ARCCA & RISKY BUSINESS present

The Economic Risks of Climate Change in California

July 14, 2015

ABOUT ARCCA

- **A**lliance of **R**egional **C**ollaboratives for **C**limate **A**daptation
- Formed in early 2012 in conjunction with the Governor's Office of Planning and Research
- Member regional collaboratives:

Bay Area Regional Collaborative

CAPITAL REGION CLIMATE READINESS COLLABORATIVE

Climate Collaborative SAN DIEGO REGION

LARC Los Angeles Regional Collaborative for Climate Action and Sustainability

SIERRA CAMP

ABOUT ARCCA

- ARCCA member regional collaboratives have come together to:
  - Amplify and solidify their individual adaptation efforts
  - Give a stronger voice to regionalism at state and federal levels
  - Share information on best practices and lessons learned
  - Identify each region's most innovative and successful strategies and determine how they can be adapted for another region
  - Empower collaboration across all sectors and levels of leadership
- Learn more at www.arccacalifornia.org

AGENDA

The Economic Risks of Climate Change in California

- Jamesine Rogers, *Risky Business Project*
- Tan Copsey, *Risky Business Project*

A State Perspective

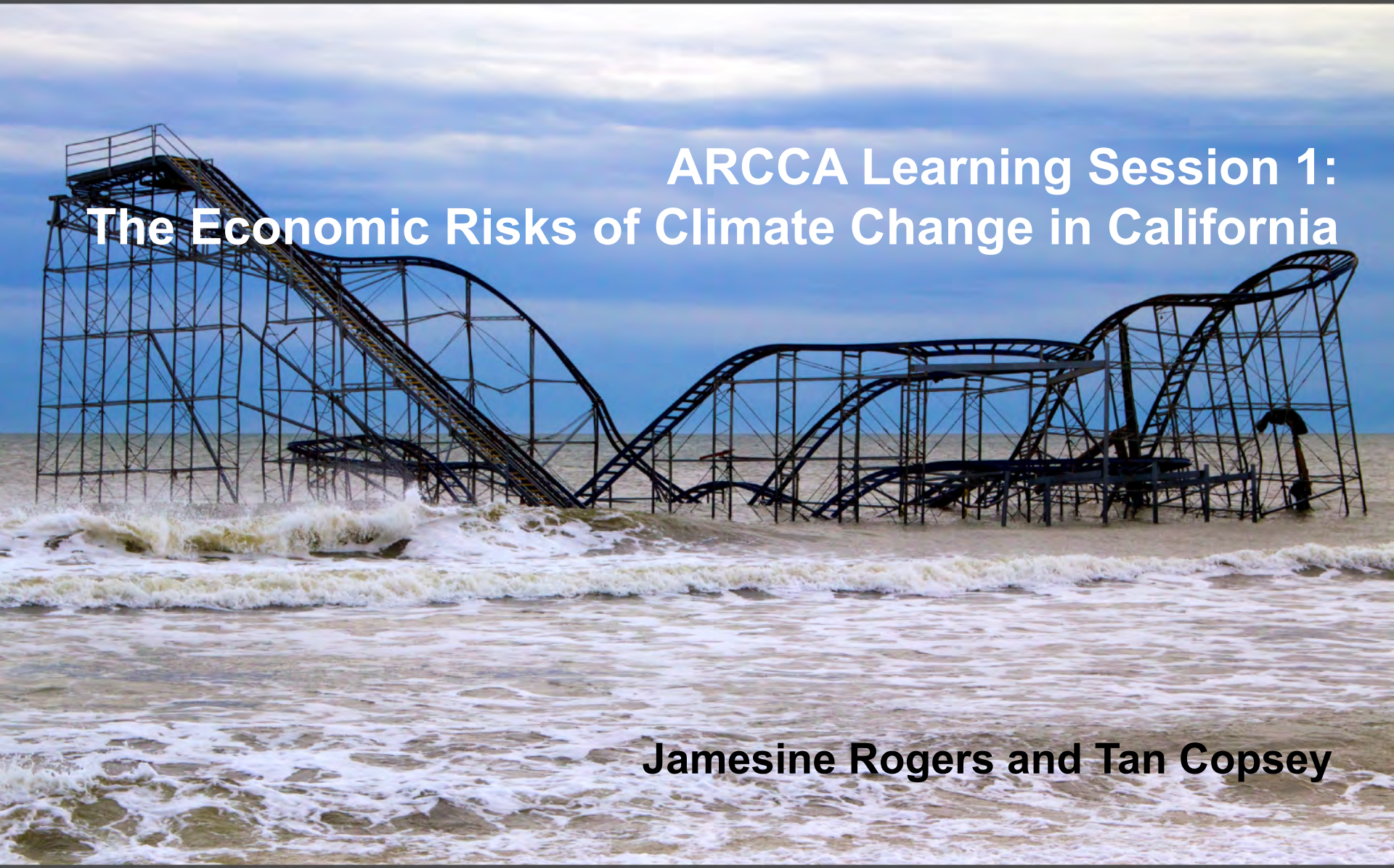
- Louise Bedsworth, *Office of Planning and Research*

