RESEARCH ON TAP

Measuring Corporate Impacts on the Environment and Society

Monday, November 13, 2023

bu.edu/research/events

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Agenda

- Welcome Remarks
- Presentations
  - Nalin Kulatilaka
  - Jonathan Buonocore
  - Eddie Riedl
  - Keith Marzilli Ericson
  - Jesse Chan
  - Shuba Srinivasan
  - Suchi Gopal
- Closing Remarks

The IMAP at Boston University
solves Investment Industry's Challenges with respect to measuring Corporate Impacts on the Environment and Society

1. Financial Asset Managers share challenges regarding ESG metrics

Human Capital

Carbon Accounting

2. Academic Teams conduct research to find solutions

3. Multiple Outputs Produced
- Databases
- Industry-Focused Publications
- Academic Peer-Reviewed Papers
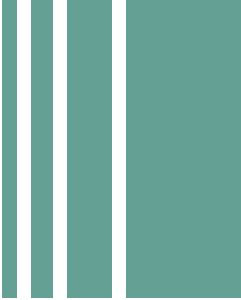
www.bu.edu/imap

The IMAP is part of both **QUESTROM SCHOOL OF BUSINESS** and the **IGS** Institute for Global Sustainability

IMAP's Active Research Projects:

Getting-Started	In-Progress	Draft Results Ready	Draft Publications Ready	Publications Available

Indoor Air Quality & Health
School of Public Health

Managing Sociopolital Issues
Chen Jing, Shuba Srinivasan, Dokyun Lee
Marketing and Information Systems

SASB Compliance Text-Based ESG
Eddie Riedel & Estelle Sun
Accounting

Green Investors Are Green Consumers
Maxime Sauzet & David Zerbib
Finance

Measuring What Shareholders Want Firms to Maximize
Keith Ericson
Markets, Public Policy & Law

Corporate Carbon Risk
Nalin, Susan, Alicia & Peter
Finance + Earth & Environment+ IGS

Disinformation and native advertising about climate change
Chris Wells & Michelle Amazeen
Communications

ESG Influence on Decision Making
Nina Mazar, Marketing

Justice in Urban Climate Finance
Claudia Diesmartinez & Anne Short Gianotti
Earth & Environment

Biodiversity Materiality in Indonesian Companies
Suchi Gopal & Mira Kelly-Fair
Earth & Environment

Market Myopia's Climate Bubble
Madison Condon
Law

Evaluating Hedge Fund Activism
Nalin Kulatilaka & Robert Kauffman
Finance + Earth & Environment

Risk of (Not) Achieving Corporate Carbon Targets

Nalin Kulatilaka

Director, Impact Measurement & Allocation Program
Associate Director, Institute for Global Sustainability; Professor, Finance, QST

Alicia Zhang, Robert Kauffman, Susan Fredholm Murphy

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More and more Companies are setting carbon targets, but not all are achieved.

The Case of Public Services New Mexico (PNM) and their "Mandatory" Targets

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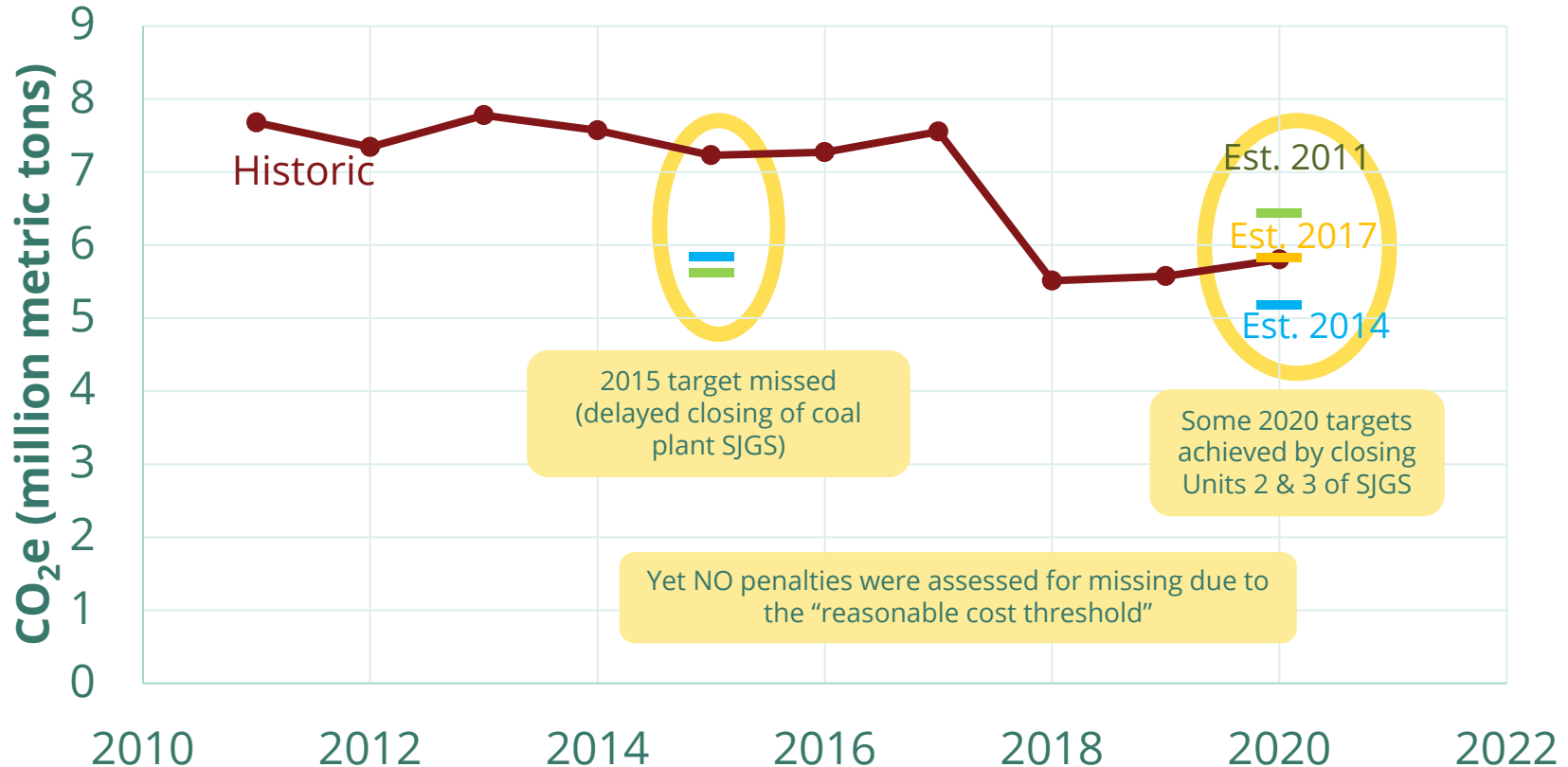
Can we predict the likelihood of achieving future targets?

