RAIS RESEARCH ASSOCIATION for INTERDISCIPLINARY STUDIES
November 20-21, 2025

DOI:10.5281/zenodo.18153864

Governance and Climate Justice in the 21st Century

Julia M. Puaschunder

Omnes Education Group, International University of Monaco, Economics &Finance Department, Monaco
jpuaschunder@ium.monaco.edu, www.juliapuaschunder.com

Abstract: About a decade ago, a comprehensive interdisciplinary framework was developed to reconceptualize climate change not merely as an environmental externality but as a systemic governance challenge (Puaschunder, 2020). A macroeconomic model was brought forward that showed that climate change produces not only economic losses, but also unevenly distributed climate-related gains. The potential benefits from a warming earth were found in warming earth temperatures, leading to productivity gains in countries with low mean temperatures and high-temperature productivity sectors. Outlining the differences between climate-related economic gains and losses was driven by ethical considerations to lead on redistributing expected economic gains of climate change. Global warming related economic gains were advocated to be partially spread around the world to those areas that will be losing from climate change the earliest and most. The overall theme of using climate change-related economic benefits to offset climate change-related losses was grounded in core notions of justice, foresight and intergenerational responsibility. Within a long intellectual tradition of welfare economics, distributive justice and institutional governance, heterodox economics was thereby meant to avert irreversible lock-ins and ecological tipping points. The second edition of the book that introduced climate change-related economic gains and losses now argues for the wealth of nature that can be analytically measured. Natural systems generate productivity, stability and welfare, yet remain underpriced or excluded from economic accounting. The book emphasizes the importance of cartographing expected economic gains and losses from global warming. This article now brings forward a further argument that "wealth of nature" not only brings trade-related advantages and financial market prospects – having natural resources and a favorable climate may also impose geopolitical risks and tensions in a fragile world.

Keywords: Climate Change, Climate Justice, Sustainable Development, Wealth of Nature

Introduction

Governance and Climate Justice: Global South and Developing Nations (Puaschunder, 2020) framed climate change as an external shock that creates economic winners and losers. Based on mean temperature of countries around the globe, their GDP composition in agriculture, service and industry productivity but also the mean temperature for productivity per GDP sector, the world map was divided into those countries that short-term gain economically from the warming of the earth and those countries that lose economically the fastest and the most over time from climate change (Puaschunder 2020). Calculating climate change winners and losers was meant to help inform redistribution schemes around the world and over time in order to combat global warming's impact on the international compound.

In its second edition, *Governance and Climate Justice* (Puaschunder, 2025) defines climate stability and favorable temperature as *Wealth of Nature* – an economic asset that countries can capitalize and use for international trade purposes. Climate flexibility, as a country's range of temperatures and climate zones, was outlined as a trade advantage, of which countries can benefit when engaging in international value chains (Puaschunder, 2025). The second edition book also factors in risk into the initial basic economic model that mapped out climate change winners and losers.

This article is now also dedicated to drawing attention to climate wealth of nations as a political risk in light of the growing economic powers emerging around the world. From the 2019 sentiment of slowbalization on, the Western world has shifted from internationalization to glocalization (The Economist, 2019). Political trends shifting towards right-wing nationalism and anti-EU tendencies further exacerbated nationalism. United States' politics of

own-nations-first spread around the globe. The 2014 accession attempts of Ukraine's Crimea up to the 2022 accession attempt of Ukraine by Russia further shifted world powers to focus on war economies in the most recent decade.

This article re-evaluates climate politics under the frame of national interests and accession strategies. Climate zones have been successfully introduced as trade asset and climate flexibility – that is the range of temperatures prevalent in a country – as a comparative advantage in the global arena. Viewing geopolitical advantages now has become a financial liability and heightened risk to attract foreign interference in politics and territorial sovereignty. The article closes with a discussion of global commons of a stable climate. The preservation of an overall favorable climate, as a shared common good without borders, is seen as a collective responsibility and shared asset to be upheld for future generations. The carbon-intensity of military action and war is debated. Legal, political and governance interventions for the future protection of temperature assets that allow for productivity around the globe are proposed.

Theory

Climate Change Winners and Losers

Unlike most climate economics literature that stresses the economic burden climate change imposes on economic productivity, Puaschunder (2020) introduced climate change-related economic gain prospects. If the earth is becoming hotter, some countries that are having climate temperatures below the economic efficiency frontier temperaturewise may gain in productive potential. For instance, cold-temperature countries, such as Nordic European territories, Russia, and the Northern Territories of Canada, are expected to have an advantage under climate change in the short run due to melting of ice that allows for using land for agriculture or harvesting underground oil reserves. The potential short-term benefits of a warming globe are likely to create economic opportunities that lead to short-term economic growth.