Regional Voices

- Larry Greene, *Capital Region Climate Readiness Collaborative*
- Krista Kline, *Los Angeles Regional Collaborative for Climate Action and Sustainability*
- Cody Hooven, *San Diego Regional Climate Collaborative*
- Kerri Timmer, *Sierra Climate Adaptation and Mitigation Partnership*

Jamesine Rogers,
Lead Author

Tan Copsey,
Communications Director



ARCCA Learning Session 1: The Economic Risks of Climate Change in California

Jamesine Rogers and Tan Copsey

The Goals

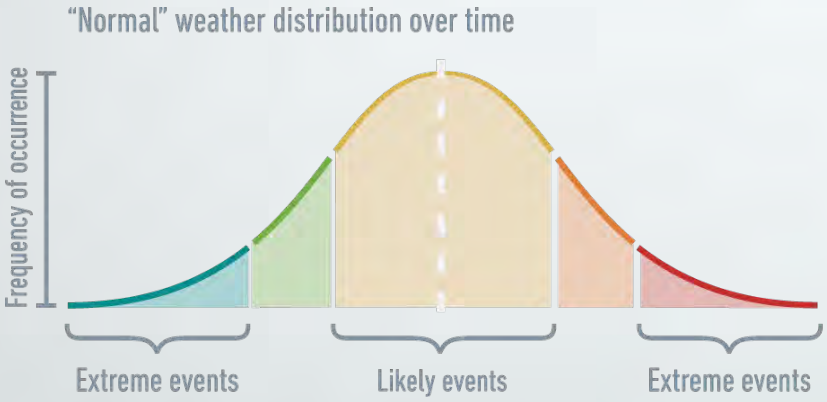
- Lead nonpartisan, business-focused national discussion on climate risk and the U.S. economy
- Provide *actionable* data for public and private sector decision-makers to incorporate climate risk into everyday activities

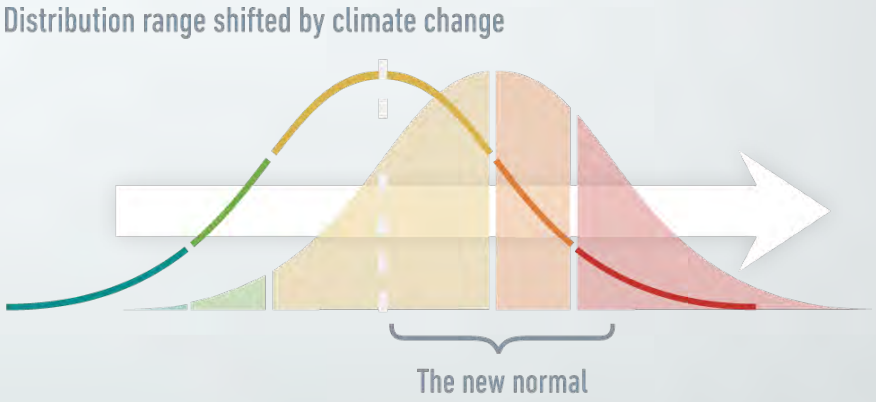
The Approach

- **Nonpartisan** Risk Committee convened by co-chairs Paulson, Bloomberg and Steyer
- **Independent** risk assessment commissioned by Risk Committee
  - Rhodium Group research lead, RMS partner
- **Assess risk without dictating solutions**

