



GCET27
Global Conference on
Environmental Taxation



POTSDAM INSTITUTE FOR
CLIMATE IMPACT RESEARCH

27th Conference on Environmental Taxation

Fiscal Instruments for International Climate Action

14 – 16 September 2026, Berlin

Conference Booklet




Berlin-Brandenburgische
AKADEMIE DER WISSENSCHAFTEN


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European Association
of Environmental and
Resource Economists

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GCET27

Global Conference of
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Contents

Welcome to GCET27	3
About GCET	5
Conference Schedule*	7
Day 1	7
Day 2	8
Day 3	9
Keynote Speaker	10
Ottmar Edenhofer	10
Carolyn Fischer	10
Anant Sudarshan	11
Panelists – Panel 1	12
Susanne Dröge	12
Beatriz Martinez Romera	12
Friederike Röder	13
Sola Zheng	13
Panelists – Panel 2	14
Susanne Åkerfeldt	14
Eswaran Somanathan	14
Claudine Uwera	15
Annette Windmeißer	15
Kreiser Award	16
Detailed Schedule of Academic Conference Sessions*	17
Day 1 14 September: International environmental taxation and cooperation	17
Day 2 15 September: Climate finance and just transitions	21
Day 3 16 September: Implementation, sectors and law	25
Publication Opportunity Critical Issues	27
Venue Location	29
Social Events	30
Dinner Reception	30
Sunset boat cruise	31
Presenters' instructions	32
List of Delegates and Their Home Institutions	33
Accepted Abstracts	40



Welcome to GCET27



Prof. Dr. Jan Steckel and Prof. Dr. Matthias Kalkuhl

Dear colleagues and friends of GCET,

Welcome to GCET27 in Berlin. We are very pleased to host this year's Global Conference on Environmental Taxation and to bring the GCET community together at the Berlin Brandenburg Academy of Sciences and Humanities.

GCET27 is organised by the Potsdam Institute for Climate Impact Research (PIK). From Berlin, we have a unique vantage point on current debates where environmental taxation, public finance, climate policy, and international cooperation increasingly intersect, both in research and in practice.

This year's conference theme, **Fiscal Instruments for International Climate Action**, focuses on a core challenge of climate policy: how to mobilise financial resources at scale while designing instruments that are effective, feasible, and fair? Across the programme we will examine how environmental taxes, carbon pricing, subsidy reforms, and related market-based approaches can support mitigation and adaptation, enable just transitions, and strengthen international collaboration. We also welcome contributions that engage with the theme through legal, institutional, and sector specific lenses, including hard to abate international sectors.

A core feature of GCET is to connect rigorous, policy-oriented academic work with implementation experience from policy-makers: The parallel sessions enable deep feedback and exchange, and the keynote lectures and panels allow for a broader perspective to connect ideas across disciplines. We also encourage everyone to take advantage of the welcome reception and conference dinner as opportunities to meet new colleagues and strengthen existing collaborations.

Berlin is a fitting host city for our gathering. Shaped by a history marked by division and reunification, the city has long been a place where global challenges are confronted and new paths imagined. As host of the first Conference of the Parties to the UNFCCC, Berlin also holds a special place in the history of international climate negotiations. Visiting Berlin in September is particularly rewarding: the city returns to its full rhythm after summer, with mild weather, vibrant cultural life, and countless spaces — from historic streets to green parks and neighborhood cafés — that invite reflection and exchange



GCET27

Global Conference of
Environmental Taxation

beyond the conference rooms. We hope the city's past, present, and atmosphere will enrich the conversations we share here.

As in previous years, authors of selected papers will be invited to submit their work for consideration, subject to peer review, for publication in the Critical Issues in Environmental Taxation series.

GCET27 has secured funding to support speaker participation and promote a diverse and inclusive conference. Thanks to the generous support of the Berlin-Brandenburg Academy of Sciences and Humanities (BBAW) and the German Research Foundation (DFG), a limited number of registration fee waivers and travel grants are available for accepted speakers.

We are grateful to all speakers, chairs, reviewers, and participants who make GCET possible. We wish you a stimulating conference and a warm, collegial stay in Berlin.

With best regards,

Prof Dr Jan Steckel

Prof Dr Matthias Kalkuhl

GCET27 Chairs

Potsdam Institute for Climate Impact Research (PIK)

On behalf of the GCET International Steering Committee

Prof. Mikael Skou Andersen

Prof. Hope Ashiabor

Prof. Janet Milne



About GCET

The Global Conference on Environmental Taxation (GCET) has been held annually since 2000 and is the leading global forum for interdisciplinary exchanges on the principles and practices of environmental taxation and other market-based instruments to address climate change, protect the environment and promote a just energy transition.

The annual conferences provide an international and interdisciplinary environment to explore issues relating to the design and implementation of environmental taxes and opportunities to network to explore a range of theoretical and practical issues. The conferences are not intended to advance any specific environmental agenda, but rather to advance knowledge and foster international collaboration. We welcome individuals from the global North and South to exchange ideas and share their expertise on environmental issues facing their respective countries, including:

- › Early career scholars and researchers from universities and higher education institutions in the fields of law, economics, taxation, accounting, public administration, environmental studies, political economy and more;
- › Government officials at all levels of administration, including provincial, state and territorial ministries and departments of finance, taxation, transport, urban design, energy, water, environment and natural resources;
- › Representatives of international and non-governmental organizations (such as the World Bank, OECD and UN), tax and accounting professionals, private sector executives and other experts.

Previous GCET conferences

Previous conferences have been held in:

- › Cleveland, Ohio, USA (2000),
- › Vancouver, Canada (2001),
- › Woodstock, Vermont, USA (2002),
- › Sydney, Australia (2003),
- › Pavia, Italy (2004),
- › Leuven, Belgium (2005),
- › Ottawa, Canada (2006),
- › Munich, Germany (2007),
- › Singapore (2008),
- › Lisbon, Portugal (2009),
- › Bangkok, Thailand (2010),
- › Madrid, Spain (2011),
- › Vancouver, Canada (2012),
- › Kyoto, Japan (2013),
- › Copenhagen, Denmark (2014),
- › Sydney, Australia (2015),
- › Groningen, Netherlands (2016),
- › Tucson, USA (2017),
- › Madrid, Spain (2018),
- › Limassol, Cyprus (2019),
- › Parma, Italy (2022),
- › Paris, France. (2023),
- › Stellenbosch, South Africa (2024) and
- › Porto Alegre, Brazil (2025).

The conferences in 2020 and 2021 were held as virtual events.



Young Researcher Award

One of the key objectives of GCET is the promotion of junior contributions and the fostering of state-of-the-art scientific research. Accordingly, any student or researcher younger than 35 years of age (as of 31 May 2026) may be considered for the "GCET27 Young Researcher Award" if their abstract has been accepted and they have registered for the conference. This year's award will be presented during the second conference day.

Scientific Committee

The GCET Conference organisers would like to express their sincere gratitude to the following members of the Scientific Committee for their valuable contribution and dedicated efforts in reviewing submissions for this year's conference:

- › **Achim Hagen** — Humboldt University of Berlin
- › **Christian Flachsland** — Hertie School
- › **Elena Verdolini** — University of Brescia & RFF-CMCC European Institute on Economics and the Environment
- › **Jan Steckel** — Potsdam Institute for Climate Impact Research (PIK) & TU Munich
- › **Johannes Gallé** — Potsdam Institute for Climate Impact Research (PIK)
- › **Lennart Stern** — Potsdam Institute for Climate Impact Research (PIK)
- › **Matthias Kalkuhl** — Potsdam Institute for Climate Impact Research (PIK) & University of Potsdam
- › **Max Kellner** — Potsdam Institute for Climate Impact Research (PIK)
- › **Michael Jakob** — Hertie School
- › **Roland Ismer** — University of Potsdam
- › **Sophia Piotrowski** — University of Potsdam
- › **Sreoshi Banerjee** — Potsdam Institute for Climate Impact Research (PIK)
- › **Thomas Sterner** — University of Gothenburg
- › **Waldemar Marz** — ifo Institute
- › **Xaquín García** — Basque Centre for Climate Change (BC3)



Conference Schedule*

* A detailed schedule of the parallel academic conference sessions can be found from page 17 onwards.

Day 1

Day 1: International environmental taxation and cooperation	
08:00 am	Registration & coffee
09:00 am	Welcome
09:15 am	Keynote 1: <u>Ottmar Edenhofer</u> (PIK and TU Berlin)
10:30 am	Coffee break
11:00 am	Parallel sessions 1, 2, 3 & 4
01:00 pm	Lunch
02:00 pm	Parallel sessions 5, 6, 7 & 8
04:00 pm	Coffee break
04:30 pm	Panel 1: Extra-territorial taxation (aviation, maritime shipping, CBAM) • <u>Susanne Dröge</u> - German Institute for International and Security Affairs (SWP) • <u>Friederike Röder</u> - Global Solidary Levies Task Force • <u>Beatriz Martinez Romera</u> - Centre for Climate Change Law and Governance, University of Copenhagen • <u>Sola Zheng</u> - International Council on Clean Transportation Moderation: <u>Matthias Kalkuhl</u>
06:00 pm	End of the scientific programme on day 1
07:00 pm	Social Event: Reception & dinner with Kreiser Award presentation - optional



GCET27

Global Conference of
Environmental Taxation

Day 2

Day 2: Climate finance and just transitions	
08:30 am	Arrival & coffee
09:00 am	Keynote 2: <u>Carolyn Fischer</u> (World Bank)
10:15 am	Coffee break
10:45 am	Parallel sessions 9, 10, 11 & 12
12:45 pm	Lunch
01:45 pm	Parallel sessions 13, 14, 15 & 16
03:45 pm	Coffee break
04:15 pm	Panel 2: International climate finance in practice • <u>Susanne Åkerfeldt</u> – Ministry of Finance, Sweden • <u>Eswaran Somanathan</u> – Indian Statistical Institute • <u>Claudine Uwera</u> – former Minister for the Environment and Finance in Rwanda, now senior advisor to the Prime Minister • <u>Annette Windmeißer</u> – German Federal Ministry for Economic Cooperation and Development Moderation: <u>Jan Steckel</u>
05:45 pm	Young Researcher Award presentation
06:00 pm	Announcement of GCET28
06:15 pm	End of the scientific programme on day 2
07:00 pm	Social Event: Sunset boat cruise - optional



Day 3

Day 3: Implementation, sectors and law	
08:30 am	Arrival & coffee
09:00 am	Keynote 3: <u>Anant Sudarshan</u> (University of Warwick)
10:15 am	Coffee break
10:25 am	Parallel sessions 17, 18, 19 & 20
12:25 pm	Closing & summary
12:40 pm	Lunch
01:30 pm	End of the conference
03:00 pm	Side event: Climate Policy for Development (personal invitation only)*

* The side event will take place at PIK Berlin: → EUREF Campus 19, Torgauer Straße 12-15, 10829 Berlin



Keynote Speaker

Ottmar Edenhofer



Ottmar Edenhofer is Director and Chief Economist of the Potsdam Institute for Climate Impact Research and Professor for The Economics and Politics of Climate Change at the Technische Universität Berlin. Furthermore, he is Chair of the European Scientific Advisory Board on Climate Change (ESABCC).

Carolyn Fischer

Carolyn Fischer is a Lead Economist focusing on climate and energy challenges in the Planet Team of the World Bank's Development Research Group. Her research addresses topics of environmental policy instrument design at the intersection with technical change, trade, development, carbon leakage, and overlapping objectives. She has held appointments as a professor of environmental economics at the Vrije Universiteit Amsterdam and as a Canada 150 Research Chair in Climate Economics, Innovation and Policy at the University of Ottawa. She spent the first 20 years of her career at Resources for the Future (RFF), where she continues to enjoy a Senior Fellow affiliation, along with the RFF-CMCC European Institute on Economics and the Environment, and is a member of the CESifo Research Network. She has served on the boards of both the American and European Association of Environmental and Resource Economists, editorial boards of leading environmental economics journals, and expert advisory boards for research institutes and programs in Europe and in North America. She earned her Ph.D. in Economics from the University of Michigan, Ann Arbor.





Anant Sudarshan



Anant Sudarshan is a Professor at the Department of Economics at the University of Warwick. He was previously the South-Asia Director of the Energy Policy Institute at the University of Chicago and taught at the Harris School of Public Policy at the University of Chicago. His research spans several aspects of energy and environment policy including the design of environmental regulation, reducing air-pollution, climate change, energy efficiency, electricity access, and renewable energy policy.



Panelists – Panel 1

Susanne Dröge

Susanne Dröge is a Senior Fellow and Head of the Climate and Energy Policy Cluster at the Berlin-based German Institute for International and Security Affairs (SWP). She holds a Ph.D. in economics. Susanne has a long-standing work experience in climate and trade, international climate negotiations, foreign climate policy. Her research includes border carbon adjustment design and carbon markets, the EU's, US's, China's and other countries' climate policy strategies. Susanne is a member of the Sino-German Track-2-Dialogue. She advises the German Parliament, the German Government and various international organisations. She is a member of the Presidium Deutscher Evangelischer Kirchentag.



Beatriz Martinez Romera



Dr. Beatriz Martinez Romera is associate professor of environmental and climate change law at the University of Copenhagen Faculty of Law. She has a keen interest in the international climate negotiations, and the regulatory processes at the International Civil Aviation Organization and the International Maritime Organization, as well as the developments at the EU level. For the last 13 years Dr. Martinez Romera has been teaching and researching on the field of climate, environment and energy transition law. She is the coordinator of the master courses on Climate Change Law and International Environmental Law and the Advanced LLM on

Energy Law (NSEL). In 2020 she was awarded the Young Investigator Carlsberg Foundation Grant for a 3-year project on International Law-Making: Actors in Shipping and Climate Change. She is PI for a number of research projects including the Independent Research Fund Denmark project Enhancing Climate Action through International Law and the NOS-HS project Climate Change and Ocean Governance: Understanding International and Regional Ocean Regimes through the Lens of Climate Change.



Friederike Röder

Friederike Röder leads the Secretariat of the Global Solidarity Levies Task Force (GSLTF), playing a key role in advancing international efforts to mobilize additional funding for climate action and sustainable development. She was instrumental in the launch of the first coalition of the willing on solidarity levies—the Premium Flyers Coalition—in June 2025 in Seville. Friederike also leads the International Finance work at the European Climate Foundation (ECF) and co-hosts the secretariat of the Green Guarantee Group (GGG). With over 20 years of experience in development cooperation, climate finance, and governance, Friederike Röder brings a deep understanding of both public policy and civil society advocacy. Prior to joining the Task Force, she held senior leadership positions at Global Citizen and the ONE Campaign. Her career has also included work with the African Union, the German government, the OECD, and the Arab Reform Initiative.



Sola Zheng



Sola Zheng is a Senior Aviation Researcher at the International Council on Clean Transportation (ICCT). Her work focuses on the environmental impacts of air travel and related policymaking processes. Specifically, Sola has published reports on aircraft fuel efficiency, flight emissions inventory, aviation carbon pricing, frequent flyer levies, and decarbonization roadmaps. She currently leads research projects and policy engagement on EU ETS, CORSIA, and solidarity levy. Sola holds a Master of Environmental Management from Yale University.



Panelists – Panel 2

Susanne Åkerfeldt

Susanne Åkerfeldt is a Senior Adviser, with more than 30 years of experience of fiscal climate policy design through her work at the Swedish Ministry of Finance. Her work has included fine-tuning the Swedish carbon tax as well as pursuing national green tax reforms and aiming for EU legislation to better reflect the Polluters Pay Principle. Her knowledge of the EU CBAM is extensive. She has been seconded by the Swedish Government to the EU Commission in 2021-2022, being the main legal drafter of the EU CBAM proposal and to the World Bank Group in 2024-2026, focusing on climate aspects of fiscal policy for developing countries. She has been engaged in global climate policy for many years within the framework of the UN, as co-coordinator of the UN Subcommittee on Environmental Taxation. Susanne has a Master of Laws degree from Uppsala University and received the GCET's Kreiser Award in 2020.



Eswaran Somanathan



Somanathan is Professor in the Economics and Planning Unit of the Indian Statistical Institute in Delhi. His research is in the economics of environment and development. He received his PhD from Harvard University and has taught at Emory University, the University of Michigan, and Princeton University. He has been Executive Director of SANDEE (South Asian Network for Development and Environmental Economics), a Co-ordinating Lead Author for the Fifth Assessment Report of the IPCC, a Fellow at the Center for Advanced Study in the Behavioral Sciences at Stanford University, and was the editor of the journal Environment and Development Economics.



Claudine Uwera

Dr. Claudine Uwera is an economist and environmental policy expert serving as Senior Strategic Advisor in the Office of the Prime Minister of Rwanda. She holds a PhD in Environmental Economics from the University of Gothenburg and has over two decades of experience in economic planning, public finance, and sustainable development. Her work focuses on integrating biodiversity, ecosystems, and natural resources into national policy, planning, and investment frameworks to support green growth and climate resilience.

She previously served as Minister of State in charge of Economic Planning and Minister of State for the Environment, where she led reforms on environmental governance and sustainable development. Dr. Uwera also served as Country Coordinator for Rwanda's Natural Capital Accounting program under the World Bank WAVES Initiative, contributing to the development of practical tools that link environmental sustainability with economic decision-making in African economies.



Annette Windmeißer



Since 2000 Dr. Annette Windmeisser has held various positions in the German Federal Ministry for Economic Cooperation and Development, i.a. in policy and sectoral divisions, and became Chief Legal Counsel in 2013. She also served as head of development cooperation at the German embassies in Uganda and Brazil, and was appointed head of Climate Finance in 2021. In this position she is responsible for the German approach to the international climate finance architecture, representing Germany in the Climate Investment Funds, the Global Environment Facility and the Green Climate Fund. She also leads on questions around the New Collective Quantified Goal and in particular private sector mobilization, including carbon markets.

Dr. Windmeisser studied Law in Hamburg and UK, and after research in the South Pacific obtained a Doctorate from the University of Vienna under the supervision of Prof. Dr. Manfred Nowak (Ludwig Boltzmann Institute for Human Rights). Her thesis explores the impact of the human rights approach to development cooperation



Kreiser Award

The Kreiser Award recognizes individuals who have made an outstanding contribution to the advancement of economic instruments in environmental policy or to the field of environmental taxation. The award is named after Professor Emeritus Larry Kreiser of Cleveland State University in Ohio. His vision led to the creation of the Global Conference on Environmental Taxation: a forum that brings together experts from different disciplines and countries to foster exchange between academic research and practical experience in environmental policy. The recipient is selected each year by the chairs of that year's conference.

**At the twenty-seventh Global Conference on Environmental Taxation,
the Kreiser Award will be presented to Dr. Peter Liese.**



A physician by training, Peter Liese has served continuously as a Member of the European Parliament since 1994, making him one of its longest-serving members. For more than three decades, he has dedicated himself to European environmental and climate policy. He serves on the Committee on the Environment, Climate and Food Safety and the Committee on Public Health and coordinates the work of the European People's Party Group on environmental and climate matters.

Above all, the award recognizes Peter Liese's tireless and unwavering commitment to the European Union Emissions Trading System. He has been a driving force behind its development into one of the world's largest and most influential market-based instruments for climate policy. His contribution extends far beyond legislative negotiations and public debate. Advancing emissions trading has required an extraordinary and sustained effort to persuade, build trust, and find common ground—among political allies as well as political opponents. Peter Liese has carried out much of this essential work patiently and persistently, often away from the public eye.

The conference chairs are therefore delighted to honor Dr. Peter Liese for his exceptional dedication to European emissions trading, his pivotal role in shaping carbon-pricing legislation, and his lifelong commitment to effective, fair, and evidence-based climate policy. His ability to combine ambitious environmental goals with political and economic realities has made a lasting contribution to climate policy in Europe and beyond.

Former Recipients of the Award

- | | | |
|-------------------------------|-------------------------------|------------------------------|
| › 2006 – Nancy Olewiler | › 2013 – Kazuhiro Ueta | › 2020 – Susanne Åkerfeldt |
| › 2007 – Ernst von Weizsäcker | › 2014 – Hans J. Larsen | › 2021 – Janet E. Milne |
| › 2008 – Hope Ashiabor | › 2015 – Bob Carr | › 2022 – Aldo Ravazzi Douvan |
| › 2009 – Alberto Majocchi | › 2016 – Hans Vos | › 2023 – Frank Convery |
| › 2010 – Rae Kwon Chung | › 2017 – Ethel Branch | › 2024 – Cecil Morden |
| › 2011 – Eduardo Merigo | › 2018 – Pedro Herrera Molina | › 2025 – Cláudia Lima Marq |
| › 2012 – Kathryn Harrison | › 2019 – Paul Ekins | |



Detailed Schedule of Academic Conference Sessions *

* This schedule will also be available during the conference via the QR code on name tags.

Day 1 | 14 September: International environmental taxation and cooperation

Parallel Sessions 1, 2, 3 & 4 | 11:00 am - 1:00 pm

Session 1 Room: “Konferenzraum 1” CBAM I – Legal & Institutional			
Presenter	Affiliation	Abstract Title	Co-authors
Dilara İnal & Yoner Ojeda Pinto	WU - Institute for Austrian and International Tax Law	Recognising Carbon Effort Across Borders: the Coordination Gap Under EU CBAM Rules	–
Alice Pirlot	Geneva Graduate Institute	The International Coordination of Carbon Taxation	–
Goran Dominioni	Dublin City University	The constitutional boundaries of climate clubs	Harro van Asselt, Julien Bétaille, Chhaya Bhardwaj, Fabrice Bin (...)
María del Carmen Cámara Barroso (Chair)	Universidad a Distancia de Madrid	The future of CBAM? Redesigning the EU Carbon Border Adjustment to Align Carbon Pricing, Climate Finance and Competitiveness	Marta Villar Ezcurra

Session 2 Room: “Leibniz Saal” Political Economy I: Public Acceptance			
Presenter	Affiliation	Abstract Title	Co-authors
Jeroen Barrez	KU Leuven	How tailored financial impact information and revenue use shape preferences for carbon pricing policies	Sandra Rousseau, Stijn Van Houtven
Kris Bachus	University Antwerpen	Piecing Together the Puzzle: Can Policy Packaging Make Carbon Pricing Work?	Jeroen Barrez
Lisa-Marie Mahlberg	Potsdam Institute for Climate Impact Research (PIK)	Climate of the Elites: Elites and Climate Policy Preferences Across Lower and Middle Income	Ganesh Gorti, Jan Christoph Steckel
Matteo Zuch	Technical University of Denmark (DTU)	From Local Exposure to National Policy Support: The relationship between renewable energy exposure and public acceptance of CO2 taxation in Denmark	Alberto Molina Valdeolivas, Jacob Ladenburg, Christian Martin Bauer, Ugur Soytaş
Leonard Missbach (Chair)	Potsdam Institute for Climate Impact Research (PIK)	Fair, effective and understood: EU citizens' perspectives on the EU ETS2	–



Session 3 | Room: “Konferenzraum 2” | Fiscal Policy I – Macro Perspectives

<i>Presenter</i>	<i>Affiliation</i>	<i>Abstract Title</i>	<i>Co-authors</i>
Max Franks	Potsdam Institute for Climate Impact Research (PIK)	When Carbon Taxes Beat VAT in Fiscal Policy: The Role of Informality	Lushanya Dayathilake, Raavi Aggarwal, Linus Mattauch
Yassmina Abdelazim	ESCP Business School	Climate Policy as Fiscal Policy: Debt Dynamics, Policy Design, and Global Value Chains	–
Alexander Sicheneder	Helmholtz Zentrum Berlin	Breaking the carbon pricing trap: A co-financing fund concept for Ukraine’s Reconstruction-Accession Challenge	Georg Zachmann, Oleh Savitskyi
Theodoros Zachariadis (Chair)	The Cyprus Institute	Helping Economic Policymakers Navigate through Ambitious Climate Policies	–

Session 4 | Room: “Konferenzraum 3” | Frontier & Emerging Tax Instruments

<i>Presenter</i>	<i>Affiliation</i>	<i>Abstract Title</i>	<i>Co-authors</i>
Jana Leutner	Green Budget Germany (GBG)/Forum Ökologisch-Soziale Marktwirtschaft e.V. (FÖS)	Climate Debt and Carbon Wealth Taxation	Denise Rösler, Yunus Röder, Hana van Loock, Henning Giesen, Ole Nekarda
Lee-Ann Steenkamp	Stellenbosch University, South Africa	Beyond Climate Corporate Compliance: South Africa’s Carbon Tax and King V Outcomes-Based Governance	–
Matthew Agarwala	Bennett Institute for Innovation & Policy Acceleration, University of Sussex	Designing taxes for sustainability in the age of AI	Felix Creutzig
Lennart Stern	Potsdam Institute for Climate Impact Research (PIK)	Aviation Levy Coalition Mechanisms	Carolin Baltzer, Matthias Kalkuhl
Janet Milne (Chair)	Vermont Law School	Critical Minerals, Taxation and the Energy Transition: A Cosmic Collision?	–



Parallel Sessions 5, 6, 7 & 8 | 2:00 - 4:00 pm

Session 5 Room: “Leibniz Saal” CBAM II – Economic & Trade Impacts			
<i>Presenter</i>	<i>Affiliation</i>	<i>Abstract Title</i>	<i>Co-authors</i>
Geoffroy Dolphin	Oxford Economics / Energy Policy Research Group (Cambridge)	The EU’s CBAM: implications for member states and trading partners	Gianluigi Ferrucci
Johannes Gallé	Potsdam Institute for Climate Impact Research (PIK)	Between and Within Countries: The Distributional Effects of the EU CBAM	Timothé Beaufils, Michael Jakob, Matthias Kalkuhl, Jan Steckel, Joschka Wanner
Maximilian Fuchs	Bruegel	Carbon Pricing Beyond Borders: Assessing Climate Policy Spillovers from the EU CBAM	Anna Bahí, Camille Reverdy
Philipp C Verpoort	Potsdam Institute for Climate Impact Research (PIK)	Supply-chain emissions of fossil fuels imported by the EU27: Options for regulation and implications	Gunnar Luderer, Frederike Bartels, Christian Bauer, Michael Jakob, Christopher Leisinger, Falko Ueckerdt, Ottmar Edenhofer
Knut Einar Rosendahl (Chair)	Norwegian University of Life Science	Competitiveness impacts of anti-leakage instruments	Christoph Böhlinger

Session 6 Room: “Konferenzraum 1” Aviation & Shipping			
<i>Presenter</i>	<i>Affiliation</i>	<i>Abstract Title</i>	<i>Co-authors</i>
Arved Dörpinghaus	Potsdam Institute for Climate Impact Research (PIK)	Welfare Gains Through Fuller Planes? Efficiency-Enhancing Tax Reforms in the Aviation Sector	Lennart Stern, Matthias Kalkuhl
Niyanta Shetye & Jan Marinko	PtX Lab Lausitz Praxislabor für strombasierte Kraft- und Grundstoffe aus grünem Wasserstoff	Re-calibrating International Aviation Carbon Governance for Paris aligned pathways	Oliver Schöttker, Anja Paumen, Martin Hock, Felix Schmermer
Rodolfo Salassa Boix	Pompeu Fabra University of Barcelona (Spain)	Charting the Course of Environmental Taxation to Reduce the Air Emissions from Maritime Transport	–
Sofie Mijic Kampp	University of Copenhagen, Faculty of Law	The IMO Net-Zero Framework: Decarbonising Global Shipping Through International Regulation	–
Thomas Sterner (Chair)	University of Gothenburg	The social costs of aviation CO2 and contrail cirrus	Daniel Johansson, Christian Azar, Susanne Pettersson, Marc Stettler, Roger Teoh



Session 7 | Room: “Konferenzraum 2” | Fiscal Policy II – Legal Design

<i>Presenter</i>	<i>Affiliation</i>	<i>Abstract Title</i>	<i>Co-authors</i>
Matheus Chebli de Abreu	University of São Paulo	Protectionism or Sustainable Development? An Analysis of the “Domestic Manufacturing Stages” Criterion for Determining the Selective Tax Rate on Automobiles	–
Sara Daniela Silva de Souza	Federal University of Rio Grande do Sul (UFRGS)	Punitive Without Incentives: Why Brazil's Selective Tax Might Fail As A Climate Policy Instrument	–
Paloma García Córdoba	Universitat Oberta de Catalunya	Reforming Tourist Taxes as Genuine Environmental Instruments: Lessons from Spain	–
Tracey Roberts	Samford University, Cumberland School of Law	One Step Forward, Two Steps Back: The Impact of the OBBB on Atmospheric and Conventional Air Pollutants	–
Mona Hymel (Chair)	University of Arizona, James E. Rogers College of Law	Trump 2.0: United States Climate Change Policy: Barriers to Environmentalists Across Disciplines	–

Session 8 | Room: “Konferenzraum 3” | Forestry

<i>Presenter</i>	<i>Affiliation</i>	<i>Abstract Title</i>	<i>Co-authors</i>
Bruna Paludo & Arthur Maria Ferreira Neto	Federal University of Rio Grande do Sul, Brazil	Climate Finance and Tropical Forests in Brazil: The Climate Gap in the Allocation of IBS Revenue and a Proposal for Integration	–
Gleiceane Libero Breda	University of Newcastle	Global assessment of the socio-ecological risks to forest-based carbon project integrity	Carla L. Archibald, Matthew Hayward, Zhimin Chen, Xiang Zheng, Yiwen Zheng, Brooke A Williams
João Daniel Macedo Sá	Federal University of Pará - Amazonian Human Rights Clinic	Between Market Expansion and Rights Protection: Indigenous Peoples and Traditional Communities in Voluntary Carbon Markets in the Amazon	Ana Beatriz Freitas, Elena Aydos, Lise Tupiassu
Natalie Stoianoff (Chair)	The Taxation Institute	Biodiversity Financing and the Australian Nature Repair Act 2023 - Are Biodiversity Certificates the Solution?	Gordon Noble, Kriti Nagrath



Day 2 | 15 September: Climate finance and just transitions

Parallel sessions 9, 10, 11 & 12 | 10:45 am - 12:45 pm

Session 9 Room: “Leibniz Saal” Carbon Pricing I – Empirical Evaluation			
<i>Presenter</i>	<i>Affiliation</i>	<i>Abstract Title</i>	<i>Co-authors</i>
Sreeja Jaiswal	Potsdam Institute for Climate Impact Research (PIK)	Environmental regulation and firms in India: Evaluating India's Perform, Achieve and Trade programme	Johannes Gallé, Jan Steckel
Daniele Malerba	German Institute of Development and Sustainability (IDOS)	How Do Governments Set the Carbon Tax Rate?	Goran Dominioni
Johannes Brehm	RWI - Leibniz-Institute for Economic Research & Hertie School	Taxing Global Externalities with Local Benefits: Installation-Level Evidence from the European Union Emissions Trading System	–
Jane Torbert	Leipzig University	Zeroing in on the Zero Waste City	Melanie Krause
Utkarsh Patel (Chair)	CSEP Research Foundation, New Delhi / LSE Global School of Sustainability	Heterogeneity, Concentration, and the Political Economy of Benchmarking: An Econometric Analysis of India's Carbon Credit Trading Scheme (CCTS)	Shreekant Gupta

Session 10 Room: “Konferenzraum 1” Fossil Fuel Subsidy Reform			
<i>Presenter</i>	<i>Affiliation</i>	<i>Abstract Title</i>	<i>Co-authors</i>
Alexandros Dimitropoulos	PBL Netherlands Environmental Assessment Agency	Money for nothing? Revisiting scrappage subsidy programmes	Hendrik Vrijburg
Constantin Tsakas	Plan Bleu (UNEP/MAP Regional Activity Centre)	From Harmful Subsidies to Blended Finance: A Tailored Fiscal Pathway for the Mediterranean's Green and Blue Transition	–
Florian Peiseler	Umweltbundesamt (Federal Environment Agency)	Beyond Fiscal Estimates: A Multidimensional Framework for Assessing Environmentally Harmful Subsidies	Michael Golde, Anne Biewald
Kai Schlegelmilch	Green Budget Germany (GBG)/Forum Ökologisch-Soziale Marktwirtschaft e.V. (FÖS)	Environmentally Harmful Subsidies in Germany – Successes, Failures and Challenges	–
Sevil Acar (Chair)	Boğaziçi University	Do Fossil Fuel Subsidies Delay a Just Transition to a Low-Carbon Economy? Evidence from the OECD	Patrícia Fortes



GCET27

Global Conference of
Environmental Taxation

Session 11 | Room: “Konferenzraum 2” | International Climate Law & Governance

Presenter	Affiliation	Abstract Title	Co-authors
Elena Aydos & Sven Rudolph	The University of Newcastle	Balancing Roles in Multi-Level Carbon Markets: Article 6 of the Paris Agreement and the Case of Brazil	–
Giedre Lideikyte Huber	University of St. Gallen	The UN Tax Committee’s Subcommittee on Environmental Taxation: Current Workstreams and Emerging Priorities in International Environmental Tax Policy	Susanne Åkerfeldt
Pierre van Limpt	KU Leuven's Institute for Tax Law	The Impact of International Investment Agreements on States' Environmental Tax Policies	–
Oliwia Kurtyka	Grenoble INP industrial engineering	On the role of drones as means of environmental policy in air pollution inspections, - feedback form Polish City Guards experience	–
Yan Xu (Chair)	University of New South Wales (UNSW)	Multilateral Alignment of Carbon Pricing	–

Session 12 | Room: “Konferenzraum 3” | Climate Policy Modelling

Presenter	Affiliation	Abstract Title	Co-authors
Adrien Fabre	French National Centre for Scientific Research (CNRS), Centre International de Recherche sur l'Environnement et le Développement (CIRED)	Designing an Internationally Uniform Carbon Price	–
Hidemichi Yonezawa	Organisation for Economic Co-operation and Development (OECD)	Towards a better understanding of international spillovers from climate change mitigation policies: a structured CGE scenario analysis	Jean Chateau, Rob Dellink, Rocío García, Geoffroy Portier, Kevin de Raat
Débora Carrer	University of São Paulo	Sequestration or Avoided Emissions? Economic Viability and Carbon Pricing Thresholds for Blue Carbon in Mediterranean Salt Marshes	Irene Isabel da Cruz Martins, Michelle Márcia Viana Martins
Ragui Farag	Independent Researcher	Economy-wide implications of Green Industrial Policies in Morocco: A CGE Analysis	Zuhal Elnou
Thomas Stoerk (Chair)	National Bank of Belgium & LSE	Ratcheting up Paris	Humberto Llavador, John Roemer



Parallel sessions 13, 14, 15 & 16 | 1:45 - 3:45 pm

Session 13 Room: “Konferenzraum 1” Fiscal Policy III – Developing Economies			
<i>Presenter</i>	<i>Affiliation</i>	<i>Abstract Title</i>	<i>Co-authors</i>
Aichiro Suryo Prabowo	Monash University, Indonesia	Do Coal-Fired Power Plants Increase Tax Revenues? Evidence from Indonesian Districts	–
Nnaemeka Chukwuone	Resource and Environmental Policy Research Centre, Environment for Development Nigeria, University of Nigeria Nsukka, Enugu State, Nigeria.	How do Citizens in a Developing Country Perceive Energy Price Reform: Evidence from Petroleum Subsidy Removal in Nigeria	–
Riffat Iqbal	Indian Institute of Management Jammu	Do Governance Quality Enhance the Effectiveness of Climate Fiscal Policies on Inclusive Green Growth	Sahima Tabasum
Holger Bär (Chair)	Green Budget Germany (GBG)/Forum Ökologisch-Soziale Marktwirtschaft e.V. (FÖS)	Accelerating Green Economy Transformation Through Environmental Taxes in Southeast Asian Countries	Jacqueline Cottrell, Jana Leutner, Hana van Loock

Session 14 Room: “Konferenzraum 3” Climate Adaptation			
<i>Presenter</i>	<i>Affiliation</i>	<i>Abstract Title</i>	<i>Co-authors</i>
Marina D’Almeida Bianco	Federal University of Rio Grande do Sul (UFRGS), Brazil	A Fiscal Duty at Any Cost? Taxpayer Vulnerability and Fiscal Justice after Climate Disasters	Arthur Maria Ferreira Neto
Maria del Pilar Salazar Vargas	Universidad Nacional Autónoma de México (UNAM), Alexander von Humboldt Foundation (AvHF)	Allocating Emissions Trading System Revenues to Climate Adaptation: Evidence from the EU, California and Québec	–
Alexandra Lehner	Wegener Center for Climate and Global Change, University of Graz	Budgets in high water? Fiscal implications of flood adaptation in the United Kingdom	Alexandra Lehner, Nina Knittel, Eva Preinfalk, Birgit Bednar-Friedl, Paul Watkiss, Alistair Hunt
Eya Douiri (Chair)	Potsdam Institute for Climate Impact Research (PIK) / Technical University of Berlin (TU Berlin)	Towards Sustainable Food Systems in Germany: a Price Elasticity's approach to Meat Taxation	–



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Global Conference of
Environmental Taxation

Session 15 | Room: “Konferenzraum 2” | Sector-Specific Instruments

<i>Presenter</i>	<i>Affiliation</i>	<i>Abstract Title</i>	<i>Co-authors</i>
Sarah Landru	Bloom Association	Phasing Out the Fuel Tax Exemption in the EU Fishing Fleet: Social and Economic Evidence from France	Vincent Deschamps, Frédéric Le Manach, Valérie Le Brenne
Victor Mylonas	International Monetary Fund, World Bank	Impacts of Differentiated Taxes: Evidence from the Dutch Automobile Market	Alexandros Dimitropoulos, Herman Vollebergh
Roberta Mann	University of Oregon School of Law	Can Taxation Save the Planet from Data Centers?	–
Morley Cromwell	University of Toronto	From Recycling Back to Reuse: What Would a Modern Deposit-Return-Reuse System Require?	Laurel Besco
Sandra Bernick (Chair)	Imperial College London	Fiscal instruments to compensate for externalities - evidence from wind power development in Denmark	–

Session 16 | Room: “Leibniz Saal” | Political Economy II: Distributional Effects

<i>Presenter</i>	<i>Affiliation</i>	<i>Abstract Title</i>	<i>Co-authors</i>
Ira Dorband	World Bank	Carbon pricing in EU neighboring countries: Sectoral employment and distributional effects of a carbon pricing reform in Moldova	Bence Kiss-Dobronyi, Melanie Trost, Bideriya Byambasuren
Naomi Fagni	Lumsa University	Carbon Pricing, Green Innovation and Regional Heterogeneity: Evidence from the EU Emissions Trading System	Maurizio Lisciandra, Giuseppe Terzo
Theresa Lange	ifo Institute and LMU Munich	Designing Compensation for Regressive Carbon Pricing: Insights from Germany (Working Title)	–
Aldy Gustinara Darwili	King Abdullah Petroleum Studies and Research Center (KAPSARC)	The Geography of Carbon Pricing: Spatial Heterogeneity, the Missing Middle, and the Distributional Incidence of Carbon Taxation	Bramka Arga Jafino
Xavier Labandeira (Chair)	Universidade de Vigo	Distributional impacts and compensations of the EU-ETS2: An empirical illustration for Spain of the Social Climate Fund in view of other energy compensatory packages (2022 and 2026)	José M. Labeaga, Xiral López-Otero



Day 3 | 16 September: Implementation, sectors and law

Parallel sessions 17, 18, 19 & 20 | 10:25 am - 12:25 pm

Session 17 Room: “Konferenzraum 1” Carbon Pricing II – Mechanism Design & Theory			
<i>Presenter</i>	<i>Affiliation</i>	<i>Abstract Title</i>	<i>Co-authors</i>
Carmen Calderón Patier	Universidad San Pablo CEU	Coordination between the EU Emissions Trading System and Carbon Taxation: A Comparative Legal and Economic Analysis	–
Max Kellner	Potsdam Institute for Climate Impact Research (PIK)	Market Design and Complementary Policies for the EU ETS2: Estimating Price and Welfare Effects	Tobias Bergmann, Matthias Kalkuhl, Michael Pahle
Nicolas Pinsonneault	HEC Montréal	Carbon Contracts for Difference as Bundled Insurance and Support	Justin Caron
Fei Ao	Helsinki University	Optimal Taxation and Multiple Externalities in a Dynamic Economy	–
Nikolaj Moretti (Chair)	Potsdam Institute for Climate Impact Research (PIK)	Minimum Corporate Taxation in Markov Perfect Equilibrium	–

Session 18 Room: “Konferenzraum 3” Energy Policy			
<i>Presenter</i>	<i>Affiliation</i>	<i>Abstract Title</i>	<i>Co-authors</i>
Felix Heuer	RWI-Leibniz Institute for Economic Research	The Capitalization of Local Energy Prices in the Housing Market	–
Lucie du Breil	University Paris Dauphine PSL - LEDa, Climate Economics Chair, CSTB	Too many hands on the boiler? Collective governance and residential energy demand responses	Edouard Civel
Nasreen Nawaz	Federal Board of Revenue	Pakistan’s Solar Policy Reversal: A Macro-Fiscal Environmental Assessment and Analysis of a Loaded Shuffle from Net-Metering to Net-Billing	Muhammad Ashfaq Ahmed
Mikael Skou Andersen (Chair)	Aarhus University, Dept. of Environmental Science	Making efficient investments for Kosovo’s energy transition – the role of health-related co-benefits	Jørgen Brandt, Camilla Geels, Toke Panduro, Lise Frohn Rasmussen, Julian Massenberger



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Session 19 | Room: “Konferenzraum 2” | Green Industrial Policy

<i>Presenter</i>	<i>Affiliation</i>	<i>Abstract Title</i>	<i>Co-authors</i>
Ilias Matterne	Ghent University	Fuelling Innovation: Unveiling the Effects of Carbon Taxes on European Corporate Ingenuity	Annelies Roggeman, Isabelle Verleyen
Olli-Pekka Kuusela	UNU-WIDER	The Composition of Jobs in the Green Economy: Labor Market Reallocation with Adjustment Frictions	Tero Kuusi
Andrea Molocchi	Ricerca sul Sistema Energetico (RSE)	Equitable carbon pricing benchmark based on a country differentiated Social Cost of Carbon	Giulio Mela
Johanna Arlinghaus (Chair)	Hertie School	The Welfare Effects of Green Industrial Policy	Antonio Bento

Session 20 | Room: “Leibniz Saal” | Political Economy III: Reform in Practice

<i>Presenter</i>	<i>Affiliation</i>	<i>Abstract Title</i>	<i>Co-authors</i>
Chizoba Oranu	Climate policies for Development (CPfD), EfD, University of Nigeria, Nsukka	From Fuel Subsidy Reform to Carbon Tax Design: Lessons from Ghana and Nigeria	Monica Lambon-Quayefio, Rex Asiama, Nwajesus Onyekuru
Susanne Åkerfeldt	Swedish Government Offices	Turning Existing Fuel Excise Taxes into Carbon Fuel Excise Taxes – the Why and the How	Ira Irina Dorband
Fabrice Ewolo Bitoto	University of Dschang	Emissions Trading for Climate Action: Impact of the Carbon Credit Market on the Ecological Transition in Sub-Saharan Africa	Nelson Derrick Nguépi
Sebastian Renner	University of Hamburg	Who Pays for Carbon Pricing? Data Gaps, Targeting Constraints, and Distributional Impacts - Evidence from Indonesia	Djoni Hartono, Jan C. Steckel, Arief A. Yusuf
Kenneth Richards (Chair)	Indiana University	Carbon Tax Design in Practice: Lessons from South Africa’s Departure from the Textbook Model	Andrew Gilder, Lee-Ann Steenkamp



GCET27

Global Conference of
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Publication Opportunity Critical Issues

Presenters at GCET27 will have the opportunity to submit their papers for possible publication in *Critical Issues in Environmental Taxation*. The Call for Papers for Critical Issues will be sent very soon after the end of the conference. **Papers must be submitted by October 15, 2026.**

Papers should be submitted by uploading them onto our online cloud folder (details will follow). Submissions must follow the manuscript requirements described below:

Critical Issues is published annually by Edward Elgar Publishing Ltd. Edward Elgar has a strong publishing record in the fields of environmental economics, environmental law, and environmental taxation. Additional information on Edward Elgar and *Critical Issues* can be found at www.e-elgar.com. Publication of a volume each year depends on receiving a sufficient number of quality papers that are recommended for publication following peer review.