In rigorous macroeconomic analytics, Puaschunder (2020) introduced economic country outlooks on climate change in relation to each other in order to find ethical and fairness-grounded redistribution arguments. Redistributing climate wealth is advocated for via financial transfers, taxation and insurance mechanisms as tools for intertemporal and international compensation. The ethical legitimacy of redistributive schemes that transfer financial capital across borders and generations is argued to preserve irreplaceable natural capital, as financial capital is substitutable while climate stability is not (Law & Smullen, 2008; Puaschunder, 2020; Rawls, 1971).

Several indices were presented that show potential redistribution frameworks around the globe based on a country's starting conditions on climate change, contributions to climate change in CO_2 emissions, climate flexibility in terms of temperature ranges available, willingness to change based on CO_2 emission levels over time, potential to attract finance to combat crises, consumption-based trade adjusted CO_2 emissions, international trade variables, diplomatic ties and global connectedness to other territories.

In addition, the framework was extended to calculate time horizons for productivity based on agriculture productivity – mainly based on crop temperatures – as well as industry peak temperature for productivity – mainly based on heating and cooling for industry production – as well as service sector productivity – mainly based on temperature-based food and water preservation as well as heating and cooling needs for favorable living conditions.

In the most recent version of the *Global Governance and Climate Justice* book, Puaschunder (2025) now also phases in risk estimates into the overall climate change winners and losers framework. As a methodological contribution of the climate change winners and losers framework, climate risk beta is introduced. Building on analogies to the Capital Asset Pricing Model (CAPM), Puaschunder (2025) proposes that countries' economic performance

under climate change can be assessed not only by temperature proximity to optimal productivity, but also by exposure to climate-related shocks and volatility. The climate beta captures how sensitive an economy is to climate disruptions relative to global temperature averages (Puaschunder, 2025). Countries with low climate beta and longer time horizons before reaching peak productivity may fare better than those with high beta exposure, even if short-term gains appear favorable (Puaschunder, 2025). Apparent climate winners may, in fact, face higher long-term instability, while some climate losers may benefit from resilience, diversification or institutional capacity (Puaschunder, 2025). The framework thus bridges climate economics with financial risk management, offering tools for stress testing, insurance design and sovereign risk assessment.

Overall, risk-adjusted climate gains reveal a fundamentally different picture of global welfare than pure temperature-based models alone (Puaschunder, 2025). This methodological innovation not only adds to contemporary temperature-based economic models of climate change. But it sets the stage for a more nuanced policy insights discussion that also addresses true distributive climate inequalities sparking geopolitical tension in the 21st century.

Climate-related Geopolitical Tensions

Global warming is one of the most globally-spanning challenges of our lifetimes. Already now, we have evidence of global warming being the most important determinant of food and nutrition prices in comparison to political tensions and financial crises (Puaschunder, under review). In the framing of climate change as a systemic risk the impact of global warming on financial markets, food systems and migration flows have been shown in empirical evidence (Puaschunder, 2025). This article now argues for attention to climate-related political crises.

Climate change can be argued to increasingly shape political decision-making by altering the strategic value of territory, resources and security, thereby influencing both accession and annexation dynamics. As climate impacts intensify, for instance through sea-level rise, water scarcity, food insecurity, and extreme weather events that can particularly damage waterfronts, states reassess borders, alliances and sovereignty as instruments of adaptation and survival rather than solely expressions of identity or power. In vulnerable regions, climate stress can motivate migration causing brain drain and infrastructure abandonment (Puaschunder, 2020).

On the cross-country level, climate adversities can also trigger accession efforts, as populations or governments seek political integration with more resilient states to secure access to resources, infrastructure and protection. Conversely, climate change can incentivize annexation attempts, particularly where melting ice, desertification or shifting ecosystems expose new valuable climate zones in other territories but also novel opportunities to extract resources, shipping routes or arable land. Shifting climates therefore may redefine geopolitical competition dynamics. For instance, shifting resource demands and resource discoveries have already shifted attention in the post-world war politics to heightened attention to gulf regions. In today's context, climate change now may act not only as an environmental damage threat multiplier. Global warming may also reshape our attention to climate stability and favorable temperature-offering territories that may trigger new political tensions, territorial claims and strategic alignments by embedding environmental risk into calculations of national interest, security and long-term state viability.

