IDOS German Institute of Development and Sustainability

IDOS POLICY BRIEF 11/2022

The Impact of Carbon Taxation and Revenue Redistribution on Poverty and Inequality

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Summary

The global policy debate on just transitions is concerned with how to achieve a socially just and acceptable transition toward a climate-neutral and climate-resilient global economy. At the core of this debate is the assumption that efforts to combat environmental threats will not succeed unless combined with measures to reduce poverty and inequality. Our research explores the potential of carbon fiscal reforms, combining a carbon tax of levels deemed appropriate to achieve climate targets and the transfer of the revenues raised to vulnerable households.

The current energy and cost-of-living crisis shows the importance of protecting the poorest and most vulnerable households from price increases. It also shows the difficulty of achieving short- and long-term policy priorities. Despite the current spikes in energy prices, carbon fiscal reforms can achieve both social and environmental goals through simultaneously decreasing emissions and reducing poverty and inequality. They should act as an effective *enabler* of just transitions.

Carbon fiscal reform can avoid some environmental impacts by incentivising reductions in emissions. Carbon pricing has been increasingly advocated and is now at the centre of policy debates, including the UNFCCC Conference of the Parties (COP) and the recent German presidency of the world's leading industrial nations (G7). But carbon fiscal reforms can *also* be used to raise revenue from carbon pricing instruments to offset the negative effects of higher prices on poorer households as well as further reaching distributional targets and poverty alleviation. Climate targets are negotiated every year, including at COP, hence it is critical to re-evaluate and improve estimates of the distributional impacts of climate policies such as carbon pricing.

Public acceptability of climate policies is key to their implementation, but it depends to a large extent on the perceived fairness of such policies. Recycling revenues from carbon taxes directly back to vulnerable households is likely to gain the approval of a large number of people, especially in low-income countries where the high proportion of the population involved in the informal economy means that lowering income tax does not benefit the poorest and most vulnerable sections of society. But the targeting of these direct transfers needs careful consideration.

Here, we assess the impact on poverty and inequality of a global carbon tax and national redistribution of revenues to vulnerable households. We look at different options for such redistribution, including a lump sum payment, the use of current social assistance programmes, and an expansion of social assistance following COVID-19.

We find that a carbon tax of US$50/tCO$_2$ without revenue redistribution could increase global extreme poverty, but the redistribution of revenue from such a carbon tax could substantially reduce poverty by between 16% and 27% (110 to 190 million people), and reduce inequality (the average Gini coefficient would decline by between 4% and 8%), depending on the scenario. This shows that the way in which revenue from a carbon tax is redistributed greatly affects its impact, underlining the importance of policy design and targeting mechanisms. The recycling of revenues should also take into account the specific political economy of a country and consider international transfers.

These findings provide policy makers with a strong basis for informing discussions, starting off with those at COP27, in which ambitious climate targets and just transition should *both* remain central goals in the context of the ongoing international energy crisis.

Background

The current energy crisis has shown the importance of protecting the poorest and most vulnerable households, as well as the difficulty of reconciling short- and long-term policy priorities such as energy independence and climate mitigation goals. Despite the current spikes in energy prices, it is possible to strive for social and environmental goals and *just transitions* by adopting a well-designed fiscal reform.

A carbon fiscal reform, with its carbon-pricing instruments (carbon taxation or emissions trading system (ETS)) reduces some of the environmental externalities by incentivising emissions reductions in both consumption and production. The recent German G7 presidency also underlines the need for the formation of carbon clubs (a group of countries adopting carbon pricing, with the possibility of extending the group in the future). In addition, carbon fiscal reforms can use the revenues raised from carbon pricing to offset potentially negative effects of higher prices on poorer households by recycling the revenues directly to vulnerable households. While revenues can address other political economy barriers, public acceptability is key to implementing climate policies and depends on the fairness of such policies.