Each volume of *Critical Issues* is limited to approximately 100,000 words (16-19 manuscripts) and has a theme approach. The theme for each volume is determined after the manuscript review process is complete, but we expect the theme will focus on the role of taxation and other market-based instruments in encouraging green growth. Readers of *Critical Issues* include academics, policy makers, accountants, lawyers, and economists.

Manuscripts accepted for publication in *Critical Issues* deal with insights and analysis for achieving environmental goals through tax policy and related market-based approaches. They address topics that are timely and of regional, national, or international interest. Manuscripts submitted for possible publication are reviewed by two external reviewers. Authors of accepted manuscripts will receive one copy of the publication. Final versions of manuscripts accepted for publication in *Critical Issues* should meet the following requirements:

- › **Format.** All manuscripts are limited to a maximum of 6,000 words including footnotes, tables, figures, etc. Each table will count as 300 words and each figure will count as 500 words. References are to be placed at the end of the manuscript as endnotes. All manuscripts must be double-spaced, including endnotes, using Microsoft Word format (Times New Roman 11). Authors should follow the Edward Elgar style guide, <https://www.e-elgar.com/author-hub/as-you-write-your-book-or-chapter/>.
- › **English.** The manuscript must be written in clear, fluent English so that readers will not be able to distinguish authors who use English as a first language from those who use English as a second language. The editors of *Critical Issues* encourage any authors who are not fluent in English to engage their own editors who can help them to meet this standard for the final manuscript.



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Global Conference of
Environmental Taxation

- › **Abstract.** If the manuscript starts with an abstract, the abstract should be eliminated from the manuscript prior to submission for possible publication. Note, however, that accepted authors may be asked to submit an abstract and key words later in the publication process.
- › **Author Credentials.** An endnote following the name(s) of author(s) should indicate the author affiliation (without abbreviations) and email address.
- › **Copyright.** The author(s) must be the sole owner(s) of the complete copyright and all other rights in the manuscript (apart from copyright material not owned by the author but included in the manuscript with the permission of the copyright holders). The author(s) have the responsibility for obtaining any necessary copyright permissions.
- › **Exclusive Publication.** The author(s) of accepted manuscripts must not have published the manuscript previously in another publication and should not publish the manuscript in any other publication without the express permission of the editors of Critical Issues.
- › **Publisher Requirements.** The author(s) of accepted manuscripts must respond to the editors promptly when receiving requests to review proofs and sign publication agreements.



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Global Conference of
Environmental Taxation

Venue Location



GCET27 will take place at the Berlin-Brandenburg Academy of Sciences and Humanities.

The Berlin-Brandenburg Academy of Sciences and Humanities (formerly the Prussian Academy of Sciences) is located on Gendarmenmarkt in the heart of Berlin. With its interdisciplinary and international association of scientists and around 350 employees, it is the largest non-university research institution with a humanities profile in the Berlin-Brandenburg region.

The building, which is now frequented by scholars from all over the world, was originally built in 1902/03 for the Prussian Maritime Trade Company, later the Prussian State Bank. To mark the academy's 300th anniversary, the historic cashier's hall was converted into a conference and event centre, which was officially opened in 2002.

The entrance to the conference is located at Markgrafenstraße 38, 10117 Berlin, on Gendarmenmarkt.

How to get there

The BBAW is centrally located in Berlin-Mitte and is easily accessible by public transport (ÖPNV). We strongly recommend using public transport, as parking in the area is limited.

Nearest Underground (U-Bahn) and Suburban Rail (S-Bahn) Stations

- › **Hausvogtei**platz (U2) – approx. 5 minutes' walk
- › **Französische Straße** (U6) – approx. 7 minutes' walk
- › **Stadtmitte** (U2, U6) – approx. 10 minutes' walk
- › **Friedrichstraße** (S-Bahn S1, S2, S3, S5, S7, S9; Regional Trains) – approx. 12–15 minutes' walk

[Download location map here](#)



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Global Conference of
Environmental Taxation

Social Events

(only if previously booked)

Dinner Reception



Join us on the first evening of the conference - 14 September, 7 pm - for a special dinner reception after the scientific program. The event will take place at *restaurant acht&dreissig* on Oranienburger Straße in the heart of Berlin's historic city center. Known for its modern German cuisine with international influences, the restaurant will serve a carefully curated three-course vegetarian/vegan menu in an elegant yet relaxed atmosphere. It's a great chance to continue discussions, network with other participants, and enjoy an inspiring culinary experience in one of Berlin's most charming settings.

Address: [Oranienburger Strasse 38, 10117 Berlin](#)



GCET27

Global Conference of
Environmental Taxation

Sunset boat cruise



Join us at the end of the second conference day - 15 September, 7 pm - on a relaxing sunset boat cruise through the heart of Berlin. This special experience takes place aboard the historic *Kaiser Friedrich*, the city's oldest passenger ship. Beautifully restored and now powered by a modern, whisper-quiet electric engine, the ship provides an environmentally friendly and peaceful way to enjoy the city from the water.

The walk from the conference venue to the boat takes about 20 minutes and leads through Berlin's historic city centre, offering a pleasant way to arrive at the departure point.

As we glide along the Spree at sunset, you'll experience Berlin from a different perspective, passing iconic sights as the city is bathed in warm evening light. The spacious sun deck and cosy indoor areas create a comfortable setting to relax, connect with fellow participants, and unwind after a full conference day. Drinks and snacks will be available on board on a self-pay basis, allowing you to enjoy refreshments at your own pace while taking in the views and atmosphere of the evening.

The boat departs from "Anlegestelle Alte Börse" at Burgstr. 27, 10178 Berlin.



GCET27

Global Conference of
Environmental Taxation

Presenters' instructions

Presentation format

- › The presentations are scheduled to last **24 minutes**, with a maximum of 15 minutes set aside for the presentation itself and the remainder reserved for the Q&A. Please respect your colleagues and keep to the allocated time for your presentation.
- › Presentation files should be in PowerPoint (.pptx or .ppt format) or .pdf format. We kindly ask you to include your last name in the file name to avoid any confusion.
- › Presentation slides can be uploaded before the conference using [this link](#), for which a password has been sent to all presenters via email, or otherwise brought directly to the sessions on a USB drive.
- › A computer (MS Windows environment) will be available in each session room and a member of the organising team will be present in every session room in case of technical difficulties.
- › Presentations should be held in English only.

Organisation of Sessions

- › All academic conference sessions will be 2 hours and will be held in parallel sessions, as can be seen in the general programme.
- › To see when your presentation will take place, please refer to the detailed programme of the academic conference sessions.
- › Presenters should come to the assigned room at least 10 minutes before the start of the session so that the Chair of the session knows that you are present and to allow time for the presentations to be copied onto the computer.
- › The session Chair will introduce each speaker and manage the timing of presentations.

Session Chairs

- › One person in each session is designated as the session Chair. To see whether you will be chairing your session, please check the detailed programme of the academic conference sessions where we will include this information in due time.
- › Chair persons should come to the room at least 10 minutes before the start of the session.
- › Chairs are asked to briefly introduce the session and the speakers, make sure the time available is divided equally and guide the discussion from the floor following each presentation
- › In the unlikely case where the scheduled chair does not attend, the presenter of the session's last paper is expected to take over the role of chair.

**GCET27**Global Conference of
Environmental Taxation

List of Delegates and Their Home Institutions

Name	Affiliation
Yassmina Abdelazim	ESCP Business School
Sevil Acar Aytekin	Boğaziçi University
Matthew Agarwala	Bennett Institute for Innovation & Policy Acceleration, University of Sussex
Muhammad Ashfaq Ahmed	United Nations - Department for Economic and Social Affairs
Susanne Åkerfeldt	Swedish Government Offices
Mikael Skou Andersen	Aarhus University, Dept. of Environmental Science
Álvaro Antón Antón	Universidad Cardenal Herrera CEU
Fei Ao	Helsinki University
Johanna Arlinghaus	Hertie School
Elena Aydos	The University of Newcastle
Kris Bachus	University Antwerpen
Holger Bär	Green Budget Germany (GBG)/ Forum Ökologisch- Soziale Marktwirtschaft e.V. (FÖS)
Jeroen Barrez	KU Leuven
Sandra Bernick	Imperial College London
Christoph Böhringer	Carl von Ossietzky Universität Oldenburg
Johannes Brehm	RWI - Leibniz-Institute for Economic Research & Hertie School
Carmen Calderón Patier	Universidad San Pablo CEU
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Sara Daniela Silva de Souza	Federal University of Rio Grande do Sul (UFRGS)
Aldy Gustinara Darwili	King Abdullah Petroleum Studies and Research Center (KAPSARC)
Kurt Deketelaere	KU Leuven/LERU
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Geoffroy Dolphin	Oxford Economics / Energy Policy Research Group (Cambridge)
Goran Dominioni	Dublin City University
Ira Dorband	World Bank
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Eya Douiri	Potsdam Institute for Climate Impact Research (PIK) / Technical University of Berlin (TU Berlin)
Susanne Dröge	German Institute for International and Security Affairs
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Steve Dwyer	Steve Dwyer
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Fabrice Ewolo Bitoto	University of Dschang
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Maximilian Fuchs	Bruegel
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Felix Heuer	RWI-Leibniz Institute for Economic Research
Mona Hymel	University of Arizona, James E. Rogers College of Law
Dilara İnal	WU - Institute for Austrian and International Tax Law
Riffat Iqbal	Indian Institute of Management Jammu
Sreeja Jaiswal	Potsdam Institute for Climate Impact Research (PIK)
Mukunda Julius	Civil Society Budget Advocacy Group (CSBAG)
Matthias Kalkuhl	Potsdam-Institut für Klimafolgenforschung
Max Kellner	Potsdam Institute for Climate Impact Research (PIK)
Nicolas Koch	Potsdam Institute for Climate Impact Research (PIK)
Oliwia Kurtyka	Grenoble INP industrial engineering
Olli-Pekka Kuusela	UNU-WIDER
Xavier Labandeira	Universidade de Vigo
Sarah Landru	Bloom Association



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Giedre Lideikyte Huber	University of St. Gallen
Peter Liese	European Parliament
Robert Lönn	Confederation of Swedish Enterprise
João Daniel Macedo Sá	Federal University of Pará - Amazonian Human Rights Clinic
Lisa-Marie Mahlberg	Potsdam Institute for Climate Impact Research (PIK)
Daniele Malerba	German Institute of Development and Sustainability (IDOS)
Roberta Mann	University of Oregon School of Law
Jan Marinko	PtX Lab Lausitz Praxislabor für strombasierte Kraft- und Grundstoffe aus grünem Wasserstoff
Beatriz Martinez Romera	University of Copenhagen
Ilias Matterne	Ghent University
Sofie Mijic Kampp	University of Copenhagen, Faculty of Law
Janet Milne	Vermont Law School
Leonard Missbach	Potsdam Institute for Climate Impact Research (PIK)
Caterina Molinari	ECCO the Italian Climate Change Think Tank
Andrea Molocchi	Ricerca sul Sistema Energetico (RSE)
Lisa-Marie Mönch	Goethe University



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Nasreen Nawaz	Federal Board of Revenue
Magnus Nilsson	Magnus Nilsson Produktion
Yoner Ojeda Pinto	WU - Institute for Austrian and International Tax Law
Arnau Oliver Antich	Transport & Environment
Chizoba Oranu	Climate policies for Development (CPfD), EfD, University of Nigeria, Nsukka
Bruna Paludo	Federal University of Rio Grande do Sul, Brazil
Utkarsh Patel	CSEP Research Foundation, New Delhi / LSE Global School of Sustainability
Anja Paumen	PtX Lab Lausitz Praxislabor für strombasierte Kraft- und Grundstoffe aus grünem Wasserstoff
Florian Peiseler	Umweltbundesamt (Federal Environment Agency)
Nicolas Pinsonneault	HEC Montréal
Alice Pirlot	Geneva Graduate Institute
Christina Poser	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
Aichiro Suryo Prabowo	Monash University, Indonesia
Aldo Ravazzi Douvan	Mase/Aeif-Sogesid
Sebastian Renner	University of Hamburg
Kenneth Richards	Indiana University
Tracey Roberts	Samford University, Cumberland School of Law
Friederike Röder	GSLTF/ ECF
Knut Einar Rosendahl	Norwegian University of Life Science
Sven Rudolph	The University of Newcastle



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Niyanta Shetye	PtX Lab Lausitz Praxislabor für strombasierte Kraft- und Grundstoffe aus grünem Wasserstoff
Alexander Sicheneder	Helmholtz Zentrum Berlin
Som Somanathan	Indian Statistical Institute
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Lennart Stern	Potsdam Institute for Climate Impact Research (PIK)
Thomas Sterner	University of Gothenburg
Thomas Stoerk	National Bank of Belgium & LSE
Natalie Stoianoff	The Taxation Institute
Anant Sudarshan	University of Warwick
Leona Tenkhoff	German Institute for International and Security Affairs (SWP)
Anna Theeuwes	KU Leuven/International Chamber of Commerce (ICC)
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Genevieve Tokic	Northwestern University Pritzker School of Law
Jane Torbert	Leipzig University



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Pierre van Limpt	KU Leuven's Institute for Tax Law
Philipp C Verpoort	Potsdam Institute for Climate Impact Research (PIK)
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Accepted Abstracts

One Deficit at a Time: The Role of Public Debt in Climate Policy Composition

Author: Yassmina Abdelazim | ESCP Business School

Climate policy instruments differ fundamentally in their fiscal character; some generate public revenue, while others require public expenditure. This paper asks whether public debt shapes the composition of climate policy whether it is revenue-based or expenditure-based. Using a panel of 50 countries over 2010–2023 and a simple theoretical framework in which fiscal constraints tighten with indebtedness, the analysis finds that expenditure-based climate policy contracts significantly as public debt rises, a result that holds across the debt-to-GDP level, an unanticipated debt shock, and sovereign risk pricing, and is amplified under financial distress. Revenue-based policy, by contrast, responds only weakly. These findings suggest that fiscal pressure falls disproportionately on the spending side of climate policy, with particular consequence for financially constrained economies navigating the energy transition.

→ This paper will be presented in Session 3: Fiscal Policy I – Macro Perspectives.

Protectionism or Sustainable Development? An Analysis of the “Domestic Manufacturing Stages” Criterion for Determining the Selective Tax Rate on Automobiles

Author: Matheus Chebli de Abreu | University of São Paulo

Is the Brazilian Selective Tax (“IS”), levied on vehicle production, a legitimate environmental pricing mechanism under Brazilian law or, rather, a protectionist instrument disguised as environmental policy? This paper examines that question in light of the Brazilian Tax Reform introduced by Constitutional Amendment No. 132/2023 and regulated by Brazilian Supplementary Law No. 214/2025. Within this new framework of Brazilian consumption taxation, the Brazilian Constitution now expressly recognizes environmental protection as a guiding principle of the Brazilian tax system, while also authorizing the Selective Tax to apply to the production, extraction, commercialization, or importation of goods and services considered harmful to health or to the environment. In that context, the Brazilian Selective Tax performs a hybrid role regarding the taxation of environmentally harmful activities: the classic function of an excise tax and the environmental function of a carbon pricing mechanism.

Specifically, this study examines Article 419, sole paragraph, item IX, of Brazilian Supplementary Law No. 214/2025, which establishes that the rates of the Brazilian Selective Tax applicable to vehicles



may be graduated according to the number of manufacturing stages carried out in Brazil. Although inserted into the context in which Brazil seeks to align its tax system with environmental objectives, that rule leads to a distinct question under international trade law: whether the tax advantage given in domestic manufacturing stages performed in Brazil is compatible with the national treatment obligation set forth in Article III of the GATT, or whether it amounts to a discriminatory and protectionist measure benefiting Brazilian production under the guise of environmental regulation.

Against that background, the study analyzes whether the Brazilian legal criterion based on domestic manufacturing stages can be justified under the environmental exceptions provided for in Article XX of the GATT. In doing so, it addresses a gap in the literature regarding the relationship between the environmental function of the Brazilian Selective Tax, as an excise tax and carbon pricing mechanism, and the principle of non-discrimination in international trade. The research is organized around two questions: First, does the graduation of Brazilian Selective Tax rates according to manufacturing stages performed in Brazil protect the environment? Second, even if an environmental objective is achieved, does the Brazilian rule nonetheless result in arbitrary or unjustifiable discrimination, or in a disguised restriction on international trade?

Methodologically, the study combines empirical, deductive, and qualitative analytical approaches. It first identifies the environmental pricing mechanisms currently in force internationally, using the World Bank's carbon pricing platform as a reference point. It then examines WTO rules and precedents concerning the application of national treatment, in order to identify the legal reasoning used to determine whether fiscal, environmental, or carbon-pricing instruments should be regarded as protectionist. In parallel, the paper also compares Brazilian environmental legislation with the environmental legislation of the ten largest exporters of vehicles and vehicle parts to the Brazilian market, classifying those legal regimes according to the degree of restrictiveness applicable to carbon emissions. Finally, it analyzes empirical data obtained through Life Cycle Assessment (ISO 14040) in order to compare carbon emissions in the automotive production chains of Brazil and those major exporters during the 2022–2023 period.

Preliminary findings indicate that the Brazilian criterion of rate graduation based on manufacturing stages carried out in Brazil may violate GATT principles, specially with the national treatment obligation. At the same time, the empirical evidence demonstrates that, among the ten largest exporters of cars, tractors, trucks, and related parts to Brazil in 2023 (Argentina, China, Mexico, Germany, the United States, Japan, South Korea, Thailand, Italy, and Sweden) not all have adopted domestic carbon-pricing instruments, and four of those jurisdictions have not instituted carbon taxes at the time in which the analysis was conducted. This finding prevents any immediate conclusion that the Brazilian rule necessarily constitutes arbitrary or unjustifiable discrimination in every case. The paper therefore reaches a partial confirmation of its central hypothesis: the graduation of Brazilian Selective Tax rates according to domestic manufacturing stages may configure arbitrary or unjustifiable discrimination, or a disguised restriction on international trade, but that conclusion depends on the analysis of the comparative regulatory and empirical context, as provided by the study.

→ This paper will be presented in Session 7: Fiscal Policy II – Legal Design.



Do Fossil Fuel Subsidies Delay a Just Transition to a Low-Carbon Economy? Evidence from the OECD

Author: Sevil Acar | Boğaziçi University

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Since the 1970s, fossil fuel subsidies (FFS) have been widely adopted to stabilize economies and protect producers and consumers from energy price volatility. Despite growing awareness that fossil fuels are the primary drivers of climate change, FFS are still implemented and have increased over fourfold in OECD countries since 2010. Thus, these subsidies have been criticized for potentially hindering climate mitigation efforts, undermining the competitiveness of clean energy technologies and hence retarding energy transition.

Although often justified as a means of consumer protection, the continued use of FFS may jeopardize a just energy transition. These subsidies may intensify existing socioeconomic disparities by benefiting higher-income households and fossil fuel industries, while diverting resources that could be used to support more vulnerable populations in shifting to clean energy. Moreover, their effectiveness in preserving employment and household welfare remains uncertain. Notwithstanding these concerns, there is a significant lack of studies examining the implications of FFS within the OECD region.

This research seeks to fill a critical gap by examining the relationship between fossil fuel subsidies (FFS) and greenhouse gas (GHG) emissions, as well as evaluating the effects of these subsidies on justice-related outcomes, including employment rates, unemployment rates, income inequality (measured by the Gini coefficient), poverty rates, and household energy costs across OECD countries. Utilizing panel data from 2010 to 2022, the study incorporates a range of variables, including disaggregated FFS data (by energy source, beneficiary type, and sector), climate taxation, renewable energy share, GDP per capita, and industrial value added. The analysis employs fixed-effects panel data models, supplemented by pooled and random-effects models to ensure robustness.

The findings reveal that subsidies targeting oil products, consumer groups, fossil fuel production, transport, and manufacturing sectors exert the most significant influence on GHG emissions. Contrary to expectations, FFS generally show negligible effects on improving employment or reducing unemployment. Moreover, specific categories of FFS are associated with increased income inequality and elevated household energy costs, while their impact on poverty reduction is both limited and modest. These results highlight the dual challenge posed by FFS in OECD countries: hindering progress toward climate mitigation targets and obstructing efforts to achieve a fair transition away from fossil fuels. The study concludes with targeted policy recommendations to guide OECD policymakers in designing FFS reforms that align with climate objectives and promote equitable energy transitions.

→ This paper will be presented in Session 10: Fossil Fuel Subsidy Reform.



Designing taxes for sustainability in the age of AI

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Artificial intelligence (AI) is rapidly reshaping production, labour markets, and global value chains. While much of the policy debate has focused on AI's implications for employment, productivity, energy use, and geopolitical competition, its consequences for tax systems and fiscal capacity remain underexplored. This paper argues that AI-driven shifts in factor shares, combined with systematically lower effective tax rates on capital relative to labour, pose a material threat to public revenues and, by extension, to the provision of public goods and progress toward the Sustainable Development Goals (SDGs). We contend that AI taxation should be treated as a core sustainability governance challenge, rather than a narrow labour market or technology regulation issue.

AI affects tax systems through two principal channels. Labour-augmenting AI may raise productivity and wages for some workers, increasing personal income tax receipts. However, labour-displacing or capital-augmenting AI shifts value added away from labour and toward AI-intensive capital—algorithms, models, data, and compute infrastructure—whose returns are typically taxed at lower effective rates through corporate income, dividends, and capital gains. Because modern tax systems rely heavily on labour income taxation, this compositional shift in the tax base risks eroding revenues even if aggregate output remains constant. A simple stylised model demonstrates that when a fraction of the labour tax base is reclassified as capital income and taxed at a lower rate, total revenue declines proportionally to the extent of base shifting and the gap between labour and capital tax rates. In high-income countries, where labour taxes account for roughly half of total revenues and effective labour tax rates exceed corporate rates by 10–15 percentage points or more, even modest shifts in factor shares could generate significant fiscal shortfalls.

The fiscal risks of AI extend beyond domestic factor shares to international tax competition and base erosion. AI-intensive firms derive value from intangible assets—data, algorithms, and knowledge capital—that are difficult to observe and geographically decouple value creation from taxable presence. Existing global tax reforms, including digital services taxes and the global minimum corporate tax, partially address profit shifting but remain insufficient if AI accelerates the concentration of value in highly mobile capital. Empirical evidence suggests that a substantial share of multinational profits is already shifted to low-tax jurisdictions, generating large global revenue losses, particularly in developing economies. AI could amplify these dynamics, undermining fiscal capacity precisely when public investment in education, infrastructure, climate mitigation, and social protection is most needed.

We situate AI taxation within a broader framework of tax system design for sustainability. Tax systems serve five core functions: raising revenue, correcting externalities (Pigouvian efficiency), redistributing income, supporting decent work and economic growth, and strengthening governance capacity. AI interacts with each of these. It generates environmental externalities through energy use, water extraction, and grid congestion; it concentrates economic returns among owners of capital and data; and it may displace workers or compress wages in mid-skill occupations. Yet the revenue function is



foundational: without sufficient fiscal capacity, governments cannot finance SDG-aligned public goods or implement effective redistributive and environmental policies.

We identify three administratively feasible avenues for expanding the AI tax base: taxing compute (hardware), taxing AI-related energy and local environmental externalities, and taxing data flows. Compute is highly detectable, quantifiable, and concentrated within a small number of supply chains, making it a promising point of intervention. Taxes could be levied at production, export, or deployment, each with distinct distributional and coordination implications. Energy and resource taxes on data centres offer a second pathway, internalising local environmental costs while generating geographically distributed revenues. Such taxes could complement or substitute for declining fuel duties during the energy transition. Third, data taxation—whether volume-based, value-based, or through data-border adjustments—seeks to treat data as a resource input to AI. Although conceptually attractive, data taxation faces significant definitional, valuation, and coordination challenges and would require high levels of international cooperation.

The political economy of AI taxation is characterised by three asymmetries between AI-intensive firms and states: informational (difficulty observing and valuing intangible assets), geographic (misalignment between value creation and tax jurisdiction), and power (lobbying capacity and regulatory capture). These

→ This paper will be presented in Session 4: Frontier & Emerging Tax Instruments.

Turning Existing Fuel Excise Taxes into Carbon Fuel Excise Taxes – the Why and the How

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Many jurisdictions across the globe already levy excise taxes on fuels and have established cost-effective administrative systems for tax authorities and firms to collect these taxes at low cost. In national legislation, excise tax rates are normally expressed in standard trade units, that is, by weight or volume, which facilitates administration and compliance by tax being collected by fuel retailers upstream in the distributional chain. Keeping the number of taxpayers to a minimum and fostering administrative simplicity and effective tax control speaks in favor of excise taxes being due early in the fuel distribution chain, in other words, upstream when the fuel enters the economy.

Excise taxes on fuels have often been introduced for non-climate reasons, as they raise revenues at low administrative cost. However, they also indirectly contribute to setting a carbon price on fuel consumption. There are good reasons for countries to consider recalculating their excise fuel taxes to be directly based on the carbon content of the fuels, such as delivering improved air quality and reduced congestion, and, when well designed, raising significant revenues and support a more efficient and growth-oriented economy. Further, a direct carbon tax can be recognized as a carbon price payment under the EU Carbon Border Adjustment Mechanism (EU CBAM) and raise revenue for



the exporting country, otherwise foregone to EU. This is especially true in the years to come, when the EU CBAM financial obligation on goods imported to the EU is expected to rise. A conversion reform can be carried out stepwise, such as starting with simply converting existing fuel tax rates, while by further reforms moving towards a single and increased carbon price for the whole economy.

The paper will, in a hands-on manner, outline how a government can make use of an existing fuel tax collection system and recalculate such taxes on the basis of standard emission factors for fuels. The national tax legislation would still express tax rates in weight or volume units, maintaining a simple administrative and compliance system. To increase transparency and recognition under the EU CBAM, the method of calculation of carbon fuel excise tax rates ought to be publicly presented in an appropriate way.

An important aspect when considering fuel tax policy reforms, is to ensure public acceptance. Appropriate policy packages could be envisaged, including for example a stepwise introduction in the carbon fuel excise tax scope and tax levels but also using tax revenues to address undesired distributional effects for certain groups of society and time-limited output-based subsidies to alleviate competitiveness concerns for industrial sectors.

Other forms of carbon pricing, such as downstream carbon taxes and emissions trading schemes, require development of facility-level MRV (Monitoring, Reporting and Verification) systems. Using an existing upstream fuel excise tax system enables introducing direct carbon pricing with minimal preparatory work. This could, e.g., be important for EU candidate countries, who upon accession face necessary adaptations to different interlinked pieces of EU legislation, all of which have a significant influence on fuel prices in the country. To mitigate disruption to the national economy from such price changes, these reforms ought to start as soon as possible. Early action suggests implementing the simplest reforms first while preparing the more complex ones for later. An upstream carbon fuel excise tax can be such an option and can also be used to fulfil the EU minimum tax levels under the EU Energy Taxation Directive.

→ This paper will be presented in Session 20: Political Economy III: Reform in Practice.

Making efficient investments for Kosovo's energy transition – the role of health-related co-benefits

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As the nations of the western Balkans are standing on the doorstep for entry into the European Union, the region continues to host a two-digit number of highly polluting coal- and lignite powered electricity providers, and its governments have largely failed in implementing the measures due in 2017 under the European Energy Community agreement with the EU. Air pollution control equipment required under the compliance pledged with the Large Combustion Plant Directive has not yet been installed in



many instances, and these power plants are large-scale emitters of CO₂ not subject to emissions trading pricing of carbon emissions.

We here focus on the Republic of Kosovo, which for 95% of its electricity generation relies on a 55 year old coal- and lignite-fired power plant, the huge 680 MW Kosovo B Power Station, with an annual emission of 7.2 million tCO₂. Besides electricity it supplies district heating to the nearby capital Pristina. Kosovo's carbon intensity, measured by CO₂ emissions per unit of output, is the highest in the western Balkans and about four times the average of the EU, according to the International Monetary Fund. Kosovo is not a member of the United Nations, nor a party to the Paris Agreement, due to limited international recognition of its 2008 secession from Serbia. Still, the targets adopted by the Ministerial Council of the European Energy Community stipulate that Kosovo should reduce CO₂-emissions corresponding to 16% in 2030 (base-line year 2016).

Over the past decade Kosovo's government has been contemplating different measures to meet the growing demand for electricity and heat, while reducing conventional air pollutants by renovating the Kosovo B Power Station. Last year the government issued a tender for an extension of the power plant's lifetime with 20 years, and for boosting capacity with an additional 200 MW by refurbishment of its non-operational block A3. The plans foresee 30% more operational hours. The investment required to breathe new life into the dilapidated plant exceed several hundred million euro. According to press coverage, funds will be made available from the government-controlled power plant's own finances, though Turkish investors are also mentioned.

This research explores the external costs related to the Kosovo B Power Station associated with the health impacts from its emissions. For this purpose we use the EVA (Economic Valuation of Air pollution) model, that links atmospheric modelling results with predictions of the health impacts in the affected population in Kosovo and beyond, from air pollution exposures. Besides premature mortality, the WHO has identified exposure-response functions for a range of chronic diseases, ranging from lung cancer, COPD, and stroke to asthma and diabetes, for which we calculate the economic costs. These calculations consider besides the direct costs, also indirect costs in terms of reduced productivity and disability adjusted life years, as derived from OECD recommendations. The outputs from the EVA model are unit damage costs per ton of emission, which in turn can be applied in financial impact assessments – delivering such figures as the World Bank called for in a 2019 report on air quality management in Kosovo. Next to the pricing of carbon emissions, they will provide an important element in any financial appraisal of alternatives to coal-fired power generation, as will be illustrated with possible alternatives.

→ This paper will be presented in Session 18: Energy Policy.

Optimal Taxation and Multiple Externalities in a Dynamic Economy

Author: Fei Ao | Helsinki University

This paper characterizes the optimal mix of linear commodity taxation and non-linear income taxation in a dynamic economy where consumption gives rise to positional and environmental externalities.



Both externalities are modeled as stock-externalities, capturing the influence of present and past consumption. In the case of non-atmospheric positional externalities, where individuals contribute unequally to the externality, the principle of targeting—modified to justify capital income taxation—no longer holds. Consequently, policy rules for all tax instruments are adjusted to account for the positional externality.

The analysis delivers three main findings. First, the shadow prices of environmental and positional externalities are dynamically interdependent, and the additivity property generally fails even in the absence of cross-substitution effects. Second, capital income taxation can serve as an ancillary corrective instrument, with its direction depending on the relative magnitude of positional damages across periods. Third, the paper provides a unified framework to analyze how the durability of stock externalities affects the socially marginal value of their correction.

→ This paper will be presented in Session 17: Carbon Pricing II – Mechanism Design & Theory.

The Welfare Effects of Green Industrial Policy

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Co-authors: Antonio Bento

Green industrial policy has emerged as a cornerstone of contemporary climate strategy, with governments across advanced economies committing substantial public resources to accelerate the deployment of clean technologies in hard-to-abate sectors such as steel, cement, and chemicals. Despite the unprecedented scale of these interventions, a fundamental question remains unanswered: how should governments choose among the wide array of available policy instruments, including investment subsidies, production incentives, price guarantees, and long-term contracts? This paper develops a unified economic framework to address that question, offering both theoretical principles and quantitative insights into the welfare consequences of alternative green industrial policy designs.

The analysis is motivated by three defining features of decarbonization in capital-intensive sectors. First, the investments required are large and irreversible, locking firms into new production processes, infrastructure, and supply chains for extended periods. Second, private returns to these investments are highly uncertain, depending on future energy prices, carbon prices, demand conditions, and the pace of technological change. Third, early deployment generates dynamic spillovers through learning-by-doing and market formation, reducing future costs and enabling broader scale-up of clean technologies. Together, these features create a central tension in green industrial policy: uncertainty induces firms to delay irreversible investment, while delay slows learning and raises the long-run social cost of the clean energy transition.

A key theoretical insight of the paper is that instrument choice is entirely irrelevant in deterministic environments. When future conditions are known, any policy instrument that induces the same level of deployment produces the same welfare outcome, conditional on equivalent public expenditure. This equivalence result mirrors classic findings from environmental economics under certainty, but it breaks down sharply once uncertainty and irreversibility are introduced. When private returns are uncertain and investment cannot be undone, the option value of waiting — the value a firm derives



from delaying commitment in hopes of more favorable conditions — becomes a first-order consideration. Different policy instruments reshape the distribution of returns across states of the world in fundamentally different ways, and these differences determine how effectively each instrument erodes the option value of waiting and accelerates socially desirable investment.

To evaluate these differences rigorously, the paper employs the marginal value of public funds (MVPF) as its central welfare metric. The MVPF, defined as the ratio of marginal willingness to pay to marginal government cost, is a standard tool in public finance that allows disparate policy interventions to be compared on a common welfare basis. Applying this metric to an environment with uncertainty, irreversibility, and state-contingent policy instruments requires extending its components to account for additional channels — including learning-by-doing, market formation, reductions in the option value of waiting, and the fiscal exposure that arises when government obligations depend on realized states of the world. These extensions enrich the framework without altering the fundamental definition or interpretation of the MVPF.

Three general theoretical results emerge from the analysis. First, in the absence of uncertainty and irreversibility, all instruments that achieve equivalent deployment are welfare equivalent, as noted above. Second, under uncertainty, instruments that provide insurance — by reducing the downside risk borne by investing firms — dominate deterministic subsidies. While an upfront subsidy raises expected returns, it leaves the distribution of outcomes largely intact and therefore fails to fully eliminate the option value of waiting. Price-based guarantees and long-term contracts, by contrast, directly compress the downside of the return distribution, making investment less risky and inducing earlier commitment. Third, among price-based instruments, symmetric contracts that stabilize returns in both directions, providing a floor against bad outcomes while recapturing upside gains for the government, weakly dominate one-sided guarantees. Symmetric contracts achieve comparable levels of deployment at lower expected fiscal cost, improving the MVPF relative to instruments that expose public budgets to upside risk without compensation.

These results generalize and extend insights from the literature on hybrid climate policy instruments and price collars, which demonstrates that combining price and quantity controls improves welfare under cost uncertainty in short-run abatement settings. The present paper derives analogous conclusions in an environment where the central margin is irreversible investment rather than static abatement, and where the welfare lens is explicitly grounded in public-finance methodology.

The theoretical analysis is complemented by a quantitative framework calibrated to stylized features of hard-to-abate industrial sectors. This exercise illustrates the magnitude of the learning, market formation, insurance, and timing channels identified by the theory, and demonstrates that differences in policy design can translate into substantial differences in welfare per dollar of public expenditure under empirically plausible parameter values.

Taken together, the results provide a principled economic rationale for prioritizing state-contingent, risk-sharing policy designs — such as contracts for difference — as core instruments of green industrial policy in uncertain, capital-intensive settings. When irreversibility and uncertainty are first-order features of the investment environment, the question is not merely whether to subsidize clean investment, but how the structure of that support is designed.

→ This paper will be presented in Session 19: Green Industrial Policy.



Balancing Roles in Multi-Level Carbon Markets: Article 6 of the Paris Agreement and the Case of Brazil

Authors: Elena Aydos & Sven Rudolph | The University of Newcastle

Article 6 of the Paris Agreement provides a framework for international cooperation to mitigate climate change, including mechanisms for the transfer of mitigation outcomes and carbon credits, and the mobilisation of finance for developing countries. Its relevance is increasing in parallel with the expansion of domestic carbon markets, giving rise to an emerging multi-level carbon market architecture. For instance, the European Union has recently indicated that it will allow the use of “high-quality” Article 6 credits for up to 5% of its 1990 baseline emissions reduction target for 2040.

Within this evolving landscape, developing countries are often positioned as potential suppliers of carbon credits. This role raises complex questions regarding environmental integrity, social impacts—including on First Nations communities—domestic mitigation priorities, and market design, particularly where countries are concurrently establishing domestic emissions trading systems.