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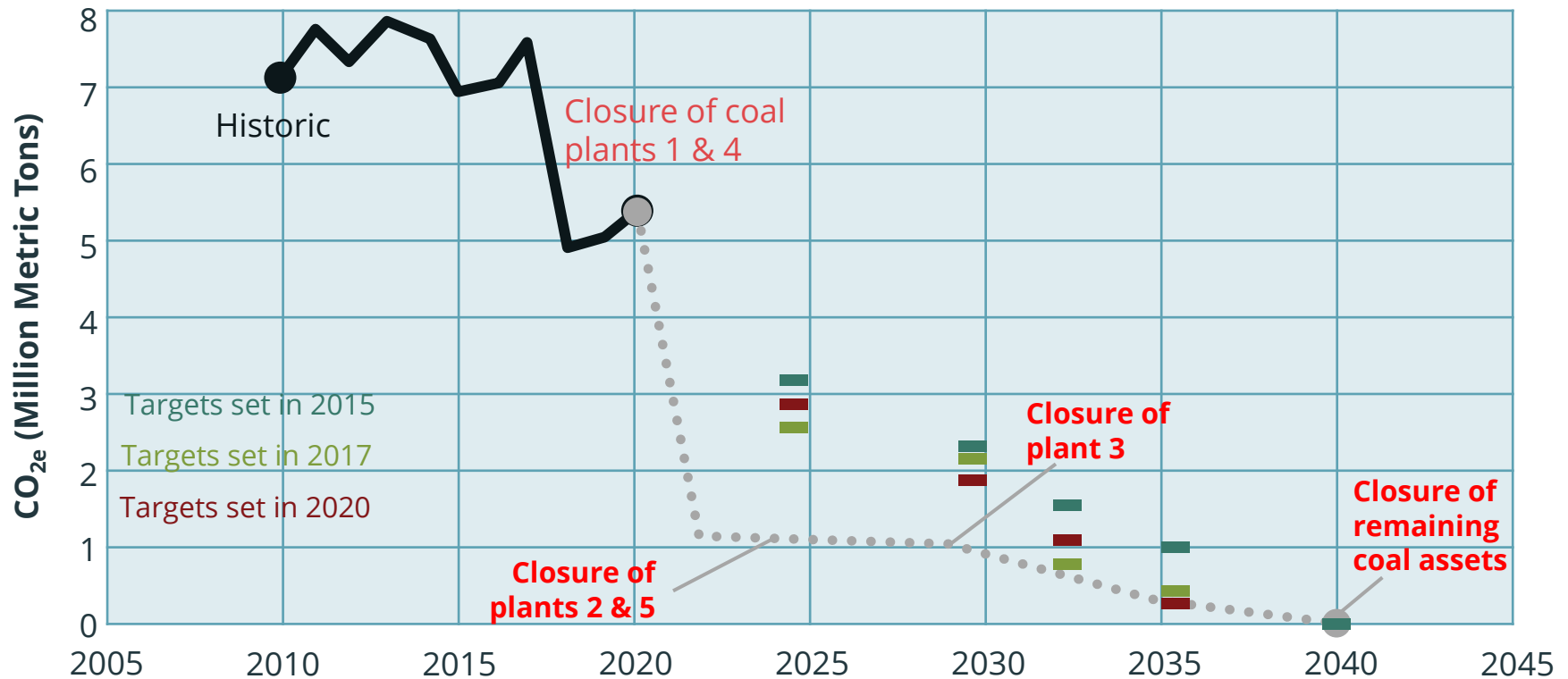
Likelihood of Retiring "dirty" plants and opening "Clean" plants

Observations from Initial work:

- Achievement of carbon targets depends on ability to retire fossil fuel plants and build renewables.

- State policies, technology characteristics, and incentives affect on time retirement and openings
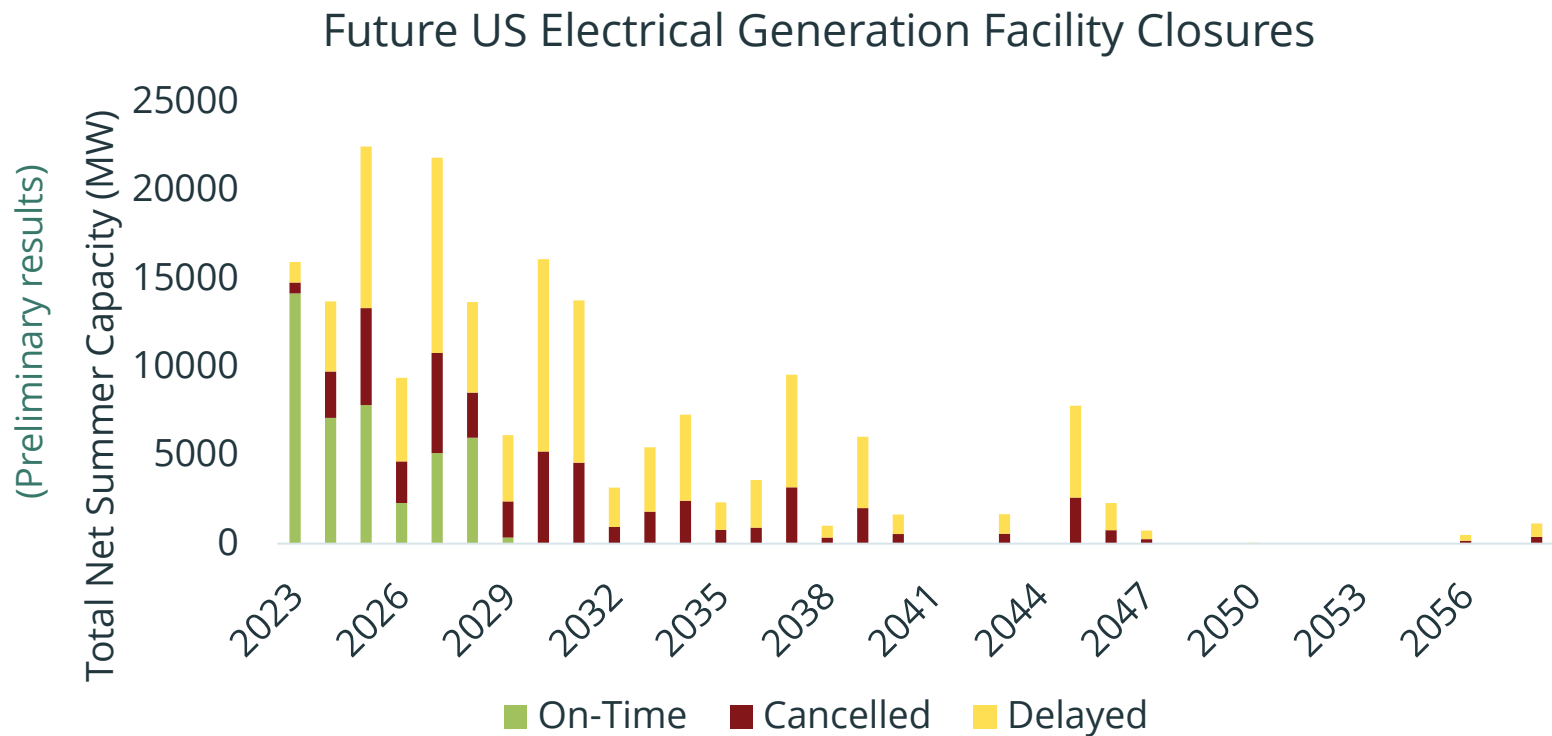
+

New dataset:

- EIA annual data on when plants are planned to be added/retired and when they are added/retired
  - 550 units planned for retirement
  - 4, 481 units planned to be built

- Use a logit-model with 110 characteristic variables for each facility

- Estimate likelihood of on-time openings and closings

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Our model predicts a mix of on-time, cancelled, and delayed Closures

Future US Electrical Generation Facility Closures

Bridging the Gap Between ESG Metrics and Science

Jonathan Buonocore

Assistant Professor

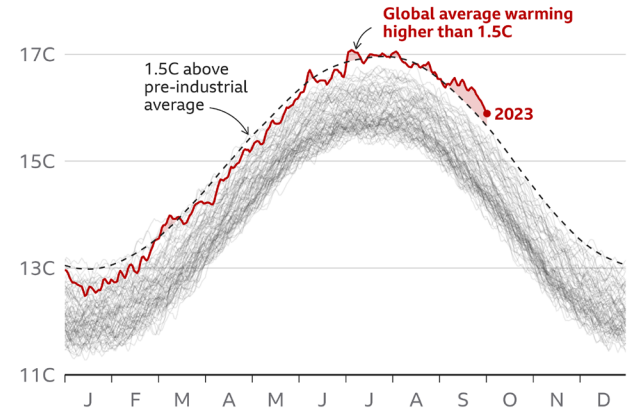Environmental Health, Boston University School of Public Health