The combination of carbon pricing and transfers to households can reduce poverty and inequality, going beyond a purely compensatory effect, and addressing some of the shortcomings of the fiscal system of transfers, taxes and subsidies. In low- and middle-income countries, overall fiscal systems are not progressive, and in many cases the poor are found to be net payers rather than beneficiaries of such systems. One reason for this is the limited revenue to redistribute, which a carbon tax can increase. Another issue is related to which groups of households benefit from redistribution. In addition, for high-income countries, targeted assistance for the most vulnerable, instead of using economy-wide subsidies, is the most efficient way to achieve poverty reduction whilst achieving carbon mitigation goals under budgetary considerations. For example, it has been argued that keeping or introducing a carbon price even with current price hikes is important, as it creates revenues that can be redistributed, increasing the welfare of vulnerable households, compared to an adjustment of CO_2 prices to short-term energy price fluctuations. Unfortunately, many countries have implemented universal subsidies instead of direct transfers to the most vulnerable in response to the current price hikes.

Given that social acceptance of climate policies such as carbon pricing is key, it is critical to understand the absolute and distributional implications of such a policy for both high-income and lower-income countries. In particular, it is of interest to see how carbon fiscal reforms can be designed as a policy mix that can simultaneously decrease emissions and reduce poverty and inequality.

Although evidence on carbon pricing and revenue recycling is growing, there are no global studies that provide sufficient detail to inform this debate. To bridge this gap, we apply an environmentally extended input–output approach, matching the Global Trade Analysis Project (GTAP) dataset to expenditure and social assistance data for 113 countries, representing about 90% of global population and GDP.

We simulate a global carbon tax whereby all countries implement a carbon tax of the same level and use the revenues that the tax generates. We simulate different scenarios that represent different carbon tax levels and different options to use the revenues to assist vulnerable households, and assess their combined effects on poverty and inequality. In this brief, in light of COP27 and subsequent international discussions, we present some of the main aggregated results from our ongoing research.

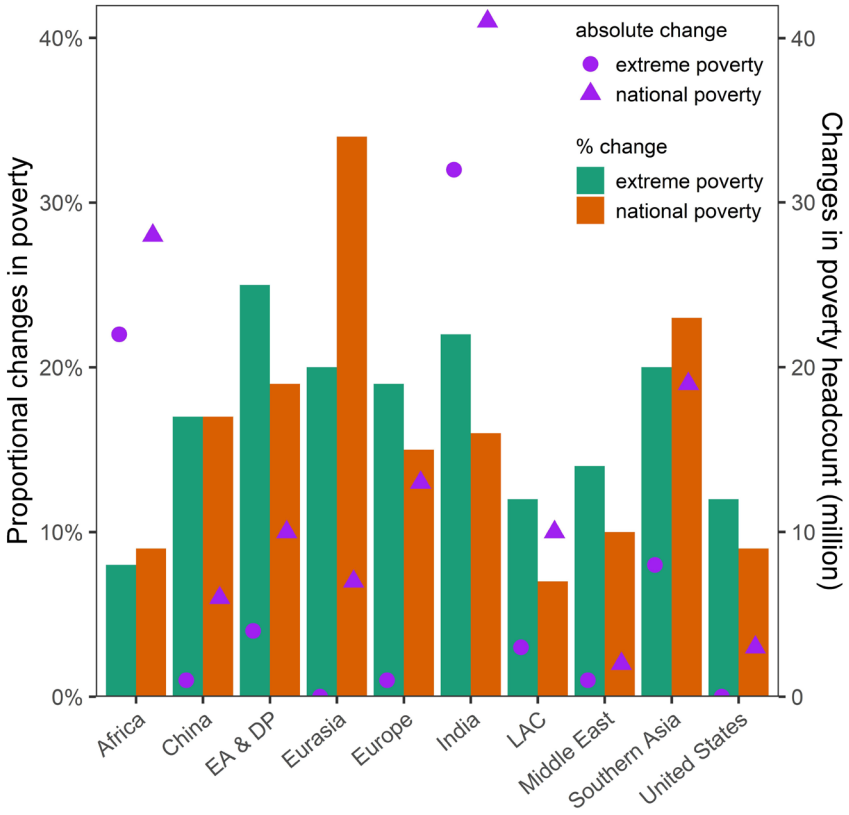
Distributional effects of a carbon tax without revenue recycling

The effects of a carbon tax on poverty are summarised by Figure 1, considering both national and international poverty lines. National poverty lines differ by country and depend on national con-

ceptualisations of poverty. For international poverty we use the World Bank "extreme poverty" line of US$2.15, based on 2017 PPPs and use this term throughout the brief.

