# Insuring Climate Change

Or statistics that matter

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# What is Risk?

Risk (noun)

- Exposure to the chance of injury or loss
- The hazard
- The degree of probability of a loss
- The type of loss, such as life, fire, earthquake

# In a Corporate Setting,

- **Enterprise Risk** – Anything that threatens an organization's capital and earnings. They look at global trends

- **Financial Risk** – Ability to maintain a viable company. They look at anything that has to do with money

- **Sustainability Risk** – The non-financial indicators and corporate exposure to those risks

# If there's a risk, who gets to know about it?

**Materiality** (general, comes from *auditing*)

- How significant is a deviation or discrepancy from what's reported?

**Financial Materiality**

- Financial information that would affect an investor's decision-making.

**Sustainability Materiality**

- Non-financial information that would affect an investor's decision-making.

# What is Insurance?

- In 1492, Columbus sailed for America in 3 ships, the largest was the Santa Maria at 17.7 m long.

- Yet, in the 1400s, the largest ship was 66.5 m

- Why didn't he just put everyone into 1 ship?

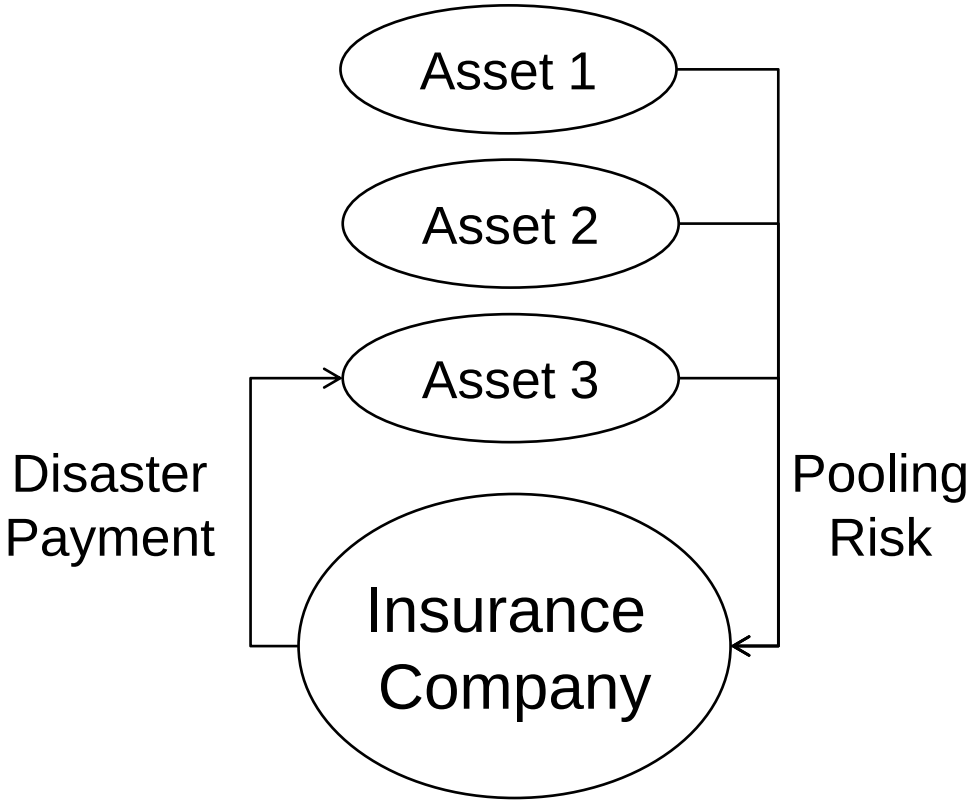


http://commons.wikimedia.org/wiki/File:Columbus_Taking_Possession.jpg

# How Insurance Works

Notion of pooling / sharing of risk

Concept began in 2nd Century with Babylon and Chinese traders




**Dutch East India Company**
Founded: 1602
First multinational megacorporation

# Coupled threats?

Insurance works if the threats against the assets are ***different***.

**What if this:**

**Causes this?**

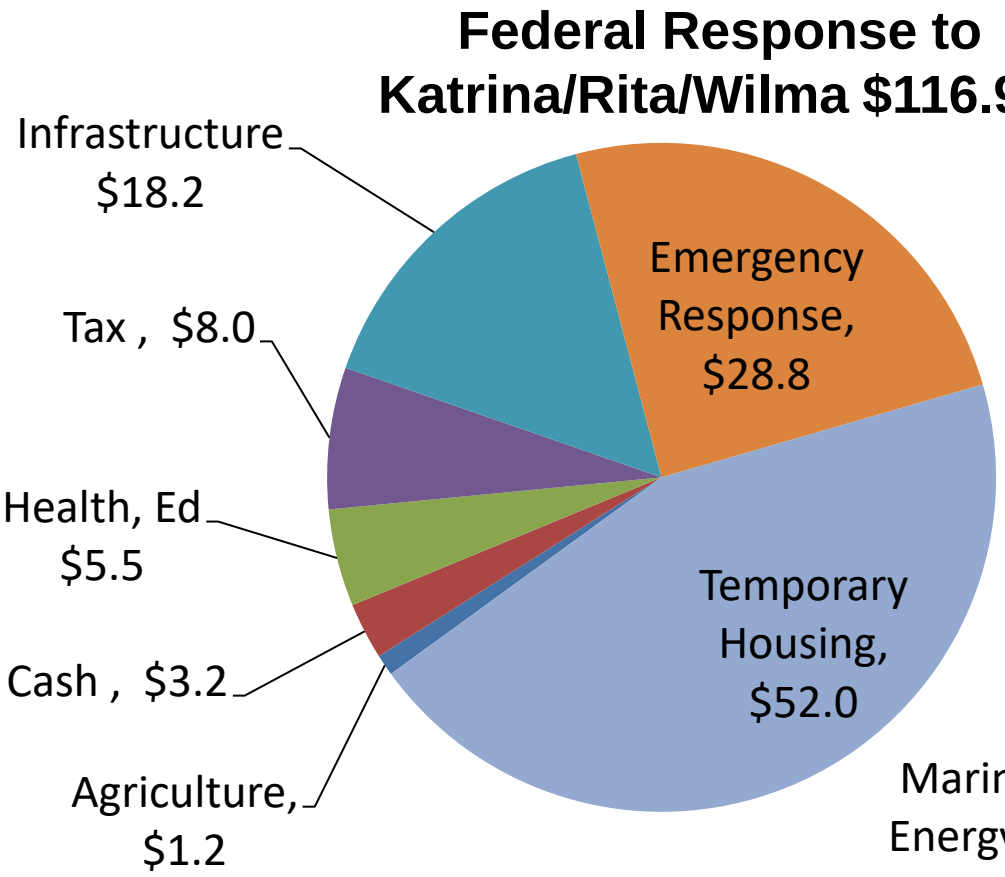
http://en.wikipedia.org/wiki/File:Flood102405.JPG

# How does climate change cause damage to…

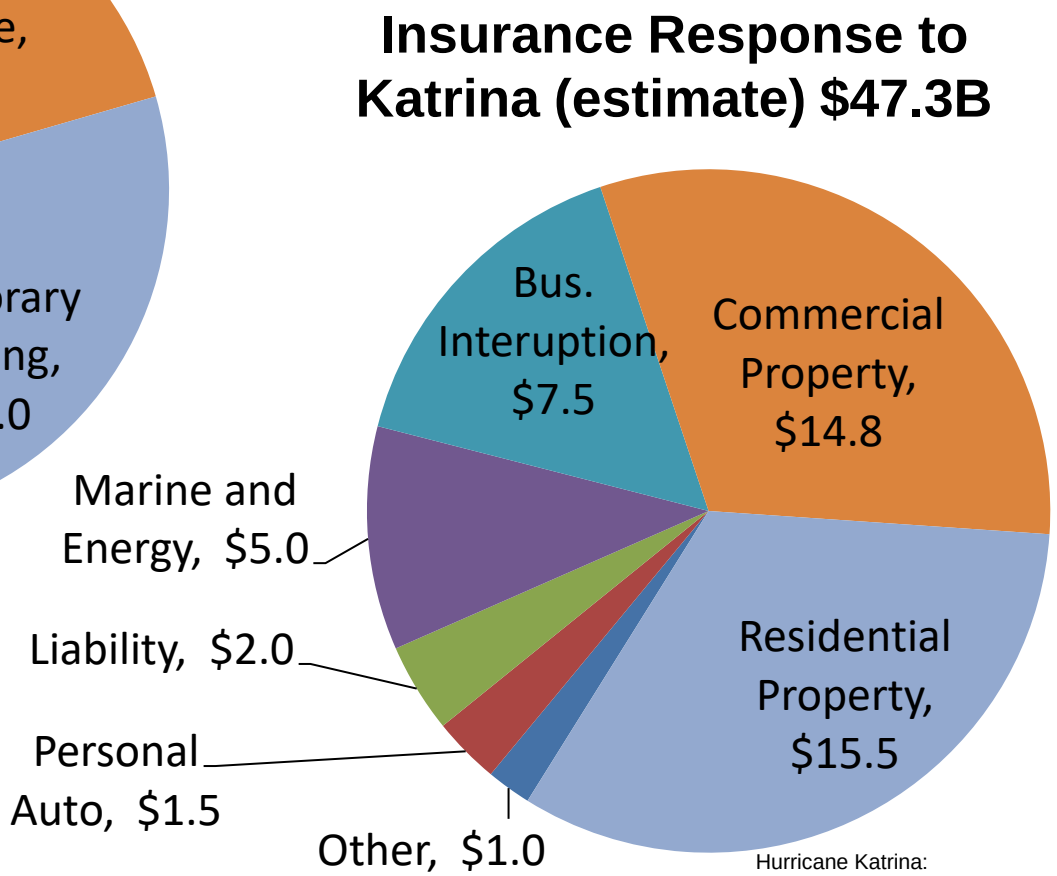
# How does climate change cause damage to…

- Real Estate
- Life
- Health
- Auto
- Municipal Bonds
- Business Continuity
- Investments
- Agriculture
- Etc…

# 2005 hurricanes

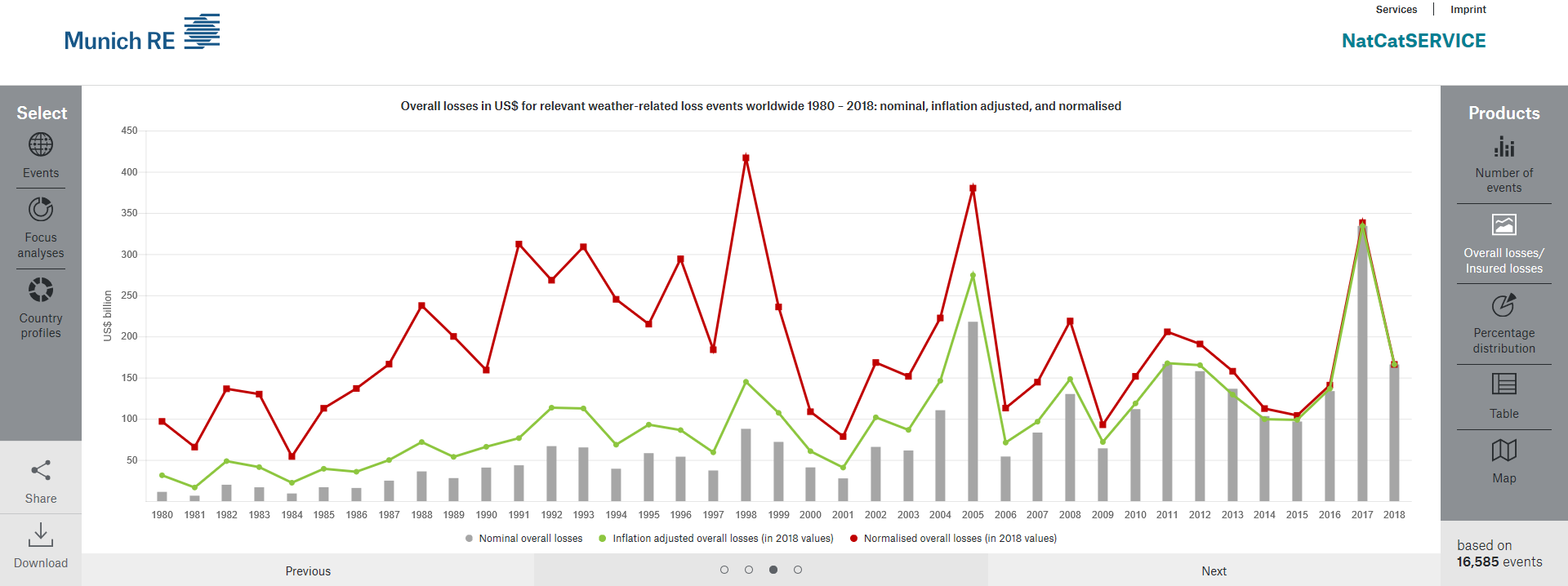



Matt Fellowes and Amy Liu **FEDERAL ALLOCATIONS IN RESPONSE TO KATRINA, RITA and WILMA: AN UPDATE** THE BROOKINGS INSTITUTION