Risk Assessment Approach and Findings

Understanding Climate Risk

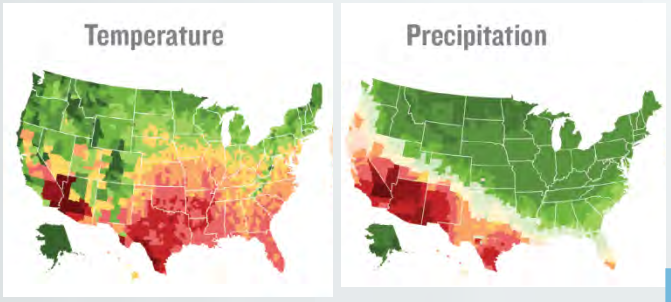


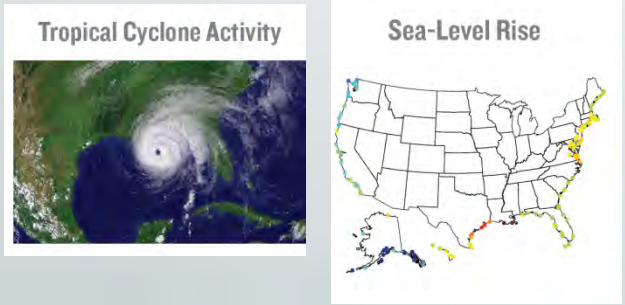


Research approach

Spatial Empirical Adaptive Global-to-Local Assessment System (SEAGLAS)

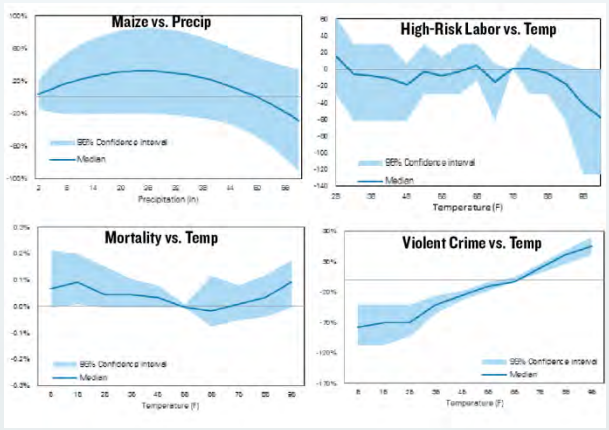
Physical Climate Projections



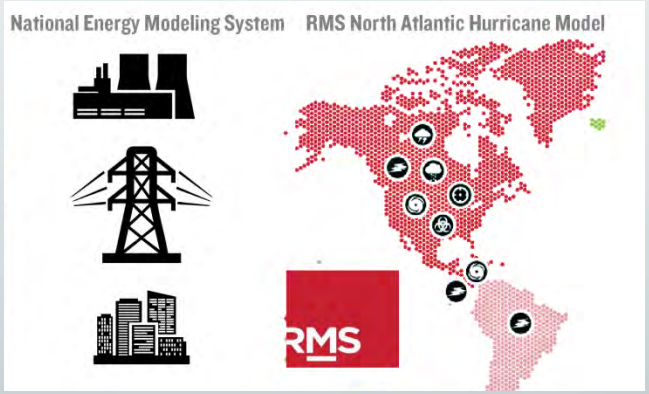


Downscaled data from 40 climate models

Econometric Research



Detailed Sectoral Models



20 TB of data, open source

Integrated Economic Analysis

Scope of coverage

Science

- Temperature - averages and extremes
- Precipitation - averages and extremes
- Local sea-level rise
- Humidity - wet-bulb temperaure
- Strong positive carbon cycle feedbacks
- Ice-sheet collapse
- Ocean temperature and acidification
- Ecosystem collapse
- Unknon unknowns

- Included
- Limited
- Excluded

Agriculture

- Grains, Soy, Cotton yields
- Other crops: fruit, vegetables, nuts
- Livestock

Other Impacts

- Water supply and demand
- National Security
- International civil conflict
- Aid and disaster relief
- Tourism, outdoor recreation
- Fisheries
- Forests
- Wildfire