A global carbon tax of US$50/tCO$_2$ would increase extreme poverty by around 90 million people, equal to a 13% increase in extreme poverty. As a result, the extreme poverty rate, indicating the ratio of population in poverty divided by total population, would increase from 0.09 to 0.1 (see also Figure 3 for absolute poverty numbers for all scenarios). Figure 1 shows the breakdown by region (based on country groupings from the IPCC's Sixth Assessment Report, and additional reporting results for China, India and the USA). Extreme poverty would increase the most in East Asia and Developing Pacific region (the poverty rate would increase from 0.03 to 0.04, representing a 25% proportional increase). India, along with Eurasia, Europe and Southern Asia, would experience a rise of about 20%.

Figure 1: Effect on poverty of a US$50/tCO2 carbon tax



Note: Country groupings are based on the IPCC's Sixth Assessment Report. We present findings for China, India and the USA separately.

EA & DP: East Asia and Developing Pacific; LAC: Latin American Countries

Source: Authors

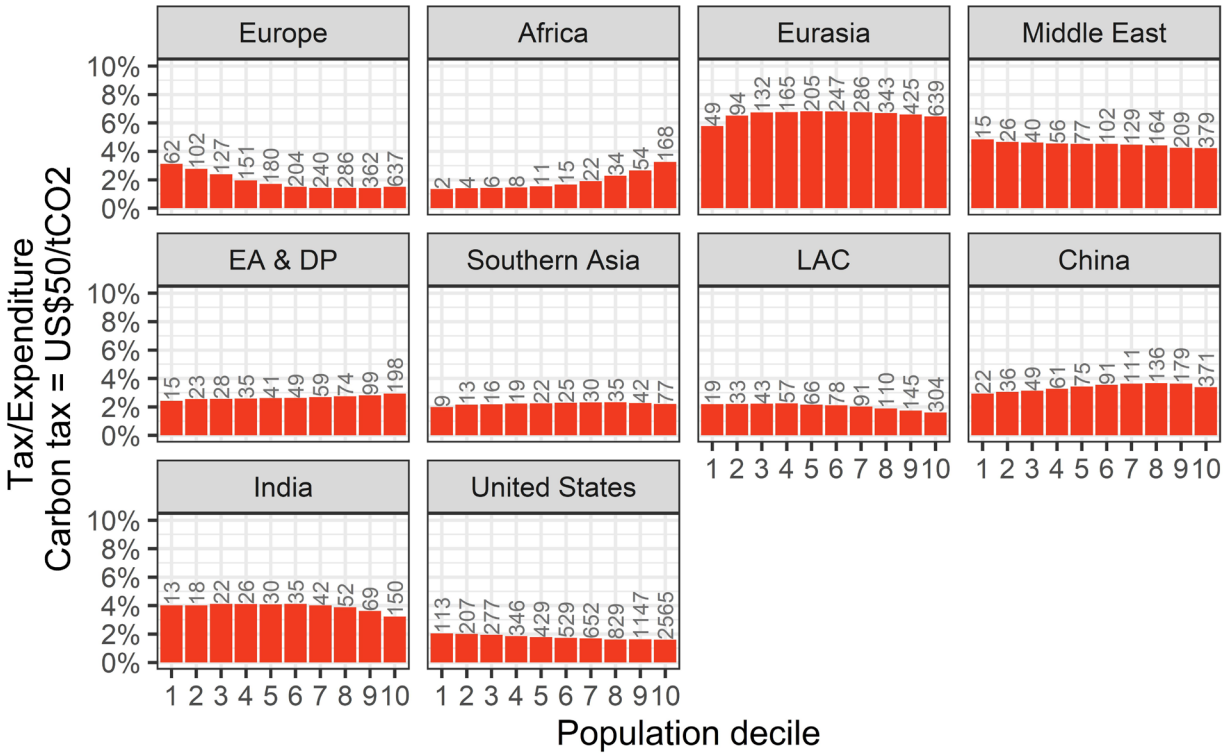
The largest increase in absolute numbers of the extreme poor would be in Africa (32 million) and India (34 million). In Africa, the extreme poverty rate would increase from 0.30 to 0.32. This is because, despite high proportional increase, extreme poverty rates for regions such as Europe are very low, and do not result in a high number of people falling into poverty. All regions have an increase of their extreme poverty rate between 0 and 0.03 (see Figure 3).

