MCC
Mercator Research Institute on Global Commons and Climate Change

ON THE WAY TO PRICING CARBON AROUND THE GLOBE DISTRIBUTIONAL IMPLICATIONS AND JUSTICE CONSIDERATIONS IN THE CONTEXT OF DEVELOPING COUNTRIES AND EMERGING ECONOMIES

Tessa Schiefer & Jan Christoph Steckel
October 2024

ON THE WAY TO PRICING CARBON AROUND THE GLOBE DISTRIBUTIONAL IMPLICATIONS AND JUSTICE CONSIDERATIONS IN THE CONTEXT OF DEVELOPING COUNTRIES AND EMERGING ECONOMIES

October 2024

Authors Tessa Schiefer[1,2], Jan Christoph Steckel[1.2.3]

1 Mercator Research Institute on Global Commons and Climate Change (MCC)
2 Potsdam Institute for Climate Impact Research (PIK)
3 Brandenburg University of Technology, Cottbus

Acknowledgements

We acknowledge research assistance by Linus Mehl, and prior research by several colleagues that is featured in this briefing paper.

Cover graphic and icons: TwoDo Studio

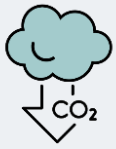
This measure was funded by financial means of the German Federal Ministry for Economic Cooperation and Development (BMZ) and supported by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH.

Supported by the

Disclaimer

The views and assumptions expressed in this discussion paper represent the views of the authors and not necessarily those of the funder.

KEY MESSAGES



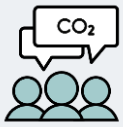
Enabling LMICs to "Leapfrog" to Low-Carbon Economies: Policies are needed to lower emissions and help LMICs to leapfrog. Carbon pricing can be an important tool for that but needs to take several risk factors into account, and should be supported by international climate finance.

Carefully Designing Carbon Pricing for Country-Specific Contexts: Carbon pricing can be an effective tool but it must be carefully tailored to fit local economic and institutional contexts. This includes accounting for institutional constraints, limited infrastructure, and informal economies. Gradual implementation, along with compensatory measures, such as targeted subsidies or cash transfers, is essential to protect vulnerable populations and ensure equitable outcomes.

Addressing Distributional Effects: Carbon pricing policies can have uneven impacts across and within income groups. Policymakers must consider factors beyond income like cooking fuel use, appliance ownership, and regional disparities to understand who will be most affected. A thorough understanding of these distributional impacts is essential for designing effective compensation schemes that ensure equity and avoid exacerbating existing inequalities.

Using Carbon Pricing to Mobilize Domestic Resources and Broaden the Tax Base: Properly designed carbon pricing can generate substantial revenue for LMICs, expanding the tax base and funding sustainable development. These resources can support renewable energy projects, green jobs, and compensatory mechanisms, ensuring an equitable transition for all.

Integrating Carbon Pricing Policies and Sustainable Development: In LMICs, carbon pricing must not conflict with other sustainable development goals, such as access to clean cooking fuels and food security. Without proper compensatory measures, higher energy prices could worsen health outcomes and increase environmental degradation through deforestation.



Building Public Support and Institutional Capacity: For carbon pricing to be politically feasible, it is vital to build public understanding of the climate and social benefits of the policy. Strengthening institutional capacity and aligning carbon pricing with broader development goals can help ensure the success of these instruments

Introduction

Despite low emissions in the past and hence limited responsibility for climate change, countries of the Global South are among today's high emitters. Their share of global emissions has doubled from 32% to 63% since 1990 (IPCC, 2022). When it comes to committed emissions, i.e. emissions that can be expected from existing infrastructure, this share is projected to even increases further, as illustrated in **Figure 1** (IPCC, 2023). This increase in emissions can be attributed to both rapid economic growth and insufficient policies to steer a low carbon development pathway, including pricing instruments (Fuhr, 2021).