Methodology

- Full probability distribution, tail risks
- Market impacts
- Quality of life
- Biodiversity, ecosystem loss
- Ecosystem services
- International trade

Impacts

Coastal Damages

- Innundation from sea-level rise
- Hurricanes and nor'easters
- Changes in hurricane activity
- Transportation
- Infrastructure

Energy

- Energy demand
- Energy supply

Labor Productivity

- Hours worked
- Labor quality, health impacts

Health

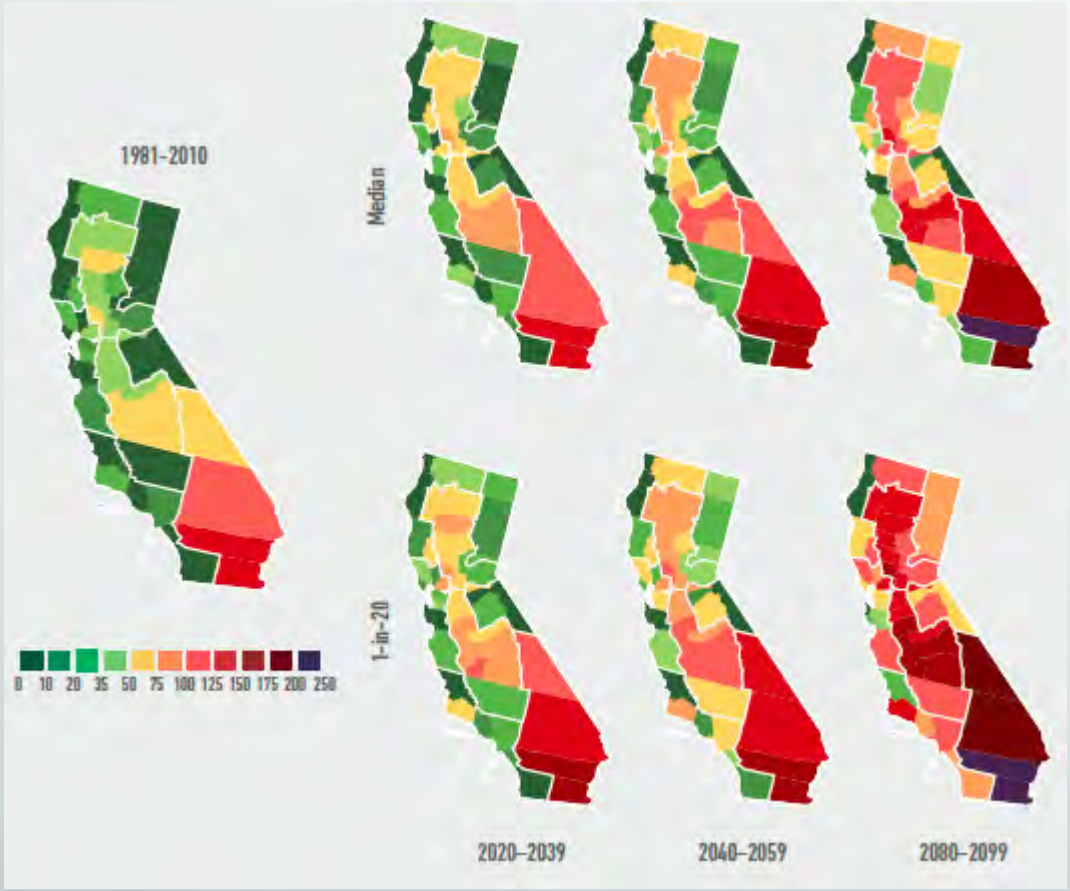
- Heat/Cold-related mortality
- Respiratory impacts
- Extreme weather
- Vector and water-borne disease

