

## RESEARCH BRIEF

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### **Negative health effects of carbon prices can outweigh the climate benefits in developing countries**

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#### **Research questions**

Carbon pricing is promoted as an efficient climate change mitigation instrument. But in many low- and middle-income countries (LMICs), especially where many consumers use biomass, carbon pricing may undermine household welfare and pose health risks, unless paired with targeted support for clean cooking. Using household data from six countries—Cambodia, Ghana, Honduras, India, Kenya, and Myanmar—the study investigates the impacts of fossil fuel price hikes on biomass consumption and its consequent health effects. The study then compares the global climate benefits from emissions reduction with the local health effects of additional biomass use, in response to carbon pricing.

#### **Key Messages**

- With carbon pricing, households in most countries and regions have a tendency to change from fossil-based fuels to more traditional and polluting alternatives like firewood and charcoal.
- Fossil fuel price hikes lead to substantial increases in indoor pollution concentrations in most countries and regions.
- Despite compensation, local health costs of carbon pricing outweigh the global climate benefits in four out of six countries (Ghana, Honduras, India and Myanmar).
- In two countries (Cambodia and Kenya), carbon prices generate net climate and health benefits.

#### **Background and Methodology**

The study applies microeconomic theory, drawing on consumer demand systems to estimate demand responses to price changes for fossil cooking energy such as electricity, LPG and kerosene, and solid fuels such as charcoal and firewood. The analyses cover a sample of six lower middle-income countries — Cambodia, Ghana, Honduras, India,

Kenya, and Myanmar, given their high dependence on solid fuels and an increasing share of fossil-based fuels for cooking. The estimated demand responses to price changes assume that consumers receive sufficient compensation to offset the negative welfare effects of fuel price increases.

From these estimated demand responses, the researchers calculate the potential reductions in CO<sub>2</sub> emissions resulting from the taxation of fossil-based fuels, referred to as global climate benefits, and the local health costs associated with increased solid fuel consumption and related increases in indoor pollution concentrations. The study draws on literature from epidemiology and public health, particularly the 2020 update to the PURE study, to estimate relative risks from disease linked to air pollution and associated health impacts.

## Results

The study shows that carbon pricing can lead households to switch away from cleaner fuels like LPG, electricity, and kerosene, towards more polluting sources such as charcoal and firewood, in most countries and regions. This is also because we assume that households get compensated for increasing fuel costs. While in the majority of cases, carbon pricing is associated with an increase in biomass use—especially firewood and charcoal—as households substitute away from fossil fuels, there are six notable exceptions where demand for one type of biomass falls. Firewood demand decreases when: (i) electricity prices rise (in rural Cambodia), (ii) LPG prices rise (in urban Cambodia), (iii) kerosene prices rise (in rural and urban Kenya), (v) LPG prices rise (in urban Myanmar). In each of these cases, households reduce their demand for firewood and substitute with charcoal use, given charcoal is more energy efficient. Additionally, in one case, electricity price increases lead to declines in charcoal use, along with an increase in fuelwood demand (in urban Myanmar).

The increase in biomass consumption generates large increases in indoor air pollution. Carbon pricing is thus associated with an increase in indoor PM<sub>2.5</sub> concentrations in most cases, resulting in a measurable rise in premature mortality and associated health costs. In two cases – electricity taxation in Cambodia and kerosene taxation in Kenya – the decline in firewood use and rise in charcoal consumption, which is half as emission intensive as fuelwood, leads to reduced PM 2.5 concentrations within homes, relative to pollution levels before carbon taxes are imposed. However, if increasing taxes lead to an increased use of charcoal at the costs of firewood (e.g. through kerosene taxation in Kenya or electricity taxation in rural Cambodia and urban Myanmar) indoor air quality can increase.

Carbon pricing in the six countries studied achieves reductions of associated CO<sub>2</sub> emissions. However, the cost-benefit analyses reveal that in four of the six countries—Ghana, Honduras, India and Myanmar—the local health costs from increased indoor air pollution can outweigh the global climate benefits of emissions reductions. These results are robust to a value of the social cost of carbon of US\$ 185 per tCO<sub>2</sub>. Despite conservative estimates for the willingness to pay to avoid risk of premature mortality

(value of statistical life), the health costs of indoor air pollution remain substantial and outweigh the climate benefits in these four countries.

Looking into the two cases where carbon taxation leads to net benefits (electricity taxation in Cambodia and kerosene taxation in Kenya) one can assume that taxing carbon only leads to benefits if the taxed alternative is particularly dirty. In Cambodia, a substantial share of electricity is generated using coal, which makes the power sector relatively emission-intensive. A tax on coal used to generate electricity would yield substantial health benefits through improved outdoor air quality. Similarly, taxing kerosene would also enable the clean cooking transition by shifting demand towards (much cleaner) LPG in Kenya.

## Policy implications

The study's findings have broader implications for how climate action is financed globally. Analyses frequently consider carbon dioxide emission abatement to be cheaper and more cost-effective in the global South. However, this study highlights one example – that of residential cooking energy – where high taxes on fossil fuels may generate additional local costs, posing net climate and health costs in several LMICs. The true costs of climate change mitigation may be higher in most LMICs than previously considered. This challenges the notion that the costs of emission abatement are lower in developing countries and reinforces the need for equity-based global support mechanisms. Hence, the introduction of carbon pricing in LMICs needs to be considered in light of these additional externalities, with appropriate compensation mechanisms needed to alleviate adverse effects.

Residential cooking energy accounts for only about 4–6% of total CO<sub>2</sub> emissions in LMICs, yet the welfare implications of taxing these fuels are disproportionately large. Therefore, the global community ought to **support clean cooking transitions** through climate finance, technology transfers, and advocate limiting carbon pricing to sectors without such substantial adverse effects to ensure effective mitigation and widespread access to clean energy, especially among poor households.

The study indicates that **country-specific policies** are needed to address the climate and health externalities, while carbon pricing needs to be considered in light of local health effects and biomass consumption. Potentially, other LMIC particularities might challenge the societal benefits of carbon pricing. This underscores the **need for more comprehensive welfare-based assessment** of the design of domestic climate policies in LMICs. The importance of income transfers to offset potential welfare losses among poorer households is often emphasized. However, given the institutional limitations in many LMICs, large-scale transfer schemes may be difficult to implement. In such cases, more practical and immediate solutions—such as providing **subsidized clean cookstoves or enabling access to modern cooking fuels**—could be more effective in reducing harm and supporting equitable transitions.

The Environment for Development initiative is a capacity-building program in environmental economics focused on international research collaboration, policy advice, and academic training. It consists of centres in Central America, Chile, China, Colombia, Ethiopia, Ghana, India,

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