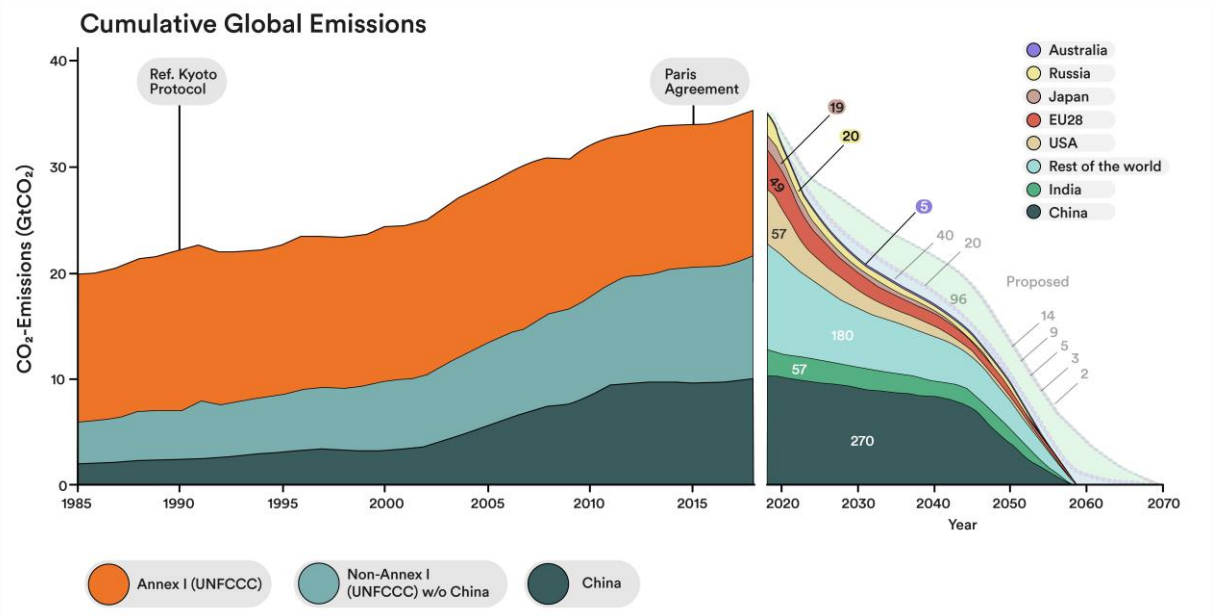


Figure 1 – Historic global emissions and projected committed emissions by country or region. (Own graphic based on IEA, 2020 and Tong et al., 2019)

Carbon pricing instruments play an increasingly important role for reaching national and international climate objectives. Indeed, carbon pricing has contributed to reducing emissions in the past (Döbbeling-Hildebrandt et al., 2024). In low- and middle income economies they are additionally considered to be promising instruments to mobilise domestic resources (DRM) (Franks et al., 2018). The effectiveness of carbon pricing instruments hinges on the level of the carbon price itself, their design, coverage, and the political will of implementing jurisdictions to enforce and strengthen them.

Despite increasing interest in carbon pricing schemes, including in LMICs (see World Bank, 2024), their introduction can come with various challenges that – if unmanaged - can jeopardize their environmental effectiveness and interact negatively with economic development. In addition, introduction of climate policies in LMICs requires international support, e.g. through dedicated climate finance.

Challenges for carbon pricing in LMICs

Theoretically an efficient tool for climate policy, the introduction of carbon pricing raises several concerns related e.g. to distributional impacts, competitiveness, and emissions leakage. For LMICs, it is often unclear how carbon pricing fits with the local economic and institutional circumstances, including fiscal constraints, limited institutional capacity, poor access to credit, lack of competition in energy markets, incomplete energy

access, and inadequate public infrastructure to facilitate the switch to cleaner alternatives (Sterner et al., forthcoming).

Theories and practices of taxation and emissions regulation have predominantly been developed within industrialized countries, not taking developing country particularities into account (Timilsina, 2022). While the economic rationale for carbon pricing remains robust, countries in the Global South face lower incomes and multiple challenges that often conflict with climate goals, potentially affecting the feasibility of various carbon pricing levels and instruments. Thus, the impact of a carbon tax is heavily influenced by the specific context of a country and the use of the revenues (Labandeira et al., 2022; Timilsina and Sebsibie, 2023).

