors related to governance, strategy, risk management, and setting metrics and targets. The framework also includes specific guidance for investors ("Guidance for the Financial Sector") and for those directly managing specific assets or infrastructure, including investors in energy, transportation, and agriculture ("Guidance for Non-Financial Groups").

The AG translated the TCFD framework into the California context by organizing a series of recommendations into three pathways:

State governance and strategy: The organizing structures that oversee and manage climate-related risks and opportunities at a statewide level and the strategies that guide the state's responses to climate change.

Direct expenditures: The kinds of grants, loans, and procurement contracts common to the state's agencies and departments, and funded through direct appropriation by the legislature.

Portfolio investments: The kind of arms-length, often passive investment common to the state pension funds and, to a lesser extent, the state treasurer's investment of funds in the state's Pooled Money Investment Account.

Chapters dedicated to each of these areas, and recommendations specific to each, are contained in this report.

It became clear almost immediately that the AG would need to pay special attention to the ways in which the TCFD guidance to corporates and investors needed to be translated to a public sector context. In particular, the AG realized that unlike private investors or corporations, states and other government entities often do not have the option to easily walk away from, or reduce investment in, areas that are clearly high risk from a climate perspective. As an example, California's Highway 1 – the Pacific Coast Highway – is at risk from sea level rise and coastal erosion, as recent closures near Big Sur have underscored. The state is not in a position to make a single "go/no-go" decision related to its investment in this system, especially given Highway 1's importance to state commuter traffic, tourism, trade, and community life.

A sound disclosure process is critical to the state's ability to understand these risks when operating and maintaining the state highway system. Requiring a thorough risk assessment and management plan communicated through disclosure ensures that critical state assets are maintained to the highest standard of climate risk management using current data and information. Disclosure will provide the ability to understand associated climate risks, as well as the cost and pricing implications of risk-mitigation strategies. In other words, embedding disclosure into a procurement processes will inform discussions around asset prices and risk allocation, and allow for comparison to other alternatives that may satisfy the same end goals of a given project. These themes are discussed further in Chapter 3.

On the transition-risk side, there is no question that oil production, taken as an isolated activity, bears transition risk, given the shift toward electrification and renewable energy sources and away from fossil fuels for transportation, buildings. and home energy happening across the globe – not to mention policies accelerating this shift in many places, including California. Yet, simply walking away from oil production without taking steps to ensure a just transition for communities and workers in this industry would have impacts on state jobs and tax receipts. This would, in turn, put the state in a position of having to spend significant funds on shoring up tax revenues in specific counties, along with targeted safety net programs, such as unemployment insurance, food and rental assistance, and job training. Given that California consumes every barrel

of oil produced in-state, cutting off production would also have broader impacts on global emissions, as imports would certainly increase in the short term.

Similarly, on the physical-risk side, every major climate disaster in the state creates the need for immediate disaster relief, along with increased safety net spending, making it even more important for the state to take immediate action to invest in climate adaptation and resilience that would reduce the cost of these disasters.

Beyond the issue that the state is the "payor of last resort" in the case of extreme climate events, and therefore faces systemic risks from climate impacts, non-financial considerations apply when translating the TCFD framework to public sector decision making. For example:

- There is no real "board equivalent" for state government. The executive branch, the pension funds, and the legislature all have the ability to make decisions about risk measurement and management independently.

- Frameworks and metrics set up through a political process are subject to change with political transition, which can send inconsistent signals to the market.

- Financial-management approaches put in place by government are often interpreted as policy signals, which can affect how financial and non-financial players calculate their own risk and opportunity.

In short, translating the TCFD framework to the state government context raises specific issues that may actually be even more acute than in the private sector context. These issues are noted wherever possible throughout the recommendations laid out in this report.

California has long been a leader in setting strong policy goals to reduce emissions within state boundaries, which has spurred countless jurisdictions to take similar action to mitigate the impacts of climate change. As the physical and transition risks – and attendant costs – become more significant in California, the AG believes it is time for the state to lead in ensuring that these risks are translated into smart fiscal decision making. Disclosure will help clarify the long-term cost of business as usual and help drive greater transparency and understanding to justify potentially greater up-front costs in resilience that provide outsized long-term benefits. Doing so will help protect taxpayers, communities, businesses, and workers from the economic impacts of climate change, while highlighting the opportunities to do more, and do it better, to prepare for a carbon-neutral future.

EQUITY ISSUES FACING THE GOVERNMENT

Avoiding disinvestment in vulnerable communities/places as part of risk-mitigation strategy, ensuring a just transition

In evaluating climate risk, governments like the State of California must take on key economic and equity questions not usually considered by private sector actors. Not only is government usually the "payor of last resort" following climate events, like wildfires and extreme heat, the government must also consider – and mitigate where possible – the long-term economic effects of market shifts and climate policy decisions. The AG identified three major areas in which state government will ultimately need to consider economic and equity impacts that are important, irrespective of the traditional definition of "transition risk" under the TCFD framework:

- **Potential disinvestment in vulnerable communities.** In evaluating the physical and transition risk of specific places, the state has to balance the danger of disclosure leading to disinvestment. This balancing act is clearest when it comes to the state's role in regulating and providing insurance in parts of the state where there is a clear and growing risk from climate events, like wildfires.

- **Potential misplaced investment that deepens inequality.** In considering policies to drive the transition toward carbon neutrality, the state has an additional interest in ensuring that expenditures and investments go to areas that typically have not benefitted from decades of economic growth and opportunity. This additional layer of analysis is often left out of traditional impact investment.

- **Potential for disorderly or unjust transition.** Several parts of California are highly dependent on jobs, but even more so on tax revenues from industries that are likely to decline as part of the transition to a carbon-neutral economy. Unlike many dispassionate private investors, the state has an additional responsibility to ensure a more orderly and just transition in these areas, with a clear strategy for jobs, economic development, and tax revenue replacement.

In sync with such disclosure comes the possibility of highlighting opportunities associated with addressing these risks in areas such as risk mitigation, remediation, adaptation, resilience, and development of replacement assets that address climate risk.

Each of these areas requires additional analysis of the long-term impact of policy and investment decisions on the health and prosperity of all Californians. Chapter 2 explores the question of which part of state government is best suited to review current risks and opportunities and consider their long-term impacts. These issues are critical for policymakers, not only in California but worldwide, as countries increasingly take on carbon-neutrality goals that by necessity require major economic transitions with tangible impacts on workers, industries, and communities.

CHAPTER 2:
EFFECTIVE DISCLOSURE IN CALIFORNIA'S GOVERNMENT CONTEXT

This chapter focuses on the groundbreaking step of translating the Task Force on Climate-Related Financial Disclosures (TCFD) framework into a government context. It will be most useful for policymakers and federal, state, and local officials interested in understanding the statewide actions necessary to implement the TCFD framework and the state-specific characteristics that make this implementation different from its equivalent in the private sector. The chapter starts by framing disclosure within the climate strategies the state has already implemented, and proposes a path to further develop and enhance California's climate policies and goals. It then explores the complex organizational structure of the state, wherein power is shared across constitutional offices, agencies, and other state entities. To circumvent the lack of a central governing body, this chapter proposes a new coordination mechanism that could enable the successful implementation of the range of disclosure recommendations throughout the report. It ends with an examination of the resources necessary for successful implementation of this report's recommendations.

Aligning disclosure with California's climate strategies: Climate-related disclosure standards are not implemented in a vacuum. Leading public and private sector organizations typically have a series of climate strategies already in place. For new strategies to be incorporated successfully and create value, it is important to account for the other climate policies and regulations in place, how they interact with disclosure, and how to build a suite of strategies that is more than the sum of its parts.

Recommendation 2.1: *Implementation of new climate-related risk disclosure standards in California should align with and support the implementation of key state climate strategies.*

In response to the significant physical and transition risks that California faces from a changing climate, the state has taken a global leadership position in charting policy and regulatory strategies. These existing strategies are used to assess and manage climate-related risks. The state has a collection of policies to guide a transition to carbon neutrality that aims to build an equitable and inclusive economy for all Californians, including the Climate Change Scoping Plan, the Cap-and-Trade Program, and the Just Transition Roadmap (see Appendix A). The state has also developed a series of policies to manage physical risk and boost adaptation efforts, including the Adaptation Strategy, Integrated Climate Adaptation and Resiliency Program (ICARP), and the California Climate Change Assessment for physical risk (see Appendix B).

Recommendation 2.2: *The state should further invest in providing state entities and third parties access to climate risk data, climate models, and other tools necessary to conduct scenario analysis.*

Investing in the provision of climate-related risk data and models would advance the state's understanding of climate impacts and would help more accurately explain how current financial decisions are reducing future risk. The development of these models is needed in California to address the limited capacity to conduct scenario analysis in the state. In overcoming this challenge, the TCFD points to the importance of information and experience exchanges and the need for collective efforts to develop tools, data sets, and methodologies, as well as working standards.

The state provides both private and public institutions downscaled climate projections for California through the California Climate Change Assessments (see Appendix B) to assess and manage physical risk to their assets. How these climate projections translate into economic impacts is, however, an area that has not yet been developed by the state. Understanding the effect of both acute and chronic climate impacts on investment cashflows is a necessary step for effective physical climate risk management. The state should invest in ensuring that organizations in California have access to the tools to understand the economic impact of future climate patterns. This provision may occur through model development by the state, guidance and collaboration with private data providers, or collaboration with other governmental entities.

Through the Scoping Plan and the Cap-and-Trade Program (see Appendix A), the state provides direction to public and private entities about the expected path of the transition to a carbon-neutral economy in California. However, in order to perform scenario analysis, organizations need both guidance on which scenarios to use and robust macroeconomic modelling of these scenarios. California should seek to collaborate with the federal government and scenario-setting organizations like the Network for Greening the Financial System (NGFS) and the International Energy Agency (IEA) to develop macroeconomic models specific to the United States that can be used by organizations looking to manage transition risk through scenario analysis. The federal government should invest in consolidating climate scenario models that incorporate the economic realities and policy pathways faced by organizations linked to the U.S. economy. These quantitative models should be calibrated to the high-level reference of internationally recognized scenarios to stay in line with international frameworks and standards. In 2020, Banque de France led a similar effort and published a discussion of their methodology's shortcomings and areas for improvement.[1] Investments in these analytical frameworks would give the necessary tools for institutions to conduct bottom-up climate-related risk analysis.

Chapter 3 further explores the need for consistent data and models across state processes and proposes modelling approaches for scenario analysis for California-based entities.

Implementation coordination and resourcing: One of the critical questions when translating TCFD to the state government context is how the state's own entities can be set up to best take in, synthesize, and react to the kind of disclosures recommended as part of both direct expenditures and portfolio investments. This exercise requires recognition of the complexity of public sector structures that rarely, if ever, rely on a single body that oversees financial decisions and coordinates risk management processes.

Since 2017, the TCFD framework has been implemented by thousands of private sector organizations with governance

1 https://acpr.banque-france.fr/sites/default/files/medias/documents/20210602_as_exercice_pilote_english.pdf

structures that allow for top-down decision making. Implementing the TCFD in the State of California poses the additional challenge of not having a central authority or "board" equivalent. The management of financial and policy decisions across the California state government falls under the purview of multiple constitutional offices and state agencies. There are eight state constitutional officers in California – including the governor – each of whom is elected at the same time in a general election. There are also myriad independent boards, commissions, and other entities – including the pension funds – that may have governor-appointed board members but are not directly accountable to the governor's office. And, of course, the legislature, a wholly separate body, makes policy and budget decisions in collaboration with, but independent of, the governor. This web of governance structures complexifies the coordination function necessary to implement statewide climate-related risk disclosure requirements.

With respect to direct expenditures, the main decision makers in state government are the agencies under the Office of the Governor. With respect to portfolio investments, the main decision makers are the state pension funds, the largest of which are CalPERS (serving state employees) and CalSTRS (serving public school educators). These funds, along with the University of California Retirement System, hold over $1 trillion in assets and are funded by a combination of employee retirement contributions, state and local government employer contributions, and investment earnings. The pensions are independent from the governor and legislature. However, the governor appoints board members for both CalPERS and CalSTRS. The treasurer and controller are ex-officio members

CLIMATE RISK GOVERNANCE IN CALIFORNIA CONSTITUTIONAL OFFICES

Of the eight constitutional offices in the state, six have direct oversight roles relevant to managing climate risk disclosure from entities with whom the state does business.

1. The **governor** is the chief executive of the state and oversees the official conduct of all executive and ministerial officers. The governor is also responsible for passing and signing a balanced annual budget in partnership with the state legislature. The Department of Finance serves as the governor's chief fiscal policy advisor and promotes long-term economic sustainability and responsible resource allocation through the state's annual financial plan.
2. The **state controller** is the chief fiscal officer of the state and supervises fiscal affairs, suggests plans for the improvement and management of public revenues, and keeps all accounts in which the state is interested, including separate accounts for each specific appropriation.
3. The **state treasurer** is the state's banker and lead asset manager. The treasurer invests monies on behalf of state government, cities, counties, schools, and other local agencies. The treasurer sells the state's bonds, including voter-approved infrastructure bonds. The treasurer serves on the boards of the California Public Employees' Retirement System (CalPERS), California State Teachers' Retirement System (CalSTRS), and the California Housing Finance Agency (CalHFA).
4. The **insurance commissioner** is responsible for overseeing California's insurance market and protecting the state's insurance consumers. The California Department of Insurance (CDI) is the largest consumer protection agency in the state and regulates the market conduct of insurers operating in California and insurance rates for property and casualty insurers, and licenses insurance companies, title companies, agents, and brokers in California. CDI is also responsible for ensuring insurers remain financially solvent so they can pay claims.
5. The **secretary of state** receives, examines, and approves articles of incorporation for new California corporations, and qualifies out-of-state and international corporations to do business in California.
6. The **attorney general** is charged with uniformly and equally enforcing California's laws. The attorney general protects Californians from fraudulent, unfair, and illegal activities that victimize consumers or threaten public safety, and enforces laws that safeguard the environment and natural resources.

of both boards, and the director of the Department of Finance holds a seat on the CalSTRS board. The funds exist to provide retirement benefits to their members and are required to meet specific returns on their investments.

There are other state entities that also have substantial investment portfolios facing climate-related risks, which will not be covered in this report. These entities include the State Compensation Insurance Fund (SCIF), which provides workers compensation insurance to employers; the Fair Access to Insurance Rates (FAIR) Plan, which is the fire insurer of last resort for homes and businesses; the California Wildfire Fund, which covers third-party claims against utilities for losses associated with fires started by utility equipment or operations; and the California Earthquake Authority (CEA), which issues a residential earthquake insurance policy for California homes.

Recommendation 2.3: *A continuing internal process should be established that coordinates state climate-related financial risk disclosure and incorporates disclosures into new state processes and policies.*

The Climate-Related Risk Disclosure Advisory Group (AG), in its work of convening experts over a nine-month period and in drafting this report, has taken the initial steps of building a set of recommendations to incorporate climate risk considerations into state decision making. The AG's expertise, however, is time-bound and external. The process the AG started should be continued by representatives of the constitutional offices and other relevant state entities to translate the recommendations into state processes and actions. For the purposes of this report, the AG will refer to this new body as the Climate Risk Coordination Committee (CRCC).

The CRCC should be a forum for constitutional offices and other state entities to:

Continue developing climate-related risk disclosure standards. This report creates the initial framework for the incorporation of climate-related risk factors into state decision making. However, there are topics that will require further exploration, including the framework of technical assistance, the prioritized plan to phase-in disclosure requirements, and further alignment on frameworks, methodologies, data sources, and scenarios to identify and assess climate-related financial risks. These questions are raised throughout Chapters 3 and 4.

Track and integrate the evolution of climate-related risk methodologies and frameworks. National and international methodologies and frameworks will continue evolving, and the state's processes will require continued updating. The CRCC could coordinate the management of the evolving practice of climate-related risk disclosure frameworks, informed by future TCFD guidance, to ensure comparability between California entities and national and international peers.

