Assessing the Compatibility of Transition Plans with CBDR-RC using Asset-Level Data

Executive Summary

Authors: Saphira Rekker, Kaya Axelsson, Chris Greig, Holger Hoffman-Riem, Matthew Hornsey, David Kampmann, Adrien Rose, Mark Dekker, Anders Bjorn, Mark Roelfsema, Sue Lynn Stubbs, Belinda Wade, Gireesh Shrimali

Full paper available on SSRN:
https://papers.ssrn.com/sol3/papers.cfm?abstract_id=5427235

September 2025

Abstract

Current corporate climate assessment methods ignore equity principles central to the Paris Agreement, applying uniform decarbonization requirements regardless of national historical responsibility or capability. This study develops a comprehensive framework operationalizing Common but Differentiated Responsibilities and Respective Capabilities (CBDR-RC) at the corporate level through CS-factors—simple multipliers that transform complex equity calculations into operational corporate assessment tools. Analysis of 20 multinational companies of both steel and power using asset-level data from 124 facilities reveals that most companies exceed equity-based carbon budgets, demonstrating fundamental misalignment between current transition plans and climate justice imperatives. The research demonstrates that equity considerations can be operationalized at the corporate level, but widespread implementation requires institutional innovations that align corporate incentives with climate justice imperatives rather than relying on voluntary compliance.

Acknowledgement

The views expressed in this paper are solely the responsibility of the authors and do not necessarily reflect the opinions of the acknowledged individuals. Funding for this work was provided by Santander. We also acknowledge the input provided by Santander and would like to particularly thank Steffen Kram, Christopher Vernon, Christopher Mogridge, Charlie Liechti, and Etienne Butruille, for their contribution. Finally, we acknowledge the feedback received by participants, which included Dr Ben Caldecott, in a workshop held in Madrid on July 9, 2025.

Executive summary

Introduction

Addressing climate change requires transformation that achieves both temperature targets and equitable burden-sharing. The principle of Common but Differentiated Responsibilities and Respective Capabilities (CBDR-RC) has been central to international climate governance since the 1992 United Nations Framework Convention on Climate Change, recognizing that countries contribute unequally to climate change and differ in their capacity to respond. The 2015 Paris Agreement reaffirmed this principle while establishing the goal of limiting global warming to "well below 2°C."

Current corporate climate frameworks systematically ignore these equity principles. Corporate climate assessment methods apply uniform decarbonization requirements regardless of national historical responsibility or capability, potentially undermining the climate justice foundations necessary for effective global climate response. Without frameworks that explicitly incorporate equity principles, corporate climate action may systematically favor historical high emitters and undermine international cooperation essential for achieving Paris Agreement goals.

This misalignment poses risks for both climate effectiveness and corporate accountability. As climate litigation expands and regulatory frameworks increasingly require corporate climate disclosures that reference jurisdictional commitments and international climate agreements, companies face growing pressure to demonstrate alignment with both temperature targets and climate justice imperatives. Recent developments include UK requirements for large companies to develop Paris-aligned transition plans, EU mandates for 1.5°C-compatible transition plan disclosures, and international standards requiring disclosure of how corporate targets relate to jurisdictional climate commitments.

This study

This study develops a comprehensive framework for operationalizing international equity principles at the corporate level, extending beyond previous approaches to enable assessment of multinational companies with geographically distributed operations**.** We introduce a novel four-step methodology (Figure 1) that addresses the structural gap between international climate agreements and corporate climate governance

1. **Climate Parameter Foundation:** Establishes temperature limits, carbon budgets, and probability thresholds based on physical science
2. **Country-First Budget Allocation [equity consideration]:** Distributes global carbon budgets to countries using equity principles, accounting for historical responsibility and population
3. **Sectoral Distribution:** Allocates country budgets across sectors based on national circumstances and decarbonization feasibilities**.**
4. **Company allocation**: Allocates the national/sectoral budgets derived in step 2 and 3 to companies.