In developing and emerging economies it is furthermore pivotal that carbon pricing does not interfere with achieving other sustainable development goals. A salient example is the role of cooking fuels. Higher prices for fossil fuels would lead to people using more biomass, implying more indoor air pollution and related health issues, as well as potential negative impacts on nutrition intake (Lay and Greve, 2023; Aggarwal et al., in press). Increased firewood collection could further drive deforestation or have negative impacts on gender equality as it could divert women's time from market work. Removing fossil fuel subsidies can further harm lower-middle-income consumers, particularly where public transportation infrastructure is inadequate and private vehicles are essential for accessing jobs, education, and healthcare.

The introduction of carbon pricing policies therefore requires careful planning and additional policy measures. The effectiveness of pricing schemes hinges on credible policy environments that allow additional prices for carbon emissions to be seen by households and firms. Transfers and complementary policies are pivotal to balance the unequal impacts of carbon pricing on households. In many countries, existing transfer policies could be used. However, in their current form they are not always reaching those parts of the population that should be targeted, that is, parts that are highly affected and very poor (see Missbach et al. 2024 for a comprehensive analysis in Latin American Countries).

Introducing carbon pricing and fossil fuel subsidy reforms in LMICs hence requires to carefully analyse the specific country context prior to their introduction. The decision on additional policy measures needs to consider factors such as market environments, institutional capacity, sectoral emission profiles, and potential co-benefits. Table 1 outlines particular challenges for implementing carbon pricing policies in LMICs, i.e. the critical factors that determine the success of emissions pricing in these regions, and approaches to mitigate associated risks. The second part offers deep dives into selected issues.

Table 1: Challenges for carbon pricing instruments in LMICs and associated risk mitigation strategies

		Risk	Risk mitigation strategy
Social Impacts & Equity	Distributional effects	• Uneven effect of carbon pricing on households between different and within the same income group (horizontal heterogeneity) with the risk of pushing people into poverty. Effect varies based on factors like income distribution, household expenditure patterns, and sources of income.	• Ex-ante assessment of impacts of carbon pricing to identify particularly affected household profiles (e.g. CPIC, CPAT) • Compensation policies such as lump sum or targeted transfers are seen as pivotal to balance the unequal impacts of carbon pricing.
	Sustainable development trade-offs	• Increased fuel costs forcing poorer households to revert to traditional fuels like firewood and dung, worsening local emissions and health outcomes. • Increased food prices decrease nutrition intake with adverse effects on health or child development	• Ex-ante assessment of carbon pricing impacts on relative cost of food and fuel increases on particularly affected household profiles • Compensation policies such as targeted transfers, food subsidies or LPG vouchers for poorer households • Exemptions for particular goods, e.g. LPG
	Accessibility of transfers	• Use of revenues for universal or targeted transfer schemes insufficient due to incomplete scheme coverage, low targeting accuracy or low institutional capacity, thus often missing the poorest and those most affected by carbon pricing.	• Mechanisms to facilitate revenue-recycling programs ideally set up before introducing a carbon price to avoid delays in taxing and payments. • Expansion of existing transfer programs or design of novel compensation mechanisms if existing programs have insufficient coverage and governments intend to use them to protect the most vulnerable. • Other alternatives are the provision of public goods (Universal Basic Services) or green investments in local economies from which the most vulnerable can profit.
	Political backlash and vested interests	• Strong opposition of well-organized and concentrated special interest groups (e.g., businesses and industry) conducting successful lobbying activities influencing the political feasibility of carbon pricing.	• Assess country-specific determinants to increase public acceptability of carbon pricing through revenue recycling in public investments in social, economic or environmental programs. • Make sure the public understands the climate benefit of the carbon pricing policy and accepts the way revenues are used.
Governance & Institutions	Limited institutional capacity	• Stunted institutional capacity to facilitate a regulatory environment for carbon pricing. • Limited administrative capacities for e.g. collecting sufficiently granular emissions data.	• Policy-based climate finance for capacity building and institutional reforms. • Carbon pricing can generate the needed revenue to support quality institutions. • Peer-to-peer learning.
	Informality & low tax revenue	• Consumption-based taxes are difficult to regulate and monitor and are likely to be less efficient as they induce tax evasion. • Large informal sectors limit government revenues necessary for functioning public institutions.	• Upstream application of a carbon tax in the formal economy (e.g., at refineries) simplifies monitoring and incentivizes businesses to shift to the formal sector by altering the relative costs of a shift. The expansion of the formal sector increases the tax base and revenue, which can be invested in social and public infrastructure.
	Alignment between government institutions	• Conflicting interest between responsible ministries and other actors, such as subnational administrative units.	• Inclusive stakeholder engagement and dialogue, potentially establishing a high-level coordinating body. • Integrating carbon pricing with broader development goals.
Local economies	Lack of competition in energy markets	• Limited effect and high politicization of setting a carbon price in highly regulated markets due to distorted pricing mechanisms.	• Emission pricing must come in tandem with market reforms or investments that make behavioral responses possible.
	Insufficient public infrastructure and high upfront costs	• Challenge of high up-front investment needs for the adoption of new technologies to enable the transition of the energy and transport sector.	• Considerable infrastructure investments and enabling policy environments needed to make alternatives viable (incl. efficient pricing to incentivize market development, public transport infrastructure, energy infrastructure and promotion of clean energy sources etc.)
	Competitiveness and emissions leakage	• Companies (and emissions) moving to other regions leading to loss of market competitiveness and emissions shifting to non-regulated areas.	• Border adjustments and international agreements
	Fossil fuel dependence	• Countries that are endowed with and whose development strategy is highly dependent on fossil fuels are in a category of their own where climate policy can be perceived as a considerable threat to development.	• International support including transfers to develop new industries and labour markets, as well as to overcome domestic political economy constraints (e.g. JETPs)