Guide state entities to use climate-related information disclosed to better inform processes and decisions. Chapters 3 and 4 include a series of recommendations delineating the information that should be disclosed by the state's counterparties when transacting with the state. The CRCC could provide guidance to state entities on how to take in this information, understand it, and translate it into action.

Incorporate learnings from disclosure efforts into other California climate policies and regulations. Climate-related risks are present throughout multiple state functions as explored in this report. The CRCC could become the vehicle to continue integrating disclosure into other aspects of California policies and regulations.

Assess resource needs to incorporate climate-related risk considerations into state processes. In order to implement climate-related risk disclosure processes, the state should identify resource needs across state entities. The first step would be to assess staff capacity and consulting needs across agencies and departments that would have a role in collecting and managing disclosures.

Share internal best practices and foster expertise. The CRCC could be the mechanism by which state entities share implementation best practices and foster expertise. It could also become the forum where external experts get invited to provide guidance on specific topics.

Recommendation 2.4: *The state should invest in additional personnel, staff capabilities, and technical assistance resources.*

State agencies and departments that receive disclosure reports will need administrative and technical staff capacity to consistently manage the incoming submissions, analyze the data, and synthesize the findings into state management decisions. State entities may also have to provide technical assistance and support to small and under-resourced firms that may not have the capacity to perform extensive risk analysis to ensure equitable access to the process.

CHAPTER 3:
CLIMATE RISK DISCLOSURE IN DIRECT EXPENDITURES

Both diverse and thriving, the State of California ranks as the world's fifth largest economy. In line with its significant scale, the state has an all funds operating budget of $262 billion for the 2021-2022 fiscal year. State expenditures cover a wide range of critical functions, including education, healthcare, and the recent COVID-19 response. Expenditures also include the maintenance of infrastructure and the procurement of a wide range of goods and services. The state expends its budget through transfer payments to other units of government, such as schools, as well as through suppliers, contractors, consultants and other counterparties.

TThe state has an interest in understanding the financial risks of both its expenditures and the counterparties with which it transacts. To that end, the state requires information from parties that might contract with the government. While this information covers a wide range of financial risks, particularly with respect to short-term risks, there is a growing recognition of the need for a full consideration of climate risks in direct expenditures. This is particularly true given that while every sector is vulnerable to climate risk, many of the industries with the greatest potential exposure overlap closely with the direct expenditures for which the state is responsible.

This chapter identifies the ways that the state can leverage disclosure recommendations for counterparties interested in contracting with the state in order to inform the management of climate risk across its extensive budgetary expenditures. Recognizing the range of projects and counterparties, and the potential costs of compliance, the chapter includes guiding principles for the development of climate risk disclosure requirements, which seek to target disclosure efforts according to materiality of climate risk, provide technical assistance to ensure equitable access, and consider the just transition and an equitable and inclusive economy.

Disclosure is considered at both the project and corporate level, as the state contracts with counterparties and spends on individual projects. The chapter focuses in particular on project-level disclosures, which require new methodologies that allow for granular analysis and are, in large part, beyond the scope of existing guidance from the Task Force on Climate-Related Financial Disclosures (TCFD). Project-level climate risk disclosure is critical for understanding the future operations of infrastructure and is paramount for the state, even though it is currently at an earlier stage relative to corporate disclosure. Corporate-level disclosure, which is what TCFD is designed for, is also critical as it allows for understanding whether counterparties are appropriately managing climate risk. In both cases, consistent data and scenarios are a necessary input to allow for comparable and decision-useful disclosure.

By setting specific requirements for counterparties to assess and disclose climate risk, both in the projects they are pursuing as well as their own corporate management, California can improve its management of long-term climate risk and thus financial risk management. At the same time, this disclosure program can allow California to advance its understanding of climate risk and inform its efforts to further advance its climate goals.

SCOPE OF EXPENDITURE DECISIONS

California undertakes a wide range of expenditures each year. Perhaps most visible are the state's efforts to build and maintain critical infrastructure, including transportation, utilities, and public schools. As an example of the state's scale, California has 386,000 lane miles of roadways. The state's billions of direct expenditures are directed through numerous agencies in multiple programs.

Direct expenditures are guided by public contract code. Expenditures are classified into a wide range of different contracting processes, including with respect to construction of public works and procurement of goods and services. Both public works and procurement utilize the scale of the state's buying power to balance multiple public outcomes. In addition, the state can buy directly and has a range of grant programs, as well as revolving loans and loan guarantees. The delivery method for each expenditure has a significant impact on the state's approach to interacting with counterparties and the eventual outlay of capital in exchange for goods or services.

Prominent examples of public works through state asset investments include the development, operations, and maintenance of the state highway system and the state water project, a water storage and delivery system of reservoirs, power plants, and pumping stations extending more than 700 miles – two-thirds of the length of California. Long-lived infrastructure is an expenditure category that is particularly sensitive to climate risks. For example, periodic flooding attributable to rising sea levels, a physical risk, could amplify maintenance needs or impact construction planning. Early access to information concerning these climate risks can facilitate well-informed fiscal spending.

Procurement includes service contracts and asset purchases. The state may contract for electricity in power purchase agreements, for instance. In making contracting decisions, identified transition and physical risks could have a material financial impact and thus impact what the state prioritizes. For example, increased wildfires due to climate change may impact the ability of power providers to satisfy their contract obligations, either because the power sector causes wildfire ignition or because power utility infrastructure is damaged by wildfire.

Expenditure processes. Depending on the project type and delivery method, state agencies interact with counterparties at a variety of different stages in the expenditure process. These include not only the decision of with whom to contract, but also the decision to undertake a project as well as the location selection. In addition, there can be a variety of counterparties engaged throughout the life of any particular asset. For example, the state might contract a consultant earlier in a project life before securing a wider range of counterparties to execute a project and others to maintain the project throughout its useful life.

The first step of any expenditure is project selection; decisions surrounding project selection are often internal to the state and prior to the involvement of external state counterparties. These decisions are outside the scope of this report, although Chapter 2 details some of the strategies for physical and

transition risk that guide state decision making. It is important to recognize the significant impact of site selection and other design decisions, including the economic impact of physical risk and resilience improvements, as well as the critical intersection of environmental and social impacts. The California Environmental Quality Act (CEQA) and other statutes and regulations require analysis and disclosure of a variety of environmental impacts, as well as the impacts on disadvantaged communities. While these decisions may have been made prior to engaging external counterparties, it is still important for the counterparties engaged by the state to assess and fully disclose climate risk relating to project selection.

Project selection is followed by project design and execution, and the engagement of external counterparties typically occurs through a Request for Proposals (RFPs) for bids. The RFP process varies in structure depending on project and delivery method, such as design and build for new infrastructure or the performance of periodic maintenance existing infrastructure. Some direct expenditures include a multi-stage process, including a Request for Qualifications (RFQ) to pre-qualify counterparties before launching RFPs for specific projects.

In an RFP process, the pre-bid conference offers an opportunity for potential counterparties to transparently engage with the state to better understand the project and desired specifications. This standard pre-bid process is where the state provides information and guidance on their expectations. Critically, the pre-bid conference is likely the ideal time for the state to engage counterparties on climate risk disclosure requirements as they are enacted. This would also involve providing climate risk data and scenarios, as well as technical assistance, as detailed later in this chapter.

Disclosure as a key step of the expenditure process. In soliciting, analyzing, and selecting bids, the state can require counterparties to assess and disclose risks that they see in the products or services on which they are bidding to provide. For example, when bidding on a lighting project, the counterparty can highlight the economic difference between lighting technologies (which might vary significantly in upfront cost), operating costs, and useful life, each of which would impact any decisions on project execution.

In these key points, it is critical that state counterparties to disclose climate risk management to inform the state's decision process, including with whom it transacts and what approach it takes to executing a project. In the example of a lighting project, projected annual operating costs are dependent on energy costs, and an assessment of transition risk might provide important insights into the economic value of increasing energy efficiency and reducing greenhouse gas emissions from the lighting installation.

In general, short-term risks are often disclosed and captured by existing contracts. This can occur through a variety of means, such as liability assumption, insurance, or product warranties. These short-term provisions cover some components of climate risk, particularly highly salient risks such as those driven by the threat of drought or wildfire. However, much of the climate risk management articulated throughout this chapter looks to the longer-term physical and transition risks that could impact the state's expenditures. As a long-term owner and insurer of last resort of a wide variety of infrastructure, the state faces a range of long-term risks, and contracting counterparties can provide the state with critical information to understand and manage these risks. Ideally, these risks could be determined and weighed in advance of financial commitments.

While this chapter focuses on climate risk disclosure for individual direct expenditures, there is a further need to

understand the overall portfolio of expenditures that the state makes, particularly the range of infrastructure it owns and maintains. This includes the potential for any interactions across maintained assets and between various types of risk. Over time, as climate risk disclosure and analysis improves for each new project, the state can develop greater climate risk expertise across its full portfolio of owned infrastructure assets.

The state, through the Climate Risk Coordination Committee (CRCC) detailed in Chapter 2 among other entities, should fit its approach to climate risk within this existing direct expenditure processes. Climate risk disclosure provides a greater range of information about the financial impacts to which the state may be exposed. A primary goal of the CRCC is to help state entities use any disclosed climate risk information to better inform processes and decisions. The remainder of this chapter focuses on the climate risk disclosures – at both the corporate and project level – that the state should request to inform its direct expenditures.

ADVISORY GROUP RECOMMENDATIONS

GUIDING PRINCIPLES

As the state undertakes competitive processes to determine the counterparties with which it transacts, it has responsibility to mitigate financial risk and steward the direct expenditure of taxpayer dollars. This involves directing taxpayer dollars to those projects that present the best mix of lowest risk and greatest reward, consistent with the public mission of the particular program. Climate risk can play a major role in the risk and reward of projects, particularly in major infrastructure contracts and projects, The disclosure of this information can aid the state in fulfilling its obligations.

This section explores the key considerations and guiding principles that should be followed as a climate risk disclosure program is implemented for direct expenditures. These principles cover who should disclose information and for which projects, as well as what support the state should provide to disclosing counterparties.

The principles recognize that efforts to mitigate risk through the transparency of disclosure also impose costs (in terms of the time and resources of counterparties) and intersect with other governmental priorities. The principles also recognize that climate risk management is still at an early stage, with best practices that are rapidly evolving alongside novel data and methodologies.

Expectations for climate risk disclosure relating to direct expenditures should vary along two factors – the characteristics of the contemplated direct expenditure project, and the characteristics of the corporate entity that may contract with the state. This reflects the two sources of climate risk on which the state should be focused. First and foremost, the state is procuring projects, which are inherently exposed to physical and transition risks. At the same time, the state also has an interest in knowing the climate competency of its counterparties. TCFD provides extensive guidance at the corporate level, whereas project-level climate risk analysis and disclosures are at an earlier stage, although advancing rapidly.

The materiality of climate risk can vary substantially depending on the nature of the direct expenditure, and the state's requirements for disclosures should vary accordingly. Certain projects, in particular large place-based infrastructure and other assets with a long useful life, will have a greater exposure to long-term physical and transition risks. Today, short-term risks, such as the immediate risk of flooding, are often considered in due diligence, but robust climate risk disclosure can help assess the long-term risk of changes in flooding frequency and severity, which could lead to stranded assets or other costs for the state.

A classification system that relates the expectations for climate risk disclosure to the materiality of climate risk can help limit unnecessary costs, and focus both counterparty and state efforts on the projects with greatest risk. Current public contract code already classifies projects on a variety of factors, such as the total dollar amount, which determines the processes for the direct expenditure, including whether decision making is centralized or delegated. Climate risk materiality can be introduced to this system, helping to target resources and efforts by the state and its counterparties.

However, given the limited understanding of climate risk in current practice, it may be difficult to determine the projects with material climate risk prior to a robust system of regular climate risk disclosures. The state should therefore begin with a broad approach to climate risk materiality, requiring climate risk disclosures based on factors such as sector, dollar amount, or asset life. These factors can be adjusted alongside learning over time. In addition, a historical review of projects and maintenance contracts can help inform this process. Lack of information is not a reason to avoid requesting disclosures but rather a further impetus to seek disclosure. The Climate Risk Coordination Committee among other entities can help set the initial guidelines and refine them over time.

Recommendation 3.1: *A classification system should be developed for direct expenditures based on potential materiality of climate risk relating to project size, asset life, and exposure to physical and transition climate hazards. This classification system should determine the granularity of required project-level climate risk disclosure.*

The state should also adjust its requirements depending on the nature of the counterparty, including their size, expertise, and resources. This is particularly important for counterparties dealing with projects that have material climate risks. For example, all entities dealing with the development of a coastal property should have some familiarity with physical climate risk. However, expectations of climate risk expertise, and granularity of disclosure requirements, might vary between an architect and a contractor, or with respect to materials suppliers. In addition, smaller counterparties, such as small businesses, might lack the resources to craft detailed reporting documents.

The state can adjust its requirements for climate risk disclosure based on these corporate factors as long as their needs for understanding climate risk are being met. This approach can limit the imposition of disproportionate costs on the wide range of smaller counterparties that work with the state, while also recognizing that for certain types of projects, it is important that all counterparties understand and disclose climate risks.

In order to ensure that counterparties are able to meet climate risk disclosure requirements, the state can provide technical assistance. Smaller counterparties will need additional support to understand new disclosure requirements and build the capabilities to meet these requirements. This could be instituted as a centralized program or built into the pre-bid conferences for any RFP where there is an expectation of material climate risk. Critically, this program should aim to ensure that access to state expenditure programs remains equitable, including by helping counterparties deal with any increase in the cost of doing business with the state. The state can target specific counterparties that they have long aimed to assist and prioritize, including small businesses, as well as minority-owned and women-owned businesses.

Recommendation 3.2: *The granularity of climate risk disclosure required of transacting counterparties should be appropriate to their size and expertise.*

Recommendation 3.3: *The state should provide technical assistance to counterparties and ensure equitable access to direct expenditures as increased requirements for climate risk disclosure are put in place.*

Ensuring equitable access is critical, but it is one part of a broader set of social equity considerations that should be prioritized alongside technical assistance. Chapter 2 highlights the state's Just Transition Roadmap, which includes economic diversification, industrial planning, workforce development, and safety-net investments as a core component of managing transition risk. Beyond the just transition, there are fundamental equity considerations that should be addressed alongside climate risk in order to deal with the legacy of historic injustices. CEQA includes some components of this in its approach to addressing impacts on vulnerable communities. Climate risk management, including the just transition, goes hand-in-hand with an equitable and inclusive economy. In developing its climate risk management program, including technical assistance and varying requirements for climate risk disclosure from particular counterparties and projects in particular neighborhoods, the state can simultaneously advance its efforts towards social equity.

Recommendation 3.4: *Climate risk disclosure requirements should include consideration of the just transition and an equitable and inclusive economy.*

Climate risk disclosure remains in the early innings and should evolve as best practices are adopted. Climate disclosure can improve resilience, minimize risk, and illuminate opportunities but requires consistent, comparable, and reliable data and related analytics. Increasing the rigor of climate risk analysis is important to fully understanding risks, but also increases the need for data and resources. California, in setting disclosure standards and requiring them of counterparties, should also be focused on data, scenarios, and methodologies. As detailed in Chapter 2, the state will need its own coordination structures to receive and process disclosures from its counterparties. To ensure baseline quality and comparability, the state should prescribe data and methodologies – as described through the remainder of this chapter.

Recommendation 3.5: *Requirements for corporate and project-level climate risk disclosure should evolve in line with emerging best practices and increasing data availability and reliability.*

CORPORATE DISCLOSURE

The state has an interest in the climate capabilities and credentials of firms it chooses to do business with. In general terms, the state looks to work with counterparties that meet certain operating standards, such as the presence of financial controls. Appropriate governance and risk management are important indicators of the quality of counterparties. Climate-related financial disclosures provide the state with important information that should be used to inform decision making, including information on governance, risk management, strategy, and metrics and targets around climate.

California has a direct interest in working with reliable and capable vendors. To determine whether a counterparty is suitable for a particular project, the state might request information on that firm's past experiences with comparable projects, whether it has sufficient employees with the requisite skills, or whether it has a history of fines or lawsuits.