Brazil provides a salient case study. As a country with significant potential to generate carbon credits, it is also in the process of implementing an Emissions Trading System, the Sistema Brasileiro de Comércio de Emissões de Gases de Efeito Estufa (SBCE), which may allow for the generation and potential international transfer of credits. Using Brazil as a case study, we ask the following question: how can developing countries sustainably balance their dual roles as carbon credit providers, market participants and domestic carbon market operators within a multi-level carbon market system? Will the requirements for developing countries to meet their own NDC targets present a challenge for the international carbon market architecture and potentially constrain the supply of carbon credits?

Against this background, our paper will, first, provide an overview of Brazil’s climate policy framework, with particular emphasis on the design and emerging role of the SBCE. Second, it analyses the legal and institutional architecture of Article 6, focusing on Brazil’s potential positioning as both a supplier and user of internationally transferred mitigation outcomes. Third, it identifies key governance and design challenges associated with managing these dual roles, including issues of environmental integrity, accounting, and domestic policy coherence.

→ This paper will be presented in Session 11: International Climate Law & Governance.



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Piecing Together the Puzzle: Can Policy Packaging Make Carbon Pricing Work?

Author: Kris Bachus | University Antwerpen

Co-authors: Jeroen Barrez

Carbon pricing can be an effective instrument for mitigating climate change. Yet, despite some growth over the past decade, public attitudes remain a major barrier to a broader adoption of these policies. Drawing on a large-scale survey experiment in Belgium with over 2000 respondents, we provide novel evidence that framing carbon pricing from the beginning of the policy process within a broader policy package can significantly enhance acceptability. We also contribute to the literature by investigating both the drivers for pure carbon pricing and carbon pricing packages (encompassing revenue recycling in a budget-neutral carbon pricing shift) in a single study. While climate concern, perceived effectiveness and especially perceived fairness are identified among the main drivers of carbon pricing policies, the expected financial impact on people's own household is only a key driver for standalone carbon pricing, so not for the policy package with revenue recycling. This result suggests that revenue recycling can mitigate concerns about the financial impact, and more broadly that policy packaging can positively affect public acceptability of carbon pricing policies.

→ This paper will be presented in Session 2: Political Economy I: Public Acceptance.

Accelerating Green Economy Transformation Through Environmental Taxes in Southeast Asian Countries

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Co-authors: Jacqueline Cottrell, Jana Leutner, Hana van Loock

Many countries in Southeast Asia face the challenge of sustaining rapid economic growth while following climate and environmental objectives. Environmental fiscal reform (EFR) offers opportunities for those countries by enabling a green economic transformation. Environmental taxes (ET) play a central role by internalizing environmental externalities while simultaneously mobilizing public revenues to support climate and development goals. They are seen as a key instrument for innovative climate financing to achieve ASEAN's 2045 strategic goals. This paper assesses the extent to which existing EFR instruments - particularly ET and the reform of fossil fuel subsidies (FFS) - are already implemented in Southeast Asian countries, and identifies opportunities to strengthen policy coherence, instrument design, and implementation across diverse national contexts.

The analysis covers ten countries: Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, the Philippines, Singapore, Timor-Leste, Thailand, and Viet Nam. After examining the socio-economic context and environmental challenges and objectives, and mapping ET and FFS, policy coherence is



analyzed using a gap analysis and by calculating the net effective carbon rate (net ECR). This is complemented by country-level case studies examining the design, implementation, and impacts of selected ET across different sectors. The approach enables both cross-country comparison and the identification of context-specific policy pathways.

The data show that population growth, particularly in urban environments, economic growth, and the energy mix are key drivers of GHG emissions, environmental degradation and biodiversity loss. While environmental strategies and goals tend to be comprehensive, ET to achieve the targets are often absent or inconsistent, although all countries do show implementation of some ET instruments. Additionally, FFS remain significant and the net ECR is negative in almost all countries, which has policy incoherence and equity effects. The case studies highlight that when implementing ET, many countries face many challenges (e.g., monitoring emissions, equity considerations), which are addressed by pragmatic design choices, exemptions for low-income groups, as well as gradual implementation of ET over time. Many countries have inadequate fiscal space and low tax-to-GDP ratios and are therefore keen to generate additional domestic revenue using EFR.

The analysis of gaps and incoherences reflects the practical challenges of balancing environmental objectives with considerations of energy affordability, industrial competitiveness, and social equity in a growing economy. Examples show that the effectiveness of environmental taxes depends not only on individual instrument design, but on their integration within a coherent environmental fiscal policy. From an international perspective, the countries in Southeast Asia show that EFR contributes to better public finances, resource mobilization while addressing environmental challenges and can strengthen the effectiveness of international cooperation on carbon pricing.

The paper provides eleven recommendations on EFR in Southeast Asian countries. To realize their potential, policy gaps and incoherences need to be addressed, and different gradual approaches can be taken to improve coverage, implementation, and intensity over time. Inter-ministerial cooperation, regional standards and further cooperations at the regional level can play a pivotal role in accelerating green economy transformation in Southeast Asia.

→ This paper will be presented in Session 13: Fiscal Policy III – Developing Economies.

How tailored financial impact information and revenue use shape preferences for carbon pricing policies

Author: Jeroen Barrez | KU Leuven

Co-authors: Sandra Rousseau, Stijn Van Houtven

Achieving climate neutrality by 2050 requires substantial emission reductions across all sectors and, consequently, the implementation of stringent climate policies. While carbon pricing is widely recognised as an effective policy for reducing emissions (Baranzini et al., 2017; Stiglitz et al., 2017; Timilsina, 2022), public resistance remains a major barrier to adopting such policies at the scale and pace needed to limit global warming to below 2 °C (Dechezleprêtre et al., 2025; Drews & van den



Bergh, 2016; Fairbrother, 2022; IPCC, 2023). However, the literature also shows that public acceptability substantially depends on how revenues are used (Barrez, 2024; Douenne & Fabre, 2022; Nowlin et al., 2020) and communicated (Carattini et al., 2017; Klenert et al., 2018). More specifically, research shows that informing people about the magnitude and financial benefits of carbon pricing revenues in a clear and visible way can change their attitudes towards carbon pricing and enhance acceptability (Baranzini et al., 2014; Beiser-McGrath & Bernauer, 2019; Carattini et al., 2017; Jagers et al., 2021; Kallbekken & Aasen, 2010). For instance, Carattini et al. (2017) show that providing information on environmental effectiveness reduces demand for environmental earmarking, while making distributional effects salient raises support for progressive designs such as social cushioning and lump sum transfers.

This study examines public preferences for carbon pricing packages and evaluates whether information on financial impacts affects these preferences. We focus on Belgium, a country characterised by a high overall tax burden but low environmental taxation and no explicit carbon price beyond the EU Emission Trading System (ETS) (Barrez & Bachus, 2023; OECD, 2022). This context creates scope for an environmental tax shift that reduces other taxes, especially labour taxes, or funds complementary policies to mitigate potential regressive impacts. Against the backdrop of EU climate policy and the new 2040 target to cut emissions by 90%, the issue is particularly timely. The upcoming introduction of ETS 2 will extend carbon pricing to buildings, road transport and additional sectors, directly affecting household budgets through higher heating and transport costs (Günther et al., 2025). Since the Social Climate Fund provides a key mechanism to channel ETS 2 revenues toward direct income support or investments in energy efficiency and sustainable mobility, understanding how revenue use and information shape public support is crucial.

We study five revenue-neutral carbon pricing packages that each combine a carbon price with a specific mechanism for recycling the resulting revenues: a linear labour tax reduction, a labour tax reduction targeted at low wages, subsidies for public transport, lump-sum transfers, and compensation transfers that offset the direct and indirect financial impacts of the carbon price on real disposable income. To elicit preferences for these packages, we employ a discrete choice experiment, a method widely used to isolate the effects of individual policy design attributes (Beiser McGrath & Bernauer, 2019; Carattini et al., 2017; 2015; Saelen & Kallbekken, 2011).

We address two central questions: (1) which carbon pricing packages citizens prefer, and how revenues should be used; and (2) whether providing information on financial impacts alters these preferences. Building on information-based interventions (Stantcheva, 2021), our experimental design varies whether respondents are shown financial impact estimates for their own household, low-income households, and the average household. These informational cues capture perceived cost–benefit considerations (Douenne & Fabre, 2022; Drews & van den Bergh, 2016; Jagers et al., 2019), perceived fairness (Bergquist et al., 2022; Ewald et al., 2022; Maestre-Andrés et al., 2019, 2021), and perceived economic impact (Carattini et al., 2017).

To enhance realism and mitigate hypothetical bias, respondents receive respondent specific financial impact estimates for their own household for each carbon pricing package. To this end, we simulate financial impacts of each carbon pricing packages with a computable general equilibrium (CGE) model linked to a microsimulation model (MSM) of taxes and benefits running on household microdata. To our knowledge, this is the first study to provide personalised financial impact information based on an integrated top-down simulation within a choice experiment on carbon pricing policies. Furthermore,



public preferences are assessed aligned with Belgium's 2030 climate target, which requires a 47% reduction in emissions compared with 2005 levels under the Effort Sharing Regulation (ESR). To achieve this target, carbon prices would need to reach €112 (ETS1) and €114 (ETS2) per tonne of CO₂ by in 2030.

Our results show that respondents prefer labour tax reductions and compensation transfers, while public transport subsidies are least favoured. Information on the financial impact for low-income and average households increases support for carbon pricing packages, whereas personalised information reduces support among respondents facing substantial losses. A hybrid latent class model identifies five segments with distinct policy preferences and shows that climate attitudes help explain this heterogeneity. Overall, the findings highlight the crucial role of revenue use and targeted communication for enhancing public acceptability of carbon pricing policies.

→ This paper will be presented in Session 2: Political Economy I: Public Acceptance.

The future of CBAM? Redesigning the EU Carbon Border Adjustment to Align Carbon Pricing, Climate Finance and Competitiveness

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Co-authors: Marta Villar Ezcurra

The Carbon Border Adjustment Mechanism (CBAM) is one of the most controversial instruments of the European Union's current climate policy, as it reflects underlying imbalances between carbon pricing, climate finance, and industrial competitiveness. Initially conceived as a complement to the EU Emissions Trading System (ETS), its appropriate design plays a crucial role in a context marked by the progressive phase-out of free allocation of emission allowances for European industry.

Against this background, this paper advances a legal-critical perspective on the potential reform of the CBAM, based on the premise that, while its theoretical design may reduce the risk of carbon leakage, its current configuration reveals significant shortcomings in terms of institutional design and coordination with other policy instruments. In this regard, the CBAM represents a clear example of the structural tensions embedded in the European Union's climate governance, particularly between regulatory ambition, industrial policy considerations -as increasingly articulated through initiatives such as the Clean Industrial Deal-, and financial constraints.

The first part of the paper situates the CBAM within the broader framework of the EU's carbon pricing and climate finance architecture, thereby shifting the focus from its trade rationale to its fiscal and budgetary implications. The proposal to designate CBAM-related revenues as a future own resource of the EU budget integrates the mechanism into the Multiannual Financial Framework, raising important questions regarding the use and allocation of these revenues, including the feasibility of using CBAM revenues to support low-carbon transitions in third countries. Particular attention is given to the temporary earmarking of CBAM revenues for decarbonisation purposes, notably through the



Temporary Decarbonisation Fund, highlighting the interaction between carbon pricing, industrial policy support, and financing needs.

The analysis further examines the CBAM as a unilateral EU standard-setting instrument that constrains competitive conditions and operates at the intersection of climate policy, fiscal policy and international trade. More broadly, carbon pricing mechanisms are shown to shape trade patterns by altering relative costs and redefining the boundaries of competition across jurisdictions. By extending the EU's internal carbon pricing logic to imports, the CBAM produces significant extraterritorial effects, effectively embedding climate-related conditionality into access to the EU market and reshaping competitive dynamics beyond EU borders. A comparison is drawn with the EU-driven global minimum tax, as both regimes respond to perceived competitive distortions through top-up mechanisms functionally designed to neutralise differences in regulatory or fiscal burdens. However, such measures entail risks of intensifying economic tensions, increasing administrative complexity, and generating asymmetric effects across countries, particularly in a context shaped by parallel responses by other major economies, most notably the United States.

Beyond its fiscal and trade-related dimensions, another core contribution of the research lies in assessing the CBAM's environmental effectiveness. Several limitations can be identified, including its restricted sectoral coverage, the exclusion of downstream products and exports, its technical complexity, and its vulnerability to resource-shuffling strategies.

Finally, and looking forward, this paper addresses the unresolved question of whether carbon credits under Article 6 of the Paris Agreement could be integrated into the EU CBAM, highlighting the legal and governance challenges such an integration would entail.

→ This paper will be presented in Session 1: CBAM I – Legal & Institutional.

Fiscal instruments to compensate for externalities - evidence from wind power development in Denmark

Author: Sandra Bernick | Imperial College London

The green transition requires the large-scale deployment of distributed, low-carbon infrastructure. However, local resistance, often driven by concerns over noise and visual disamenities, poses a significant barrier, delaying the rollout of renewable energy and grid infrastructure. This creates a fundamental tension: while clean energy reduces global externalities, it introduces new, localised costs. As a result, policymakers have increasingly turned to compensation mechanisms to address these local impacts. This paper studies whether such compensation policies reduce externalities from renewable energy using a natural experiment in Denmark, a frontrunner in the green transition.

A key question is whether developers, who are responsible for paying compensation, respond strategically by minimizing total compensation costs. For profit-maximizing firms, reducing compensation liabilities helps limit overall project costs. However, this behavior may have unintended consequences. For example, developers may shift projects to areas with lower property values, which



are often poorer or more marginalized, or to less densely populated but environmentally sensitive locations. The paper therefore addresses three questions: (1) does the compensation policy reduce overall externalities, (2) does it change their distribution, and (3) does it affect local resistance to wind power?

The Danish policy setting provides a unique opportunity to study these effects. In 2009, the Danish government introduced a major reform requiring developers of new or upgraded renewable energy installations to compensate nearby homeowners for losses in property values. Compensation amounts are determined by regional assessment boards using independent appraisals and must be paid before construction begins. A later reform allowed homeowners to sell their properties to developers. These changes represented a significant departure from traditional nuisance law and introduced uncertainty regarding project costs.

To evaluate the policy, I assemble a comprehensive dataset covering all renewable installations in Denmark before and after the reform, combined with detailed property transaction data, compensation awards, and other local outcomes. Using a difference-in-differences approach, I compare installations before and after the policy change. The results show that wind farms built under the new rules generate larger externalities per affected property but lower total externalities at the project level. This pattern appears to be driven by strategic responses from developers, who adjust project characteristics and locations to reduce overall compensation costs. These effects are observed for commercially owned and mixed-ownership wind farms, but not for fully community- or farmer-owned projects.

While commercial developers have greater capacity to absorb risk across portfolios, they respond in ways that reduce total externalities, suggesting that the compensation policy has unintended but beneficial effects beyond its original intent. These effects persist over time, although they weaken.

The analysis also identifies several unintended consequences. Wind farms are more likely to be located in areas with lower property values, which tend to have higher levels of deprivation. This raises important equity concerns, as the policy may shift externalities toward more vulnerable populations. Additionally, property markets in these areas are often less liquid, potentially leading to larger realised losses than anticipated by compensation valuations, although evidence on this point is mixed. There is also some indication that commercial developers reduced their activity in Denmark following the policy change.

Ongoing work examines whether the policy affected local political resistance to renewable energy projects. Due to the absence of direct survey data, I exploit features of the Danish electoral system that allow voters to allocate personal votes to candidates. By analyzing municipal election data, relevant because municipalities play a key role in permitting decision, I aim to measure changes in support for incumbent politicians associated with renewable energy expansion.

This paper contributes to the literature on the local externalities of renewable energy and the policy tools used to address them. A large body of research has documented negative effects of renewable infrastructure on nearby property values, particularly for wind energy, with impacts varying by visibility, turbine size, and other characteristics (e.g., Sunak and Madlener, 2016; Gibbons, 2015; Dröes et al., 2021; Andersen et al., 2025). While some of these effects can be mitigated through regulation, compensation has emerged as an increasingly important policy tool (Germeshausen et al., 2025).



This paper makes two main contributions. First, it provides the first empirical evidence, to my knowledge, on how compensation policies affect not just the redistribution of externalities but their magnitude and spatial allocation. Second, it highlights how such policies can induce strategic responses by developers, with important implications for both efficiency and equity. These findings are particularly relevant as compensation schemes become more widely used to facilitate the energy transition.

→ This paper will be presented in Session 15: Sector-Specific Instruments.

A Fiscal Duty at Any Cost? Taxpayer Vulnerability and Fiscal Justice after Climate Disasters

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Climate change is the defining issue of our time, with repercussions that are global in scope and unprecedented in scale. Climate disasters generate large-scale losses and pressing material asymmetries. Yet, most national tax systems were fashioned for conditions of normality, presuming regular administrative capacity, economic continuity and ordinary conditions of compliance to obligations. As the climate crisis renders abnormal economic conditions increasingly recurrent, tax systems can no longer behave as though emergency were a deviation external to their limits. Even so, a climate disaster does not, by itself, extinguish fiscal obligations. It may, however, alter their concrete effects and the constitutional conditions under which their enforcement remains constitutionally admissible. In such circumstances, both the taxpayer's ability to comply with fiscal duties and the tax authorities' power to enforce them must be examined through the lens of the taxpayer's fiscal vulnerability, understood in this article as a temporary but legally relevant condition arising from environmental catastrophe and capable of affecting both. Using the 2024 floods in Rio Grande do Sul as its jurisdictional anchor, the article asks on what constitutional grounds fiscal duties may still bind the taxpayer once climate disaster has radically altered the taxpayer's material circumstances. Brazilian constitutional tax law contains normative resources capable of addressing such cases. Ability to pay, substantive equality, minimum subsistence, legal certainty, protection against excess, and the safeguarding of essential economic continuity all bear on situations in which formal tax duties no longer weigh equally in substance. Accordingly, this research is compelled to ask: when climate disasters radically impair taxpayers' material conditions, on what constitutional grounds may ordinary fiscal duties continue to be enforced, suspended, or differentiated without violating equality, capacity to pay, minimum subsistence, legal certainty, and the prohibition of excess? Within that framework, the article employs the legal notion of taxpayer fiscal vulnerability. It is temporary because it is linked to an exceptional state of material disruption rather than to a permanent status; it is legal because that disruption bears directly on the constitutional assessment of incidence and differentiated treatment in taxation. This article argues that taxpayer fiscal vulnerability designates the legally relevant condition in which climate disaster impairs the taxpayer's ability to bear, perform, regularise, or contest fiscal obligations, while simultaneously affecting the constitutional adequacy of their



incidence and enforcement. In this setting, vulnerability itself does not found differentiated treatment; rather, it identifies possible tools towards defining the situation in which existing constitutional tax principles must be re-specified under altered facts. Therefore, the article proceeds on two levels. First, it reconstructs the Brazilian constitutional tax-law framework within which differentiated treatment under environmental-disaster conditions must be justified. Here, taxpayer ability to pay is read together with substantive equality, minimum subsistence and the prohibition of tax power excess, so that the legitimacy of fiscal intervention depends not only on formal tax guarantees but also on the preservation of the minimum efficacy of the rights and protected legal interests affected by taxation. Secondly, the article turns to the administrative fiscal response to the Rio Grande do Sul floods in Brazil and examines selected measures as institutional tests of a deeper question: can fiscal duties remain enforceable at any cost after climate disasters, in light of taxpayer vulnerability and the demands of fiscal justice? As climate shocks become more frequent, this problem can no longer be treated as marginal to finance or fiscal policy. This problem concerns the conditions under which fiscal justice remains defensible when catastrophe renders ordinary equal treatment materially untenable.

→ This paper will be presented in Session 14: Climate Adaptation.

Emissions Trading for Climate Action: Impact of the Carbon Credit Market on the Ecological Transition in Sub-Saharan Africa

Author: Fabrice Ewolo Bitoto | University of Dschang

Co-authors: Nelson Derrick Nguépi

Carbon pricing is proving to be one of the most powerful ways for policy-makers to encourage emissions reductions. Based on the premise that market mechanisms linked to emission play a key role in ecological transition, this study aims to analyze the impact carbon credit market adherence policy on ecological transition in Sub-Saharan Africa (SSA). The data used come mainly from the World Development Indicators (WDI) and Voluntary Registry Offsets Database (VROD), for a panel of 48 SSA over the period 2000-2023. The empirical analysis relies on several recent impact analysis methods, including Entropy balancing, Propensity Score Matching (PSM) and Heterogenous Difference in Difference (HDID) to correct for econometric biases inherent in impact. The main results indicate joining the carbon credit market significantly reduces greenhouse gas emissions and promotes sustainable development. By offering an economic value to gas emission, carbon credits encourage companies to adopt more practices. What's more, the involvement of international players in this market encourages the transfer of clean technologies and helps strengthen the technological capacities of SSA in their fight against climate change. This study recommends further integration of SSA countries into the carbon credit market to technological innovation and ecological transition. We also stress the need for effective environmental governance and equitable distribution of the benefits generated by carbon credits.

→ This paper will be presented in Session 20: Political Economy III: Reform in Practice.



Charting the Course of Environmental Taxation to Reduce the Air Emissions from Maritime Transport

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Maritime transport is indispensable to international trade but remains a significant source of atmospheric pollution. Its emissions produce environmental effects at different geographical scales: greenhouse gas (GHG) emissions contribute to global climate change, whereas nitrogen oxides (NO_x), sulfur oxides (SO_x), and particulate matter (PM) are particularly relevant to air quality, human health, and ecosystems at the local and regional level. These differences are important not only environmentally, but also for the selection, territorial scope, and coordination of policy instruments.

Over the past several years, the regulatory framework applicable to maritime air emissions has expanded substantially. At the international level, MARPOL Annex VI provides the principal technical and operational standards developed within the International Maritime Organization (IMO). The European Union (EU) has complemented this framework through instruments such as FuelEU Maritime and the extension of the EU Emissions Trading System (EU ETS) to maritime transport. At the same time, the IMO has developed its proposed Net-Zero Framework, which combines a fuel-intensity standard with an economic compliance mechanism. Environmental taxation, by contrast, remains comparatively underused in this sector. The Norwegian NO_x tax and the Catalan proposal on port emissions provide contrasting examples of national and subnational fiscal intervention.

This paper examines the extent to which taxation can still contribute to reducing maritime air emissions within this increasingly complex policy environment. Particular attention is paid to the relationship between tax measures, technical standards, and other economic instruments, as well as to the significance of the geographical scale at which different emissions generate their environmental effects.

The analysis identifies a marked difference between climate-related emissions and pollutants whose effects are primarily local or regional, with important consequences for the scope and design of environmental taxation. It concludes that environmental taxation retains meaningful potential in maritime transport, but that this potential varies considerably according to the pollutant concerned, the point at which the fiscal measure operates, and the territorial scale of intervention. For climate-related emissions, coordination with existing regulatory and pricing mechanisms (and the risk of cumulative compliance costs) is the principal concern and limitation. For pollutants with predominantly local and regional effects, greater fiscal space appears to exist, although mobility, competitive distortions, and policy-coherence concerns remain significant constraints.

The paper concludes that the potential of environmental taxation in maritime transport depends fundamentally on the pollutant targeted, the point of intervention, and the territorial scale. Effective design requires not only additional price signals, but coherent integration with the instruments already in place.

→ This paper will be presented in Session 6: Aviation & Shipping.



GCET27

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Environmental Taxation

Global assessment of the socio-ecological risks to forest-based carbon project integrity

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Co-authors: Carla L. Archibald, Matthew Hayward, Zhimin Chen, Xiang Zheng, Yiwen Zheng, Brooke A Williams

Forest-based carbon projects are widely used to channel finance towards climate change mitigation, yet variability in environmental and social safeguards can undermine confidence in carbon markets and increase exposure to credit invalidation, regulatory intervention, and reputational loss. Despite growing recognition that community wellbeing, land rights, and ecological integrity are central to durable carbon outcomes, socio-ecological risks are rarely assessed consistently across projects at scale. In this study, we aim to conduct a global assessment of approximately 800 forest-based carbon projects to quantify the types, extent, and magnitude of socio-ecological risks to project integrity, and to examine how risk varies across regions, proponents, and delivery structures. Using a sophisticated natural language processing (NLP) model guided by a structured and theory-driven coding framework aligned with widely used integrity principles, we extract project-level evidence from public documentation across the multiple dimensions of biodiversity and environmental co-benefits, social safeguards, and system-wide integrity conditions. We then combine these dimensions into a transparent risk metric and derive risk profiles that capture distinct patterns of co-occurring weaknesses (e.g., robust carbon accounting paired with weak social safeguards, or strong community processes paired with limited biodiversity monitoring). The resulting typology supports cross-project comparability and identifies where integrity risks concentrate geographically and institutionally, including projects with elevated social risk linked to ambiguous land and carbon rights, limited evidence of meaningful consultation, and weak documentation of benefit-sharing or grievance processes. By translating project reports into a standardised indicator, our approach provides an implementable due diligence tool for investors, standards bodies, and policymakers to target safeguards, improve disclosure, and design incentives that reward high-integrity outcomes. The findings underscore that strengthening socio-ecological integrity is not only a normative objective but also a practical strategy to reduce market-wide risk and improve the effectiveness of climate finance delivered through carbon markets and tailor policy strategies based on historical data.

This contribution aligns most directly with the conference's focus on implementation and climate finance: it clarifies when market-based instruments deliver credible mitigation and when integrity risks can erode political feasibility, distributional legitimacy, and the effective use of revenues for just transitions.

→ This paper will be presented in Session 8: Forestry.



Taxing Global Externalities with Local Benefits: Installation-Level Evidence from the European Union Emissions Trading System

Author: Johannes Brehm | RWI - Leibniz-Institute for Economic Research & Hertie School

Carbon pricing is central to climate policy, but its broader environmental effects remain uncertain. This paper estimates whether the European Union Emissions Trading System (EU ETS) reduces emissions of local air pollutants -- nitrogen oxides (NO_x) and sulfur dioxide (SO₂) -- at regulated industrial installations. Because these pollutants generate substantial local health damages and are regulated separately from carbon, any reductions would constitute an important co-benefit of emissions trading and would strengthen the welfare case for carbon pricing.

The analysis combines installation-level data from national Pollutant Release and Transfer Registers in France, the Netherlands, Norway, and the United Kingdom with the EU Transaction Log. These linked data cover both ETS-regulated and unregulated installations over the full history of the scheme and provide substantial pre-treatment variation. I exploit staggered entry into the EU ETS, driven by installation characteristics and phase-specific coverage rules, in a difference-in-differences design that uses never-treated and not-yet-treated installations as controls. Estimation uses heterogeneity-robust staggered-adoption methods and Poisson models that treat observations below reporting thresholds as censored rather than as zeros.

The paper makes two contributions. First, it provides installation-level causal evidence on the co-pollutant effects of the EU ETS. Existing quasi-experimental evidence relies on sector-level data, which cannot exploit within-sector variation in regulatory status. Second, it separates the effect of the carbon price from that of overlapping command-and-control regulation. In particular, the Large Combustion Plant Directive imposed binding NO_x and SO₂ standards on many of the same facilities covered by the ETS from 2008 onward. To isolate the carbon-pricing channel, I exploit the gap between the 20 MW EU ETS threshold and the 50 MW threshold for large-combustion regulation: installations in this interval face the carbon price but not the concurrent combustion-plant standards.

The results confirm earlier findings that the EU ETS reduced CO₂ emissions. Preliminary estimates also indicate meaningful reductions in NO_x emissions, with effects emerging most clearly from Phase II onward and remaining robust across estimators. The findings inform the evaluation of carbon pricing beyond the carbon externality and bear directly on the design of integrated climate and air-pollution policy.

→ This paper will be presented in Session 9: Carbon Pricing I – Empirical Evaluation.



Too many hands on the boiler? Collective governance and residential energy demand responses

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Co-authors: Edouard Civel

Carbon pricing and energy taxation are central instruments in the decarbonization of the residential sector. Yet their effectiveness rests on the implicit assumption that the agent who receives the price signal is also the one who controls consumption. When governance structures decouple these two roles, price instruments may face structurally inelastic segments of demand, not because households are unresponsive to prices in general, but because the relevant decision-maker does not face the signal. This paper provides empirical evidence of this mechanism in the French residential heating sector, where the governance structure of heating systems varies sharply across buildings and generates measurable heterogeneity in both price and temperature elasticities.

The building sector accounts for nearly 30% of global final energy consumption, and up to 45% in France, making it a priority target for climate policy. Within this sector, multi-family buildings present specific challenges. Compared to single-family housing, they tend to exhibit slower adoption of energy efficiency improvements, due to technical constraints and complex collective decision-making processes. A key but underexplored dimension of this heterogeneity is the governance regime of heating systems. In multi-family buildings, heating is provided either through individual boilers (where each household controls and pays for its own consumption) or through collective central heating systems, where decisions over boiler activation, temperature settings, and maintenance are made at the building level. This distinction creates a natural empirical setting to study how governance structure shapes consumption behavior.

We construct a comprehensive panel dataset of 65,000 French residential buildings with 280,000 annual observations of gas consumption over the 2018-2022 period, drawing on the National Database of Buildings (BDNB) developed by the Scientific and Technical Center for Building (CSTB). This dataset harmonizes approximately twenty administrative and public sources, providing granular building-level information on dwelling count, construction year, floor area, geographic location, and Energy Performance Certificate ratings. To our knowledge, this dataset has not been widely used for the empirical analysis of residential energy demand; it offers an unusually detailed micro-level perspective. Using a fixed effects panel estimator, we compare price elasticity and temperature sensitivity across buildings with collective and individual heating systems, exploiting national semi-annual price variation and monthly departmental heating degree-day (HDD) variation. To capture seasonal dimensions of the heating response, we construct an index based on the share of non-winter HDD in total annual HDD, enabling us to distinguish between settings with tightly winter-concentrated demand and those with more dispersed seasonal patterns.

Our results reveal striking differences across governance regimes. Price elasticity is nearly twice as large in absolute value in individually heated buildings compared to collectively heated ones (-0.539 vs. -0.231), consistent with more direct exposure to price signals in individual systems. Collectively heated buildings exhibit stronger sensitivity to temperature shocks during the heating season (0.335 vs. 0.168), but paradoxically adjust far less to off-season cold spells, as reflected in a markedly lower



non-winter HDD index (0.062 vs. 0.191). This combination (higher in-season temperature sensitivity, lower price elasticity, and near-zero off-season flexibility) is the empirical signature of a governance-induced rigidity, not a preference-based one.

We interpret these patterns through two distinct mechanisms rooted in the governance structure of collective heating. First, heating decisions in collectively managed buildings are made by co-ownership assemblies from which tenants are structurally excluded despite bearing costs through service charges. As tenants are on average less wealthy than owner-occupiers, their exclusion shifts the median decision-maker upward in the income distribution, dampening price responsiveness while sustaining comfort-driven temperature sensitivity among wealthier decision-makers. Second, seasonal boiler activation is a discrete collective decision subject to coordination frictions, suppressing the extensive-margin flexibility that individually controlled systems provide naturally in response to off-season cold spells.

These findings carry direct implications for the design of energy taxation and carbon pricing policy. Where heating governance separates the decision-maker from the price signal, carbon taxes face a structurally inelastic segment of the housing stock, not temporarily but by design. France's failed attempt to mandate individual heat cost allocation in collective buildings illustrates the practical limits of realigning incentives through governance reform alone, and points toward direct performance regulation as a necessary complement to price instruments.

→ This paper will be presented in Session 18: Energy Policy.

Sequestration or Avoided Emissions? Economic Viability and Carbon Pricing Thresholds for Blue Carbon in Mediterranean Salt Marshes

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Co-authors: Irene Isabel da Cruz Martins, Michelle Márcia Viana Martins

Vegetated coastal ecosystems (salt marshes, mangroves, and seagrass meadows) occupy roughly 0.2 percent of the ocean surface yet account for approximately half of all carbon buried in marine sediments, with sequestration rates ten to one hundred times higher than those of terrestrial forests per unit area. The loss of one-third of global coverage in recent decades has converted these environments from carbon sinks into emission sources, with economic damages estimated at 6 to 42 billion dollars annually. Despite this relevance, the financial value of coastal carbon services remains poorly internalized in markets and public budgets, limiting integration into carbon pricing mechanisms and fiscal policy for climate mitigation.

This paper investigates the economic viability of a blue carbon project for the 3,452.8 hectares of salt marshes in Ria Formosa, a mesotidal coastal lagoon classified as a Natural Park in southern Portugal, and evaluates which financing instruments could operationalize such a project within existing carbon pricing and fiscal architectures. The study offers three contributions: a structured net present value



(NPV) model with carbon price scenarios updated to current markets; the evaluation of five financing instruments in the EU institutional context; and the identification of conditions under which carbon pricing thresholds determine project viability.

The economic valuation follows the NPV framework established in the seminal blue carbon cost-benefit literature. The gross benefit is a function of the annual greenhouse gas flow, continuous carbon sequestration, avoided emissions from non-conversion of soil stocks, and methane deduction, multiplied by the carbon price and discounted over a 25-year horizon. The model is implemented under two specifications. Specification A (conservative) considers only net sequestration minus methane, yielding a constant flow of 7.6 t CO₂e per hectare per year. Specification B (complete) additionally includes avoided emissions modeled through exponential decay of the soil carbon stock, with a half-life of 7.5 years. Three price scenarios are defined: 15 dollars per tonne of CO₂e (voluntary market floor), 50 dollars (EU ETS average 2023–2024), and 100 dollars (social cost of carbon). Sensitivity analysis varies biophysical parameters, substituting global estimates with those from the Venice Lagoon, a comparable Mediterranean system, and the discount rate between 3.5 percent (social), 5 percent (multilateral development bank), and 10 percent (financial).

Results reveal that including or excluding avoided emissions qualitatively alters the viability conclusion. Under Specification B, the project yields positive net returns from 15 dollars per tonne of CO₂e, with a gross NPV of 7,849 dollars per hectare at a 10 percent discount rate, replicating within 1.9 percent the reference estimate in the literature. Under Specification A, viability requires prices around 50 dollars per tonne, implying necessary integration into compliance markets such as the EU ETS or the Carbon Removal Certification Framework. Sensitivity analysis confirms the robustness of Specification B: net returns remain positive in all combinations of discount rate and price scenario, even when Mediterranean parameters reduce returns by 55 to 61 percent. In contrast, Specification A is unfeasible with Mediterranean parameters in virtually all scenarios. Biophysical parameters have a larger impact than the discount rate: shifting from 3.5 to 10 percent reduces returns by 27 percent, compared to 55 to 61 percent from substituting global for regional parameters.

Five financing instruments are evaluated for their applicability to Ria Formosa: the voluntary carbon market through the Verified Carbon Standard protocol, the EU Carbon Removal Certification Framework, payments for ecosystem services, green and blue bonds, and blended finance. The voluntary carbon market represents the most operationally accessible short-term mechanism, provided the project focuses on restoring degraded salt marsh areas to satisfy additionality requirements, a critical condition given the existing legal protection status of the site. The analysis identifies a two-phase blended finance architecture as the most viable pathway: public capital from EU programs finances baseline carbon stock measurements, restoration of degraded areas, and initial certification costs in the first phase, while carbon credit revenues cover ongoing management and monitoring costs in the operational phase, with potential transition to compliance certification under the CRCF at higher carbon prices.

The findings carry implications for three areas at the intersection of carbon pricing and environmental fiscal policy. First, the carbon pricing threshold for viability varies by an order of magnitude depending on whether avoided emissions are creditable, with direct consequences for the design of effective carbon rates and emissions trading rules for nature-based solutions. Second, the additionality constraint creates a tension between conservation and restoration that fiscal instruments must address through differentiated crediting mechanisms. Third, the blended finance architecture



illustrates how public fiscal instruments can de-risk private carbon market investment in coastal ecosystems, offering a replicable model for Mediterranean and European coastal sites.

→ This paper will be presented in Session 12: Climate Policy Modelling.

How do Citizens in a Developing Country Perceive Energy Price Reform: Evidence from Petroleum Subsidy Removal in Nigeria

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Energy reform is one of the measures policymakers have implemented to enhance emissions reduction, income generation, and green infrastructure investment. Energy price reform, for example, the removal of petroleum subsidies, has been recommended to improve transparency in downstream petroleum-sector governance, reduce waste, enhance investment in social services, and facilitate economic development. However, despite the gains in economic development and emission reduction due to energy price reform, especially petroleum subsidy removal, Nigeria's subsidy rose to over N400 billion monthly in 2023, which translates to over N4.8 trillion or 6.27 billion USD (766 NGN /1 USD) annually, accounting for more than 20% of the fiscal budget. With the subsidy in place, gasoline faced non-zero (negative) effective carbon rate (ECR) even as the road sector accounted for 7.9% of CO₂ emissions in Nigeria. To reverse losses and promote sustainable economic development and emissions reduction, the Nigerian government removed the petroleum subsidy in May 2023, after many attempts by successive governments to do so. To facilitate the success of the reform, given the failure of previous attempts, this study determined citizens' perception of the subsidy removal and used the revenues from the subsidy removal. The study was carried out in three Nigerian states, namely Lagos, Enugu and Kaduna and the Federal Capital Territory (FCT), Abuja. The three states and FCT were selected to cover North and Southern Nigeria. We applied a multi-stage sampling procedure involving sampling enumeration areas (EAs) (clusters of housing units) and households. In the first stage, we randomly select 30 EAs in each state for the study: 20 Urban and 10 rural. From each EA, we randomly selected 10 households. This resulted in 300 households per State and a total sample size of 1200 households for the study. A structured questionnaire was used to collect data. Data collection was carried out using CAPI with Survey Solutions software. Trained enumerators were used to collect data. Before data collection, the instrument (questionnaire) was pilot-tested (pre-tested) with 30 households selected from an EA in Lagos to ensure its reliability. We also applied for and obtained ethical clearance from the University of Nigeria Research Directorate before the main data collection. Descriptive statistics and ordered probit were applied in the data analysis. The results show that with the assumption that the money saved from the subsidy is not stolen, the government does not use the money corruptly, and the saved money is used in the federal budget to fund healthcare, education and development projects, 62.05% support subsidy removal, while 30.34% do not support; 7.67% were indifferent. Also, assuming the money saved from the subsidy is not stolen or used for corruption, only 4.42% thought it should be spent on oil subsidies. Regarding their views on the current subsidy removal in Nigeria, 47.75% indicated it was good (19.25% said very good, and



28.50% said quite good). Using an ordered probit model, the results show that being educated and having a high income increase the likelihood of holding this opinion. On measures to cushion the effect of subsidy removal, the highest proportion (35.50%) indicated that the government should provide better and cheaper public transport, 19.83% indicated that government should urgently allocate and use the revenue saved from subsidy removal, 18.50% indicated that they should increase the salary of workers, while only 1.17% indicated that they should pay citizens a transport allowance for one year. The report recommends that policy interventions to cushion the effects of subsidy removal should target low-income and less-educated people, who are likely to be more affected and would oppose the removal. Investment in an effective transport system could strengthen support for subsidy removal and reduce its negative impact on people.

→ This paper will be presented in Session 13: Fiscal Policy III – Developing Economies.

Reforming Tourist Taxes as Genuine Environmental Instruments: Lessons from Spain

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Tourist taxes are proliferating across the European Union (EU) under the idea of environmental sustainability, yet their legal design does not always live up to the objectives they proclaim. Experiences from France, Italy, the Netherlands and Spain illustrate this gap with varying degrees of intensity. In some cases, revenues must be earmarked for municipal tourism promotion; in others, they are directed towards tourism-related interventions and the recovery of local cultural and environmental assets. This may appear as an environmental allocation, but the taxable base in these cases remains the tourist's accommodation rather than the externality generated. In yet other cases, revenues carry no legal earmarking at all and are simply absorbed into the general municipal budget. Adding to these divergences, tensions arise between municipalities and central or regional governments over who collects the tax, who decides how funds are spent, and which level of government holds the competence to levy a charge on tourist activity.