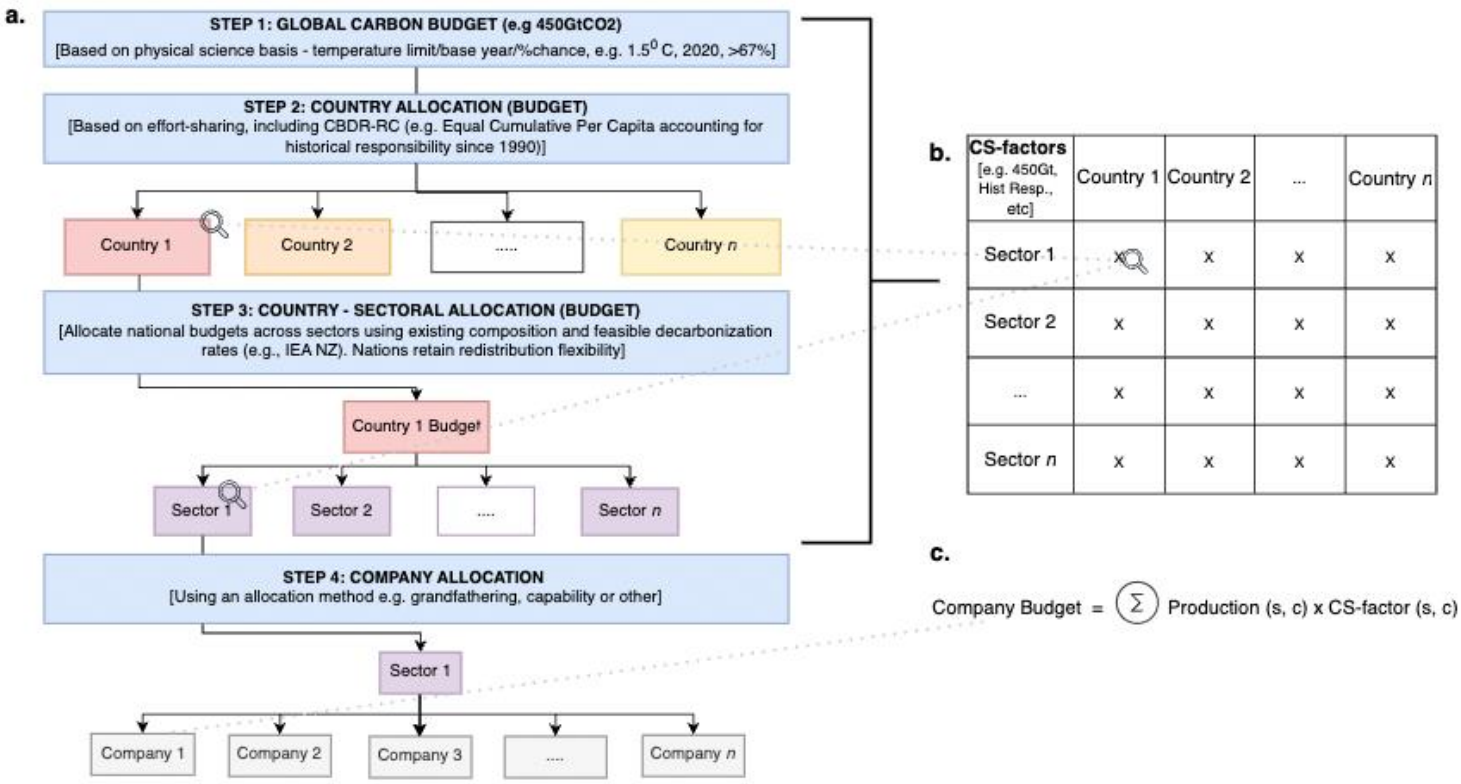

Figure 1: The four step framework, CS-factors, and company carbon budgets

The framework employs simple multipliers – CS-factors – that make equity operationally accessible as it only requires a companies' base emissions. The CS factors transform complex equity calculations involving historical emissions, population data, and capability metrics that corporations and investors can readily apply. CS-factors provide a transparent, reproducible method for translating abstract equity principles into concrete corporate carbon budget allocations.

In our framework companies inherit the equity-based responsibilities and capabilities of their host nations, providing an operationally feasible approach where multinational operations face differentiated decarbonisation requirements based on each country's historical contributions and economic capabilities.

