

Data Science Capstone

Capitalizing on Climate Action Opportunities for Green Finance

DATA 501 L01 Winter 2024

Presented to: Professor Mario Costa Sousa, Professor Jim Stallard,
& Teaching Asst. Kosar Lotfalikhan

Presented by: Gustavo Bravo & Ivy Lee 

April 5th, 2024

Our Team



Gustavo Bravo
Data Scientist



Ivy Lee
Data Strategist



GI ANALYTICS

Topic – Why we chose it?



Topic - Enabling a Sustainable Future

Sustainability Commitment



Motivations



Shift in Sustainable Business Practices



Ever Changing Effect of Climate Change

Personal Interest



EU is a Known Leader in Sustainability



Finance & Investment Reporting's



Climate Change & Sustainability

An aerial night photograph of a city, likely Reykjavik, with its lights reflecting on the water. The sky is dark with vibrant green aurora borealis visible in the upper half. The text is overlaid in white, bold, sans-serif font.

To what extent are **European Markets and Nations** prepared to undergo the **Transition** towards the **Integration and Adoption of Green Finance Initiatives?**

Review of Paper 1



An Exploration in the Climate-Neutrality Mission: Green Finance in Cities

Funding the financing the zero emissions journey: urban visions from the 100 climate-neutral and smart cities mission

Authors: Giulia Ulpiani, Enrique Revollo, Nadja Vetter, Pietro Florio, & Paolo Bertoldi

Journal Name: Humanities & Social Sciences Communications

Year of Publication: 2023

Humanities & Social Sciences
Communications



ARTICLE

Check for updates

<https://doi.org/10.1057/s41599-023-02055-5>

OPEN

Funding and financing the zero emissions journey: urban visions from the 100 Climate-Neutral and Smart Cities Mission

Giulia Ulpiani¹, Enrique Revollo², Nadja Vetter³, Pietro Florio¹ & Paolo Bertoldi¹

Cities play a critical role in delivering emission-free futures, yet the financial capacities, together with the unprecedented estimated capital requirements represent substantial barriers to climate action. In this study, we use data collected through the European Mission on 100 Climate-Neutral and Smart Cities to investigate how 362 ambitious, yet differently prepared cities are fostering climate investment, under three aspects of (i) financial readiness, (ii) financial proactiveness, and (iii) financial innovation. On one hand, according to their self-assessment, over 70% of the cities have not yet estimated—not even roughly—the total investment needed to become climate neutral and the majority (i) have experience in financing only a few specific climate projects, (ii) are ill-equipped to tap capital markets, (iii) have developed only marginally co-financing with the private sector, and (iv) have taken no

Review of Paper 1



Abstract Overview

100 Climate-Neutral Cities Mission



Examines 362 Cities on Financial Readiness, Proactiveness, and Innovation



70% of Cities Lack the Estimates of Funds Required



Struggle with Access To Capital Markets

Tallest Barriers



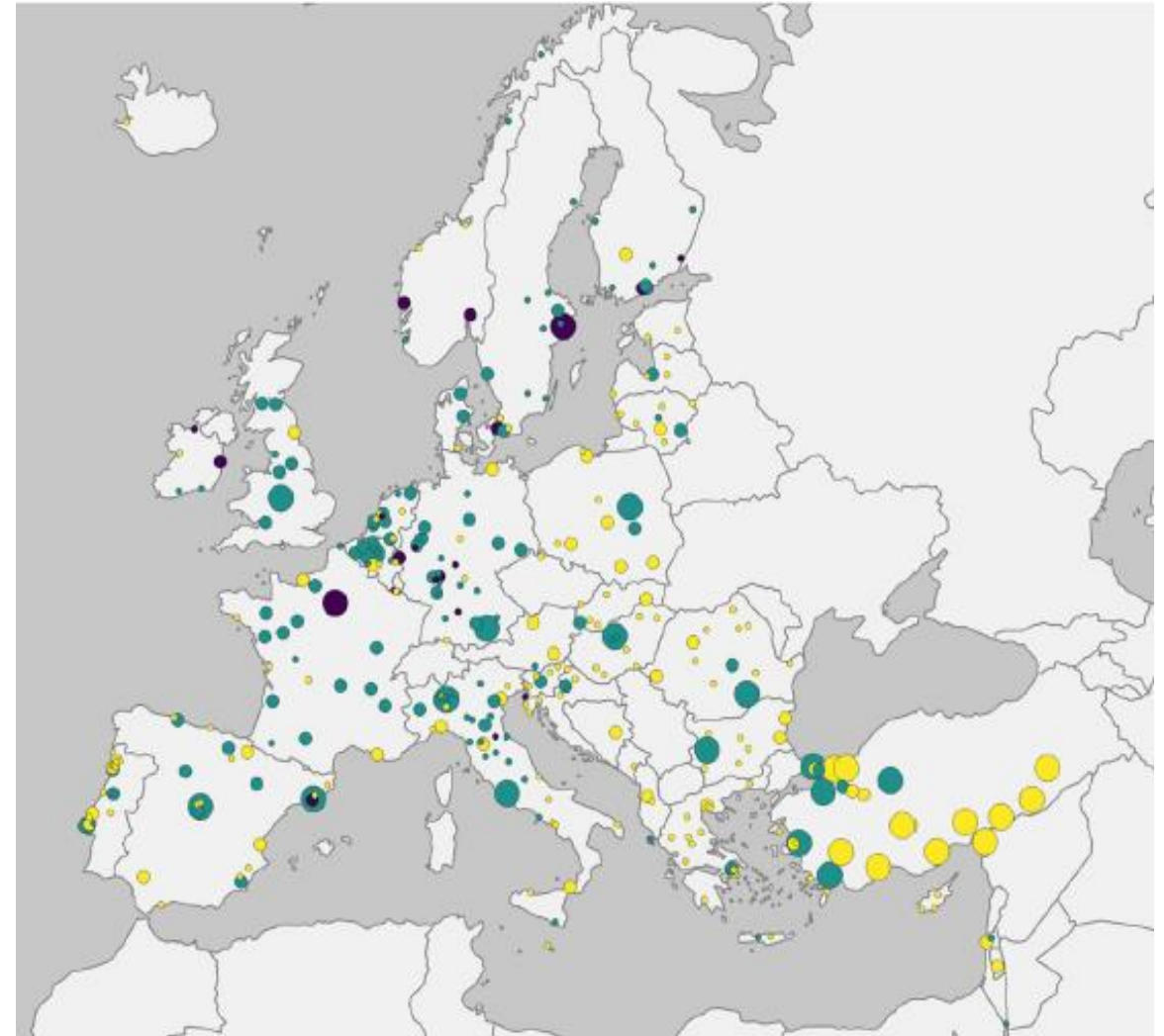
**Financial
Management**



Regulation



**Institutional
Arrangement**



Review of Paper 1



How Did This Help Us?

Understanding the Gap of Knowledge

1

A strong need for sustainable finance

Large estimate of funds is required, how can this be raised?

2

Governments play a major role in helping

Policy can influence the private sector to invest into sustainable projects

3

Europe is making a push to accomplish this goal

Most cities showed interest in increasing their amount of non-carbon intensive projects

Analysis of the Effectiveness of Green Bonds: Are Companies Holding up Their End?

European green bond market is attracting a growing number of corporate issuers, for environmental impact on their liquidity

Authors: Julien Mazzacurati

Journal Name: European Securities and Markets Authority

Year of Publication: 2021

Investor protection
Environmental impact and liquidity of green bonds

Contact: julien.mazzacurati@esma.europa.eu¹⁸⁶

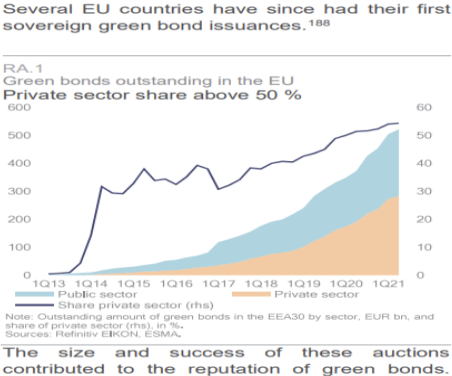
Summary
The European green bond market is attracting a growing number of corporate issuers, which has implications for the environmental impact of these instruments and their liquidity. This article first investigates the carbon dioxide emissions of green bond issuers. We show that, between 2009 and 2019, energy firms, utilities and banks that issued a green bond were much more likely to disclose emissions data, and they have on average reduced their carbon intensity to a larger extent than other firms – confirming the view that green bonds act as a signal of firms’ climate-related commitments. We then compare the liquidity of green and conventional EUR corporate bonds from green bond issuers using proxy indicators. Green bond liquidity appears to be tighter, but the differential with conventional bonds has remained small and broadly constant during the COVID-19 turmoil, suggesting no particular vulnerability for the green segment of the corporate bond market.

Introduction

Since the EIB issued the world’s first climate bond in June 2007, green bonds have experienced a remarkable development. From almost nothing 10 years ago, the global green bond market has grown to nearly EUR 1 tn today.¹⁸⁷

One major change that has taken place in recent years is the emergence of a deep private-sector green bond market (RA.1). While this supports the development of green finance and brings diversification benefits, it also has significant implications for the environmental impact of green bonds and their liquidity.