In assessing bids from a variety of counterparties, the state can require that corporate climate risk information be disclosed. This information serves a variety of purposes. First and foremost, understanding the management of climate risk by its counterparties allows the state to make more informed decisions. Where a project is exposed to climate risk, the counterparties responsible for fulfilling the project need to have the capabilities to understand and manage the risk. For example, counterparties might need specific insights into their legal liabilities from any climate-related damages to an asset, such as from future wildfires or flooding. However, climate risk disclosure also provides necessary information about

whether counterparties are aligned with state policy positions and allows the state to make decisions that advance its policy priorities.

With respect to corporate disclosure, the TCFD provides detailed guidance that the state can directly adopt. While much of this report seeks to adapt the TCFD recommendations to the state context, corporate disclosure for individual counterparties is a more straightforward usage of TCFD guidance for its primary audience in the financial and non-financial sectors. That said, it is important to reiterate the guiding principles noted previously, including the variation in expectations of disclosure granularity based on the size and expertise of counterparties. Chapter 4 seeks to provide ambitious guidance beyond TCFD for financial asset owners and asset managers that are fluent in financial risk management. In this case, counterparties range from self-employed and small businesses to multi-national corporations. TCFD guidance should serve as a baseline, with the support of technical assistance as needed, and the state should raise its expectations for climate risk disclosure from those counterparties that have sufficient capabilities and expertise.

Recommendation 3.6: *All relevant counterparties transacting with the state should provide a corporate disclosure in line with TCFD spanning the four pillars of governance, strategy, risk management, and metrics and targets, as well as the industry guidance for non-financial sectors.*

Understanding and managing climate risk will improve the resilience of California's business partners and thus enhance the state's ability to meet its stated goals for each expenditure. This will ensure that companies have sufficient governance processes and a knowledge base to assess and manage climate risk. Information gathered through disclosure will allow the state to better judge whether counterparties are of sufficient quality to successfully carry out projects for the state.

The disclosure of corporate-level climate risk information also provides critical data for the state to understand and advance its policy goals. Procurement policies, RFPs, and bid documents can highlight disclosures about jobs, including the quantity, quality (wages, benefits, career ladders), and focus on equitable access to jobs. As noted throughout the report, it is important that California act to promote a just transition and an equitable and inclusive economy through its efforts on climate risk disclosure. Disclosures can provide information about the range of climate-related activities that a counterparty is undertaking, beyond the facets of an individual project.

With this information, the state can take procurement actions that advance its public mission. This approach has long been a component of expenditure programs, such as prioritization or support for small businesses and women- and minority-owned businesses. While California is not alone in prioritizing certain counterparties in its procurement programs, it has been a leader in setting minimum ethical standards for parties that receive its taxpayer dollars. Beyond basic standards, such as those surrounding legal compliance, the state has taken an active stance within its expenditures to support LGBTQ+ rights. Assembly Bill (AB) 1887, enacted in 2016, restricts non-essential state funded travel to states that discriminate against lesbian, gay, bisexual, and transgender people.[1]

The state can take ambitious steps beyond current practice regarding the quality of climate governance and performance of its counterparties. Entities that have robust climate risk management programs, or those actively transitioning their business in line with science-based targets, should be prioritized in line with the guiding principles (e.g., equitable access). Critically, the state should take a leading position in setting minimum standards for the climate change approach

1 https://oag.ca.gov/news/press-releases/attorney-general-bonta-add-five-states-travel-restrictions-list-result-wave-new

of its counterparties, avoiding business with counterparties that are wholly opposed to California's climate goals. While there are a variety of factors that the state could look to, a starting point should be transparent disclosure of climate-related lobbying.

Recommendation 3.7: *There should be minimum standards relating to climate change for the counterparties transacting with the state, such as mandatory disclosure of climate-related lobbying.*

PROJECT DISCLOSURE

As California launches procurement and public works processes, it needs to understand the climate risk inherent in the infrastructure and other assets that it is purchasing. As described previously, counterparties engage in a competitive process through an RFP, and the state should require them to submit an analysis of the climate risk of a proposed project.

The climate risk inherent in a project varies along a multitude of factors, including its place-based location and operations and maintenance throughout the expected life of the asset. Given the resource intensity of assessing climate risk, and the potential that climate risks are not material for certain types of projects, it is important that the state develop guidance that targets climate risk disclosure to direct expenditures where physical or transition risk are likely to be material (Recommendation 3.1).

California typically procures individual assets or contracts around discrete projects, and project-level disclosures are therefore critical. However, the methodologies for assessing the climate risk of a project are at an earlier stage of development relative to corporate disclosure, as they do not have the benefit of the extensive TCFD guidance; and within emerging project-level methodologies, there has been significantly more work to date on physical risk compared to transition risk. Given this early stage, it is particularly helpful for the state to prescribe project-level climate risk disclosure methodologies and to engage with other stakeholders to encourage refinement of these methodologies. The remainder of this section articulates the latest developments in **project-level physical and transition risk assessments**, with recommendations on what the state should require of its counterparties.

Recommendation 3.8: *Counterparties should disclose relevant project-level physical and transition climate risk as part of their bids.*

Recommendation 3.9: *The state should prescribe methodologies for the disclosure of project-level physical and transition risk based on emerging best practices as detailed below.*

METHODOLOGIES FOR PROJECT PHYSICAL RISK DISCLOSURE

Physical risk reflects the exposure of place-based assets to the shocks and stresses of climate change. As California develops and maintains physical assets throughout the state, a methodology for assessing physical risk is necessary. New methodologies are being developed and are at various stages of maturity. Given the complexity of physical risks, the early stage of understanding, and the need for credible and comparable risk analysis by a wide range of counterparties, it is important that the state put forward a consistent methodology for physical risks assessments at the project level.

One of the most advanced methodologies is being promulgated by the Coalition for Climate Resilient Investment (CCRI).[2] CCRI was launched in 2019 at the UN Climate Action Summit, and includes private sector and government representatives, including the State of California and asset managers that manage more than $10 trillion. CCRI is a flagship initiative of the 26th UN Climate Change Conference of the

2 https://resilientinvestment.org/

Parties (COP26) in Glasgow in November 2021, with the specific goal of aiding in asset design and structuring by publishing frameworks and case studies for the integration of physical climate risk into project-level infrastructure investment decisions.

The CCRI's work on asset design and structuring provides an ideal framework for the necessary disclosure of physical climate risks and the interpretation of these risks in cashflow modelling practices. As noted above, this framework aligns with the goal of developing climate risk disclosures that impact decision making, allowing the state to better manage climate risk and steward the expenditure of taxpayer dollars. However, CCRI requires granular and rigorous analysis, leveraging a variety of data providers and technical partners. In adapting CCRI for California, the state needs to consider improving access to data as an initial step towards enabling the level of detail afforded through CCRI analysis.

TRANSLATING PHYSICAL CLIMATE RISK TO FINANCIAL MODELLING AND PERFORMANCE

Physical climate risks can manifest in the financial modelling and performance of a project through five primary means:

1. Physical risk can directly and indirectly impact the revenue of a project, including through systemic exposure (e.g., GDP changes), network effects from the interconnected nature of the asset, and changes in usage due to the changing climate.
2. Engineering estimates may be adjusted for the increased capital expenditures necessary to protect an asset when building it, and for the subsequent change in climate-related operational expenditures in maintaining the asset.
3. Insurability may change as insurers increasingly adjust their risk pricing for climate risks.
4. The cost of capital may change alongside impacts to cash flow predictability.
5. Asset valuation may change due to the presence of physical risk, particularly through the life of the asset and its terminal value. Particular factors are less relevant for state expenditures, such as insurability if the state does not insure the asset directly, and terminal value if the state does not plan to sell the asset.

Digging deeper on CCRI physical climate risk assessment methodology. The Physical Climate Risk Assessment Methodology (PCRAM) of CCRI details a five-step process for gathering raw data and translating them into the value-maximizing decision for the asset, and should serve as a model for state project-level disclosure requirements. The first three steps – scoping, data gathering and materiality assessment – are the foundations for effective climate risk disclosure. The other PCRAM steps – resilience building, and economic and financial analysis – begin with the disclosure of climate risk exposure and aim towards improved outcomes through risk management adjustments. By fully implementing all five steps, physical risks can be efficiently priced to encourage resilience actions that improve revenue and provide more predictable cash flows, particularly in the face of unpredictable weather events.

Scoping and data gathering require collecting data from various sources. Operational asset data reflect historical and forward-looking capital and operations expenditures, as well as the life of the equipment. Financial data cover the contractual details of future cash flows, as well as risk allocation and the legal viability of resilience-focused modifications. Both data sources are standard items that owners and operators develop in the course of project development.

Critically, operational asset data and financial data are overlaid with climate data, utilizing historical and forward-looking models of climate hazards in the geographical area where the asset is located. Climate data can be sourced from commercial data providers with access to large-scale data models and do not require information from project owners. However, the cost of such commercial offerings may pose barriers to certain

counterparties. Also, as discussed in Chapter 2 and later in this chapter, the state has made significant investments to provide best in class, high-resolution, and publicly available climate projection data, which are a valuable resource in the context of risk disclosure. Disclosure of physical climate risk can only progress if there is sufficient quality data across three categories: operational, financial, and climate data. Combining these three sources of data allows for an assessment of physical climate risks, although for each type of asset, the necessary data will vary.

After collecting the relevant information and identifying climate hazards, the next step is to assess how vulnerable the asset is to these hazards through a materiality assessment. This requires defining the minimum financial threshold to consider a climate hazard material. With assessments of vulnerability and a threshold for materiality, the climate risk analysis can cover the scope of down time, the loss of service or reinvestment relating to potential climate hazards, and the associated financial impact.

At this stage, the counterparty could simply disclose the material climate risks to the asset, but they should continue the analysis to provide potential solutions. CCRI details two additional steps: resilience building, and adjusting the economic and financial analysis. With a complete climate risk analysis, the counterparty can attempt to identify feasible design options to improve resilience and decrease the vulnerability of the asset. Once the counterparty has a list of options, it can run a cost/benefit analysis. This allows for modelling each resilience option and changing the relevant variables to evaluate financial impacts of the reduction of physical risk and assess the value of each option. The result of the analysis might suggest the need for additional resilience options or no changes if the asset is already resilient.

When considering material physical climate risks, it is important to recognize that many hazards are already taken into account in asset design and thus do not need to be accounted for separately in climate risk assessments. Relative to other jurisdictions, California has high design standards through building codes, which reduce climate risk by requiring

CCRI CASE STUDY: PHYSICAL CLIMATE RISK ASSESSMENT OF HYDROPOWER FACILITY

CCRI has produced case studies of its physical climate risk assessment, including a hydropower facility with a robust financial model. In this case, two climate data providers supplied complementary climate data. One provider reviewed satellite imagery and utilized machine learning to collect climate data relevant to the operations of the facility. The other provider extracted a mean from global climatic models to assess the coming incidence of impactful events. The data output focused on key hazards for this type of asset: decreased precipitation, decreased river discharge, and increased drought. This approach narrowed-in on concerns in the region housing the hydroelectric facility, such as a forecasted increase in the frequency of droughts from 70 percent to 120 percent.

These climate data were translated into an adjusted hydrological assessment, and thus an energy production estimate, accounting for the projected changes in precipitation. The new climate projections revealed a 0 percent to 5 percent reduction in river discharge through 2040 and a 15 percent to 20 percent reduction in discharge from 2040 to 2060. These adjustments indicated unanticipated changes in energy production per annum.

Interestingly, this overall hydroelectric case study reveals two very different sets of circumstances occurring over the asset's lifetime. The asset is not materially impacted up to 2040 due to the ability to operate under low river flow. However, beyond 2040, it is expected to be materially impacted, with a significant loss of energy production anticipated year on year. With the lack of rainfall and reduced river flow projected, the owners would need to investigate viable options to supplement energy production from alternative sources.

protection against certain types of hazards. However, many of these protections reflect short-term climate risk and do not account for the changing nature of physical climate shocks and stresses, which will increase hazards and vulnerabilities over longer time horizons. Such long-term insight is particularly important from the perspective of the state, which owns and operates infrastructure across long time horizons and is responsible for overall system planning and integrity.

Recommendation 3.10: *Project-level physical risk disclosure should align with PCRAM or other best practices for physical risks assessment as endorsed by the state in the future. Physical climate risk disclosure should include an assessment of relevant climate hazards and a long-term materiality assessment, as well potential resilience improvements.*

CCRI CASE STUDY: EU GUIDELINES FOR ADAPTING INFRASTRUCTURE TO CLIMATE CHANGE IMPACTS

The European Commission (EC) provides significant funding to infrastructure across EU member countries through its European Structural and Investment Funds (ESIF), allocating EUR675 billion between 2014 and 2020. ESIF requires that climate change vulnerability and risk assessments be completed in the project preparation phase for all projects larger than EUR50 million; the EC then validates whether climate risk has been adequately addressed. EC Guidelines outline the process for integrating climate risk considerations into major projects, including methodologies and opportunities to integrate resilience improvements throughout the project life. To help member states produce these assessments, the EC, the European Investment Bank (EIB), and the European Bank for Reconstruction and Development (EBRD) partnered to launch a technical assistance initiative, the Joint Assistance to Support Projects in European Regions (JASPERS).

METHODOLOGIES FOR PROJECT TRANSITION RISK DISCLOSURE

Transition risk reflects the exposure of assets to the changing policy and market forces inherent in the transition to a net-zero economy. As California accelerates its transition, regulatory requirements will become increasingly stringent and new technologies will advance in their innovation and cost lifecycles. Assets procured or built without consideration to the net-zero transition may be subject to stranding.

There are fewer established methodologies for assessing the transition risk inherent in specific projects. However, similar to physical risk, there is a need for credible and comparable risk analysis. It is important that the state put forward a preferred methodology as a sufficiently robust methodology develops.

In the lead-up to the November 2021 COP26 climate conference, a wide variety of coalitions and initiatives plan to publish new approaches to assessing climate risk. These efforts will include new approaches to understanding net-zero trajectories and sectoral decarbonization pathways, which can then translate into project-level transition risk assessments.

While transition risk data differ dramatically from physical risk data, the general methodological approach of CCRI is relevant. Scoping and data gathering are the first steps, including gathering emissions data and information on potential exposures to climate-related regulation, and consumer preference changes. Materiality assessments can then help elucidate whether emissions, regulation, or other transition exposure pose a material financial impact on the contemplated project. In general, long-life assets are more exposed to changes in policy, technology, or consumer preferences that may lead to stranded assets or other financial impacts.

In the absence of specific and detailed methodologies, which exist for physical risk, there are key components of transition risk on which California should seek disclosure. First and foremost, the emissions of the project are critical. Emissions disclosure of the project should encompass Scopes 1, 2, and,

to the extent practicable, 3 emissions. While some projects have emissions only from a single point in time, many projects have emissions over the course of their life, such as public works projects that involve buildings with heating, cooling, and lighting needs. A growing number of products have Environmental Product Declarations, which utilize lifecycle assessment models to produce a third-party verified document that quantifies the carbon emissions of a product throughout its value chain.

The emissions from a project can then be translated into financial impacts based on an estimated price on carbon. The forecasted carbon price can come from a variety of sources, including California's cap-and-trade program or from standardized scenarios, as discussed later in the chapter. Changes in consumer preferences and technological breakthroughs are more difficult to quantify, but standardized scenarios may provide some level of estimation on a sector-by-sector basis.

Some companies and projects seek to leverage carbon offsets, which embody external emissions avoidance or removal activity to reduce net impact. Work is ongoing in the private sector on voluntary offset markets, such as the Taskforce on Scaling Voluntary Carbon Markets (TSVCM). However, there are significant concerns about the integrity of markets and the legitimacy of their use as a means to manage transition risk. The approach to offsets, including whether they are used and the transparency of criteria for quality and integrity, should be disclosed in detail. Chapter 4 (Recommendation M5) provides more details on offset metrics and recommended disclosure.