Crime

- Property crime
- Violent crime

Regional definitions

Average days/year > 95°F

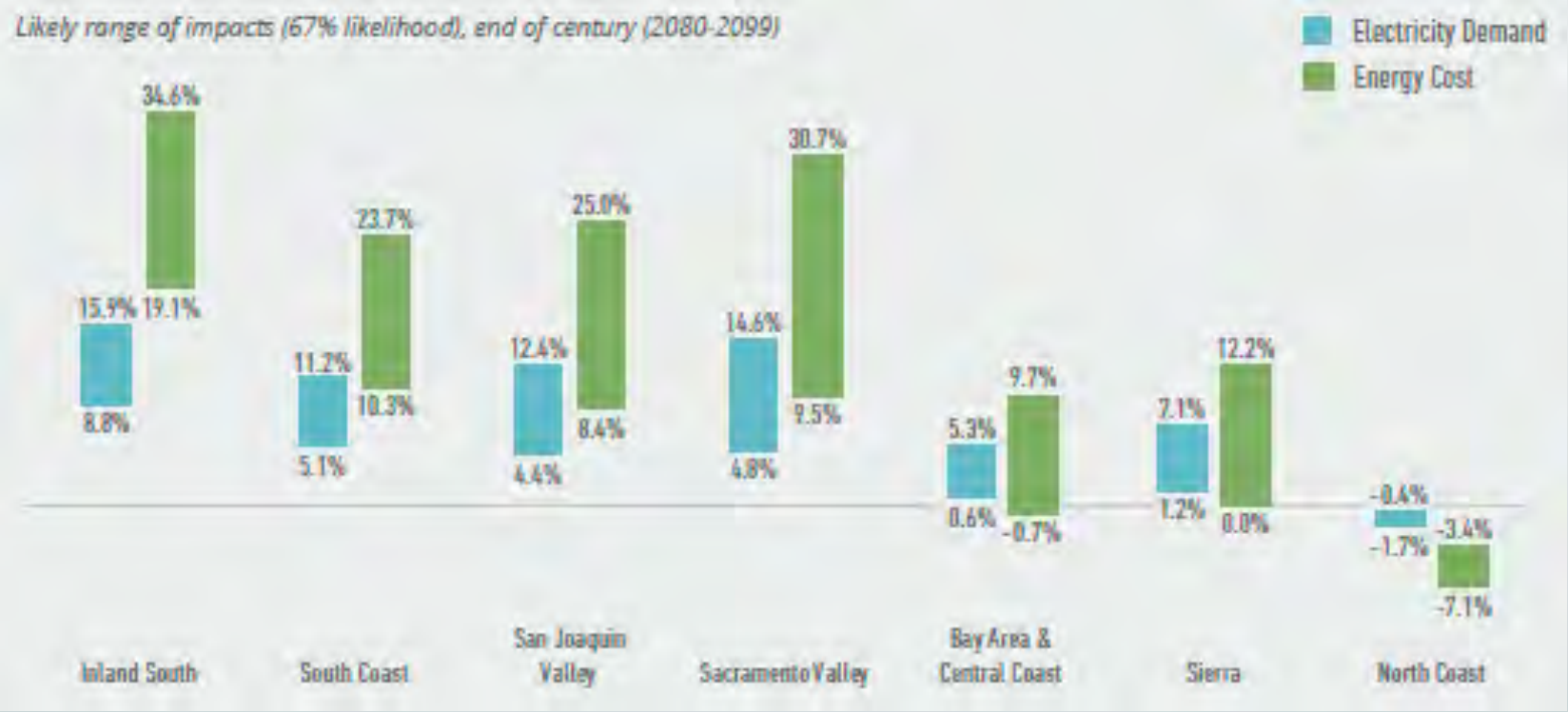


Average days/year < 32°F

- Likely 60-90% decline in days each year below freezing statewide
- Biggest change in Sierra and North Coast regions
  - Likely as few as 25 d/yr in Sierra by century's end (1-in-20: 5 d/yr, current av: 88 d/yr)

Sea Level Rise

Energy Demand & Cost



Agriculture

- Absent adaptation, likely impacts on commodity crops include:
  - Yield declines in cotton, corn
  - Yield gains for wheat
- Warmer temperatures put major CA crops (vegetables, fruits, nuts) & livestock at risk
- Water availability concerns

Labor Productivity

Inland regions have most severe risks:

- Likely decline in labor productivity by up to 2.2%
- 1-in-20 chance of greater than 2.9% decline (the Valley, Inland South)