As the EU is set to launch its own green bond label, this article investigates the environmental impact of green bonds, and features several indicators to monitor the liquidity risk attached to these instruments. Initially a niche market involving a small number of supranational issuers, from 2013 the green bond market saw a growing number of local government issuers.

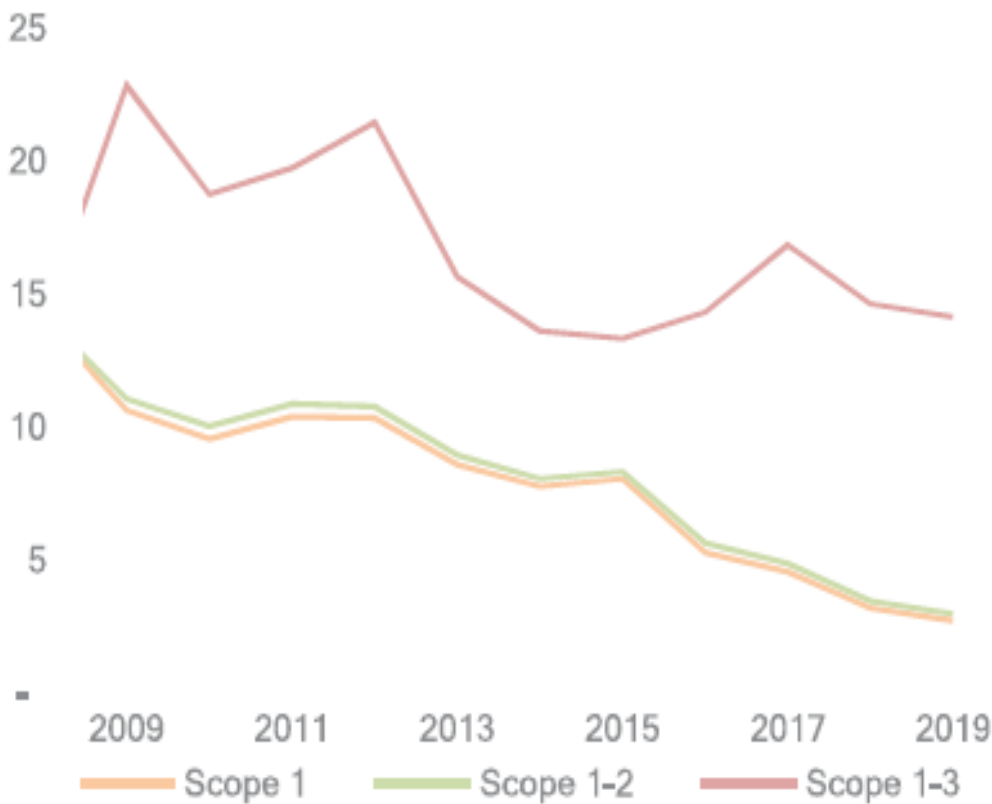


Review of Paper 2



Relationship between Green Bond Issuing and Carbon Intensity of Companies

Average GHG emissions of green bond issuers
Overall reduction in GHG emissions



Green bond issuers average reduction of GHG over ten years totaled 38%

Signals for Climate Commitments

Between 2009-2019, essential **business decreased its carbon intensity** when **green bonds** were issued

Investors **do not view them as being significantly riskier** and are still considered healthy investments

Areas of Emphasis



Greenwashing Concerns



Impact on CO2 Emissions

Review of Paper 2



How Did This Help Us?

Understanding the gap of knowledge

1

Green bonds used as an attribute

Green bonds showcase a strong measure in sustainable finance

2

Conclude that green bonds are effective

A strong way for companies to raise funds for green projects

3

Keep an eye out for labels

Investors will pay more for labelled bonds as it reduced information asymmetry

Gap of Knowledge



What is Causing the Barrier?

1. Traditional financial education rarely extends to environmental sustainability.
2. Green finance has evolved rapidly, marked by standards, initiatives, and products.
3. Emerging markets and developing economies receive aid from multilateral banks for projects.

Sustainable Disclosure Standards



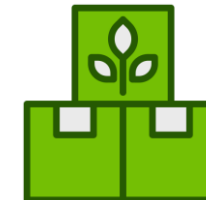
Incentive Mechanisms



Green Financial Products



Incubation of Local Green Projects



Green finance cannot just be a few products. It must be an ecosystem.

Importance of Green Finance



What Drove our Curiosity in Sustainability and Finance?

Growing Attention



Benefits of Green Finance



Delivers Economic and Environmental Advantages to Everybody



Broadens Access to Environmentally-Friendly Goods and Services



Equalizing the Transition to a Low-Carbon Society

=

Socially Inclusive Growth

Research Questions

Goals

1



**What countries are the most prepared for the green finance transition?
Which countries are falling behind?**

2



**What factors most greatly contribute to a country's preparedness towards
green financing?**

3

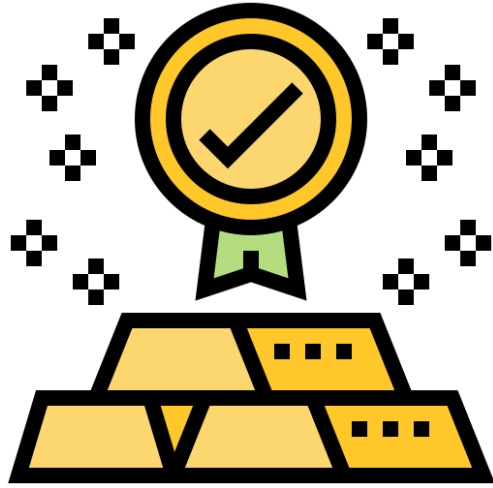


**In which areas should underprepared countries prioritize their efforts to
achieve the 2050 sustainability goals?**

Methods – Data Aggregation



Pivot on Measurement



Create a Golden Standard

Methods – Data Aggregation



Pivot on Measurement



Create a Golden Standard

Arbitrary Approach

**Difficult to
Define Perfection**

Methods – Data Aggregation



Pivot on Measurement



Create a Golden Standard

Arbitrary Approach

**Difficult to
Define Perfection**



Scorecard

**Specifically Assess
Individual Attributes**

**Scientifically Driven
Answer**

Methods – Data Aggregation



Not Successful Methods



Leverage Paper 1 Insights



Collect Country Data

Methods – Data Aggregation



Not Successful Methods



Leverage Paper 1 Insights

Scarcity of Data – Private Surveys

Difficult to Aggregate – Encompass Country



Collect Country Data

Methods – Data Aggregation



Not Successful Methods



Leverage Paper 1 Insights

Scarcity of Data – Private Surveys

Difficult to Aggregate – Encompass Country



Collect Country Data

Difficult to Standardize

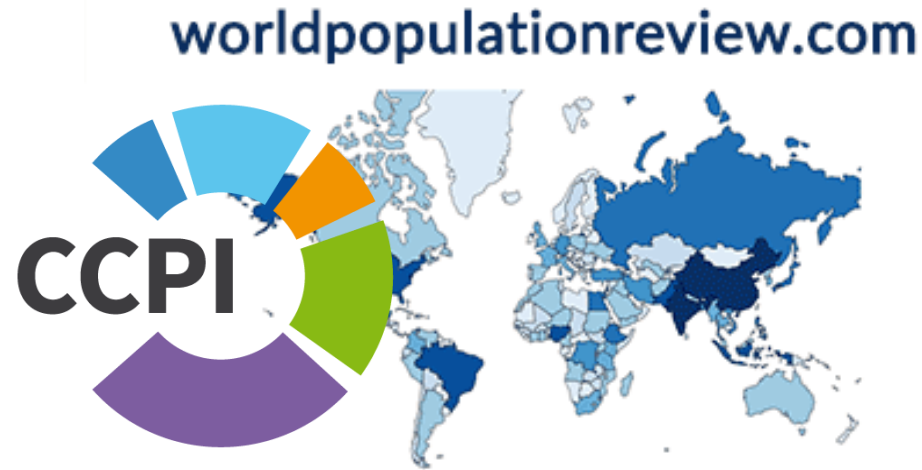
No Need to “Reinvent the Wheel”

Methods – Data Aggregation



Successful Methods

The Goal is to Combine and Aggregate Data, not to Recreate Research Methods



Existing Indexes

Thorough Analysis
Completed by Experts

No Need for Aggregation –
Country Level Data

Bloomberg

MSCI



Market Data

Direct Demonstration of
Private Sector

Easily Aggregated by
Country (Average)



Research Question #1

What Countries are the Most Prepared for the Green Finance Transition? Which Countries are Falling Behind?



What Countries are the Most Prepared for the Green Finance Transition? Which Countries are Falling Behind?