Deep dive I: Opportunities for domestic resource mobilisation through carbon pricing

Carbon pricing offers significant opportunities for domestic resource mobilization in low- and middle-income countries. By implementing carbon pricing mechanisms, such as carbon taxes or cap-and-trade systems, countries can generate substantial revenue that can be reinvested into their economies. This revenue can be used to fund critical public services, such as healthcare, education, and infrastructure, or to support the transition to a low-carbon economy through investments in renewable energy and energy efficiency.

Additionally, carbon pricing can help LMICs reduce reliance on external aid by creating a sustainable and predictable source of domestic revenue. This financial autonomy strengthens fiscal resilience and enables governments to pursue development goals that align with both national priorities and global climate commitments. By carefully designing carbon pricing policies to be progressive and equitable, LMICs can ensure that the benefits of this revenue generation are broadly shared, supporting both economic growth and social welfare.

Transitioning from fossil fuel subsidies to carbon pricing could generate significant public revenues, which would cover a significant part of public spending needed to fulfil the agenda 2030 investment need (Franks et al. 2018). The potential impact varies by country, with some nations, particularly in Asia and Africa, being able to finance a substantial portion of their SDG needs through this approach (see Figure 2). Countries such as India could finance up to 95% of their public SDG investment needs through carbon pricing, while in countries such as Senegal or the Democratic Republic of Congo, carbon pricing could cover 67% and 72% of these needs, respectively.