For national poverty lines (which are usually higher than the international extreme poverty line), the impacts are similar but show more variation; all regions apart from China (which has a low poverty line) and the US witness an absolute increase of 0.02 to 0.05 of the poverty rate.

The effects on inequality of a carbon tax without revenue recycling can be inferred by looking at Figure 2, which shows the incidence of the tax (measured as the potential tax amount in relation to total expenditure) and the average amount that would be paid in tax. The figure shows that the effect of carbon taxation is close to neutral in many countries but also confirms that it would be slightly regressive in high-income countries (such as in the EU or the USA) and slightly progressive in some lower-income regions (such as in Africa). The incidence is particularly high (6% or more) for all deciles for the Eurasia region in particular. In contrast, the incidence is lowest for the poorest deciles in Africa; this is because carbon footprints are very low. This is in line with previous cross-country research.

To complement Figure 2, using a more aggregate measure of inequality, we estimate that changes in the Gini coefficient are also small, with the proportional change of the average Gini coefficient ranging from 0.4% (Europe) to -0.2% (Africa).

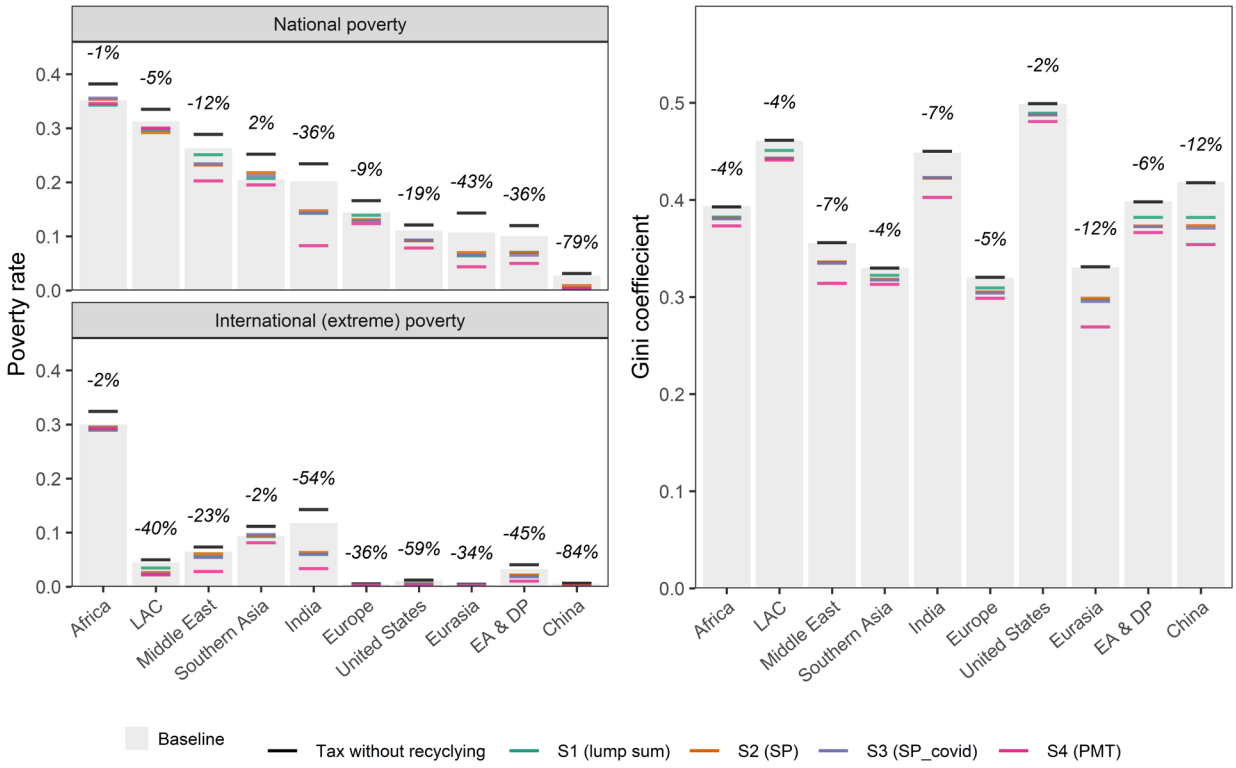
Figure 2: Potential impact of a carbon tax of US$50/tCO2 as proportion of expenditure and absolute amount, by population decile and region