As with the approach to physical risk at a project level, the ultimate goal of disclosure is to enable reductions in transition risk. With respect to emissions, achieving reductions entails the eventual preference for lower carbon products in terms of both upfront emissions and emissions throughout the asset life. Transition risk assessments should also consider which suppliers have product-specific transition plans that include active work to reduce emissions and transition risk exposure. State contracting for these products can encourage their further development and allow the state to meet its long-term goals.

Recommendation 3.11: *Project-level transition risk disclosure should align with emerging methodologies and best practices as they are widely adopted. Transition climate risk disclosure should include lifecycle carbon emissions, carbon price sensitivity, and any approach to offsets. Furthermore, it should include an assessment of broader impacts relating to the transition and the project's transition readiness.*

CCRI CASE STUDY: EU GREEN PUBLIC PROCUREMENT PROGRAM

The EU has a voluntary Green Public Procurement (GPP) program, which sets model guidelines for integrating the emissions of products into procurement decisions. The primary focus of the GPP is to translate externalities, such as the emissions of a vehicle, and other costs into a full lifecycle cost analysis. The GPP has sector-based disclosure criteria, with core criteria that provide the most important information and the least additional requirements for verification and costs, and a more comprehensive set of criteria that are more ambitious but require greater verification and costs.

CONSISTENT DATA AND SCENARIOS

Comparability and reliability across climate disclosures is a prerequisite to the state improving its climate risk management related to direct expenditures. This section focuses on the provision of data as a key input to the climate risk disclosure methodologies described above. Provision of data and scenarios is an important component of the technical assistance that will be required to ensure counterparties are able to undertake climate risk analysis and disclosure.

California already provides physical climate data through its state-level Climate Change Assessment, which leverages global climate models, as noted in Chapter 2. Transition risk data span both first-order emissions trajectories and carbon prices, as well as second-order changes in markets, technology, and consumer preferences. California offers greater visibility into the first-order trajectories through its emissions goals and cap-and-trade program.

There are growing efforts to provide more robust and granular climate risk data, spanning both physical and transition risk. Commercial data providers are developing advanced climate models and risk analytics targeted for this purpose. While some commercial data providers are providing their services to regulators and other government entities at no cost, it is important that all counterparties contracting with the state can access the data they need to meet disclosure requirements. Government entities, including the U.S. federal government, are exploring means to increase accessibility and transparency of climate data, including through clearinghouses or license agreements, and through the wide range of data produced by government-owned measurement infrastructure.

Given this wide range of potential data, counterparties need specificity in terms of the scenarios they should contemplate when analyzing climate risk. With respect to physical risk, scenarios are typically aligned with emissions and warming scenarios articulated by the Intergovernmental Panel on Climate Change (IPCC). With respect to transition risk, scenarios often begin with emissions trajectories with corresponding carbon prices and economic shifts. The state needs to be able to assess the climate risk across bids for a particular project, and that requires consistent data and scenarios to be used by each counterparty to produce comparable outputs of project-level climate risk.

Recommendation 3.12: *The state should further expand its provision of climate risk data, such as through clearinghouses, license agreements with commercial providers, a list of preferred providers, or cooperation with other public sector entities. This approach should cover transition risk data in addition to physical risk data.*

Recommendation 3.13: *The state should specify the physical and transition scenarios to be used for consistent climate risk analytics and disclosure.*

Physical risk scenarios. The State of California, through the California Climate Change Assessments (Senate Bill 1320) and other state climate research and analysis processes, continues to consider and incorporate new and evolving global climate science into planning and investment decisions. This will include the forthcoming Sixth Assessment Report from the IPCC, where the first of three Working Groups recently released its contribution. Specific terminology and models may evolve as the science evolves. Any related changes to the state's guidance and reporting requirements will take place through processes established as part of the Integrated Climate Adaptation and Resilience Program (ICARP) formed by the Office of Planning and Research (OPR) under the direction of SB 246.

Global climate models are used to model potential climate impacts under different global emissions scenarios, or Representative Concentration Pathways (RCPs). California's Fourth Climate Change Assessment, published in 2018, builds on work of past international, national, and state assessments and uses two RCPs from the Fifth IPCC Assessment Report, one high and one medium.[3] California's Climate Change Assessment will be updated continually in line with scientific consensus, including the Sixth IPCC Assessment Report.

3 California's Fourth Climate Change Assessment: Statewide Summary Report, pages 20-21 (report); and Planning and Investing for a Resilient California, pages 21-22 (report)

The state has developed localized assessments of climate impacts based on global climate models. Using a technique called LOCA (Localized Constructed Analogs), results from the climate models are downscaled to provide estimated impacts at finer scale. This downscaling technique allows for better representation of variability across the state.[4] These localized data and various tools are available online for public access and use through Cal-Adapt.[5]

Recommendation 3.14: *Physical risk disclosure should refer to the state's climate assessment and data provision, as well as global climate models and other internationally recognized physical risk scenarios.*

Transition risk scenarios. As discussed in Chapter 2, the State of California's Climate Change Scoping Plan includes targets to reduce carbon emissions 40 percent below 1990 levels by 2030, and 80 percent below 1990 levels by 2050. The plan has also instituted a statewide goal to achieve carbon neutrality no later than 2045. These targets will be achieved through a wide variety of actions spanning electricity, transportation, buildings and industry, among other sectors, and reinforced by California's cap-and-trade program.

Assessing transition risk begins with carbon emissions and typically utilizes a price on carbon. In California, the allowance budget for the cap-and-trade system and related price floors and ceilings can provide rough estimates for an appropriate carbon price. However, specific sectoral requirements, such as for zero-emission vehicles, can lead to a different price on carbon for individual sectors. Projects that have primary emissions outside of the state can use both local carbon prices and the baseline of California-specific prices to allow for customization alongside comparability.

Transition risk encompasses not just the explicit or implicit price of carbon emissions but also the uncertain financial impacts that arise from changes in policy, technology, and consumer preferences – including changes in transportation habits, such as reduced airport usage due to consumer preferences for lower emission transportation sources, or a potential breakthrough in electric vertical take-off and landing (eVTOL) technology. Transition risk could apply to the physical infrastructure surrounding said airport and any businesses that rely on traffic to the airport. Across sectors, changes to consumer behavior, energy costs, technological change, and stranded assets can lead to different levels of transition risk.

Scenarios for transition risk are at an earlier stage relative to physical risk scenarios, which are based on years of established climate science. The Network for Greening the Financial System (NGFS), a network of 94 central banks and 15 observers, has published eight scenarios of climate risk for central bankers and supervisors. NGFS worked with an expert group of climate scientists and economists to develop scenarios for both physical and transition risk. NGFS published three primary scenarios, which cover an orderly transition to net zero, a disorderly transition with action that is sudden and disruptive, and a hothouse world with elevated physical risks. The first two scenarios reflect medium- and high-transition risks and utilize integrated assessment models to assess changes in energy demand, emissions trajectories, and GDP among other outputs. The International Energy Agency (IEA) has also published a comprehensive roadmap for the global energy sector in its Net Zero by 2050 scenario, which the state could use to explore collaborations to develop localized transition estimates and scenarios.

Recommendation 3.15: *Transition risk disclosure should refer to NGFS orderly and disorderly transition scenarios, IEA Net Zero by 2050, and other internationally recognized transition risk scenarios.*

4 Ibid

5 https://cal-adapt.org/

CHAPTER 4:
CLIMATE RISK DISCLOSURE FOR FINANCIAL PORTFOLIOS

With roughly $1 trillion in combined assets under management, and operating in the world's fifth largest economy California's three largest public pension funds – California Public Employees' Retirement System (CalPERS), California State Teachers' Retirement System (CalSTRS), and University of California Retirement System (UC Investments) – are major players on the global investment stage. Their leadership across a variety of investment principles and practices sets the direction for other large asset owners and drives activity among investment managers, consultants, and large corporations.

This chapter identifies the ways in which California can build on the leadership of its three largest pensions by delivering more specific and ambitious climate risk disclosure guidance for long-term asset owners that is aligned with evolving national and international best practices.

For this chapter, the Climate-Related Risk Disclosure Advisory Group (AG) considered disclosure in the context of managing a portfolio of financial investments that vary with respect to duration (short-, medium-, and long-term), asset class (including cash, public and private equity, fixed income, and real assets), and whether, as often is the case, a third-party asset manager is involved. The state entities whose activities overlap with the questions explored in this chapter include the constitutional offices of the State Treasurer (STO), Controller, and the California Department of Insurance (CDI); and the Governor's Office of Business and Economic Development's Infrastructure and Economic Development Bank (iBank). Although independent from the governor and legislature, CalPERs, CalSTRS, and UC Investments (which also manages the UC endowment and its working capital pools) are the primary audience for the AG's recommendations on portfolio investment disclosure. While the AG's recommendations can apply to some activities of the state constitutional offices and entities – for instance, in 2009, CDI was the first among peers to administer a climate risk disclosure survey established by the National Association of Insurance Commissioners (NAIC) – tailoring the recommendations to the specific operations of those entities fell beyond the scope of the AG's work.

CALIFORNIA'S LEADERSHIP

CalPERs, CalSTRS, and UC Investments are experienced in managing climate-related transition and physical risks. The three funds are responsible for managing the retirement savings of employees who live in a state that is governed by leading climate policies, including a target to achieve carbon neutrality by 2045, and subject to increasing levels of heat, drought, fires, floods, and even a melting glacier.

As early as 2015, CalPERS began to publicly disclose the carbon footprint of its public equity portfolio. In 2017, it became the first U.S. public pension plan to disclose the carbon footprint of its fixed-income portfolio. Among its many leadership positions, CalPERS served as the inaugural chair of the Climate Action 100+ Steering Committee[1] (an investor-led initiative to engage the world's largest corporate emitters on necessary climate action, to which UC Regents and CalSTRS are also signatories) and was the first U.S. public pension to join the Net-Zero Asset Owners Alliance (NZAOA).

In 2016, CalSTRS conducted a climate risk assessment of its portfolio, and in 2017, the fund excluded from its portfolio global companies that derive 50 percent or more of their revenue from the sale of thermal coal. In 2019, CalPERS and CalSTRS published reports aligned with Task Force on Climate-Related Financial Disclosures (TCFD) guidance in response to enactment of state Senate Bill 964. In the spring of 2021, CalSTRS was instrumental in driving a historic shareholder vote to place three climate-competent members on ExxonMobil's board of directors.[2] Also that spring, the CalSTRS board approved a dedicated sustainability-focused portfolio representing up to 5% of the total fund.

In 2020, UC Investments announced that its investment portfolios were "fossil free," and that it had surpassed its five-year goal of investing $1 billion in promising clean energy projects.[3]

California's pensions embrace responsibility for tracking the three major threats to their systems: (1) their ability to sustain investment returns; (2) their employers' capacity to pay-in; and (3) the impacts of climate change. Given that a changing climate will impede a pension's capability to manage the first two risks, climate risk management is not in competition with fiduciary duty. Rather, managing climate risk is imperative to a fund's ability to realize its duty to loyalty and care. Furthermore, with their large size and long duration, California's pension funds are "universal owners," meaning they have risks and opportunities inherent in the performance of the financial system and the real economy. Therefore, it is in the best interest of large pension funds to directly protect their investments by managing risks to individual holdings posed by climate change, while also managing risks to the system as a whole. In other words, it serves pension funds, and indeed all large-asset owners, to pay a little in maintenance costs for a livable planet, since they will be unable to avoid paying the bigger costs of a planet in runaway decline.[4]

WHY SHOULD ASSET OWNERS DISCLOSE CLIMATE-RELATED INFORMATION?

According to the Sustainability Accounting Standards Board (SASB), industries totaling 93 percent of U.S. market capitalization are materially exposed to climate risk.[5] While awareness of these risks is increasing, investors still lack the climate-related information necessary to make informed decisions. The formative 2020 Commodity Futures Trading Commission (CFTC) report, "Managing Climate Risk in the U.S. Financial System," identified multiple benefits of climate risk disclosure. Those benefits include helping investors better

1 http://www.climateaction100.org

2 https://www.calstrs.com/statement/statement-third-calstrs-backed-director-joining-exxonmobil-board

3 https://www.universityofcalifornia.edu/press-room/uc-s-investment-portfolios-fossil-free-clean-energy-investments-top-1-billion

4 There are many studies and reports that analyze the cost of climate change on the global economy. One recent analysis by Swiss Re Institute found global GDP would drop by 18 percent in a 3.2°C warming scenario. https://www.swissre.com/media/news-releases/nr-20210422-economics-of-climate-change-risks.html. Another useful reference is this NASDAQ Sustainable Leadership podcast featuring Woodwell Climate Research Center's Spencer Glendon and Harvard Business School's Rebecca Henderson: https://www.nasdaq.com/podcast/sustainable-leadership%3A-creating-a-climate-for-change-with-rebecca-henderson-and-spencer

5 https://www.sasb.org/knowledge-hub/climate-risk-technical-bulletin/ SASB has since merged with the International Integrated Reporting Council (IIRC) to form the Value Reporting Foundation (VRF).

assess the impact of climate change on asset and company valuations, operations, and supply chains; and helping society gain greater assurance that investors and issuers are taking climate risks seriously. Conversely, lack of disclosure can affect market confidence in management, valuation multiples, and the cost of capital. Furthermore, and most relevant to this report, comprehensive disclosure evaluating climate risk and uncertainties arms users with a greater understanding of the impacts of climate change on firms and investors. This, in turn, can enable the state to develop more relevant regulation to improve resilience of its economy, work force, and tax base.[6]

Climate-related disclosure also plays an important role in the process of managing risk at the financial portfolio level. Disclosure of science-based targets helps organize and inform financial analysis and decision making. In addition to improving risk management, disclosure may also serve to guide overall investment strategy – from portfolio composition within and across asset classes, to tilts toward green finance, just transition, and environmental justice.

Public policy objectives and industry collaboration, which are foundational elements of global carbon-neutral initiatives, are similarly driven by climate-related financial disclosure. Goals and objectives based on scientific targets establish a platform for peer engagement and leadership. Such platforms foster learning and collaboration, and increase organizational and network resilience. By signaling the value of disclosure, universal owners can enable the broader investment community and actors in the real economy to better price climate risk and accelerate the flow of capital toward a climate-resilient economy.

6 https://www.cftc.gov/sites/default/files/2020-09/9-9-20%20Report%20of%20the%20Subcommittee%20on%20Climate-Related%20Market%20Risk%20-%20Managing%20Climate%20Risk%20in%20the%20U.S.%20Financial%20System%20for%20posting.pdf

ADVISORY GROUP OBJECTIVES, TACTICS AND PRINCIPLES

Numerous reports have been written about the impact of climate change on investment portfolios. Guidance for TCFD implementation is also widely available. These resources are important and provide much needed common ground. Rather than simply restating what has already been published, the AG set its sights on the frontier of practice and charted a course toward the next level of ambition. This chapter is intended as both a contribution of thought leadership and a roadmap for investors in a race to financial and climate stability. The recommendations that follow build on the frontier of best practice for using disclosure as a means to translate climate science and scenarios into financial impacts, and to develop greater capacity for managing climate-related risks and opportunities.[7] In each section, the text notes where recommendations reach beyond TCFD guidance as of August 2021.

The AG's objectives are to: (1) recognize and reinforce California state pension funds' leadership in understanding and acting on climate risks and opportunities, and their impact on global financial markets; (2) build on existing TCFD guidance for asset owners; (3) offer more specific, actionable, and ambitious guidance; (4) ensure consistency with evolving national and international best practices; and (5) avoid unnecessarily onerous or ineffective reporting requirements.

The AG's recommendations are organized according to the TCFD framework and build on previous work, including guidance from the Principles for Responsible Investment (PRI) [8]and the U.K. Government Department for Work and Pensions.[9] It is because of the state's leadership on these issues that the

7 https://acpr.banque-france.fr/en/analysis-and-synthesis-no-122-main-results-2020-climate-pilot-exercise

8 https://www.unpri.org/climate-change/an-asset-owners-guide-to-the-tcfd-recommendations/3109.article

9 https://www.gov.uk/government/consultations/taking-action-on-climate-risk-improving-governance-and-reporting-by-occupational-pension-schemes-response-and-consultation-on-regulations

AG could raise the level of ambition to where the practice of managing climate-related financial risks must, and will, head in the future.