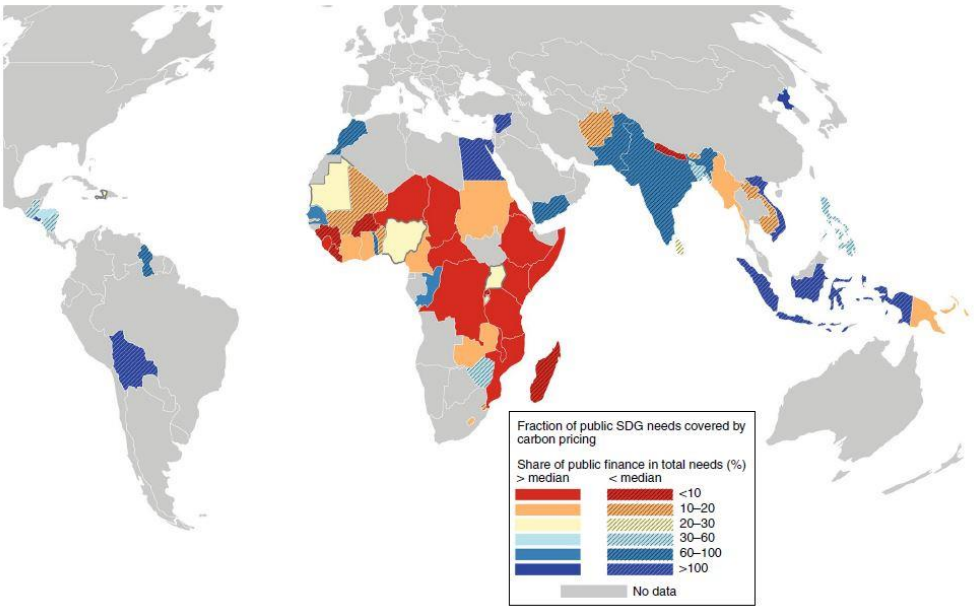


Figure 2 - Fraction of the national public investment need for the SDG agenda that could be financed by replacing negative by positive national carbon prices consistent with the 2 °C target. (Franks et al. 2018)
Shading indicates that private investment needs are higher than in the median country, Swaziland, in which 41% of the required total SDG investments can be financed by private sources.

Deep dive II: Distributional impacts of carbon pricing policies and the Carbon Pricing Incidence Calculator (CPIC)

Distributional implications of carbon pricing policies

The social outcomes of carbon pricing are key for gaining public and political support for carbon pricing policies. Generally, carbon pricing policies tend to be more progressive in lower-income countries, meaning that low-income households are relatively less affected (Dorband et al., 2019; Ohlendorf et al., 2021). The specific design scheme of a carbon price is, in addition, decisive for a specific distributional outcome.

Yet, looking at average effects and comparing income quintiles ignores a large variation in how households within specific income groups are affected. In many countries, income alone is not a reliable predictor how strongly a household will be impacted by carbon pricing policies (Missbach and Steckel, 2024). To understand which households would in particular be impacted by carbon pricing policies, it is crucial to consider other factors, such as the type of cooking fuel used, car or appliance ownership. A thorough understanding of the heterogeneity of distributional effects, including within income groups (also called horizontal effects) is essential for designing effective compensation schemes for households.

Furthermore, distributional effects can vary significantly at the regional level. In many countries, there are highly heterogeneous regional effects that are politically and economically difficult to balance. This is important for policymakers to consider, as the regional level is often of great political importance. One example is India. Ordonez at al. (2023) find that the abolition of energy subsidies and the introduction of carbon pricing in India will have varied distributional effects on households across regions, with significant disparities between wealthier and poorer states (see Figure 3).

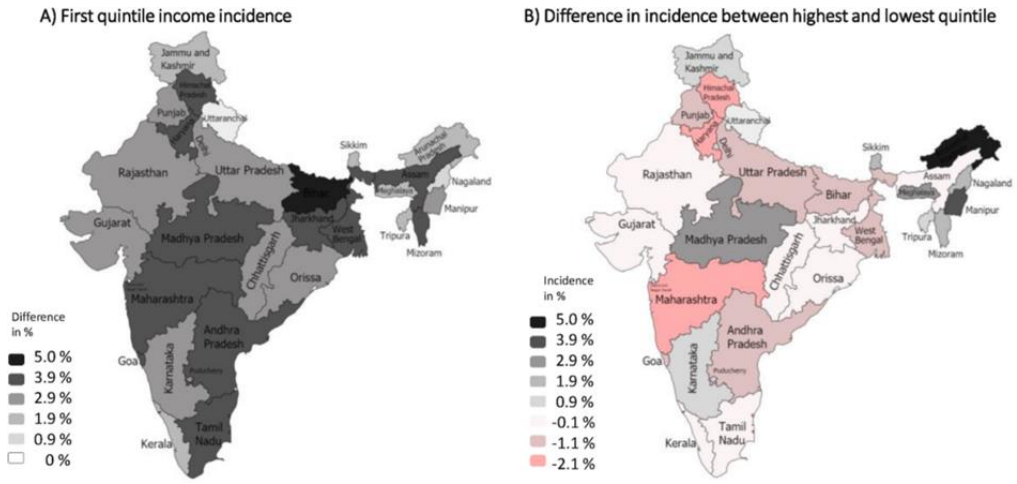


Figure 3: Impacts on households of abolition of energy subsides and carbon pricing. Incidence towards first quintile (A) and difference in incidence between highest and lowest quintile (B). Red values indicate progressive effects (Ordonez et al., 2023).