Spain offers the most illustrative case study of this tension. Three Autonomous Communities have introduced taxes on tourist stays with markedly different earmarking regimes. The Balearic Islands direct all revenues to the Fund for the Promotion of Sustainable Tourism, which has financed ecological and heritage restoration projects, and introduce elements of differentiated pricing. In Catalonia, the allocation of revenues is shaped by a concern quite separate from the environmental question. The March 2026 reform earmarks 25% of total receipts for regional housing policies, with the remaining 75% distributed among municipalities and regional bodies through the Fund for the Promotion of Tourism. Amounts transferred to local entities may additionally be used for housing and economic development, which further distances the instrument from any corrective function. In Galicia, the legislation proclaims an extrafiscal purpose aimed at internalising negative externalities, yet the Autonomous Community has applied a 100% rebate to its own levy, leaving it operational only through voluntary municipal surcharges. While all three regimes contain some elements of



environmental protection, the taxable base in each case taxes the economic capacity of the tourist consumer, not the externality generated.

This paper argues that tourist taxes, drawing on the experiences described above, could be reoriented towards a genuine environmental extrafiscal purpose. Three issues must be addressed for this to happen. First, the taxable base must function as a measurable indicator of environmental harm, requiring the legislature to identify and legally define the specific externalities to be corrected, such as waste generation, congestion or ecosystem pressure, and to calibrate the levy accordingly. Second, the rate structure must follow corrective logic through dynamic tariffs that vary with congestion levels, seasonality and the ecological sensitivity of the destination. Third, earmarking must be legally binding and structurally coherent. Dedicating revenues to environmental purposes is necessary but not sufficient if the taxable base remains unchanged; without this, the levy is little more than a financing tool dressed in environmental language.

The paper also examines whether minimum harmonisation standards for tourist taxes at EU level could provide the coordination framework that purely national or subnational redesign cannot deliver.

→ This paper will be presented in Session 7: Fiscal Policy II – Legal Design.

From Recycling Back to Reuse: What Would a Modern Deposit-Return-Reuse System Require?

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Deposit-return systems are widely used to encourage the recovery of beverage and packaging materials, yet many contemporary systems have shifted away from their historical reuse-oriented purpose toward recycling. Earlier deposit systems often relied on localized networks in which containers were returned, cleaned, refilled, and redistributed. As markets expanded and supply chains became more complex, however, deposit-return systems increasingly prioritized material recovery rather than reuse. While recycling-based systems can improve collection rates, they do less to reduce overall material production and consumption, creating renewed interest in reuse-based approaches. This research examines how deposit-return systems might be reoriented toward reuse under contemporary market, logistical, and institutional conditions. The study builds on a systematic review of deposit-return-reuse (DRR) systems, which identified a limited empirical evidence base on operating reuse initiatives. Much of the existing literature relies on modelling, life-cycle assessments, or hypothetical scenarios, while empirical research is concentrated largely in European contexts. These findings reveal an important gap between understanding the potential environmental benefits of reuse and understanding the conditions required to implement and scale reuse systems in practice. To address this gap, the research is conducting semi-structured interviews with organizations actively engaged in DRR systems in Canada and the United Kingdom. Participants represent three key forms of involvement in reuse systems: reuse-system intermediaries that provide shared return, collection, washing, or logistics services; businesses that participate in DRR through a third-party reuse provider;



and businesses that operate their own reuse systems internally. Examining these different perspectives allows the study to capture variation in how reuse systems are organized, financed, and operated. Interviews explore motivations for adopting reuse, operational and logistical challenges, financial viability, barriers to participation, and the conditions associated with successful implementation and scaling. Particular attention is given to questions of system governance, including how costs should be distributed across producers, retailers, consumers, reuse providers, and governments, and what role public policy should play in supporting shared infrastructure and broader adoption. Ultimately, this research asks what it would take to make reuse work within modern markets and supply chains. Bringing together evidence from the systematic review and organizations actively engaged in DRR, the study examines how economic viability, operational coordination, shared infrastructure, and policy support can enable a transition from recycling-oriented deposit systems toward systems designed for repeated reuse.

→ This paper will be presented in Session 15: Sector-Specific Instruments.

The Geography of Carbon Pricing: Spatial Heterogeneity, the Missing Middle, and the Distributional Incidence of Carbon Taxation

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How would the impacts of carbon pricing on households of different income levels vary in the presence of price disparities across geographical regions? We construct a spatially explicit dynamic assessment model to evaluate the implications of simultaneous carbon pricing implementations at both national and global levels on households bearing different economic characteristics due to their geographical location. The model combines a Multi-Regional Input-Output (MRIO) framework with a household-level microsimulation module. The MRIO component captures how carbon price shocks propagate through spatially differentiated supply chains, tracing cost increases across sectors and regions before they reach final consumers. The microsimulation component then translates these economy-wide price changes into household-level welfare outcomes by identifying the economic characteristics of households based on their geographical location and applying exogenous price elasticities of demand to model how households of different income levels and locations respond to price changes. We further compare distributional outcomes across alternative revenue recycling scenarios, including lump-sum transfers, targeted household subsidies, and spatially-sensitive transfers, to assess which designs are most effective in protecting vulnerable groups and what trade-offs each approach entails in terms of coverage, fiscal cost, and distributional reach.

We use Indonesia as our case study. As one of the largest global emitters of CO₂ and the world's largest archipelagic country, Indonesia faces the dilemma of reducing emissions while maintaining economic growth. Its economy is fundamentally shaped by geographical characteristics that generate



substantial variation in market access, production structures, and household livelihoods. The contrast between Java, which benefits from dense infrastructure and integrated markets, and the outer islands, where remoteness drives up commodity prices and limits economic opportunity, illustrates why a spatially uniform carbon price does not translate into a spatially uniform welfare burden. Significant disparities in commodity prices exist due to transportation costs, infrastructure gaps, and regional market segmentation. As a result, the welfare impacts of carbon pricing are unlikely to be spatially uniform, and aggregate national models are poorly equipped to capture this heterogeneity. Indonesia therefore represents not just a convenient but a necessary setting for this analysis: its geographical complexity makes the spatial dimension of carbon pricing incidence impossible to ignore.

A particular concern motivating this study is the vulnerability of lower middle-income households, a group we refer to as the missing middle. These households sit above the poverty line and are largely excluded from means-tested safety nets, yet they lack the financial buffers to absorb energy price shocks the way richer households can. In a spatially fragmented economy like Indonesia, their exposure is further compounded by location: households in regions already burdened by high commodity prices and limited market access face a disproportionate share of the cost. Critically, because this group sits outside the conventional poverty headcount, their vulnerability goes largely undetected in standard policy evaluations. Our framework is designed to surface the missing middle explicitly, and to assess whether conventional revenue recycling schemes are sufficient to protect them or whether more spatially and distributionally targeted mechanisms are needed. We expect to show that generic recycling designs, calibrated around the very poor, leave this intermediate group systematically underprotected, while spatially-sensitive transfers are better positioned to close that gap.

These findings carry direct implications for fiscal policy design in large, geographically complex developing economies. By linking spatial price heterogeneity, household-level economic profiles, and a structured comparison of revenue recycling mechanisms, this paper offers policymakers a more complete account of who truly bears the cost of carbon pricing and what an equitable and politically sustainable recycling design must account for. In a just transition context, protecting the missing middle is not only a welfare imperative but a condition for maintaining the broad-based social support that long-term climate policy requires.

→ This paper will be presented in Session 16: Political Economy II: Distributional Effects.

Money for nothing? Revisiting scrappage subsidy programmes

Author: Alexandros Dimitropoulos | PBL Netherlands Environmental Assessment Agency

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Scrappage subsidies have been a popular policy instrument to stimulate the replacement of polluting old vehicles with cleaner alternatives and to support trade in times of economic downturns. We focus on the design of vehicle scrappage subsidy programmes and study how the eligibility criteria for participation in them affect car owners' selling, purchasing and scrappage behaviour.



We first develop a stylized model of the car market in which heterogeneous individuals trade new and used vehicles. Our model accounts for the correlation between the quality of the discarded vehicle and the quality of the replacement vehicle, and describes how consumer behaviour is influenced by the eligibility criteria for participation in a scrappage subsidy programme. Replacement cars do not need to be new – they can instead be relatively clean second-hand ones.

Our model shows that stricter requirements on replacement cause some consumers to buy a newer and cleaner vehicle than originally intended, but also discourage others from participating in the programme. Furthermore, it illustrates that the well-known adverse-selection problem for scrappage subsidies erodes the environmental gains expected from stricter eligibility criteria for replacement vehicles. This is because amongst the group of individuals who are affected by the stricter requirement, it is those who own vehicles with the highest pollution potential who are the least likely to buy a cleaner vehicle due to the programme. The model also allows us to define various types of programme participants based on the type of behaviour change – or the absence thereof – induced by the programme's requirements.

Subsequently, we empirically estimate the effects of the eligibility requirements of a real-world programme on consumers' discarding and replacement decisions. Our analysis concentrates on a nationwide scrappage subsidy programme implemented in 2009-10 in the Netherlands, with differentiated eligibility requirements on gasoline and diesel vehicles. Most notably, the eligibility requirement on replacement gasoline vehicles in this programme was relatively lax compared to the vast majority of other national scrappage programmes: participants could opt for a second-hand vehicle up to 9 years old. By contrast, replacement diesel vehicles had to be almost new.

Using a unique combination of datasets on the universe of vehicles in the country between 2008 and 2013 and quasi-experimental econometric methods, we study the extent to which the programme removed old cars earlier from the roads, stimulated car trade and increased the sales of cleaner replacement vehicles. To establish reliable counterfactuals of consumer behaviour in the absence of the programme, we exploit two requirements imposed by the policy on the retired vehicle: one on its minimum age, and another on the minimum duration of ownership by the same individual.

Three key findings emerge from our analysis, all of which align with our theory. First, the programme induced a strong increase in scrappage, which for gasoline vehicles was on average equivalent to a doubling of the scrappage rate. Second, on average 40% of the estimated extra scrappage is caused by individuals accelerating the sale of their old car (early traders). Third, the programme induced the purchase of newer, lighter, less polluting and more fuel-efficient vehicles than those that would have been bought in its absence. However, two different behavioural mechanisms underpin this last result: (i) buying earlier a vehicle of the intended vintage; and ii) buying a newer vehicle than originally intended (type adjusters). We estimate that 3-7% of participants owning a gasoline vehicle are such type adjusters. For owners of diesel cars, we do not find empirical evidence of vehicle choice changes in response to the policy.

Although we find very limited free-riding on the subsidy, we estimate that about 56% of all participants complied with the policy requirements by simply offering their car for scrap instead of selling it on the second-hand market. While the early scrappage of polluting vehicles yields environmental benefits, the behavioural change of these participants was minimal. Considering only tailpipe emissions savings



of CO₂ and air pollutants, we estimate the environmental and public health benefits of the policy to be on average about 30% of the subsidy for retired gasoline cars and 48% for retired diesel ones.

Our results overall suggest that laxer programme requirements on replacement gasoline cars led to high scrappage additionality and cleaner car purchases. By contrast, the strict requirements on replacement diesel vehicles mostly discouraged owners of polluting diesel cars from participating in the programme. Strict requirements on replacement vehicles may be particularly discouraging for lower-income households, as these households cannot usually afford buying newer and more expensive vehicles. By shifting attention in programme design from the adoption of the cleanest technology to the removal of the dirtiest, scrappage subsidy programmes could increase both their welfare benefits and support for the energy transition, without forgoing their environmental effectiveness. Allowing the purchase of a second-hand clean replacement product is an example of such a shift in programme design.

→ This paper will be presented in Session 10: Fossil Fuel Subsidy Reform.

The EU's CBAM: implications for member states and trading partners

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The EU Carbon Border Adjustment Mechanism (CBAM) came into force on 1 October 2023, introducing reporting requirements for importers of covered products and, from 2026, an obligation to pay a fee on the carbon content of imported goods. This paper uses indices of ad valorem tariffs to assess the incidence of the EU CBAM on both EU member states and the EU's trading partners. Overall, the direct impact on EU countries' trade is estimated to be small, adding 0.1 percent to the value of EU imports when averaged across all imports, and 0.04 percent to the average cost of non-EU countries' exports to the EU—with a maximum

of 1.2 percent. However, effects could be sizeable for specific products such as iron, steel and aluminium, which can help explain CBAM's political salience. Moreover, an expanded CBAM featuring full coverage of ETS sectors, and a significantly higher carbon price could entail larger costs in the more distant future.

→ This paper will be presented in Session 5: CBAM II – Economic & Trade Impacts.



GCET27

Global Conference of
Environmental Taxation

The constitutional boundaries of climate clubs

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Academics and policymakers frequently propose climate clubs to motivate ambitious climate action. While extant research analyzes the required economic, environmental and political characteristics of a climate club, we consider distinctively the relationship between instrument choice and domestic legal procedures for implementation. We analyze whether domestic legal constraints may influence the design of climate clubs, covering key jurisdictions - G7 countries, the EU, Brazil, China, and India.

We find that creating a climate club through an informal agreement is procedurally easier if the agreement focuses on simple cap-and-trade systems rather than carbon taxes. However, when both linking and price-based control mechanisms are included in cap-and-trade, a carbon tax may be procedurally advantageous. Finally, in China and the EU, using a legally binding international agreement makes the procedure especially complex and uncertain. Therefore, it may be worth exploring the possibility of creating climate clubs without either.

→ This paper will be presented in Session 1: CBAM I – Legal & Institutional.

Carbon pricing in EU neighboring countries: Sectoral employment and distributional effects of a carbon pricing reform in Moldova

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As the EU's Carbon Border Adjustment Mechanism enters its financial phase in 2026, non-EU countries exporting to European markets face a strategic choice: pay the CBAM charge at the border - transferring revenues to the EU - or introduce domestic carbon pricing and retain fiscal space at home. For Moldova, an EU candidate country that imports all fossil fuels and where natural gas accounts for 55 percent of combustion-related CO₂ emissions, this choice intersects with deep energy poverty, high household energy expenditure shares averaging 15 percent of budgets, and limited administrative capacity. Meanwhile, Moldova's total carbon price has turned negative in recent years as energy crisis-driven subsidies have outweighed existing fuel excise taxes, weakening decarbonisation incentives precisely when alignment with EU climate policy is most urgent. Understanding the employment and distributional consequences of domestic carbon pricing is therefore critical for policy design and political feasibility - particularly in a context where even modest energy price increases risk significant welfare losses for vulnerable households.



We apply MINDSET (Model of Innovation in Dynamic Low-Carbon Structural Economic and Employment Transformations), a global macroeconomic input-output model covering 120 sectors and 164 countries. The model traces direct, indirect, and induced supply-chain effects of policy shocks through detailed inter-sectoral and cross-country linkages, drawing on GLORIA multi-regional input-output data linked to IEA energy balances and GAINS emission factors. MINDSET does not assume full employment or optimising behaviour, instead incorporating spare capacity and involuntary unemployment - assumptions particularly suited to Moldova's labour market conditions. We link sectoral output changes to detailed labour market outcomes using Moldova's 2022 Labour Force Survey, disaggregating employment effects by sector, occupation, and income decile. Consumption incidence is assessed across expenditure deciles, capturing both direct fossil fuel price impacts and indirect price pass-through via intermediate goods. We model five illustrative carbon tax scenarios with phased introduction from 2026 to 2030, ranging from excise and VAT alignment with EU Energy Taxation Directive minima to an ambitious economy-wide carbon tax of EUR 45/tCO₂, each combined with two revenue recycling strategies: general government spending, and targeted transfers and investments allocating 40 percent to household compensation, 30 percent to energy efficiency, and 30 percent to renewable electricity generation.

All carbon pricing scenarios yield net positive GDP effects of up to 2.1 percent by 2030 and energy-sector CO₂ reductions of up to 10 percent below baseline, driven by three reinforcing mechanisms: reduced fossil fuel import expenditure improving the trade balance, domestic production stimulus from fuel substitution toward locally generated electricity, and demand effects from revenue recycling. Aggregate consumer price impacts remain below 2 percent by 2030, though energy sector prices rise more substantially. The distributional analysis reveals a mildly regressive consumption burden before compensation: the poorest decile faces a relative tax burden of approximately 0.6 percent of consumed income by 2028 under the most ambitious scenario, while wealthier deciles bear higher absolute costs but proportionally lower burdens. Revenue recycling design proves decisive in determining whether the policy is ultimately progressive or regressive. Uniform transfers make the policy progressive in early years, delivering net consumption gains of around 0.2 percent for the poorest decile in 2026, but lose effectiveness as the carbon tax rate rises. Targeted transfers directed to deciles 1 through 5 deliver substantially stronger protection, with net gains exceeding 1 percent of consumed income for the poorest decile by 2028.

Employment effects differ markedly by recycling strategy. General government spending raises total labour demand by 0.59 percent relative to baseline in 2030, with gains distributed broadly across sectors and income groups - notably in education, construction, health, and public administration - and across a wide range of occupations including professionals, service workers, and craft trades. Targeted investments and transfers generate nearly double the aggregate employment effect at 1.08 percent but concentrate gains heavily in the construction sector and among craft and related trades workers, with the strongest benefits accruing to the lowest income deciles. Both strategies show minimal impact on agricultural employment, flagging a gap that requires complementary policy attention. Importantly, while the targeted approach delivers larger and more pro-poor employment gains, the general spending approach offers broader sectoral resilience - suggesting that a hybrid recycling strategy may best balance equity and economic diversification objectives.

These results demonstrate that a domestically retained carbon tax - rather than passive CBAM compliance transferring revenues to the EU - can simultaneously reduce emissions, stimulate



employment, and protect vulnerable households, provided revenues are recycled through well-designed mechanisms. The findings support the case for early introduction of administratively simple upstream carbon taxes in EU accession countries as a fiscally and socially beneficial strategy. They also underscore that the distributional outcome of carbon pricing is not determined by the tax itself but by the deliberate design of accompanying revenue use - a finding with direct relevance for the political economy of climate policy in energy-poor, import-dependent economies across the EU neighbourhood.

→ This paper will be presented in Session 16: Political Economy II: Distributional Effects.

Welfare Gains Through Fuller Planes? Efficiency-Enhancing Tax Reforms in the Aviation Sector

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Co-authors: Lennart Stern, Matthias Kalkuhl

This article identifies a "spoilage distortion": laissez-faire leads to an inefficiently high vacancy rate on flights. We revisit the classical dynamic pricing model for a single flight (Gallego & van Ryzin 1994) and find under a large family of demand functions that the spoilage distortion is the only distortion: a tax on vacant seats can exactly align the monopolist's incentives with social welfare. In extensions with time-varying demand and oligopolistic market structure a tax on vacant seats can bring market outcomes much closer to the social optimum. We then introduce a new dynamic pricing model in which flight frequency is endogenized through a zero-profit condition. Consumers arrive stochastically and choose among temporally equidistant flights taking into account their valuation for flying at all and the disutility from schedule delay. Each flight is operated by a different airline that selects a dynamic pricing policy in Markov perfect equilibrium. Branch-consistent numerical comparative statics show that the welfare-maximizing tax on vacant seats equals 82.6% of the status quo average ticket price, or approximately USD 160 per vacant seat. Holding flight frequency fixed, the tax reduces the vacancy rate from 20% to 4.7% and raises annual welfare by USD 87.7 billion. The optimal vacancy tax is approximately independent of the prevailing carbon tax and the assumed social cost of carbon. A policy package that abolishes existing ticket taxes, introduces the vacancy tax, and imposes a global carbon tax of approximately USD 127 per tonne of (CO_2) approximately preserves the status quo passenger flow of 4.8 billion passengers. It reduces flight frequency by 17.7%, lowers the vacancy rate to 2.7%, raises annual welfare (excluding the SCC) by USD 55.1 billion, and generates a fiscal dividend of USD 50.7 billion.

→ This paper will be presented in Session 6: Aviation & Shipping.



Towards Sustainable Food Systems in Germany: a Price Elasticity's approach to Meat Taxation

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The way we eat shapes our individual health, defines our quality of life and tremendously impacts our environment: Current meat production as we know it, especially beef, leads to high emissions of greenhouse gases, impairs biodiversity, generates harmful by-products such as nitrogen and phosphorus, and requires extensive land and water resources. This Master's thesis's analysis is based on cross-sectional microdata from the German Income and Expenditure Survey (EVS) 2018. It first examines heterogeneity in meat consumption patterns across key sociodemographic groups, including income quantiles, gender, age, level of higher education, and the urban–rural gradient. Descriptive results reveal heterogeneous meat consumption patterns across these variables. A multiple regression analysis further indicates that income is not the primary predictor of meat consumption, suggesting that while economic constraints matter, behavioural and sociodemographic factors play a more prominent role in shaping dietary choices.

To evaluate the responsiveness of food demand to price and income changes, the study employs a Quadratic Almost Ideal Demand System (QUAIDS). This approach allows for the estimation of income elasticities as well as both uncompensated (Marshallian) and compensated (Hicksian) price elasticities across twelve food categories aligned with the Planetary Health Diet framework. Particular attention is given to three meat categories: red meat, poultry, and processed meat products.

Based on the estimated demand system, the paper simulates a policy scenario in which the value-added tax (VAT) on meat is increased from the current reduced rate of 7% to the standard rate of 19%. The results indicate moderate reductions in consumption: red meat consumption decreases by 8.4%, poultry by 6.6%, and processed meat by 7.5%. However, cross-price elasticity estimates suggest limited substitution toward plant-based alternatives, raising concerns about the overall effectiveness of taxation alone in shifting dietary patterns.

A welfare analysis shows that the absolute financial burden of the tax reform is modest, amounting to approximately 3–4 EUR per household per quarter on average. Nevertheless, these costs are relatively higher for lower-income households, pointing to regressive distributional effects.

Overall, the findings suggest that while meat taxation can contribute to reducing consumption, its effectiveness is constrained by limited substitution effects and heterogeneous behavioural responses. The thesis concludes that fiscal measures like a meat tax need to be compensated for and complemented by supportive policies, such as improved availability and subsidisation of plant-based alternatives, information campaigns, and measures that lower practical barriers to changing everyday food practices.

→ This paper will be presented in Session 14: Climate Adaptation.



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Designing an Internationally Uniform Carbon Price

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In this paper, I show that there is a distributional equivalence between a system of carbon prices differentiated by country and a uniform carbon price with differentiated emission rights involving international transfers. I introduce a policy proposal based on a uniform price and international transfers, with emissions rights close to an equal per capita allocation, and show how it compares to existing proposals. Using the model NICE, I simulate prominent international climate policy proposals and compare their welfare effects at the year-country-decile level.

This paper is divided into four sections. First, I take stock of the current international climate policy regime. After showing that the current regime falls short of ensuring decarbonization aligned with the Paris Agreement's target and providing sufficient resources for sustainable development in the Global South, I delineate the objectives that a new regime should meet. Second, I propose that voluntary countries form a "Fossil-Free Union" whereby they would establish an international emissions trading system to guarantee that their emissions are in line with the target, and where the allocation of emissions rights would ensure North-to-South transfers in a way that would make most countries willing to join. I provide precise estimates of the distributive effects of the Fossil-Free Union. Third, I propose a "Sustainable Union", where voluntary countries would commit to reallocate one percent of their GNI to all participating countries in proportion to their population, financed by global solidarity levies on the wealthiest. These proposals are complementary and would put the world on track for the climate and sustainable development targets. Furthermore, they garner majority support among the population in every country. Fourth, I provide a comparative analysis of alternative international climate policies.

→ This paper will be presented in Session 12: Climate Policy Modelling.

Carbon Pricing, Green Innovation and Regional Heterogeneity: Evidence from the EU Emissions Trading System

Author: Naomi Fagni | Lumsa University

Co-authors: Maurizio Lisciandra, Giuseppe Terzo

By putting a price on carbon emissions, the EU ETS aims to incentivize firms to invest in cleaner technologies and accelerate the green innovation necessary for decarbonization. Yet European regions are profoundly heterogeneous in terms of economic development, technological capacity, industrial structure, and institutional quality. Whether carbon pricing stimulates green innovation equally across this heterogeneous landscape, or whether it interacts with pre-existing territorial inequalities in ways that amplify regional disparities remains an open question.



This paper investigates the relationship between carbon pricing and green innovation across European NUTS2 regions over the period 2008–2023, with a focus on territorial heterogeneity and distributional implications. The analysis contributes to two interconnected debates: the empirical literature on the Porter hypothesis, which posits that well-designed environmental regulation can stimulate innovation, and the policy discussion on the just transition, which raises concerns about the distributional consequences of climate policy for less developed regions and communities.

The empirical analysis draws on a panel of 252 NUTS2 European regions, combining data on verified ETS emissions, EU carbon prices, and green patent applications filed at the European Patent Office. A key conceptual distinction is drawn between the gross carbon burden, which captures the full price signal faced by regulated firms, and the net carbon burden, which accounts for free allowances under the EU ETS and reflects the actual compliance cost paid. This distinction is theoretically important because the two measures capture different economic mechanisms: the gross burden operates primarily through a price signal that incentivizes innovation, while the net burden operates through financial pressure on firms that must purchase allowances to cover their emissions.

The baseline estimation relies on Poisson Pseudo Maximum Likelihood models with region and year fixed effects, using log population as an offset to account for regional size differences. To address identification concerns arising from the potential endogeneity of the carbon burden, a shift-share instrument is constructed by interacting pre-policy regional emission intensity, measured as the average ratio of verified emissions to gross value added in 2005–2007, with the common EU carbon price. This instrument isolates exogenous variation in regional exposure to the carbon price, driven by the pre-determined industrial composition of regions rather than contemporaneous economic or innovation dynamics. The validity of the instrument is supported by a placebo test using the lead of the shift-share shock, which is not significant.

The main findings reveal significant heterogeneity in the innovation response to carbon pricing across European regions. In the aggregate, the net carbon burden has a positive and statistically significant effect on green patenting, consistent with the Porter hypothesis. The gross burden, by contrast, does not produce a significant average effect, suggesting that the financial pressure mechanism is the primary driver of innovation in the full sample.

This average effect, however, conceals important differences across regions classified by EU cohesion policy categories. The burden stimulates green innovation specifically in transition regions, those with sufficient technological capacity to respond to the price signal but not yet on the innovation frontier. More developed regions do not respond significantly to it, consistent with the hypothesis that they are already close to the technological frontier and do not require a price signal to innovate. Less developed regions respond to neither measure, suggesting a fundamental capacity constraint that carbon pricing alone cannot overcome.

A second layer of heterogeneity emerges from the interaction between the net burden and pre-policy GDP per capita. Within each cohesion category, the effect of the net burden is stronger in relatively poorer regions, consistent with a compliance cost mechanism: firms in resource-constrained regions face greater financial pressure to innovate as a cost-reduction strategy. This result is robust to replacing R&D expenditure with gross fixed capital formation as the control variable.

Beta convergence analysis adds a dynamic dimension to the findings. After an initial period of divergence, convergence prevails for transition regions, suggesting that they eventually catch up as



the innovation incentives embedded in the carbon price diffuse more broadly. Less developed regions represent a persistent exception: even after accounting for lagged effects, no convergence is observed, suggesting that the carbon price does not help them close the innovation gap with more advanced regions and may instead deepen the territorial innovation divide over time.

These findings have direct implications for the design of climate and cohesion policy in the EU. Carbon pricing is not distributionally neutral with respect to regional innovation capacity. A policy architecture that relies solely on carbon pricing to drive the green transition risks reinforcing existing territorial inequalities, particularly for less developed regions that lack the absorptive capacity to benefit from the innovation incentives embedded in the carbon price. Complementary instruments may be necessary to ensure that the benefits of the green transition are shared across all European regions, consistent with the objectives of a just and territorially inclusive transition.

→ This paper will be presented in Session 16: Political Economy II: Distributional Effects.

Economy-wide implications of Green Industrial Policies in Morocco: A CGE Analysis

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Economy-wide implications of Green Industrial Policies in Morocco: A CGE Analysis

1. Introduction

Green industrial policies (GIP) are government interventions aimed at restructuring the economy to develop targeted, sustainable sectors, with the aim of mitigating negative externalities associated with climate change while fostering growth in areas with potential positive externalities, such as the emergence of local manufacturing and knowledge spillovers.

Morocco faces multiple economic challenges, further exacerbated by an energy deficit, which significantly burdens the public budget. In response to these challenges, Morocco has implemented a series of policies since 2008 to promote renewable energy development. However, quantitative assessments of the broader macroeconomic impacts of potential future policies remain scarce. Most existing studies focus primarily on the direct effects on the energy supply sector and on associated market creation. This research fills that gap by moving beyond sector-specific analyses to evaluate the economy-wide effects of four distinct GIP instruments on household welfare, GDP, and the trade balance.

2. Research Methods

This study applies a comparative-static single-country Computable General Equilibrium (CGE) model, specifically the STAGE version 2 model, developed by McDonald and Thierfelder (2015). The model is calibrated to a 2017 Social Accounting Matrix (SAM), constructed using data from the SAM provided by the Global Trade Analysis Project (GTAP), complemented by data from national statistical



authorities, such as the Moroccan National Accounts. The SAM distinguishes seven electricity generation sources, which are central to the analysis.

We constructed four scenarios aimed at boosting renewable electricity production:

a. Carbon Tax on Fossil-Fuel Electricity

This scenario simulates the imposition of a carbon tax on electricity production from fossil fuels. With this policy, the cost of renewable energy production would stay the same but would become relatively more competitive compared to conventional electricity generation. Additionally, the public budget will get an additional source of revenue.

b. Tax Cut for Renewable Electricity Generation

In this scenario, the government cuts factor taxes on renewable electricity generation, encouraging investment by increasing profitability. These tax cuts account for only 0.17% of the total tax income, and therefore it does not lead to a significant increase in public debt.

c. Small-Scale Feed-In Tariffs

Under this scenario, rooftops would become renewable energy sources through the installation of photovoltaic panels (PV), with a guaranteed selling price for the electricity they generate. This could lead to increased electricity supply, heightened demand for solar panel materials and related services, and potential financial impacts on grid operators, depending on the difference between electricity selling prices and feed-in tariff rates.

d. Green Hydrogen Production for Export

This scenario explores the construction of large-scale renewable energy facilities dedicated to producing green hydrogen for export—primarily to the European Union. By focusing on hydrogen production, Morocco could position itself as a renewable energy exporter in global markets.

3. Results

The simulations reveal some trade-offs between environmental and economic goals. The carbon tax is the most effective instrument for reducing coal-based electricity output (by 16.4%) but leads to a net contraction of GDP and household welfare due to the income effect of increased energy costs.

In contrast, the feed-in tariff demonstrates significant untapped potential, nearly tripling solar output and providing modest welfare gains for urban households, as they have a larger capacity to invest in rooftop PV panels. The remaining challenge is the resistance to feed-in tariff from large electricity producers as they derive substantial profits from wealthier urban households.

A persistent finding across all scenarios is the widening welfare gap, as rural households are disproportionately burdened by price shifts, even with the rooftop PV boom under the feed-in tariff scenario. This is due to the income disparities between urban and rural household, where urban per capita income is 216 percent of that of rural areas. Hence, rural households remain more vulnerable to energy price changes under all scenarios and less capable of investing in rooftop PV (owning only 12 percent of investment capital).

While green hydrogen offers a promising path toward becoming a net energy exporter, its success depends on large-scale infrastructure expansion that may not address immediate domestic needs.



The results suggest that for a "Just Transition," Moroccan policymakers must pair GIP with targeted social protection, revenue-recycling mechanisms, and the development of local component production to ensure that the transition to a green economy does not exacerbate existing regional disparities.

→ This paper will be presented in Session 12: Climate Policy Modelling.

When Carbon Taxes Beat VAT in Fiscal Policy: The Role of Informality

Author: Max Franks | Potsdam Institute for Climate Impact Research (PIK)

Co-authors: Lushanya Dayathilake, Raavi Aggarwal, Linus Mattauch

A central but underexplored question in the fiscal design of developing and emerging economies is whether upstream carbon taxation can serve as a viable — and potentially superior — alternative to further reliance on the value-added tax (VAT) when governments need to mobilise additional revenue in the presence of pervasive informality. This paper addresses that question directly, recasting carbon taxation not as a narrowly environmental add-on but as a mainstream fiscal instrument whose incidence and efficiency properties must be compared systematically with those of the VAT.

In many low- and middle-income countries (LMICs), informality accounts for more than 60 percent of employment and substantially narrows the effective base of income and profit taxes. As a result, governments rely heavily on broad-based indirect taxes, above all the VAT, which contributes roughly 25 percent of total tax revenue across Asia and the Pacific — well above the OECD average. Yet the VAT performs unevenly in high-informality settings. Informal firms do not remit VAT on their final sales, but when they purchase intermediate inputs from registered suppliers they bear unrecoverable VAT, turning part of the VAT into a de facto input tax on the informal sector. This architecture creates a systematic wedge between formal and informal producers that worsens with each incremental VAT rate increase.

We develop an analytical two-sector model that embeds the VAT's invoice–credit architecture explicitly, endogenises formal–informal substitution through differential price wedges, and makes normative trade-offs transparent through a welfare function that assigns distinct weights to public funds and informal-sector earnings. Within this framework, we compare two marginal revenue instruments: an increase in the invoice–credit VAT rate and an upstream tax on the carbon content of fossil energy used in production, with household electricity exempt.

Our first result concerns tax-induced reallocation. A marginal VAT increase raises the formal break-even price more than it raises informal marginal cost, because informal producers bear only part of the VAT burden through input channels while escaping the output-stage wedge entirely. Aggregate output contracts, formal output contracts more sharply, and the informal share of production rises. An upstream carbon tax operates differently: it raises energy costs in both sectors through a common channel, reduces aggregate activity, but does not mechanically widen the statutory wedge between



formal and informal producers. Its effect on informality is governed entirely by differences in energy intensity across technologies. Under empirically plausible conditions — where informal producers employ relatively energy-inefficient technologies and rely less heavily on VAT-registered intermediates than formal firms — a higher carbon tax is at worst approximately neutral for the informal share and may even exert a modest formalisation pressure.

Our second result concerns welfare and revenue efficiency. We derive three-margin decompositions of the marginal welfare effects of each instrument: a final-demand margin operating through the consumer price and aggregate demand; a formal–informal reallocation margin operating through profitability wedges; and a mechanical base-and-incidence margin capturing how statutory rate changes rescale existing VAT and energy-tax bases. These decompositions yield portable sufficient-statistics formulas for the marginal cost of public funds (MCPF) of each instrument. Under a parametric specialisation, the MCPF comparison collapses to a single inequality in observable cost shares: the carbon tax dominates the VAT as a revenue instrument whenever the ratio of energy to VAT-taxed intermediate costs in the informal technology exceeds the VAT-amplified, price-weighted energy intensity of the formal technology. This condition is naturally satisfied in the many LMIC sectors — transport, construction, food processing, brick kilns, metalworking — where informal producers use energy inefficiently and operate largely outside formal input chains.

A corollary is that, for any given marginal revenue target, the associated consumer-price increase is strictly smaller under the upstream carbon tax than under an equivalent VAT increase. Per unit of revenue raised, the carbon tax generates less pass-through into consumer prices because it draws on a broader effective base that is harder to evade through informality.

We calibrate the model using Indian firm-level survey data for 2023–24, drawing on the Annual Survey of Industries (ASI) for the formal sector and the Annual Survey of Unincorporated Sector Enterprises (ASUSE) for the informal sector, covering approximately 70,000 formal and 500,000 informal manufacturing firms across 24 industries. The estimated informal-sector energy coefficient substantially exceeds the VAT-taxed intermediate coefficient in most sectors, confirming that the sufficient condition for carbon-tax dominance holds broadly across Indian manufacturing.

Taken together, these results suggest a reframing of carbon taxation in LMIC fiscal strategies. In high-informality settings, the relevant policy choice is not only between "no carbon tax" and "a carbon tax with recycling" but between alternative instruments for expanding broad-based fiscal capacity. Upstream carbon taxes, designed to exempt household electricity while taxing energy used in production, can complement and in some margin replace further VAT increases — raising revenue at lower welfare cost, with smaller consumer-price pass-through, and without the VAT's structural tendency to push activity into the informal sector. Climate mitigation and domestic revenue mobilisation in developing economies should be treated as a single design problem.

→ This paper will be presented in Session 3: Fiscal Policy I – Macro Perspectives.



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Environmental Taxation

Carbon Pricing Beyond Borders: Assessing Climate Policy Spillovers from the EU CBAM

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The European Union has some of the world's most ambitious climate policies, yet it only accounts for a small share of global carbon emissions. Achieving meaningful global emissions reductions thus depends on other countries strengthening their own climate policies. The EU's carbon border adjustment mechanism (CBAM) incentivises EU trading partners to adopt domestic carbon pricing systems to retain carbon revenues at home. Whether this incentive is sufficient to encourage such policy diffusion is an important question for global climate governance.

This paper examines whether CBAM has increased the adoption of carbon pricing policies in third countries. Using data on trade exposure to CBAM-covered sectors and the evolution of carbon pricing mechanisms in 163 countries between 2014 and 2025, we estimate the effect of exposure to CBAM on the likelihood of non-EU countries adopting carbon pricing policies. Using a difference-in-difference setup, we find that countries with greater trade exposure to CBAM have significantly increased announcements of carbon pricing policies since the European Commission previewed CBAM in 2019. On average, a one-percentage point increase in a country's CBAM exposure raises the probability of adopting a carbon pricing policy by about 2 percent.

This result suggests that the EU's CBAM can generate positive international spillovers by encouraging the wider adoption of carbon pricing policies. However, these effects are concentrated among high- and upper middle-income countries, indicating that developing countries face technical and institutional constraints in adopting similar carbon pricing policies.

→ This paper will be presented in Session 5: CBAM II – Economic & Trade Impacts.

Between and Within Countries: The Distributional Effects of the EU CBAM

Author: Johannes Gallé | Potsdam Institute for Climate Impact Research (PIK)

Co-authors: Timothé Beaufils, Michael Jakob, Matthias Kalkuhl, Jan Steckel, Joschka Wanner

This paper examines the distributional consequences of the Carbon Border Adjustment Mechanism (CBAM) introduced by the European Union. While carbon pricing is widely regarded as an efficient instrument for mitigating climate change, its fragmented implementation across countries has generated concerns about competitiveness, emissions relocation, and inequitable economic burdens. Against this background, the EU CBAM represents a major shift in international climate policy, with



profound implications for global trade patterns and income distribution. This study provides a comprehensive empirical assessment of these implications, focusing on both between-country and within-country distributional effects of the EU CBAM.

Methodologically, the paper develops a novel framework that integrates a quantitative general equilibrium trade model with detailed household-level survey data of 71 countries (incl. 27 EU countries). The trade model builds on recent advances in multi-sector, multi-country trade modeling (e.g. Caliendo and Parro, 2015) and is calibrated using global trade and emissions data, including sectoral information on production and greenhouse gas intensities. It captures the impact of the EU CBAM on relative prices, trade flows, and sectoral outputs under different policy scenarios and sectoral labor mobility assumptions. These macroeconomic results are then linked to micro-level data on household consumption patterns and occupational information. This approach enables a granular assessment of how policy-induced price and income changes translate into heterogeneous welfare effects across households within and outside the EU.

At the aggregate level, the results indicate that the overall real income effects of the EU CBAM are modest for most countries. However, there is substantial variation across countries depending on their economic structure, trade exposure, and carbon intensity of exports. Fossil fuel-exporting countries and economies with carbon-intensive production processes experience the largest welfare losses. These effects are driven primarily by reduced demand from the EU, as well as by shifts in comparative advantage resulting from the imposition of carbon costs on exports. In addition, the policy leads to increases in production costs in downstream sectors within the EU, reflecting higher prices for imported intermediate inputs subject to the CBAM.

Beyond these aggregate effects, the analysis reveals distinct distributional income effects within countries. Household-level impacts differ significantly depending on sectoral employment and consumption patterns. In particular, households employed in energy-intensive and trade-exposed sectors are disproportionately affected by negative income shocks. These findings highlight that even when aggregate effects are small, the underlying distributional consequences can be substantial. Contrasting the distributional effects within and outside the EU, the study finds that within-country inequality effects are generally more pronounced within EU member states than in non-EU countries. This is partly due to stronger linkages between domestic sectors and the EU carbon pricing system, as well as greater price exposure in household consumption patterns. In contrast, impacts in non-EU countries are more concentrated in specific sectors and regions, particularly those heavily reliant on exports of CBAM-covered goods. Nevertheless, certain middle-income countries such as Turkey with strong trade ties to the EU, experience notable distributional effects.