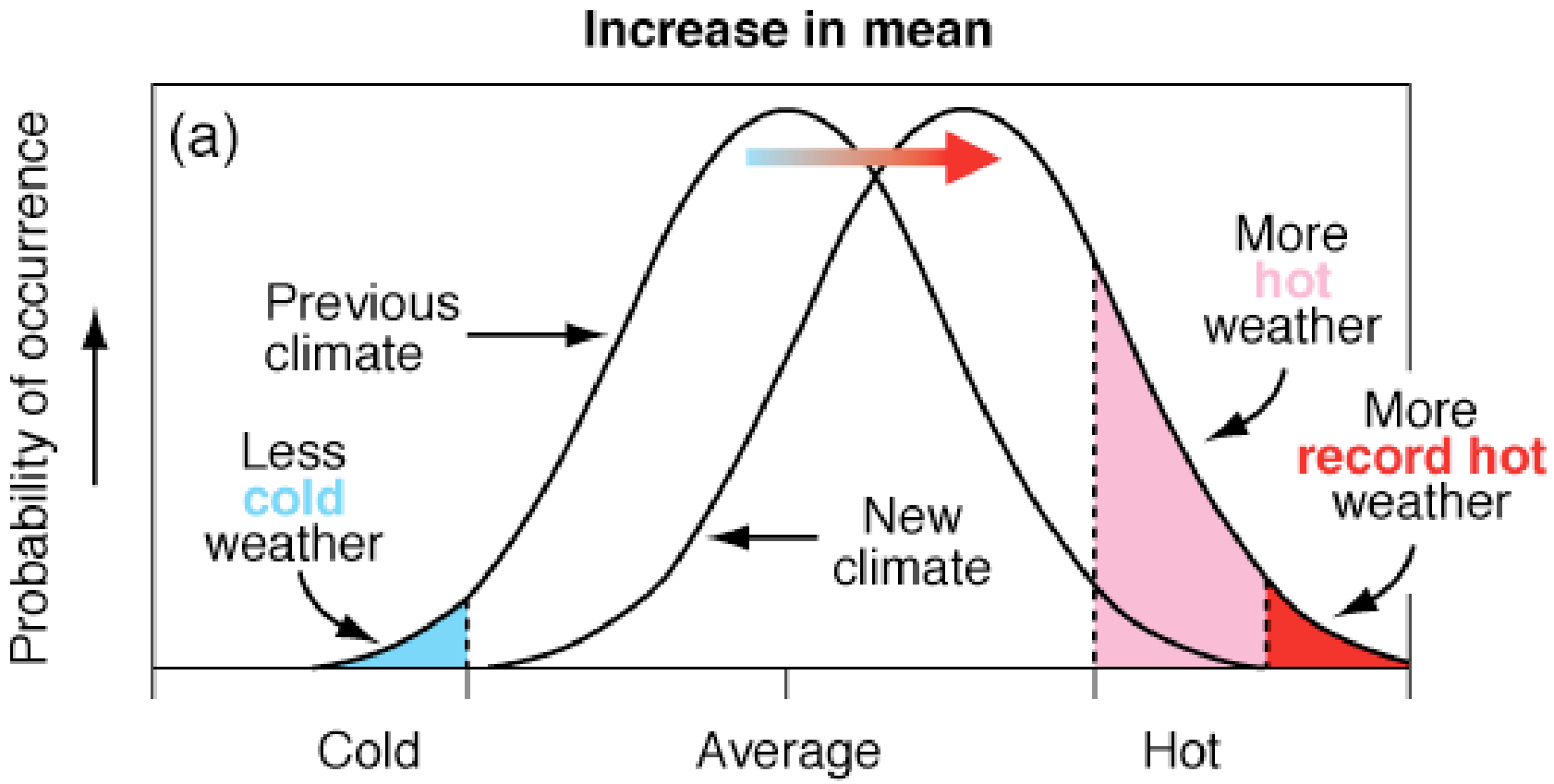

Hurricane Katrina: Analysis of the Impact on the Insurance Industry Towers Perrin 2005

# Weather-related Losses




https://natcatservice.munichre.com

# How Weather Changes




Determining the impact of Climate Change on Insurance Risk and the Global Community: Phase 1: Key Climate Indicators. American Academy of Actuaries' Property/Casualty Extreme Events Committee 2012

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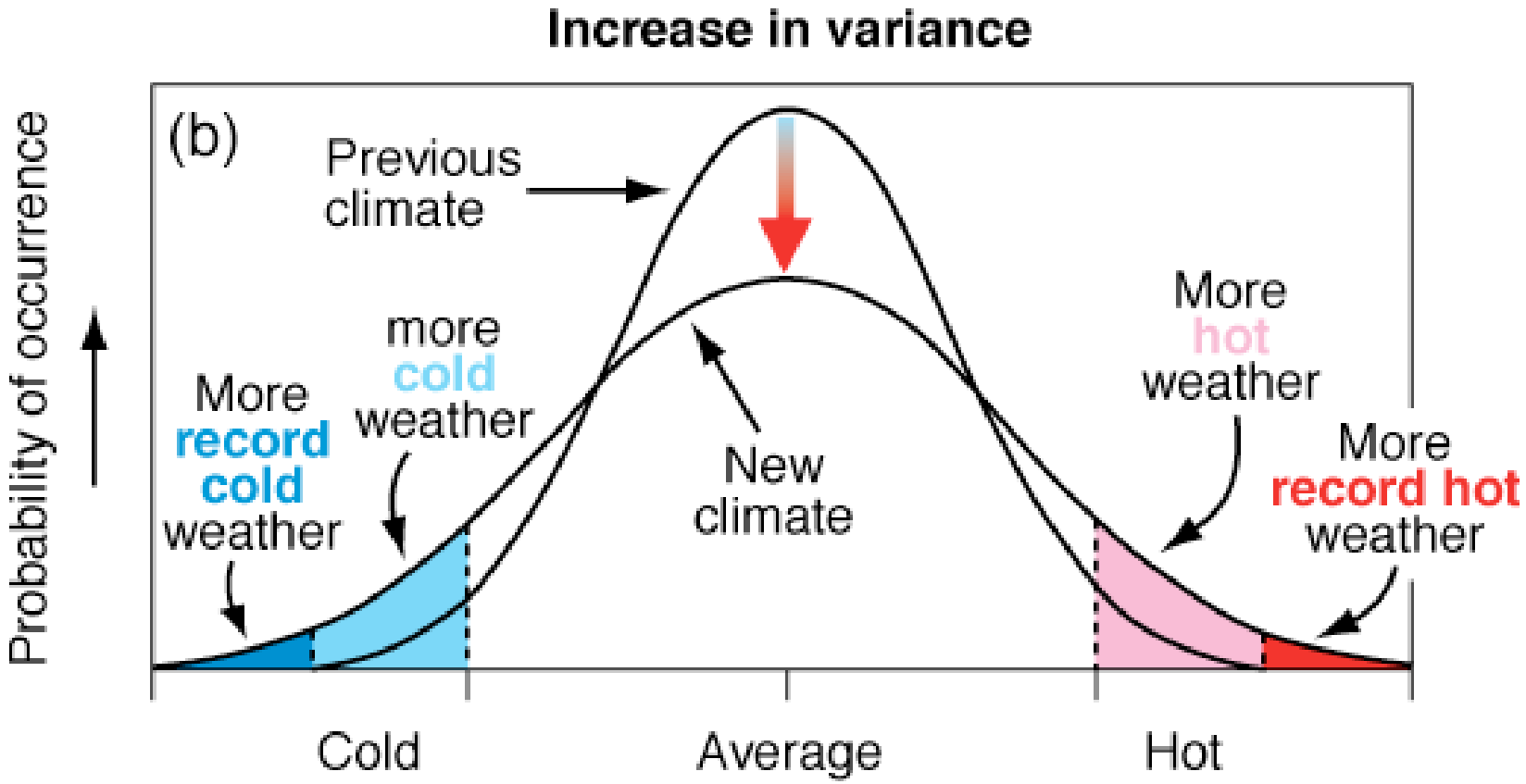


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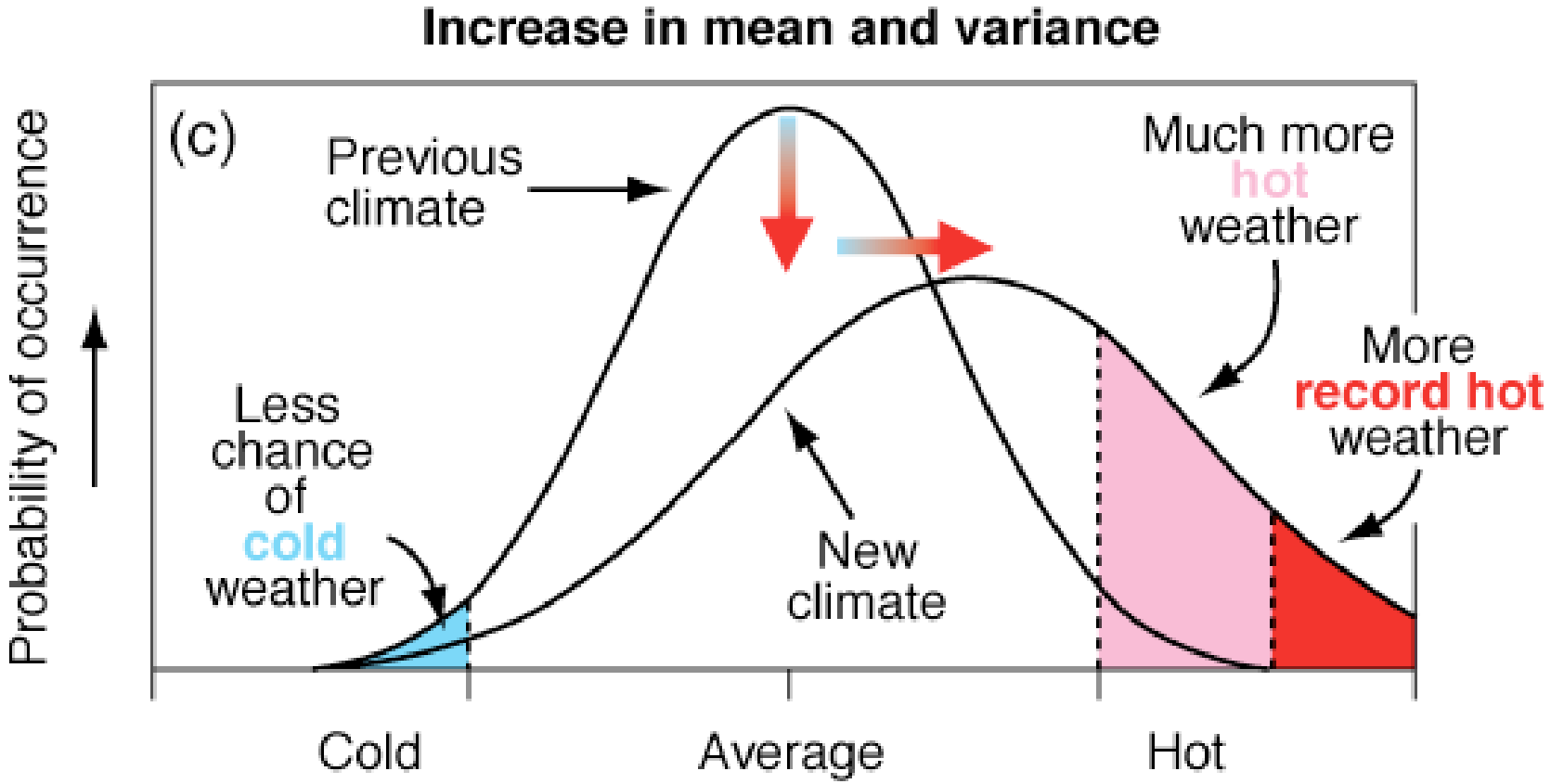