Eastern states like Bihar, Jharkhand, and West Bengal, which have higher concentrations of low-income households, are expected to face the most regressive impacts. The poorest households in these regions spend a larger proportion of their income on energy-related goods, making them more vulnerable to price increases resulting from subsidy removal and carbon taxes. In these areas, the combined effects of carbon pricing and the abolition of subsidies for LPG, kerosene, and electricity could lead to a sharp rise in household expenditures, pushing many into deeper poverty. In contrast, more affluent states like Gujarat, Kerala, and Tamil Nadu, with a higher average income and a lower proportion of energy-related spending among households, are expected to experience more neutral or even progressive effects. This is because the wealthier populations in these regions are better equipped to absorb the increased costs, and any impacts would be less pronounced. Therefore, policies that target subsidy removal and carbon pricing without adequate compensation mechanisms risk exacerbating pre-existing regional and income inequalities.

To make data on distributional impacts, including horizontal effects and regional disparities, accessible to policy makers and the general public the interactive Carbon Pricing Incidence Calculator (CPIC) has been developed.

About the Carbon Pricing Incidence Calculator

The Carbon Pricing Incidence Calculator (CPIC) is an interactive web tool which allows to explore the vertical and horizontal distributional consequences of carbon pricing and various compensation measures for currently 88 countries. The tool calculates the additional costs to households after a carbon price is introduced, i.e. the carbon pricing incidence.

CPIC is designed to provide insights for a broader policy dialogue on design and implementation of carbon pricing schemes. It helps to facilitate a deliberative public dialogue to make resulting policies politically and socially acceptable. In comparison to other tools, it targets a broad audience of societal stakeholders, including policy makers, civil society and media in an accessible manner. Supplementing policy analysis, CPIC can help to address socially unbalanced outcomes of carbon pricing. CPIC can be used to explore different carbon pricing scenarios and stylized redistribution mechanisms and compare the distribution of additional costs in or between different groups of the population in the selected country.

Source: Steckel, J., Missbach, L. and Schiefer, T. (2023). The global Carbon Pricing Incidence Calculator (CPIC) (Version 1.0). http://www.cpic-global.net.

CPIC is based on a large body of peer-reviewed literature and uses a robust methodology that combines country-level household budget surveys and multi-regional input-output data (GTAP). The tool currently features household data of around 1.5 million households from 88 countries.

The interactive tool was developed in an iterative process with finance ministries and other relevant stakeholders in multiple pilot countries, including Mexico and Uganda, supported by German Development Cooperation (GIZ)). Staff was trained to use CPIC enabling them to produce adhoc results and evaluate stylized scenarios, facilitating inter- and intra-ministry dialogue, helping governments to take informed decisions. Further, the underlying data can be used to conduct more detailed country-specific analysis of various carbon pricing schemes and compensation measures. Besides its use in the policy process, CPIC enables civil society to have access to information on distributional impacts of carbon pricing in an accessible manner and can therefore support a rationale, fact-based discourse.

Deep dive III: Approaches and challenges for revenue recycling in LMICs

Introducing carbon pricing policies might be politically challenging based on equity and social acceptability concerns. It is recommended that revenues should – at least partly - be recycled back to households to mitigate potential regressive impacts of carbon taxation (Timilsina and Sebsibie, 2023). Indeed, revenue recycling makes carbon pricing schemes generally more acceptable (Mohammadzadeh Valencia et al., 2024).

Revenue recycling can take different forms, including lump-sum transfers, targeted or progressive redistribution, i.e. directing more benefits to low-income or heavily affected households, tax cuts or investments in infrastructure. Implementing these approaches, however, requires a robust administrative framework to ensure that funds reach intended recipients. Furthermore, progressive redistribution can be controversial, being viewed as unfair, which can hence affect policy acceptance.

Most studies on revenue recycling focus on high-income countries where carbon pricing has already been implemented. Generally, recycling funds to foster low-carbon investments is found to be more acceptable in existing studies than transfers (Mohammadzadeh Valencia et al., 2024). Studies suggest that support for carbon taxes may increase if revenues fund climate-related projects, such as renewable energy infrastructure. In low-income countries, indirect options, such as funding public goods like health and education, may also be important for fostering progressive impact (Harring et al., 2024).