While Chapter 2 considers the ways in which TCFD's governance and strategy recommendations differ in the state context, this chapter treats state entities (in this case, the state's three largest pension funds) as asset owners operating in a similar capacity to other large, long-term pools of capital. The AG recognizes that the state pensions have unique governance and obligations, including boards mandated by law and annual pension benefit payment obligations, and has drafted its recommendations accordingly.

Definitions and treatment of third parties. The following definitions and details are provided to guide the reader toward a better understanding of how the AG envisions information flowing from third parties to the pensions, and in turn, to the public.

The term "asset owner" refers to the state pension funds. State pensions (and similarly, university and foundation endowments, and sovereign wealth and insurance funds) sit at the top of the capital supply chain. As the ultimate asset owner, pensions invest capital directly into corporate and project equity and debt, and indirectly through asset managers. They also frequently engage consultants to advise on investment decisions and asset allocation. This collection of actors – including corporates, project developers, asset managers, and consultants – are referred to as "third parties." Third parties own and manage much of the information that will be necessary for the pensions to identify and assess portfolio climate risk and opportunity.

The recommendations that follow are, for the most part, directed at both asset owners and third parties, keeping in mind the varying levels of control and influence asset owners have over third parties. For example, with respect to companies, asset owners can engage through direct contact, proxy voting, and collective efforts like Climate Action 100+ to influence disclosure, scenario development, and transition pathways. With respect to asset managers, owners have control and influence on how they allocate capital and design tools like side letters, manager appraisals, and due diligence questionnaires (DDQs). Consultants can be evaluated and retained based on their climate credentials. Asset owner control over third parties is not unilateral. For example, owners cannot simply remove companies or sectors from passive public equity indexes or undo illiquid private investments in the middle of a fund life.

In some cases, the language of the recommendation might be ill-fitted for direct application to a third party. The use of the phrase "as appropriate" is meant to address these discrepancies and give asset owners room to use discretion alongside evolving best practices.

Ultimately, the ability of asset owners to disclose and manage the climate risks of their portfolios depends on the quality and consistency of the underlying data they collect from third parties. In the absence of guidance from the Securities and Exchange Commission (SEC) and, in the case of private asset management, perhaps even regardless of SEC guidance, U.S.-based asset owners must navigate the frontier of practice, and nurture the development of data and disclosure capacities of the companies and managers in which they invest. The AG's recommendations are intended to help asset owners with these challenges.

A phased approach. In pursuit of more specific, actionable, and ambitious guidance, the AG's recommendations expand current practice to other areas of investment portfolios and

chart new territory across all four pillars of TCFD reporting. To make these recommendations practically implementable, the AG suggests that the pensions – perhaps in partnership with the proposed Climate Risk Coordination Committee (CRCC, see Chapter 2) – develop a phased-in application of the recommendations based on the size and duration of holdings. The AG also recognizes that, beyond the financial sector, the TCFD has identified energy; transportation; materials and building; and agriculture, food, and forest products as industries with the greatest potential exposure to climate risk.[10] The pension funds should prioritize their efforts accordingly with regard to implementing the AG's recommendations at the company or sectoral level, or with regard to asset managers investing in various sectors.

ADVISORY GROUP RECOMMENDATIONS

Governance: Effective oversight and management of climate-related risks and opportunities starts with good governance. Purpose-built governance enables asset owners and organizations to process climate risk effectively and respond accordingly. The TCFD and associated guidance is clear on the need for climate competence at the board level and requires basic disclosures with regard to board and management oversight of climate-related risks and opportunities. Here, the AG proposes recommendations that elevate current practice across the state's largest pension funds and address competency, incentives, attestation, and conflicts of interest. By applying most of these recommendations to third parties, California has the opportunity to play a leading role in bringing managers, companies, industry associations, and other stakeholders along the path to climate preparedness.

According to state law, members of the boards of CalPERS, CalSTRS, and UC Investments are a mix of appointed and elected officials. Therefore, the AG's governance recommendations will need to accommodate the plenary power of the boards (for more on governance in the state context, see Chapter 2.) Other than Recommendation 4.1 and part of Recommendation 4.4, the governance recommendations listed below apply to asset owners broadly.

Recommendation 4.1: *CalPERS and CalSTRS should phase the AG's recommendations into the reports to comply with SB 964. Other state entities managing financial portfolios will need to determine the appropriate form for disclosure. With regard to third parties, the AG recommends that asset owners request information be disclosed in commonly used formats until the SEC provides further guidance.*

Recommendation 4.2: *Asset owners should disclose the organization's climate change policies, including investment beliefs, proxy voting policies and principles, coal phase-out policies, and climate action plans (including their science-based targets) and how these policies are actively supported by their board and senior management.[11] Such governing policy disclosure should be requested of third parties as appropriate.*

Recommendation 4.3: *Asset owners should disclose how their board manages climate risk identification, assessment, and management and request this information from third parties as appropriate.*

Recommendation 4.4: *The governor and legislature should consider climate competency when appointing directors to an asset owner's board of directors, and asset owners should evaluate and improve the climate competency of their boards over time. Asset owners should request information about and seek ongoing improvement of climate-competent governance from third parties.*

The following three recommendations push beyond current TCFD guidance and may require phasing in or further adjustment to incorporate existing risk-management processes.

10 The Task Force developed supplemental guidance for non-financial industries that account for the largest proportion of greenhouse gas emissions, energy usage, and water usage. https://assets.bbhub.io/company/sites/60/2020/10/FINAL-2017-TCFD-Report-11052018.pdf (page 16).

11 https://theinvestoragenda.org/wp-content/uploads/2021/05/expectations-ladder.pdf

Recommendation 4.5: *Asset owners should link executive incentives and/or variable employee compensation with the achievement of a climate-related target, and engage with third parties to do the same.*

Recommendation 4.6: *Asset owners should disclose independent third-party assessments or internal attestation (board or CIO/CFO) of the asset owners' climate change reporting, and request this information from companies and asset managers.*

Recommendation 4.7: *Asset owners should request that third parties disclose public policy positions, lobbying expenditures, and key differences between the third-parties' lobbying positions or the lobbying position of trade groups and the entity's stated climate policies and goals.*

Asset owners may ensure the climate competency of their boards by establishing channels for expert advice, or by inviting board members with the talent and expertise to integrate climate risk into relevant discussions. Whole-of-board climate competence can be developed further through periodic trainings. Involvement with coalitions and advocacy organizations may also promote awareness of maturing understanding of physical and transition risks. For instance, partnerships with Climate Action 100+, PRI, Ceres, and the Council of Institutional Investors serve to further the climate competence of directors and executives. The AG encourages affiliation with an accredited Race-to-Zero alliance to ensure rigor in target setting. Positive indications of robust climate competence may include board awareness of industry trends (such as technological developments) relating to climate change and confidence in overseeing climate-risk processes, such as climate-scenario analysis.

In requesting information regarding public policy positions and lobbying expenditures, the state can glean critical information about the quality of climate governance and performance of third parties. As described in Chapter 3 and Recommendation 3.7, this information can inform minimum standards relating to climate change for third parties working with the state.

Strategy: The purpose of disclosing a firm's strategy with regard to climate-related financial risks is to gain a better understanding of actual and potential climate impacts over the short, medium, and long term, and how those impacts will affect the organization's business, strategic, and financial planning. According to TCFD guidance, firms are to report on the resilience of their organization's strategy using scenario analysis. As discussed later in this chapter, the current practice of scenario analysis is nascent and sparsely practiced. The more scenarios are demanded and scrutinized by large asset owners, the more opportunity third parties (data providers and consultants in particular) will have to improve the practice and the more sophisticated scenario analysis will become.[12]

Recommendation 4.8: *Asset owners should disclose how climate risks, identified through physical and transition risk scenario analyses, affect the fund's strategy and financial planning over the short, medium, and long term and request this information from third parties as appropriate.*

Recommendation 4.9: *Asset owners should issue transition plans that articulate the organization's strategy for operating under increasing constraints on greenhouse gas (GHG) emissions, changing consumer preferences, technological developments, and mounting physical risks according to internationally recognized reference scenarios, and request this information from third parties as appropriate.*

12 Scenario analysis is important for climate, because traditional "normal distribution" assumptions, which are challenged even for everyday market analysis, are of limited value due to the likelihood of a "fat negative" tail. Climate change progresses linearly and through both negative step functions (fire tornadoes, melting polar ice) and positive step functions (technological advancement). Normal distributions cannot handle any of these complexities, but well-designed scenario analysis can.

Recommendation 4.10: *Asset owners should disclose their approach to transition and physical risk scenario analysis, including details on the assumptions, the financial analysis performed, the data used, and the scenario used. Asset owners should include a low-emissions scenario for transition risk and a high-emissions scenario for physical risk. They should also request this information from the third parties in which they invest.*

Recommendation 4.10 pushes beyond current TCFD practice. Accordingly, asset owners will need to phase their approach to 4.10 by prioritizing the highest risk/highest impact areas and developing the building blocks necessary to implement the recommendations across their portfolios.

A key element of recommendation 4.10 is to recognize that, not only is current practice of scenario analysis for transition risk generally normative, for physical risk it is generally optimistic. With regard to transition risk, the recent International Energy Agency (IEA) analysis, "Net Zero by 2050," paints perhaps the most comprehensive view of what it will take to limit global temperature rise to 1.5°C, detailing the enormous scale and complexity of the associated transition.[13]

Scenario analysis informs transition plans by providing insights into what a credible set of future expectations imply for a firm. Transition plans articulate an organization's overarching and detailed strategy for reducing risks and seizing opportunities as the world, and the organization's particular business environment, transitions to a carbon-neutral economy.[14] A net-zero, carbon-neutral, zero-carbon, or Paris-aligned commitment is not a transition plan, although it should drive the creation of one. A high-quality transition plan will be: (1) anchored in quantitative elements, including climate-related metrics and targets; (2) approved and overseen by a climate-literate board; and (3) actionable, accountable, and linked to specific interim milestones and initiatives. Transition plans interlace other subsections of this report, such as governance and metrics and targets.

Emissions metrics can aid asset owners in identifying "emissions hotspots" across their portfolio. In addition, emissions metrics are useful tools for tracking portfolio emissions goals and engaging with fund managers and companies on their transition plans. However, as discussed above and again at the end of this chapter, emissions data provide only a part of a larger story to assess physical and transition risk.

Scope 1 encompasses direct emissions from assets under the organization's control or ownership. Scope 2 encompasses indirect emissions that accrue from purchases of electricity, steam, heating, and cooling. Scope 3 emissions, for real economy companies, encompass any other indirect emissions from the organization's value chain – either upstream suppliers or downstream in the use of the products. The end-consumption of fossil fuel is an example of Scope 3 emissions for an oil company. For financial institutions, Scope 3 emissions include the underlying emissions associated with the loans and investments, otherwise known as "financed emissions."

The focus of transition planning may vary according to the organization's characteristics and needs. For instance, entities from high-emitting sectors may focus on Scope 1 and Scope 2 emissions in their transition plan and related quantitative elements (metrics and targets), whereas financial institutions may focus on Scope 3 financed emissions. Transition plans are not only useful for organizational decision makers, they also inform investors and regulators who price carbon-related assets and assess systemic risk, respectively (see "Emissions data").

13 https://www.iea.org/reports/net-zero-by-2050

14 https://assets.bbhub.io/company/sites/60/2021/05/2021-TCFD-Metrics_Targets_Guidance.pdf

Asset owners should consider developing Investor Climate Action Plans (ICAPs) as a means for articulating future strategy. Developed and supported by The Investor Agenda, a global partnership of seven major investor networks, ICAPs cover the four interlocking areas of investment, corporate engagement, policy advocacy, and investor disclosure. ICAPs enable investors to assess their current approach to managing climate change risk and opportunity, and to communicate their current activities and future plans to stakeholders.

Historic greenhouse gas emissions data alone are not a complete measure of inherently forward-looking transition risk. The financial sensitivity of carbon-intensive companies and assets under transition scenarios will depend on a variety of unknowns, including external variables (e.g., carbon price; other climate policy drivers, such as mandates, targets, and levels of government investment; the status of technological development; and the future of energy demand and mix), as well as internal variables (e.g., carbon intensity, price elasticity, and capital structure). Multiple transition risk scenarios exist in the public domain, including models from the Intergovernmental Panel on Climate Change (IPCC), the IEA, and the Network for Greening the Financial System (NGFS). In addition, a number of private sector firms, including BlackRock and Willis Towers Watson, have developed proprietary transition risk scenarios. Like carbon-emissions data, these models are tools that can be used to estimate the risk facing carbon-intensive assets under a range of possible futures.

Physical risk modeling should, at a minimum, include high-emissions scenarios. Analyzing physical risks implied by average temperatures greater than 4°C (7°F) of warming over pre-industrial levels is prudent, given feedback loops and the alarming experiences of the 2021 summer heatwave in the Pacific Northwest, where temperatures shot up to 28°C (50°F) above historic average. Chapter 3 investigates data sources and methodologies for physical risk scenario analysis with regard to place-based infrastructure. Asset owners can apply that chapter's insights and recommendations toward constructing scenario analysis for investments in their portfolios. Currently, scenario analysis of transition and physical risk are largely conducted as separate exercises. As the practice evolves, scenario analysis should account for the interrelationship between physical and transition risk. The degree of near-term transition risk has significant bearing on long-term physical risk, because physical climate impacts are the direct result of emissions trajectories. In short, the less transition risk global markets take on in the near term, the more physical (and transition) risk gets baked into the system in the long term.

Risk management: Disclosure of risk management processes provides insights into how the organization identifies, assesses, and manages climate-related risks. This information feeds the development of an asset owners' strategy design covered in the previous section. Building on existing TCFD guidance, the AG offers the following recommendations.

Physical risk assessments can be time and resource intensive in the context of a portfolio of financial investments with different levels of intermediation, and therefore will need to be phased in, starting with the most exposed assets in the portfolio where data are available. Note that Recommendation 4.12 moves beyond current TCFD practice, which does not put as much emphasis on physical risk assessments.

Recommendation 4.11: *Asset owners should require asset managers to disclose how their transition and physical risk analyses integrate into their risk management processes, and engage with companies to do the same.*

Recommendation 4.12: *Asset owners should disclose the degree to which they perform transition and physical risk analysis on their portfolio, including, where possible, the level of assessment (e.g., asset level, asset class level, mandate,*

portfolio, or fund level); the data providers, tools, and timescales used; the scope (e.g., direct, indirect, and macroeconomic impacts); the inclusion of chronic and acute climate-related hazard; and the methodology used for combining layers of climate and socioeconomic data (e.g., climate-impact data, critical thresholds, investee-level data). They should also request this information from third parties.

Recommendation 4.13: *Asset owners should disclose their processes of engagement with managers and companies to influence transition and adaptation plans, including whether and how they develop and enforce minimum standards for high-emitting sectors.*

Asset owners should engage and influence companies in high-emitting sectors through principles-based minimum standards – a defined set of criteria that establishes the conditions under which assets should be sold or reweighted, typically using science-based targets. Universal owners maintain a special vulnerability to non-adaptive, high-emissions companies. For example, liquid fuels are harder to remove from investment portfolios than coal without a cheap and easily substitutable alternative available today at scale. Asset owners can employ minimum standards to address the transition risks facing investments in liquid transportation fuel by focusing on transforming operations of industry laggards. This engagement strategy requires oversight and penalties for companies that fail to transition according to science-based targets.

Metrics and targets: Metrics are important inputs for strategic planning and risk management. TCFD guidance has yet to be very prescriptive with regard to metrics and targets.[15] This makes sense in the context of a rapidly evolving field where high-level recommendations enable the greatest flexibility. When considering the ways in which California can achieve higher levels of ambition and efficacy, while maintaining consistency with national and international best practices, the AG built on the leading work of the U.K. Government and Department for Work and Pensions (DWP), and the Partnership for Carbon Accounting Financials (PCAF), a leading harmonized standard for investment metrics related to carbon emissions.[16] DWP's multi-year, multi-stakeholder consultative process recommended more specificity with regard to metrics and targets than most TCFD guidance. In addition to the DWP, the AG reviewed dozens of submissions to the SEC in response to its request for information on climate-related disclosures.