Note: The number in the bar shows the carbon tax per capita (in current US$ for 2017) for each population decile.
EA & DP: East Asia and Developing Pacific

Source: Authors

Figure 3: Effects on poverty and inequality of final carbon fiscal reforms, by scenario and region (% changes over the bar are the average across scenarios S1 to S4)



Note: EA & DP: East Asia and Developing Pacific; LAC: Latin American Countries

Source: Authors

Redistribution of carbon tax revenues to support vulnerable households

While many political economy barriers exist, public support is critical for the implementation of climate policy. It has been found that the strongest determinant of public support is fairness in relation to the distributional effects of the policy. Revenues from a carbon tax can be used to address poverty by compensating for higher costs but also changing the status quo (pre-tax) of poverty. Nonetheless, the recycling of revenues to households needs careful consideration. On average, countries could raise 1.9% of GDP as revenue from a carbon tax of US$50/tCO$_2$, which corresponds to 2.1 times the amount of money needed to close the poverty gap, according to national definitions of poverty, and 15.3 times the amount needed to lift everyone out of “extreme poverty”, according to the international definition.

In comparison, overall expenditure on social protection measures is estimated to average around 16.4% of GDP, but with substantial differences between high-income countries (more than 20%) and low-income countries (1%).

For revenue recycling, we consider four scenarios based on measures that have been considered and used in other contexts.

S1 represents an untargeted lump sum transfer, meaning that all citizens receive the same amount; sometimes this is also referred to as a “climate dividend”. This follows current experiences, such as in Switzerland and Canada, as well as many current proposals.

S2 uses existing social assistance programmes that target the poorest, simulating an increase in the transfer level of current beneficiaries (vertical expansion). Transfers can help to reduce poverty and inequality as the total budget is divided between a smaller number of people and should

go to those who need it most. Overall, we find that these programmes cover around half of the global population, with the lowest coverage in Africa. In many countries these programmes suffer from high exclusion errors, meaning that many people in poverty are not reached.

S3 is based on increased coverage of current social assistance that resembles the regional expansion rates of the COVID-19 period, as reported by regional studies.

S4 is targeted, using a perfectly executed proxy means test (PMT) based on World Bank data. PMT is the most common way of targeting vulnerable people in poorer countries and is used here as a reference scenario of a well-executed and progressive targeting mechanism.

In terms of feasibility, S2 would be the easiest to implement; it relies on programmes that exist already and would require channelling new resources into existing architectures. Similarly, S3 is a scenario that models a feasible expansion as it is based on the extended coverage achieved in the response to the COVID-19 pandemic. On the other hand, S1, while mostly feasible in richer countries, is more difficult in lower-income countries, where it is difficult to reach everybody, especially the most vulnerable. Similarly, S4 is considered as an ideal benchmark, as it is difficult to have perfect information on – and programme participation of – all households. In addition, apart from technical feasibility, each scenario and accompanying targeting mechanism satisfies different political economy perspectives, with more targeted transfers leaving out part of the middle classes and high-income groups. These differences are also particularly relevant in the contexts of certain countries. Policy implementation in the United Kingdom, for instance, does not generally face the same constraints as, for instance, implementation in South Africa. In this brief, we offer results based on the same targeting scenario for all countries, for simplicity and illustrative purposes. Nonetheless, we recognise that each country should also consider their own political and social circumstances and see which targeting scenario serves them best.

How does revenue recycling change poverty in comparison to the pre-tax status? In all the revenue-recycling scenarios we find that global poverty decreases significantly. In the case of a US$50 tax with revenues recycled directly to households, global extreme poverty decreases between 16% and 27% across scenarios. In other words, between roughly 100 and 190 million people around the world would be able to escape poverty, leading to a decline in the extreme poverty rate from 0.09 to 0.07.