In many LMICs, existing cash transfer programs already target low-income groups, offering a foundation for distributing carbon pricing revenues. Yet, these systems often suffer from imperfect targeting and coverage issues, which means that a significant portion of the population affected by carbon pricing may not receive adequate compensation. A modelling study on Latin American countries finds that while some of the poorest households would be deeply impacted by carbon pricing, they are not always covered by existing cash transfer programs (Missbach et al., 2024). The findings highlight the need to expand coverage of existing transfer programs or to design novel compensation mechanisms, if governments envisage compensating households for additional losses. Existing transfer programs exclude some parts of the population of which some are prone to excessive additional costs by carbon pricing.

In LMICs, tax cuts might not always support progressive recycling effectively. Income tax cuts may favour wealthier individuals due to high exemption thresholds, while reducing indirect taxes on essentials like food may have limited impact because of small existing tax rates and the large informal economy. Direct household compensation, whether universal or targeted, depends on the program's coverage, targeting accuracy, and institutional capacity (World Bank, 2023). Alternatively, revenue could fund key services, which might be more progressive, as seen in Nigeria where investments in infrastructure were found to be more equitable than direct cash transfers (Dorband et al., 2022).

A case study on Indonesia, Iran, Dominican Republic and Ecuador, highlighted that reforming regressive energy subsidies succeeded largely due to well-planned revenue recycling and public awareness campaigns (Moayed et al., 2021). However, even highly progressive reforms can face political resistance, particularly from influential groups. Successful implementation of revenue recycling in LMICs requires careful consideration of local institutional limitations and pre-existing social assistance structures to avoid delays in both taxing and disbursement (Steckel et al., 2021).

Deep dive IV: Carbon pricing and sustainable development trade-offs

Increasing energy prices, e.g. induced by carbon pricing, can have negative effects on household welfare that go beyond income. One salient example relates to households cooking with biomass. A lack of clean cooking contributes to 3.7 million premature deaths annually, with women and children most at risk (WHO, 2023). Without proper compensation schemes, people might be pushed back to using more firewood and charcoal when faced with carbon pricing or – related – fossil fuel subsidy reforms (Greve and Lay, 2023). This shift would likely exacerbate indoor air pollution, with adverse health impacts, particularly in rural and low-income households, and could also lead to environmental degradation through increased deforestation.

One example is Uganda, where poorer households tend to have significantly lower carbon footprints than richer ones, largely due to limited access to carbon-intensive goods and services (Missbach and Steckel, 2024). This creates a distinct pattern of carbon consumption that differs from more industrialized or urbanized countries. With up to 90% of Ugandan households relying on biomass for cooking, higher fossil fuel prices driven by carbon pricing could inadvertently push more families towards traditional fuels like firewood. Aggarwal et al. (forthcoming) show that carbon taxes on fuels such as LPG and kerosene can indeed generate substantial health costs from increasing indoor air pollution that exceed the benefits of climate mitigation. Moreover, carbon pricing could negatively impact household welfare by impacting calorie and nutrient intake. Carbon prices in Uganda would increase food prices (particularly by increasing transportation costs) and shifts in cooking fuels also impact particularly diets. Finally, an increasing demand for firewood and particularly charcoal can also put additional pressure on deforestation (Rose et al. 2022).

The design of climate policies needs to take contextual factors into account, in particular for fuels used by the poorest parts of the population and consider additional policy measures, e.g. LPG vouchers. To mitigate unintended consequences, it is crucial that revenues from carbon pricing are partially allocated to compensatory measures, such as targeted transfers or subsidies, to protect vulnerable households. In addition, complementary social protection policies in conjunction with carbon pricing could ease potentially adverse effects on economic development outcomes in Uganda (Aggarwal et al, forthcoming). This approach would help balance the need to reduce emissions with the imperative to safeguard public health and maintain household welfare, ensuring that carbon pricing contributes positively to Uganda's sustainable development goals and population well-being.

REFERENCES

Aggarwal, R. S. Ayhan, M. Jakob & J.C. Steckel (in press): Carbon pricing and household welfare: Evidence from Uganda. Environment and Development Economics. https://doi.org/10.1017/S1355770X24000214

Döbbeling-Hildebrandt, N., Miersch, K., Khanna, T. M., Bachelet, M., Bruns, S. B., Callaghan, M. & Minx, J. C. (2024). Systematic review and meta-analysis of ex-post evaluations on the effectiveness of carbon pricing. *Nature Communications*, 15(1), 4147.