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The metrics that matter

Record number of days breaking 1.5C in 2023
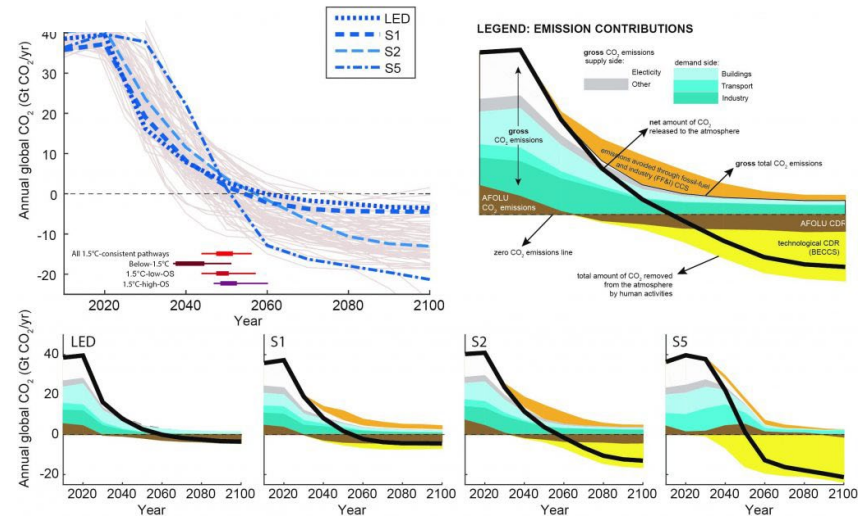Daily global average air temperature, 1940-2023

Note: Temperature data for 2 October 2023 is preliminary. Each line represents a year. Pre-industrial average calculated from 1850-1900 levels.
Source: ERA5, C3S/ECMWF

3.3 million deaths due to air pollution in 2010, were on track for ~6.6 million in 2050

Emissions pathways to 1.5°C

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Example metrics from corporate sustainability or ESG reports

Walmart	13.99 MMT CO23e in FY2022 (scope 1 + 2)	>70,000 food safety audits in FY2022	78% of waste diverted from landfill in CY2022
Chevron	71 g CO_2e per MJ in FY2022	106 thousand metric tons NOx FY2022	63 million cubic meters freshwater in FY2022
Apple	Carbon neutral operations since 2020 via renewables + offsets	2.5 Mtons waste redirected	1,374 Mgal water used at corporate facilities

- Focus on goals, then progress, then actual performance
- Reporting is inconsistent across impact categories, often not tied to real-world impacts with little focus on disparities
- "Black box" methods for ranking and evaluation
- Little space for benefits of company activity

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Evidence-based tools for better evaluations do exist

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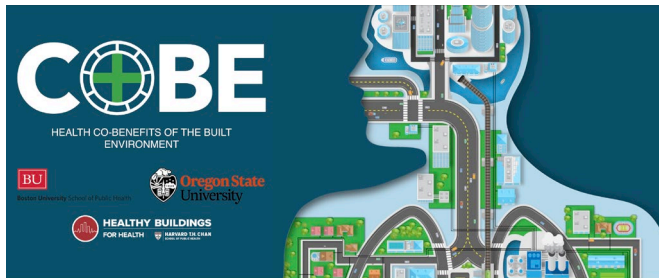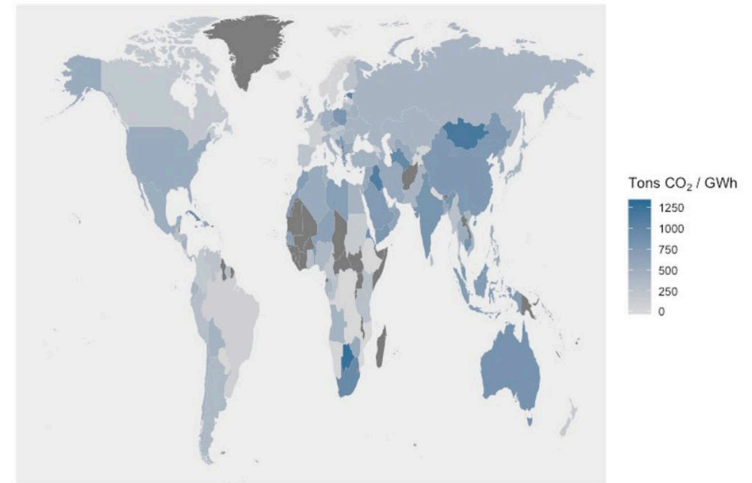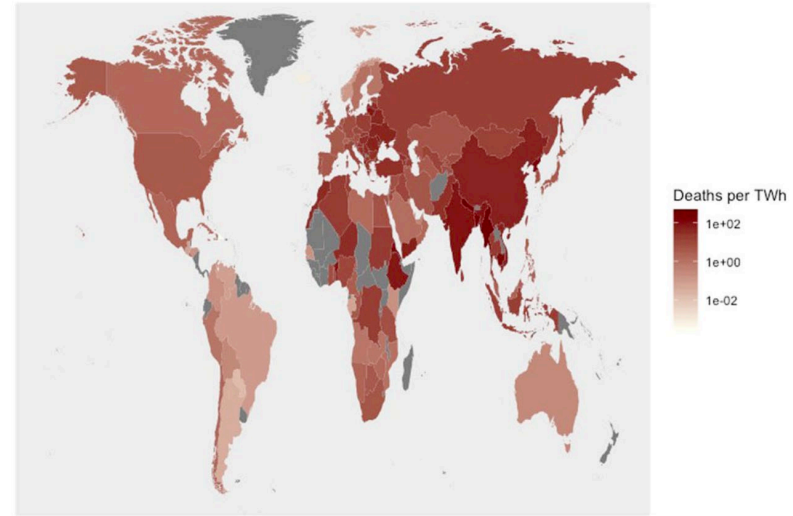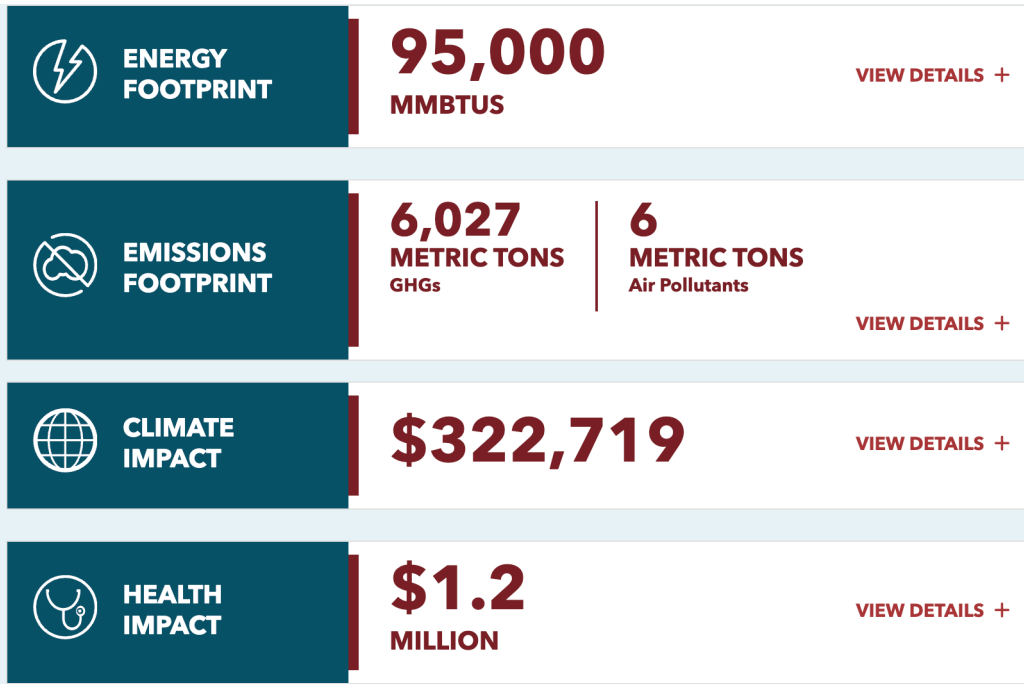
The possibilities of merging self-reported data with public health, life cycle assessment and Earth observation
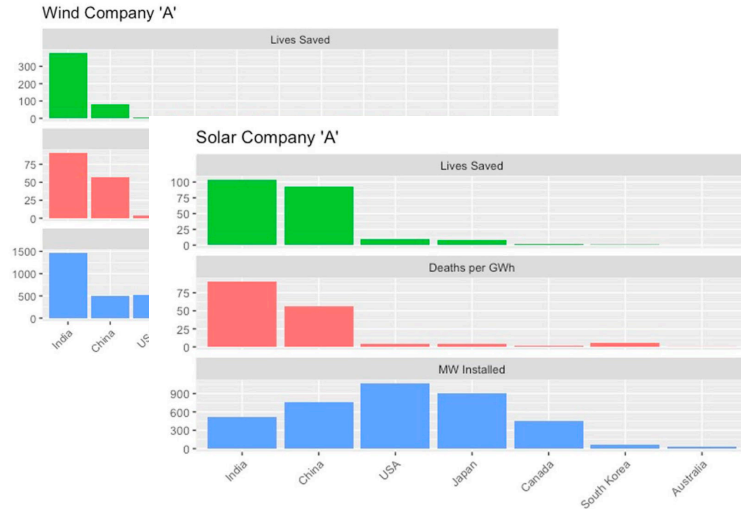
Consistent calculation methods to fairly compare benefits of companies