One of the ways to newly cartograph the world for natural resources and favorable temperature conditions for productivity to extract them is geolocating. Geolocating refers to the process of identifying the geographic position of an object, person or device using technological means such as satellite systems (e.g., GPS), mobile networks, IP addresses, or sensor data. Geolocated resources and estimations of the costs and benefits to extract them, more and more plays an increasingly central role in contemporary societies. Enabling

location-based services, navigation, logistics, emergency response, urban planning, and environmental monitoring have become tools to evaluate wealth of nature. In governance and security contexts, geolocating supports border control, disaster management and surveillance. In economic and commercial settings, geolocating underpins digital platforms, targeted advertising and global supply chain coordination. At the same time, the widespread use of geolocation technologies raises important legal, ethical, and political questions related to privacy, data ownership, consent and newly forming power asymmetries, particularly as location data can reveal sensitive information about individuals' movements, behaviors and social relationships. The use of geolocating and the potential to use it as a public policy and global governance anchor is restricted to only a few countries in the world, which makes geolocating a diversifying and potentially disparate impact creating means of the 21st century.

Another way to directly impact on climate and thereby changing environmental conditions to become more productive is geoengineering. Geoengineering is technical solution to intervene in climate conditions. These deliberate, large-scale geoengineering interventions in the Earth's climate system target at counteracting or mitigating the effects of anthropogenic climate change (National Research Council, 2015; Smith et al., 2016). For instance, geoengineering includes carbon dioxide removal (CDR) and solar radiation management (SRM); but also using methods such as afforestation/reforestation, enhanced weathering, bioenergy with carbon capture and storage (BECCS) and direct air capture (DAC) come to play in geoengineering (National Research Council, 2015; Smith et al., 2016). As an example, SRM techniques seek to reduce the amount of solar energy absorbed by the Earth by increasing planetary reflectivity, for instance through stratospheric aerosol injection or marine cloud brightening (Shepherd et al., 2009; Royal Society, 2009). While geoengineering could theoretically complement mitigation and adaptation strategies, it also raises significant scientific uncertainties, ethical concerns, governance challenges and geopolitical risks – particularly because of its risks to trigger uncontrollable environmental conditions and the uneven benefits accessible shifting military power dynamics (Preston, 2012). The debate around geoengineering underscores the need for robust international governance frameworks to manage research, deployment and potential unintended consequences (Victor et al., 2009; Jinnah et al., 2019). From a national security perspective, the capacity to alter or stabilize climatic conditions carries military implications, including the protection of strategic assets, bases and supply routes as well as concerns over dual-use technologies and asymmetric power. As a result, geoengineering increasingly intersects with geopolitics, where cooperation, competition and deterrence dynamics shape how such interventions are developed, regulated and potentially deployed.

In all these features, geolocating and geoengineering are increasingly viewed not only as a climate-economic impact measuring and climate intervention tools but also as a strategic instrument shaping international alliances, trade relations and military considerations. States investing in or hosting geolocating and geoengineering research and deployment, such as GIS, carbon removal technologies, solar radiation management research or large-scale climate adaptation infrastructure, can leverage these capabilities to strengthen diplomatic partnerships, set technological standards and influence global climate governance. In the current economic climate, control over geolocating and geoengineering technologies and associated supply chains may affect international trade by creating new dependencies in critical materials, data and expertise, while also offering economic and political leverage similar to that historically associated with energy resources.

As for future anticipated consequences, the shift of geopolitical tension based on climate change may heighten the importance of climate diplomacy. Climate diplomacy refers to the use of diplomatic negotiations, alliances and international institutions to address climate change. Climate, as a transboundary global condition, is a collectively created phenomenon that no state can fully manage alone by itself. The consequences of climate-changing actions

are borne by everyone. Climate diplomacy targets common climate goals to stabilize a favorable climate, which entails climate change mitigation and adaptation efforts around the globe in the age of climate change. In the international compound, coordination within countries but also on the global stage as well as over time is enacted by climate diplomacy. For instance, climate diplomacy encompasses efforts to coordinate mitigation commitments, adaptation support, climate finance and technology transfer, while balancing divergent national interests, development priorities and historical responsibilities. Through forums such as the United Nations Framework Convention on Climate Change (UNFCCC), which hosts the yearly Conference of the Parties (COP) on climate change, climate diplomacy shapes norms, rules, and expectations that influence domestic policies and international cooperation. Increasingly, climate diplomacy also intersects geopolitics, trade, security and development assistance, as states use climate commitments to build strategic partnerships, enhance soft power and secure influence in global governance. In this sense, climate diplomacy is not only an environmental endeavor but also a central arena in which power, equity and global responsibility are negotiated in the context of a changing climate impacting on trade advantages and productivity gain and loss prospects. Thereby, climate diplomacy becomes a vital arm of science diplomacy, which stresses attention to scientific discourse in global governance above geopolitical agendas (Puaschunder, 2022).