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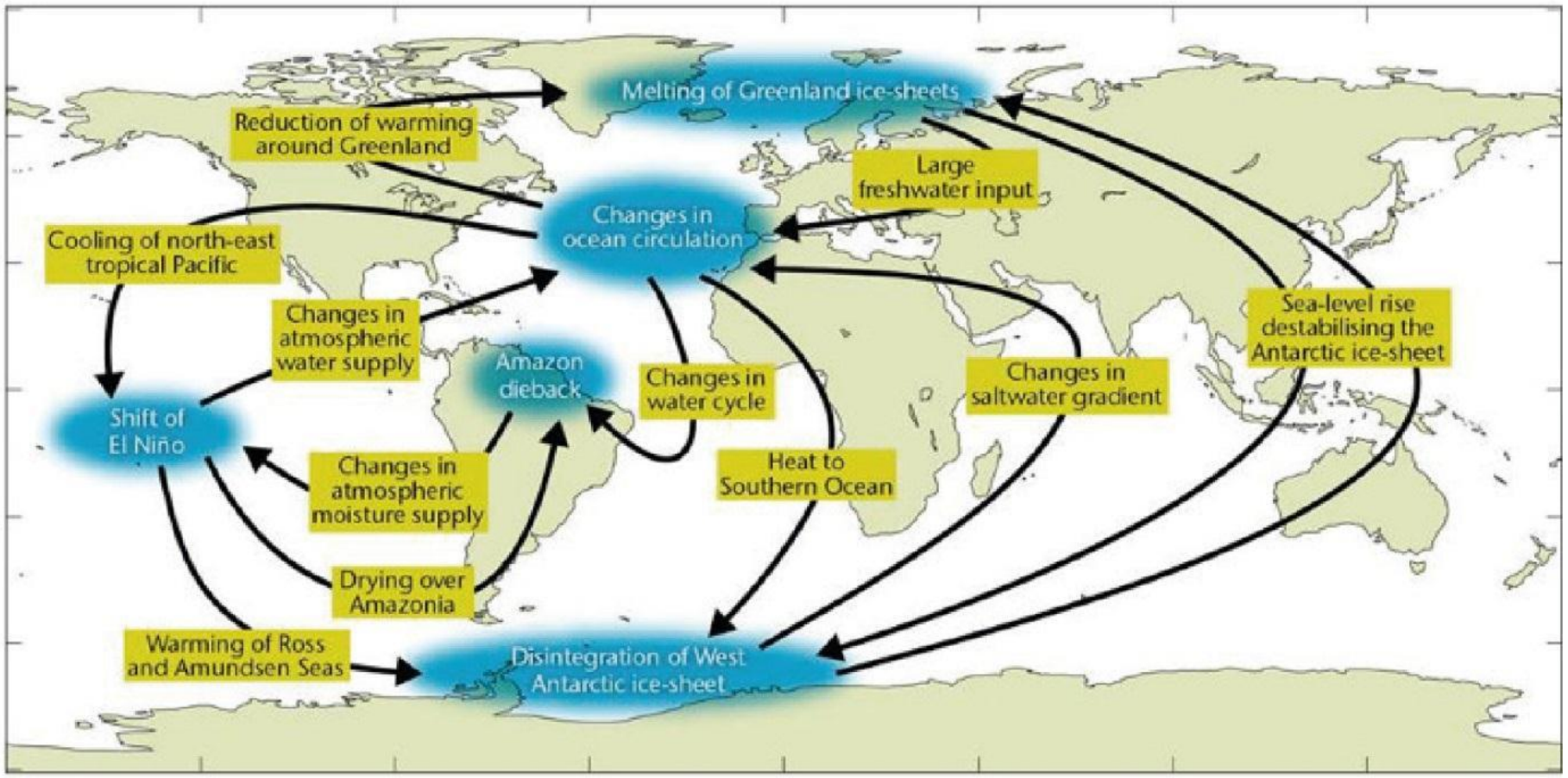
# Global ***CHANGE*** of weather

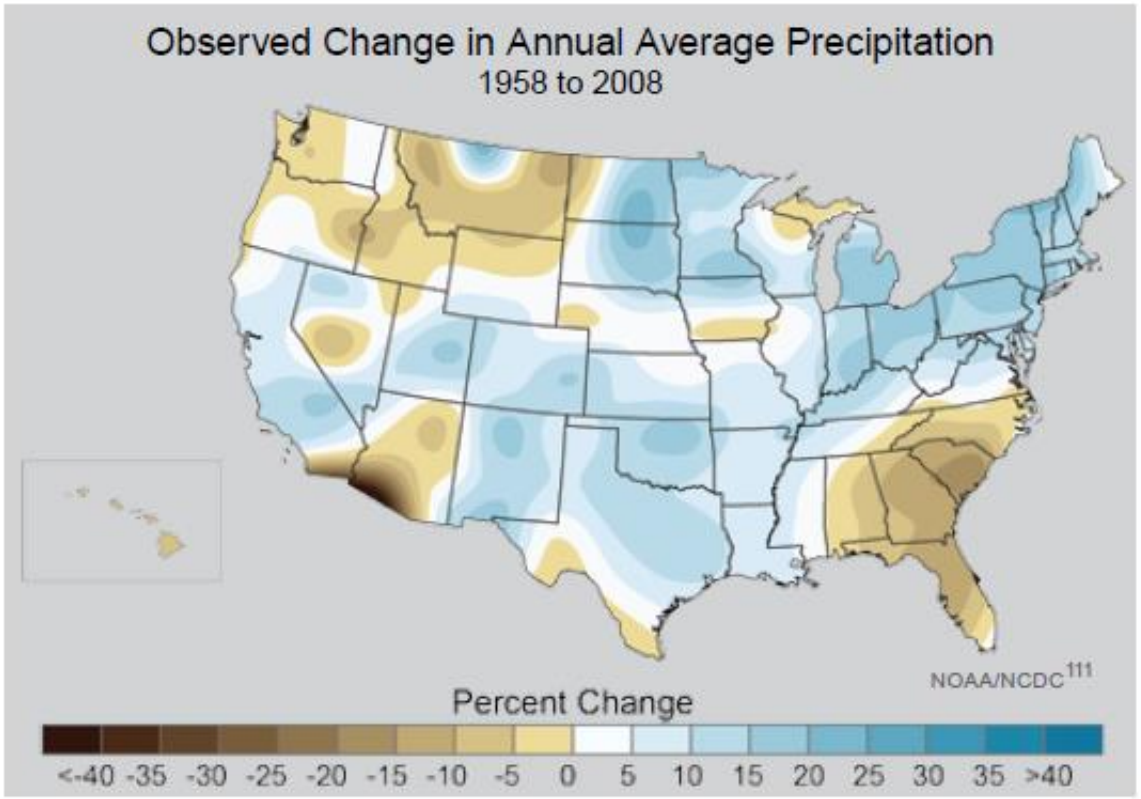


# Risk vs. Uncertainty

1) Not enough data (white parts of map)

2) Noisy data (increases and decreases of rain)

Unfortunately,
***"uncertainty"***
gets interpreted as
***"does not exist"***



# Uncertainty in cause / effect

GE has:

- 8 major divisions
- 283,000 employees
- Thousands of decisions per day
- Which ***ones*** are contributing to climate change?

## Power

**Mission:** Powering lives and making electricity more affordable, reliable, accessible, and sustainable

**Units:** Gas Power Systems, Steam Power Systems, Power Services, Grid Solutions, Power Conversion, Automation & Controls, GE Hitachi Nuclear

**Employees:** 59,700

| | 2018 | YoY |
|---|---|---|
| **Revenues:** | $27,300 | (22)% |
| **Profit/(Loss):** | $(808) | U |
| **Profit/(Loss) margin:** | (3.0)% | (860) bps |
| **Orders:** | $27,460 | (23)% |
| **Backlog:** | $91,876 | (6)% |

## Renewable Energy

**Mission:** Making renewable power sources affordable, accessible, and reliable for the benefit of people everywhere

**Units:** Onshore Wind, Offshore Wind, Hydro, LM Wind Power

**Employees:** 22,900

| | 2018 | YoY |
|---|---|---|
| **Revenues:** | $9,533 | 4% |
| **Profit/(Loss):** | $287 | (51)% |
| **Profit/(Loss) margin:** | 3.0% | (330) bps |
| **Orders:** | $10,894 | 5% |
| **Backlog:** | $17,269 | 16% |

## Aviation

**Mission:** Providing our aviation customers with the most technologically advanced and productive engines, systems, and services for their success

**Units:** Commercial Engines, Commercial Services, Military, Systems, Additive

**Employees:** 48,000

| | 2018 | YoY |
|---|---|---|
| **Revenues:** | $30,566 | 13% |
| **Profit/(Loss):** | $6,466 | 20% |
| **Profit/(Loss) margin:** | 21.2% | 130 bps |
| **Orders:** | $35,517 | 22% |
| **Backlog:** | $223,527 | 12% |

## Oil & Gas

**Mission:** Providing leading physical and digital technology solutions to enhance customer productivity across the oil & gas value chain

**Units:** Oilfield Services, Oilfield Equipment, Turbomachinery & Process Solutions, Digital Solutions

**Employees:** 65,800

| | 2018 | YoY |
|---|---|---|
| **Revenues:** | $22,859 | 33% |
| **Adjusted Profit/(Loss)*:** | $1,045 | 25% |
| **Adjusted Profit/(Loss) margin*:** | 4.6% | (30) bps |
| **Orders:** | $23,895 | 39% |
| **Backlog:** | $21,492 | (2)% |

## Healthcare

**Mission:** Making precision health a reality—delivering outcomes by digitally connecting precision diagnostics, therapeutics, and monitoring

**Units:** Healthcare Systems, Life Sciences

**Employees:** 53,800

| | 2018 | YoY |
|---|---|---|
| **Revenues:** | $19,784 | 4% |
| **Profit/(Loss):** | $3,698 | 6% |
| **Profit/(Loss) margin:** | 18.7% | 40 bps |
| **Orders:** | $20,897 | 2% |
| **Backlog:** | $17,409 | (4)% |

## Transportation

**Mission:** Being a global technology leader and supplier to the railroad, mining, marine, stationary power, and drilling industries

**Units:** Locomotives, Services, Digital Solutions, Mining, Marine, Stationary & Drilling

**Employees:** 9,400

| | 2018 | YoY |
|---|---|---|
| **Revenues:** | $3,898 | (1)% |
| **Profit/(Loss):** | $633 | (1)% |
| **Profit/(Loss) margin:** | 16.2% | (10) bps |
| **Orders:** | $5,684 | 17% |
| **Backlog:** | $18,925 | 5% |

## Lighting

**Mission:** Helping businesses, cities and homes become more energy efficient and productive with LED and solar technologies, networked sensors and software, and connected lighting solutions

**Units:** GE Lighting, Current

**Employees:** 3,000

| | 2018 | YoY |
|---|---|---|
| **Revenues:** | $1,723 | (11)% |
| **Profit/(Loss):** | $70 | F |
| **Profit/(Loss) margin:** | 4.1% | 270 bps |
| **Orders:** | $966 | (16)% |
| **Backlog:** | $217 | (10)% |

## Capital

**Mission:** Designing and delivering innovative financial solutions for customers and the GE industrial businesses in markets around the world

**Units:** GE Capital Aviation Services (GECAS), Energy Financial Services (EFS), Industrial Finance (IF), Insurance

**Employees:** 2,300

| | 2018 | YoY |
|---|---|---|
| **Capital continuing operations:** | $(489) | 93% |
| **Discontinued operations:** | $(1,670) | U |
| **GE Capital Earnings:** | $(2,159) | 70% |

* Non-GAAP Financial Measure. Please see the Non-GAAP Financial Measures section on pages 70-77 of the Management's Discussion and Analysis within our Form 10-K for explanations of why we use these non-GAAP measures and the reconciliation to the most comparable GAAP financial measures.

U Unfavorable

F Favorable

# Management challenges…

**Managing risk: You know (or have a sense of) the outcome**

- If I drive too fast, I might get into a car accident …
- I might have a fire in my apartment if I light candles often …

**But managing uncertainty? Don't know what's going to happen.**

- Bought 20 raffle tickets to enter a drawing for a new car … but I have no garage. What should I do?
- I submitted 20 job applications … should I quit now?

Most risk management strategies are to ***hedge their bets***

# Risk Management Models – Value Destruction


4) Transfer the risk to someone else so I don't bear the cost

*Buy Insurance*

1) Risks are discovered usually when "Something Bad Happens"

*I got into a car accident.*

3) Mitigate my losses by getting a payment.