Top 3 Countries



Netherlands



Denmark



Sweden

Bottom 3 Countries



Portugal



Italy



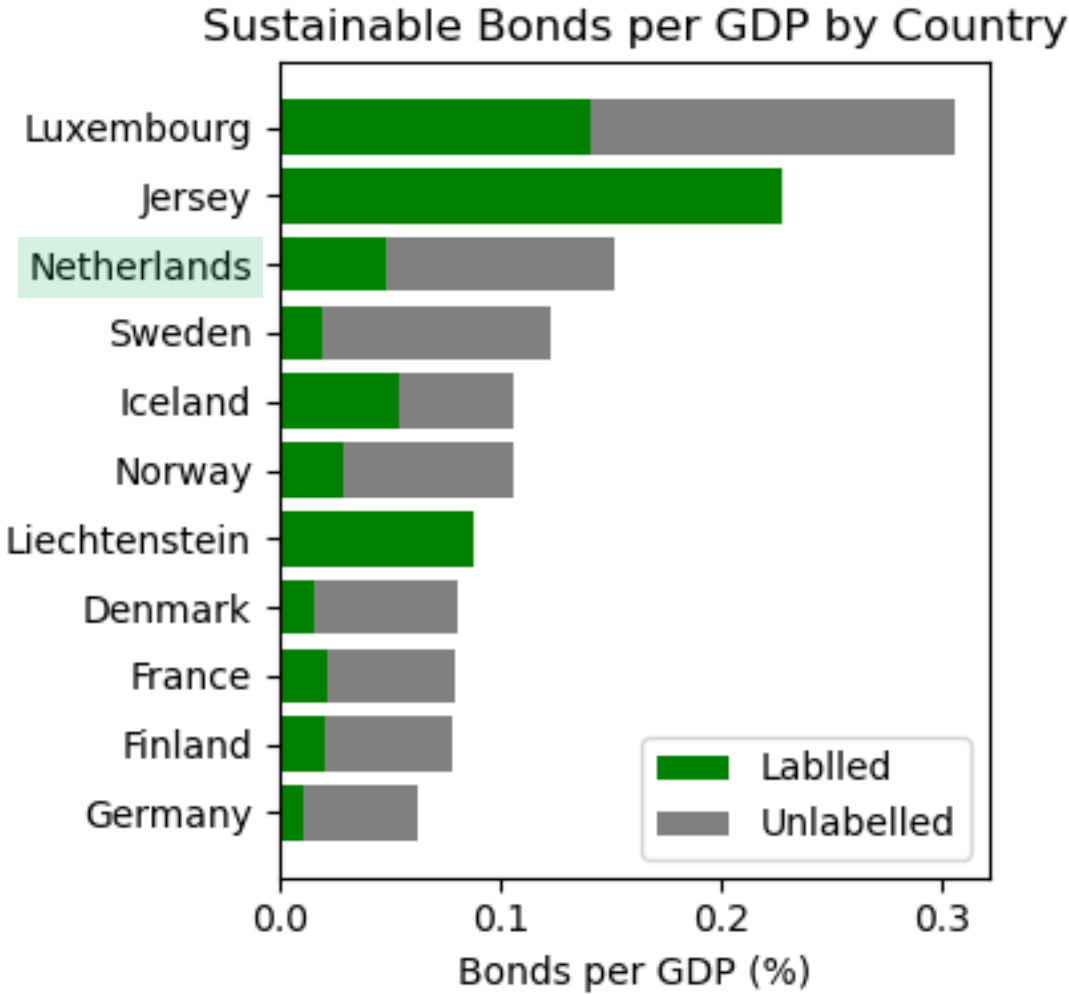
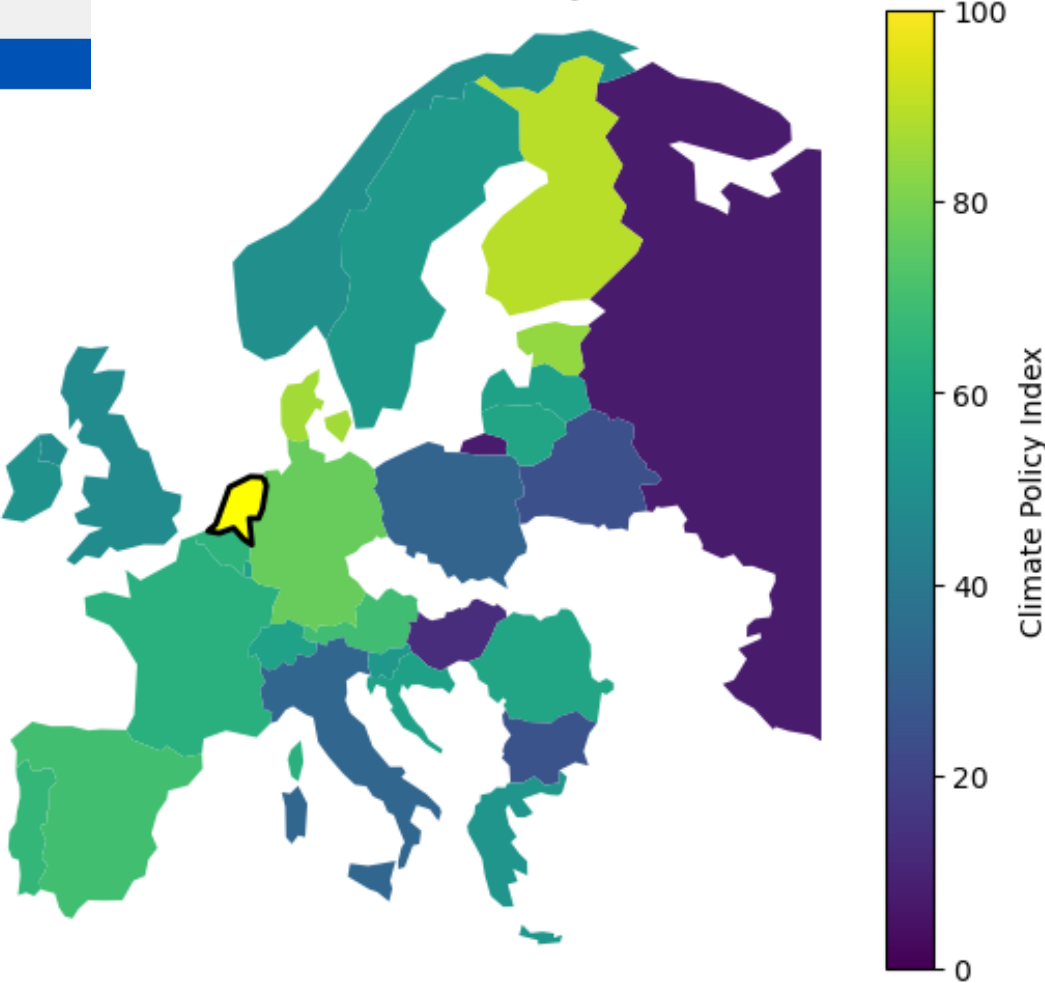
Poland



The First Guiding Light to our Research



2024 CCPI Climate Policy



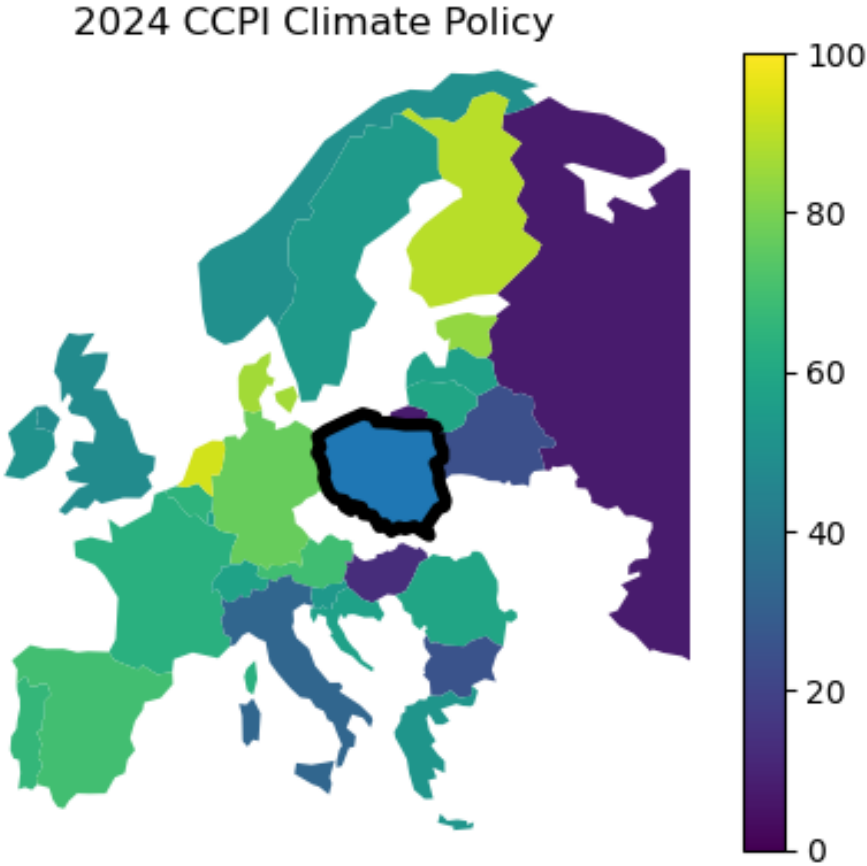
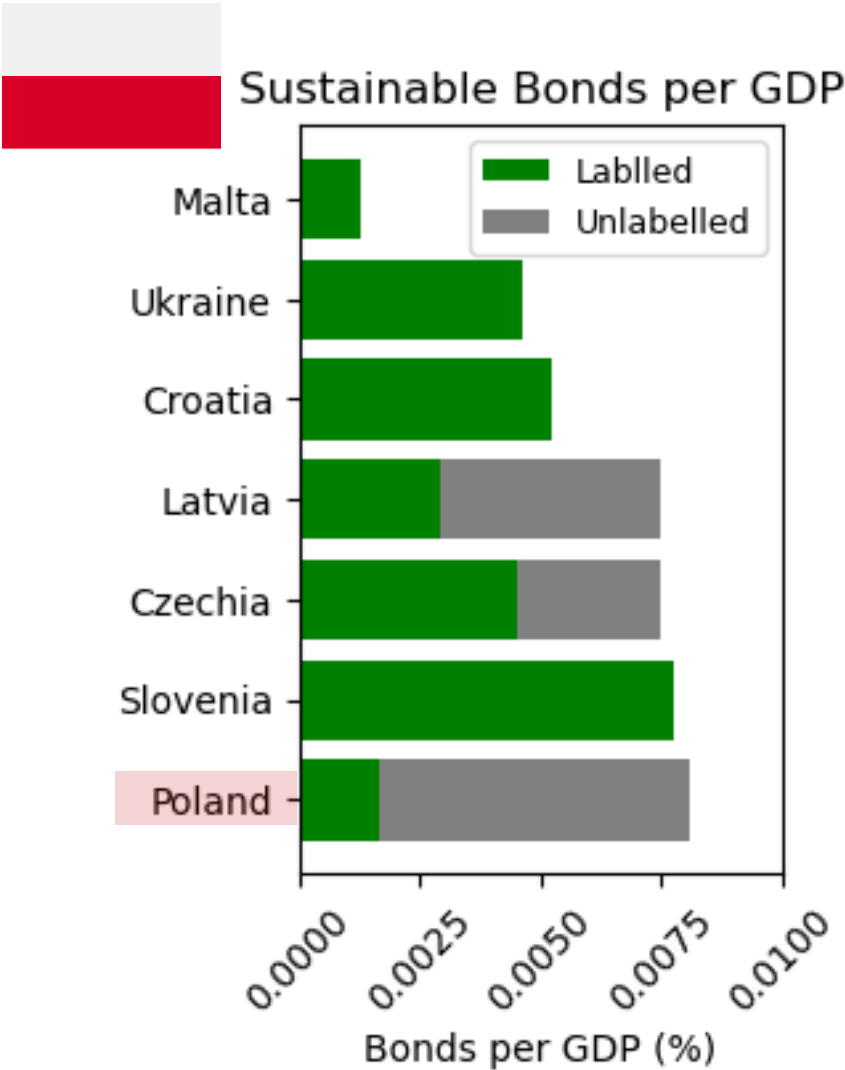