The state's pensions are already reporting several of the metrics detailed in the recommendations that follow, although in some cases the information reported covers only a portion of the portfolio because of limited data or resources (or both). The AG recognizes that it will take time and resources to implement all of its metrics recommendations, both with respect to expanding currently used metrics to cover more of a fund's portfolio and to account for new metrics.

Recommendation 4.14: *Asset owners should disclose Scope 1, 2, and 3 emissions annually across the portfolio using best available data and request third parties do the same.*

Recommendation 4.15: *Asset owners should disclose at least two emissions-based metrics, one absolute and one intensity-based, and an appropriate forward-looking climate metric annually. They should ask companies and managers to provide this information as appropriate and as well as they are able.*

Recommendation 4.16: *Asset owners should disclose the analytical methodology and underlying data sources used in calculating emissions intensity, absolute emissions, and forward-looking metrics. They should ask companies and managers to provide this information as appropriate.*

Recommendation 4.17: *Asset owners should disclose what percentage of their portfolio emissions is based on reported or verified data, as well as which standards were used to report the emissions metrics, and ask third parties to do the same.*

15 As of the drafting of this report, TCFD is undertaking a public consultation on more advanced metrics and targets guidance. The AG consulted with TCFD in an attempt to align its recommendations with any anticipated outcomes of that process.

16 PCAF, currently being instituted worldwide, represents over $43 trillion of assets under management, and has been led by several leading pension funds, including APG in the Netherlands.

Recommendation 4.18: *Project details for offset purchases should be disclosed, including location, project type, price, verifier, permanence and corresponding adjustments (to avoid double counting.)*

Among the variety of commitments that motivate the construction of transition plans, net zero is gaining significant momentum. A country or company meets net zero when the amount of greenhouse gas it produces and removes are in equilibrium. However, there is a delicate interplay between net-zero targets and the use of offsets. The first order ambition of a net-zero commitment is to reduce carbon emissions, and carbon offsets should not be used to achieve net zero unless abatement is prohibitively challenging or impossible. Without vigilance, low-quality and inexpensive carbon offsets might be purchased in lieu of organizational changes that reduce emissions directly and permanently.

Nevertheless, carbon offsets are likely to be a component of transition plans, which should clearly articulate any approach to using offsets. For instance, carbon offsets can be used to further reduce global carbon emissions after net zero has been achieved. In addition, carbon offsets can have co-benefits for local communities and biodiversity, as in the case of avoided deforestation projects.

Buyers and sellers of offsets should be able to demonstrate the quality and integrity of those instruments by determining that the offsets are: (1) based on realistic and credible baselines; (2) monitored, reported, and verified on an ongoing basis by trusted third parties; (3) permanent; (4) "additional" (would not have occurred but for the offset purchase); (5) able to account for and minimize leakage; (6) only counted once; and (7) doing no net harm.[17]

17 https://www.iif.com/Portals/1/Files/TSVCM_Phase_2_Report_Summary.pdf

Recommendation 4.19: *Asset owners should disclose the percent of the fund that is vulnerable to physical risk, as well as they are able. To collect the necessary data, asset owners should request that the companies and managers in which they invest identify, analyze, and disclose climate-related physical risks to the best of their ability.*

Physical risk and resilience metrics and targets are not generally practiced in TCFD reporting. The AG recommends California take a leadership position by requesting these metrics from asset owners and their third parties.[18] Recommendation 4.20 pushes slightly beyond current practice. Asset owners can phase in the recommendation by starting with geographic areas or asset classes where they have the greatest concentration of investment or data.

Recommendation 4.20: *Asset owners should disclose what percentage of their portfolio is invested in transition and in green finance, as well as they are able to and according to referenced standards.*

While definitions and taxonomies for green finance and transition finance are evolving, it is useful for asset owners to track their investments in these assets according to the frameworks of their choosing.

"Transition finance" refers to investment in carbon-intensive sectors that can and must be made less carbon intensive to meet broader decarbonization goals. It may take the form of a reallocation of capital within existing emitters and thus be tracked through global equity or fixed income. The International Capital Market Association (ICMA) defines climate transition finance as "the extent to which an issuer's financing program supports the implementation of its climate change

18 In 2019, CalSTRS laid a conrnerstone to this work by developing the Physical Risks of Climate Change (P-ROCC) framework in partnership with Wellington Management and Woodwell Climate Research Center. Woodwell and Wellington launched P-ROCC 2.0 in 2021 https://www.wellington.com/uploads/2021/06/a9cd7252e39cb14ef1ca2a2d5ba982ad/physical-risks-of-climate-change-p-rocc-2.0.pdf

strategy."[19] The EU taxonomy defined transition finance as "an economic activity for which there is no technologically and economically feasible low-carbon alternative [...] where it directly supports the transition to a climate-neutral economy consistent with a pathway to limit the temperature increase to 1.5°C." Asset owners may self-define in line with a recognized standard as they see fit.

"Green finance" refers to investments in environmentally sustainable economic activities. To meet its climate and energy targets for 2030, the EU has developed a green taxonomy to classify investments as environmentally sustainable.[20] The EU Taxonomy holistically reviews sustainable activities that relate to six environmental objectives: climate change mitigation, adaptation, sustainable water usage, transition to a circular economy, pollution prevention and control, and ecosystem protection. Using the EU Taxonomy, or an alternative standard, asset owners may track investments that align with standard definitions of sustainability to mitigate greenwashing and, together with enhanced strategies driving targets, help shift capital to green companies and projects. Green finance (sometimes referred to as "climate solutions") is, at present, easier to track than transition finance and often takes the form of new allocations in public and private markets.

The AG recognizes that the current lack of standardization with regard to definitions and underlying data presents challenges for tracking green and transition finance investment metrics. Yet, the state's three largest pension funds are already reporting their own versions of these metrics. Continued efforts to disclose this information can lead to improved standardization of definitions and reductions in greenwashing which, in turn, can help ensure greater emissions reductions in the real economy.

Recommendation 4.21: *Asset owners should report the location of financed emissions for applicable investments (e.g., commercial and residential real estate, project finance, real assets, and revenue bonds in low-income communities and communities of color).*

The transition to a low-carbon economy must not follow the path of unequal access and prosperity that has plagued the growth of the U.S. economy, nor can it further exacerbate global inequality and injustice to indigenous communities. The state can benefit from using disclosure as a means to pursue its non-financial equity and climate policy objectives beyond the risks income, racial and global inequality pose to the stability of economic and social systems.

The AG was particularly interested in information that could help address and avoid historical patterns of locating polluting assets in or adjacent to low-income communities and communities of color, and the associated patterns of reduced property values and higher health care costs. While CO_2 does not create localized pollution hazards, facilities that generate significant CO_2 emissions tend to produce air pollution with known harms to human health, including NOx, SOx, particulate matter (PM10 and PM2.5), dioxins/furans, volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons, and heavy metals.

Significant advances have been made in satellite technology to map the geographic location of physical assets and their associated pollution impacts.[21] Collecting location information of financed emissions, as recommended in 4.21, can help asset owners design strategies to more equitably distribute the benefits of the transition.

19 Climate Transition Finance Handbook: Guidance for Issuers, International Capital Market Assoc. (Dec. 2020), https://www.icmagroup.org/assets/documents/Regulatory/Green-Bonds/Climate-Transition-Finance-Handbook-December-2020-091220.pdf

20 https://ec.europa.eu/info/business-economy-euro/banking-and-finance/sustainable-finance/eu-taxonomy-sustainable-activities_en

21 https://spatialfinanceinitiative.com

Targets help asset owners track progress against metrics, and hold executives and boards accountable to stated long-term objectives. Asset owners should endeavor to set short-, medium-, and long-term targets no more than 12-18 months after committing to the disclosure of related metrics. The targets should be aligned with a 1.5°C trajectory. There are many ways to accomplish such alignment. For instance, the EU Climate Benchmarks requires portfolio decarbonization at a rate of 7 percent annually. Alternatively, NZAOA recommends sector-specific or asset class-specific targets, such as 16-29 percent decarbonization in the first five-year period for equity portfolio emissions.

Recommendation 4.22: *Asset owners should disclose targets for reducing total portfolio emissions and annual progress made towards those targets.*

Recommendation 4.23: *Asset owners should set a target and track the percent of the portfolio that is reporting emissions.*

Recommendation 4.24: *Asset owners should set a target and track the percent of the portfolio that is invested in transition and green finance.*

As noted above, as green and transition finance taxonomies evolve, asset owners will have flexibility in choosing appropriate definitions of these terms. The value of these targets is to create transparency and eventual accountability for driving investment in line with the climate transition as a means to manage climate risk and capitalize on new opportunities.

NZAOA, among other organizations, recommends using 2019 as the baseline year for decarbonization targets. However, 2015 is also a reasonable baseline as it aligns with the Paris Agreement on climate change. Emissions-intensity and absolute-emissions metrics should have targets associated with them. In addition, asset owners should disclose engagement targets for external managers.

Over time, asset owners may find it beneficial to set targets for other metrics, including emissions intensity, physical risk, location, or forward-looking climate metrics.

Application of recommendations to the State Treasurer's Office (STO): The STO has a long history of requesting Environmental, Social and Governance (ESG) information from its counterparties; but STO, like all treasury offices, is just beginning to understand its need for, and capacity to, identify, assess, and manage climate-related financial risks associated with the instruments in which it has taken a position.

While the state's largest pension funds (and by extension, all large pension, insurance, or endowment portfolio owners) are the primary audience for the preceding recommendations, the AG also worked with the STO to explore ways in which the recommendations intersect with its investment in the Pooled Money Investment Account (the Account), STO's portfolio of roughly $200 billion designed for liquidity and safety of principal.

The Account is primarily invested in short-term, fixed-income securities (generally maturing in less than three years) or money market instruments (typically, commercial paper, short-term unsecured promissory notes issued by companies with durations of no longer than 270 days). The purpose of the Account is to manage surplus cash to meet the disbursement needs of the state's numerous funds and accounts in a timely manner. The Account also encompasses a significant amount of idle cash beneficially owned by more than 2,000 local agencies held in the Local Agency Investment Fund, a component of the Account.

Furthermore, while the AG's recommendations raise the level of specificity and ambition for asset owners, when it comes to the Account, the application of even basic TCFD reporting would

be a significant step. With this context in mind, the AG offers the following recommendations for the STO.

Recommendation 4.25: *The STO should request disclosure from counterparties about whether they have coherent, time-bound, specific, and attainable goals for climate-related risks and opportunities to determine if such counterparties are taking tangible steps toward setting and achieving climate-related targets.*

Recommendation 4.26: *The STO should request disclosure from those counterparties about whether their risk disclosures align with the recommendations of the TCFD.*

Recommendations 4.25 and 4.26 are similar to the activities of the CDI with regard to climate risk disclosure. Over time, both constitutional offices should move in the direction of more specific guidance on the details of requested climate-related disclosure and more specific obligations regarding what the offices will do with that information.

While the governance and strategy recommendations discussed in Chapter 2, and to some degree in this chapter, generally apply in the Account context, the application of risk management and metrics and targets disclosures will differ because of the much shorter investment horizon and the emphasis on liquidity inherent to the Account.

EMISSIONS DATA

Scope 1 and 2 emissions alone have shortcomings. First, Scope 1 and 2 emission sums can be manipulated. For example, a company that was once vertically integrated can procure materials from outside suppliers. Thus, the emissions produced during the making of an input material could be moved off the company's balance sheets and excluded from measurement. This would hide the true amount of carbon emitted throughout the organization's value chain and thwart the asset owner's efforts to estimate climate risk. In addition, Scope 1 and 2 emissions are under-inclusive. These deficiencies can be addressed through the inclusion of Scope 3 emissions.

In 2011, the Association of Chartered Certified Accountants (ACCA) reported that Scope 3 accounts for up to 75 percent of a company's emissions. However, there are challenges in acquiring comprehensive and consistent Scope 3 emissions data. The GHG Protocol Corporate Value Chain (Scope 3) Accounting and Reporting Standard sorts Scope 3 emissions into 15 categories.[22] Users may be unsure whether to tabulate all, some, or none of these categories of indirect emissions. Nonetheless, asset owners should endeavor to disclose these data to the extent they are able, because the most accurate picture of climate risk can be painted when all of Scope 1, 2, and 3 emissions are measured.

Early focus should center on Scope 3 emissions for high-emitting sectors. For the few sectors where Scope 3 emissions are de minimis (below 25 percent of total emissions), Scope 3 calculations can be initially deemphasized.

Over time, Scope 3 emissions disclosures will move to more uniform methodologies and boundaries. Disclosing entities that are navigating these movements will need leeway. Methodological shifts may result in fluctuations in absolute emissions that are unrelated to changes in the underlying carbon intensity of the portfolio. Potential fluctuations should be explained and disclosed.

Over time, authoritative standard-setting bodies may intervene to issue standards for Scope 3 emissions disclosure. These bodies could help avoid a "race to the bottom." in which all voluntarily reported Scope 3 emissions are calculated using the least specific or inclusive methodologies. The SEC, Generally Accepted Accounting Principles (GAAP) or International Financial Reporting Standards (IFRS) may select an efficient Scope 3 emissions calculation methodology that better enables the implementation of Recommendation 4.14.

According to the GHG Protocol, absolute or gross emissions refer to all generated emissions. Values for avoided emissions or offsets are not considered in the gross emissions calculation. All disclosed emissions information should be reported in terms of CO_2 equivalents to facilitate comparability. And ideally, emissions data should be scored

22 https://ghgprotocol.org/standards/scope-3-standard

along a quality metric, such as the ratings system developed by PCAF.[23]

Emissions-intensity metrics allow asset owners to more easily compare the emissions of investments when making financial decisions. Total CO2 emissions per unit of currency invested is an example of an intensity-based metric. Another possibility is Weighted Average Carbon Intensity. WACI is calculated by dividing the sum of Scope 1, 2, and 3 emissions by a denominator, such as per million dollars in asset revenue. Revenue is not sensitive to confounding factors or outliers, such as sector in the case of assets or profit margin in the case of earnings. However, this methodology might advantage companies with higher pricing levels than their rivals. The sum of emissions may be weighed by a variety of economic outputs besides revenue. For example, DWP promotes using Enterprise Value Including Cash (EVIC) as the denominator. Other options include the company's valuation, earnings, or assets. For instance, some sectors (e.g., energy) are asset intensive, and others are asset light (e.g., technology). If emissions intensity is weighed by total assets, a decreasing intensity metric may reflect the decision to increase investment in asset-intensive industries rather than increased investment in emissions-conscious targets. Asset owners should endeavor to select parameters that are tailored to their needs (see Recommendations M1 4.14 and M24.15).

As noted in Recommendation M24.15, the AG recommends the use of two emissions-based metrics (absolute and intensity). When asset owners reduce emissions intensity, fewer emissions are created per million dollars of revenue. If revenue grows, however, a decrease in emissions intensity may hide stagnant or growing total emissions. For this reason, emissions-intensity metrics should be coupled with an absolute emissions metric. Together, these metrics give asset owners a more complete picture of the portfolio's carbon intensity and any progress made.

Forward-looking climate metrics. Because emissions-based metrics are constructed from past emissions, they are backward looking. Yet past emissions are not perfect indicators of future emissions, especially from companies that are proactively adapting their business strategy to the emerging green economy. Thus, to best evaluate investment decisions in light of long-term climate goals, backward-looking data and forward-looking projections should be paired. Many portfolio alignment tools have emerged to address the need for forward-looking insights. Due to their nascence, challenges remain in applying these tools. Nevertheless, asset owners should adopt a forward-looking climate metric of their choosing. The TCFD's "Measuring Portfolio Alignment: Technical Supplement" provides a starting place in selecting an appropriate forward-looking metric.[24]

Data sources and standards. Data sources may include self-reported information by companies or asset managers, and approximations from third-party data providers. For example, many reported emissions are provided through CDP, a nonprofit that distributes self-reported data submitted by companies through the CDP Questionnaire. Most asset owners will also use information from data providers that perform additional analysis including Trucost, Sustainalytics, and MSCI. Data providers will vary in terms of quality by metric, sector, and geography, so asset owners may select data providers that align with their needs.