Dorband, I. I., Jakob, M., Steckel, J. C., & Ward, H. (2022). Double progressivity of infrastructure financing through carbon pricing — Insights from Nigeria. World Development Sustainability, 1, 100011. https://doi.org/10.1016/j.wds.2022.100011

Dorband, I. I., Jakob, M., Kalkuhl, M. & Steckel, J. C. (2019). Poverty and distributional effects of carbon pricing in low- and middle-income countries—a global comparative analysis. World Dev. 115, 246–257.

Franks, M., Lessmann, K., Jakob, M., Steckel, J.C. and Edenhofer, O. (2018). Mobilizing domestic resources for the Agenda 2030 via carbon pricing. *Nat Sustain* **1**, 350–357 (2018). https://doi.org/10.1038/s41893-018-0083-3

Fuhr, H. (2021). The rise of the Global South and the rise in carbon emissions. Third World Quarterly, 42(11), 2724-2746.

Greve, H., & Lay, J. (2023). "Stepping down the ladder": The impacts of fossil fuel subsidy removal in a developing country. Journal of the Association of Environmental and Resource Economists, 10(1), 121-158.

Harring, N., Ndwiga, M., Nordén, A., & Slunge, D. (2024). Public acceptability of policy instruments for reducing fossil fuel consumption in East Africa. *Climate Policy*, *24*(6), 812–827. https://doi.org/10.1080/14693062.2024.2302319

IPCC (2022). *Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* [P.R. Shukla, J. Skea, R. Slade, A. Al Khourdajie, R. van Diemen, D. McCollum, M. Pathak, S. Some, P. Vyas, R. Fradera, M. Belkacemi, A. Hasija, G. Lisboa, S. Luz, J. Malley, (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA. doi: 10.1017/9781009157926

IPCC (2023). *Climate Change 2023: Synthesis Report.* Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, H. Lee and J. Romero (eds.)]. IPCC, Geneva, Switzerland, pp. 35-115, doi: 10.59327/IPCC/AR6-9789291691647.

Labandeira, X., Labeaga, J. M., López-Otero, X., & Sterner, T. (2022). Distributional impacts of carbon taxation in Mexico. Cuadernos económicos de ICE, (104).

Mohammadzadeh Valencia, F., Mohren, C., Ramakrishnan, A. et al. Public support for carbon pricing policies and revenue recycling options: a systematic review and meta-analysis of the survey literature. npj Clim. Action 3, 74 (2024). https://doi.org/10.1038/s44168-024-00153-x

Missbach, L., & Steckel, J. C. (2024). *Distributional impacts of climate policy and effective compensation: Evidence from 88 countries* [Working Paper]. Kiel, Hamburg: ZBW - Leibniz Information Centre for Economics. https://www.econstor.eu/handle/10419/296491

Missbach, L., Steckel, J. C., & Vogt-Schilb, A. (2024). Cash transfers in the context of carbon pricing reforms in Latin America and the Caribbean. *World Development*, *173*, 106406. https://doi.org/10.1016/j.worlddev.2023.106406

Ohlendorf, N., Jakob, M., Minx, J. C., Schröder, C. & Steckel, J. C. (2021). Distributional impacts of carbon pricing: a meta-analysis. Environ. Resour. Econ. 78, 1–42.

Ordonez, J. A., Jakob, M., Steckel, J. C., & Ward, H. (2023). India's just energy transition: Political economy challenges across states and regions. Energy Policy, 179, 113621. https://doi.org/10.1016/j.enpol.2023.113621

Rose, J., Bensch, G., Munyehirwe, A., & Peters, J. (2022). The forgotten coal: Charcoal demand in sub-Saharan Africa. World Development Perspectives, 25, 100401.

Steckel, J.C., Dorband, I.I., Montrone, L. et al. (2021). Distributional impacts of carbon pricing in developing Asia. Nat Sustain 4, 1005–1014. https://doi.org/10.1038/s41893-021-00758-8

Sterner, T., Ramakrishnan, A., Fischer, C., Steckel, J., & Lindberg, V. (in press). Emission pricing in Developing Countries. In T. Lundgren, M. Bostian, & S. Managi (Eds.), Encyclopedia of Energy, Natural Resource, and Environmental Economics (2nd ed.). Amsterdam: Elsevier Science.