By bridging macroeconomic trade modeling with micro-level household data, this paper contributes to two strands of literature. First, it advances the analysis of the global distributional consequences of border carbon adjustments by incorporating a high degree of sectoral and regional detail, as well as a realistic representation of the EU CBAM design. Second, it extends the literature on the distributional impacts of carbon pricing by embedding household heterogeneity within a general equilibrium framework, thereby capturing both price and income channels of policy transmission. Overall, the findings underscore the importance of considering distributional effects when designing and implementing climate policies such as the EU CBAM. While the mechanism may be effective in reducing carbon leakage by leveling the playing field, it also generates uneven economic impacts across and within countries. Policymakers should therefore consider complementing such measures



with targeted redistribution policies and international support mechanisms to mitigate adverse effects on vulnerable countries and households.

→ This paper will be presented in Session 5: CBAM II – Economic & Trade Impacts.

The Capitalization of Local Energy Prices in the Housing Market

Author: Felix Heuer | RWI-Leibniz Institute for Economic Research

This paper investigates how heating costs are capitalized in the housing market and whether housing demand responds to local energy prices. Understanding these mechanisms is essential for designing effective climate policies, as the housing sector remains a major emitter of greenhouse gases. While price-based policies aim to incentivize transitions to renewable heating, their effectiveness depends on whether energy costs are capitalized into basic rents (rents excluding auxiliary costs). If landlords can pass higher energy costs to tenants without adjusting rents, the financial incentive for landlords to invest in low-carbon technology is severely diminished.

I develop a theoretical framework to analyze how energy prices affect the housing market along two margins: equilibrium prices and market liquidity. In a frictionless market, higher heating costs should lower demand and lead to a downward adjustment in rents. However, if rents are rigid, the adjustment may manifest through market liquidity, where expensive-to-heat units remain on the market longer as demand shifts toward units with lower heating costs. A parametrization of the model allows me to predict the effect of the 2022 energy crisis and provides a benchmark for empirical estimates.

To identify the causal effect of energy prices on both basic rent and time on market, I use the gas price increase following the Russian invasion of Ukraine in February 2022 as a quasi-experimental setting. This event was unexpected and created a sharp divergence in heating costs between gas-heated apartments and those using renewable-based district heating. I combine real estate data from the RWI-GEO-RED dataset with zip-code level gas price data (Verivox) to capture differences in the exposure to rising gas prices. Moreover, I leverage a self-collected, geo-coded dataset of over 1,100 district heating networks to identify apartments insulated from higher gas prices. Using a continuous difference-in-differences approach, I compare gas-heated and district-heated apartments using variation in the magnitude of local gas price increases. To address structural differences between heating types, I apply entropy balancing to strengthen the causal claim.

The estimation results reject the full capitalization of energy prices into rents. Basic rents for gas-heated apartments remained largely unchanged relative to district-heated apartments, despite a massive increase in relative heating costs. Instead, capitalization occurs primarily through market liquidity. Time on the market for gas-heated apartments increased significantly by 6.1% on average, and up to 12% during the peak of the crisis. Moreover, each €100 increase in annual heating costs leads to a 0.6% increase in time on the market, while the effect on basic rent is statistically insignificant. The limited capitalization in rents appears not to be explained by housing market tightness; even in less tight market segments, the estimated effect on rents remains small and well below both full capitalization and model predictions. Notably, heating cost capitalization is only



observed among private landlords, who may be less equipped to withstand vacancies and face higher search costs than professional real estate firms.

This paper makes several key contributions. First, it provides the first evidence of local energy price capitalization in the housing market. Previous studies have used relative energy prices at the state level or relied on temporal variation within heating types, providing limited evidence on the incentive for retrofitting. Second, this study moves beyond equilibrium prices by developing a framework for how energy prices affect liquidity. Finally, I introduce a novel adjustment margin where negative demand shocks affect landlords' listing behavior and the provision of information in advertisements.

The findings present supportive evidence for a “split-incentive” problem: while tenants are sensitive to energy costs, the resulting shift in demand does not force landlords to lower rents. Consequently, the financial burden of carbon pricing falls on tenants, while landlords—responsible for building renovations—face no financial incentive to invest. This highlights a potential inefficiency of relying solely on price signals to drive the decarbonization of the rental sector and might suggest other supply side regulations.

→ This paper will be presented in Session 18: Energy Policy.

The UN Tax Committee's Subcommittee on Environmental Taxation: Current Workstreams and Emerging Priorities in International Environmental Tax Policy

Author: Giedre Lideikyte Huber | University of St. Gallen

Co-authors: Susanne Åkerfeldt

This presentation reports on the ongoing work of the Subcommittee on Environmental Taxation of the United Nations Committee of Experts on International Tax Cooperation (UN Tax Committee), offering a timely account of how one of the principal intergovernmental bodies in international tax is engaging with these challenges. As the urgency of the climate crisis intensifies, the role of tax policy as an instrument of environmental governance has moved from the margins to the centre of international fiscal debates. Yet while the normative case for environmental taxation is broadly accepted across disciplines, fundamental questions of design, coordination, and equity remain deeply contested — and largely unresolved at the international level.

The UN Tax Committee occupies a distinctive position in the landscape of global tax governance. Mandated to serve the interests of both developed and developing countries, and operating under the auspices of the United Nations rather than any single-constituency organisation, it brings to environmental tax questions a perspective attentive to equity, development, and the structural asymmetries that characterise the international economic order. The Subcommittee's work proceeds from the premise that effective and just environmental tax policy cannot be designed in isolation from the broader architecture of international taxation, nor without systematic attention to the differentiated capacities and vulnerabilities of states across the global North and South.



The presentation will survey the Subcommittee's active workstreams, spanning a range of issues at the frontier of international environmental tax policy — from carbon pricing and its cross-border implications, to sector-specific taxation challenges, to the fiscal treatment of emerging technologies with significant environmental footprints. Across these areas, recurrent themes include the tension between environmental effectiveness and revenue adequacy, the distributional consequences of environmental tax reform for developing countries, and the coherence of environmental measures with existing international legal frameworks.

By presenting this work in progress to the GCET community, the session aims to foster interdisciplinary dialogue on how international tax cooperation can best support ambitious and equitable environmental outcomes

→ This paper will be presented in Session 11: International Climate Law & Governance.

Trump 2.0: United States Climate Change Policy: Barriers to Environmentalists Across Disciplines

Author: Mona Hymel | University of Arizona, James E. Rogers College of Law

Donald Trump and the U.S. Supreme Court have erected significant obstacles to the advancement of climate change initiatives by those agencies traditionally tasked with providing rules and procedures necessary to carry out their mandate. These actions take place when at the same time, the World Meteorological Organization forecasted a 66 percent chance that the world will exceed 1.5 degree Celsius within the next 5 years resulting in global ecosystem destruction. Modern science is “unequivocal that human influence”—in particular, the emission of greenhouse gases like carbon dioxide— “has warmed the atmosphere, ocean and land.” United States’ policy makers fail when failure carries such dire consequences.

This article discusses how Trump’s Executive Orders and recently decided U.S. Supreme Court cases are re-writing administrative structures. These dramatic changes in U.S. climate policy threaten eliminate the United States as a necessary party at the international table fighting climate change. This article addresses the most recent timeline on actions taken by the Trump administration irresponsibly eliminating federal participation in solutions. In addition, several major U.S. Supreme Court cases also erode the power of agencies to regulate climate change issues and evaluates the remaining environmental landscape in the United States. The paper considers the role of agencies as the primary source for U.S. environmental policy. This evaluation leads to conclusions that will require the participation of many non-traditional partners and unusual alliances for the United States’ to remain relevant in international climate change efforts.

Executive Orders:

As soon as Donald Trump began his second presidential term, executive orders began to flow from the White House. Noteworthy, merely a beginning yet foreshadowing what was and is to come, Trump pulls the United States from the Paris Accord. The Executive Orders keep coming. This article takes us “back to the future” examining Trump’s Executive Orders and the recent case law in reverse chronological order.



Cases:

Following *West Virginia* (discussed below), the Supreme Court dealt a deep blow to U.S. agencies regulating the environment when the Court struck down the long-standing Chevron doctrine providing significant deference by United States courts to U.S. Treasury regulations, as well as other agency regulations, such as the Environmental Protection Agency. Until 2024, Chevron deference, established in 1984, required courts to defer to “permissible” agency interpretations of the statutes those agencies administer, even when a reviewing court reads the statute differently. This principle of deference to administrative agencies was a cornerstone of administrative law for nearly four decades and one that Chevron opponents had looked to overturn for years.

Then, two cases *Loper Bright Enterprises v. Raimondo* and *Relentless, Inc. v. Department of Commerce*, a pair of cases seeking to overturn Chevron deference. As the Court’s questions at oral argument inferred, the Court might very well eliminate Chevron deference. The majority opinion in *Loper Bright* and *Relentless, Inc.* represents an emphatic rejection of the agency deference ushered in by Chevron and its progeny.

Just two years earlier, the U.S. Supreme Court significantly limited the Environmental Protection Agency’s (EPA) power to regulate carbon emissions that cause climate change. The decision by the conservative court majority implicates further limitations on the regulatory power of other agencies as well.

In *Loper*’s precursor, *West Virginia et al. v. Environmental Protection Agency*, by a vote of 6 to 3, the U.S. Supreme Court said that any time an agency takes action that is “something big and new – in this case addressing climate change – the regulation is presumptively invalid, unless Congress has specifically authorized regulating in this sphere.” An expert in environmental law, one Harvard professor warned “That’s a very big deal because they’re [the EPA] not going to get it from Congress because Congress is essentially dysfunctional.”

Unfortunately, an agency cannot use an existing statute under which regulations were issued and implemented, then under the same statute issue new regulations to address new problems that are generally within the agency’s jurisdiction. This article is concerned with the implications of this decision on other agencies, particularly environmental tax law and the regulations issued by the Internal Revenue Service.

In sum, this paper will first provide a brief discussion on administrative law explaining the U.S. government’s regulation of agencies. Next, the paper discusses those aspects of the recent U.S. Supreme Court decision limiting the Environmental Protection Agencies’ regulatory power and the implications of its decision. The paper next provides some background on current U.S. Climate policies, both regulatory and fiscal measures, such as tax incentives and penalties. The paper also discusses how current presidential executive orders addressing climate change together with these Supreme Court decisions have gutted U.S. climate change laws. Finally, the paper analyzes the current U.S. situation and offers possible alternatives involving international partnerships if the United States is to live up to its climate change obligations.

→ This paper will be presented in Session 7: Fiscal Policy II – Legal Design.



Recognising Carbon Effort Across Borders: the Coordination Gap Under EU CBAM Rules

Authors: Dilara İnal & Yoner Ojeda Pinto | WU - Institute for Austrian and International Tax Law

In recent years, carbon pricing has become a key element of climate governance. As a result, emissions reductions are now shaped by both national carbon-pricing frameworks and transnational correctional tools, such as border adjustments. The interplay between these two types of carbon-pricing tools poses new challenges regarding the coordination of climate policy. At present, multiple layers of regulation and financing to pursue decarbonization are used, including domestic carbon-pricing systems like carbon taxation or emission trading systems combined with domestic support measures including rebates, offset allowances, free allocations or exemptions. While the reasons behind the design choice of such domestic carbon-pricing systems are generally based upon legitimate concerns about competitiveness, social acceptance, industrial transition and equity/fairness, they may also hinder the coherent application of border-correction instruments designed to identify and address differences in carbon constraints across jurisdictions, such as the EU Carbon Border Adjustment Mechanism (CBAM). In this context, the article addresses the following central research question: to what extent EU CBAM recognizes, for certificate-reduction purposes, carbon effort arising under third-country regimes that combine an explicit carbon price with offset-based neutralization or other authorized compensatory mechanisms?

This paper argues that a weakness of the EU Carbon Border Adjustment Mechanism (CBAM) is its limited capacity to recognize and assess heterogeneous domestic carbon-pricing architectures in third countries. This weakness particularly stems from its Article 9, which reduces the number of CBAM certificates that need to be surrendered when a carbon price has been “effectively paid” in the country of origin. It also requires any “rebate or other form of compensation” received in the country of origin to be taken into consideration. The provision, however, offers no sufficiently clear framework for determining when domestic compensation merely tempers the economic impact of carbon pricing and when it actually neutralises the underlying mitigation signal.

The paper contends that this ambiguity reveals a deeper coordination problem between domestic mitigation policies and broader instruments such as CBAM. On the one hand, the absence of clear criteria makes it difficult for the EU to identify and credit equivalent or comparable carbon effort in third-country jurisdictions, especially where mitigation is pursued through mixed policy designs rather than through a single uniform carbon price. On the other hand, this interpretive uncertainty risks disregarding or mischaracterising genuine decarbonization efforts, particularly in developing and emerging economies that rely on differentiated domestic instruments to reconcile climate ambition with fiscal, social, and competitiveness constraints.

This problem is not merely technical. It has significant implications for the legitimacy and efficacy of carbon-border corrections as an instrument of international climate-governance. Specifically, if CBAM cannot appropriately assess how third-country jurisdictions construct their domestic decarbonization efforts, then CBAM could potentially cause distortion in foreign cost-of-carbon perceptions across borders, diminish incentive for policy convergence, and create tension between environmental



ambitions and regulatory fairness. Therefore, the questions presented by Article 9 relate not only to how one determines "carbon prices effectively paid", but also to how one creates a border-adjustment mechanism that can engage coherently with various levels of domestic transformation processes.

To illustrate these issues, the paper analyses Colombia's carbon tax design, in which 50% of the carbon tax is not levied if taxable companies demonstrate carbon neutrality in compliance with the domestic legal requirements. The analysis shows that inadequate coordination between CBAM recognition rules and domestic carbon pricing schemes results in legal uncertainty, undermines comparability across jurisdictions, and punishes context-specific climate policy designs. The paper proposes an interpretative approach to Article 9 centered on functional-equivalence principles. This would provide greater legal certainty for companies exporting goods subject to CBAM, enable EU authorities to recognize foreign carbon effort, and ultimately increase the fairness and efficiency of CBAM within an overall more coordinated system of international climate governance.

→ This paper will be presented in Session 1: CBAM I – Legal & Institutional.

Do Governance Quality Enhance the Effectiveness of Climate Fiscal Policies on Inclusive Green Growth

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Co-authors: Sahima Tabasum

Inclusive Green Growth (IGG) has emerged as a primary policy goal for both developed and developing nations amid intensifying climate change issues and socio-economic disparities. Carbon taxes, environmental subsidies, and green public spending are viewed as critical policy instruments used to transition low carbon and sustain economic growth. The effectiveness of climate fiscal policies to generate inclusive outcomes is dependent upon the quality of governance and the institution within which they are implemented. Therefore, this study will investigate the extent to which governance quality will enhance the effectiveness of climate fiscal policies to promote inclusive green growth. Although an increasing amount of literature emphasizes their capacity to lower emissions and boost green investments, limited attention has been put into the institutional circumstances that influence their efficacy in generating inclusive growth. One of these conditions is how the quality of governance impacts the effectiveness of climate fiscal policies in achieving IGG. This study seeks to fill this gap by investigating whether and how the quality of governance supports climate fiscal policy's efforts to promote inclusive green growth.

The research utilizes a balanced panel dataset comprising industrialized and developing nations from 2011 to 2024. The economic, environmental, and social dimensions of Inclusive Green Growth (IGG) will be described using a composite index that includes metrics on income growth, environmental sustainability, inequality, and access to basic services. The indicators for Climate Fiscal Policy (CFP) include environmental tax revenues, public spending on environmental protection, subsidies for renewable energy sources, etc. In order to account for governance quality, four well-known



governance indicators (government effectiveness, regulatory quality, rule of law, and control of corruption) will be combined into one composite governance index.

The findings suggest that climate fiscal policies positively and significantly impact inclusive green growth. Furthermore, governance quality has a significant moderating effect on this relationship. Specifically, countries with better institutional quality achieve greater gains in IGG from climate fiscal actions because strong governance helps implement these policies, reduce inefficiencies in policy use, and create a more equitable distribution of both environmentally and economically related benefits. Weak governance limits the effectiveness of climate fiscal measures and produces worse outcomes than would be achieved without strong institutions and provides less inclusive outcomes than would be generated without institutional barriers. The results demonstrate significant variances between developed and less developed nations. Industrialized markets already have established methods of governance whereas developing areas are working under basic rules that impede the achievement of the potential benefits of climate change regulations. Thus, this emphasizes that developing the governance framework (like enhancing visibility, compliance with regulations and developing the capabilities of government) is critical for maximizing fiscal investments made by governments. The study adds to the scientific evidence for climate policy and sustainable development by examining the conditional role good governance plays in these areas and providing empirical evidence. This indicates that, along with increasing climate fiscal policy effectiveness, strengthening good governance should be a precondition for inclusive green growth, particularly for developing countries with institutional constraints

→ This paper will be presented in Session 13: Fiscal Policy III – Developing Economies.

Environmental regulation and firms in India: Evaluating India's Perform, Achieve and Trade programme

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Co-authors: Johannes Gallé, Jan Steckel

We evaluate the effectiveness of India's Perform, Achieve and Trade (PAT) scheme, a flagship policy instrument aimed at improving energy efficiency in energy-intensive industrial sectors. Introduced in 2012 under the National Mission for Enhanced Energy Efficiency, the PAT scheme combines regulatory targets with market-based mechanisms by assigning firm-specific energy intensity reduction targets and enabling trading of Energy Saving Certificates (ESCerts). Unlike conventional emissions trading schemes that focus on absolute emission caps, PAT emphasizes reductions in specific energy consumption (SEC) and thereby directly targeting the enhancement of energy efficiency. This design aligns with India's broader climate commitments, including its target of reducing emissions intensity relative to GDP. The scheme follows a multi-cycle structure, with each cycle spanning three years. During each cycle, DCs are assigned individual SEC reduction targets based on their baseline energy performance, typically averaged over the previous three years.



We contribute to the growing literature on environmental regulation in developing economies, situating our analysis within the broader policy landscape in India, particularly the planned introduction of a domestic carbon market through the Carbon Credit Trading Scheme (CCTS). As the PAT scheme is expected to lay the ground for the CCTS, understanding its strengths and limitations is crucial for informing policy design. While earlier research has largely focused on the first PAT cycle and a limited number of sectors, we expand the scope by incorporating later cycles and a broader set of industries. This longer-term perspective is important because evidence from similar policies suggests that policy effectiveness may increase over time due to institutional learning, tighter targets, and improved market functioning.

For the econometric evaluation, we combine two primary data sources. First, we retrieve official lists of designated consumers (DCs) under the PAT scheme published by the Bureau of Energy Efficiency (BEE). And second, we rely on firm-level panel data from the Prowess database compiled by the Centre for Monitoring of the Indian Economy (CMIE), which covers the output of about 80% of India's organized industrial sector. We identify firms as treated if at least one of their plants is included in the PAT scheme. We employ a careful matching process, including fuzzy name matching and manual verification, ensuring a high level of accuracy in linking firms to policy participation. Our empirical strategy proceeds in two stages. First, we employ coarsened exact matching (CEM) to construct a comparable control group of non-regulated firms. The coarsening process applies a predefined common binning strategy, creating unique observations within the coarsened data. Each of these unique observations constitutes a stratum. Treated and untreated firms are then exactly matched on these strata. Observations whose strata do not contain at least one treated and one untreated observation are dropped, and weights are used to compensate for the different strata sizes: We match firms exactly at the industry level. Additionally, firms are matched on the basis of their five year average of sales, energy expenditure and assets between 2005 and 2010. We drop firms that do not satisfy our matching criteria and keep the remaining firms for estimation.

Second, we exploit the staggered rollout of the PAT scheme using an event study framework based on a difference-in-differences approach. To obtain unbiased estimates in this setting in the presence of heterogeneous and dynamic treatment effects, we rely on the estimator proposed by Callaway and Sant'Anna (2021), which – similar to other estimators in the literature – ensures that already-treated units are not used as a control group for later-treated units.

Based on our current analysis, we do not yet find robust evidence that the PAT scheme has led to significant improvements in energy efficiency as measured by the sales-to-emissions ratio among regulated firms. We find no statistically significant impact on emission intensity, although there are tentative indications of a decline in emissions over time. To explore potential mechanisms, we consider firm behaviour related to technology adoption, including imports and research and development (R&D) expenditures. Our preliminary findings suggest some positive effects on imports, but no clear evidence of increased R&D spending.

As we continue to refine our analysis, several key areas of improvement remain. First, we aim to improve our identification strategy, particularly regarding matching techniques and the Difference-in-Differences (DiD) estimation approach. We will explore improved matching and weighting methods to ensure more reliable control-group comparisons, especially since some sectors currently have limited matches. Further, the treatment of firms in the PAT scheme is complex, as it involves not only staggered implementation but also repeated treatment over time.



This raises unique challenges in accurately estimating causal effects. Therefore, identifying the most suited identification technique is currently an ongoing process. Second, we intend to conduct a detailed heterogeneity analysis to explore how the effects of the PAT scheme vary across different sectors and firm characteristics. Finally, we will implement a series of robustness checks to validate the consistency and reliability of our results.

→ This paper will be presented in Session 9: Carbon Pricing I – Empirical Evaluation.

The IMO Net-Zero Framework: Decarbonising Global Shipping Through International Regulation

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The international shipping industry has a significant impact on climate change, as it contributes to approximately 3 per cent of the world's total greenhouse gas emissions. As the global society heavily depends on maritime transport, international law and policy makers are seeking regulatory solutions that can mitigate the contribution to climate change from the industry. The International Maritime Organization (IMO), which is an international regulatory agency for the shipping industry has, on this note, developed a legal framework as a mean to reach its goal of a Net-Zero future. This framework is known as the IMO Net-Zero Framework.

This paper researches the IMO Net-Zero Framework and examines the function of the IMO Net-Zero Framework as a regulatory instrument and its potential effectiveness in mitigating the amount of greenhouse gases emitted by the global shipping industry. The paper examines the structure of the framework and the legal nature of its mechanism. The main focus of the framework is its built-in greenhouse gas pricing mechanism. Through a comparative analysis, the IMO Net-Zero Framework is examined alongside the EU Emissions Trading System (EU ETS), which is a cap-and-trade system, to identify the differences and similarities between the two systems and to examine a possible overlap. Lastly, the political climate surrounding the framework will be assessed, and key actors will be identified. Furthermore, this political aspect provides clarification on how political powers can affect the implementation of global climate change regulation.

The IMO Net Zero Framework is the IMO's effort to mitigate the GHG emissions from the shipping industry. An essential part of the framework is the carbon pricing mechanism. Although the framework is often referred to as a tax, the findings of this paper show that the IMO Net Zero Framework is not a carbon taxation, as it does not impose a single fixed rate on the emissions from ships. Rather, the paper concludes that the system is a combination of a market-based framework with greenhouse gas intensity targets and compliance fees paid by non-compliant ships, and a credit system where over-compliant ships can earn tradable surplus units. While it is discussed whether the system and the goals of the framework are sufficiently ambitious, the paper concludes that the framework has potential to importantly contribute to the mitigation of greenhouse gases emitted from the industry, as the revenue generated under the system solely goes towards financing projects against climate change.



When comparing the IMO Net-Zero Framework and the EU ETS, the paper finds a present risk of regulatory overlap. The structures of the systems are different, but because the EU ETS can apply to non-EU Member States, ships going to or from EU ports risk compensating twice for the same emissions. While an overlap could accelerate decarbonisation, it could also risk burdening shipping companies disproportionately and thereby damaging the industry. To avoid a potential overlap, the EU could seek to harmonize the two systems. Nevertheless, it would not make sense to change the EU ETS until the IMO Net-Zero Framework has been formally adopted.

An examination of the political aspect of the IMO framework shows that the shipping industry itself does not pose the primary source of opposition. Rather, there are certain prominent nations, such as the United States, that oppose to the framework. The findings of the analysis of the political climate surrounding the IMO Net-Zero Framework show that resistance from key actors can effectively delay international regulation, even if it has general support. In this specific case, the opposition towards the framework has affected the possibility of meeting the goals and ambitions of the framework, as adoption is postponed by a year. Not only does this delay have consequences for the global climate, but moreover, the global shipping industry must deal with the uncertainty of not knowing whether the framework will be implemented after all.

→ This paper will be presented in Session 6: Aviation & Shipping.

Market Design and Complementary Policies for the EU ETS2: Estimating Price and Welfare Effects

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The second European Emissions Trading System (EU ETS2), scheduled to cover road transport and heating fuels, has become a politically contested instrument of EU climate policy. Concerns about high prices and associated distributional impacts have fueled debates about postponing the system's introduction. Alternatively, permit prices could be adjusted downwards by reducing demand via complementary policies such as national taxes, subsidies and offsets. Yet, the economic literature lacks a transparent, tractable framework to quantify how such design choices and complementary policies interact to shape ETS2 prices over time. Existing projections rely almost exclusively on large integrated assessment models whose complexity makes it difficult to trace which policy assumptions drive results, and to flexibly examine effects of changing individual policies.

This paper develops a simple dynamic model of the ETS2 grounded in the Hotelling rule for optimal extraction of a depletable resource, i.e., the cumulative emissions budget in the ETS. The framework has three distinguishing features. First, it captures the gradual transition from rigid short-run demand responses, driven by intensive-margin adjustments such as reduced driving or lower indoor temperatures, to more elastic long-run responses associated with extensive-margin investments in electric vehicles and heat pumps. We model this transition via a time-varying price elasticity linked to a backstop price. Second, the model incorporates complementary policies in a modular way, allowing



us to translate heterogeneous instruments (national carbon prices, EU vehicle fleet standards, and international offset certificates) into carbon-price equivalents. Third, we develop a welfare-analytic framework that distinguishes between price effects and efficiency effects, formalizing how complementary policies that concentrate abatement in narrower sectoral bases trade off political feasibility against higher aggregate abatement costs.

Calibrated to EEA emission projections, the observed ETS2 futures curve, and household-level fossil fuel prices across member states, our baseline specification yields an initial ETS2 price of approximately 365 EUR/t CO₂ in 2027, rising along a Hotelling path until it reaches a backstop level of 500 EUR/t CO₂ in 2045.

In face of these high price estimates, we quantify the price-dampening effect of three complementary policy instruments. Existing national carbon prices in nine member states reduce the initial ETS2 price by roughly 20 EUR/tCO₂. EU fleet standards for new cars and vans - modeled via a cohort-based implicit carbon price that accounts for the lifetime abatement effect of each new vehicle registration - lower the initial price by 15 to 17 EUR/tCO₂, depending on whether the 2035 penalty criterion is softened. Permitting international offsets, as agreed in the EU's 2040 climate framework, reduces the initial price by a further 24 to 35 EUR/tCO₂, depending on the assumed allocation of offsets between ETS1 and ETS2. Because these effects are additive, complementary policies that are already in place or politically agreed can cumulatively lower the ETS2 price by up to 70 EUR/t CO₂ or roughly 20% of the baseline price.

In contrast, we show that postponing the ETS2 by one year without adjusting the cumulative cap - as currently under discussion - is economically equivalent to tightening the permit budget. Because one year of price-induced abatement is lost while the total emissions budget remains fixed, the 2028 certificate price rises by approximately 77 EUR/t CO₂ relative to a timely 2027 introduction. Delaying the introduction of the ETS2 does not effectively reduce the price burden; it merely shifts and amplifies it. Our welfare analysis further clarifies that lower ETS2 prices achieved through sectoral complementary policies should not be interpreted as pure welfare gains: for a given aggregate emissions target, concentrating abatement on a narrower base raises total compliance costs by a factor inversely proportional to the elasticity-weighted relative emissions share of the regulated sectors. Sensitivity analyses with respect to the long-run backstop price (300–500 EUR/t CO₂) and the baseline emission trajectory confirm that these qualitative findings are robust, though initial price levels are contingent on assumptions about long-run abatement costs.

Beyond our quantitative findings, the paper contributes a replicable and transparent tool for rapid policy assessment. The framework can be extended to evaluate additional national measures, alternative market stability mechanisms, or changes to the cumulative cap with minimal data and computational requirements, complementing the insights of larger integrated assessment models.

→ This paper will be presented in Session 17: Carbon Pricing II – Mechanism Design & Theory.



On the role of drones as means of environmental policy in air pollution inspections, - feedback from Polish City Guards experience

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Despite decreasing trends and numerous policies implemented, air pollution poses one of the largest health risks in Europe. It contributes in particular to respiratory and cardiovascular diseases. The European Environmental Agency (EEA) estimates that exposure to fine particulate matter and nitrogen dioxide levels above the World Health Organization recommendations causes an estimated 253,000 and 52,000 premature deaths, respectively (EEA, 2023, Harm to human health from air pollution in Europe: burden of disease 2023).

The share of the EU urban population exposed to air pollutant concentrations above WHO guidelines in 2022 is equal to 96%, 83%, 88%, and 65% for fine particulate matter (PM_{2.5}), particulate matter (PM₁₀), nitrogen dioxide (NO₂), and benzo(a)pyrene (BaP), respectively. Seven Polish cities are included among the 20 most polluted cities in Europe (EEA, European city air quality viewer 2024), namely Nowy Sącz, Częstochowa, Żory, Piotrków Trybunalski, Łomża, Gliwice, and Kraków, all with poor air quality (PM_{2.5} index). Deaths attributable in Poland due to PM_{2.5} and NO₂ are 47,300 and 4,160, respectively (EEA, Air pollution Poland country sheet).

Recently, the pollution problem has received significant attention in Poland. Many regions have adopted anti-smog laws. Anti-smog resolutions are regulations adopted under the Environmental Protection Act by the provincial assembly of a given province, intended to help reduce air pollution. Such resolutions may specify the type or quality of fuels that may be used or whose use is prohibited, as well as parameters, technical solutions, or emission standards for installations in which fuels permitted in a given area are burned. However, the efficiency of such laws depends on compliance with the rules. For this purpose, City Guards have been granted the right to inspect installations. Moreover, the use of drones in air pollution control is becoming increasingly common.

The general hypothesis concerning recent innovations is that new technology increases efficiency. It is believed that drones reduce labor, equipment, and time requirements, often delivering results at a fraction of the cost of traditional methods. According to the Jouav drone blog, for example, major gains stem from “saving time and money, pinpoint accuracy, keeping people safe, reaching unreachable areas, getting the job done faster, better data for better decisions, readiness for various conditions, quick deployment and redirection, a smaller footprint for a greener planet, around-the-clock coverage, and smarter monitoring and surveillance.” However, drones also pose challenges, including privacy concerns, risks to infrastructure, outdated laws and legal loopholes, noise, battery life limitations, weather constraints, and insurance issues.

According to the Polish Smog Alert association, “checking the smoke composition [with drones] takes approximately 30 seconds. The measurement result is then forwarded to participating officials, who have the appropriate authorization to conduct inspections granted by the commune head, mayor, or president (such inspections can also be conducted with police assistance). If waste burning is suspected, officials can decide to immediately enter the property and inspect the combustion



chamber. This approach allows for surveying a large area and facilitates the identification of homes posing a serious threat to air quality. The result of several hours of patrol is a ‘poison map,’ i.e., locations that should be checked later.”

Municipal (gminne) and City (miejskie) Guards are local government uniformed forces established to maintain public order within municipalities. Currently, there are 444 such units operating in Poland: 381 City Guards and 63 Municipal Guards. City Guards in major cities in Poland (10 per region) were contacted in two waves, in January 2024 and August 2024. They were asked to provide statistics on anti-smog inspections for the period 2001–2023 and to indicate whether they had drones. When a City Guard responded positively, they were asked to provide contact details for a person available for a detailed interview. For completeness, some City Guards were also asked why they had not acquired drones. The survey was sent to 229 City Guards, and 137 responses were received, yielding a 60% response rate.

Among respondents, 44 City Guards were or had been using drones for pollution inspections (either owning them or purchasing related services). This was followed by 20 semi-structured phone interviews with these units. In this paper, we provide a qualitative analysis of the advantages and disadvantages of using drones in air pollution control. In particular, we emphasize the importance of legal frameworks as a factor that may hamper the efficiency of new technologies.

→ This paper will be presented in Session 11: International Climate Law & Governance.

The Composition of Jobs in the Green Economy: Labor Market Reallocation with Adjustment Frictions

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This paper studies the labor-market and macroeconomic implications of a carbon tax in a general-equilibrium framework with heterogeneous firms, search-and-matching frictions, endogenous firm entry, endogenous technology adoption, and costly capital reallocation. Our starting point is Finkelstein Shapiro and Metcalf (2023), which embeds carbon taxation in a Melitz-style macroeconomic model with a frictional labor market, endogenous labor-force participation, firm creation, and a firm-level choice between polluting and clean production technologies. We extend it along two dimensions. First, we disaggregate the clean economy into a high-productivity clean technology (n) and a low-productivity clean technology (s), so that the economy contains three technologies and two endogenous productivity cutoffs. Second, we introduce Jermann-style sector-specific capital adjustment costs, which make the transition path depend on the speed at which capital can move across technologies.

The mechanism operates through the endogenous reallocation of firms, capital, and workers. Firms pay a sunk entry cost, draw an idiosyncratic productivity from a Pareto distribution, and select into whichever of the three technologies yields the highest net profit at the realized draw. Workers are



allocated across sectors through a frictional labor market with matching, unemployment, and an endogenous participation margin, and Nash-bargained wages reflect sector-specific productivity. A carbon tax alters production costs, capital returns, and firm profitability, and thereby shifts both cutoffs. Sector-specific capital carries a quadratic adjustment cost, which determines how quickly capital can be reallocated.

Two versions of the model are calibrated to the same Finnish data: a two-sector clean-versus-polluting version and the three-sector version. Both are subjected to the same policy experiment: a carbon tax that delivers a 40% long-run reduction in domestic emissions, phased in as a linear ramp over 40 quarters. The comparison between the two model versions is our central result. Both achieve the same emissions target, but their macroeconomic consequences differ in sign. In the two-sector model, the transition moves resources from polluting production to a single clean destination: average firm productivity rises by 1.65%, output rises by 0.08%, and consumption is essentially unchanged. In the three-sector model, the same emissions reduction lowers output by 0.22% and consumption by 0.17%, and the aggregate productivity gain collapses to 0.19%.

Along the transition path, capital adjustment costs turn out to be welfare-improving in this calibration. The reason is because slower capital reallocation delays the economy's movement toward a steady state that is worse than the initial one. The same friction, however, delays the run-down of polluting capital and pushes attainment of the emissions target deeper into the transition horizon. We also study a coordinated experiment in which the rest of the world reduces emissions by the same 40% in step with Finland. The domestic adjustment is virtually unchanged but the steady-state welfare effect flips from -0.23% to +2.35% of baseline consumption, because the damage function is now evaluated at a materially lower global pollution stock. Finally, a sensitivity exercise shows that halving the effective cost of abatement offsets roughly 36% of the welfare cost of the transition.

→ This paper will be presented in Session 19: Green Industrial Policy.

Distributional impacts and compensations of the EU-ETS2: An empirical illustration for Spain of the Social Climate Fund in view of other energy compensatory packages (2022 and 2026)

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In 2028, a new emissions trading system in the European Union (EU-ETS2) will become operational, covering emissions from the so-called diffuse sectors (mainly transport and buildings), with the aim of creating increasingly greater and more harmonized economic incentives for greenhouse gas emission reductions. However, its introduction will cause an increase in energy costs, which could disproportionately affect lower-income households, where energy costs represent a higher proportion of income as they tend to consume more energy-intensive products to satisfy their basic needs and, furthermore, they are more likely to own older and less energy-efficient durable goods. To correct its potential regressive distributive impacts, the EU-ETS2 will be accompanied by the so-called Social



Climate Fund (SCF), a mechanism to channel part of the revenue from auctioning emission allowances toward the most vulnerable households.

In this context, this paper simulates the short-term impacts of the EU-ETS2 on Spanish households, focusing on its distributional effects and considering several alternatives for recycling revenues, as provided for in the SCF legislation. To carry out the simulation, we focus on the main energy products affected (gasoline, diesel, natural gas, and heating oil) and consider three alternatives for the use of the allocated revenues to SCF that allow for both mitigating the adverse distributional impacts of the EU-ETS2 and continuing to advance in the decarbonization of the covered sectors: direct cash transfers to households, subsidies for the acquisition of low-emission vehicles, and subsidies for public transport.

The simulation results show that the EU-ETS2 will have a regressive distributional impact in Spain, largely due to the price increases of transport fuels and differentially affecting rural areas, and will cause more inequality. The simulated SCF-compatible compensatory measures can correct this situation, but their impact will depend on the type of measure and its design. In this sense, both lump-sum transfers and public transport subsidies would have a progressive impact and would reduce inequality. In the case of lump-sum transfers, they will be progressive because they represent a larger proportion of the income of low-income households, while the progressivity of public transport subsidies is derived from their greater use by lower-income households. In the case of subsidies for the acquisition of low-emission cars, if an income limit were not established to receive them, they would mainly go to the wealthiest households, thus casting doubts on their additionality and leading to an increase of inequality due to their regressivity. Therefore, it is fundamental that these subsidies are directed exclusively to lower-income households, and that are enough to overcome the financial barriers they face when acquiring these vehicles.

In sum, this paper shows that the compensatory measures provided for in the SCF can allow the EU-ETS2 to have an overall progressive impact on households while simultaneously continuing to advance in the decarbonization of crucial and delayed sectors. Yet, this will depend on the adopted instruments and their design. In this sense, measures that mainly benefit the poorest households (such as lump-sum transfers or public transport subsidies) combined with the establishment of income limits on investment subsidies (such as those for the purchase of clean vehicles) should be favoured.

These results contrast very positively with the poor effects of the measures adopted by the Spanish government in 2022 and 2026 in the face of sharp increases of energy prices due to geopolitical crises, consisting of more costly tax reductions with less progressive distributional impacts and negative implications on decarbonization efforts.

→ This paper will be presented in Session 16: Political Economy II: Distributional Effects.



Phasing Out the Fuel Tax Exemption in the EU Fishing Fleet: Social and Economic Evidence from France

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Similarly to many fishing fleets worldwide, the European fleet benefits from fuel tax concessions under Article 15 of the Energy Taxation Directive — a capacity-enhancing subsidy widely regarded as inconsistent with the decarbonisation objectives enshrined in the European Green Deal. In 2023, the estimated foregone revenue for EU member States amounted to €734 million, corresponding to 1.6 billion litres of untaxed fuel and 4.8 billion kg CO₂ equivalent emitted. Beyond these fiscal and environmental costs, such tax concessions artificially sustain the most energy-intensive vessels and those most destructive to benthic ecosystems, while incentivising an increase in fishing effort. The progressive phasing out of these subsidies is therefore both economically justified and ecologically necessary in the context of a much-needed sectoral transition, while minimising socioeconomic impacts on small-scale and coastal fisheries, which have been proven to be socially, economically, and environmentally more virtuous.

What are the socioeconomic consequences of eliminating subsidies on fuel for both profits and crew wages? How can a socially equitable taxation system be implemented? To answer these questions, the present paper applies a progressive taxation scenario to the French fishing fleet using the STECF socioeconomic fleet data from 2017 to 2023, as well as excise duties on energy published by the Weekly Oil Bulletin. While our findings are broadly consistent with the existing literature and demonstrate that the incidence of the tax strongly correlates with vessel size and fishing gear type (i.e., large-scale trawlers and seiners are the most impacted), this work explicitly integrates the share-based remuneration system (widely prevalent in France), into the model. The results indicate that the tax would exert a significant negative effect on crew income, with the magnitude of this effect positively correlated with vessel size and gear type. This dimension, which has not been quantified in prior studies, suggests that the tax could carry broader implications for sectoral employment, further eroding the socioeconomic attractiveness of an already structurally fragile industry. These findings highlight the necessity of carefully designing the phase-out process, potentially including appropriate aid schemes to support the most fragile segments.