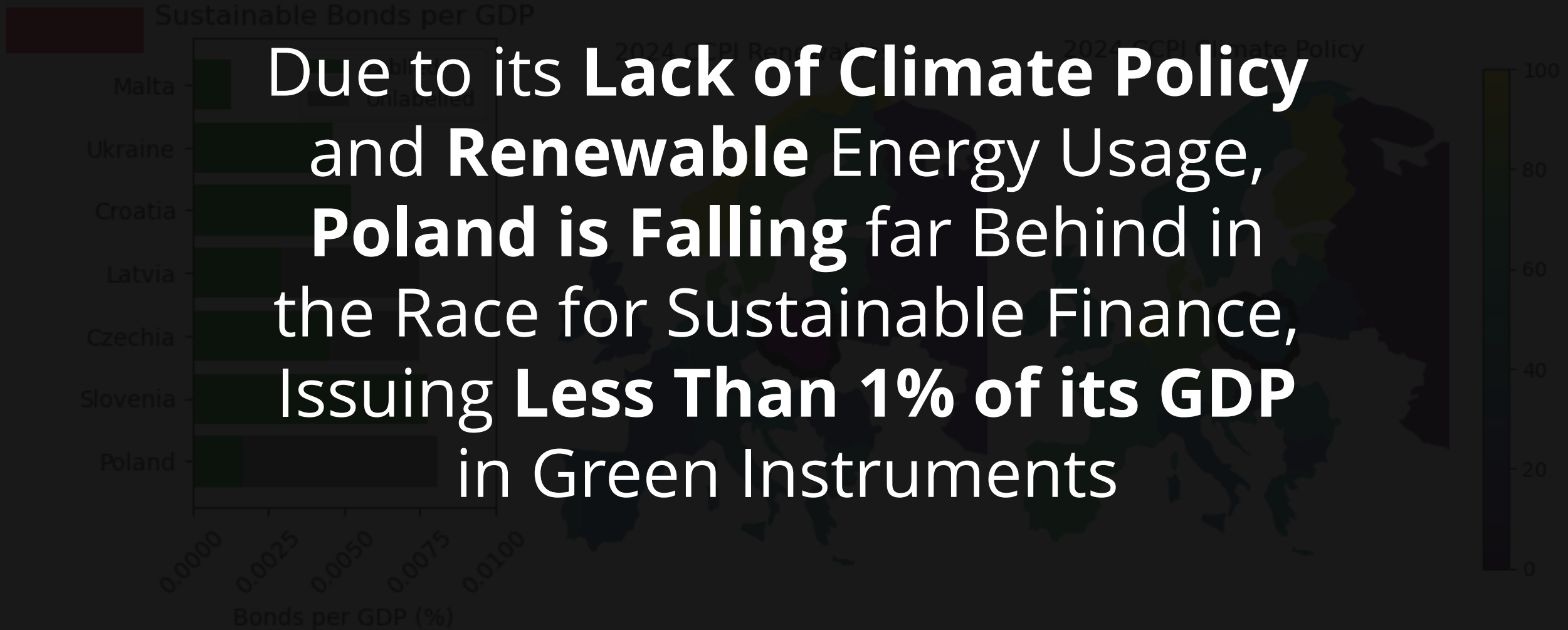
Ranking the **Highest in Climate Policy**,
The Netherlands has Established Itself as
**the European Leader in Sustainable
Finance**, issuing **~15% of its GDP** in
Sustainable Bonds





The First Guiding Light to our Research



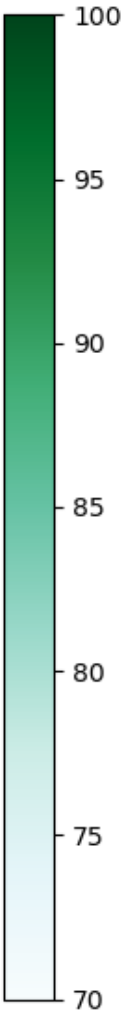
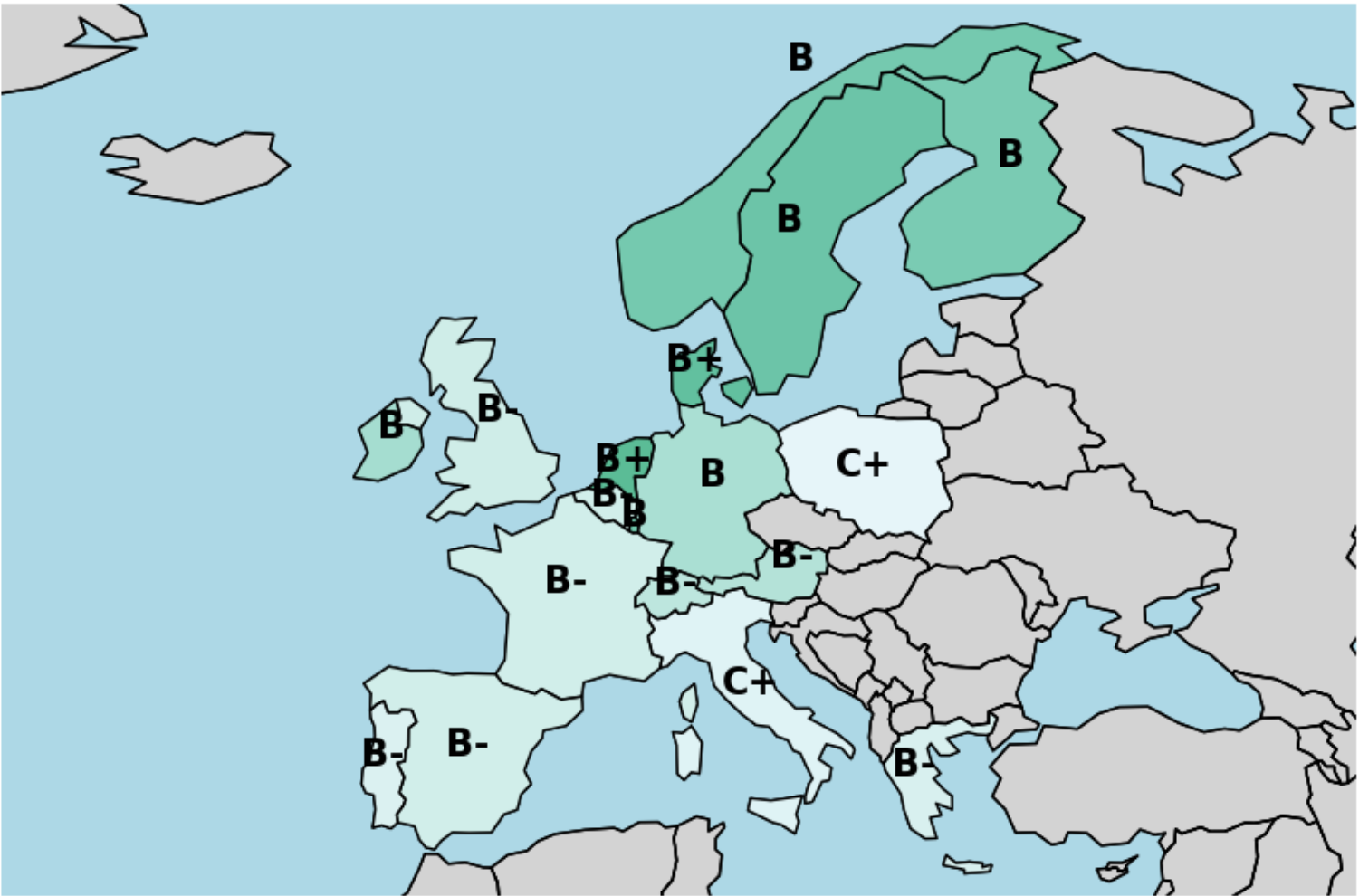