Heat-Related Mortality

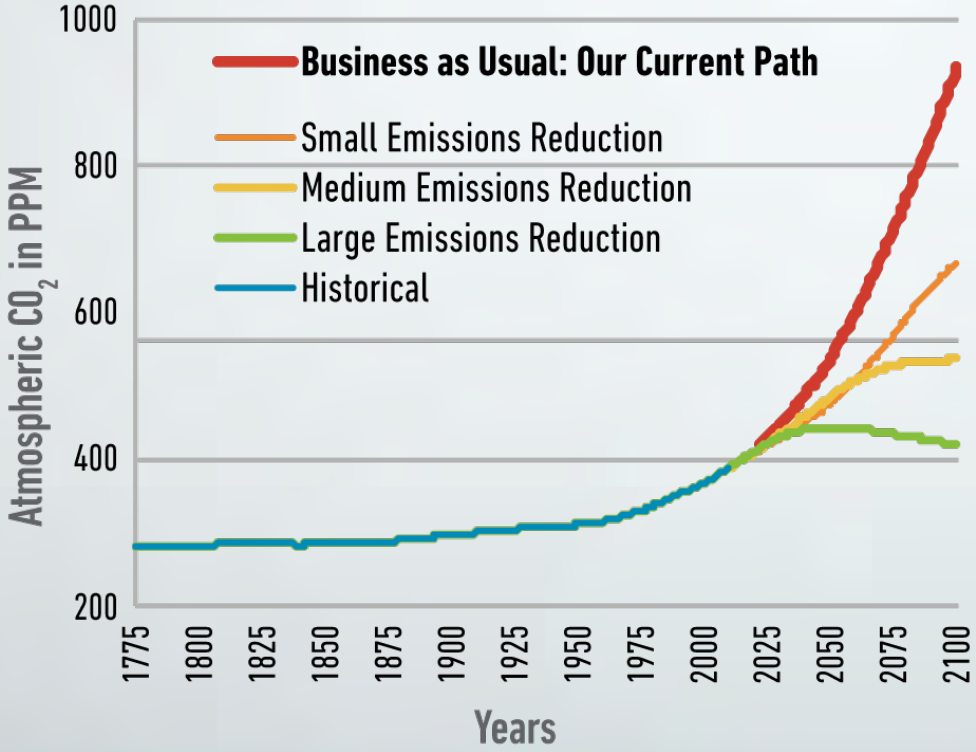
Southern and inland regions have most severe risks:

- Likely up to addl 7,700 deaths/ yr statewide by end of century
- Almost half - up to 3,500 deaths/yr - in South Coast (1-in-20: over 6,200 deaths/yr)

Water Availability

- Original research shows most regions will likely see less precipitation in spring/fall
- Rising temperatures affect snowpack, snow:rain ratio, timing of snowmelt
- Drought risk increases and more extreme events
- Impacts on water quality

Risks are Not Inevitable



If we act immediately, we can still avoid most of the worst impacts.

The only reasonable and responsible course is to alter the path we're on, and bring our carbon emissions down toward zero.

California Leadership

- California is leading the nation and the world in efforts to reduce carbon emissions
- Opportunity to become a model of climate resilience as well

Business Sector Engagement

Audience Research Summary

~400 surveys were conducted in late May, 2014 across three key financial audiences: Raters, Issuers and Investors

1. **The vast majority of respondents believe climate change is occurring, and is likely to have an economic impact**

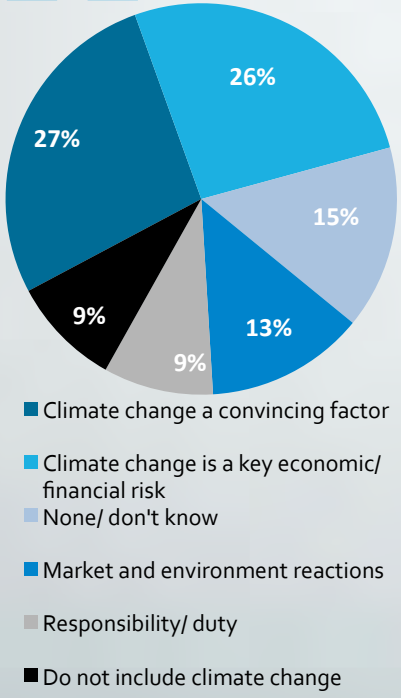
2. **Climate change is considered in the risk models, however it is rated near the bottom of the list of risks measured in terms of importance**
   - Of the 15 types of risk measured, climate change ranks 12th on average; risks measured include:

- Business and credit risk
- Climate change risk
- Commodity price volatility risk
- Competitive risks
- Currency/exchange rate risk
- Economic and market risk
- Inflation/deflation risk
- Interest rate risk
- Legal risks
- Legislative, regulatory and tax risk
- Liquidity risk
- Natural disaster risk
- Political and social risk
- Reinvestment risk
- War and terrorism risk

Source: Risky Business Climate Change Market Research Study June 2014

Why Include Climate Change? - Investors

Q. What is the best argument for including climate change in financial risk assessment models?



Climate change a convincing factor (27%)

"Hurricane Sandy, Katrina and the other storms that have come in at the edge of the 'norm' curve during the last decade. The rapid melting of the ice caps. The sky in Shenzhen, China."

Climate change is a key economic/financial risk (26%)

"Without including climate change, you are missing a major risk factor that is going to impact many different aspects of operations, both supply chain, future markets, stability in the global and domestic economy and more."

Market and environmental reactions (13%)

"Regulations will force more expenses to try to curb it - Costs will be high for many and will dampen economic activity which is the point of these regulations."

Responsibility/duty (9%)

"It is a major risk medium to long term and models should try to incorporate all risks."

Do not include climate change (9%)

"We do not include climate change as a risk because it is an unproven theory not supported by scientific evidence. Most scientists and layman do NOT believe in anthropogenic global warming or climate change."

Source: Risky Business Climate Change Market Research Study June 2014

Some Examples of Mitigating Risk

- Financial disclosure
- Portfolio management
- Divest/Re-invest strategies
- Accurate pricing of risk by long-term investors

CDP
DRIVING SUSTAINABLE ECONOMIES

Ceres

ASSET OWNERS DISCLOSURE PROJECT

SUSTAINABILITY ACCOUNTING STANDARDS BOARD
SASB

Carbon Tracker Initiative

Private sector action alone is not enough

"We do not face a choice between protecting our environment or protecting our economy. We face a choice between protecting our economy by protecting our environment — or allowing environmental havoc to create economic havoc."

—Robert Rubin

Next Steps

Governor's Office of Planning and Research

- State's long-term planning office
- Primary liaison with local government
- General Plan and CEQA Guidelines
- Implementing Executive Order B-30-15

www.opr.ca.gov

CAPITAL REGION CLIMATE READINESS COLLABORATIVE

The Capital Region Climate Readiness Collaborative is a network designed to promote greater resilience coordination at the regional and local level across the six-county Sacramento region.

Our Mission

- Protect and strengthen the Capital Region's people, economy, resources, and heritage
- Build a network for regional cooperation, bringing together leaders from across sector and jurisdictional boundaries to share information and ideas
- Amplify the voice of the Capital Region at the state and national level
- Help members identify, apply for and access funding for important regional priorities

The LARC
Website: www.LARegionalCollaborative.com
Email: larc@ioes.ucla.edu
Twitter: @The_LARC
The LARC is housed at the UCLA Institute of the Environment and Sustainability

Climate Collaborative

SAN DIEGO REGION

A network for public agencies that serve the San Diego region to share expertise, leverage resources, and advance comprehensive solutions to facilitate climate change planning.

www.SDClimateCollaborative.org

SIERRA BUSINESS COUNCIL

Sierra CAMP

A collaborative effort to support vibrant communities, create a more resilient environment, and improve quality of life in the region, while connecting downstream communities with the resources they depend upon

SIERRA CAMP

www.sbcsierracamp.org

THANK YOU!

- Contact Julia at jkim@lgc.org if you have any additional questions for today's speakers.
- Stay tuned for ARCCA's next Learning Session webinar!
- More information: www.arccacalifornia.org