In this perspective, we first test for a more equitable redistribution of the fiscal burden across the fleet through the definition of taxation brackets based on vessels' fuel consumption. Then we introduce two revenue-recycling measures designed to support crews' income within the modelling framework. The first measure provides full income support to small-scale coastal fishers, small dredgers, and polyvalent vessels, while the second distributes a uniform lump sum grant to all fishers. Both schemes deliver substantial support to crew aboard small vessels employing passive gears, dredges, or mixed gear configurations. Each scheme nonetheless entails considerable public expenditure, but a significant share of the tax revenue remains available for reallocation towards complementary support measures.

Our results therefore demonstrate that introducing an energy tax on vessels whilst preserving the most environmentally virtuous fleets is theoretically feasible. Moreover, adopting a single-criterion



approach based on economic indicators does not allow all stakes of taxation to be addressed. Integrating the social dimension to our model has shown that the socioeconomic attractiveness might be one of the principal challenges to face when taxing vessels' fuel. This work brings analytical elements towards the design of a socially equitable fossil fuel taxation framework for the fisheries sector, alongside operationally viable public policy measures, in line with the objectives of the European Green Deal and the environmental imperatives associated with the preservation of marine ecosystems.

→ This paper will be presented in Session 15: Sector-Specific Instruments.

Designing Compensation for Regressive Carbon Pricing: Insights from Germany (Working Title)

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Even though carbon pricing is a key instrument to reduce greenhouse gas emissions and is increasingly implemented worldwide, concerns about potential regressive effects that disproportionately burden low-income households persist. These can lead to low public support and hinder higher prices on carbon, especially in high-income countries. To counteract adverse distributional effects, the design of compensating policies that redistribute the revenue from carbon pricing while considering household heterogeneity is crucial. Therefore, this paper investigates the distributional effects of carbon pricing and analyzes different revenue-redistributing schemes regarding their efficiency and potential to mitigate regressive effects. Given ongoing policy debates in rich and industrialized countries in Europe, I analyze Germany as a policy-relevant case to inform the design of compensation mechanisms in carbon pricing regimes.

To model the distributional effects across heterogeneous households, this paper captures four channels through which carbon pricing affects the distributional outcome: the direct price effect, the indirect price effect, the behavioral response in consumption, and the labor supply response. Building on this framework, I simulate compensating reforms that aim to offset the resulting price burden via different revenue-redistributing mechanisms.

First, to quantify the price effects of direct and indirect emissions, I combine microdata from the German household budget survey (EVS) with emission intensities derived from a multi-region input-output table (EXIOBASE), capturing all direct and embedded emissions within the supply chain. To capture a broader set of dimensions of household heterogeneity, these data are imputed to the German Socio-Economic Panel (SOEP). Based on this comprehensive dataset, I model a carbon price across 44 household consumption categories.

Second, I model the behavioral responses to these price increases. Regarding the change in household consumption, I use a Quadratic Almost-Ideal Demand System (QUAIDS) to account for both income and substitution effects. Additionally, the framework incorporates labor market adjustments by integrating a discrete choice labor supply model. This model estimates changes in labor supply based on the disposable income of households after the carbon price is applied.



Finally, to evaluate different revenue-recycling schemes, this setup is combined with an established microsimulation model of the German tax and transfer system (ifo-MSM). I simulate several redistributive reforms, including lump-sum transfers, targeted transfers per income decile, revenue-neutral reductions in social security contributions, and adjustments to the income tax scheme. Next to mechanical changes in the households' disposable income, I again adjust for labor supply responses using the discrete choice model. The performance of these policies is evaluated by calculating their economic efficiency via the Marginal Value of Public Funds (MVPF) and by quantifying their equity-enhancing effects using established inequality indices.

As a starting point, I simulate a carbon price of 200€ per ton of CO₂-equivalent on all household consumption expenditures in the year 2018, while using Engel curves as the simplest version of the QUAIDS depicting only the income effect, and omit labor supply responses. As a result of this initial simulation, the carbon price achieves emission reductions of 221 Mt CO₂eq and generates €97.09 billion in revenue, while decreasing household consumption expenditures by an average of €5,171 per year and implying an average price burden of €2,090 per household. The carbon price is regressive when assessed relative to disposable income: the price burden amounts to 8.1% of disposable income for households in the lowest income decile and 4.4% in the highest decile. The regressivity persists when considering expenditure deciles instead of income. The decomposition of channels shows that this pattern is mainly driven by the high energy burden of lower-income households, and limited scope for adjustment in carbon-intensive necessities.

Regarding the revenue-redistributing policies, lump-sum transfers and transfers differentiated by income deciles significantly reduce regressivity, whereas reductions in labor or income taxes have only limited equality-enhancing effects. At the same time, horizontal inequalities persist within income deciles after rebating, indicating that compensation per decile is unlikely to address the full heterogeneity of policy burdens. In ongoing work, the analysis of horizontal inequality is broadened by examining additional dimensions of household heterogeneity, in particular differences between urban and rural households, household composition, and heterogeneous (energy) consumption patterns.

This paper contributes to existing literature by modeling the four key channels through which carbon pricing affects the distributional outcome, while preserving household heterogeneity. Coupled with a detailed microsimulation model, this framework yields critical insights into the design of politically feasible and socially equitable climate policies. The preliminary findings demonstrate that while carbon pricing achieves substantial emission reductions, its inherent regressivity cannot be adequately offset by revenue-neutral reductions in distortionary labor or income taxes. Instead, targeted transfers are required to mitigate inequality. Crucially, by revealing the persistence of horizontal inequalities within income groups even after targeted vertical rebating, this ongoing research demonstrates the necessity of accommodating multidimensional household heterogeneity when designing redistributive measures to ensure public acceptance of ambitious climate policies.

→ This paper will be presented in Session 16: Political Economy II: Distributional Effects.



Budgets in high water? Fiscal implications of flood adaptation in the United Kingdom

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Climate change poses substantial fiscal challenges for governments, driven by increasing damages and adaptation costs. While the benefits of timely public adaptation are well established, the question of financing these measures remains underexplored.

Public investment decision-making requires information on adaptation effectiveness and on the consequences of different financing decisions. These aspects have not yet received much attention in the literature, which has mostly focused on budgetary needs and direct fiscal effects of adaptation. This paper addresses this gap by examining flood adaptation in the United Kingdom, which stands out for its focus on leveraging private finance for climate action through its green finance programme.

Using the multi-sectoral, multi-regional global CGE model COIN-INT, we analyse how public financing mechanisms affect fiscal sustainability and economic welfare under different warming scenarios until 2030 and 2050. Considered flood costs are based on projections from the latest national risk assessment for damages to private capital and public infrastructure, combined with estimates of flood-induced health impacts. Analysed financing mechanisms for flood adaptation include (i) shifts in public expenditures maintaining budget neutrality, and (ii) deficit financing via domestic green bonds and (iii) deficit financing via international bonds.

We find that adaptation moderates economic losses and fiscal consequences from flooding, despite considerable upfront investment costs. However, the extent of positive effects depends on the financing mechanism and time horizon, as well as future lending conditions, captured by different interest rates. Domestic bond financing comes at the cost of suppressing private investment, while budget-neutral financing requires cuts in public consumption. Debt financing allows higher public consumption, but in the long run, this effect is counteracted by interest payments on accumulating public debt. Mixing financing options can moderate these trade-offs and help manage uncertainties related to future lending conditions. Our analysis shows that expenditure cuts can be averted by choosing some level of deficit financing. Choosing a larger share of domestic deficit financing limits interest payments flowing abroad. It therefore reduces macroeconomic volatility both in public expenditures and welfare under uncertainty about lending conditions, compared to other financing schemes.

The results demonstrate that, while adaptation improves long-term welfare, fiscal outcomes depend on the chosen financing mechanism and time horizon. Therefore, effective adaptation strategies have to explicitly consider financing decisions to account for their full fiscal implications. Hence, better-informed expectations regarding future lending conditions can lead to more robust financing decisions under uncertainty.

→ This paper will be presented in Session 14: Climate Adaptation.



Climate Debt and Carbon Wealth Taxation

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The climate crisis is increasingly recognized as a question of distributional justice, yet current policy frameworks continue to exhibit a fundamental asymmetry: while carbon-intensive consumption and production are progressively subject to taxation, the wealth structures that drive and benefit from carbon-intensive economic activity remain largely unaddressed. This paper argues that this imbalance undermines both the effectiveness and the fairness of climate policy. To address this asymmetry, we develop the concept of a carbon wealth tax as a mechanism to align taxation with both the polluter-pays and the ability-to-pay principles, focusing on the role of ultra-high-net-worth individuals (UHNWIs, the global top 0.01%, individuals with USD 30 million net wealth and above) in driving emissions and accumulating climate-related debt.

Building on recent advances in the literature on climate debt, the paper presents a new perspective, connecting climate debt not to the state level but to UHNWI. To do this, the document contrasts consumption-based and ownership-based approaches as two different carbon accounting methods, attributing emissions to different groups of individuals. The consumption-based approach assigns emissions to the final consumers of goods and services. In contrast, the ownership-based approach allocates emissions to the owners of assets or capital, emphasizing responsibility linked to wealth, investment decisions, and control over production. While the consumption-based perspective is useful for understanding demand-driven pressures and lifestyle impacts, the ownership-based approach highlights structural drivers of emissions and inequality, particularly among high-wealth actors. Given that a wide range of policy instruments already exists to address consumption-based emissions, this analysis focuses primarily on the ownership-based approach as a foundation for designing fiscal policy tools.

We estimate that UHNWI have accumulated approximately USD 16.27 trillion in ownership-based climate debt between 1990 and 2022, corresponding to roughly 25% of their total wealth in 2026. The yearly climate debt of the same group amounted to USD 906 billion in 2022. Projections show that the climate debt of UHNWI could accumulate to USD 75 – 117 trillion between 2023 and 2050 (depending on the scenario).

To address the climate debt of UHNWI, two complementary instruments are developed. First, a carbon wealth fee is proposed as a transitional mechanism designed to mobilize substantial revenues over a defined period. Second, a carbon wealth tax is introduced as a structural, long-term instrument targeting the net wealth of centi-millionaires and billionaires globally. One central feature of the tax is a climate bonus mechanism, which reduces tax rates by 25% depending on the share of green versus carbon-intensive assets within individual portfolios. This ensures that taxation reflects the climate impact of existing investments while simultaneously creating a forward-looking incentive to reallocate capital toward sustainable activities.

The results indicate that even moderate tax rates applied to extreme wealth can generate substantial revenues, reaching hundreds of billions USD annually.



A further goal of the paper is a contribution to start a debate about reforming international taxing rights in wealth taxation, and it includes a first proposal for the international redistribution of revenues. Given the pronounced mismatch between the geographical concentration of wealth (predominantly in the Global North) and the distribution of climate damages (disproportionately affecting the Global South), the paper develops a needs-based allocation mechanism. Revenues are distributed according to a formula combining climate vulnerability (e.g. ND-GAIN index) and economic capacity (inverse GNI per capita).

Overall, the paper demonstrates that the climate debt of UHNWI is significant and that carbon wealth taxation represents an ambitious yet feasible and normatively compelling addition to the climate policy toolkit. By linking wealth, emissions, and redistribution in a coherent framework, it provides ideas for rethinking global taxing rights and advancing climate justice through fiscal policy.

→ This paper will be presented in Session 4: Frontier & Emerging Tax Instruments.

The Impact of International Investment Agreements on States' Environmental Tax Policies

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The conflict in the Middle East and the ongoing war in Ukraine have sharpened concerns about energy security and raised fears of a slowdown in global economic growth, reshaping policy priorities and pushing climate change from the political foreground. Yet these same disruptions should strengthen, rather than weaken, the case for accelerating the transition away from fossil fuels, since a faster shift towards renewable energy would reinforce energy security, build resilience against future shocks and contribute to the Paris Agreement objective of limiting global warming to 1.5°C above pre-industrial levels. Within this transition, environmental tax policies are well-established as appropriate policy instruments to steer economic behaviour, mobilise public revenue and redirect investment towards lower-carbon activities, with carbon taxes, energy taxes, resource taxes, tax incentives for climate-friendly investments and the reform of implicit fossil fuel subsidies among the principal tools available to states.

Policymakers, however, do not enjoy unlimited discretion in designing such environmental tax policies. Both developed and emerging economies remain dependent on foreign direct investment (FDI) to sustain economic growth, finance infrastructure and consolidate public finances. For decades, bilateral investment treaties (BITs) have been the principal legal instrument through which states seek to attract such FDI, offering foreign investors substantive guarantees against expropriation, unfair and discriminatory treatment, coupled with direct access to investor-state arbitration. Yet the protections designed to attract capital may now restrict the capacity of host states to redesign their tax systems in response to climate change, particularly where environmental tax measures affect carbon-intensive assets, extractive industries or incentives previously granted to foreign investors. This paper addresses that difficulty by examining how BITs affect the capacity of states, particularly in North-South investment relations, to adopt environmental tax policies as instruments of climate action.



The paper first examines BIT architecture, addressing the definitions of protected investors and investments before turning to the substantive and procedural safeguards granted to foreign investors and their application to tax measures. Particular attention is paid to four guarantees most likely to bear on taxation, namely national treatment, most-favoured-nation treatment, fair and equitable treatment and protection against expropriation, together with the privilege of investor-state arbitration. Although taxation has traditionally been regarded as a sovereign prerogative, arbitral tribunals have repeatedly accepted that tax measures fall within the scope of these guarantees, particularly where they substantially deprive an investor of the value of its investment or frustrate its legitimate expectations. Whether and to what extent the guarantees apply depends on the wording of the applicable treaty. Some BITs contain broad tax carve-outs, others exclude only specific standards, and many preserve claims concerning expropriatory, discriminatory or arbitrary taxation. The paper assesses the principal forms of these carve-outs and their capacity to shield environmental tax policy from investor claims. Their effectiveness, however, hinges on tribunal interpretation, including what qualifies as a “taxation measure”.

The impact of this BIT framework becomes most visible in arbitral practice, where investment treaty standards have repeatedly been invoked to challenge tax measures that host states would characterise as legitimate exercises of sovereign policy. Since the CJEU’s *Achmea* judgment of 2018 and the 2020 Agreement for the Termination of intra-EU BITs, that practice operates primarily in extra-EU and particularly North-South investment relations, where BITs remain in force and investor-state arbitration remains available. The arbitral awards discussed in this paper illustrate how protection standards can translate into concrete constraints on environmental tax policy design. The paper analyses two recurring settings of particular relevance to the clean energy transition. The first concerns the introduction or increase of taxes on fossil fuel extraction. In *Occidental v. Ecuador*, for example, the denial of VAT refunds to a foreign oil exporter, while exporters in other sectors remained eligible for such refunds, was found to breach the national treatment standard. The second concerns the reform of tax incentives previously granted to foreign investors in the renewable energy sector. Although such disputes have been brought primarily under the Energy Charter Treaty, a multilateral energy-sector treaty whose substantive standards closely parallel those of BITs, their reasoning is directly relevant to BIT analysis, as illustrated for example in *Antin v. Spain*.

Building on these findings, the paper concludes with a normative proposal. Future BITs should preserve investor protection while explicitly safeguarding the policy space required for environmental taxation. This entails clearer tax carve-outs, public policy exceptions covering environmental objectives, more precise formulations of fair and equitable treatment, and procedural mechanisms allowing competent tax authorities to assess tax-related claims before arbitration. In parallel, investment instruments should address the design of tax incentives, ensuring that they are transparent, time-limited and aligned with environmental objectives. Recent treaty practice, including the 2019 Belgium-Luxembourg Model BIT, demonstrates that environmental considerations can be integrated into investment law without dismantling investor protection and offers inspiration for the reform of existing BITs and the negotiation of future ones.

→ This paper will be presented in Session 11: International Climate Law & Governance.



Climate of the Elites: Elites and Climate Policy Preferences Across Lower and Middle Income

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Co-authors: Ganesh Gorti, Jan Christoph Steckel

Research Question: A large body of literature explains climate (in)action through public attitudes. Public concern about climate change and support for environmental policies are often seen as key drivers of policy adoption and implementation. For instance, climate concern is positively associated with the adoption of local climate policies (Ebner et al. 2025), while pro-environmental behaviour correlates with stronger support for environmental regulation (Sharpe, Perlaviciute, and Steg 2021). Evidence from Europe suggests that citizens prioritize environmental protection over economic goals (Arato et al. 2024). Taken together, such strong public support should translate into more ambitious climate action. Yet, this has not been the case.

We argue that this gap stems from insufficient attention to the preferences and incentives of political elites. As Holcombe (2021) notes, influence does not flow exclusively from the public to policymakers, elites often shape agendas and anchor public discourse. Moreover, elites strategically evaluate the political costs and benefits of policy choices, taking into account coalition dynamics and electoral incentives (Beiser-McGrath 2023). Thus, even in contexts of broad public support, elite-level calculations may influence the adoption of ambitious environmental policies.

Our study aims to shed light on this pattern and understand how elites prioritize climate through the lens of Sustainable Development Goals, and how this prioritization compares to what citizens prefer. Specifically, we combine data from elite and citizen surveys to explore whether similar discrepancies exist in attitudes toward environmental protection and economic growth.

Data and methods: For elite preferences, we draw on the Listening to Leaders (LTL) survey (AidData), a cross-sectional time-series survey of elites across LMICs fielded in 2014, 2017, 2020, and 2024. We focus on the 2017, 2020, and 2024 waves, which ask respondents to rank the Sustainable Development Goals (SDGs), with particular attention to SDG 13 (Climate Action) and SDG 8 (Decent Work and Economic Growth). For citizen preferences, we use Wave 7 of the World Values Survey (2017–2022), which asks respondents to choose between prioritizing environmental protection even at the cost of slower growth, or prioritizing economic growth even if environmental quality suffers. Beyond descriptive analysis, we use Multiple Correspondence Analysis (MCA) to examine how SDG 13 prioritization co-occurs with other SDGs and whether these relationships shift over time.

Key findings: Using data from the LTL survey, we examine how elite prioritization of climate action has evolved over time in the Global South. Our analysis leads us to four main findings.

First, elite prioritization of climate action increased markedly in 2024 relative to 2017 and 2020, suggesting that COVID-19 and its associated economic disruptions did not durably crowd out climate concerns.

Second, the upward trend is broadly shared across geographies. It also holds when excluding respondents in environmental policy sectors, suggesting that elites beyond environmental specialists are increasingly attentive to climate. Among government actors specifically, however, a small but



visible deprioritization of SDG 13 and related environmental SDGs is observed in 2020, consistent with pandemic-related effects.

Third, MCA reveals meaningful temporal variation in how SDG 13 clusters with other development goals. In 2017, SDG 13 co-occurs with other environment-related SDGs, particularly SDG 15 and SDG 12, suggesting coherent environmental prioritization. In 2020, this pattern breaks down: SDG 13 prioritization is associated with the absence of other non-environmental SDGs, potentially pointing to crisis-driven trade-offs. By 2024, SDG 13 is embedded within a broader cluster, co-occurring with both environmental SDGs (SDG 6, SDG 15) and socio-economic goals (SDG 1, SDG 5).

Fourth, despite rising climate attention among elites, a persistent and significant gap exists between elite and citizen priorities on the environment–economy tradeoff, with elites prioritizing the economy more than the environment. Taken together, these findings suggest that while elites in the Global South increasingly view climate action as a central component of development, economic objectives retain primacy.

Implications: These findings have two main implications. First, the elite–citizen gap on the environment–economy trade-off is substantively important. Public acceptability shapes whether climate policies are politically feasible — and the literature on ambitious climate policies such as carbon pricing shows that perceived fairness is central to that acceptability (Maestre-Andrés, Drews, and Van Den Bergh 2019; Haring et al. 2024; Dechezleprêtre et al. 2025). But public support and acceptability are insufficient if the officials responsible for adoption have a different calculus. Elites are not passive actors and can actively influence policy outcomes. Understanding what shapes their priorities is essential to understanding policy outcomes. Second, climate policy scholarship has rightly focused on public attitudes and demand-side conditions to understand policy adoption. Our results point to an equally important and understudied supply-side question — why do elites weigh economic objectives so heavily even when their constituents do not, and what political, institutional, or contextual conditions can shift that weighting? These questions are especially important given the rising backlash against both climate policies and the institutions and norms that support such policies.

→ This paper will be presented in Session 2: Political Economy I: Public Acceptance.

How Do Governments Set the Carbon Tax Rate?

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Carbon taxes are deemed as an important and efficient tool to reduce emissions, with more governments increasingly adopting or considering them. The tax rate is one of the key aspect of the design of carbon taxes, determining the environmental effectiveness, competitiveness and carbon leakage concerns, and revenue raised. This article aims to shed new light on the criteria governments use to set the tax rate in their domestic instruments. To do so, we first outline a taxonomy of methods that government can use in setting the tax rate. We then analyze the criteria used in 13 countries to set their carbon tax rate.



We find that empirically driven approaches to identify tax rate benchmarks, such as the marginal abatement cost curves (MACC) and the social cost of carbon (SCC), are rarely used to determine the tax rate. Few countries use MACC to set their carbon tax rate and always in combination with other criteria. In addition, the Nobel award winning idea of the SCC is not used in any of the countries analyzed, despite it can be manipulated to fit political preferences. The common description of carbon taxes as instruments that aim primarily at internalizing externalities does not fit their implementation in practice. A corollary of this finding is that scholarship that criticizes carbon taxes for embedding a cost-benefit analysis approach to climate policy, criticizes these instruments for something they are not.

Our analysis indicates that emulation plays an important role in setting the tax rate, as governments copy price levels implemented in other jurisdictions or supranational carbon pricing instruments. Finally, we also find that in countries that adopt a shadow price in government policy, the shadow price tends to be higher than the carbon tax rate. This suggests that the political economy of shadow pricing may be easier than that of carbon taxation.

→ This paper will be presented in Session 9: Carbon Pricing I – Empirical Evaluation.

Can Taxation Save the Planet from Data Centers?

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Data centers are essential to the continued deployment of artificial intelligence (AI) used in such applications as ChatGPT. AI is playing an outsized role in today's economy, with market capitalization of AI-related companies reaching stratospheric levels. The market capitalization of AI-related firms in the S&P 500 has grown by around USD 12 trillion since 2022. Globally, companies invested USD 500 billion in data centers in 2024. Data centers process huge amounts of data that enable such applications to rapidly answer questions and provide solutions. The International Energy Agency (IEA) reported that as a share of the online population, over 50% of survey respondents report using generative AI at least weekly. Artificial intelligence has captured the attention of scholars in many areas of law, including privacy and security, environment, and taxation. Data centers use large amounts of electricity for processing and water for cooling the data servers. Most environmental scholars focus on the environmental harm caused by the proliferation of energy and water intensive data centers. Most tax law scholars focus on either the non-taxation of exchange of consumer data for the use of digital products or on the challenges of taxing transactions in intangible consumer data, which is hard to value and source to a particular jurisdiction. This article will use a different tax law approach, exploring the impact of current tax law on data centers and focusing on using tax policy to mitigate the environmental harms caused by data centers. In part I, this paper will acknowledge and quantify the harms caused by data centers. Large data centers can use as much electricity as a community with 2 million homes. Consumers' energy costs have increased in areas with significant data center development. Over half of the electricity used by U.S. data centers is generated by fossil fuels, creating climate-changing carbon emissions. Most data centers also use 10 million gallons of water per year for cooling equipment. In many cases, this is potable water. Data centers also have job



and community impacts. While some communities are enticing data centers to locate in their communities with generous tax abatements, hoping for jobs and economic prosperity, data centers may create many construction jobs in the short term, but most result in relatively few permanent jobs. Given the potential harm caused, should data centers and AI be encouraged? In part II, we will consider this question. Should the potential profits from data centers be enough encouragement? Nvidia, which makes computer chips that are essential to building artificial intelligence, is the first company with a market capitalization of USD 5 trillion. Admittedly, at certain point, numbers this large become uncomfortably meaningless. For context, one trillion inches is about 15 million miles, approximately the distance between the earth and our moon. Over the last 12 months, Google, Microsoft, Amazon and Meta spent about \$360 billion on new data centers. Most highly profitable tech companies, like Google, Microsoft, Amazon and Meta achieve low effective federal tax rates by employing profit shifting strategies. However, despite the favorable tax climate for tech companies, U.S. policy makers consider that profit is not enough encouragement to build data centers. This paper will examine how the current tax systems in the United States at both the federal and state and local levels encourage the proliferation of data centers. Federal tax provisions, such as qualified opportunity zones (QOZ) investment deferral and the permanent expensing of capital expenditures, which were recently expanded in the One Big Beautiful Bill Act (OBBBA), enhance the attractiveness of investing in data centers by providing investors with shelter from tax liabilities. In particular, QOZ provisions incentivize locating data centers in rural areas, which may exacerbate environmental harms. As previously mentioned, many states and localities also provide tax incentives to encourage data centers to locate in their jurisdictions.

→ This paper will be presented in Session 15: Sector-Specific Instruments.

Fuelling Innovation: Unveiling the Effects of Carbon Taxes on European Corporate Ingenuity

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This paper examines the impact of carbon taxes on firm-level innovation across European countries, addressing a notable gap in the empirical literature on environmental policy and technological change. While carbon pricing is widely recognised as an effective instrument for reducing greenhouse gas emissions, its role in stimulating innovation, particularly at the firm level and across multiple countries, remains insufficiently understood. Existing studies predominantly focus on emissions trading systems, single-country analyses, or macro-level outcomes, leaving limited evidence on how carbon taxes influence corporate innovative behaviour within a heterogeneous European setting.

To address this gap, the study combines multi-country firm-level data from the Orbis database with detailed information on carbon tax implementation and design sourced from the World Bank and the OECD. The empirical analysis exploits variation in the timing of carbon tax adoption across European countries between 1989 and 2020. Given the staggered nature of policy implementation, the paper



applies a synthetic difference-in-differences (DiD) approach, which constructs weighted control groups to improve identification and relax the restrictive assumptions associated with conventional DiD estimators. This methodology allows for more credible estimation of treatment effects in settings with heterogeneous adoption timing and potential violations of parallel trends.

Innovation is measured using both input- and output-based proxies, namely firm-level R&D expenditure and patent applications, with particular attention to low-carbon patents. This dual approach captures both the effort invested in innovation and its observable outcomes. To account for the dynamic nature of innovation processes, the empirical specification incorporates lag structures in both dependent and control variables. The analysis further controls for firm-specific characteristics, including size, age, ownership structure, and financial capacity, as well as macroeconomic conditions and industry effects. Firms covered by the EU Emissions Trading System are excluded to isolate the impact of carbon taxes from overlapping policy instruments.

The paper contributes to the literature in several ways. First, it provides novel firm-level evidence on the relationship between carbon taxation and innovation across multiple European countries, thereby enhancing external validity relative to single-country studies. Second, by employing a synthetic DiD framework, it addresses recent methodological concerns regarding staggered policy evaluation and improves the robustness of causal inference. Third, the use of detailed firm-level data enables the identification of heterogeneous effects across industries and firms, offering insights into how carbon taxes interact with firm characteristics and sectoral structures.

By providing a comprehensive assessment of the innovation effects of carbon taxes at the firm level, this study offers important implications for policymakers. Understanding how firms respond to carbon pricing is essential for designing policies that not only reduce emissions but also foster technological development and long-term economic competitiveness. The findings are particularly relevant for European policymakers seeking to complement existing instruments, such as the EU Emissions Trading System, with carbon taxes that effectively stimulate innovation while supporting the transition to a low-carbon economy.

→ This paper will be presented in Session 19: Green Industrial Policy.

Critical Minerals, Taxation and the Energy Transition: A Cosmic Collision?

Author: Janet Milne | Vermont Law School

Critical minerals are an essential part of the global energy transition away from reliance on fossil fuels. Yet their use brings complexities. They generate environmental benefits by enabling technologies that will avoid the use of fossil fuels. At the same time, they have adverse environmental impacts, such as the effects of mining on the ecosystem at the cradle stage and disposal at the grave stage. They also raise geopolitical (and environmental) questions of who controls a supply chain of potentially mounting significance. These factors yield a fundamental and complex policy question: What is the net effect of reliance on critical minerals?



This paper does not predict the answer to that question. It instead looks at one facet of the larger picture. It explores the role of taxation in influencing potentially colliding forces—just one aspect of the complex policy calculations now and in the future. Taxation might address both positive and negative environmental externalities of the cradle-to-grave use of critical minerals. It might influence control over the supply chain and where job creation occurs during the global energy transition.

To provide a concrete context, the paper uses the United States as a case study. It explores, for example, tax incentives that encourage production of critical minerals and link green technology deployment to environmental and nonenvironmental criteria, tax policies that have addressed mining reclamation in the past, and the role of tariffs that the United States Supreme Court recently characterized as taxes. Although drawing on US perspectives, the paper aspires to highlight tax policy issues that may be relevant to other countries as they consider the role of tax policy in influencing the energy transition and its technological paths.

In short, what might happen in the policy cosmos as pressure to advance the energy transition, demand for critical minerals, environmental impacts, geopolitical forces collide—can taxation contribute creative, constructive force?

→ This paper will be presented in Session 4: Frontier & Emerging Tax Instruments.

Fair, effective and understood: EU citizens' perspectives on the EU ETS2

Author: Leonard Missbach | Potsdam Institute for Climate Impact Research (PIK)

The EU has postponed the introduction of the second EU ETS targeted at the heating and transport sectors - in parts motivated by concerns over excessive costs for households and distributional effects. But do citizens actually care? What is it that drives their support for or opposition to a specific, legislated, not yet implemented climate policy? This talk presents novel insights from a survey experiment with more than 11,000 citizens from Germany, France, Spain and Romania. Based on their respective carbon intensity of consumption, respondents receive personalized information about their expected costs, also in comparison to other citizens. Major findings include that citizens are primarily concerned about effective policies and fairness, but their perceptions of fairness are not necessarily determined by their individual cost profile.

→ This paper will be presented in Session 2: Political Economy I: Public Acceptance.



Equitable carbon pricing benchmark based on a country differentiated Social Cost of Carbon

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Co-authors: Giulio Mela

Carbon pricing has become a central policy instrument in global climate governance, yet its international deployment remains fragmented and inconsistent with the levels required for achieving net-zero emissions and with the equity principles recognised under the UNFCCC. National carbon prices diverge widely, and proposals for a single global benchmark based on the Social Cost of Carbon (SCC)—often advanced in academic and grey literature—face distributional concerns and political resistance in both developed and developing countries. This article addresses these challenges by proposing an equity-based framework for differentiating the SCC across countries, grounded in the UNFCCC principle of Common but Differentiated Responsibilities and Respective Capabilities (CBDR-RC). The aim is not to estimate a new SCC or define a specific price trajectory, but to design a transparent and operational methodology through which an institutionally determined SCC (for example, the best estimate proposed by US-EPA in 2023) can be translated into a country-differentiated carbon pricing benchmark that preserves the cost-efficient property of a uniform SCC while aligning with CBDR-RC. The approach seeks to enhance political acceptance of a global benchmark by incorporating two equity indicators that allow a mathematical, non-subjective differentiation: income per capita (economic capacity) and cumulative per capita CO₂ emissions (historical responsibility).

To motivate the policy proposal, the paper first examines the historical relationship between effective carbon pricing levels and these two indicators. A global multi-country dataset is assembled, combining effective carbon rates and implicit and explicit carbon pricing instruments from OECD and the World Carbon Pricing Database; income per capita and population from the World Bank; cumulative per capita CO₂ emissions from EDGAR. The time span considered is between the early 1990s (first attempts of international climate policy) and 2024 (latest year with available data). The empirical analysis employs a two-stage hurdle model: a probit specification estimates the probability that a country adopts explicit carbon pricing, and a Poisson pseudo maximum-likelihood estimator assesses adoption intensity for those countries/years that adopt such taxation schemes. This allows analysis of structural relationships linking carbon pricing, income, and historical responsibility for emissions. The empirical exercise provides the conceptual foundations for a policy proposal aimed at facilitating the adoption of country-specific SCC benchmark inspired by equity.

The study develops and compares two alternative methods for deriving a country-differentiated SCC benchmark from a uniform global SCC. Both express country-level SCCs as a function of income per capita and cumulative per capita emissions, and both satisfy the efficiency condition that the weighted global average price equals the marginal damage cost. However, they differ in functional form and in how climate finance commitments by developed countries are incorporated.

The multiplicative model is based on a Cobb–Douglas specification. It assigns elasticities to the two equity components, allowing them to interact. This reflects the empirical modelling strategy and ensures interpretability in terms of responsiveness: increases in income or historical responsibility



raise the differentiated SCC benchmark, while reductions lower it. When elasticities sum to one, the model satisfies constant returns to scale, a property that can be defended as a reasonable normative principle and a politically acceptable compromise. Choosing equal elasticities—e.g., 0.5 for income and 0.5 for historical responsibility—gives symmetrical weight to the two CBDR-RC dimensions. Preliminary conceptual exploration suggests that the multiplicative approach performs well in terms of internal coherence and balance, even though parameter values ultimately reflect normative and political choices.

The additive model offers different advantages. Its two components—one proportional to income per capita and the other to cumulative per capita emissions—are separable, allowing an analytically tractable incorporation of the share of carbon pricing revenues that all countries collect but only developed countries devote to international climate finance. By linking the quantification of the most contentious equity component—historical responsibility—to a specified global climate finance commitment (such as the current USD 100 billion annual UNFCCC target or the increase to USD 300 billion by 2035), the model determines the parameters of the economic capacity component solely through indicator-based, non-subjective conditions. The additive formula can thus be calibrated under agreed climate finance targets, enabling cost-effective and equitable differentiation without further policy assumptions. This feature minimises subjective choices, increases transparency, and provides a mechanism linking carbon pricing revenues to climate finance based on historical responsibility. A limitation of the additive approach is that, in its simplest form, it may underweight historical responsibility relative to economic capacity; however, it reflects the calibration of parameters to real world climate finance commitments.

A key research question explored in the article is whether the two approaches may ultimately converge when parameter settings and climate finance targets are harmonised with UNFCCC. The article's contribution is to transparently present these equity-based approaches, demonstrating that SCC differentiation can be achieved in a way that respects CBDR-RC while maintaining the integrity of an SCC-based global carbon pricing benchmark.

→ This paper will be presented in Session 19: Green Industrial Policy.

Minimum Corporate Taxation in Markov Perfect Equilibrium

Author: Nikolaj Moretti | Potsdam Institute for Climate Impact Research (PIK)

This article analyzes the introduction of a minimum tax rate in a dynamic stochastic game of tax competition between two players. Even though the chosen application is the introduction of a minimum corporate tax rate for firms in Germany in 2004, the results are directly relevant for the introduction of the global minimum corporate tax that is being currently phased in. Moreover, understanding the dynamic incentives of such a minimum tax for global tax competition is an important prerequisite for the design of international tax clubs. These clubs could play an important role for the financing global public goods in the future.



In the model, players set tax rates strategically, taking into account both immediate and future payoffs and incentives for other players. The timing of decisions is influenced by a stochastic process, thus dispensing of arbitrary assumptions on the ordering of moves. The model is solved for the Markov Perfect Equilibrium in affine-linear strategies. It is calibrated to match observed tax rates right before the introduction of a minimum corporate tax for municipalities in Germany in 2004. In this setting, introducing a minimum tax reduces the steady-state tax rate of the high-tax municipality. The reason is that the minimum tax prevents the low-tax municipality from reacting by lowering their tax rate, too, thus changing the incentives for the high-tax municipality.

The model reconciles the observed reactions in the aftermath of the introduction of the minimum tax in Germany with the notion of strategic complementarity of tax rates in a tax competition model. This is a significant improvement over the workhorse simultaneous move model of tax competition, which struggles to explain the observed reactions by German firms after 2004. Moreover, the findings cast doubt on the Pareto-improving potential of the global minimum tax that is gradually being phased in since 2024, as it predicts that the low-tax municipality is a net loser of the policy.

→ This paper will be presented in Session 17: Carbon Pricing II – Mechanism Design & Theory.

Impacts of Differentiated Taxes: Evidence from the Dutch Automobile Market

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Co-authors: Alexandros Dimitropoulos, Herman Vollebergh

During the period 2006-2009, the Netherlands implemented a (categorical) differentiated vehicle purchase tax. Under this policy, the purchase of vehicles with low-energy efficiency labels (“D”, “E”, “F”) was taxed at a higher effective rate (via a surcharge), while that of higher energy efficiency-label vehicles (“A”, “B”) was taxed at a lower effective rate (via a tax credit). The purchase tax for vehicles carrying a “C” label remained unaffected. Thus, the policy exhibits a stepwise functional form, i.e., buyers of vehicles with similar relative fuel efficiency levels could have paid different amounts in effective tax, depending on their proximity to energy efficiency label cutoffs.

We exploit the differential treatment of vehicles with similar fuel efficiency levels under the policy to locally identify consumer behavioral responses affecting vehicle sales and the quantity demanded of other vehicle characteristics. For this purpose, we use a regression discontinuity design (RDD) at various tax schedule “cutoffs” and points in time. Additionally, we take advantage of the variation in vehicle label-specific tax treatments, coupled with a 2008 reform intensifying the differentiated tax schedule, to globally identify the consumer behavioral response with respect to our outcomes of interest. We do this through a difference-in-differences (DiD) framework that also incorporates specifications with propensity score matching (PSM-DiD). Given the short-run and non-salient nature of the policy parameters in question, we argue that our estimates are not confounded by manufacturer behavioral responses to the tax. Nor are they confounded by consumer behavioral responses to vehicle fuel efficiency levels signaled by the (pre-existing) energy labels themselves.



Under our preferred specification, we find that the policy induced an increase in the sales of: i) lighter; ii) less polluting; and iii) less energy-consuming vehicles. Disaggregating results by main vehicle fuel and ownership type, we find that this response is mainly driven by individually owned gasoline cars, particularly in the intensified schedule (post-2008 reform) period. We motivate this finding through evidence showing that the policy represented a small fraction of company (employee fringe benefit) car prices. For diesel cars, we find very limited evidence of a policy impact on sales.

The paper forms part of the empirical literature on the (environmental, economic) impact evaluation of non-linear/differentiated tax or tax-subsidy schemes, with a focus on the Netherlands. In particular, it offers reduced-form estimates of behavioral responses to differentiated tax/tax-subsidy schemes, complementing existing evidence from more structural/simulation-based studies. Additionally, the paper offers findings with policy implications for optimal feebate design, hence also contributing to the literature on instrument choice for climate mitigation policy. This is particularly relevant, given: i) the increasing adoption of fiscal policies to incentivize use of more (fuel-)efficient vehicles; and ii) that existing feebate (“bonus-malus”) policies implemented at the international level seem to largely deviate from best practices in the literature.

Key contributions of the paper include the following. First, the paper focuses on an intervention designed as a “policy mix” – information provision via energy labels plus differentiated tax scheme based on the same labels. In this context, the paper disentangles the relative impact of the tax component without the need to control for energy label information provision. Second, the paper’s setting allows for precise identification of consumer behavioral responses, since the policy is exogenous to suppliers in the short run. Suppliers are technologically constrained and cannot respond by changing the vehicle attributes (e.g., length, width) specifically targeted by the non-salient fuel economy index used to define energy labels, hence being unable to respond to consumer preferences. Third, the paper takes advantage of policy design features to identify consumer behavioral responses: i) locally, i.e., at or around different policy “cutoffs” for similar vehicles in terms of fuel efficiency; and ii) globally, i.e., across the entire tax credit-surcharge schedule and vehicle spectrum. Regarding point i) above, the paper examines consumer behavioral responses at different policy margins: 1) surcharge vs. no surcharge (cutoff between label “D” and “C”); 2) tax credit vs. no tax credit (cutoff between label “B” and “C”); and 3) higher surcharge or tax credit when these already apply (remaining cutoffs). Fourth, to achieve the above, the paper utilizes unique administrative microdata on the universe of Dutch vehicle registrations in the period 2006-2009, covering the entire policy timeframe and allowing us to apply the policy rules to construct counterfactuals for causal estimation.

→ This paper will be presented in Session 15: Sector-Specific Instruments.