Tracking progress toward UN Sustainable Development Goals

Accountability on progress toward Paris

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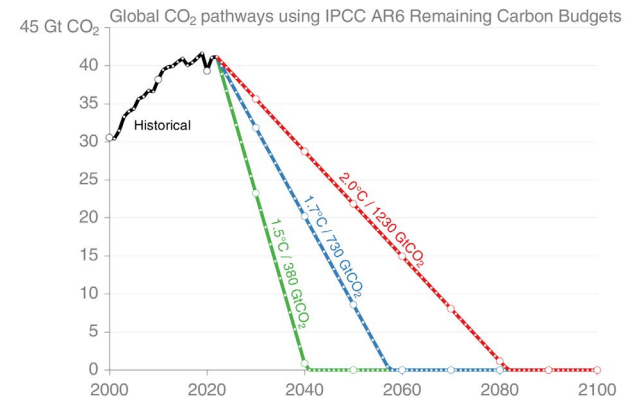
ESG Risk Disclosures:
The Predictive Ability of Industry Best Practice

Eddie Riedl

John F. Smith, Jr. Professor of Accounting
Questrom School of Business

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Aliya Korganbekova

Questrom
Doctoral Student

Eddie Riedl

John F. Smith
Professor

Federico Siano

Assistant Professor
UT Dallas

Estelle Sun

Associate
Professor

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Have We Seen This Movie Before?

Financial Statements '33 Act (all US firms)	Fair Value Reporting (banks/insurance)	IFRS (130+ countries)	ESG?
1920's	1990's	2000's	2020's

All Had Common Characteristics:
(1) demand/need for (new) information
(2) "leader" firms reporting this info (voluntarily)
(3) industry slowly coalesces – but still variability
(4) regulator standardizes reporting framework

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Measuring ESG Risk Disclosure

SASB Materiality Map
(1 example industry out of 77)

https://materiality.sasb.org/

Food & Beverage

Dimension	General Issue Category ⓘ	Agricultural Products
Environment	GHG Emissions	SASB-Material
	Air Quality	
	Energy Management	SASB-Material
	Water & Wastewater Management	SASB-Material
	Waste & Hazardous Materials Management	
	Ecological Impacts	
Social Capital	Human Rights & Community Relations	
	Customer Privacy	
	Data Security	
	Access & Affordability	
	Product Quality & Safety	SASB-Material
	Customer Welfare	
	Selling Practices & Product Labeling	
Human Capital	Labor Practices	
	Employee Health & Safety	SASB-Material
	Employee Engagement, Diversity & Inclusion	
Business Model & Innovation	Product Design & Lifecycle Management	
	Business Model Resilience	
	Supply Chain Management	SASB-Material
	Materials Sourcing & Efficiency	SASB-Material
	Physical Impacts of Climate Change	
Leadership & Governance	Business Ethics	
	Competitive Behavior	
	Management of the Legal & Regulatory Environment	
	Critical Incident Risk Management	
	Systemic Risk Management	

26 ESG Categories

Each topic has key terms

Examples of Keywords for Classification and Mapping:

- product/s or service/s quality

- product/s or service/s safety

- ingredient/s management

- CDC investigation/s or inspection/s

Note: measurement of multiple keywords is within a same sentence

7 ESG Categories are *Material* per SASB

ALICO, INC.

Form 10-K for the 2011 filing year

Industry: Food and Beverage, Agricultural Products

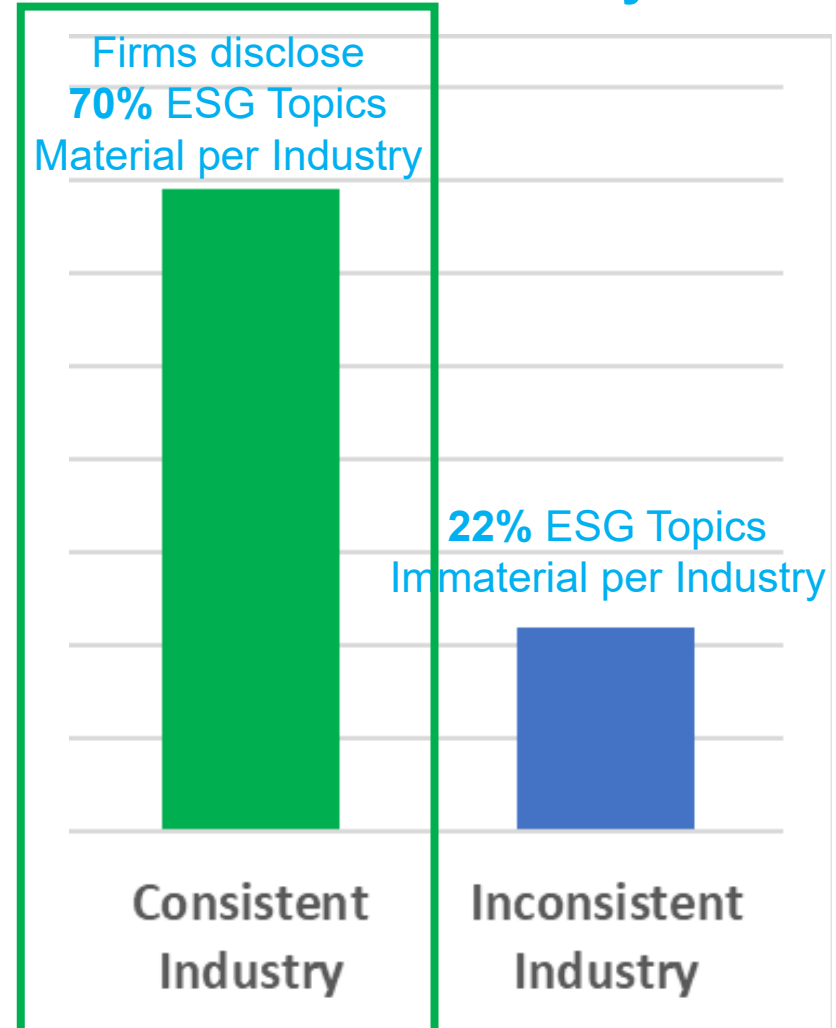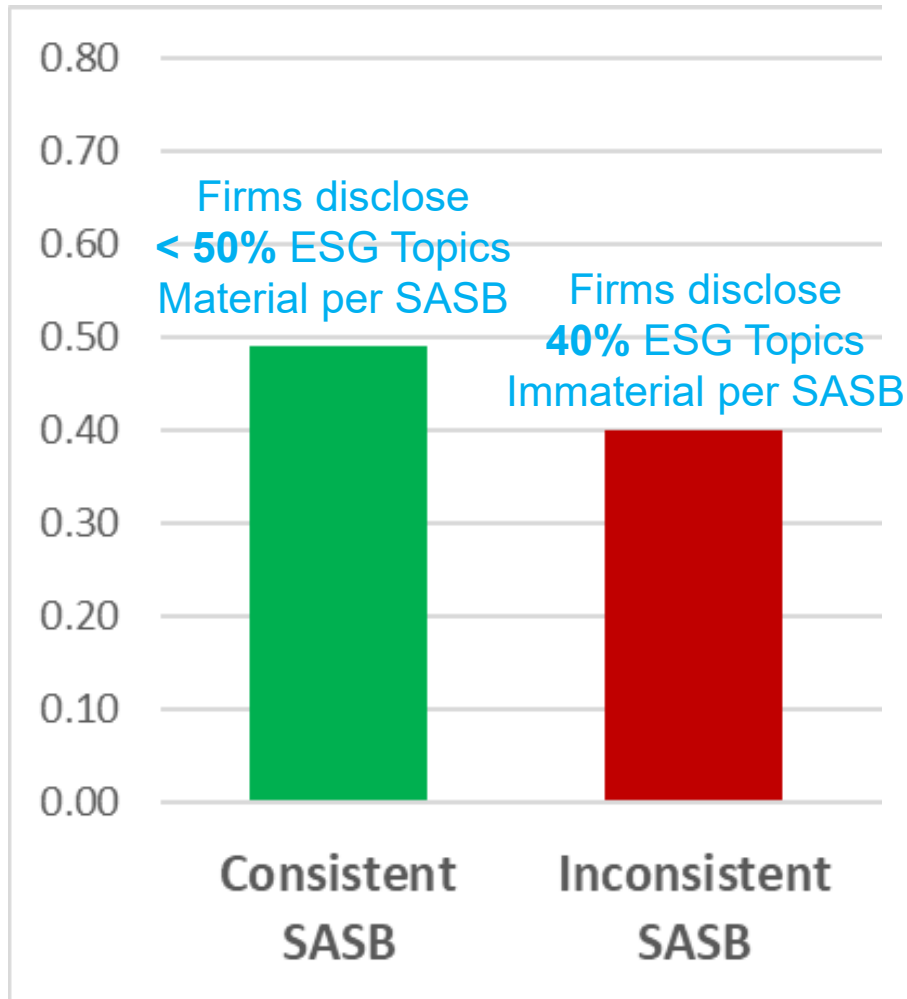**Use text analysis to match to 10-K Risk Disclosures**