Research Images



The First Guiding Light to our Research

Score Card Results



Country	Score	Grade
Austria	79.29	B-
Belgium	76.79	B-
Denmark	85.36	B+
Finland	83.57	B
France	76.79	B-
Germany	80.00	B
Greece	75.71	B-
Ireland	80.36	B
Italy	74.64	C+
Luxembourg	84.29	B
Netherlands	86.07	B+
Norway	83.93	B
Poland	73.57	C+
Portugal	75.36	B-
Spain	76.79	B-
Sweden	84.64	B
Switzerland	78.57	B-
United Kingdom	77.14	B-



Research Question #2

What Factors Most Greatly Contribute to a Country's Preparedness towards Green Financing?



What Factors Most Greatly Contribute to a Country's Preparedness towards Green Financing?



Morgan Stanley Capital International
Leading provider of critical decision for the global investment community

Data Sources

MSCI: Internal Value Assessment
MSCI: Accounting Risk
MSCI: Governance Score

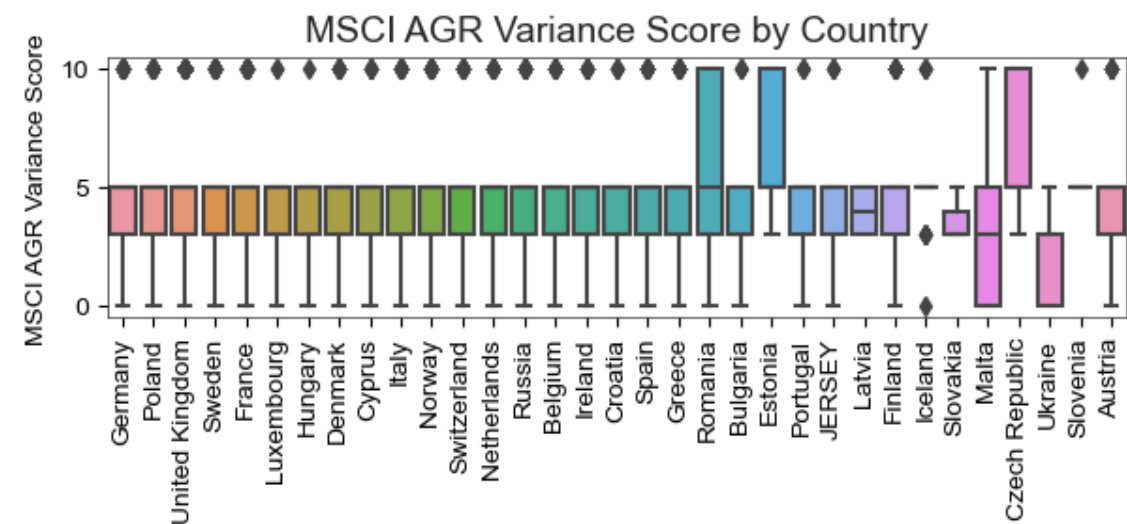
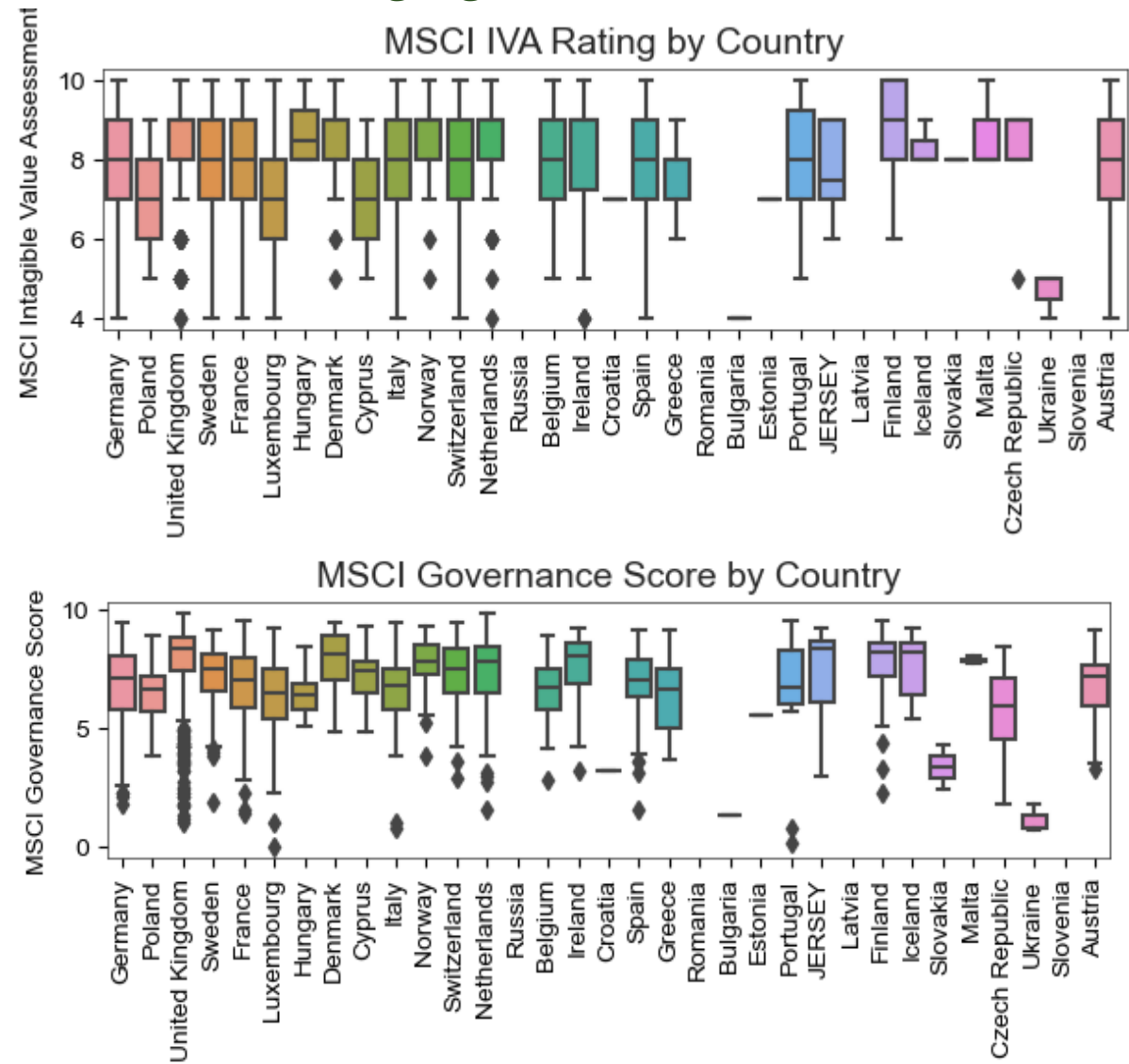
Critical Findings & Observations



Results showed how the private businesses are acting towards ESG initiatives. Heavily influenced by politics and corporate willingness for adoption and change.



The Second Guiding Light to our Research



Contributions to Research

IVA and Governance score help measure **ESG activities of the private sector**

AGR aids us to determine **investor risk for companies in that country**



What Factors Most Greatly Contribute to a Country's Preparedness towards Green Financing?