We test this framework using comprehensive asset-level data from multinational companies. Our analysis examines 10 steel and 10 power companies using asset-level data from 124 facilities across multiple countries. We apply two equity-based allocation methods on a country level —Equal Cumulative Per Capita (ECPC, capturing historical responsibility) and Ability to Pay (AP, capturing capability)—alongside approaches that do not capture CBDR-RC; Equal Per Capita (EPC) and conventional application of Absolute Contraction Approach (ACA), comparing company transition plan scenarios against different carbon budget allocations.

This study also incorporates analysis of institutional implementation challenges and the potential evolution of climate governance frameworks. We examine how the systematic misalignment between current corporate transition plans and equity-based requirements reveals

fundamental gaps that may affect future corporate climate accountability. At minimum, the framework provides transparency by enabling stakeholders to assess whether corporate climate commitments that claim to be Paris-aligned actually align with equity principles, rather than allowing vague claims to go unchallenged.

Key findings

First, equity-based approaches fundamentally redistribute corporate climate responsibilities based on geographic footprints, with dramatically different allocations across countries. When companies inherit their host nations' equity-based responsibilities, it creates substantial variations in carbon budget allocations. For example, under ECPC allocation, operations in developing countries receive relatively large CS factors multipliers (up to 70× for India Steel operations), while developed country operations face budget constraints or negative allocations.

This redistribution represents a fundamental departure from conventional uniform approaches, where geographic location plays no role in determining corporate climate responsibilities for corporation. Under equity-based frameworks, a company's portfolio composition across countries becomes the primary determinant of its overall carbon budget allocation.

Second, despite receiving larger equity-based allocations for some countries, companies still systematically exceed their budgets across jurisdictions. The analysis reveals that companies consistently overshoot their allocated budgets even in countries where they receive larger equity-based multipliers than under non-equity allocation. For example, ArcelorMittal exceeds budgets across most countries, including India where it receives a 70× F-factor reflecting India's relatively low contribution to historical emissions.