Item 1A – Risk Factors

Changing public perceptions regarding the quality, safety or health risks of Alico's agricultural products can affect demand and pricing of such products.

The general public's perception regarding the quality, safety or health risks associated with particular food crops we grow and sell could reduce demand and prices for some of our products. To the extent that consumer preferences evolve away from products we produce for health or other reasons, and we are unable to modify our products or develop products that satisfy new customer preferences, there could be decreased demand for our products. Even if market prices are unfavorable, produce items which are ready to be or have been harvested must be brought to market. Additionally, we have significant investments in our citrus groves and sugarcane fields and cannot easily shift to alternative crops for this land. A decrease in the selling price received for our products due to the factors described above could have a materially adverse effect on Alico.

If firm discloses
Material ESG topic per SASB – "**consistent**"

If firm discloses
Immaterial ESG topic per SASB – "**inconsistent**"

Descriptive and Predictive Findings

Expanded Analysis to Benchmark vs Industry Leaders

Firms disclose 70% ESG Topics Material per Industry

Firms disclose < 50% ESG Topics Material per SASB

Firms disclose 40% ESG Topics Immaterial per SASB

22% ESG Topics Immaterial per Industry

| 0.80 | 0.70 | 0.60 | 0.50 | 0.40 | 0.30 | 0.20 | 0.10 | 0.00 |

Consistent SASB · Inconsistent SASB · Consistent Industry · Inconsistent Industry

Strongest predictor of left-tail ESG outcomes (penalties, incidents)

Consumer Welfare and the Objective of the Firm

Keith Marzilli Ericson

Professor

Markets, Public Policy, and Law

Questrom School of Business

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The Theory of the Firm

- **What do shareholders want firms to maximize? Profits? ESG?**
  - Shareholders are consumers
  - Shareholders have social preferences

- **Consumer welfare is a social objective**
  - Yet *pricing* largely ignored in ESG/CSR
  - Lower prices = unique technology for promoting consumer welfare
  - Economists know a lot about the structure of this "technology"

The Objective of the Firm

$$Q(p)(p - c) + \lambda CW$$

Profits $\qquad$ Weight on Consumer Welfare

- Profit maximization has $\lambda = 0$ $\qquad$ $p = c + \dfrac{Q}{-Q'}$

- ↑ value on consumer welfare ($\lambda > 0$) → lower prices

$$p = c + (1 - \lambda)\dfrac{Q}{-Q'}$$

- Weight λ matters for how you set prices

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Eliciting Shareholders' Preferences, λ, via Votes

- Recruit: *N=435,* approx. representative sample of US
- Asked: Consider a shareholder vote on pricing strategy
  - Set prices to maximize profits or
  - Set prices lower: give up $1 million in profits for $x million for consumers

- Median $\lambda \approx 0.25.$
  - Willing to give up $25 in profits to transfer $100 value to consumers

- Only 12% wants to max profits only and set $\lambda = 0$

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Conclusion

- Eliciting desired votes possible for firms and mutual funds voting on owners' behalf

- Shareholders want firms to place weight on consumers
  - Desired weight varies by stockholding, income, and gender but is not zero

- Weight on consumers is sizeable
  - Impact on prices: $\approx 25\%$ reduction in markups
  - Comparable to desired weight on *environmental* benefits (consumers get half that weight)
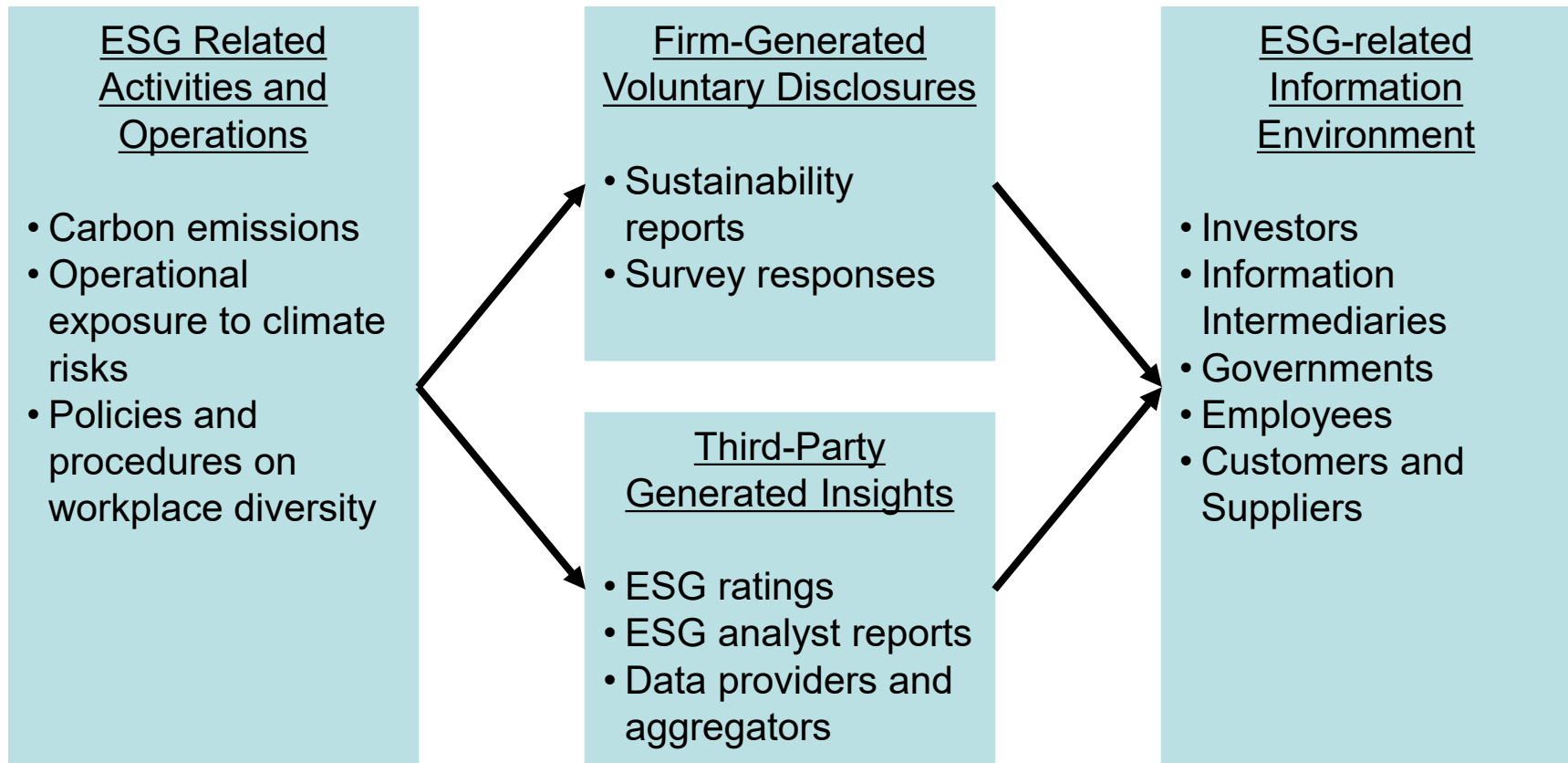
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How Do Financial Markets Consume and Integrate ESG Metrics?