*I got paid $5000 to fix my car*

1) How much did the total experience cost me?

*Lost time in dealing with paperwork, health issues, going to the mechanic, etc.*

# Risk Management Models – Value Creation


1. I know car accidents are a risk
2. Quantify how much that risk costed

   *It could cost me several thousand dollars, plus weeks of time to deal with the issue, and possible health troubles too*

3. What can I do to minimize the cost?

   *I might drive slower, drive less, wear a seat belt, reward students with higher GPAs, etc.*

4. Transfer the risk to someone else so I don't bear the cost

   *Buy insurance for those situations that I can't mitigate.*

# The Role of Insurance

How much impact could they have?

# The Role of Insurance

- "The commercial success of insurers, reinsurers, lenders and asset managers relies on their ability to identify, quantify and manage risk"

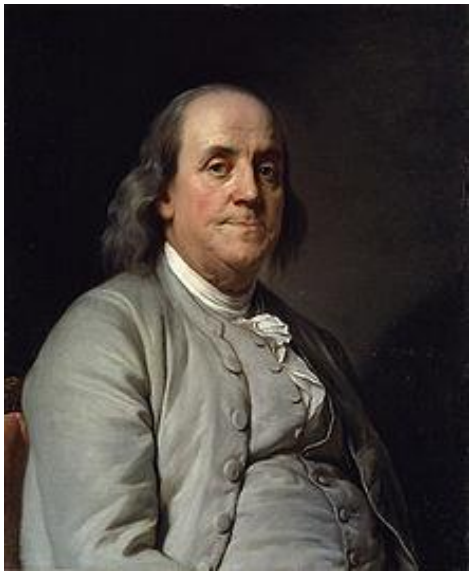
  -- *Advancing adaptation through climate information services SBI 2011*

- "Insurers have the potential, in keeping with their historical role, to be significant innovators in contributing to the solutions of climate change…"

  *-- The Potential Impact of Climate change on Insurance Regulation*

# Premiums change due to behavior

Ben Franklin organized US's first fire department

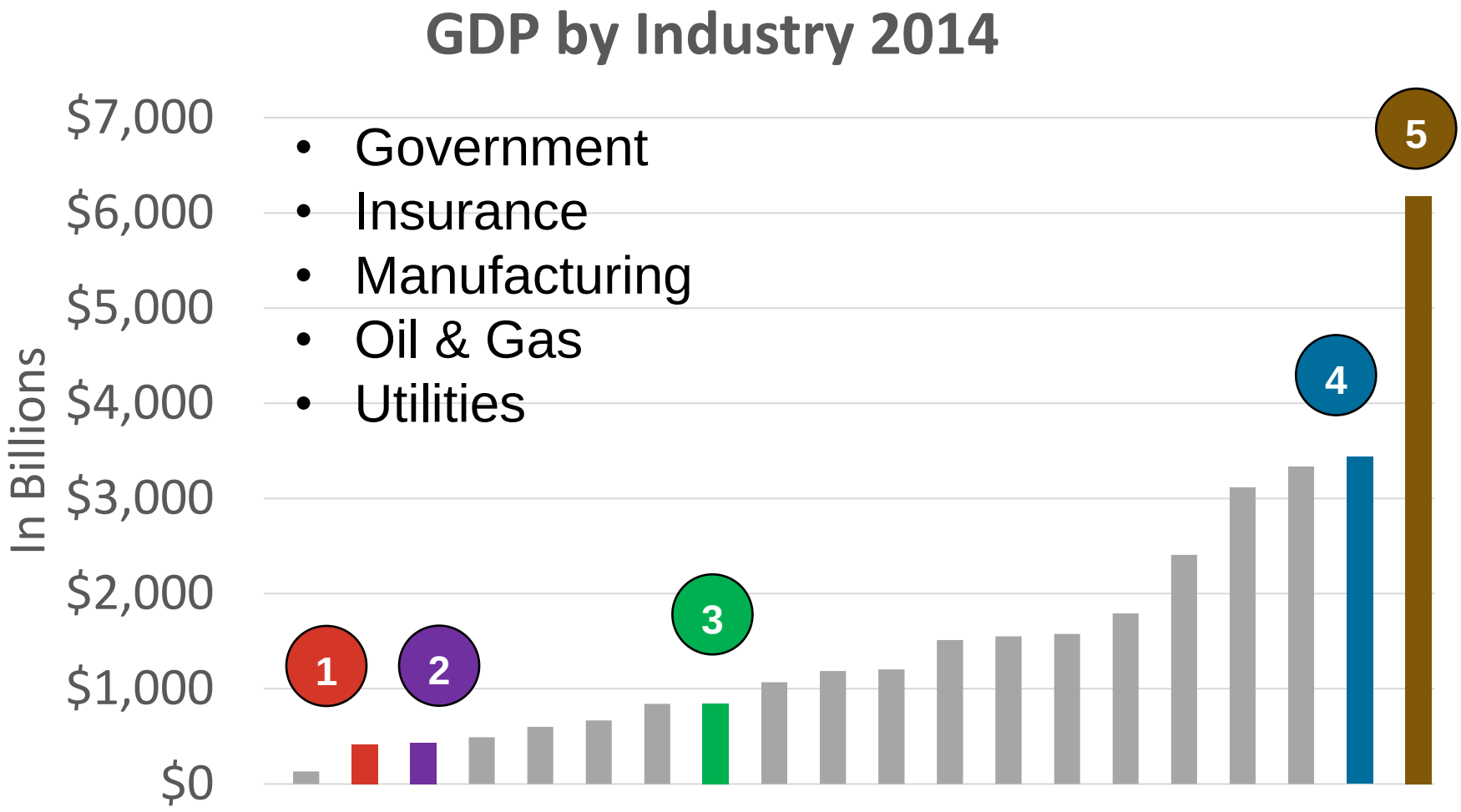


Ben Franklin imported London's fire insurance system

Poorly built houses were not insured

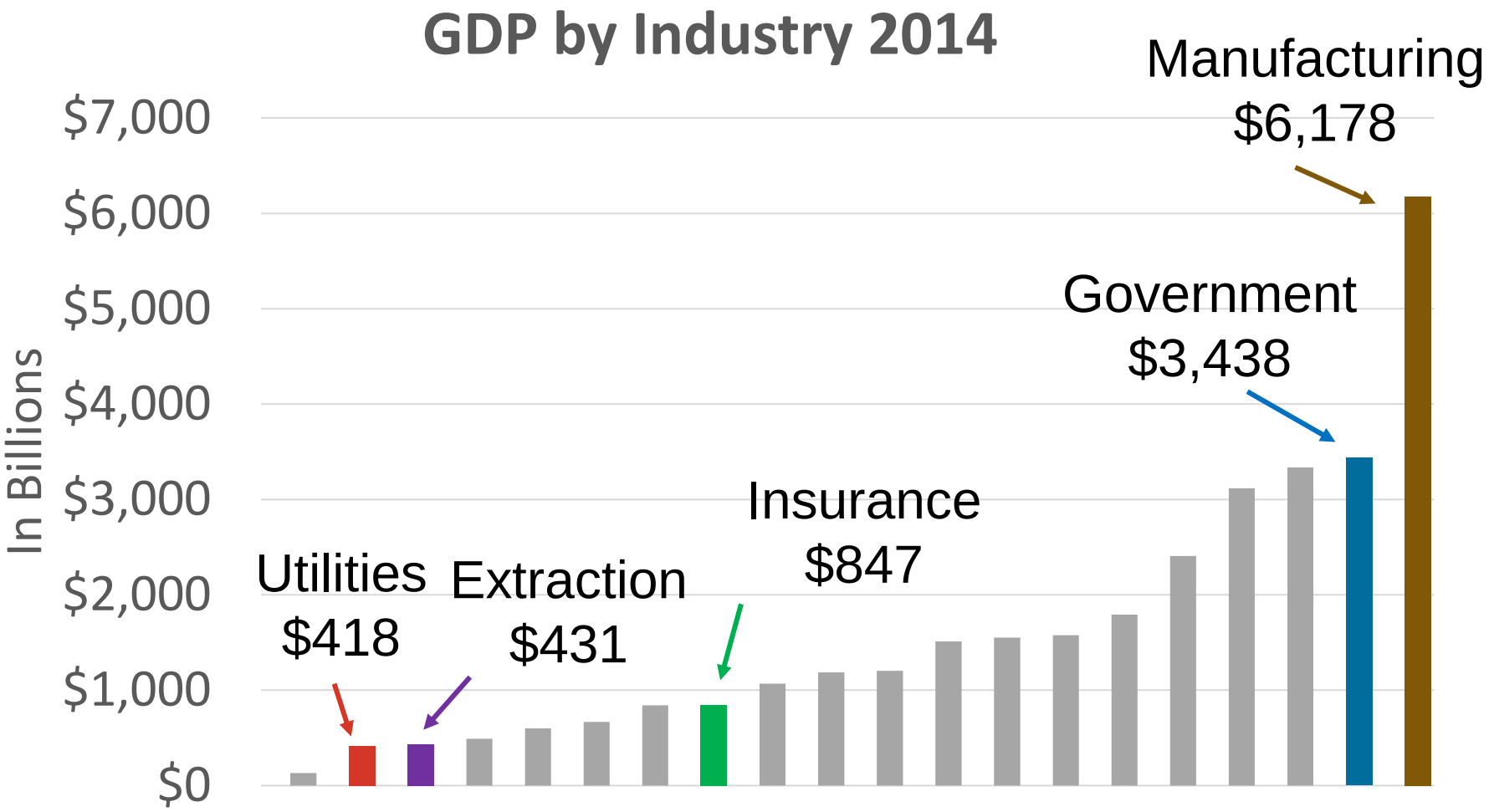
**Result: Encouraged buildings to meet existing building codes for fire safety**

# How large is the Insurance Industry?




http://www.bea.gov

# How large is the Insurance Industry?

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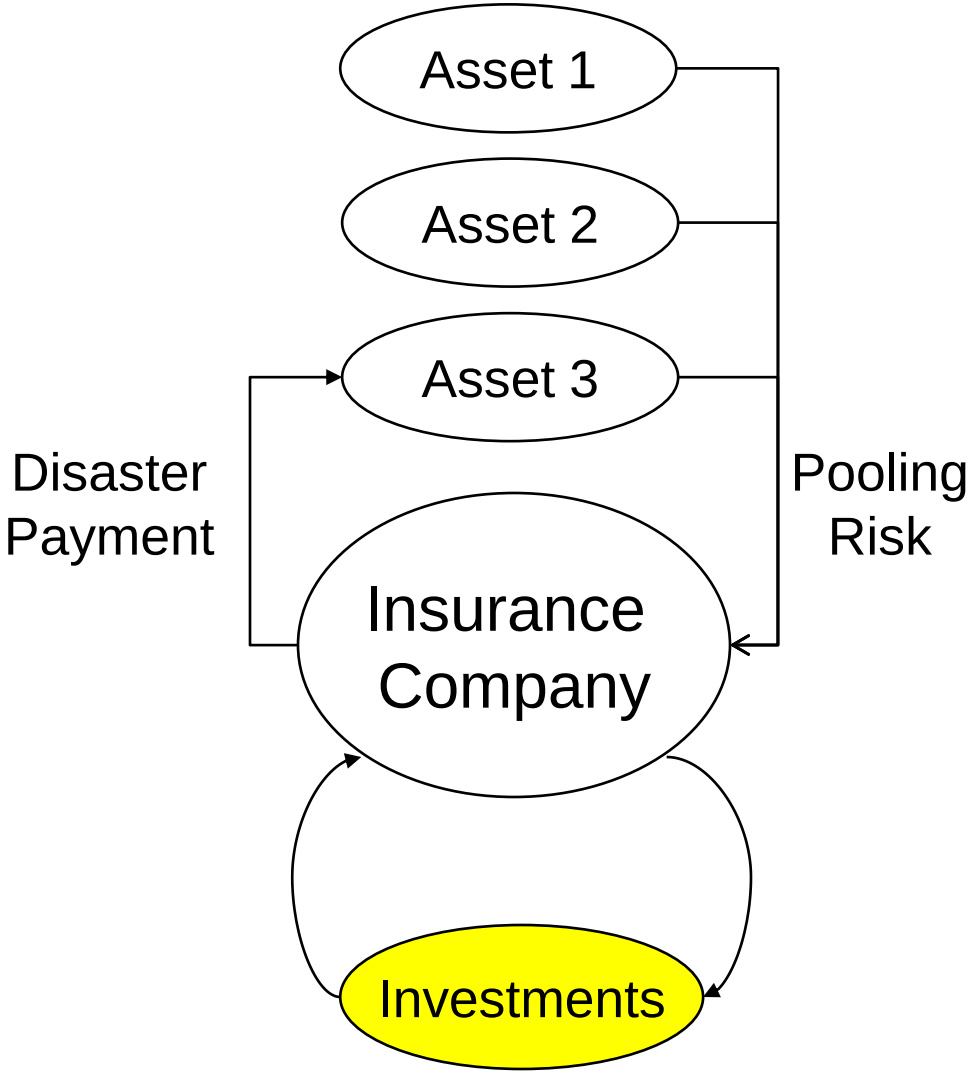
# How Insurance Works