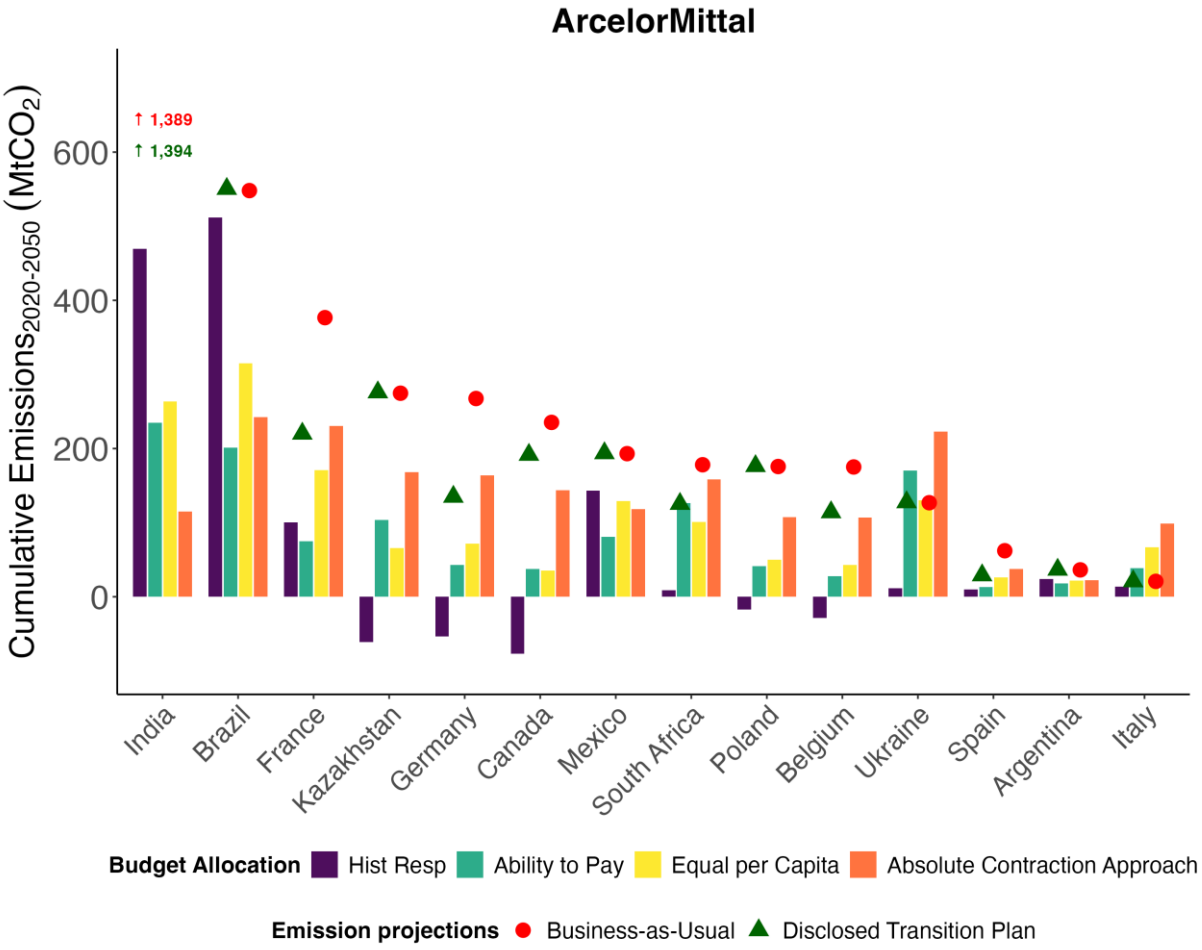

Figure 2 | Carbon budget allocations versus emissions projections for ArcelorMittal (steel). Country-specific allocations under equity-based approaches; Historical Responsibility and Ability to Pay, and conventional (EPC, ACA) approaches. Red circles show Business as Usual emissions; green triangles show Transition Plans (based on Kampmann et al, 2024). TOTAL row displays company-wide totals.

This pattern indicates that current corporate transition plans systematically fail to account for historical responsibility principles, with severe misalignment even in developing countries that receive larger equity-based allocations and often face significant decarbonization barriers. The geographic distribution of overshoot demonstrates how equity considerations fundamentally redistribute corporate climate obligations compared to uniform approaches.

Third, while companies systematically overshoot carbon budgets across all allocation methods, equity considerations typically increase the magnitude of overshoot compared to conventional approaches. Equity considerations fundamentally change the scale of budget overshoots (Figure 3). Under conventional allocation, companies typically overshoot by 2-5×, while equity-based approaches reveal extreme cases of over 330× exceedance in specific country operations. This significant difference in magnitude exposes how current uniform approaches mask the true severity of misalignment when historical responsibility and capability are properly accounted

for. Companies receive vastly different allocations based on their geographic footprint (ranging from 75× multipliers for developing country operations to negative budgets for developed country operations), yet still consistently exceed even these differentiated budgets by much larger margins.

Fourth, equity-based allocation fundamentally changes how corporate Paris alignment should be assessed. The framework reveals how different allocation principles create different assessments of corporate climate performance. Companies with significant operations in developed countries would be assessed as substantially less Paris-aligned under equity-based frameworks, while those with developing country operations would receive higher alignment scores despite often still exceeding their allocated budgets.

For example, a company might appear Paris-compliant under conventional ACA allocation but severely misaligned under ECPC allocation due to the geographic distribution of its operations. This creates fundamental questions about how corporate climate performance should be measured and reported in a world that would integrate climate justice principles captured in the Paris Agreement. Geographic footprints would become central to determining climate alignment assessments, recognizing that production typically serves local markets and reflects legitimate development needs rather than creating relocation incentives.

Fifth, implementation challenges reveal tensions between accountability and practical feasibility. The shrinking carbon budget challenge creates inherent tensions as global emissions continue above Paris-aligned pathways. The remaining carbon budget diminishes each year, requiring increasingly steep decarbonization trajectories that may become practically infeasible while maintaining accountability for historical emissions.

Data consistency challenges across scales present significant practical limitations. Comprehensive country-level data using identical methodologies is often unavailable, with substantial discrepancies between sources (e.g., 51% difference between EDGAR and IEA cement emissions data) requiring explicit methodological choices that affect framework integrity.