Jesse Chan

Assistant Professor

Accounting, Questrom School of Business

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Where do ESG measures come from?

ESG Related Activities and Operations

- Carbon emissions
- Operational exposure to climate risks
- Policies and procedures on workplace diversity

Firm-Generated Voluntary Disclosures

- Sustainability reports
- Survey responses

Third-Party Generated Insights

- ESG ratings
- ESG analyst reports
- Data providers and aggregators

ESG-related Information Environment

- Investors
- Information Intermediaries
- Governments
- Employees
- Customers and Suppliers

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What are we learning?

How are stakeholders consuming ESG data?	How are firms communicating ESG related metrics?	How do ESG issues affect market participant behavior?

• Equity analysts' consideration of climate related risks remains nascent and focused in high exposure industries (Chan 2023)
 	
• Voluntary disclosure to CDP reduces investor uncertainty, but only among high-performing ESG firms (Chan and Hagigi 2023)
 	
• Investors find management forecasts less credible after negative ESG events (Campbell et al. 2023)
	• How do firms use images and pictures to manage investors' perceptions of ESG performance?
	  • Work-in-progress with Moshe Hagigi
	
	• Utilities' use and disclosure of renewable energy tax credits foreshadows their ESG reporting behavior (Chan and Fischer 2023)
		• Social movements impact auditor-client relationships, with the consequence of improving financial reporting quality (Ballestero and Chan 2023)
		
		• Does a client's employee satisfaction have spillover effects on auditors?
		  • Work-in-progress with Ryan Ballestero
		
		• Women systematically face a 'higher bar' for promotion on Wall Street (Chan et al. 2023)

Open questions related to ESG metrics

Increasing standardization of reporting	• How will the IFRS' implementation of IAS S1 and S2 affect the ESG information environment? (mandatory sustainability and climate risks and opportunities disclosure) • What will final implementation of the SEC's mandatory climate reporting proposal look like and how will it affect preparers and investors?
Growing role of advanced technologies in ESG reporting	• Can new advanced technologies (e.g., generative AI) help to reduce the frictions to producing and consuming ESG metrics? • How will firms and investors use advanced technologies and new data (e.g., more detailed climate risk modeling) to assess and report on ESG issues?
Expanding divergence in consideration of ESG issues	• How will increasing divergence in beliefs about ESG's importance among market participants affect firms' reporting behavior? • What are the consequences of any potential increased divergence in ESG beliefs?

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Do or Do Not, There Is No Try: Managing and Mitigating Sociopolitical Firm Risk Events

Shuba Srinivasan

Adele and Norman Barron Professor of Marketing

Marketing Department, Questrom School of Business

Co-authors: Chen Jing, DK Lee, S. Fournier

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Introduction

**High effort
(Do it)**
- Offending action curtailed
- Training program
- Terminate the employment contract
- Suspend operations
- Settles/dismiss lawsuit

**Low effort
(Try it)**
- Deny
- Statement
- Apology but no further actions

(Do not)
- No response

Brush off the haters

OR

ACT NOW!

Research Questions

1. What are the effects of high effort vs. low effort firm responses in mitigating the harm of sociopolitical risk events on social media reactions?

2. What are the effects of high effort vs. low effort firm responses in mitigating the harm of sociopolitical risk events on firm stock returns?

3. How do these effects vary depending on the moderating factors such as brand equity, company involvement, and firm ESG (Environment Social Governance) performance?
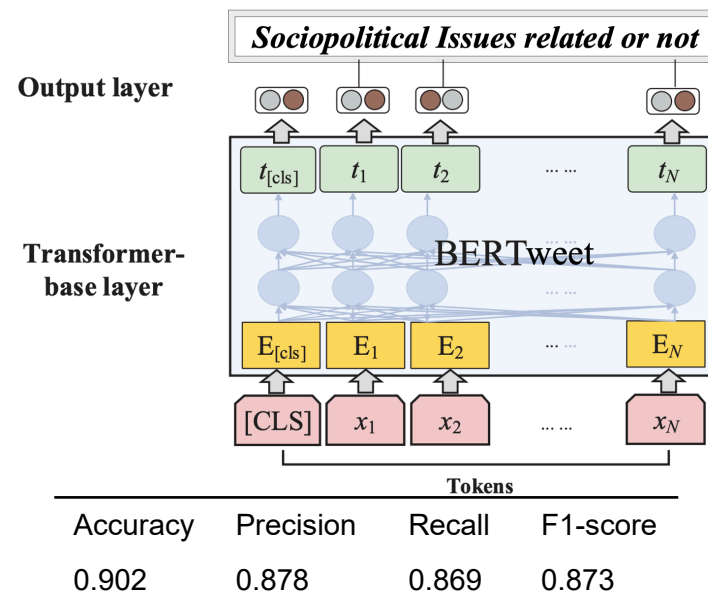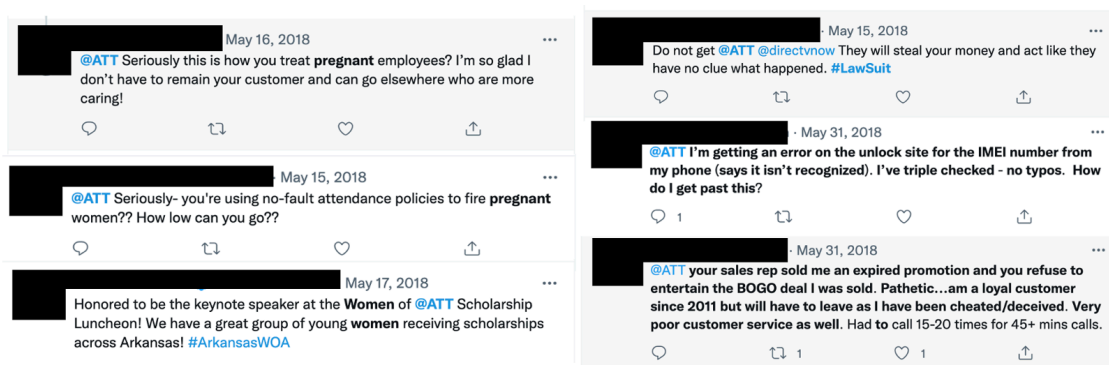
Data & Method

News reports of risk-relevant incidents data:

- February 2018 - April 2019

- (Sustainalytics & Factiva news database)

Response types: Count (%)	Low-effort responses: 109 (49.1%)	High-effort responses: 113 (50.9%)
Sub Response types: Count (%)	Deny: 33 (14.86%) No response: 16 (7.2%) Statement: 44 (19.82%) Apology: 16 (7.2%)	Actions/operations suspended: 37 (16.67%) Training program: 8 (3.6%) Employee termination: 28 (12.61%) Settle lawsuit: 32 (14.41%) Other: 8 (3.6%)