# How much do they collect per year in premiums?

Table 1 **World insurance in 2008**

| Region | Premium volume (USD million) | Real growth |
|---|---|---|
| America | 1,450,749 | -2.4 |
| North America | 1,345,816 | -3.1 |
| Latin America and Caribbean | 104,933 | 8.4 |
| Europe | 1,753,200 | -6.2 |
| Western Europe | 1,656,281 | -6.9 |
| Central and Eastern Europe | 96,919 | 9.0 |
| Asia | 933,358 | 6.6 |
| Japan and newly industrialised Asian economies | 675,109 | 3.8 |
| South and East Asia | 229,036 | 16.3 |
| Middle East and Central Asia | 29,213 | 4.7 |
| Oceania | 77,716 | 8.6 |
| Africa | 54,713 | 4.9 |
| **World** | **4,269,737** | **-2.0** |

The global state of sustainable insurance UNEP Finance initiative 2009

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The global state of sustainable insurance UNEP Finance Initiative 2009

| Rank | Country/Region | GDP (Millions of $US) |
|---|---|---|
| | *World* | **70,201,920** |
| 1 | United States | 14,991,300 |
| 2 | China | 7,203,784 |
| 3 | Japan | 5,870,357 |
| 4 | Germany | 3,604,061 |
| 5 | France | 2,775,518 |
| 6 | Brazil | 2,476,651 |
| 7 | United Kingdom | 2,429,184 |
| 8 | Italy | 2,195,937 |
| 9 | India | 1,897,608 |
| 10 | Russia | 1,857,770 |
| 11 | Canada | 1,736,869 |
| 12 | Australia | 1,515,468 |
| 13 | Spain | 1,478,206 |
| 14 | Mexico | 1,155,206 |
| 15 | South Korea | 1,116,247 |

# How much in assets do they have?

| Rank | Fund type | billions USD | Figures as of |
|---|---|---|---|
| — | Private wealth | $ 32,800 [1] [1][2] | 2008 |
| 1 | Pension funds | $ 31,500 [3] | 2011 |
| 2 | Insurance companies | $ 24,400 [3] | 2011 |
| 3 | Mutual funds | $ 23,800 [3] | 2011 |
| 4 | Real estate | $ 10,000 [4][5] | 2006 |
| 5 | Foreign exchange reserves | $ 7,341 [6] | February 2008 |
| 6 | Sovereign wealth funds | $ 3,980 [7] | 2011 |
| 7 | Hedge funds | $ 2,845 [8] | 2014 |
| 8 | Private equity funds | $ 1,600 [9] | 2009 |
| 9 | REITs | $ 764 [10] | 2007 |

https://en.wikipedia.org/wiki/Global_assets_under_management#Assets_by_classification

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$78 Trillion under management.

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$78 Trillion under management.

Global GDP is $80 Trillion

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**Materiality** (general, comes from *auditing*)

- How significant is a deviation or discrepancy from what's reported?

**Financial Materiality**

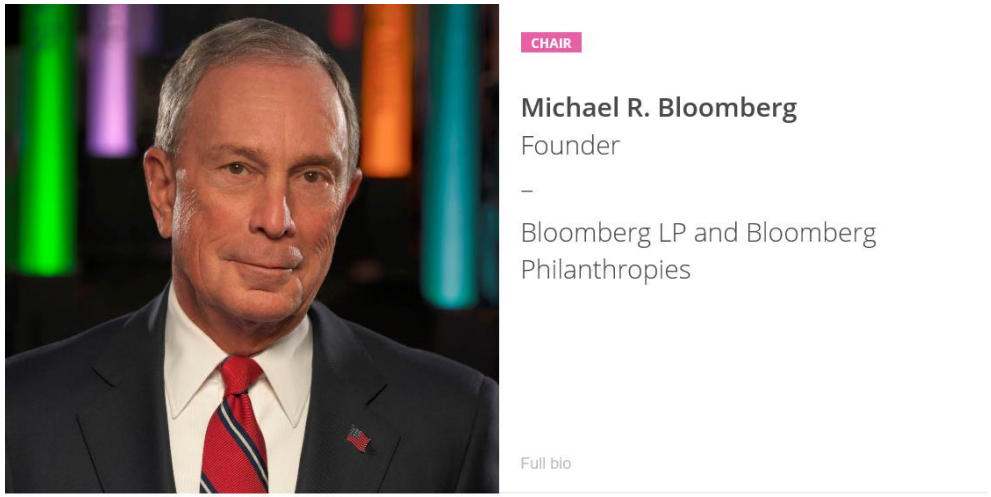
- Financial information that would affect an investor's decision-making.

**Sustainability Materiality**

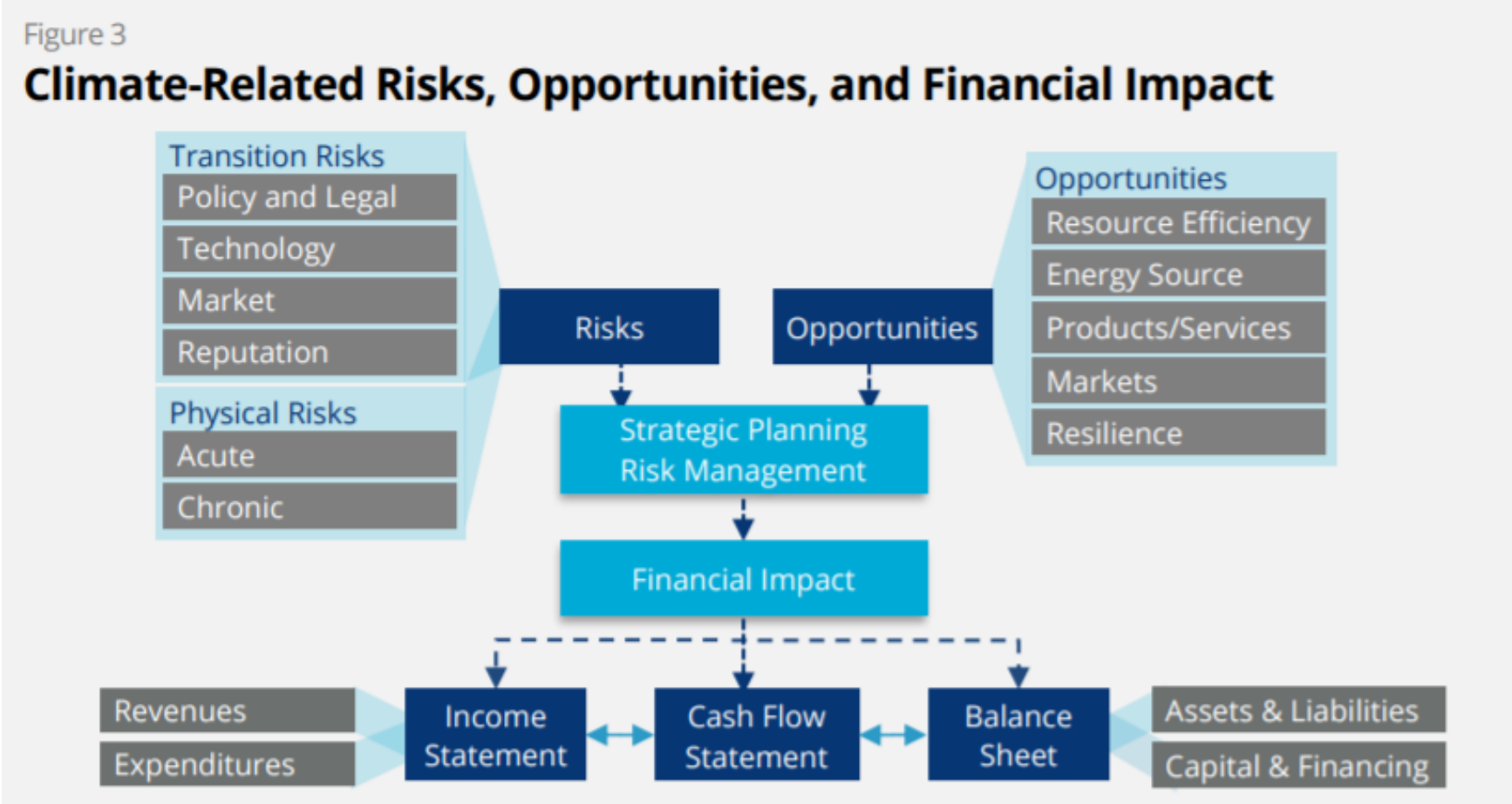
- Non-financial information that would affect an investor's decision-making.

# Taskforce for Climate-related Financial Disclosures (TCFD)

- Global asset managers (pension funds, banks, insurance) needed to know how their portfolio was affected by climate risks!
- … and what were the new climate opportunities for underwriting, credit, debit, and innovative financial products.



# What are climate-related risks?



# Sustainable Accounting Standards Board

ESG issues that are material to financial concerns

- *Environment:* including climate change risks, energy, water, carbon and waste concerns.
- *Social capital:* such as customer health, ethical advertising, community development, and access to services.
- *Human capital:* for example, diversity and equal opportunity, employee health, compensation, and recruitment.
- *Business model & innovation:* product life cycle, packaging, pricing, safety, etc.
- *Leadership & governance:* such as regulatory, policy, board structure, and compensation.

# The SASB Materiality Map®

## SASB Materiality Map®

SASB's Materiality Map® identifies sustainability issues that are likely to affect the financial condition or operating performance of companies within an industry. In the left-hand column, SASB identifies 26 sustainability-related business issues, or General Issue Categories, which encompass a range of Disclosure Topics and their associated Accounting Metrics that vary by industry. For example, the General Issue Category of Customer Welfare encompasses both the Health and Nutrition topic in the Processed Foods industry and the Counterfeit Drugs topic in the Health Care Distributors industry. For commercial use terms of the Materiality Map®, please contact us.