More specifically, some countries and regions would see their poverty rates significantly decrease, as in the case of China (driven by very low initial poverty rates). In contrast, the effects are the lowest in Africa, where extreme poverty would decrease by 2% across scenarios. This is mainly due to low revenues raised by the tax. India would experience the largest absolute decrease in terms of poverty rate, starting from a 0.12 initial poverty rate.

The design of the recycling programmes plays a critical role and also depends on the context. The lump sum payment seems to work better in richer countries where lower-income groups are already close to the poverty line; this is the case in China. More targeted approaches are needed where poverty is more severe, given the condition that exclusion errors are not too big (such as in scenario S4).

Revenue recycling can also change inequality. With a tax of US$50/t$CO_2$, inequality (represented by the average Gini) can decrease by between 4% and 8%. As expected, decreases in inequality are linked to the scenarios and the targeting of the revenues. The smallest increases are for scenario S1, where all people get the same amount. All targeted scenarios (S2, S3 and S4) witness larger decreases in inequality, with scenario S4 showing the strongest results. This benchmark scenario combines, in fact, both progressivity in targeting and low exclusion errors in the lowest deciles. In regions such as Eurasia, inequality would see a significant decrease of more than 10% under this scenario. Conversely, in other regions, such as

high-income Europe, and in the US, transfers are not that high compared to expenditure level, and thus show less of an effect on inequality. The same is true for middle- and low-income contexts, such as in the Latin American and the Caribbean region and in Africa, which see their inequality decline less because revenues raised are low.

In the previous sections we presented the results using a carbon tax of US$50/tCO$_2$. Simulating a carbon tax of US$100/tCO2, we find much stronger redistribution effects, given that the revenue raised by the tax would be doubled (representing, on average, 4% of GDP). The global extreme poverty rate could be reduced to between 0.06 and 0.07, representing a decline of between 29% and 31% across the different scenarios.

Policy implications

The current global policy debate on *just transitions* is concerned with how to achieve a socially just and acceptable transition to a climate-neutral and climate-resilient global economy. Accordingly, our research explores the potential of carbon fiscal reforms, combining a carbon tax of levels deemed appropriate to achieve climate targets, and the distribution of revenues to households.

Our analysis shows how carbon fiscal reforms can address the trade-off between environmental and social goals. It indicates that such reforms can, while incentivising emissions reductions, also significantly decrease poverty and income inequality compared to the status quo.

Moreover, we want to emphasise three additional important policy implications:

- *Political economy: leveraging social and political acceptability*: First, from a political economy perspective, focusing on the potential distributional gains of such reforms may partially address some of the barriers that have until now hindered the implementation of climate policies. Increased social and public acceptability, as a result of potential decreases in poverty and inequality, can keep alive climate targets. Even in a period of energy price hikes, carbon taxation can create additional revenue and achieve ambitious carbon mitigation goals *and* social goals.
- *Country contexts: improving fiscal systems in low- and middle-income countries*: Second, it is clear that the results of our modelling depend on the country context. Alleviation of poverty is found across the board but even more so in low- and middle-income countries. This is important, as carbon taxes, can be a way to improve fiscal systems in many low- and middle-income countries, which tend to be regressive.
- *Setting up complementary international transfers*: Third, some countries, especially African ones, raise less carbon tax revenue due to their low carbon footprints. While in this paper we present findings based on the assumption that countries control only their national revenues, international transfers (from richer to poorer countries) might help if global architectures are created. This is also related to discussions around carbon clubs and carbon border adjustment mechanisms. International transfers could potentially finance the social protection infrastructure and information systems in lower-income countries, and improve the capacity for implementing more targeted redistribution.

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Published with financial support from the Federal Ministry for Economic Cooperation and Development (BMZ).

Suggested citation:
Malerba, D., Chen, X., Feng, K., Hubacek, K., & Oswald, Y. (2022). *The impact of carbon taxation and revenue redistribution on poverty and inequality* (Policy Brief 11/2022). Bonn: IDOS. https://doi.org/10.23661/ipb11.2022.

IDOS Policy Brief / German Institute of Development and Sustainability (IDOS) gGmbH

ISSN (Print) 2751-4455
ISSN (Online) 2751-4463

DOI: https://doi.org/10.23661/ipb11.2022

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E-mail: publications@idos-research.de
http://www.idos-research.de

Printed on eco-friendly, certified paper.