Twitter for Public Opinion

- January 2018 to December 2019

- ~ 160 millions Tweets overall

Output layer

Transformer-base layer

Sociopolitical Issues related or not

BERTweet

Tokens

Accuracy	Precision	Recall	F1-score
0.902	0.878	0.869	0.873

Difference-in-Differences with multiple time periods

(Callaway and Sant'Anna, 2021)

$$Y_{ijt} = Y_{ijt}(0) + \sum_{g=1}^{T} [Y_{ijt}(g) - Y_{ijt}(0)] G_{ijg}$$

$$ATT(g,t) = E[Y_{ijt}(g) - Y_{ijt}(0)|G_{ijg} = 1]$$

Overall treatment effect

$$\theta_0 = \frac{1}{k_0} \sum_g \sum_{t>g} \omega_g ATT(g,t)$$

Firm value - stock abnormal return

$$AR_{ijt} = R_{ijt} - E(R_{ijt})$$

$$E(R_{ijt}) = \beta_{0ij} + \beta_{1ij}R_{mt} + \beta_{2ij}SMB_t + \beta_{3ij}HML_t + \varepsilon_{ijt}$$

Results

- Do or do not, there is no try

- Heterogenous treatment effect on social media for high effort response
  - Firms with strong brand equity have a lower harmful effect, this effect is further attenuated with a high-effort response.
  - When the wrongdoer's connection is remote, no mitigating effect of high-effort response
  - Firms with strong ESG performance received a stronger mitigation effect from high-effort response

- Heterogenous treatment effect on stock returns for high effort response

	Stock abnormal return
Overall	0.000 (0.004)
Highly admired brand	0.006*** (0.003)
Distant wrongdoer	-0.008*** (0.003)

	Low vs. No	High vs. No
SP volume	−0.371 (0.222)	−1.223*** (0.239)
non-SP volume	−0.257** (0.119)	−0.358** (0.148)
Negative SP sentiment share	−0.014 (0.014)	−0.066*** (0.015)
Negative non-SP sentiment share	−0.004 (0.008)	0.000 (0.006)
Neutral SP sentiment share	−0.008 (0.006)	−0.019 (0.015)
Neutral non-SP sentiment share	0.012 (0.013)	0.041*** (0.014)
Positive SP sentiment share	−0.001 (0.006)	−0.010 (0.007)
Positive non-SP sentiment share	0.014 (0.016)	0.055*** (0.016)
Abnormal stock return	0.000 (0.006)	0.000 (0.005)

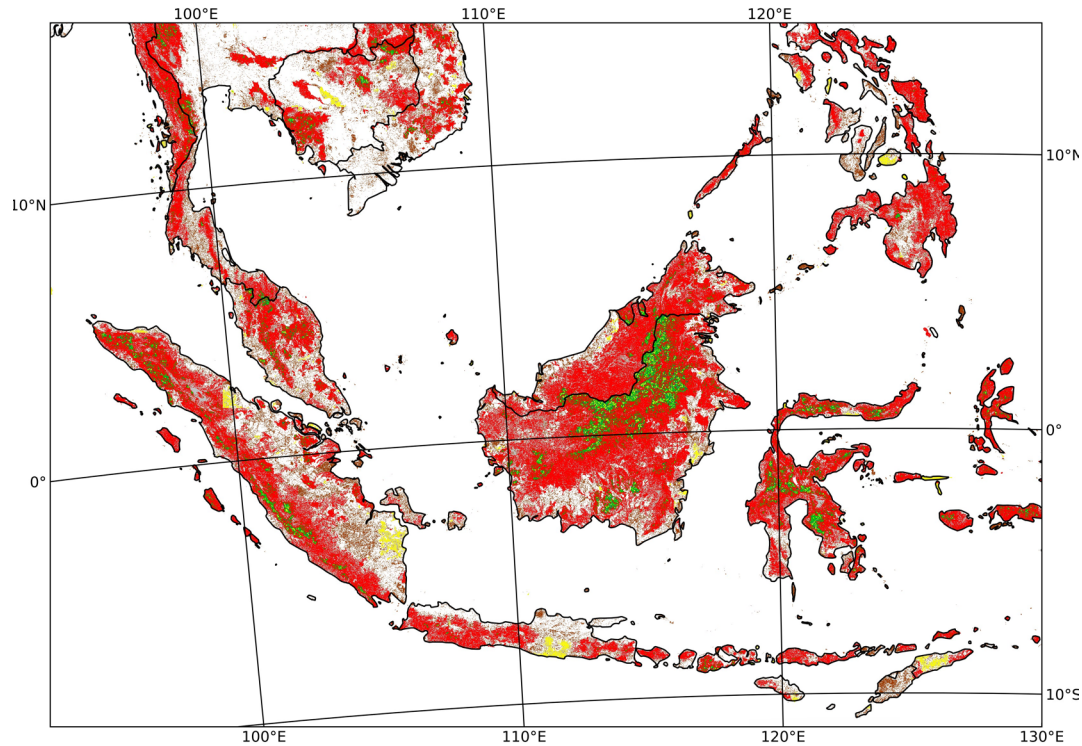*Notes:* $^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$
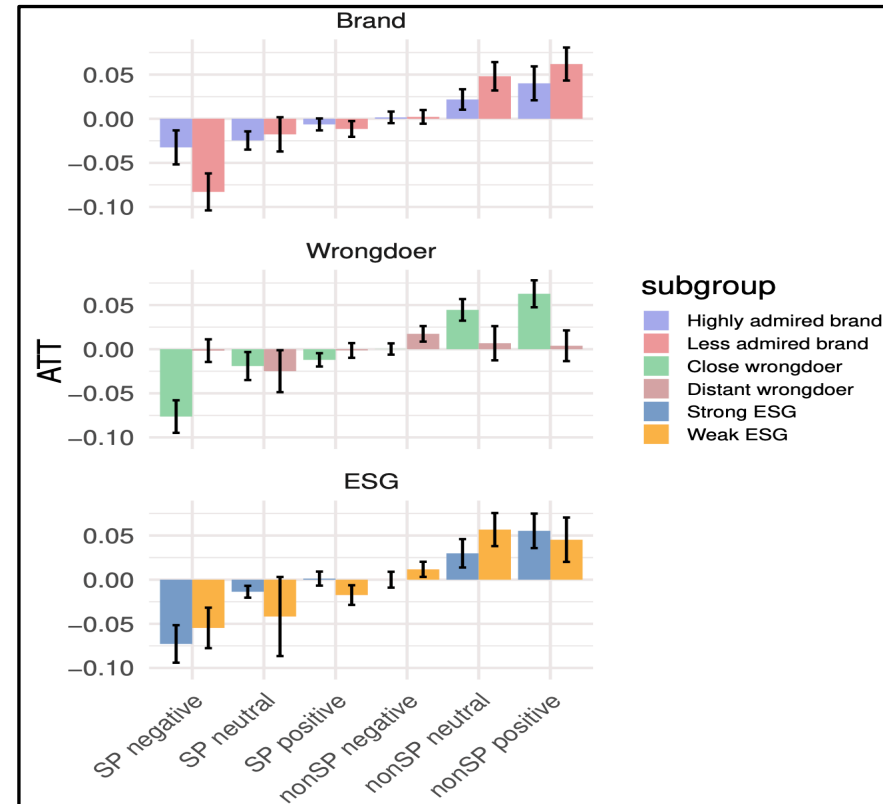
Green Growth or Red Losses: Navigating the Future of Palm Oil Cultivation, Deforestation, and Carbon Impact