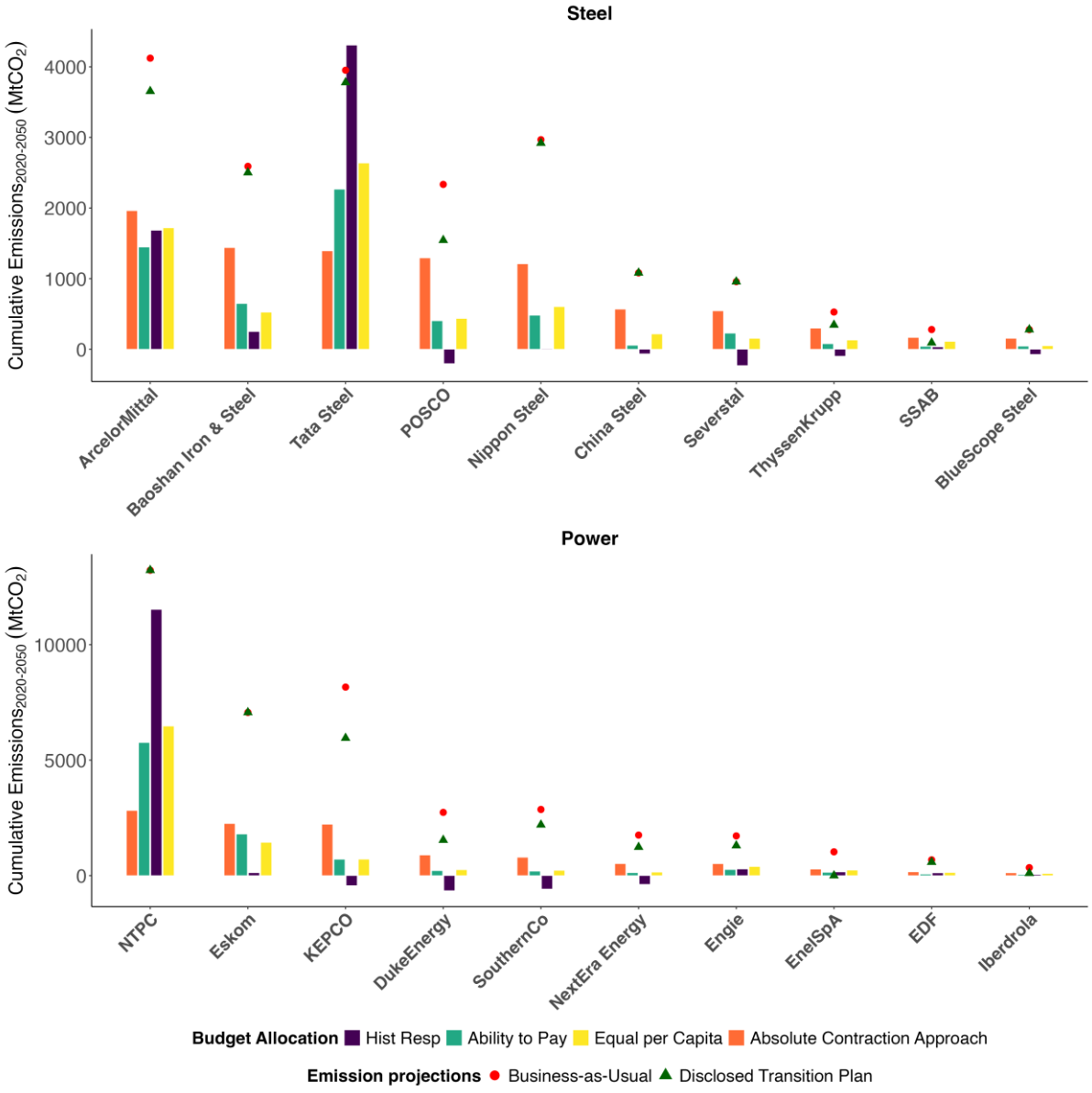

Figure 3 | Carbon budget allocations versus 2050 emissions projections for steel (a) and power (b) companies. Coloured bars show budget allocations under equity-based (ECPC, AP) and conventional (EPC, ACA) approaches. Red circles indicate Business as Usual emissions; green triangles show Transition Plans. Companies ranked by projected emissions in 2050 under BAU.

Conclusions

This study demonstrates that equity considerations central to international climate agreements can be operationalized at the corporate level through practical CS-factor methodologies. However, the analysis reveals fundamental misalignment between current corporate transition planning and climate justice principles embedded in the Paris Agreement, with geographic footprints emerging as primary determinants of corporate climate responsibility under equity-based allocation.