**The Materiality Map® does not contain all guidance necessary for use of the standards. To download the SASB standards, click here.**

### Sector Level Map

- Issue is likely to be material for more than 50% of industries in sector
- Issue is likely to be material for fewer than 50% of industries in sector
- Issue is not likely to be material for any of the industries in sector

### Industry Level Map

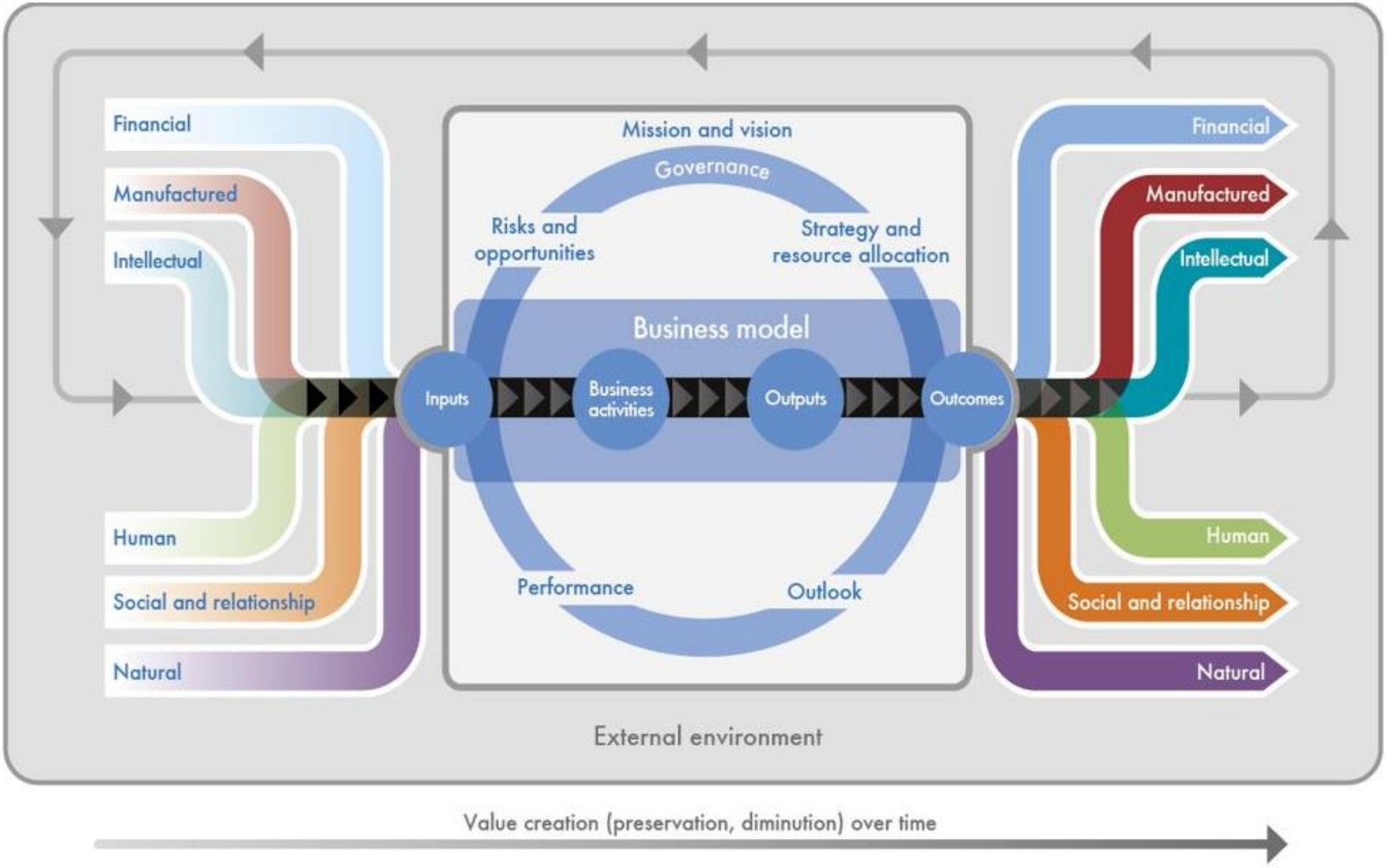
- Not likely a material issue for companies in the industry
- Likely a material issue for companies in the industry

| | | Consumer Goods | Extractives & Minerals Processing | Financials | Food & Beverage | Health Care | Infrastructure | Renewable Resources & Alternative Energy | Resource Transformation | Services | Technology & Communications | Transp |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dimension** | **General Issue Category** | Click to expand | Click to expand | Click to expand | Click to expand | Click to expand | Click to expand | Click to expand | Click to expand | Click to expand | Click to expand | Click to |
| Environment | GHG Emissions | | | | | | | | | | | |
| | Air Quality | | | | | | | | | | | |
| | Energy Management | | | | | | | | | | | |
| | Water & Wastewater Management | | | | | | | | | | | |
| | Waste & Hazardous Materials Management | | | | | | | | | | | |
| | Ecological Impacts | | | | | | | | | | | |
| Social Capital | Human Rights & Community Relations | | | | | | | | | | | |
| | Customer Privacy | | | | | | | | | | | |
| | Data Security | | | | | | | | | | | |
| | Access & Affordability | | | | | | | | | | | |
| | Product Quality & Safety | | | | | | | | | | | |
| | Customer Welfare | | | | | | | | | | | |



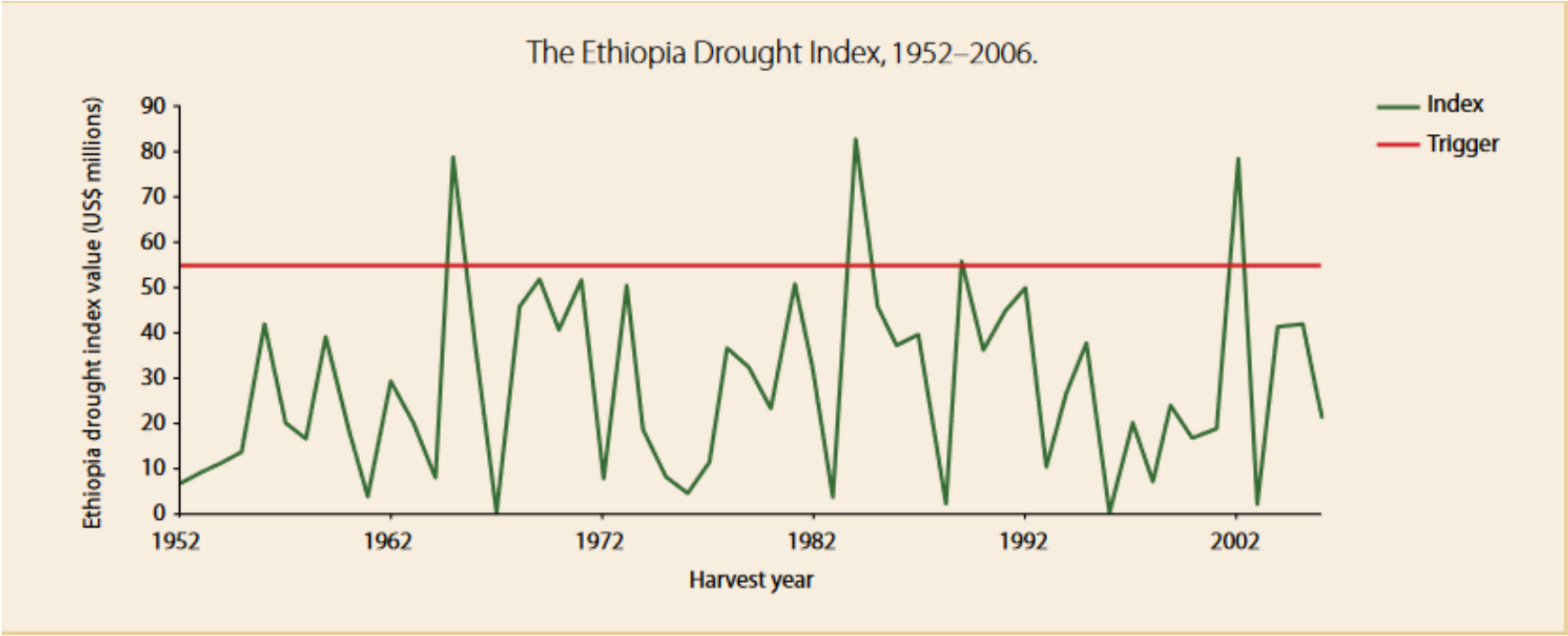
https://materiality.sasb.org/

# Integrated Reporting



# Index Insurance

Index insurance can be applied across a diverse range of weather-related risk problems, from loss of crops due to drought, to loss of livestock in harsh winter conditions, to losses resulting from hurricanes



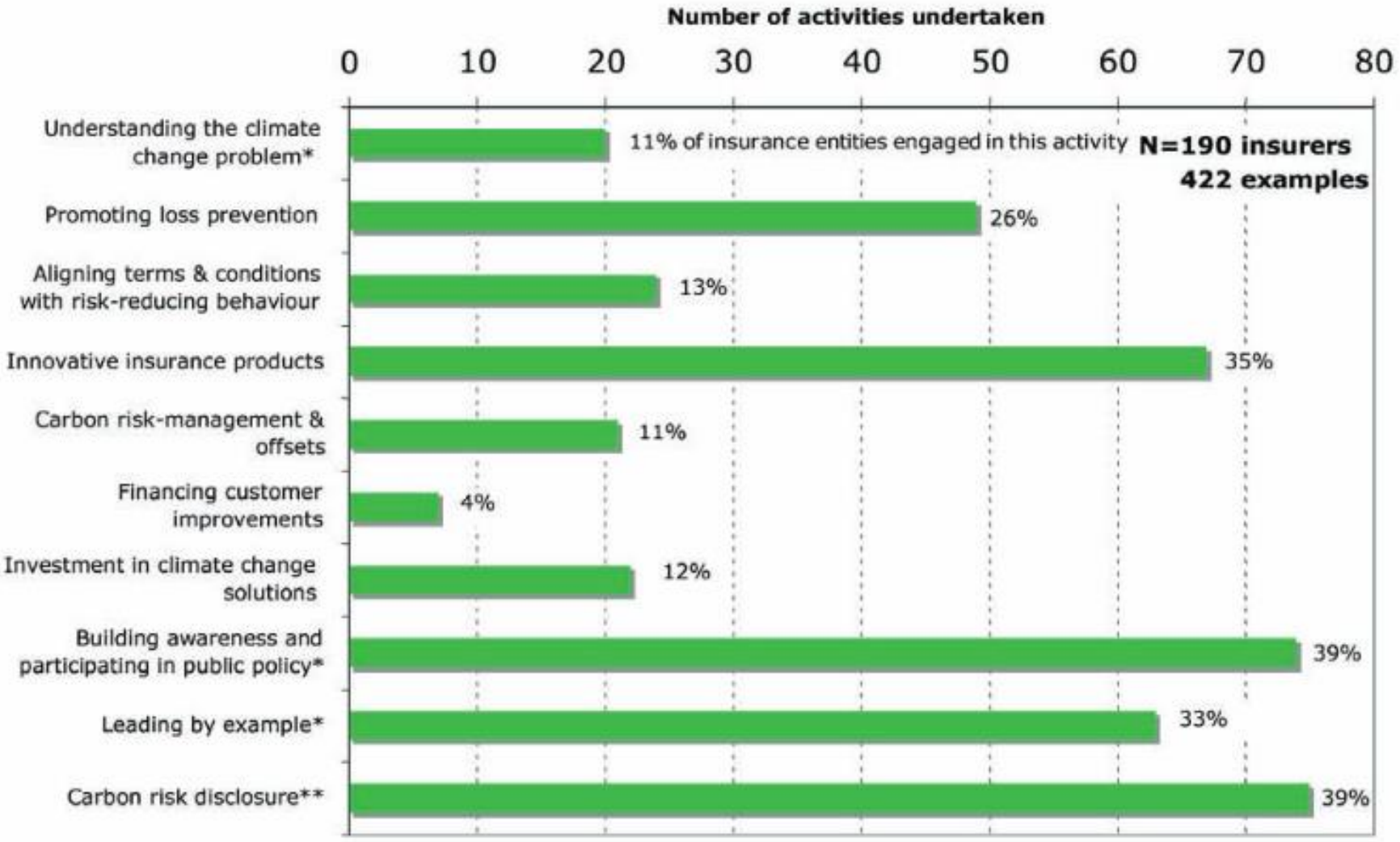

*https://iri.columbia.edu/wp-content/uploads/2013/07/Climate-and-Society-Issue-Number-2.pdf*

# Ways insurance companies change behaviors:

- CCRIF launches new excess rain product to protect its member countries against losses
- Pay-as-you-drive insurance products – *GMAC*
- "Green" building insurance coverage
- Facilitating carbon trading – *Aon*

- *What about flood, wildfire insurance?*

# Evolution of Insurance Sector



# Bank of England – Climate Stress Test

BANK OF ENGLAND

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Home / News and publications / Bank of England consults on its proposals for stress testing the financial stability implications of climate change

## Bank of England consults on its proposals for stress testing the financial stability implications of climate change

(i) Today the Bank of England has published a discussion paper which sets out its proposed framework for the 2021 Biennial Exploratory Scenario ('BES') exercise.

Published on 18 December 2019

The objective of the BES is to test the resilience of the largest banks and insurers ('firms') to the physical and transition risks associated with different possible climate scenarios, and the financial system's exposure more broadly to climate-related risk.