Suchi Gopal

Professor

Earth & Environment, CAS

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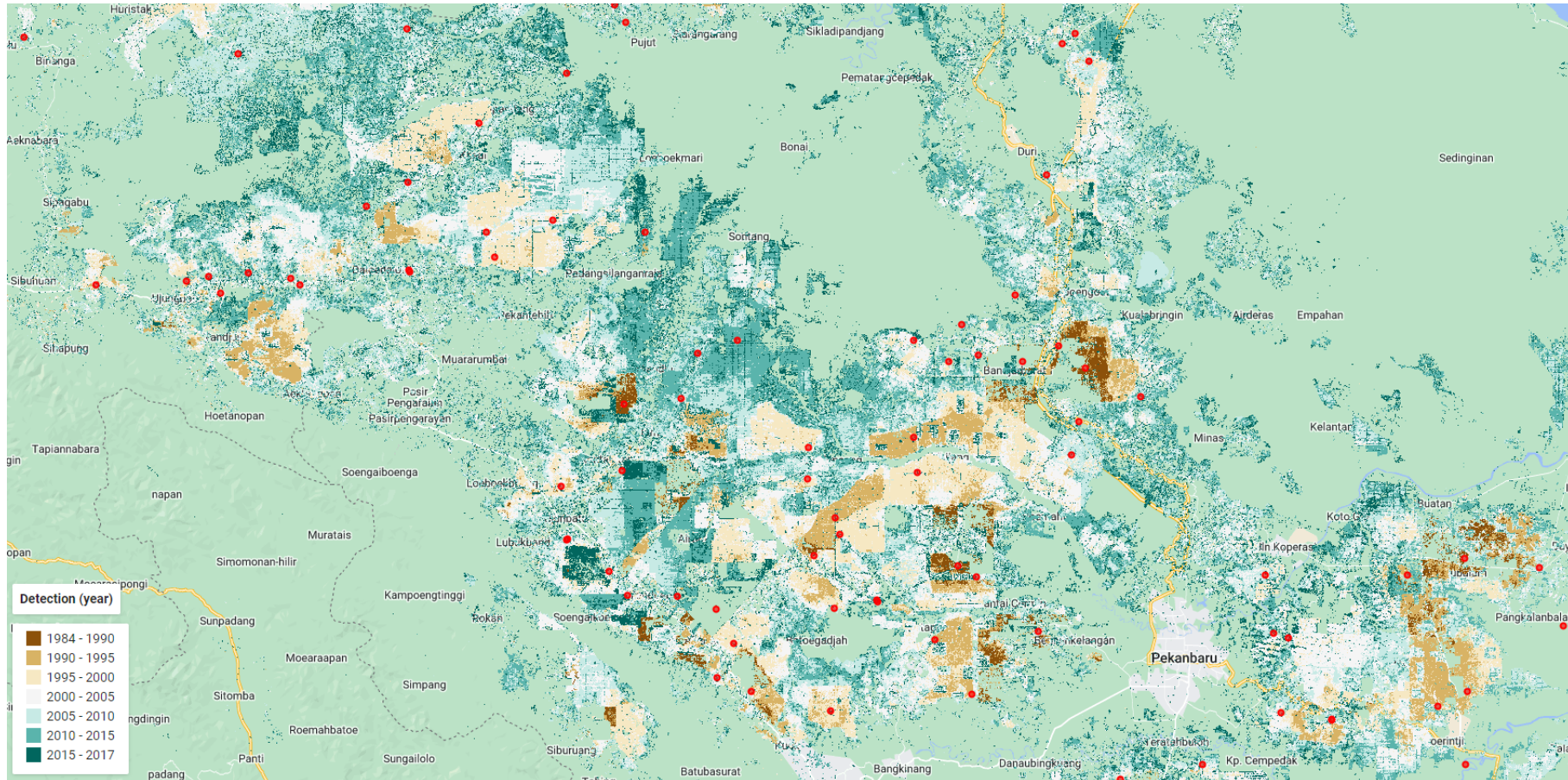# Deforestation Trends in SE Asia – Change Detection Analysis based on Satellite Data

Deforestation through
- 2000
- 2010
- 2016
- 2021

Core   Edge   Perforation   Bridge   Loop   Branch   Islet   Background   No data

Oil Palm Detection using Satellite Data – Training Data based on Field Samples

Spatio-temporal Analysis - Biodiversity Loss, Deforestation, and Carbon Loss

Forest Loss Around 1400 Oil Palm Sites (sq mt)

Biodiversity Impact Across All Study Sites
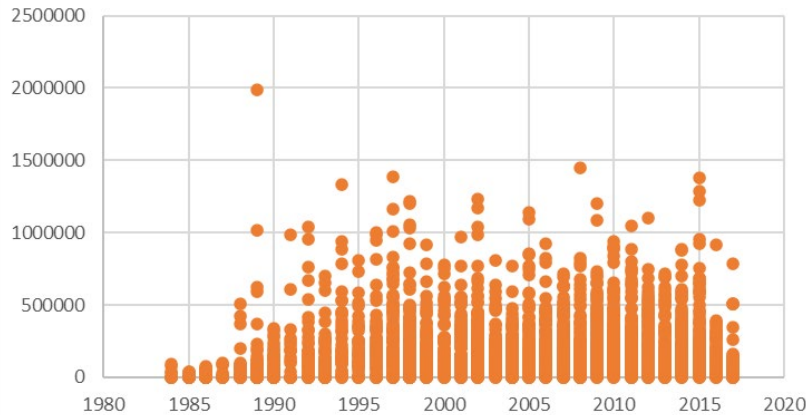—**Critically Endangered** —**Endangered** —**Vulnerable**

Figure (left panel). Forest and Biodiversity Loss in Indonesia and Malaysia around 1400 Plantations. Critically endangered mammals (Orangutans) are at the highest risk (right panel).
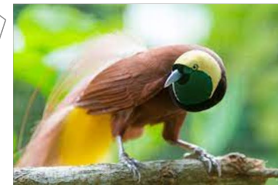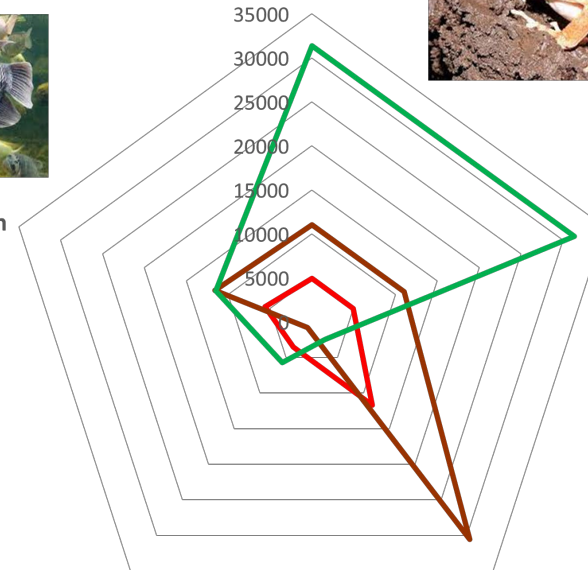Work in progress. AI Deep Learning based Palm Oil Plantation Detection

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Balancing Sustainable Development Goals and Palm Oil

SDGs Tradeoff Context: No poverty (SDG 1), Sustainable communities (SDG 11) tradeoff with Climate action (SDG 13) and Life on land (SDG 15). Balance needs to be achieved by the following:

- **Zero-deforestation commitments**: Encouraging palm oil companies to adopt and enforce strict policies against deforestation and land conversion.(SDG 13 and SDG 15)

- **Protecting peatlands**: Implementing regulations and practices that prohibit or restrict the drainage of peatlands for palm oil cultivation. (SDG 15)

- **Improved waste management**: Investing in technologies and infrastructure to treat and utilize palm oil mill effluent, reducing methane emissions. (SDG 13, SDG 11)

- **Certification and sustainable sourcing**: Encouraging the adoption of certification schemes, such as the Roundtable on Sustainable Palm Oil (RSPO), which promotes environmentally and socially responsible palm oil production and provides sustainable livelihoods (SDG 1). Our analysis examines how many plantations are RSPO certified; confusion around local versus global certification programs

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THANK YOU!

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UPCOMING EVENTS

Learn more & RSVP: bu.edu/research/events
Topic ideas & feedback: bu.edu/research/topic-ideas

RESEARCH ON TAP

Health Data Science
November 29, 2023 | 4-6 pm

RESEARCH HOW-TO

On Rotation: Deepen Your Impact through
Temporary Government Service
November 15, 2023 | 2-3 pm

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