Reporting standards are rapidly consolidating and solidifying as leading actors on the global stage merge and align behind shared objectives. With the newly formed Value Reporting Foundation (VRF), strong signals from the International Financial Reporting Standards (IFRS), ongoing work at the SEC, and the fulfillment of President Biden's May 2021 Executive Order on Climate-Related Financial Risk,[25] evolution in data availability and reliability is poised to accelerate in the near term.

23 In June 2021, TCFD recommended PCAF's methodology for carbon accounting https://assets.bbhub.io/company/sites/60/2021/05/2021-TCFD-Metrics_Targets_Guidance.pdf

24 https://assets.bbhub.io/company/sites/60/2021/05/2021-TCFD-Portfolio_Alignment_Technical_Supplement.pdf

25 https://www.whitehouse.gov/briefing-room/presidential-actions/2021/05/20/executive-order-on-climate-related-financial-risk/

CONSIDERATIONS BEYOND THE BOUNDARIES OF THE TCFD FRAMEWORK

The AG identified four additional considerations that sit outside of, or cut across, the specific categories of the TCFD framework. This chapter concludes with a discussion of those topics. What follows are not recommendations as much as commentary on the current state-of-play of climate-related disclosure.

Future SEC rulemaking and expanding availability of climate disclosures. As discussed earlier, state pension funds often rely on third parties to execute their investment strategies. The SEC appears poised to propose rules by the end of 2021 that will require companies to file climate-related risk disclosures. Although SEC action will take time, it would be a welcome step and go a long way in providing consistent and comparable disclosures across firms. The AG's recommendations are designed to be consistent with future federal rulemaking, while also keeping in mind the direction of travel of international standards and best practices, which have remained largely ahead of U.S. activity.

Accordingly, while an eventual SEC rulemaking will greatly improve the quality and quantity of third-party information available to asset owners, the AG encourages asset owners to follow this report's (likely) more specific and ambitious guidance as a means to more effectively manage risks to the State of California and to more proactively drive capital into the climate transition. Furthermore, the question of whether and how much the SEC will address private markets is critical and, as of yet, unanswered. The AG sees potential for California's pensions to play a role in eliciting information from private markets.

Data quality, availability, and consistency. The collection, reporting, and verification of climate-related information is still in early innings. Scope 3 emissions data is one prominent example, but the list also includes the vulnerability and resilience of place-based infrastructure to physical climate risk, among others. As a consequence, some data that investors collect through disclosure are still a few steps away from decision useful. The AG noted this challenge and agreed that it remains important for investors to track, report, and manage climate-related information to inform strategy and avoid unnecessary volatility as data availability and reliability improve.

In considering the accuracy and utility of climate-related data, it is important to acknowledge the industry-wide efforts being made to improve the data that are currently available. Asset owners can find comfort in knowing that corporations, market participants, and financial authorities are working diligently to expand the universe of high-quality metrics to best capture climate risks.[26] Despite some differences in underlying data and measurement standards, there is general agreement regarding which industries, subindustries, and (in many cases) individual assets are most exposed to climate risk. Asset owners will be well served to get started with climate risk management using currently available data. The perfect need not be the enemy of the good. Climate-related organizational planning and management processes will take time to put in place, even as the quality of the data continues to improve over time. For example, recent steps by the TCFD and the EU Taxonomy to incorporate Scope 3 have increased focus on Scope 3 emissions measurement and demonstrate a path to improvement and convergence over time.

Research has shown that divergences in emissions data need not be limiting factors in the data's usefulness.28 Climate data have less disparity across estimates than data associated with other fields (such as ESG ratings), which have been the subject

26 https://www.cepweb.org/climate-financial-risks-assessing-convergence-exploring-diversity/

of quality debates. Current efforts to expand the disclosure of high-quality Scope 1 and 2 emissions data will also translate into material improvements in the quality of Scope 3 data (which are a byproduct of Scopes 1 and 2.)

Asset owners should begin the process of setting targets, building teams, and starting initial measurements and disclosures in recognition that the industry is actively paving the road toward a higher caliber of data disclosure. In the words of Andrew Bailey, the Governor of the Bank of England, "uncertainty and lack of data are no excuse for inaction."

Forward-looking statements. In practice, much of TCFD is focused on past and current emissions. Companies have expressed concern about making forward-looking statements regarding emissions trajectories and conducting scenario analysis for fear of litigation over false or misleading statements, or for choosing scenarios that do not come to pass. It was beyond the reach of the AG to consider the merits of these concerns; they should be addressed in a way that meets the needs of both investors and companies. Asset owners should be prepared to publicly disclose their own forward-looking climate action plans, articulating their portfolio alignment targets and their strategies to achieve those targets.

Costs of compliance. The AG recognizes the importance of maintaining fair access to pension fund capital, which means ensuring that reporting requirements do not serve to exclude small and/or underrepresented managers. This concern is discussed in Chapters 2 and 3 and merits ongoing consideration and accommodation by the proposed CRCC. In addition to asset manager and other third-party considerations, the AG recognizes that implementing the above recommendations to their full extent will require additional resources at the pension level in the form of staff, consultants, data providers, and time. In each section of this chapter, the AG notes where the recommendations build on existing activities and where the recommendations go beyond current practice. Even where recommendations build on existing activities, additional resources will be required to implement them across the entire portfolio, and areas that go beyond current practice will likely require further resources. Climate risk disclosure has moved into the mainstream, in that investors and companies recognize the financial and moral imperative. The practice of climate risk disclosure, however, has much ground to cover when it comes to right-sizing the level of commitment required to collect, let alone manage, the information that is disclosed.

AFTERWORD

Alicia Seiger
Stanford University
September 2021

In a report whose thrust is a series of recommendations driving toward more specific and ambitious climate-related risk disclosure, it may seem odd to conclude with a critical discussion of its limits.

And yet, that is what follows. Disclosure has a central role to play as an enabler of risk management and climate action. Yet to more effectively steer disclosure to its full potential – and to ensure that our species arrives at the desired destination of a safe, stable, and equitable planet – drivers must consider the ways in which current practice risks heading off course. This Afterword offers brief commentary on the rough edges of disclosure in practice, how the state intersects with these unsettled frontiers, and sets the stage for the road ahead.[1]

As of August 2021, asset owners and managers controlling over USD$37 trillion have joined more than 700 cities, 3,000 businesses, and 120 countries in the UN Race to Zero campaign leading up to the Conference of Parties in Glasgow (COP26).[2]

Participants have committed to achieving net-zero emissions by 2050. The Race to Zero embodies the multi-decadal transformation of global climate action from the purview of environment ministers to a "come one, come all" approach. Racing to zero greenhouse gas emissions is a good thing. And disclosure will be a key driver in the race. But net zero, without further refinement and accountability, is not necessarily the same destination as a safe and stable planet.

Disclosure is the central means by which countries, states, cities, investors, and businesses racing to zero can calculate and report their progress. To effectively serve this role, conventions must be developed to ensure comparability, accuracy, and accountability. Specifically, regulators must attend to issues of greenwashing, coverage and boundaries (which become apparent as one pulls on the thread of Scope 3), and emissions stocks and flows over time (embodied in the debates over interim targets and the appropriate use of offsets).

In the absence of a global price on carbon, governments have left pricing decisions largely in the hands of private firms. The rise of net zero and disclosure is shaping carbon price discovery in the form of decisions to manage and reduce emissions, especially Scope 3. Not only is that a suboptimal means to arrive at a price on carbon, it perpetuates the transfer of climate damages to governments as the ultimate risk bearer.

1 The ideas in this Afterword are based on the research and findings articulated in the forthcoming book, *Settling Climate Accounts: Navigating the Road to Net Zero*, edited by Thomas Heller and Alicia Seiger. The book is scheduled for publication in October 2021.

2 https://unfccc.int/climate-action/race-to-zero-campaign#eq-2

The costs of this shift takes the form of disaster relief and social services, including unemployment, healthcare, relocation, and other social benefits.

Without greater attention to greenwashing, Scope 3 conventions, and the timing of targets and offsets, the race to net zero risks achieving alignment of individual firm and portfolio emissions with normative targets, while governments (and their citizens) remain exposed to potentially unchanged, if not increasing levels of risk and associated costs. As governments steward and advance strong disclosure and reporting conventions, and as disclosure standards are deployed in harmony with supporting climate policies and infrastructure development, the race to net zero will come closer to a desirable destination.

Even as disclosure conventions advance in the direction of more accurate net-zero accounting, it is important to keep an eye on what is still missing. Progress on the race to net zero risks coming up short on two critical fronts – equity and accountability. Net zero and disclosure do not explicitly address questions of distributing the costs and benefits of the "downside" and the "upside" of the transition to a carbon-neutral economy, and thus are not (yet) fit for the task of managing a just and equitable transition. The equity imperative demands the attention of states and sovereigns and their abilities to enact policy, invest in infrastructure, and act as stewards of the transition to carbon-neutral economies. In the race to net zero, governments must embrace the responsibilities of distributing the transition's economic losses and benefits, and delivering remedies for historic and future patterns of pollution.

The second unattended front is accountability. As previewed in the Foreword, one of the pressing questions the practice of climate-related disclosure forces is, once one has this information, what is one to do with it? Answers to that question will vary by state, firm, and investor according to their strategic and financial positions. But just as emissions don't stop at state or national borders, they are equally undaunted by firm and portfolio boundaries. Greenhouse gas emissions are a global problem. Without governments serving as the ultimate accountants and holding actors accountable, net zero will not add up.

THE ROAD AHEAD

The rise of net zero and disclosure demand that states serve their roles as providers of infrastructure and as stewards of best practice, equity, and the transition. The two pathways of the AG's purview – shorthanded as "the real economy" (Chapter 3) and "the financial economy" (Chapter 4) – come together in the context of the state-level strategy and coordination questions raised throughout this report. As a borrower, lender, insurer, guarantor, and residual owner of climate-exposed assets, the state performs its classic roles as a provider, funder, operator, and regulator of infrastructure systems. As these systems transition from high- to low-carbon, state-led market design and financial blending will be critical to catalyzing private investment.

The state can also actively participate in the stewardship of the evolving practice of climate risk conventions – a coordination function that the state can and should embrace. As an investor and regulator, California can help drive progress on key issues at the frontier of climate risk disclosure.

Continuing the process and dialogue launched with the AG can go a long way toward advancing the efficacy of climate disclosure as a means to identify and manage the risks climate change imposes on investment portfolios and state economies. Following the guidance of this report, California can build on its climate leadership by assuring disclosure's returns to a more complete portfolio of climate action.

LIST OF **RECOMMENDATIONS**

Recommendation 2.1: *Implementation of new climate-related risk disclosure standards in California should align with and support the implementation of key state climate strategies.*

Recommendation 2.2: *The state should further invest in providing state entities and third parties access to climate risk data, climate models, and other tools necessary to conduct scenario analysis.*

Recommendation 2.3: *A continuing internal process should be established that coordinates state climate-related financial risk disclosure and incorporates disclosures into new state processes and policies.*

Recommendation 2.4: *The state should invest in additional personnel, staff capabilities, and technical assistance resources.*

Recommendation 3.1: *A classification system should be developed for direct expenditures based on potential materiality of climate risk relating to project size, asset life, and exposure to physical and transition climate hazards. This classification system should determine the granularity of required project-level climate risk disclosure.*

Recommendation 3.2: *The granularity of climate risk disclosure required of transacting counterparties should be appropriate to their size and expertise.*

Recommendation 3.3: *The state should provide technical assistance to counterparties and ensure equitable access to direct expenditures as increased requirements for climate risk disclosure are put in place.*

Recommendation 3.4: *Climate risk disclosure requirements should include consideration of the just transition and an equitable and inclusive economy.*

Recommendation 3.5: *Requirements for corporate and project-level climate risk disclosure should evolve in line with emerging best practices and increasing data availability and reliability.*

Recommendation 3.6: *All relevant counterparties transacting with the state should provide a corporate disclosure in line with TCFD spanning the four pillars of governance, strategy, risk management, and metrics and targets, as well as the industry guidance for non-financial sectors.*

Recommendation 3.7: *There should be minimum standards relating to climate change for the counterparties transacting with the state, such as mandatory disclosure of climate-related lobbying.*

Recommendation 3.8: *Counterparties should disclose relevant project-level physical and transition climate risk as part of their bids.*

Recommendation 3.9: *The state should prescribe methodologies for the disclosure of project-level physical and transition risk based on emerging best practices as detailed below.*

Recommendation 3.10: *Project-level physical risk disclosure should align with PCRAM or other best practices for physical risks assessment as endorsed by the state in the future. Physical climate risk disclosure should include an assessment of relevant climate hazards and a long-term materiality assessment, as well potential resilience improvements.*

Recommendation 3.11: *Project-level transition risk disclosure should align with emerging methodologies and best practices as they are widely adopted. Transition climate risk disclosure should include lifecycle carbon emissions, carbon price sensitivity, and any approach to offsets. Furthermore, it should include an assessment of broader impacts relating to the transition and the project's transition readiness.*

Recommendation 3.12: *The state should further expand its provision of climate risk data, such as through clearinghouses, license agreements with commercial providers, a list of preferred providers, or cooperation with other public sector entities. This approach should cover transition risk data in addition to physical risk data.*

Recommendation 3.13: *The state should specify the physical and transition scenarios to be used for consistent climate risk analytics and disclosure.*

Recommendation 3.14: *Physical risk disclosure should refer to the state's climate assessment and data provision, as well as global climate models and other internationally recognized physical risk scenarios.*

Recommendation 3.15: *Transition risk disclosure should refer to NGFS orderly and disorderly transition scenarios, IEA Net Zero by 2050, and other internationally recognized transition risk scenarios.*

Recommendation 4.1: *CalPERS and CalSTRS should phase the AG's recommendations into the reports to comply with SB 964. Other state entities managing financial portfolios will need to determine the appropriate form for disclosure. With regard to third parties, the AG recommends that asset owners request information be disclosed in commonly used formats until the SEC provides further guidance.*

Recommendation 4.2: *Asset owners should disclose the organization's climate change policies, including investment beliefs, proxy voting policies and principles, coal phase-out policies, and climate action plans (including their science-based targets) and how these policies are actively supported by their board and senior management.[1] Such governing policy disclosure should be requested of third parties as appropriate.*

Recommendation 4.3: *Asset owners should disclose how their board manages climate risk identification, assessment, and management and request this information from third parties as appropriate.*

Recommendation 4.4: *The governor and legislature should consider climate competency when appointing directors to an asset owner's board of directors, and asset owners should evaluate and improve the climate competency of their boards over time. Asset owners should request information about and seek ongoing improvement of climate-competent governance from third parties.*

Recommendation 4.5: *Asset owners should link executive incentives and/or variable employee compensation with the achievement of a climate-related target, and engage with third parties to do the same.*

Recommendation 4.6: *Asset owners should disclose independent third-party assessments or internal attestation (board or CIO/CFO) of the asset owners' climate change reporting, and request this information from companies and asset managers.*

Recommendation 4.7: *Asset owners should request that third parties disclose public policy positions, lobbying expenditures, and key differences between the third-parties' lobbying positions or the lobbying position of trade groups and the entity's stated climate policies and goals.*

Recommendation 4.8: *Asset owners should disclose how climate risks, identified through physical and transition risk scenario analyses, affect the fund's strategy and financial planning over the short, medium, and long term and request this information from third parties as appropriate.*

Recommendation 4.9: *Asset owners should issue transition plans that articulate the organization's strategy for operating under increasing constraints on greenhouse gas (GHG) emissions, changing consumer preferences, technological developments, and mounting physical risks according to internationally recognized reference scenarios, and request this information from third parties as appropriate.*