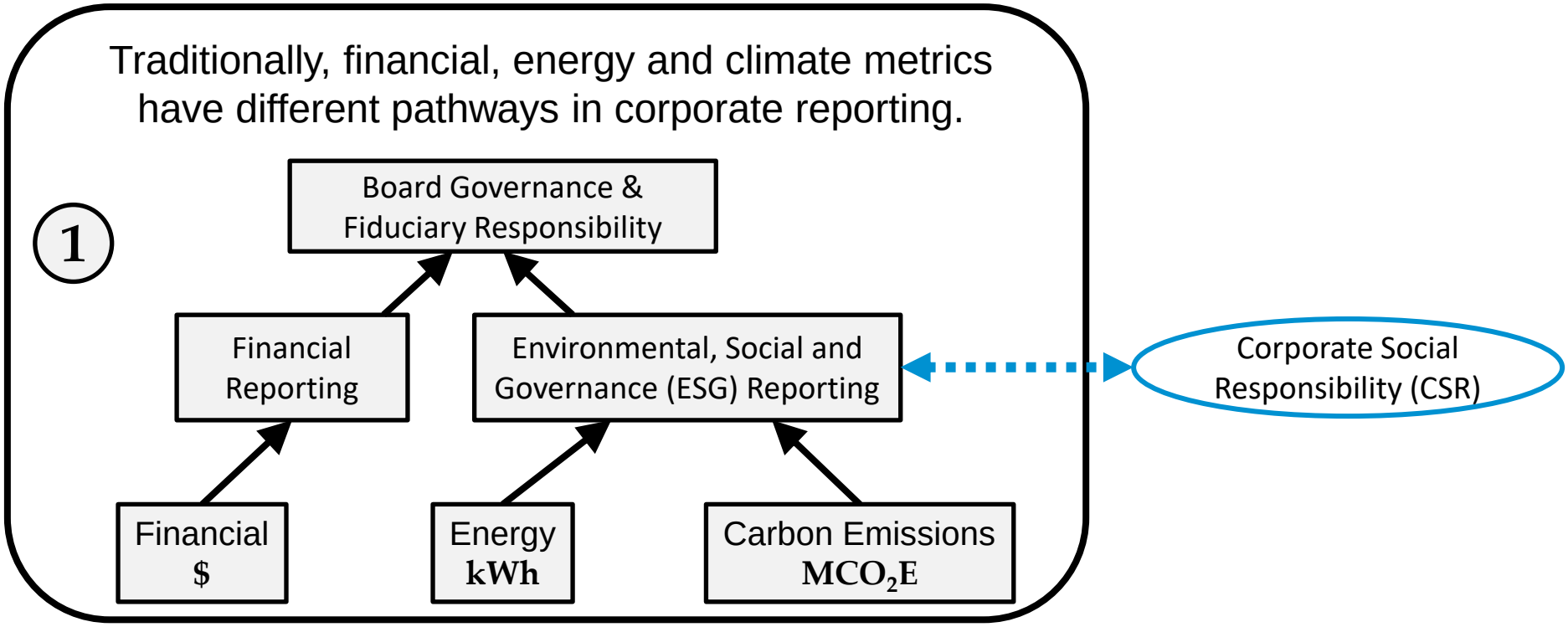
# The silent change agent that hits the bottom line

" The insurance sector is uniquely positioned between two ends of the climate change spectrum – the causes and impacts. Insurers insure carbon-intensive industries as well as homes, autos and pollution-emitting airplanes that are some of the primary causes of anthropogenic greenhouse gas emissions"

-- *The Potential Impact of Climate Change on Insurance Regulation*

# Coupling Actions

# Financial, energy and climate impacts are interrelated



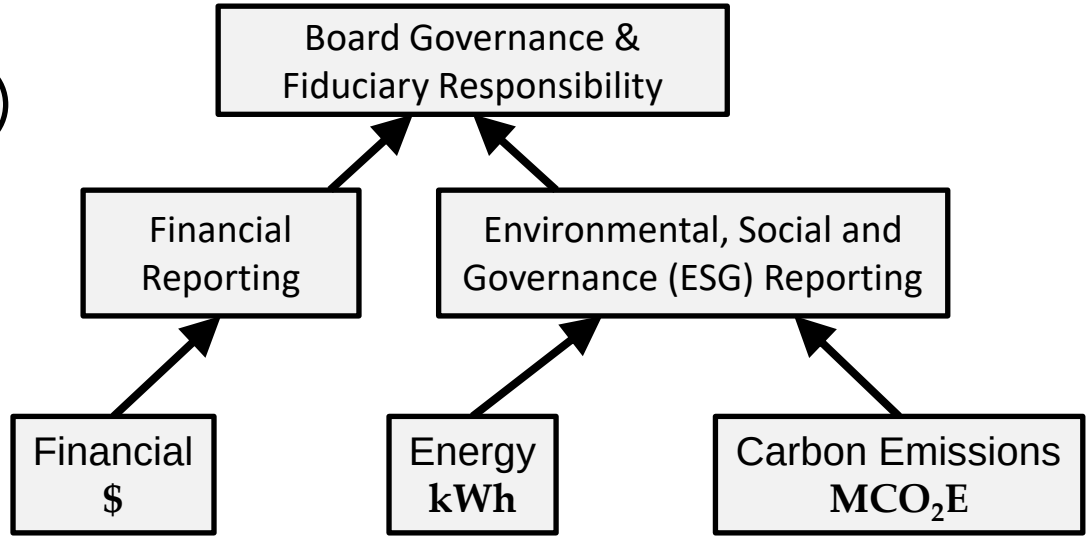

CSR – represents a company's effort to have a positive impact ==> "Glossy brochures"

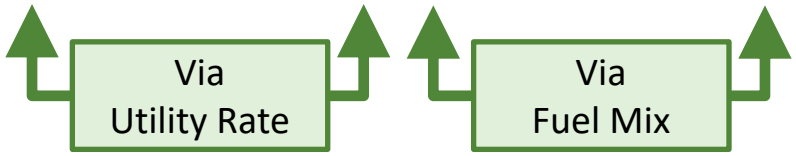
ESG – assessment's of a company's actions ==> "Board room discussions"

# Financial, energy and climate impacts are interrelated

Traditionally, financial, energy and climate metrics have different pathways in corporate reporting.

1




2

Yet, it is often overlooked that these three metrics are deeply intertwined.
Coupled flows, risks, opportunities AND tools!

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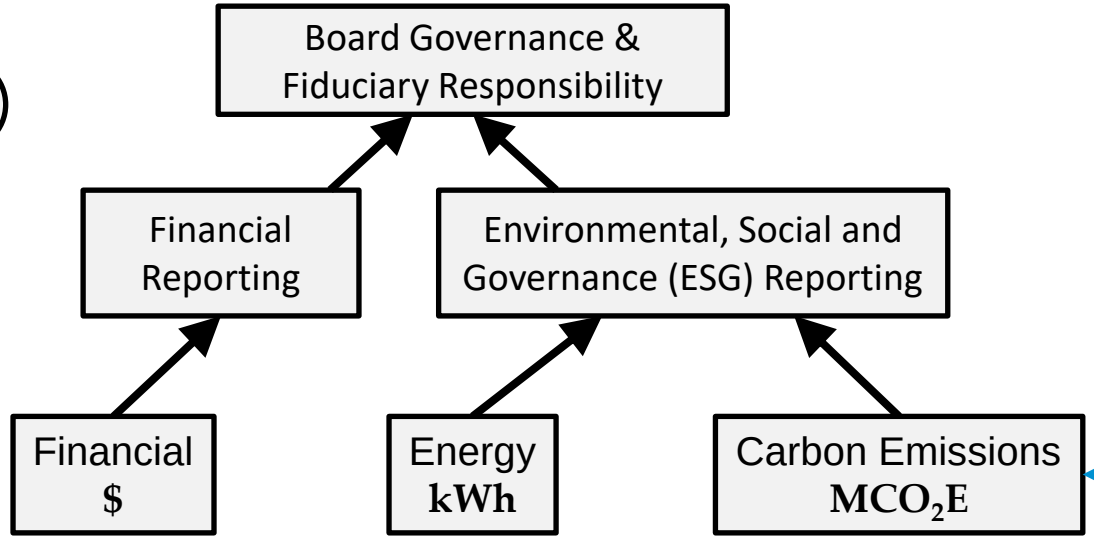


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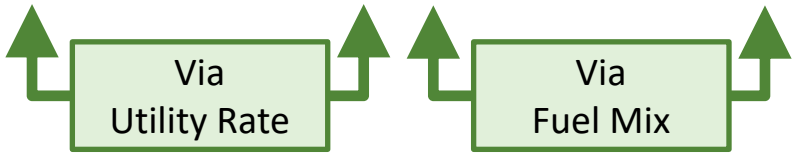


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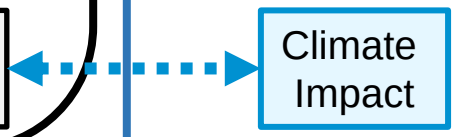


Instead, via ***energy indicators***, we can connect ***climate impact*** to ***financial decisions***.

# What is the interaction of the three financial statements?

## CURRENT STATE

**Balance Sheet**

*"Snapshots in time"*

| **Assets** | **Liabilities** |
| --- | --- |
| *"Something I own from which I can derive revenue"*<br><br>*ie,*<br>*a building*<br>*a truck* | *"Obligations to spend due to ownership of the asset"*<br><br>*ie, loan payment, bills* |
| | **Owners Equity**<br>*"Residuals available for me"* |

*J. Jia, The Corporate Energy Strategist's Handbook*

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## FUTURE STATE

Do I want to
Increase Assets?
Decrease Liabilities?
Increase Equity?

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# Pro Formas: Future Looking

**Income Statement**
*"What initiatives are we going to fund? (marketing, sales, etc.)*

**CURRENT STATE**

**Balance Sheet**
*"Snapshots in time"*

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**FUTURE STATE**

Do I want to
Increase Assets?
Decrease Liabilities?
Increase Equity?

**Cash Flow Statement**
*Do we have enough resources to get there?*

*J. Jia, The Corporate Energy Strategist's Handbook*

# Financial Reporting: Backwards Looking

**Income Statement**
*"What did we spend our money on? (marketing, sales, etc.)*

**PAST STATE**

Where was I last month or year?

**CURRENT STATE**

**Balance Sheet**
*"Snapshots in time"*

| **Assets** | **Liabilities** |
| --- | --- |
| *"Something I own from which I can derive revenue"*<br><br>*ie,*<br>*a building*<br>*a truck* | *"Obligations to spend due to ownership of the asset"*<br><br>*ie, loan payment, bills* |
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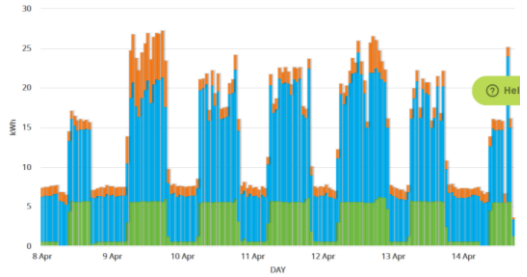
**Cash Flow Statement**
*How much did we spend?*

# What is the climate exposure of your portfolio?

Existing environmental, social and governance (ESG) reporting tries to address investor concerns, yet none of the existing tools evaluate the asset's climate-related exposures and risks.

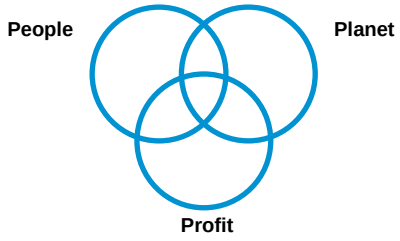
## Energy as a Cash Flow Metaphor

Traditional energy management focuses on consumption metrics, such as ***kWh***, ***gallons*** and ***therms***.




## Energy as a P&L Metaphor

ESG metrics in financial reporting, such as triple bottom line, are rooted in ***revenue*** and ***profit***.




## Energy as a Balance Sheet Metaphor

***Does not Exist***

Without it, we cannot

- Monitor ***risk exposure*** of assets.
- Ensure ***asset quality*** is maintained.
- Quantify ***ESG impact*** on assets.

# A *balance sheet* tool completes the metric system

In adopting the principles behind financial statements,
we can categorize a firm's energy attributes with a balance sheet metaphor.

We can also:

- ***Identify*** climate exposures that threaten asset values.
- ***Harmonize*** year-on-year ESG data across diverse portfolio.
- ***Complement*** existing reporting methodologies, such as SASB and TCFD.

| **Energy Assets** | **Energy Liabilities** |
| --- | --- |
| *"Contracted to provide energy capacity"* | *"Obligations of energy capacity purchased"* |
| | **Energy Productivity** |
| | *"Residuals available for profit-making"* |

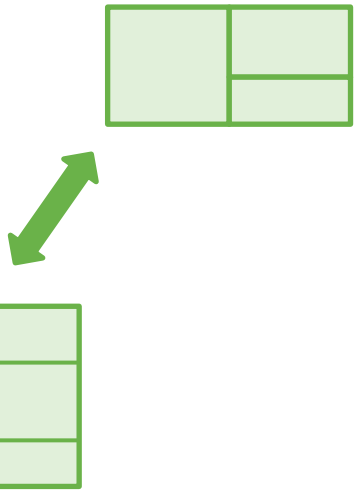
*J. Jia, The Corporate Energy Strategist's Handbook*

# The *energy statements* as a metric system

When the energy balance sheet is used in conjunction with other reports, the Energy Statements are a unified metric system that quantifies climate impact with metrics that track progress.