CCPI

Climate Change
Performance Index

Climate Change Performance Index

Independent monitoring tool for tracking countries' climate protection performance

Data Sources

CCPI: Greenhouse Gas

CCPI: Renewables

CCPI: Energy Use

CCPI: Climate Policy

Critical Findings & Observations

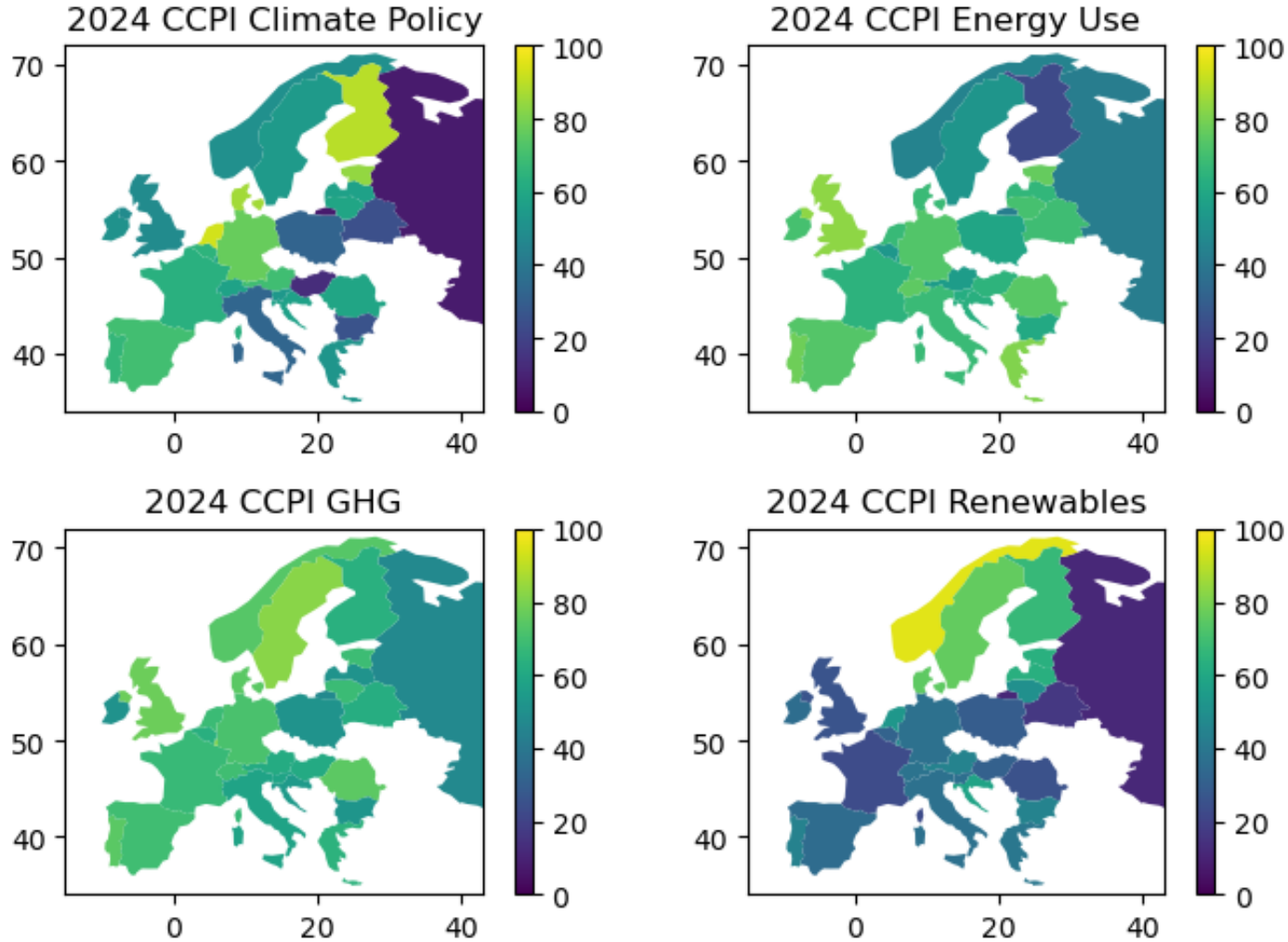


Country and Population acclimation towards sustainable methods, driven by policies. The global shift is positive in addressing challenges while fostering economic growth and societal well-being

Research Images



The Second Guiding Light to our Research



Insights

Climate Policy shows a high discrepancy between eastern and western Europe

Northern Europe has a significant lead in its **Renewable Usage**

Europe overall fairs well in the areas of **GHG Emissions** and **Energy Usage**

Research Question



The Second Guiding Light to our Research – World Population Review

What Factors Most Greatly Contribute to a Country's Preparedness towards Green Financing?

World Population Review

Turns complex demographic information into easy-to-understand articles on the population of countries and cities

Data Sources

WPR: Natural Disaster Risk Exposure
WPR: Natural Disaster Risk Vulnerability
WPR: Natural Disaster Risk Susceptibility
WPR: Natural Disaster Lack Adaptive Capacities
WPR: Natural Disaster Lack Coping Capacities

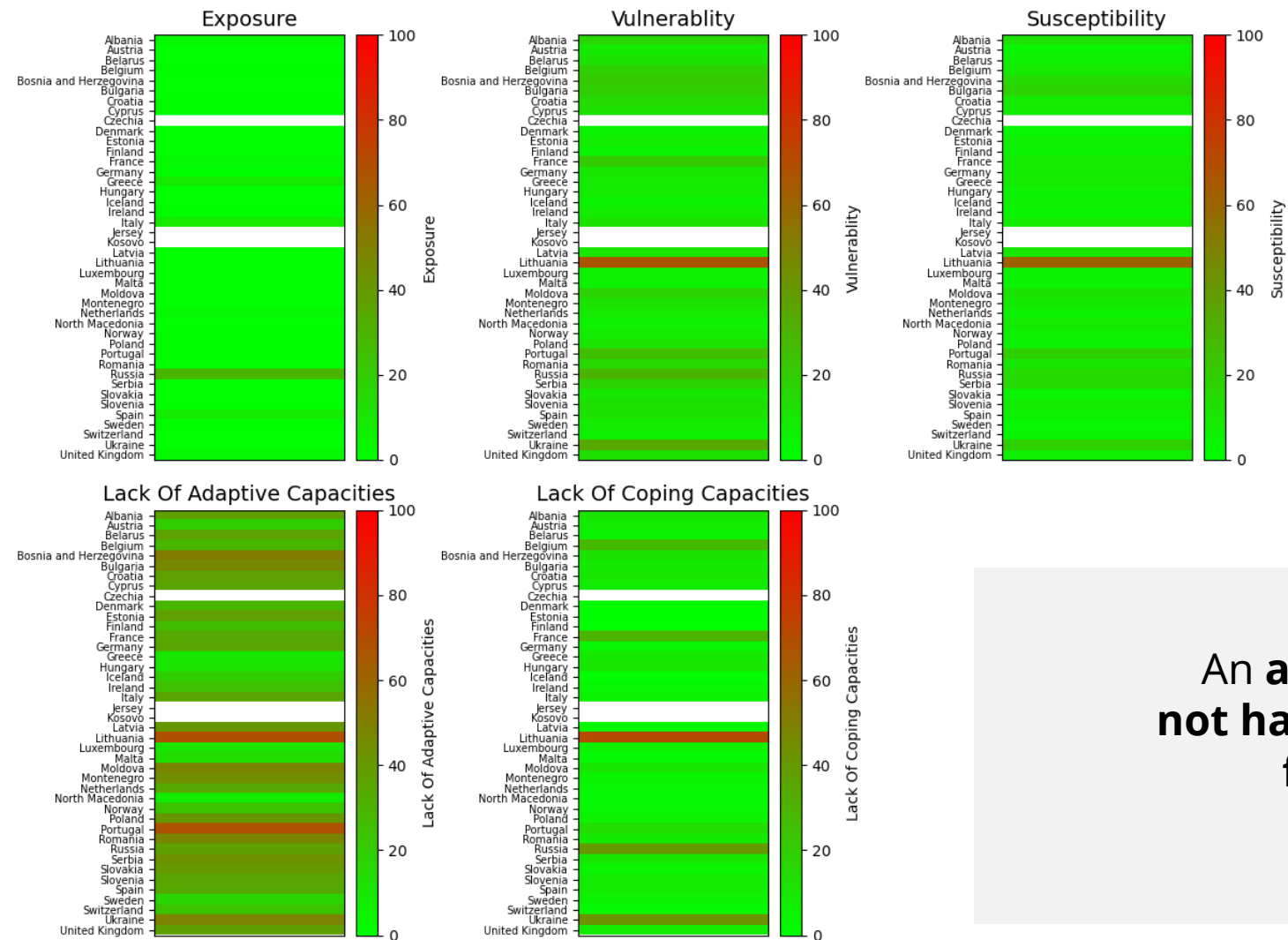
Critical Findings & Observations



The impact of climate change on green instruments, is directly affected by the available resources, ecosystems, and viability of investments.



The Second Guiding Light to our Research



Insights

Aside from Lithuania, **Europe** overall **fairs well in exposure, vulnerability, and susceptibility** to natural disasters

An **alarming number** of countries **do not have long-term (adaptive) strategies for the mitigation** of climate change **damage potential**



What Factors Most Greatly Contribute to a Country's Preparedness towards Green Financing?