The findings carry profound implications for the evolution of corporate climate governance. While 82-90% of companies are expected to exceed equity-based carbon budgets compared to 85% under conventional allocation, the magnitude of overshoot increases dramatically under equity approaches (up to 330× versus typical 2-5×). This reflects how equity considerations create highly differentiated allocations - with some operations receiving much smaller budgets (or negative budgets in developed countries) while others receive larger allocations that companies still systematically exceed. As climate litigation expands and regulatory frameworks increasingly incorporate equity considerations, companies face a strategic imperative to reassess their transition plans through an equity lens.

For the investment community, this framework provides essential tools for evaluating transition risks under evolving climate governance approaches that may increasingly reflect equity-based allocation mechanisms - such as legal precedents establishing corporate climate responsibilities and regulatory requirements for Paris-aligned transition plans. The ability to quantify these risks through CS-factors enables more sophisticated capital allocation decisions and portfolio risk management in a carbon-constrained world.

The technical feasibility demonstrated by this study addresses a critical gap in climate governance tools. However, widespread adoption faces significant implementation challenges, including tensions between accountability and practical feasibility as carbon budgets shrink, and operational complexities for multinationals managing differentiated national obligations that are designed to channel development benefits toward historically disadvantaged countries. The framework also faces data consistency challenges across scales that require explicit methodological choices affecting its integrity.

This framework enables concrete decision-making across stakeholder groups. Investors can integrate CS-factors to evaluate how corporate portfolios would perform under equity-based climate governance. Regulators can incorporate equity principles into disclosure requirements to ensure transparency about companies' alignment with Paris Agreement equity provisions. Companies can use CS-factors to understand their responsibility under equity-based interpretations of Paris commitments and assess strategic implications across their geographic footprint.

The question is no longer whether equity can be operationalized at the corporate level, but whether institutional and political will exists to implement frameworks that align corporate transition strategies with climate justice imperatives. The CS-factor methodology provides the technical foundation; the challenge now lies in creating the institutional innovations necessary to

transform corporate incentives and ensure that climate action reflects both practical feasibility and principles of fairness.

Future climate governance will increasingly require tools that bridge the gap between international agreements and corporate action. This study provides a foundation for that bridge, but building it requires sustained commitment from regulators, investors, and corporations to implement frameworks that truly align climate action with climate justice.

The Smith School of Enterprise and the Environment (SSEE)

SSEE was established with a benefaction by the Smith family in 2008 to tackle major environmental challenges by bringing public and private enterprise together with the University of Oxford's world-leading teaching and research.

Research at the Smith School shapes business practices, government policy and strategies to achieve net zero emissions and sustainable development. We offer innovative evidence-based solutions to the environmental challenges facing humanity over the coming decades. We apply expertise in economics, finance, business, and law to tackle environmental and social challenges in six areas: water, climate, energy, biodiversity, food, and the circular economy.

SSEE has several significant external research partnerships and Business Fellows, bringing experts from industry, consulting firms, and related enterprises who seek to address major environmental challenges to the University of Oxford. We offer a variety of open enrolment and custom Executive Education programmes that cater to participants from all over the world. We also provide independent research and advice on environmental strategy, corporate governance, public policy, and long-term innovation.

For more information on SSEE please visit: www.smithschool.ox.ac.uk

Oxford Sustainable Finance Group

Oxford Sustainable Finance Group are a world-leading, multi-disciplinary centre for research and teaching in sustainable finance. We are uniquely placed by virtue of our scale, scope, networks, and leadership to understand the key challenges and opportunities in different contexts, and to work with partners to ambitiously shape the future of sustainable finance.

Aligning finance with sustainability to tackle global environmental and social challenges.

Both financial institutions and the broader financial system must manage the risks and capture the opportunities of the transition to global environmental sustainability. The University of Oxford has world leading researchers and research capabilities relevant to understanding these challenges and opportunities.

Established in 2012, the Oxford Sustainable Finance Group is the focal point for these activities.

The Group is multi-disciplinary and works globally across asset classes, finance professions, and with different parts of the financial system. We are the largest such centre globally and are working to be the world's best place for research and teaching on sustainable finance and investment. The Oxford Sustainable Finance Group is part of the Smith School of Enterprise and the Environment at the University of Oxford.

For more information please visit: sustainablefinance.ox.ac.uk/group