Discussion

The article aimed at providing anchors for scholars and policymakers seeking tools to navigate the political economy of climate change beyond mitigation targets alone. Emphasis on risk-adjusted modeling and political feasibility of climate governance positions was meant to prepare a future discussion about climate geopolitics. In today's economic climate, mapping climate winners and losers has not only been an anchor to redistribute some of the expected gains from climate change to areas that are losing out from global warming the fastest and starkest. Quantification of the expected economic gains and losses due to climate change has also triggered important discussions about why global cooperation has been so difficult to achieve on the climate agenda: climate wealth of nations determines new incentives, sets differing temporal horizons for productivity and shifts new global cooperation benefits asymmetrically.

In light of the current redefinition of global governance priorities, where geopolitical tensions rise due climate stability threats but also new incentive targets wink from a shifting climate structure around the globe, the "wealth of nature" cartography elevates to unprecedented momentum. In light of climate fragilities and the vast differences of climate flexibility around the world, climate is not a marginal factor anymore but has become the key to sustainable prosperity but also global political stability. New strategic alliances may form due to the elevated attention to global climate performance. For instance, China embracing Africa but also the Middle East partially cooperating with Western nations may not only be an alignment due to political endeavors – it may foremost speak to the potential of bundling climate zones on the international level. Forming new climate alliances across the globe may become the comparative advantage of our times that may shadow political agendas more and more as the climate change problem develops.

Addressing climate governance from an economic standpoint and paying attention to the geopolitical wealth of nature represents a major contribution to climate economics, law and governance. The central argument to pay attention to the geopolitical implications of a stable climate and the impetus climate fragility has on the world stage is an important point to make, which may have been left out of standard neoclassical versions and consensus-seeking institutions that do not want to change historically constituted power dynamics. Our contemporary times, however, heighten importance to integrate climate risk in geopolitical calculus into a coherent framework. By imbuing analytical relevance of climate gains

alongside risks into dominant geopolitical narratives will strengthen the case for political predictions, strategic allies and foresighted governance.

As for future research developments, climate stabilization requires different lenses to focus, including local, national and international ones. Tomorrow's effective climate governance may see polycentric coordination among states, markets, international organizations and civil society. While geolocating and geoengineering may become vital policy-informing tools of the future, legal frameworks but also international diplomacy are critical enablers of these climate politics of the future.

Constitutional principles and regulatory authority that are limited by national interests and administrative governance realities may shift towards more international solutions on the climate agenda, particularly in the context of environmental disclosure mandates. It remains a future endeavor for global governance to successfully balance environmental urgency with concerns about democratic legitimacy and legal overreach.

References

Jinnah, S., Nicholson, S., & Parker, A. (2019). (2019). Governing Climate Engineering: A Proposal for Immediate Governance of Solar Radiation Management. *Sustainability, 11*(14), Article 3954. https://doi.org/10.3390/su11143954

Law, J., & Smullen, J. (2008). *A dictionary of finance and banking.* Oxford University Press.

National Research Council. (2015). *Climate Intervention: Carbon Dioxide Removal and Reliable Sequestration*. National Academies Press.

Preston, C. J. (2012). *The Ethics of Climate Engineering: Solar Radiation Management and Non-Ideality.* Cambridge University Press.

Puaschunder, J. M. (2020). *Governance and Climate Justice: Global South and Developing Nations*. Palgrave Macmillan.

Puaschunder, J. M. (2022). Science Diplomacy Index: Leadership and Responsibility to Act on Climate Change. *Scientia Moralitas: International Journal of Multidisciplinary Research, 7*(2), 11-30.

Puaschunder, J. M. (2025). *Governance and Climate Justice: Global South and Developing Nations.* Palgrave Macmillan.

Puaschunder, J. M. (under review). *What moves food prices? The impact of climate change, war and financial crises on food commodity prices.*

Rawls, J. (1971). *A theory of justice.* Harvard University Press.

Royal Society (2009). *Geoengineering the Climate: Science, Governance and Uncertainty.* https://royalsociety.org/news-resources/publications/2009/geoengineering-climate/

Shepherd, J. G., et al. (2009). *Geoengineering the climate: science, governance and uncertainty.* Royal Society.

Smith, P., Davis, S. J., Creutzig, F., Fuss, S., Minx, J., Gabrielle, B., ... & Yongsung, C. (2016). Biophysical and economic limits to negative CO_2 emissions. *Nature Climate Change 6*(1), 42-50.

The Economist. (2019, January 26). *The steam has gone out of globalisation: Slowbalisation*. The Economist, 17–20.

Victor, D. G., Morgan, M. G., Apt, J., Steinbruner, J., & Ricke, K. (2009). The geoengineering option: a last resort against global warming? *Foreign Affairs 88*(2): 64-76.