Bloomberg

Bloomberg Terminal

Computer software system enabling users to monitor and analyze real-time data, news, and analytics in Finance

Data Sources

Labelled Sustainable Bonds Issued per GDP
Unlabelled Sustainable Bonds Issued per GDP

Critical Findings & Observations

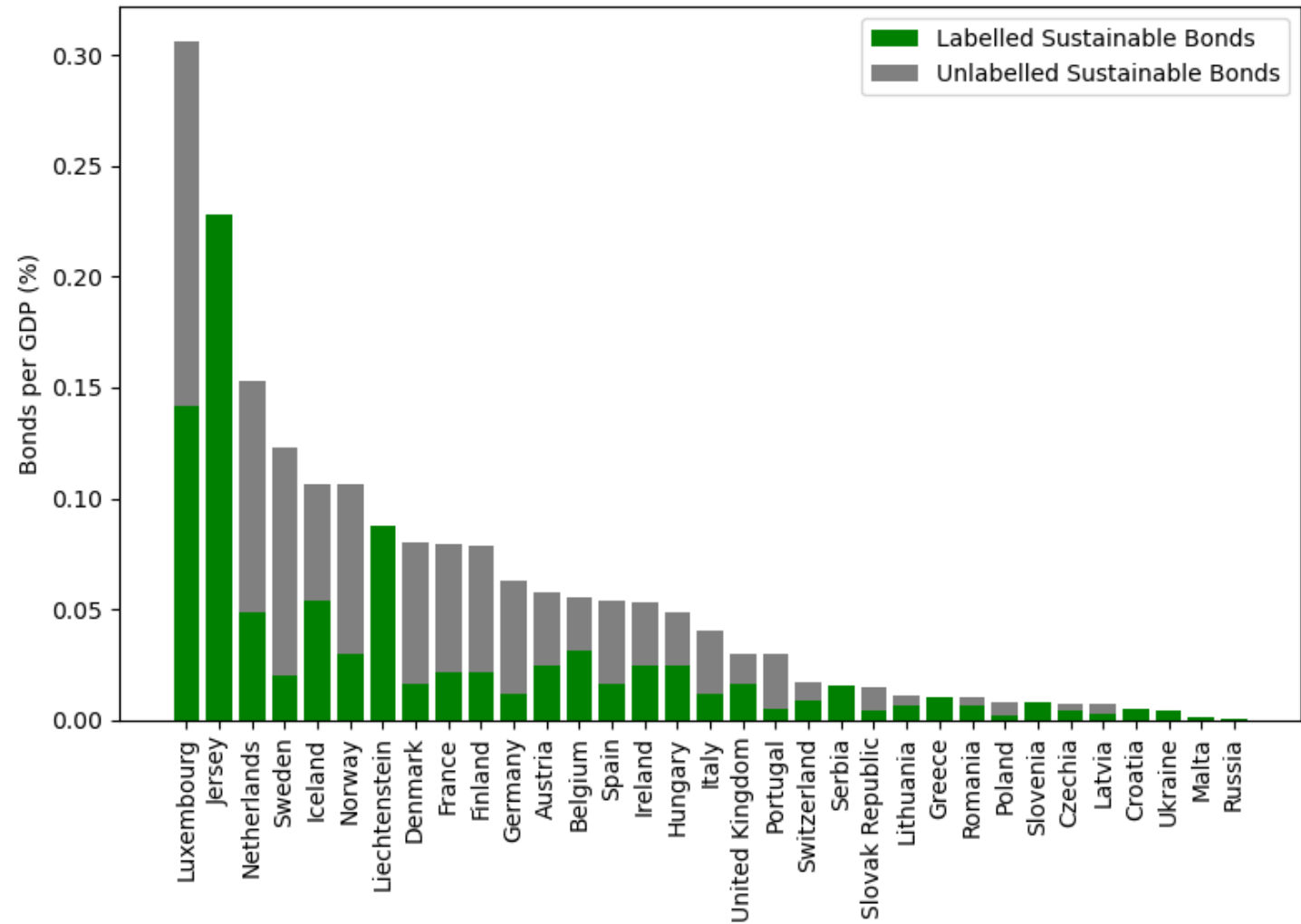


Utilization of green instruments allocate funds to sustainable, low-carbon projects is driving a shift towards a greener economy and combating climate change



The Second Guiding Light to our Research

Sustainable Bonds per GDP by Country



Contributions to Research

Normalized comparison by **using GDP** as a measure of economic power

Compare **labelled vs. unlabelled** issuance of bonds (paper 2)

Insights

Smaller economies sit at the top of the list, with **northern European nations** following

Research Question #2



In Which Areas Should Underprepared Countries Prioritize their Efforts to Achieve the 2050 Sustainability Goals?



In Which Areas Should Underprepared Countries Prioritize their Efforts to Achieve the 2050 Sustainability Goals?