**Energy Balance Sheet**

***KPI**: Value, Productivity, Resiliency*



**Energy Gains and Uses**

***KPI**: Generation Sources, End Uses*

**Energy Flows and Offsets**

***KPI**: kWh, Therms, Flows*

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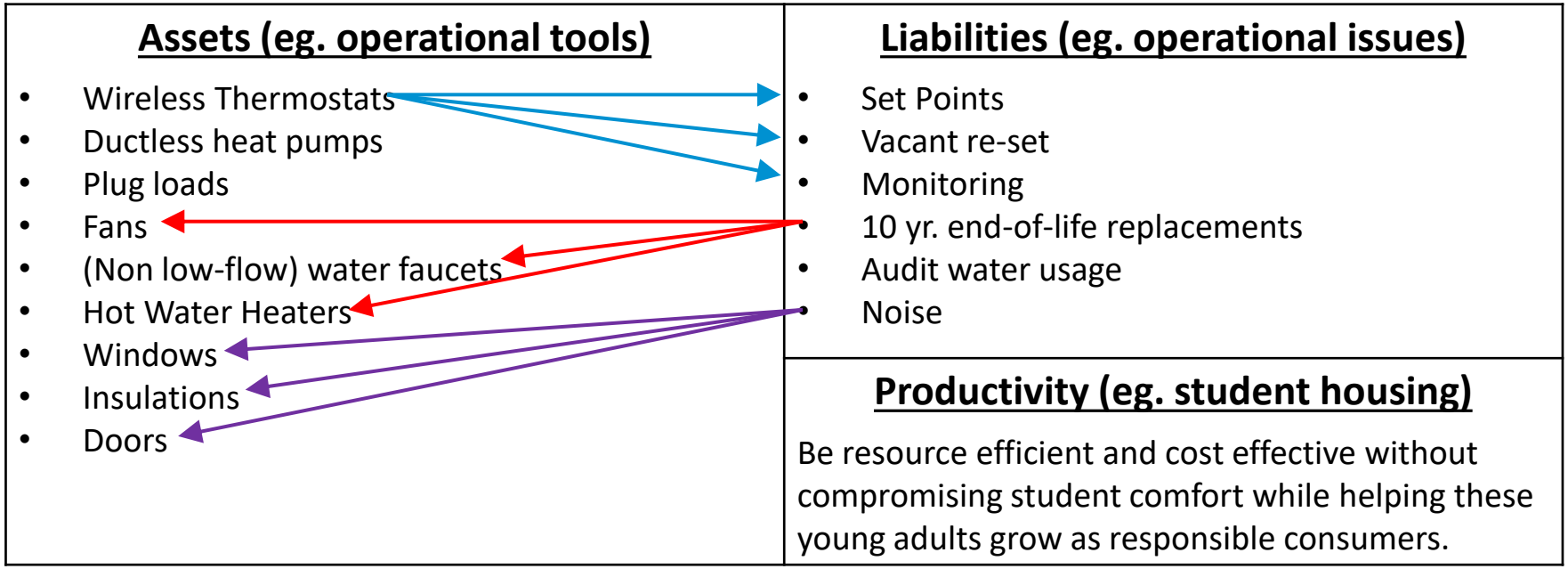
# Application: Aligning strategy to operations

By itself, the energy balance sheet can be used by an operating company to reveal strategies that improve environmental performance and enhance asset value.

## Student Housing Example



# Application: Informative at all stages of deal flow

For the portfolio managers, the Energy Statements inform the value of an asset, enabling wiser pricing decisions, reveals risks and demonstrates achievements of ESG targets.

**Due Diligence**

- Are climate risks/exposures accounted for in the price of the asset?
- Is there potential for cross-portfolio collaborations?
- Is the asset's ESG metrics aligned with our investment thesis?

**Asset Performance**

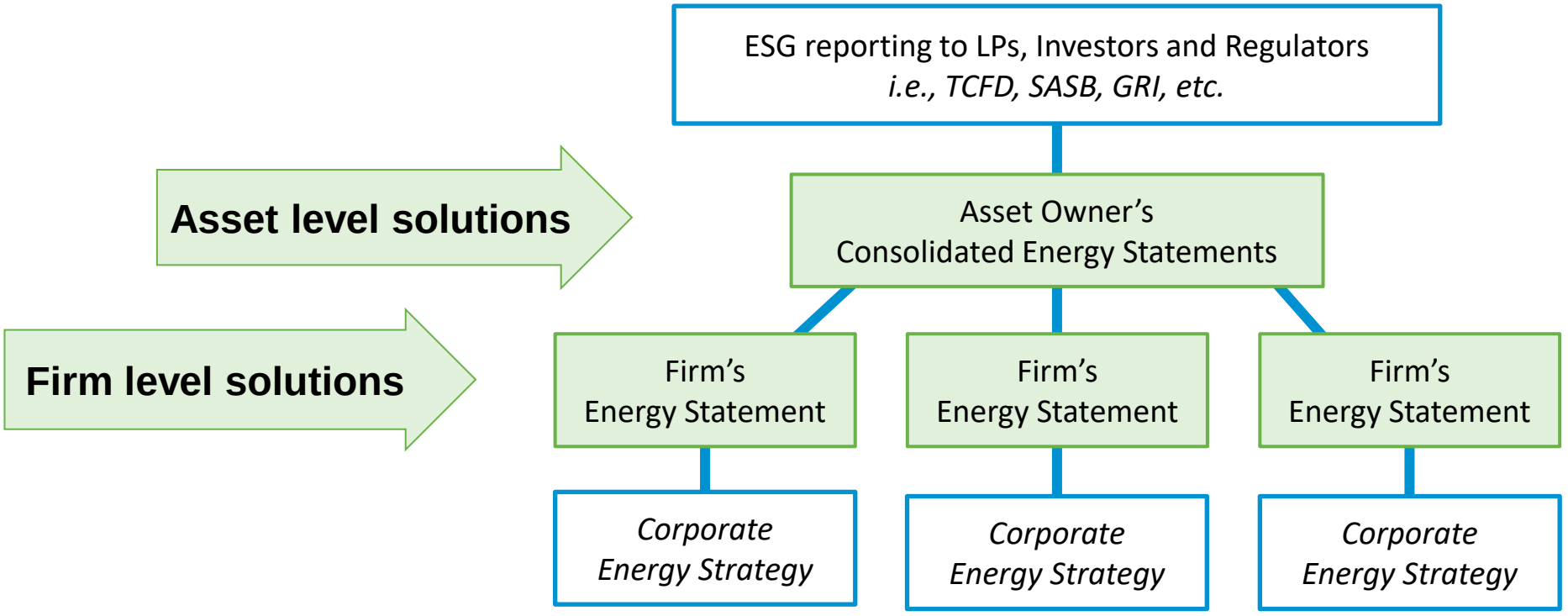
- Do we understand how counterparties are positioned regarding climate risks?
- Is the asset performing as expected?
- What corrective actions are we taking to meet ESG targets?

**Exit**

- Can we defend our sell price due to the mitigation of ESG risks?
- Did we meet our ESG qualitative and quantitative target?
- What ESG due diligence will a potential buyer perform?

# Application: ESG tool that complements investment strategy

For a private equity firm, we can set up a process for ESG management to understand current position, set clear targets and create methods for your firms to achieve them.



# Kaya Identity

$$CO_2\ Emissions\ = \frac{CO_2\ Emissions}{}$$

# Kaya Identity

$$CO_2\ Emissions = Energy\ Consumption \times \frac{CO_2\ Emissions}{Energy\ Consumption}$$

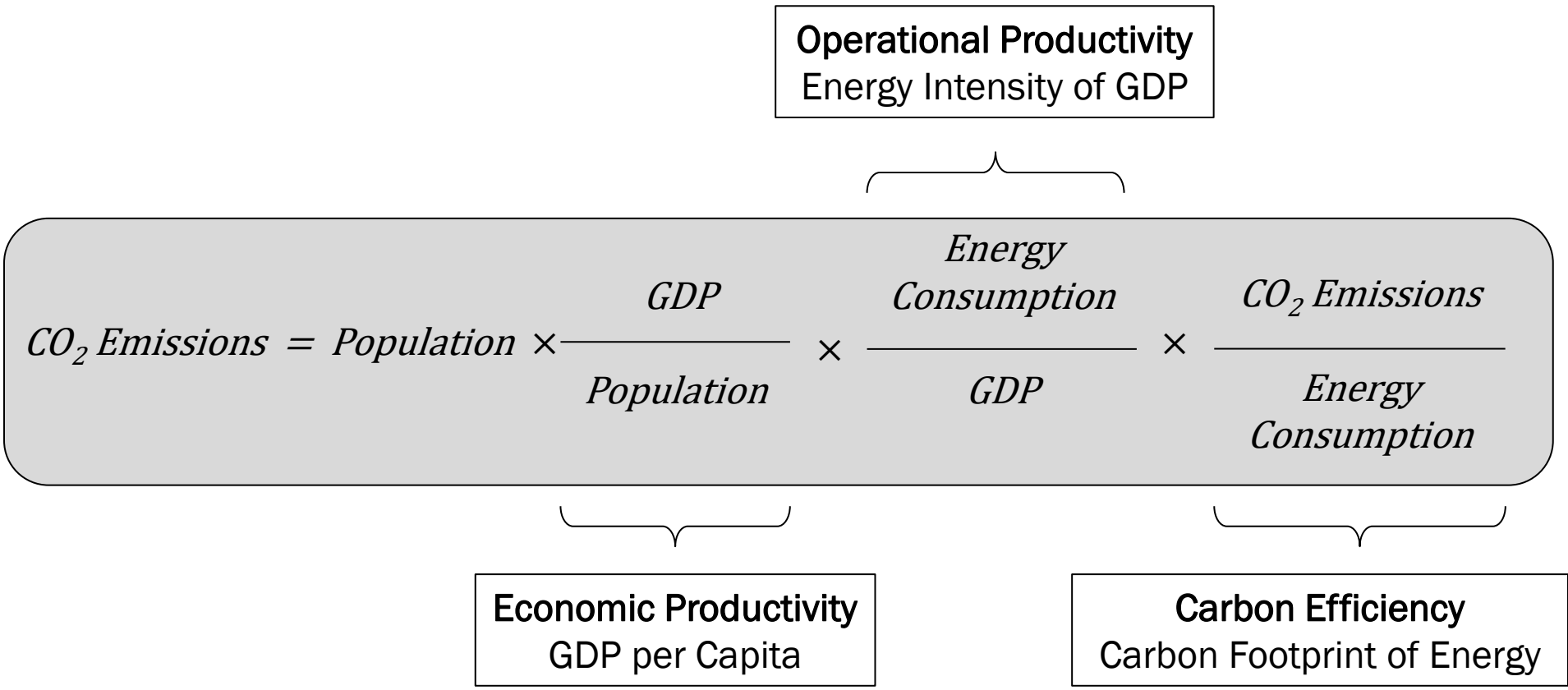
# Kaya Identity

$$CO_2\ Emissions = GDP \times \frac{Energy\ Consumption}{GDP} \times \frac{CO_2\ Emissions}{Energy\ Consumption}$$

# Kaya Identity

$$CO_2\ Emissions = Population \times \frac{GDP}{Population} \times \frac{Energy\ Consumption}{GDP} \times \frac{CO_2\ Emissions}{Energy\ Consumption}$$

# Kaya Identity



# Kaya Identify for a Corporation: Implementing Strategy

**Overall Productivity**
Widgets produced or services rendered

**Operational Productivity**
Energy Intensity of Revenue

$$CO_2\ Emissions = Widgets \times \frac{Revenue}{Widgets} \times \frac{Energy\ Consumption}{Revenue} \times \frac{CO_2\ Emissions}{Energy\ Consumption}$$

**Economic Productivity**
Revenue per Widget

**Carbon Productivity**
Carbon Footprint of Energy

# In Summary

- What is Climate risk, and who gets to know about it?
- Leveraging the assets under management as an investment-for-good.
- Energy Statements can parallel Financial Statements and optimized for energy/climate outcomes.
- Use the Kaya Identity as a way to support development of carbon-neutral products.

# Thank You