Recommendation 4.10: *Asset owners should disclose their approach to transition and physical risk scenario analysis, including details on the assumptions, the financial analysis performed, the data used, and the scenario used. Asset owners should include a low-emissions scenario for transition risk and a high-emissions scenario for physical risk. They should also request this information from the third parties in which they invest.*

Recommendation 4.11: *Asset owners should require asset managers to disclose how their transition and physical risk analyses integrate into their risk management processes, and engage with companies to do the same.*

1 https://theinvestoragenda.org/wp-content/uploads/2021/05/expectations-ladder.pdf

Recommendation 4.12: *Asset owners should disclose the degree to which they perform transition and physical risk analysis on their portfolio, including, where possible, the level of assessment (e.g., asset level, asset class level, mandate, portfolio, or fund level); the data providers, tools, and timescales used; the scope (e.g., direct, indirect, and macroeconomic impacts); the inclusion of chronic and acute climate-related hazard; and the methodology used for combining layers of climate and socioeconomic data (e.g., climate-impact data, critical thresholds, investee-level data). They should also request this information from third parties.*

Recommendation 4.13: *Asset owners should disclose their processes of engagement with managers and companies to influence transition and adaptation plans, including whether and how they develop and enforce minimum standards for high-emitting sectors.*

Recommendation 4.14: *Asset owners should disclose Scope 1, 2, and 3 emissions annually across the portfolio using best available data and request third parties do the same.*

Recommendation 4.15: *Asset owners should disclose at least two emissions-based metrics, one absolute and one intensity-based, and an appropriate forward-looking climate metric annually. They should ask companies and managers to provide this information as appropriate and as well as they are able.*

Recommendation 4.16: *Asset owners should disclose the analytical methodology and underlying data sources used in calculating emissions intensity, absolute emissions, and forward-looking metrics. They should ask companies and managers to provide this information as appropriate.*

Recommendation 4.17: *Asset owners should disclose what percentage of their portfolio emissions is based on reported or verified data, as well as which standards were used to report the emissions metrics, and ask third parties to do the same.*

Recommendation 4.18: *Project details for offset purchases should be disclosed, including location, project type, price, verifier, permanence and corresponding adjustments (to avoid double counting.)*

Recommendation 4.19: *Asset owners should disclose the percent of the fund that is vulnerable to physical risk, as well as they are able. To collect the necessary data, asset owners should request that the companies and managers in which they invest identify, analyze, and disclose climate-related physical risks to the best of their ability.*

Recommendation 4.20: *Asset owners should disclose what percentage of their portfolio is invested in transition and in green finance, as well as they are able to and according to referenced standards.*

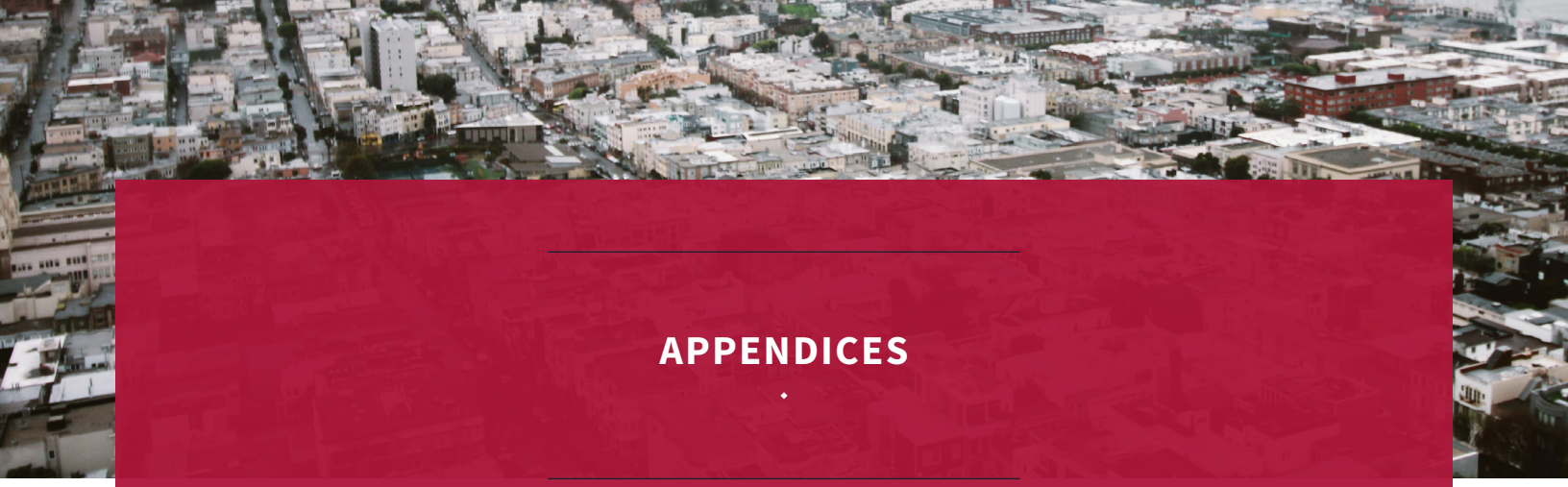
Recommendation 4.21: *Asset owners should report the location of financed emissions for applicable investments (e.g., commercial and residential real estate, project finance, real assets, and revenue bonds in low-income communities and communities of color).*

Recommendation 4.23: *Asset owners should set a target and track the percent of the portfolio that is reporting emissions.*

Recommendation 4.24: *Asset owners should set a target and track the percent of the portfolio that is invested in transition and green finance.*

Recommendation 4.25: *The STO should request disclosure from counterparties about whether they have coherent, time-bound, specific, and attainable goals for climate-related risks and opportunities to determine if such counterparties are taking tangible steps toward setting and achieving climate-related targets.*

Recommendation 4.26: *The STO should request disclosure from those counterparties about whether their risk disclosures align with the recommendations of the TCFD.*



APPENDICES

APPENDIX A: CALIFORNIA TRANSITION RISK STRATEGIES

CLIMATE CHANGE SCOPING PLAN

The Scoping Plan outlines the sector-based emissions reduction targets necessary to achieve the state's ambitious climate goals (see Figure 2), and recommends key policy and regulatory actions for the governor and legislature to consider. As mandated by the California Global Warming Solutions Act of 2006 (AB32), the California Air Resources Board (CARB) updates the state's Climate Change Scoping Plan every five years. Publishing the state emissions targets gives certainty to market participants and empowers them to manage the transition responsibly.

The first plan was approved by CARB in 2008 and was updated in 2013 and 2017. In 2018, the state met its goal to reduce statewide greenhouse gas (GHG) emissions to below 1990 levels. Subsequently, the legislature set a new target to reduce emissions to 40 percent below 1990 levels by 2030. California has also established goals for 60 percent of the state's energy to come from renewable sources by 2030 and 100 percent of the state energy grid to be powered by zero-carbon energy before 2045. The 2022 Scoping Plan update currently underway will assess progress towards the 2030 target and set a path forward to achieve carbon neutrality by mid-century. Notably, the Scoping Plan only addresses emissions reductions; it does not highlight broader transition risk by industry, sector, or region.

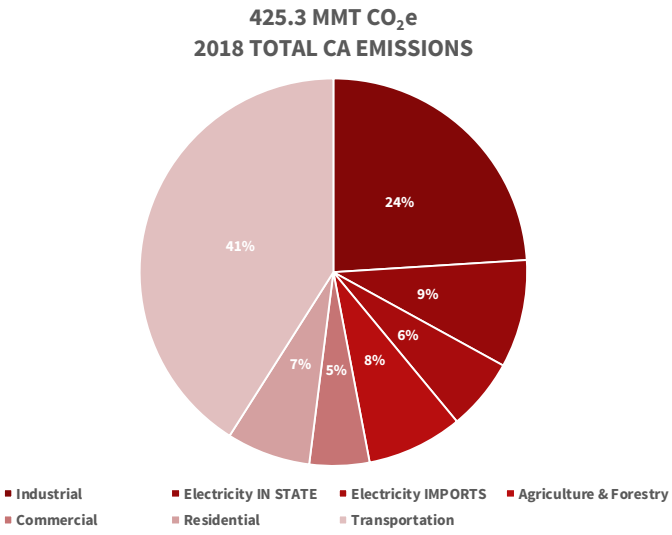


Figure 2: Emission by sector
(Source: 2022 Scoping Plan Update Kick-Off Workshop)

CAP-AND-TRADE PROGRAM

The Cap-and-Trade Program is another instrument to reduce California's GHG emissions. The program sets a declining limit or cap for GHG emissions in California from key sources, including electricity generation, large stationary sources (e.g., refineries, cement production facilities, oil and gas production facilities, glass manufacturing facilities, and food processing plants), and fuel distributors (e.g., natural gas, propane fuel, and transportation fuel providers), comprising 80 percent of the

state's total emissions. The amount of allowances, or tradable permits to emit one metric ton of a carbon dioxide equivalent GHG emission, decreases every year. There is an increase reserve (or floor) price for allowances in an auction which creates a carbon price signal for the reduction of GHG emissions.

JUST TRANSITION ROADMAP

Recognizing that reducing GHG emissions is just one piece of the state's strategy on transition risk, Governor Newsom called on the Governor's Office of Planning and Research (OPR), in collaboration with the Labor and Workforce Development Agency (LWDA), to develop a "Just Transition Roadmap" focused on the risks to industries, workers, and communities from the transition to a carbon-neutral economy. This approach acknowledges that the current economy is largely built on some of the very industries that generate the most emissions and are most at risk from new carbon-neutral technology developments.

California's Just Transition Roadmap, required by Executive Order N-79-20, recognizes that measuring and managing the economic transition to carbon neutrality looks different in every region and for every sector. For example, the state's two largest oil and gas producing counties are Kern County and Los Angeles County. Kern is highly dependent on both oil and commodity agriculture, a high-risk sector given physical climate impacts. Los Angeles is economically diversified and thus more resilient to an eventual transition away from oil and gas production. The economic strategies each county relies on to ensure that the transition is "just" – providing accessible high-quality jobs and a solid tax base across these communities – will be very different.

The roadmap, therefore, lays out four key pillars that should underpin any transition strategy, recognizing that how these are implemented will vary across regions and sectors. Those pillars include:

1. **Economic diversification:** investment in a diverse array of industries that can survive and thrive in a transition to carbon neutrality, including, but not limited to, clean energy industries.
2. **Industrial planning:** support for industries themselves and for workers in declining industries to transition.
3. **Workforce development:** education and training for jobs in growth industries.
4. **Safety-net investments:** retirement bridges, health care, and other supports to workers and communities experiencing job and tax-base losses or a gap between industry decline and new industry growth.

Understanding the relationship between California's larger just transition agenda and its financial decisions – whether through direct expenditures from the state budget or investments made in California through the pension funds – is a critical part of the state's transition risk accounting. Balancing macro-economic considerations with the disclosure from third parties must be a key part of the state's approach to a just transition.

APPENDIX B: CALIFORNIA PHYSICAL RISK STRATEGIES

Despite the complexity of managing physical climate risk across all sectors, geographies, and time horizons, the state does not have a single regulatory analog to the Scoping Plan for physical climate risk. Multiple state agencies, boards, and commissions play important regulatory and policy roles in mitigating physical climate risk.

However, over the past few years, the state has made significant gains in charting an integrated and multi-sector strategy on climate risk and resilience. The key components to this strategy include: (1) the State's Adaptation Strategy pursuant to SB 1482 (2015); (2) state and local policy alignment

through the State's Integrated Climate Adaptation and Resiliency Program (ICARP) pursuant to SB 246 (2015); and (3) sustained investment in actionable climate science needed to identify physical climate risk in California through the California Climate Change Assessments, recently codified through SB 1320 (2020).

ADAPTATION STRATEGY

The state is statutorily required to develop and update a comprehensive state adaptation strategy every three years. The 2021 update is underway and builds on previous updates from 2009, 2014, and 2018. Given the significance of physical climate risks in California, the 2021 State Adaptation Strategy update aims to deliver a framework for action by:

1. Nesting existing state efforts to reduce climate risks and build climate resilience under one cohesive strategy.
2. Setting strategic direction for state agencies, clearly identifying key outcomes to guide state policies, programs, and investments.
3. Serving as a framework for action to which all sectors and regions can contribute.
4. Providing up-to-date information on the state's efforts to build climate resilience, including development of resilience metrics to track progress over time.

The 2021 update will also chart a process for delivering annual implementation reports to the Legislature.

INTEGRATED CLIMATE ADAPTATION AND RESILIENCY PROGRAM (ICARP)

Through the Office of Planning and Research (OPR), ICARP serves a coordinating function across state, regional, and local efforts. Through this coordinating governance role, ICARP developed a vision for a resilient California, as well as principles to guide state implementation efforts. ICARP has also led the state's work to define vulnerable communities in an adaptation context, and is currently developing tools and resources to aid in implementation across state and local adaptation efforts, including updating state guidance on operationalizing climate risk in planning and asset investment decisions through EO N-19-19.2

CALIFORNIA CLIMATE CHANGE ASSESSMENTS

SB 1320 directs OPR, through ICARP, to administer the California Climate Change Assessments in partnership with the California Natural Resources Agency, the California Energy Commission, and the Strategic Growth Council. California's Climate Change Assessments are a regionally focused example of a regular series of broader assessments, like the U.S. National Climate Assessment (NCA) and global assessment reports from the Intergovernmental Panel on Climate Change (IPCC).

California's Climate Change Assessments build on global and national processes, and go further by including a set of state-funded primary research that examines how climate change affects specific sectors and California-specific policy questions. Also unique to the California assessments is the state's investment in high-resolution, downscaled climate projections. No other assessment process provides the same resolution or quality of publicly available climate projection data out to 2100 in California.

This valuable investment in high-resolution climate projection data addresses two of the three key challenges with conducting scenario analysis, as identified by TCFD. First, most scenarios "have been developed for global and macro assessments of potential climate-related impacts," and second, the challenge of assessing risks across different "jurisdictions and geographic locations." California is ahead of the curve on both points in relation to the availability of cutting- edge, public, statewide physical climate risk data. The third challenge – limited expertise and capacity to conduct scenario analysis as part of standard business practice – needs to be addressed.

MEMBERS OF THE **ADVISORY GROUP**

NAME	ORGANIZATION	POSITION
Marla Bleavins	Port of Los Angeles	Deputy Executive Director & Chief Financial Officer
Kathleen L. Brown	Manatt, Phelps & Phillips, LLP	Partner (Former State Treasurer)
Chris Costello	Environmental Market Solutions Lab at UC Santa Barbara's Bren School	Director
Dr. Craig Davies	European Bank for Reconstruction and Development	Associate Director for Green Economy and Climate Action
Jib Ellison	Blu Skye	Founder and Chief Executive Officer
Nili Gilbert	David Rockefeller Fund	Board Member and Chair of the Investment Committee
Janine Guillot	Value Reporting Foundation	Chief Executive Officer
Thomas Heller	Stanford Steyer-Taylor Center for Energy Policy and Finance, Stanford Law School	Faculty Director
Dan Iancu	Stanford Graduate School of Business (GSB)	Associate Professor of Operations, Information and Technology
Scott Jacobs	Generate Capital	Co-Founder and Chief Executive Officer
Dave Jones	Climate Risk Initiative at UC Berkeley's Center for Law, Energy and the Environment (CLEE)	Director
Mary Obasi	Bank of America	Global Climate Risk Executive in Global Risk Management
Tim Profeta	Nicholas Institute for Environmental Policy Solutions at Duke University	Director
Carlos Sanchez	Willis Towers Watson	Director of Climate Resilience Investment
Lynn Schenk	Business and Environment Initiative at Harvard Business School	Director
Alicia Seiger	Stanford University Sustainable Finance Initiative	Managing Director
The Rev. Kirsten Spalding	Ceres	Senior Program Director
Laura D'Andrea Tyson	Haas School of Business of the University of California Berkeley	Distinguished Professor
Marilyn Waite	William and Flora Hewlett Foundation	Program Officer in Environment
Bill Weil	Tempest Advisors	Program Strategist