Bottom 3 Countries



Portugal



Italy



Poland

Key Observations

1

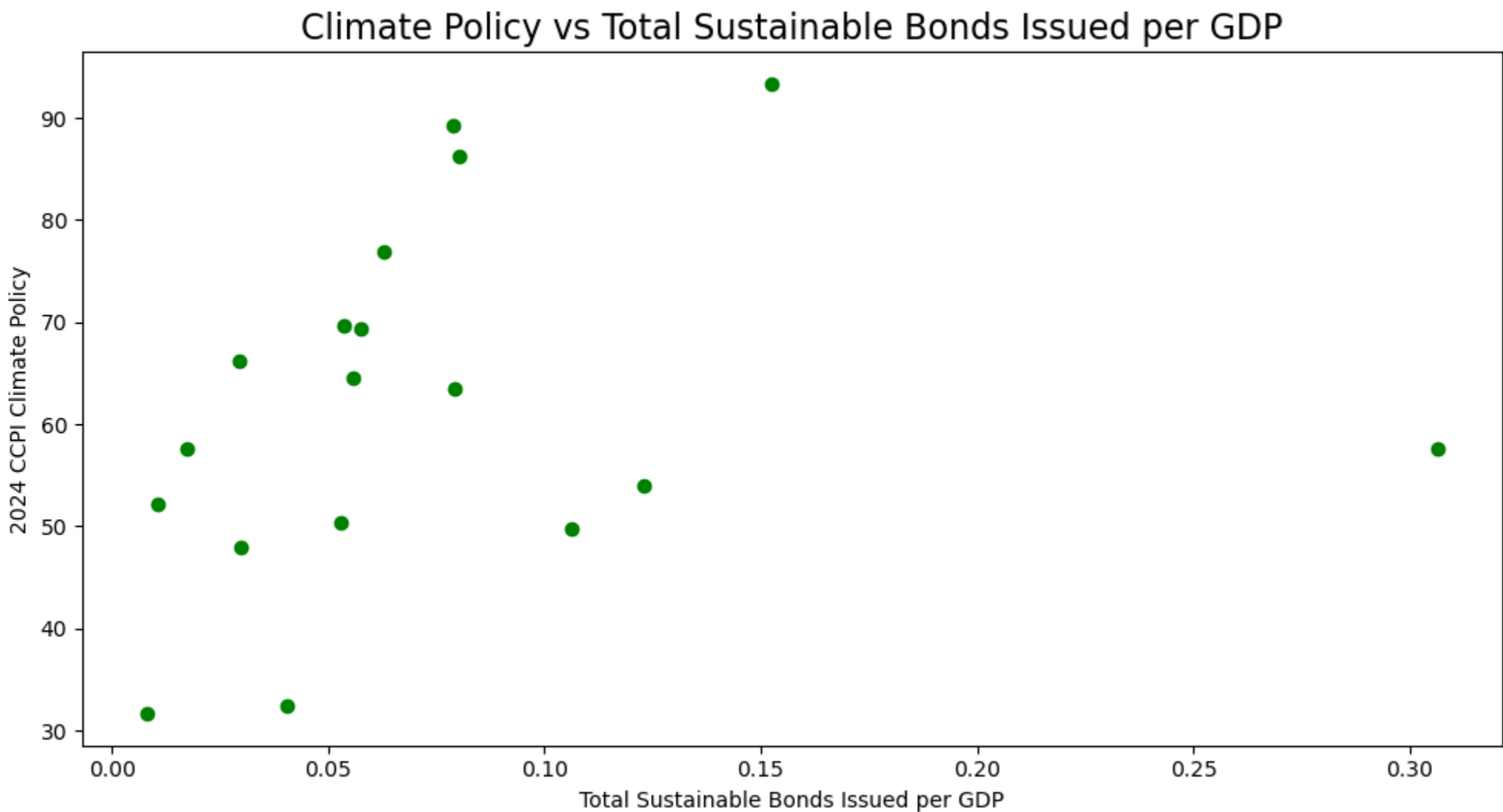
Climate Policy

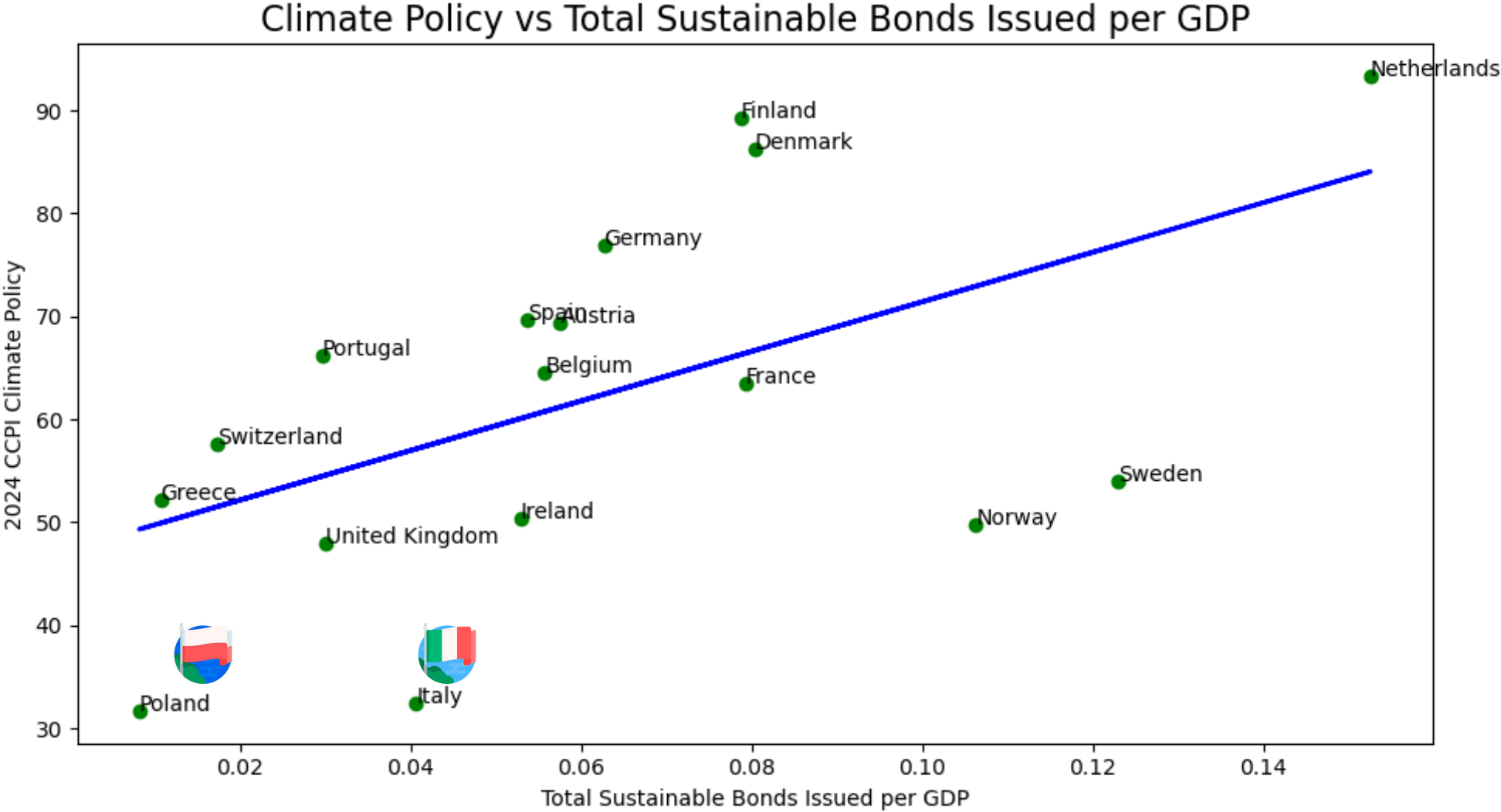
2

Bonds (Green Bonds - Finance)



The Third Guiding Light to our Research

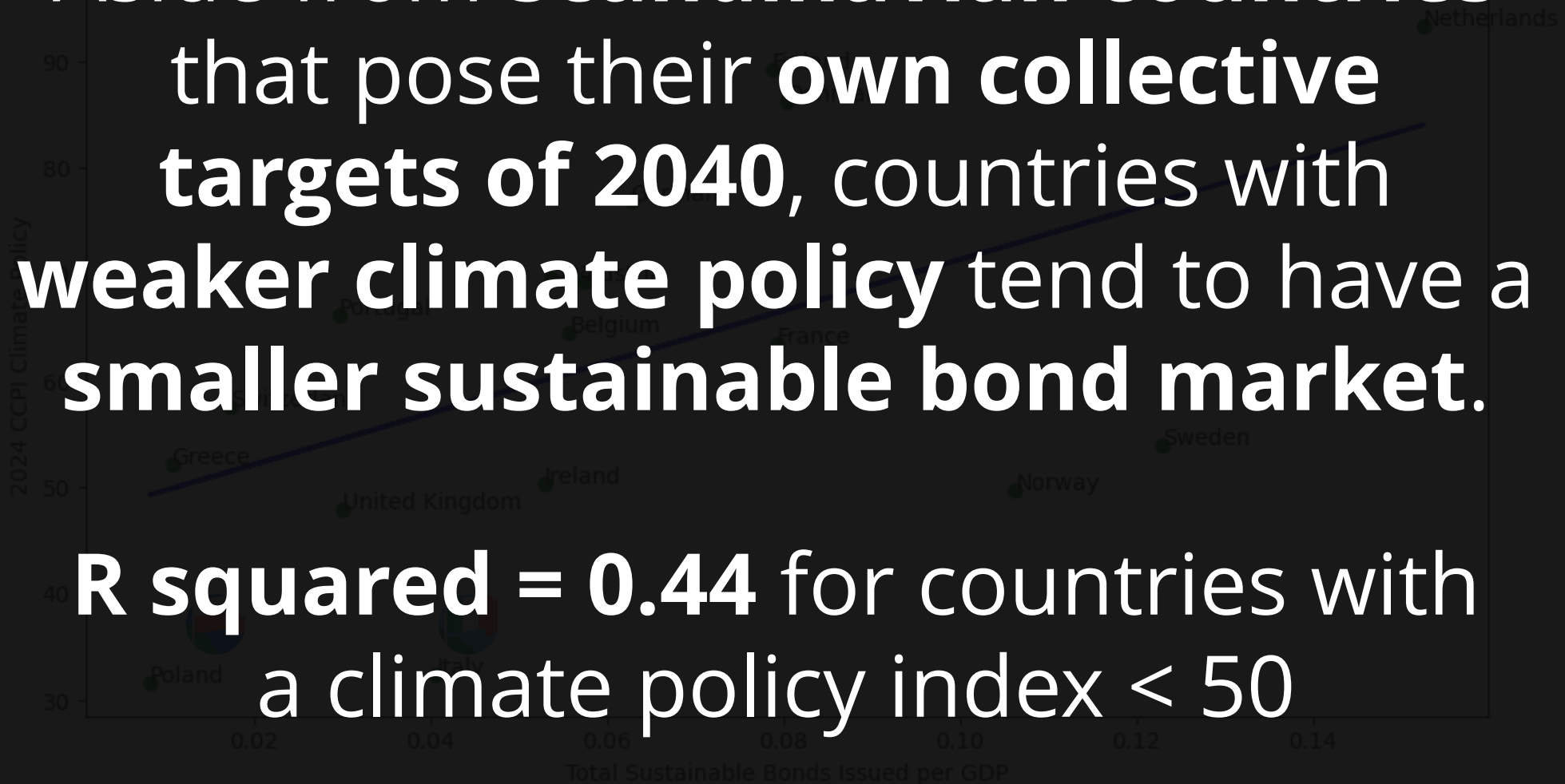






The Third Guiding Light to our Research

Aside from **Scandinavian countries** that pose their **own collective targets of 2040**, countries with **weaker climate policy** tend to have a **smaller sustainable bond market**.



Research Results

The Third Guiding Light to our Research – Climate Policy



Weak climate policy links to lower bond sustainability ratings and country governance scores.

Stronger climate policies boost bond appeal to sustainable investors and enhance governance scores, fostering resilience to climate change.



Research Results



The Significance of Green Bonds as a Deciding Factor

— GREEN BONDS —

MAIN USES



Renewable
energy



Energy
efficiency



Clean
transportation



Responsible
waste management

Green Bonds play a crucial role as a deciding factor in **sustainable investments**.

Investors increasingly **prioritize environmental considerations**, making green bonds an attractive option for financing projects with **positive environmental impacts**.

Research Results

Impact of Green Bonds on Investment Portfolios



Green Bonds in investment portfolios
diversifies risk and enhances resilience
against climate-related disruptions.



Investors can align their financial objectives with
environmental goals, contributing to both
financial returns and **positive environmental outcomes**.

Discussion



Reflection on Climate Change and Green Financing in Data Analytics

Lessons Learned



Sustainable finance is effective at encouraging sustainable projects.

Governments must create incentives for the private sector.

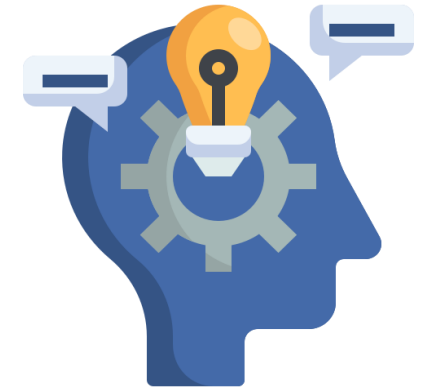
Traditional economies trail further behind.

Actions Taken



Leveraged environmental and financial data to assess and optimize data-driven investment strategies to support and drive towards sustainability goals.

Goal Reflection



Enhanced our understanding of the need for green financing to see a change in climate change impacts.

"Top Down" approach is the most effective strategy.



Data Model Adoption

Facilitating the replication of successful strategies and fostering the expansion of sustainable finance initiatives on a global scale in countries like Canada, and the United States.



Accessibility of Data



Bandwagon Effect in Adoption



Stronger Policies in Favour of Sustainable Practices



Big Players in the Private Sector To Trickle Down through Adoption & Influence



What Are The Next Steps?

Extrapolate Using ML



Can we predict the performance of other countries with less data

Attribute Relationship



Discover more relationships within established model

Government Incentives



Find available data on the buy-in from governments and the local companies

Dashboard



Developing a centralized platform to analyze data results

Data Science Capstone

Capitalizing on Climate Action Opportunities for Green Finance

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Credits & References



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