GCET27

Global Conference of
Environmental Taxation

Pakistan's Solar Policy Reversal: A Macro-Fiscal Environmental Assessment and Analysis of a Loaded Shuffle from Net-Metering to Net-Billing

Author: Nasreen Nawaz | Federal Board of Revenue

Co-authors: Muhammad Ashfaq Ahmed

In February 2026, Pakistan changed its policy on solar power production by households and businesses rather abruptly. This paper provides a macro-level empirical assessment of Pakistan's transition from retail-rate net metering to a net-billing regime for distributed solar generation. Using publicly available data on rooftop solar capacity, retail tariffs, buyback rates, grid sales, and fixed capacity payments, the study quantifies the fiscal, structural, and environmental implications of the reform. These empirical estimates are then leveraged to dissect the loaded policy choice from a political economy lens.

Between 2020 and 2025, retail electricity tariffs increased by over 200 percent, triggering rapid growth in distributed solar installations, which reached approximately 3,000–6,000 MW. Under the previous regime, exported solar electricity was compensated near retail tariffs; the new policy reduces the buyback rate by roughly 60–70 percent. Our macro-simulation suggests that while the reform may generate annual fiscal savings of approximately PKR 25–30 billion, this amount is modest relative to Pakistan's structural circular debt and annual capacity payment obligations. The reform therefore reallocates financial burden rather than addressing the underlying rigidity embedded in fixed, dollar-indexed power purchase agreements.

The analysis further estimates that current distributed solar capacity avoids approximately 2–5 million tons of CO₂ annually. By materially lowering investment returns, the net-billing regime is likely to slow rooftop solar expansion, thereby moderating Pakistan's carbon mitigation trajectory and potentially complicating its climate commitments. The study argues that the core distortion lies not in distributed solar compensation but in legacy capacity payment structures. Sustainable reform requires restructuring fixed obligations, introducing time-of-use pricing, and integrating storage incentives rather than suppressing decentralized renewable adoption.

The findings contribute to the literature on political economy of energy transition in developing economies by demonstrating how policy reversals aimed at short-term fiscal stabilization may undermine long-term efficiency, environmental sustainability, and consumer welfare.

→ This paper will be presented in Session 18: Energy Policy.



GCET27

Global Conference of
Environmental Taxation

From Fuel Subsidy Reform to Carbon Tax Design: Lessons from Ghana and Nigeria

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Co-authors: Monica Lambon-Quayefio, Rex Asiama, Nwajesus Onyekuru

Environmental taxation has increasingly become central to climate policy as countries seek fiscal instruments capable of reducing greenhouse gas emissions while mobilizing resources for climate action. Carbon taxes, emissions trading systems, and fossil fuel subsidy reforms are among the most prominent market-based instruments for advancing mitigation and supporting climate finance objectives under the Paris Agreement. However, in developing countries, particularly fossil fuel-dependent economies, implementing environmental fiscal reforms remains politically sensitive and institutionally complex. This challenge is especially pronounced where energy pricing directly affects livelihoods, inflation, and economic stability.

Fossil fuel subsidies remain one of the most difficult fiscal reforms in many developing countries. While they are often justified as mechanisms to protect consumers from volatile energy prices, they impose significant fiscal burdens, distort energy markets, encourage overconsumption of fossil fuels, and undermine climate goals. Their removal, however, often triggers public resistance because of immediate welfare implications. These same political economy dynamics are highly relevant for carbon taxation, as carbon taxes similarly increase energy prices and create distributional consequences. This suggests that fuel subsidy reform can provide practical policy lessons for carbon tax design and implementation.

This paper examines how the political economy of fossil fuel subsidy reform can inform carbon tax implementation in Africa, using comparative evidence from Ghana and Nigeria. Both countries are highly dependent on fossil fuels and have pursued subsidy reforms under different political and institutional conditions. While Ghana adopted a relatively gradual transition toward market-based petroleum pricing, Nigeria's subsidy removal was more abrupt and politically contentious. These contrasting experiences provide useful insights into sequencing, institutional design, revenue recycling, and political acceptability for carbon pricing reforms.

The paper adopts a mixed-methods comparative approach, combining policy review, secondary fiscal data, and qualitative evidence from stakeholder interviews. A systematic review of policy documents, national budgets, government reports, and existing literature on fuel subsidy reforms and carbon taxation was conducted to establish the policy and institutional context in both countries. The documentary review focused on subsidy design, fiscal implications, compensation mechanisms, and broader climate policy frameworks. A key informant interview with stakeholders was also conducted across both countries (Ghana and Nigeria), including government agencies, energy regulators, academia, civil society organisations, and private sector actors. The interviews explored stakeholder perspectives on subsidy reforms, implementation challenges, political constraints, and opportunities for carbon taxation. Data were transcribed and analyzed using thematic content analysis to identify recurring patterns in institutional governance, political feasibility, and fiscal policy design.



The findings highlight important contrasts in subsidy reform experiences. In Ghana, subsidy reforms evolved incrementally through institutionalized petroleum pricing systems and levy mechanisms that gradually shifted pricing responsibility toward consumers while preserving fiscal stability. Stakeholders highlighted the importance of institutional continuity, regulatory clarity, and gradual implementation in sustaining reform. This incremental approach reduced economic shocks and allowed broader stakeholder adjustment. In Nigeria, by contrast, subsidy removal was largely driven by political decision-making at the highest executive level, with limited public consultation and weak social cushioning. Low public trust, limited transparency in the management of savings, and weak institutional coordination were identified as major barriers to the legitimacy of reform. Although the removal reduced fiscal pressure and curbed some market distortions, it generated widespread concerns about inflation, transport costs, and household welfare.

Three major lessons emerge for carbon tax design. First, sequencing matters: gradual, sector-targeted implementation, starting with high-emission sectors such as oil and gas, improves political feasibility and allows institutional learning. Second, revenue recycling is critical: transparent reinvestment of carbon tax revenues into climate adaptation, renewable energy, and social protection can strengthen public acceptance and perceptions of fairness. Third, institutional trust is fundamental: public support depends heavily on transparency, accountability, and inclusive stakeholder engagement in revenue management and policy implementation.

These findings have important implications for environmental taxation. Carbon taxation in developing countries should not be approached merely as an economic efficiency instrument but as a broader political and social reform requiring careful sequencing, equity considerations, and institutional legitimacy. For countries like Nigeria and Ghana, carbon taxes can generate domestic climate finance while creating incentives for emissions reduction, but only if embedded within broader just transition frameworks that protect vulnerable households and businesses. The study also highlights the importance of regional coordination. Differences in fuel pricing regimes across West Africa create opportunities for cross-border smuggling and carbon leakage. Coordinated regional approaches to fuel taxation and carbon pricing could improve effectiveness and reduce policy arbitrage. Successful carbon taxation in Africa will depend not only on economic efficiency but on political legitimacy, institutional capacity, and distributive fairness. The fuel subsidy reform offers both a cautionary lesson and a practical roadmap for designing politically feasible carbon tax systems.

→ This paper will be presented in Session 20: Political Economy III: Reform in Practice.

Climate Finance and Tropical Forests in Brazil: The Climate Gap in the Allocation of IBS Revenue and a Proposal for Integration

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Tropical forests play a central role in the contemporary climate agenda, not only as vulnerable ecosystems but also as strategic assets for mitigating climate change. By storing large volumes of



carbon and acting as natural sinks, these forests represent one of the most scalable and cost-effective solutions for reducing emissions. In this context, results-based climate finance instruments, such as REDD+, carbon markets, and recent initiatives like the Tropical Forest Forever Facility (TFFF), seek to find economic value in forest conservation by linking financial flows to deforestation reduction and carbon capture.

Despite their potential, these instruments operate predominantly at the international level and have significant limitations regarding their integration with domestic legal and fiscal systems. As a consequence, the economic valuation of forests remains largely dissociated from the fiscal structure of the countries that concentrate such environmental actions.

The Brazilian case clearly reveals this gap. The recent tax reform, promoted by Constitutional Amendment No. 132/2023, revitalizes the Tax on Goods and Services (IBS) and restructures the consumption tax system, while expressly incorporating environmental protection as a principle of the national tax system. This constitutional innovation represents a significant milestone, considering that taxation should be guided not only by criteria of economic efficiency and distributive justice, but also by environmental objectives.

At the sub-constitutional level, the complementary legislation regulating the IBS established a revenue allocation model that incorporates specific public policies in the distribution among federative entities. In this sense, portions of the tax revenue are allocated to funds with defined objectives, such as financing education and combating poverty, demonstrating that the Brazilian system supports the earmarking of tax revenues for structuring public policies.

Notwithstanding this normative openness, the climate dimension was not included in the IBS allocation model. The protection of tropical forests, although recognized as essential internationally, is not reflected, to date, in the revenue allocation mechanisms of the national tax system. On the contrary, empirical evidence indicates a trend of reduced subnational investments in environmental policies, even in states with high ecological relevance, such as Minas Gerais, Rondônia, and Mato Grosso. Therefore, there is a disconnect between the constitutional recognition of environmental protection as a tax principle and the absence of concrete instruments to operationalize this mandate.

Given this scenario, this article proposes the inclusion of the TFFF as a specific allocation of a portion of the IBS revenue, similar to the funds already provided for education and poverty alleviation. This does not involve the creation of new distributive criteria, but rather the coherent expansion of an existing model, incorporating the climate dimension into the Brazilian fiscal structure. The proposal consists of allocating part of the tax's base revenue to a fund directed towards forest conservation, aligning the national tax system with the recently introduced constitutional guidelines.

It is noted that the proposal presents relevant comparative implications for other countries with tropical forests, such as Indonesia and the Democratic Republic of Congo, which also have high potential for carbon capture and storage and adopt value-added tax systems. Although the institutional specificities of these countries may require adaptations, the Brazilian experience suggests that incorporating the environmental dimension into the structure of tax revenue allocation constitutes a promising path to strengthen the effectiveness of climate policies.

In summary, the article argues that the realization of the principle of environmental protection in the national tax system requires not only its normative provision, but also its effective translation into revenue allocation mechanisms. In this sense, the inclusion of the TFFF in the allocation of the IBS



represents a proposal for integration between climate finance, tax law, and environmental policy, contributing to the development of fiscal instruments more consistent with the challenges of the transition to a low-carbon economy.

→ This paper will be presented in Session 8: Forestry.

Heterogeneity, Concentration, and the Political Economy of Benchmarking: An Econometric Analysis of India's Carbon Credit Trading Scheme (CCTS)

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As India transitions from the energy-efficiency-focused Perform, Achieve, and Trade scheme to a greenhouse gas (GHG) emissions intensity-based Carbon Credit Trading Scheme (CCTS), its unique design, blending command-and-control (via unit-specific emissions intensity targets) with market-oriented flexibility (through trading), has emerged as a critical determinant of market integrity. The CCTS aims to institutionalise a market-based mechanism for GHG reduction across eight hard-to-abate sectors: Aluminium, Cement, Chemicals, Petroleum Refinery, Pulp & Paper, Iron and Steel and Textiles. Design features aside, the efficacy of such instruments is often compromised by the "political economy of benchmarking"—where the final stringency of targets could be influenced by the obligated entities. This research provides a dual-layered analysis of the first phase of CCTS targets: first, an empirical mapping of emissions intensity among 488 'obligated entities' (i.e., plants under the ambit of CCTS), and second, an econometric investigation into the systematic relaxation of targets between the draft and final notifications, and firm characteristics.

The study utilises a comprehensive dataset of the 2023 baseline GHG emission intensities and the subsequent 2026 targets as notified by the Government of India under the CCTS. A Pareto-style evaluation reveals extreme concentration of emissions: in Composite textiles sub-sector, for example, just 13% of units (6 out of 46) account for 50% of total sub-sectoral emissions. Similar patterns in the Petroleum Refinery and Integrated Pulp & Paper sectors underscore that the success of India's carbon market rests on the compliance of a few large emitting entities.

Initial descriptive analysis of aggregate emission intensities reveals a mandated reduction of 3.5% (weighted average) by 2026-27 across sectors relative to 2023-24 baseline. Comparing across sectors, we see that agro-based pulp and paper mills are subjected to highest reduction targets (9.3% over the same period), whereas cement clinker plants are subjected to the least (2.3%).

We also compare the emission intensity reduction targets between the final and draft notifications. The econometric results reveal presence of potential biases in the downward revision of these targets. There is a statistically significant positive correlation between the size of the unit in the cement sectors (measured by output) and the degree of target relaxation, implying that final target was made less



stringent than initially proposed for larger units. This points to potential regulatory shielding or a strategic accommodation of planned brownfield expansions in the cement sector, which is crucial given the large share of capital expenditure on infrastructure in India. This could potentially hamper price signals within the carbon market if these large units are not eventually brought into a more stringent compliance net.

These findings point to a complex political economy underlying the CCTS. While the scheme is technically a market-based instrument, the unit-specific baseline-setting process that takes into account the available mitigation technologies and the implementation costs reflects the interplay between industrial scale and regulatory oversight. The systematic relaxation for large-scale private players in some core sectors contrasts sharply with the stricter performance required from large, high-emitting units.

Furthermore, the analysis intersects industrial performance with corporate governance, specifically examining the role of entities which are among the 100 largest listed companies on the Bombay Stock Exchange (BSE 100) versus private and public sector undertakings. About a third of the obligated entities are part of BSE 100 parent groups, which are increasingly subject to international Environmental, Social, and Governance reporting standards (such as Business Responsibility and Sustainability Reporting mandates in India). The data suggests that these larger, listed entities often operate at higher scales of efficiency but also face more scrutiny in their target settings. The interplay between domestic CCTS compliance and international border carbon adjustments (like EU Carbon Border Adjustment Mechanism) is discussed as a secondary driver for these firms to exceed domestic mandates.

The paper concludes by discussing the implications for market stability and carbon pricing. If targets for the largest emitters are systematically relaxed, the market may face an immediate surplus of credits, depressing prices and stalling the adoption of renewable energy sources and energy efficiency measures needed for deep decarbonisation of these sectors. Further, addressing the extreme concentration of emissions and sub-sectoral variations identified in this study would be necessary to ensure effective functioning of the market.

This research provides a timely case study on the challenges of implementing environmental taxation and emission trading schemes in emerging economies, where the need for industrial growth often creates "grandfathering" pressures that can dilute the stringency of market-based climate policies. We argue that for the CCTS to provide a robust price signal, the regulator must move toward standard benchmarking methods that minimises any the scope for any persistent biases.

→ This paper will be presented in Session 9: Carbon Pricing I – Empirical Evaluation.



GCET27

Global Conference of
Environmental Taxation

Coordination between the EU Emissions Trading System and Carbon Taxation: A Comparative Legal and Economic Analysis

Author: Carmen Calderón Patier | Universidad San Pablo CEU

This article examines the coordination between the European Union Emissions Trading System (EU ETS) and carbon taxation within the European Union, focusing on the tensions between supranational harmonization and Member States' fiscal sovereignty. Drawing on the theoretical framework of carbon pricing, it analyzes the interaction between price-based instruments (taxes) and quantity-based instruments (emissions trading), whose coexistence may result in double pricing, distorted economic signals, and competitiveness concerns.

Using a comparative legal and economic approach, the paper identifies three coordination models. First, the exclusion and deduction model, which ensures a single carbon price signal by exempting EU ETS sectors from national taxes. Second, the complementarity model, based on national emissions trading systems covering sectors not regulated at the EU level. Third, the friction model, characterized by the overlap between the EU ETS and traditional energy taxes.

The article assesses the implications of each model in terms of regulatory coherence and economic efficiency, as well as the challenges posed by the introduction of EU ETS II. Spain is examined as a representative case of the friction model. The paper concludes that the EU framework is evolving towards greater convergence, requiring enhanced coordination to ensure effective climate policy.

→ This paper will be presented in Session 17: Carbon Pricing II – Mechanism Design & Theory.

Beyond Fiscal Estimates: A Multidimensional Framework for Assessing Environmentally Harmful Subsidies

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Co-authors: Michael Golde, Anne Biewald

Early contributions on the issue of environmentally harmful subsidies from the 1990s and 2000s focused on conceptualizing the problem and developing definitions. Building on this groundwork, national-level reporting has translated these approaches into more or less detailed inventories and estimates of their fiscal magnitude. Reports by the German Federal Environment Agency (UBA) have played a central role in this process, identifying environmentally harmful subsidies across the sectors transport, energy, agriculture, and housing. This development has significantly increased the policy relevance of the issue.

However, this has not translated into policy progress in terms of subsidy reforms. Substantial challenges remain in identifying, assessing and reforming environmentally harmful subsidies. There is broad agreement that such subsidies create environmentally detrimental incentives and undermine the green transition. At the same time, there is less consensus on how these subsidies should be



defined, how strong their environmental effects are in practice, and how reforms should be designed and implemented.

Therefore, we explore the key challenges that need to be addressed in order to provide robust policy advice for reforming environmentally harmful subsidies.

The most central challenge is the assessment of actual environmental impacts. In many cases, the causal chain from subsidy to price signal, behavioral response, and environmental outcome is not well established empirically. Existing analyses often rely on stylized assumptions rather than robust evidence, making it difficult to compare and prioritize reform options.

A second challenge concerns the effectiveness of reforms. Economic theory suggests that removing subsidies should improve allocative efficiency and reduce environmentally harmful behavior. However, this depends critically on the availability of alternatives and on behavioral responsiveness, which are often not systematically assessed in existing approaches. In domains such as commuting, agriculture, or energy-intensive industry, adjustment options are often limited, at least in the short run. In such cases, subsidy removal may primarily increase costs without inducing significant behavioral change.

Additional challenges relate to issues of distribution, political feasibility and path-dependency, as subsidy reforms can have uneven and potentially regressive effects, particularly for households with limited adjustment options.

At the same time, many subsidies serve implicit objectives related to competitiveness, administrative simplicity, or energy security. This creates trade-offs between environmental effectiveness and other policy goals.

Last but not least, the estimation of subsidy magnitudes is challenging. These are typically calculated based on current behavior and tax bases (revenue loss), but do not account for behavioral adjustments or necessary compensations following reforms (revenue gain). As a result, the fiscal gains from subsidy removal are often overestimated in the debate, particularly where reforms induce the intended reduction in environmentally harmful activities.

While multiple dimensions are often considered, they are rarely assessed in an integrated manner, and oversimplified fiscal estimates tend to dominate the interpretation of results. Against this background, existing reporting approaches should be extended. In this context, we propose, as a first step, a multidimensional assessment framework that integrates environmental impact, behavioral effectiveness, availability of alternatives, distributional effects, and fiscal implications. The aim is not to provide definitive policy recommendations, but to structure a decision space that helps to identify both reform areas with relatively low conflict and high potential, and areas where the scientific evidence remains insufficient.

By addressing both existing knowledge and its limitations, this approach contributes to a more transparent and policy-relevant debate on subsidy reform. It emphasizes that improving decision-making in this field requires not only better data, but also a more explicit treatment of uncertainty, constraints, and trade-offs.

→ This paper will be presented in Session 10: Fossil Fuel Subsidy Reform.



GCET27

Global Conference of
Environmental Taxation

Carbon Contracts for Difference as Bundled Insurance and Support

Author: Nicolas Pinsonneault | HEC Montréal

Co-authors: Justin Caron

Carbon contracts for difference (CCfDs) are increasingly used to support industrial decarbonization. We develop a public-economics framework that decomposes a two-way CCfD into risk transfer and expected support and values both within a common project-level welfare score. Insurance value depends on carbon-price exposure and on the relative cost of public risk-bearing, whereas support value depends on project-specific external benefits and fiscal costs. The two functions can therefore rank projects differently, and the same strike price has different welfare implications depending on whether carbon pricing would already have induced the project. We show that under an ETS, that choice can displace potentially cheaper abatement that would otherwise satisfy the cap. Auction bids generally do not resolve this problem as a truthful strike price bid reveals the firm's reservation guaranteed carbon value, but not external benefits, public exposure costs, counterfactual investment status, or displacement. When eligibility rules are not broad enough, a lowest-strike auction can award a contract to a project with large carbon-price exposure even when the associated public cost makes it undesirable.

→ This paper will be presented in Session 17: Carbon Pricing II – Mechanism Design & Theory.

The International Coordination of Carbon Taxation

Author: Alice Pirlot | Geneva Graduate Institute

This paper examines scholarly and policy proposals to coordinate carbon taxes globally. It starts with a description of the current state of affairs where carbon taxes are primarily operationalised as domestic pricing instruments. It then discusses the main justifications for the coordination of carbon taxes at the global level, focusing on the environmental and economic benefits of a global approach. Third, it examines the main obstacles to the international coordination of carbon taxes, including political hurdles as well as legal difficulties. Finally, it reviews different models of coordination at the global level in the light of recent scholarly and policy proposals, including those by the OECD and the IMF. This paper outlines how each of these proposals rely on different justification and potentially face different types of obstacles.

→ This paper will be presented in Session 1: CBAM I – Legal & Institutional.



GCET27

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Do Coal-Fired Power Plants Increase Tax Revenues? Evidence from Indonesian Districts

Author: Aichiro Suryo Prabowo | Monash University, Indonesia

Despite international pledges to phase out coal-fired power plants, their footprint continues to expand in many emerging economies. One possible explanation is that governments become fiscally dependent on extractive revenue, creating incentives for policymakers to maintain the status quo. This study puts that idea to the test by examining whether the presence of coal-fired power plants strengthens government finances at the subnational level. The analysis focuses on Indonesia, a major global coal producer, and constructs a panel dataset covering more than 300 districts (kabupaten and kota) over 2014-2025. It traces how local taxes evolve around the timing of plant operation, accounting for the fact that plants were announced, built, and became operational at different times across districts. Preliminary results show that coal plant operation is associated with a decline in local taxes per capita, with the effect growing over time, running counter to the fiscal dependence hypothesis. When measured in proportional rather than per-capita terms, no significant effect emerges. Taken together, these findings suggest that the fiscal benefits often assumed to accompany coal expansion may not be borne out at the local level, at least not through the channel of tax revenue.

This paper will be presented in Session 13: Fiscal Policy III – Developing Economies.

Who Pays for Carbon Pricing? Data Gaps, Targeting Constraints, and Distributional Impacts - Evidence from Indonesia

Author: Sebastian Renner | University of Hamburg

Co-authors: Djon Hartono, Jan C. Steckel, Arief A. Yusuf

This paper examines the vertical and horizontal distributional impacts of carbon pricing in

Indonesia. We find that horizontal inequality, the variation of welfare losses within income groups, is two to three times larger than vertical inequality across income groups. This finding is robust to how the large gap between survey-based and national accounts measures of household consumption is treated. We separate this gap into definitional differences and a remaining component whose distributional incidence is unknown, and present vertical incidence results as bounds rather than point estimates. Depending on assumptions about the data gap, the vertical pattern ranges from mildly regressive to mildly progressive, but horizontal dispersion remains large throughout. Revenue recycling through existing social transfer programs can compensate poor households on average, but proxy means tested targeting amplifies horizontal inequality rather than reducing it. Within-group dispersion of welfare outcomes quadruples when moving from universal transfers to targeted transfers via the social registry. Under the prevailing uncertainty about the true income distribution,



universal per capita transfers emerge as the preferred compensation instrument because they minimize horizontal inequality without requiring accurate identification of who is poor.

→ This paper will be presented in Session 20: Political Economy III: Reform in Practice.

Carbon Tax Design in Practice: Lessons from South Africa's Departure from the Textbook Model

Author: Kenneth Richards | Indiana University

Co-authors: Andrew Gilder, Lee-Ann Steenkamp

In economic theory, a carbon tax is often presented as a relatively simple instrument: set a price on greenhouse gas emissions equal to marginal environmental damages, apply it broadly across emissions sources, and allow the resulting price signal to induce cost-effective abatement. Yet carbon taxes as implemented rarely follow this stylized model. Real-world systems vary substantially in coverage, point of regulation, effective tax rates, revenue use, administrative architecture, and the use of exemptions, allowances, and offsets. This paper examines that divergence through a detailed analysis of the South African carbon tax.

The paper uses South Africa as a case study to explore a broader claim: departures from the theoretical ideal are not necessarily evidence of poor policy design or limited technical understanding. Rather, they often reflect the legal, political, institutional, and administrative constraints within which governments actually operate. At the same time, the South African experience suggests that once policymakers begin deviating from the simple ideal, they may enter a sequence of interlocking compromises in which each adjustment generates pressures for further modifications, producing cumulative effects on efficiency, effectiveness, transparency, and administrative burden.

The paper first develops a benchmark model of an “ideal” carbon tax oriented toward economic efficiency and cost-effectiveness. In its simplest form, that model yields a small set of familiar design principles: apply a uniform tax to emissions, cover as many sources as feasible, and set the price to reflect the social cost of carbon or the marginal damages associated with emissions. The paper then broadens this benchmark by incorporating two additional categories of costs that are central in practice but often underemphasized in simplified treatments: implementation costs and public finance costs. Once these are included, design questions such as upstream versus downstream taxation, thresholds, proxy measures, revenue recycling, and administrative assignment become central rather than peripheral.

Against that benchmark, the paper analyzes the South African carbon tax as implemented beginning in 2019. Particular attention is given to the tax base, the point of application, the large set of allowances and deductions, the interaction with other elements of South Africa's mitigation regime, and the practical realities of administration through the environmental levy framework. The analysis highlights the extent to which the announced tax rate differs from the effective regulatory price faced



by many liable entities and how the structure of the tax reflects efforts to reconcile climate objectives with trade exposure, political feasibility, institutional capacity, and legal design constraints.

The South African case offers two broader lessons. First, analysts should be cautious in evaluating carbon taxes solely against highly simplified theoretical ideals, because such comparisons can obscure the genuine constraints policymakers face. Second, practitioners should pay greater attention to the cumulative consequences of design compromises. A tax may depart from the ideal for understandable reasons, but successive accommodations can produce a system that is substantially more complex, less transparent, and less environmentally effective than initially intended.

By examining South Africa's carbon tax in detail, the paper contributes to ongoing debates about the design of fiscal instruments for climate policy and about how carbon taxes should be assessed in settings where administrative feasibility, institutional architecture, and political economy are as important as textbook efficiency conditions.

→ This paper will be presented in Session 20: Political Economy III: Reform in Practice.

One Step Forward, Two Steps Back: The Impact of the OBBB on Atmospheric and Conventional Air Pollutants

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While the Inflation Reduction Act of 2022 (IRA) is regarded as the largest climate bill in U.S. history, the One Big Beautiful Bill Act (OBBB Act) repealed, and subsequent regulatory changes have reversed, many of the key parts of the IRA. As a result, not only will the United States fail to achieve significant greenhouse gas emissions reductions in the near future, but the levels of conventional pollutants governed under the Clean Air Act will rise. This article first outlines the changes to the IRA wrought by the OBBBA, with a particular focus on wind and solar energy incentives, and then discusses the likely impacts on climate emissions. The article then examines increases in conventional air pollutants, primarily from the unlimited support for fossil fuels under the Clean Electricity Investment Tax Credit, IRA §13702 (IRC §48E), the Clean Electricity Production Tax Credit, IRA §13701 (IRC §45Y), and the Carbon Oxide Sequestration Credit (IRC § 45Q) and from modifications to the regulations governing those credits. Far from mitigating climate change and conventional pollutants, the incentives originally developed under the IRA are now poised to worsen environmental outcomes, particularly in view of expansive data center development throughout the United States to support artificial intelligence use.

→ This paper will be presented in Session 7: Fiscal Policy II – Legal Design.



Competitiveness impacts of anti-leakage instruments

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Co-authors: Christoph Böhringer

The European Union (EU) is a front-runner in climate protection with ambitious unilateral reduction targets for greenhouse gas emissions. In order to create cost-effective incentives for emissions reductions across the EU, the EU is focusing on market-based emissions pricing. The most important pillar in this context is the EU Emissions Trading System (EU ETS), covering power generation, energy-intensive industries, aviation and maritime transport.

A key challenge for EU climate policy is the global cost-effectiveness of unilateral action and, closely related to this, the impact on the competitiveness of its energy-intensive and trade-exposed (EITE) industries. When CO₂ emissions are priced unilaterally, the global environmental impact will be undermined to the extent that international markets transmit spillover effects that increase emissions in other countries with no or much more lax emissions regulations – a phenomenon known as carbon leakage. The EU climate policy debate focuses on the so-called competitiveness channel for leakage, where unilaterally regulated carbon-intensive companies reduce their production due to higher operating costs, while the production of less regulated manufactures abroad increases.

To prevent carbon leakage, the EU has so far supplemented emissions pricing in the EU ETS with output-based allocation (OBA): EITE industries at risk of carbon leakage receive free allowances in proportion to their production needs. One disadvantage of this approach—which effectively subsidizes output—is that carbon costs are not sufficiently passed on to consumers and users of EITE products. Recently the EU has decided to gradually replace free allowances with the so-called carbon border adjustment mechanism (CBAM), which functions as a tariff on the carbon content of selected imported products.

One potential drawback of carbon tariffs such as CBAM for the EITE industries is that the tariff increases the costs of intermediate use of EITE goods in EITE production. Hence, although the carbon tariff is intended to protect domestic industries, the protection is diluted if the EITE industries use a significant amount of EITE goods as intermediates.

In this paper we explore this issue by comparing the effects of respectively OBA and carbon tariffs (with and without supplemented with export rebates) on the competitiveness of domestic EITE producers. We use a combination of theoretical analysis of a stylized partial equilibrium (PE) model, numerical simulations of the PE model, and simulations of a multi-region, multi-sector computable general equilibrium (CGE) model calibrated to the latest GTAP12 data, exploring anti-leakage climate policies in the context of the EU.

In our theoretical analysis we derive a clear-cut condition for comparing OBA and carbon tariffs, stating that OBA outperforms tariffs if and only if the share of EITE intermediates in EITE production (γ) is larger than $1 - 2\sigma$, where σ is the OBA-rate, i.e., the volume of free allowances as a share of emissions (for EITE industries). Furthermore, we find that OBA outperforms full border carbon adjustments (tariffs + export rebate) if and only if $\gamma > 1 - \sigma$. In other words, the higher is share of own use of EITE goods in EITE production, the more likely it is that OBA is more suited to protect domestic



industries than carbon border adjustments. Irrespective of anti-leakage instrument, we find that the higher is the share of own intermediates (γ), the less able the instruments are in protecting domestic industries.

Our numerical simulations on the less stylized PE model confirm our theoretical findings to a large degree. In addition, we explore the effects of the import share of EITE products, the substitutability of domestic and imported EITE goods, the number of regions, and the demand and (implicit) supply elasticity of EITE goods – for the effectiveness of the three anti-leakage instruments.

Our next step is to perform the full CGE simulation, which remains to be completed. Here we consider the EU as the policy region, and all other regions as non-policy regions. Then we will examine to what extent the findings from the stylized PE model carries over the broader and more detailed CGE model.

→ This paper will be presented in Session 5: CBAM II – Economic & Trade Impacts.

Between Market Expansion and Rights Protection: Indigenous Peoples and Traditional Communities in Voluntary Carbon Markets in the Amazon

Author: João Daniel Macedo Sá | Federal University of Pará - Amazonian Human Rights Clinic

Co-authors: Ana Beatriz Freitas, Elena Aydos, Lise Tupiassu

The progressive consolidation of the international climate agenda under the Paris Agreement has conferred institutional recognition on economic instruments, particularly those associated with carbon sequestration and storage. In the absence of a centralized regulatory authority governing the global carbon market, and in the context of successive delays in the operationalization of a regulated carbon market in Brazil, Voluntary Carbon Market activities have become the predominant modality for climate project implementation in the Amazon. While their relative flexibility and accessibility have attracted private sector participation, the normative and operational frameworks governing these activities remain uncertain.

Disputes have emerged raising concerns about human rights violations, including the absence or inadequacy of free, prior, and informed consent (FPIC), social participation, and benefit-sharing arrangements for Indigenous Peoples and Traditional Communities in the Amazon region. In response, these groups are turning to judicial mechanisms, seeking the protection of their fundamental rights before Brazilian courts.

In 2024, Brazil enacted Law No. 15,042, establishing the legal framework for the Brazilian Emissions Trading System (SBCE) and regulating the implementation and commercialization of the Brazilian market for carbon credits more broadly. The SBCE statute introduces requirements for developer-funded consultation, establishes minimum benefit-sharing thresholds, and mandates contractual compensation mechanisms for collective harm caused by certain carbon offset projects. It also enshrines the “respect and guarantee of the rights and autonomy of Indigenous peoples and traditional peoples and communities” as a guiding principle of the SBCE.



Against this backdrop, this paper investigates the extent to which this new regulatory framework has the potential to strengthen the protection of the rights of Indigenous Peoples and Traditional Communities, with particular attention to FPIC, territorial rights, and benefit-sharing. It begins with a case study of high-profile disputes before the Brazilian judiciary concerning the intersection of carbon sequestration and storage projects and the rights of Indigenous Peoples and Traditional Communities. Six cases were identified through the JusClima 2030 and Juma platforms. In addition, three emblematic cases not yet in the public domain – the Juma Project, the Suruí Carbon Project, and a case of suspension of FPIC in the State of Amazonas – are analysed based on available technical and journalistic reports.

This case study establishes a baseline for identifying recurring patterns of rights violations associated with carbon sequestration and storage projects in the Amazon. The paper then revisits these cases in light of the regulatory framework established by Law No. 15,042/2024, assessing the extent to which the SBCE addresses the deficiencies identified in practice.

The paper argues that Law No. 15,042/2024 represents a step forward in strengthening rights protection, but that important limitations remain, particularly in relation to territorial rights, the effective operationalisation of FPIC, and equitable benefit-sharing. More broadly, the analysis contributes to the ongoing debate on whether economic instruments are structured in a manner that is equitable and consistent with human rights, responsive to the specificities of local socioecological system, and implemented through participatory processes that enable the meaningful inclusion of diverse social actors in environmental governance and sustainable development.

→ This paper will be presented in Session 8: Forestry.

Environmentally Harmful Subsidies in Germany – Successes, Failures and Challenges

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Germany has abolished several harmful subsidies but also experienced several failures and rollbacks. In addition, the remaining challenges are large and require strong political will.

On the positive side there are the phase-out of hard coal subsidies over a period of 50 years by 2018 and the phase-out of the homeowners supplement (Eigenheimzulage) by 2008. Furthermore, there were several waves of internalization external environmental damage costs: 1999-2003 the Ecological Tax Reform was introduced and continued. 2011 taxes on flights and nuclear fuels were introduced – triggered by the substantive need for financing the impacts of the global financial crisis.

Yet, the nuclear fuels tax had to be abolished again in 2016 due to a decision by the Federal Constitutional Court. Next steps were initiated in 2023 after another decision of that Court: the use of credits for financing the covid-crisis was considered not to be in line with the constitution and thus



requiring other ways of financing. This led i.a. to the first out of intended three steps of phasing out the subsidies for diesel used in agriculture.

The next and current Government made a turn around and subsidises this diesel again at its initial level since the beginning of 2026. This was decided already laid down in the current coalition treaty. But it is not only these diesel subsidies which are affected, but an analysis by FÖS unveiled that the level of environmentally harmful subsidies would increase by 12-15 billion € - which is running completely against various commitments.

Hence, an open question and thus large challenge is, if, when and which next steps does the Government take to comply with the many political commitments? These were made within the climate protection programmes 2023 and 2026, the national biodiversity strategy 2024, the 8th EU-Environmental Action Programme 2021, several G 7- and G 20-commitments, the Kunming-Montréal Global Biodiversity Framework (GBF) 2021 and the Paris Climate Agreement 2015.

Or is it easier for the parties in the German Parliament – instead of the Government – to take such decisions, not at least since the final decision on the budget is in its competence. Often, the final Budget Committee Session (called "Bereinigungssitzung", clarification meeting) at the end of a year offers the chance to take steps which seemed not feasible before. The pressure and necessity to conclude a budget which is – as far as possible – balanced, but in any case, in line with the Constitution – an excellent opportunity. Yet, the most important for such next steps is the political courage of politicians which is often lacking.

The German Government, and this applies to most times, independent which parties were governing, has committed itself again and again to abolish respectively to redirect environmentally harmful subsidies.

There are sufficient processes which the Government could link to and use to do so even jointly with other countries which would reduce potentially negative impacts on the competitiveness of its industries. In the following these are just listed, yet without further qualification in this abstract:

The OECD has a „Joint Working Party on Tax and Environment” (JWPTXE).

The Netherlands organizes for the last years, with support and contributions from the OECD, the European Commission, Italy, France, Germany and others workshops in Paris to contribute to complying with target no. 18 of the Kunming-Montréal Global Biodiversity Framework.

The European Commission (DG ENVI) organises a group of Member States to identify ways to implement the polluter pays principle according to the 8th Environmental Action Plan. It pushes for more Green Budgeting, organises conferences, establishes websites and trainings for mutual exchanges, all on the basis of the European Green Deal. It developed an EU Green Budgeting Reference Framework in addition to the OECD "Paris Collaborative on Green Budgeting", a Survey on Green Budgeting, "Green and Brown budgetary items lists".

→ This paper will be presented in Session 10: Fossil Fuel Subsidy Reform.



Re-calibrating International Aviation Carbon Governance for Paris aligned pathways

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Ten years after the adoption of the Paris Agreement, carbon pricing and Market-Based Mechanisms (MBMs) have become the central pillar of global climate governance. However, international aviation remains partially integrated into these frameworks, revealing a persistent governance and fiscal policy gap. While domestic aviation is increasingly covered under the emissions trading systems (ETS), international aviation is regulated through the offset-based mechanism from the International Civil Aviation Organisation's (ICAO's) Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA). These offset based mechanisms largely operate beyond the value chain of airline operators resulting in a market landscape that interprets environmental integrity differently. Additionally, CORSIA has no plans to be renewed post 2035 and is yet to be adopted by countries having the highest aviation volumes. This fragmented architecture raises critical questions regarding effective carbon pricing and international policy coordination for defossilising international aviation. This research therefore examines the strengths and weaknesses of the evolving international carbon market architecture (ETS and CORSIA) to highlight opportunities and insights of re-calibrating MBMs with Paris-compatible defossilisation pathways for international aviation. To address this research question, the paper is positioned at the intersection of three core themes relevant to the conference: (1) carbon pricing and effective carbon rates, (2) climate club approach and international cooperation, (3) sector instruments for international aviation, fuels, and transport tax. The paper employs a narrative literature review combined with legal and policy analysis. It synthesizes academic literature, institutional reports, and research on legal instruments governing defossilisation of aviation, including the ETS frameworks, CORSIA, and the emerging mechanism under Article 6 of the Paris Agreement. The analysis is situated at a critical 2026-2028 policy window, during which several developments are expected to re-shape global carbon markets, particularly for international aviation. This includes the transition to the mandatory phase of CORSIA in 2027, the operationalisation of the Paris Agreement Crediting Mechanism (PACM) and its linking to CORSIA, the transition of Clean Development Mechanism (CDM) to the PACM, and the possible expansion of EU ETS to international aviation. The study therefore employs a cross-mechanism framework to assess the strengths, weaknesses, and interactions between MBMs while evaluating how these instruments facilitate aviation defossilisation pathways. Particular attention is given to emerging forms of international cooperation such as the climate club approach through linking agreements to expand ETS among jurisdictions with higher climate ambition.

Our finding reveals three critical insights: Firstly, carbon pricing signals in international aviation remain insufficient and fragmented. Seven ETS systems currently cover domestic aviation to incentivise market uptake of Sustainable Aviation Fuel (SAF). These range from 6€ to 80€/tonne CO₂eq while CORSIA offsets which are beyond value chain often range between 4€ to 20€/ tonne of CO₂eq. These disparities weaken incentives for in-sector mitigation particularly for international aviation. Secondly, offset-based mechanisms risk undermining environmental integrity and delay sectoral



transformation. The anticipated influx of credits particularly transitioning from CDM projects to PACM and from PACM to CORSIA (inter-UN agreement credits) could flood the market with 1 to 2.8 billion tonnes of CO₂eq low-cost offsets creating risks for fossil lock-in, as airlines will rely on cheap offsets rather than investing in cleaner fuels. And lastly, the paper identifies climate ETS clubs as a promising pathway for addressing defossilisation of international aviation. We propose a 50% ETS expansion model whereby major ETS systems covering domestic aviation extend their systems to cover half emissions of international flights, while the remainder can be addressed through CORSIA or national carbon pricing schemes. This hybrid approach brings additional revenues for the market uptake of SAF while balancing the polluter pays principle and the common but differentiated responsibilities principle. Additionally, such a measure would also incentivising the broader participation in carbon pricing regimes evolving into a sectoral and regional climate clubs defined by coordinated pricing through ETS linkages, minimum standards, and aligned revenue usage for SAF market-uptake. In conclusion, the paper argues that aligning carbon pricing through a sectoral and regional club approach for international aviation is politically, legally, and economically viable and essential for Paris aligned defossilisation pathways for international aviation.

→ This paper will be presented in Session 6: Aviation & Shipping.

Breaking the carbon pricing trap: A co-financing fund concept for Ukraine's Reconstruction-Accession Challenge

Author: Alexander Sicheneder | Helmholtz Zentrum Berlin

Co-authors: Georg Zachmann, Oleh Savitskyi

Ukraine's simultaneous fight for survival and push for European Union membership that requires integration into the Union's Emission Trading System presents a unique climate-policy dilemma: how can an active (post-)war economy prepare for EU ETS convergence while preserving political and social stability?

Drawing on political-economy insights and an empirical evaluation of Ukraine's carbon revenue recycling architecture, the paper documents a self-reinforcing "chicken-and-egg" problem: very low carbon prices yield negligible revenues; negligible revenues produce limited, non-visible investments; limited visibility undermines domestic coalitions for higher carbon prices. To break this vicious circle, the paper develops a policy blueprint centred on a rule-based, predictable co-financing mechanism in which European financial contributions systematically match domestic carbon revenue trajectories, thereby mobilising substantially larger annual funding. Eventually, the matched money from abroad has the potential to make the transition into a rising carbon price smoother, and socially as well as politically less resistible.

→ This paper will be presented in Session 3: Fiscal Policy I – Macro Perspectives.



GCET27

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Punitive Without Incentives: Why Brazil's Selective Tax Might Fail As A Climate Policy Instrument

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This paper critically examines the Selective Tax introduced by Constitutional Amendment No. 132/2023 in Brazil within the context of climate policy and fiscal instruments for climate action. Also referred to as a sin tax, the Selective Tax is formally aligned with the polluter-pays principle and aims to discourage environmentally harmful consumption. However, it operates predominantly as a punitive instrument and lacks a promotional extrafiscal dimension capable of fostering sustainable behavior.

Adopting a doctrinal and comparative approach, the study argues that, despite its formal environmental rationale, the current design of the tax presents structural limitations that compromise its effectiveness as a climate policy tool. In particular, the absence of incentive-based mechanisms limits its capacity to influence long-term behavioral change and to contribute meaningfully to climate mitigation objectives. This limitation contrasts with international approaches that combine taxation with incentive-based mechanisms, particularly within integrated climate policy frameworks.

Furthermore, although the Brazilian tax reform explicitly incorporates the principle of environmental protection as a legal guiding principle of the National Tax System, the Selective Tax does not yet operate as an effective instrument of climate action or climate finance. It relies almost exclusively on punitive taxation, without integrating mechanisms such as the strategic use of tax revenues for environmental and climate policies, green incentives, or policy coordination. As a result, the tax risks functioning primarily as a revenue-generating instrument rather than contributing to an effective and equitable climate transition.

By proposing a reconfiguration of the Selective Tax within a broader framework of environmental fiscal reform, this paper argues that effective climate policy requires hybrid instruments capable of combining deterrence, incentives, and distributive mechanisms. Without such adjustments, the Brazilian model risks remaining only formally aligned with climate goals, without delivering substantive environmental outcomes.

→ This paper will be presented in Session 7: Fiscal Policy II – Legal Design.

Beyond Climate Corporate Compliance: South Africa's Carbon Tax and King V Outcomes-Based Governance

Author: Lee-Ann Steenkamp | Stellenbosch University, South Africa

South Africa's Carbon Tax Act 15 of 2019 serves as the nation's primary market-based fiscal instrument designed to fulfil its Nationally Determined Contributions (NDCs) under the Paris



Agreement. By placing a direct price on greenhouse gas emissions, the policy aims to incentivize behavioural shifts across carbon-intensive industries. Concurrently, domestic corporate accountability is guided by the King V Code on Corporate Governance for South Africa—a voluntary, principles-based governance framework rendered legally mandatory for publicly listed corporations via the Johannesburg Stock Exchange (JSE) Listings Requirements. By explicitly adopting the concept of double materiality, King V legally anchors board fiduciary duties in both inward financial impacts and outward environmental consequences, forcing companies to account for their broader ecological footprint.

However, a systemic friction point persists at the intersection of corporate finance and environmental law. Rather than viewing escalating carbon tax liabilities as an urgent strategic risk triggering impact-driven governance, many corporate boards continue to silo carbon tax management as a localized financial accounting liability, completely detached from long-term capital allocation strategies and fiduciary oversight.

This study addresses this regulatory gap by investigating the systemic misalignment between corporate fiscal mitigation and board-level fiduciary accountability in South Africa. Specifically, the research aims to deconstruct the legal obligations under the King V Disclosure Framework to evaluate how they reshape the fiduciary duties of corporate directors regarding environmental tax liabilities. It further analyses the extent to which JSE-listed high-emission entities utilize or under-utilize the revenue-recycling incentives embedded within the Carbon Tax Act architecture. Ultimately, it seeks to establish whether a board's failure to pursue operational decarbonization—in the face of predictable, compounding tax phase hikes—constitutes an actionable breach of the statutory duties of care, skill, and diligence under the South African Companies Act 71 of 2008. To achieve this, the study utilizes a doctrinal legal analysis and regulatory hermeneutics framework to evaluate the systemic alignment between environmental tax compliance and corporate fiduciary duties.

The preliminary legal and textual analysis reveals a disconnect between the "integrated thinking" mandated by King V and the operational reality of corporate carbon tax management. Corporate disclosures treat tax liabilities as compliance expenses rather than strategic capital allocations. Prioritising cheap carbon offsets over operational decarbonisation fails to future-proof enterprises, creating clear legal exposure to claims of managerial negligence and breach of director fiduciary duties.

The paper concludes that achieving a genuine Just Transition requires corporate climate governance to move resolutely "beyond compliance." Regulators must leverage King V's mandatory JSE disclosure framework to enforce transparent, assurance-driven reporting that aligns corporate tax strategies with national green economy targets. This alignment is critical to transforming carbon taxation from a passive accounting expense into an active driver of private capital mobilization for South Africa's Just Energy Transition Investment Plan (JET-IP).

→ This paper will be presented in Session 4: Frontier & Emerging Tax Instruments.



Aviation Levy Coalition Mechanisms

Author: Lennart Stern | Potsdam Institute for Climate Impact Research (PIK)

Co-authors: Carolin Baltzer, Matthias Kalkuhl

There currently exists a strong international norm against the unilateral carbon pricing of international aviation when the countries imposing the price retain the resulting revenue for themselves. When the EU included all international flights in its ETS in 2012 and retained the auction revenue for its member states, China threatened to stop buying Airbus planes, inducing the EU to suspend the measure after only 11 months. To avoid such tensions, this article proposes new club mechanisms for taxing international aviation that would incentivise participants to allocate the revenue to Global Public Good Institutions (GPGIs) rather than retain it. In each of the three mechanisms studied, participants would be obliged to tax all outgoing international flights as well as all flights coming in from non-participants, and could retain at most a fraction r of the revenue collected, called the retention rate parameter. In the first proposal, called here CORSIA+ in view of its similarity to the existing CORSIA mechanism, the remaining revenue would be allocated to GPGIs according to a fixed rule. In the second, the Simple MGF Mechanism, participants could instead allocate their tax revenue to GPGIs of their choice, and only by foregoing this right to allocate funding would they be allowed to retain the fraction r ; the revenue that is neither allocated nor retained would be split between GPGIs in proportion to the aggregate direct allocations they receive through the mechanism, thereby enhancing the influence of the countries that do allocate. The third mechanism, the MGF Mechanism with Proportional Matching Funds (PMFs), additionally allows countries to support a subset of GPGIs by giving to a corresponding PMF that splits its budget between the GPGIs it supports in proportion to their direct allocations; the unallocated money is used to match the PMFs. We compare the three mechanisms using an empirically calibrated simulation of best response dynamics between the 12 regions of the RICE model, based on estimates of the payoff each region derives per dollar reaching each GPI.

→ This paper will be presented in Session 4: Frontier & Emerging Tax Instruments.

The social costs of aviation CO₂ and contrail cirrus

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Co-authors: Daniel Johansson, Christian Azar, Susanne Pettersson, Marc Stettler, Roger Teoh

The radiative forcing of contrail cirrus is substantial, though short-lived, uncertain, and heterogeneous, whereas the RF from CO₂ emissions is long-term and more predictable. To balance these impacts, we calculate the social costs of CO₂ and contrail cirrus using a modified DICE model. The main case estimate of the global social cost ratio of contrail cirrus to aviation CO₂ emissions ranges from 0.075 to 0.57, depending on assumptions. Accounting for uncertainty in contrail cirrus RF and climate efficacy further widens this range. We also quantify flight-specific social costs of contrail cirrus



by analyzing nearly 500,000 flights over the North Atlantic, revealing substantial variability due to meteorological conditions. While uncertainty is considerable, our findings suggest that carefully implemented operational contrail avoidance could offer climate benefits even when the social cost of additional CO₂ emissions is considered.

Currently, aviation contributes about 2.5% of the global annual CO₂ emissions, while its total contribution to current warming is larger due to the impact of non-CO₂ forcers. Most important of the non-CO₂ forcers is contrail cirrus, which currently has an effective radiative forcing (ERF) comparable to that of aviation CO₂.

Contrail cirrus is formed when hot and moist aircraft exhaust meets ambient air that is cold and humid enough. In the formation process exhaust water vapor condenses on particles originating primarily from soot in the aircraft exhaust. For the contrails to remain in the atmosphere for more than a few minutes, the air must be ice supersaturated. Under such conditions, atmospheric vapor continues to deposit on the ice nuclei. Eventually, the cloud sublimates. Persistent contrail cirrus has atmospheric lifetimes on the order of hours.

Contrail cirrus has both warming and cooling effects since it absorbs infrared radiation and scatter solar radiation. Consequently, contrails have a much smaller warming impact in the daytime, and they may even have a net cooling effect. Further, ice-supersaturated regions tend to be variable in both space and time and hard to forecast. Hence, the properties of contrail cirrus depend on ambient conditions, fuel and engine characteristics, causing substantial variability and uncertainty in their warming effects. At the global level, it has been estimated that about 2–3% of all flights lead to 80% of the ERF caused by all contrail cirrus.

CO₂ emissions have long-lasting effects. Given prevailing climate conditions about 40% of an emission pulse is present in the atmosphere after 100 years, and about 20% after 1000 years. Furthermore, the long atmospheric lifetime of CO₂, combined with the thermal inertia of the oceans, results in a close to linear relationship between cumulative CO₂ emissions and global temperature change. This can be contrasted to the forcing of contrail cirrus that dissipates within a few hours. Hence, fundamental differences exist in the time dynamics of the climate impacts of CO₂ emissions and contrail cirrus. This temporal difference in climate impacts is critical when evaluating mitigation options and policy instruments for the aviation sector.

Currently analyzed mitigation strategies for reducing contrail cirrus forcing include a reduction of soot emissions through cleaner fuels or better engines and through rerouting of flights so as to avoid contrail forming regions. To make informed decisions regarding these measures, the climate impacts of different forcers must be made comparable. Hence, an understanding of how to value the climate impacts of a short-term and uncertain forcer such as contrail cirrus vis-a-vis the climate impact of the long-term forcer CO₂ is critical for the design of cost-efficient mitigation strategies.

The climate impacts of different forcers are typically assessed using emission metrics. These can either be physics-based, e.g., Global Warming Potential (GWP) or be based on economic approaches, e.g., the social cost. Its value for a given climate forcer is given by the integrated change in ERF over a chosen time horizon following an emission pulse of that forcer, divided by the corresponding estimate for an emission pulse of CO₂.

A social cost-based approach offers an alternative. The social cost of a climate forcer is defined as the net present value of future damages caused by an emission pulse of that forcer. This value depends



on the discount rate, which gradually reduces the present value cost of impacts occurring further into the future, the damage function, economic growth, and the temperature pathway considered.

In relation to GWP, the social cost-based approach considers additional dimensions that have theoretical appeal for characterizing the marginal climate impact of emissions. It is based on economic damage rather than radiative forcing. It adopts the use of discounting instead of an integration time horizon.

The aim of this paper is to estimate the social cost of CO₂ (SCC) and contrail cirrus (SC-contrail) in a consistent framework and discuss policy options for aviation.

→ This paper will be presented in Session 6: Aviation & Shipping.

Ratcheting up Paris

Author: Thomas Stoerk | National Bank of Belgium & LSE

Co-authors: Humberto Llavador, John Roemer

The Paris Agreement is designed to increase climate ambition gradually through a process of ratcheting up. This paper asks what the plausible endpoint of that process could be. It develops a tractable integrated assessment model in which countries interact through a decentralized general equilibrium and negotiate unanimously over a global carbon budget. Production, emissions, and abatement decisions are decentralized at the country level, while governments jointly determine the global emissions constraint. Mitigation is implemented through a global carbon price, and carbon-pricing revenues are redistributed across countries according to pre-established national shares. Governments choose their preferred level of global emissions by maximizing carbon revenue net of climate damages. A unanimous international agreement is reached when all governments agree on the same global carbon budget.

The model endogenizes global emissions, temperature outcomes, carbon prices, and international climate-finance transfers. The paper proves existence and uniqueness of the economic equilibrium for any admissible global emissions level, and then establishes existence and uniqueness of a unanimous international agreement under a sufficient concavity condition on carbon revenue. In equilibrium, carbon-pricing revenues are redistributed in proportion to countries' marginal climate damages. Revenue shares therefore act like Lindahl-type prices, aligning governments' marginal gains from carbon revenue with their marginal losses from climate change. The resulting equilibrium represents a plausible end game of the Paris Agreement's cooperative logic: what countries could credibly sustain through repeated negotiations without external enforcement.

For the quantitative application, the model is calibrated for 154 countries representing more than 98 percent of global population, GDP, and emissions. Country-level production is represented by Cobb-Douglas technologies with heterogeneous capital shares, factor productivity, labor endowments, and carbon intensities. Abatement costs are modeled as convex functions of the control rate, with regional heterogeneity calibrated conservatively relative to the RICE framework. Climate damages are country-specific, increasing and convex in temperature, and are calibrated to empirical estimates from Kahn



et al. (2021). Temperature change is linked to cumulative emissions through the transient climate response to emissions, adjusted for non-CO₂ greenhouse gases. Governments evaluate the present value of carbon revenue net of discounted climate damages through the end of the century, under the assumption that the world reaches net-zero emissions in the second half of the century.

Solving the calibrated model yields two central objects: the level of global emissions that all countries would unanimously accept, and the international financial flows required if the agreement were implemented solely through carbon pricing. The main result is that there is room for cautious optimism. In the preferred calibration, ratcheting up the Paris Agreement leads to a unique equilibrium in which global mean surface temperature increase is limited to 1.51°C, close to the Agreement's 1.5°C ambition and well below its 2°C ceiling. The carbon price required to support this outcome is 320 USD per ton of CO₂. At this price, total global carbon-pricing revenue amounts to roughly 7 trillion USD per year, while international climate-finance transfers—defined as the share of carbon revenue redistributed across borders—amount to 2.3 trillion USD annually, or about 0.8 percent of global GDP. This is far above the Paris Agreement's original climate-finance target.

A central implication is that these transfers are progressive even though no explicit redistributive objective is imposed. Because carbon revenues are redistributed in proportion to marginal climate damages, and because lower-income countries tend to suffer greater damages relative to their economic size, the equilibrium generates net transfers from higher-income to lower-income countries on average. Most low-income countries are net recipients, while high-income and upper-middle-income countries contribute relatively more. At the same time, most donor outflows remain below 2 percent of GDP, while gains for recipient countries can be substantially larger. The model therefore suggests that ambitious climate policy and international development objectives can be complementary.

The paper also studies robustness and institutional interpretation. Sensitivity analyses show that uncertainty in abatement costs and climate damages affects the quantitative results but not the qualitative conclusion that strong mitigation can be sustained under unanimity. Lower abatement costs reduce the required carbon price and slightly lower equilibrium warming, while higher abatement costs do the opposite. Higher climate damages strengthen mitigation incentives and lower warming modestly. Uncertainty in climate sensitivity generates a wider range of temperature outcomes, from below 1°C to just under 2°C, while leaving the scale of international transfers relative to global GDP broadly stable.

The paper further compares the unanimity equilibrium to a hypothetical Pareto-efficient benchmark in which governments behave as price takers with respect to the carbon price. In that case, the efficient outcome would imply higher warming of 1.86°C and a lower carbon price of 137 USD/tCO₂. The unanimity equilibrium is therefore more ambitious than the Pareto-efficient benchmark because governments internalize their effect on the global carbon price when choosing the emissions target. Finally, the paper shows that this cooperative logic is fragile: only small deviations from the altruism assumption embedded in the Paris framework can be accommodated before the unanimity equilibrium breaks down. With larger deviations, the model reproduces the more pessimistic conclusions of earlier non-cooperative treaty theory.

→ This paper will be presented in Session 12: Climate Policy Modelling.



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Biodiversity Financing and the Australian Nature Repair Act 2023 - Are Biodiversity Certificates the Solution?

Author: Natalie Stoianoff | The Taxation Institute

Co-authors: Gordon Noble, Kriti Nagrath

The Kunming-Montreal Global Biodiversity Framework (GBF), adopted in 2022 at the fifteenth meeting of the Conference of the Parties (COP 15) of the Convention on Biological Diversity (CBD), commits parties (member nation states) to protect at least 30 percent of the world's land, freshwater and ocean ecosystems by 2030 ('30 by 30'). Having committed to the GBF, Australia has set a national target requiring the preparation and implementation of national biodiversity finance plans and the stimulating of innovative schemes such as payment for ecosystem services (PES), green bonds and biodiversity credits pursuant to Target 19 under the GBF.

Biodiversity financing and natural capital are in early stages of development in Australia following passage of the Nature Repair Act 2023. Driven by the GBF that recognises the importance of leveraging private finance to close the biodiversity finance gap, nations are focused on developing mechanisms to integrate nature into finance to achieve the shift to nature-positive. The Nature Repair Act 2023 provides a framework for a world-first legislated, national, voluntary biodiversity market in Australia. It came into force in December 2023. The scheme is a government initiative that incentivizes actions to restore and protect the environment by establishing a marketplace where individuals and organisations can undertake nature repair projects to generate a tradable certificate. This paper critically analyses this scheme in the light of various taxation, finance or implementation mechanisms that have been used across the world to increase biodiversity funding.

→ This paper will be presented in Session 8: Forestry.

Zeroing in on the Zero Waste City

Author: Jane Torbert | Leipzig University

Co-authors: Melanie Krause

The inclusion of municipal waste incineration in the European Emission Trading Scheme, provisionally agreed in December 2020 and phasing in from 2024, marks a significant expansion of carbon pricing to the urban waste sector. As municipalities across Europe face new fiscal pressure to reduce residual waste and shift away from incineration, a pressing policy question arises: what can voluntary environmental commitment programs realistically deliver alongside, or in lieu of, fiscal instruments? This paper provides direct empirical evidence on that question by evaluating the Zero Waste Europe initiative — the largest voluntary municipal waste reduction program in Europe — using eleven years of Italian municipal-level waste data.



The Zero Waste Europe initiative operates through soft commitment rather than fiscal compulsion. Member municipalities sign a commitment letter pledging to reduce residual waste, increase separate collection, and move toward a circular waste management model, but face no mandatory targets, no carbon price, and no financial penalty for non-compliance. The initiative thus represents a canonical case of a voluntary environmental program: self-selected, non-binding, and reliant on signaling, public communication, and institutional norm-setting rather than price incentives. Understanding its effectiveness — and its limits — has direct implications for the design of environmental policy instruments, including the conditions under which carbon pricing alone is or is not sufficient to achieve municipal waste objectives.

Our dataset covers 7,920 Italian municipalities from 2010 to 2020, including 314 treated cities that joined Zero Waste Europe at staggered points across the sample period. Italy is the ideal setting: it is the founding country of the movement, hosts the largest concentration of member cities in Europe, and provides rich municipal-level waste data through ISPRA, the national environmental research institute. Outcome variables are municipal waste per capita and the share of separately collected waste. We combine socioeconomic, geographic, demographic, and hydrogeological control variables from Eurostat, ISTAT, and ISPRA.

The analysis proceeds in three stages. First, we use machine learning classification methods — logistic regression with ridge regularization, decision trees, and random forests — to characterize which municipalities select into the Zero Waste program. All three classifiers achieve accuracy rates above 94 percent on the test set. The dominant predictors of program adoption are provincial and regional location, population size, and initial rates of separate collection. This strong geographic clustering indicates that Zero Waste adoption is shaped substantially by administrative and neighborhood spillover effects rather than city-specific waste performance. The finding has a direct implication for fiscal instrument design: voluntary programs of this kind are likely to achieve uneven geographic uptake, concentrating in areas where environmental norms are already strong, and cannot substitute for universal price signals in reaching resistant municipalities.

Second, we estimate the causal effect of Zero Waste membership on both outcome variables using panel fixed effects and propensity score matching, exploiting the staggered timing of program adoption as quasi-experimental variation. On the primary outcome — municipal waste per capita — we find no statistically significant effect. Treated cities do not reduce their total waste generation relative to comparable control cities within the ten-year window. This null result is robust across pooled OLS, fixed effects, and random effects specifications. It is consistent with a broader literature showing that voluntary environmental programs often fail to shift the overall scale of activity when the underlying fiscal or regulatory environment remains unchanged.

On the secondary outcome — separate collection rates — the picture is markedly different. Zero Waste membership is associated with a four to six percentage point increase in the share of separately collected waste, an effect that is statistically significant at the one percent level across all specifications and economically substantial given baseline rates. This result suggests that the initiative functions as a genuine commitment device for waste composition and recycling infrastructure, even where it does not reduce total waste volumes. Membership appears to accelerate investment in separate collection systems — organic, paper, glass, and plastic — that alter the structure of waste management without yet affecting aggregate generation.



GCET27

Global Conference of
Environmental Taxation

Third, we implement the staggered difference-in-differences estimator of Callaway and Sant'Anna to address heterogeneity in treatment timing and obtain more robust causal estimates.

The policy interpretation of these results is directly relevant to the fiscal instrument design questions at the core of GCET27. Voluntary commitment programs and carbon pricing appear to operate on different margins: the Zero Waste initiative shifts recycling infrastructure and waste composition but does not reduce total waste generation, while fiscal instruments such as unit pricing schemes and waste taxes — as shown in related studies for Italy, Switzerland, and Belgium — achieve measurable reductions in residual waste volumes. The ETS expansion to incineration creates a new fiscal incentive precisely where voluntary programs have shown limited reach. Our findings suggest that these instruments are complements rather than substitutes: carbon pricing on incineration can address the scale margin that voluntary programs leave untouched, while voluntary programs may accelerate the compositional and infrastructural changes that make carbon pricing more effective over time.

→ This paper will be presented in Session 9: Carbon Pricing I – Empirical Evaluation.

From Harmful Subsidies to Blended Finance: A Tailored Fiscal Pathway for the Mediterranean's Green and Blue Transition

Author: Constantin Tsakas | Plan Bleu (UNEP/MAP Regional Activity Centre)

The Mediterranean region is a prominent climate change hotspot facing severe environmental degradation, water scarcity, and a persistent "sustainability investment gap" (MedECC, 2020; UNEP/MAP and Plan Bleu, 2020). A major structural obstacle to the region's climate and biodiversity goals is the prevalence of Environmentally Harmful Subsidies (EHS), which currently dwarf environmentally beneficial funding by a factor of five to six (Plan Bleu and UNEP/MAP, 2024). Drawing on the comprehensive research trilogy conducted by Plan Bleu and UNEP/MAP (2024-2026), this paper proposes an integrated, evidence-based fiscal and economic governance framework to accelerate the region's transition toward sustainability.

First, the paper addresses the prerequisite of reforming EHS through the deployment of the Mediterranean EHS Phase-Out and Reform Framework (EHS-MedFRAME) (Milo & Fosse, 2024). This framework provides cross-sectoral economic, social, and environmental indicators to systematically track and phase out detrimental support—such as fossil fuel and capacity-enhancing fisheries subsidies (Milo & Fosse, 2024; Demirel, Ertör-Akyazı, & Yıldız, 2024). Crucially, it emphasizes that subsidy removal must be accompanied by targeted compensatory measures to protect vulnerable coastal communities and ensure a "just transition" (Acar, 2024; Milo & Fosse, 2024).

Second, building on the fiscal space created by EHS elimination, the research demonstrates how to proactively deploy environmentally friendly economic tools and green public finance (Plan Bleu and UNEP/MAP, 2025). Empirical evidence from the region reveals that targeted energy taxation acts as a powerful demand-pull driver for energy-efficient innovation, particularly within energy-intensive manufacturing firms in Southern Mediterranean Countries that possess voluntary environmental management practices (Barakat & Ramzy, 2025). The paper advocates for a nuanced Pigouvian



approach, including the application of a differentiated Social Cost of Carbon (SCC) (Boulila, Benbekhti, & Metadger, 2025). This allows for aggressive carbon taxation in Northern Mediterranean economies while adopting a phased, gradual approach in the South and East to ensure social acceptability and economic stability (Boulila, Benbekhti, & Metadger, 2025). Furthermore, the paper highlights innovative local fiscal mechanisms—such as "Climate Tourist Taxes" (Mazzarano & Galluccio, 2025) and "Desalination-to-Restoration" Pigouvian loops (Aubert, 2025; Maliki et al., 2024)—which internalize localized environmental costs to directly fund municipal climate adaptation and marine biodiversity restoration, such as the recovery of *Posidonia oceanica* meadows (Aubert, 2025).

Finally, the paper explores the frontier of Blended Finance as a mechanism to strategically combine public, philanthropic, and private capital to "de-risk" large-scale conservation and low-carbon infrastructure efforts (Plan Bleu and UNEP/MAP, 2026, forthcoming). While instruments like Blue Bonds and Resilience Bonds offer immense potential for scaling up marine protection (Aubert, 2025), a critical focus is placed on establishing governance safeguards to avoid the "cherry-picking" trap. This ensures that private investments do not solely target the most commercially attractive projects while leaving vital socio-ecological needs underfunded.

To operationalize these tools and mitigate the high risk of greenwashing in voluntary markets, the paper concludes by calling for the co-construction of a "Mediterranean Green Common Language" (soft guidelines) rather than a rigid, EU-centric taxonomy (Dupouy, 2025). This adaptable framework respects the diverse socio-economic and institutional realities of both EU and non-EU Mediterranean countries (Plan Bleu Working Group, 2025), ultimately supporting the implementation and sustainable finance objectives of the revised Mediterranean Strategy for Sustainable Development (MSSD 2026-2035) (UNEP/MAP, 2025).

→ This paper will be presented in Session 10: Fossil Fuel Subsidy Reform.

Allocating Emissions Trading System Revenues to Climate Adaptation: Evidence from the EU, California and Québec

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This study explores how and to what extent revenues generated by Emissions Trading Systems (ETSs) have contributed to financing climate change adaptation policies, analyzing three case studies. Using a mixed-methods approach that combines quantitative revenue analysis with qualitative case study research across three jurisdictions; the European Union, California, and Québec, the study addresses a critical gap in the literature connecting carbon pricing revenues to adaptation finance.

Findings reveal that while ETSs revenues represent a significant potential funding source, the share allocated to adaptation remains remarkably limited: 0.37% in the EU, 8.5% in California, and 4.4% in Québec. The analysis shows that these differences are influenced not only by the amount of revenue generated but also by the institutional rules and policy priorities that shape how resources are



allocated. The research identifies key barriers including political prioritization of mitigation, institutional path dependencies, and challenges in adaptation project identification.

Based on these findings, the research proposes six policy recommendations to enhance the role of ETSs revenues in closing the adaptation finance gap. These include strengthening enabling framework, improving budgetary and allocation rules, mainstreaming adaptation within existing funds, and developing new adaptation financing vehicles.

→ This paper will be presented in Session 14: Climate Adaptation.

Supply-chain emissions of fossil fuels imported by the EU27: Options for regulation and implications

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Fossil fuels imported by the EU27 generate substantial CH₄ and CO₂ emissions during extraction and transportation. Here we compare two policy approaches for regulating these upstream supply-chain emissions: (i) a CH₄ emissions standard, which the EU plans to introduce under the EU Methane Regulation by 2030, and (ii) a price on both CH₄ and CO₂ emissions, which could be implemented by expanding the scope of the EU Carbon Border Adjustment Mechanism (CBAM).

In the absence of additional regulation, we can show that supply-chain emissions caused by EU27 fossil-fuel imports will reach roughly 400 MtCO₂eq of greenhouse gases (GHG) in 2030. This is comparable in scale to direct emissions from Germany's transport sector in 2024 (143 MtCO₂eq) and France's agricultural and forestry sector in 2023 (73 MtCO₂eq). Current regulation of these extra-territorial emissions remains fragmented or absent in many exporting jurisdictions, which is further exacerbated by recent policy reversals by the Trump administration in the United States.

We develop a partial-equilibrium model of EU27 oil and gas imports with elastic supply and demand, endogenous abatement of supply-chain CH₄ and CO₂ by exporters, and alternative policy regimes (a CH₄ standard or a GHG price).

We find that both policy instruments can deliver similar aggregate reductions in supply-chain emissions, yet the precise amount of abated emission depends on the ambition level of the CH₄ emission threshold or the level of the GHG price. However, their economic incidence and strategic properties differ.

Because CH₄ is relatively inexpensive to abate — at least according to available bottom-up engineering and top-down econometric estimates — most exporters choose to comply through CH₄ mitigation, according to our model. Under a CH₄ standard, this results in only minor effects on exporter revenues and EU market prices. By contrast, a GHG price modestly increases EU import prices while generating fiscal revenue. Depending on the tax level, net EU welfare effects can be positive once terms-of-trade gains from world-market effects are taken into account.



A key asymmetry emerges when exporters do not abate — which could occur either because real-world abatement costs exceed current estimates or because of strategic political reasons. Under a binding CH₄ standard, non-compliance can sharply restrict market access, causing steep price increases and large demand contraction in the EU. Under a GHG price, by contrast, prices and quantities adjust more gradually even when abatement is limited.

These results highlight an underappreciated political-economy risk in standards-based regulation. Exporters might threaten non-compliance with the EU Methane Regulation, exploiting the EU's concern over energy security. Anticipating such risks, the EU may face pressure to dilute or delay implementation. Pricing instruments are less vulnerable to such effects, as they penalise emissions intensity without restricting market access.

The importance of this finding is underscored by recent announcements by Qatar, the world's largest LNG producer, which has threatened to cut exports to the EU if the Methane Regulation is implemented as planned.

Finally, we present a techno-economic assessment of demand-side abatement options, where we compare continued abated fossil-fuel use with non-fossil alternatives. We show how pricing supply-chain emissions can help establish a more level playing field across mitigation options and reduce the risk of carbon-intensive lock-ins.

→ This paper will be presented in Session 5: CBAM II – Economic & Trade Impacts.

Multilateral Alignment of Carbon Pricing

Author: Yan Xu | University of New South Wales (UNSW)

This article examines whether, and to what extent, carbon pricing can be aligned multilaterally across jurisdictions using different regulatory instruments, specifically emissions trading schemes (ETs) and carbon taxes. It argues that meaningful alignment cannot be understood solely in terms of a headline carbon price or statutory tax rate. Rather, alignment depends on a wider set of variables, including emissions coverage, institutional design, administrative capacity, and the legal mechanisms through which domestic systems interact at the international level. By comparing carbon taxes and ETs as explicit pricing models, the article identifies the technical features that facilitate or impede cross-border comparability and, in turn, multilateral alignment. It then considers the limits of existing carbon pricing instruments, including uneven global uptake, partial emissions coverage, and persistently low price levels under many schemes. Given these limitations, the article evaluates possible pathways towards greater alignment, including carbon border adjustment mechanisms and forms of global standard-setting inspired by recent international tax coordination. It concludes that multilateral alignment is plausible where technical design and legal frameworks are sufficiently convergent, even if full harmonisation remains unlikely. Whether such alignment can have an impact on global emissions reduction depends on the proportion of emissions covered and on credible carbon price levels.

→ This paper will be presented in Session 11: International Climate Law & Governance.



Towards a better understanding of international spillovers from climate change mitigation policies: a structured CGE scenario analysis

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Mitigation policy effectiveness depends on how domestic climate action interacts with global markets and foreign policies. By changing production costs, prices and innovation incentives, mitigation can create cross-border spillovers that shift emissions and economic activity abroad (carbon leakage). As countries pursue Paris Agreement goals at different speeds and with different instruments, concerns about spillovers and leakage have intensified. Several economies are now introducing or considering anti-leakage measures that may reshape trade and investment, renewing debate over how to manage these effects internationally.

To support a shared evidence base, this paper provides a systematic modelling assessment of policy asymmetry and coordination across regions by using the ENV-Linkages model, a multi-sectoral, multi-regional recursive dynamic CGE (computable general equilibrium) model that focuses on interactions between economic and environmental systems. It simulates a USD 100 carbon tax applied across 16 384 possible regional coalitions, examining sectoral channels and how design choices affect leakage and economic outcomes. This differs from earlier studies, which examine climate policies and coalition size only for a very limited set of coalitions, such as the EU or Annex I regions.

The results of the analysis suggest that:

- International coordination significantly reduces carbon leakage. Economy-wide leakage falls as coalition coverage rises. With limited coverage, rates range from about -10% to above 16% (reflecting region-specific trade and production structures). Once coalitions cover roughly 25% of global emissions, leakage converges to a lower, tighter band of ~2% to 6.5%.
- Some regions are more vulnerable to leakage than others. The EU, OECD Europe (non EU) and OECD Latin America and Asia-Pacific can face leakage above 10% when acting alone or in small coalitions, reflecting higher effective policy stringency and lower baseline emissions intensity (often implying higher abatement costs). When large producers remain outside the coalition, leaked emissions tend to shift toward regions with strong export capacity and lower costs—especially India, China, the United States and, in some cases, the EU.
- Leakage concentrates in emissions-intensive trade-exposed (EITE) and transport sectors. Because these sectors are both carbon intensive and highly exposed to international competition, they channel most leakage at all coalition sizes. Coalition regions see persistent declines in EITE output and exports, while non-participants expand production and emissions—driven roughly two-thirds by higher output and one-third by rising emissions intensity of energy supply.
- Fossil-fuel price effects are the dominant driver of leakage and become more important as coalitions expand. Lower fossil-fuel demand in coalition regions depresses world prices, encouraging greater use elsewhere. In very large coalitions, however, reduced global extraction



increasingly offsets emissions increases outside the coalition, potentially neutralising leakage. Trade-related leakage from cost differentials matters less as participation broadens and those differentials narrow.

- Spillovers affect GDP beyond borders, and impacts grow with coalition size. Unilateral action yields domestic GDP effects from about -0.35% to 0.1%, depending on structure and baseline stringency. Outside the coalition, GDP is often slightly negative because lower real incomes in acting regions reduce import demand, though some regions gain from improved competitiveness. At low coverage, impacts on non-actors are small (-0.13% to 0.02%), but at very high coverage (above ~75%) they widen to roughly -1.7% to 0.3%. Fossil-fuel exporters face the largest losses as global demand falls.
- Policy design shapes spillovers in important, predictable ways. Higher carbon-tax rates raise leakage and GDP spillovers for non-acting regions, though they also deliver larger emissions cuts. Faster implementation slightly increases peak leakage but reduces longer-run leakage as cleaner technologies enter the capital stock—at higher near-term cost. Differentiating rates by income can backfire: if lower-income regions stay outside the coalition, higher taxes in acting regions can increase leakage and worsen spillovers for non-participating lower-income countries. Integrating existing carbon-pricing schemes matters most in small coalitions (notably those including the EU), where it lowers effective stringency and reduces leakage; effects are negligible in large coalitions.

Although the stylised modelling approach provides important generalisable insights into the drivers and dynamics of spillovers, its findings cannot be directly applicable to real-world policy scenarios. Several avenues for further analysis therefore remain. These include improving the modelling of transmission channels, focusing particularly on technology spillovers, for which quantitative evidence remains limited; deepening the assessment of specific domestic and internationally oriented policy options, such as border carbon adjustments, free allowances, and industrial support measures; enhancing the regional and sectoral disaggregation of the model to enable more granular country-level analysis, including the separation of individual G20 economies; and placing greater emphasis on developing economies to better understand the conditions under which mitigation finance, technology transfers, and other forms of support may be required to facilitate their participation in high-ambition coalitions.

→ This paper will be presented in Session 12: Climate Policy Modelling.

Helping Economic Policymakers Navigate through Ambitious Climate Policies

Author: Theodoros Zachariadis | The Cyprus Institute

Achieving climate stabilisation in line with the Paris agreement is an economy-wide endeavour because deep decarbonisation, on the road to net zero greenhouse gas emissions by mid-21st century, is impossible without interventions in all aspects of economic and social life. Ministries of Economy / Finance must be involved in the design of decarbonisation pathways because they are



responsible for budget preparation and implementation, economic incentives and policy reforms, and public investments. This involvement is crucial for integrating green public finances and economic tools to mobilise resources for sustainable development initiatives. However, economic policymakers are not familiar with technical aspects that are essential to evaluate the fiscal, macroeconomic, and distributional impacts of climate policy. For this purpose, they need to collaborate closely with environment, energy, agriculture, and transport ministries. This paper describes a suite of methods that can provide valuable insights for economic policymakers when they assess the economic impacts of low-carbon strategies, which are not immediately evident to Economy/Finance Ministries and require cooperation between different public authorities. These methods involve detailed exploration of national data for: (a) the assessment of effective carbon rates and fossil fuel subsidies across the economy; (b) the medium- and long-term fiscal challenges associated with decarbonisation; (c) the identification of climate-related investments and future investment needs; and (d) the prioritisation of low-carbon investments with an explicit set of criteria. We present them as a specific case study, their application in the Republic of Cyprus. Although the general policy orientation in this study is the EU decarbonisation framework, the work presented is essentially conducted at national level and therefore our approach is equally relevant for non-EU Member States as well.

→ This paper will be presented in Session 3: Fiscal Policy I – Macro Perspectives.

From Local Exposure to National Policy Support: The relationship between renewable energy exposure and public acceptance of CO2 taxation in Denmark

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This study investigates the relationship between local exposure to existing renewable energy infrastructure and public support for national climate policies. Specifically, we investigate if and to what extent individual proximity to onshore wind turbines and large-scale photovoltaic (PV) installations shapes public acceptance of consumer CO2 taxation in Denmark.

The analysis draws on stated acceptance data from a nationally representative online survey (n=4,024) conducted in 2022, combined with high-resolution spatial data on existing energy infrastructure and environmental features at the respondent-level. By integrating geocoded acceptance responses, socio-demographic variables, and detailed information on respondent-specific renewable energy exposure, the study provides new insights into spatial, social, and contextual mechanisms shaping public attitudes toward fiscal climate instruments.

The findings demonstrate that public support for climate policies cannot be explained solely by economic reasoning or simplified proximity-based accounts such as the ‘not-in-my-backyard’ (NIMBY) framework. Instead, attitudes toward CO2 taxation reflect more complex contextual and



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perceptual dynamics, shaped by lived experience and exposure to renewable energies and other socio-demographic factors. We uncover threshold effects on the association between renewable exposure and carbon tax acceptance, indicating attitudinal substitution beyond a threshold. In particular, higher (local) concentrations of nearby wind turbines and greater municipal share of rooftop PV installations are associated with lower public support for consumer-based CO₂ taxation. The findings are robust to alternative spatial specifications, external question ordering, and geographical fixed effects at the municipality and postal zones.

Overall, the observed patterns indicate that individual experience with and exposure to (visible) climate mitigation technologies can impact public support of complementary policy instruments, potentially driven by distributional justice and fairness concerns. From a policy perspective, the study underscores the need to carefully integrate spatial assessments and contextual heterogeneity to ensure an efficient design of equitable and socially-just climate policies.

→ This paper will be presented in Session 2: Political Economy I: Public Acceptance.