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# Free green services could substantially reduce emissions and improve climate justice

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Policy Brief

NOVEMBER 2021

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Milena Büchs, Diana Ivanova, Sylke V. Schnepf



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# Free green services could substantially reduce emissions and improve climate justice

## Policy Brief

Milena Büchs, Diana Ivanova, Sylke V. Schnepf

### Executive summary

Carbon and energy taxes are an important component of many European climate change policy packages, aimed at avoiding dangerous climate change. However, carbon and energy taxes on home energy and motor fuels often put higher burdens on poorer than richer households relative to their income, they are regressive. This is often perceived as socially unjust and undermines public support. New compensation mechanisms are needed to make carbon and energy taxes fairer and more environmentally effective.

In new research, we compared two possible compensation mechanisms funded using the revenue from the carbon taxes. We looked at equal per capita tax rebates versus an in-kind green vouchers scheme for free renewable electricity and public transport. The outcomes were modelled using data from 27 European countries. The study found:

- Carbon taxes on home energy were regressive in all 27 European countries; while taxes on motor fuels were regressive in all but nine, mostly Eastern European countries;
- Both compensation mechanisms are equally redistributive and reversed the regressive impacts of carbon taxes on lower earners;
- Providing green vouchers gave the largest emissions savings, reducing home energy emissions by 13.4%, and motor fuel emissions by 23.8% across the 27 European countries;
- Green vouchers reduced fuel and transport poverty, whereas both carbon taxes and tax rebates increased these.

The green voucher scheme would need additional public investments into renewable energy and public transport to meet increased demand, but this would be balanced in the longer term by reduced expenditure on climate change related economic, infrastructure and health damage .

Overall, we find the green voucher scheme delivers both the best emissions cuts and fairest option. We therefore recommend green vouchers as the preferred option over tax rebates for addressing regressive impacts of carbon taxes.

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## The need for carbon taxes

Very rapid action is required to reduce emissions to net zero before 2050 to avoid an acceleration of already existing climate change impacts (IPCC, 2021). Carbon and energy taxes are an important component in many climate change policy packages, including the European Green Deal (European Commission, 2019). The issue with carbon and energy taxes charged on necessities such as home energy is that they burden low income households more than high income households, i.e. they are regressive. This reduces public support for carbon and energy taxes: the European Social Survey data shows that in many European countries, more than half of the population oppose such taxes (Schnepf et al., 2021).

## Comparison of cash and in-kind compensation schemes

In our [article in Environmental Research Letters](#), we examine two options for addressing regressive impacts of carbon taxes on home energy and motor fuels: cash and in-kind compensation. Cash is provided through equal per capita tax rebates, and in-kind compensation via green vouchers for green electricity and public transport.

We compare the emission reductions, distributional impacts, and impacts on fuel and transport poverty of the carbon taxes and the two compensation options. Microsimulation modelling is applied to estimate outcomes.

The study is based on matching household expenditure data from the EU Household Budget Surveys (HBS) (2010 and 2015) with

emission factors from Exiobase. In total, 27 European countries are included in the study, achieving a sample size of 275,614 households.

In the study, the carbon tax was set at €80 per ton of carbon (price adjusted across countries).

The tax rebates are designed such that the full carbon tax revenue is redistributed to residents on an equal per capita basis.

The green vouchers are designed such that they are equivalent in value to the tax rebates, but instead of giving people cash, they provide people directly with free renewable electricity which replaces average grid electricity, or with public transport to replace car travel. These green vouchers could be tradable to make them flexible, with equivalent distributional impacts.

## Uneven impact of carbon taxes

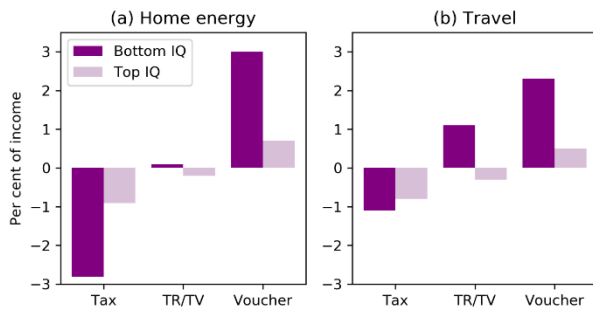
Our analysis shows that carbon taxes on home energy have regressive distributional impacts in all 27 European countries included in the study, putting higher tax burdens on poorer than on richer households relative to income.

Older people, people with long-term health issues, households with children and those headed by women were also more affected by carbon taxes on home energy than their counterparts.

Carbon taxes on motor fuels were regressive in most European countries, except for Bulgaria, Croatia, Czech Republic, Greece, Hungary, Lithuania, Latvia, Poland, and Romania where they were progressive. Carbon taxes on both home energy and motor fuel also increase fuel and transport poverty.

## Both compensation schemes redistribute benefits

Both the tax rebate and green voucher schemes reverse regressive impacts of carbon taxes and benefit poorer households more than richer households.



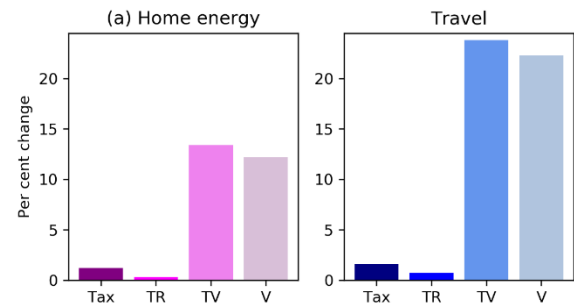
**Fig. 1. Average burdens and gains from carbon taxes and compensation schemes for 27 European countries.** Tax = tax models, without compensation. TR = Tax and rebate model, TV = tax and voucher model, which are shown together here because they are distributionally equivalent. Voucher = “Voucher only” model which is a model that provides vouchers without a prior tax. Burdens and gains are measured in per cent of household income, comparing the bottom (IQ1) and top (IQ5) income quintiles. Panel a) demonstrates that rebates for taxes on home energy compensate low income households, but less so than rebates for taxes on motor fuels in panel b). The “voucher only” schemes in both the home energy and travel models are progressive, benefitting low income households more than rich households.

## Emission reductions are higher with green voucher scheme

The green voucher schemes achieve higher emission reductions than the tax and tax rebate models. The tax rebates actually reverse some of the initial emission reductions from the carbon taxes because households spend the money they receive from tax

rebates back into the economy while, in this model, the underlying carbon intensity of consumption remains unchanged.

In contrast, if the consumption of average grid electricity is replaced with renewably generated electricity for the amount received from the green voucher, we estimate that 92.3 MtCO<sub>2e</sub> or 13.36% of initial home energy and 31.58% of initial electricity greenhouse gas (GHG) emissions could be saved across all 27 countries combined. If the vouchers for public transport replaced car journeys, we estimate that 177.5 MtCO<sub>2e</sub> or 23.8% of the initial amount of motor fuel emissions would be saved.

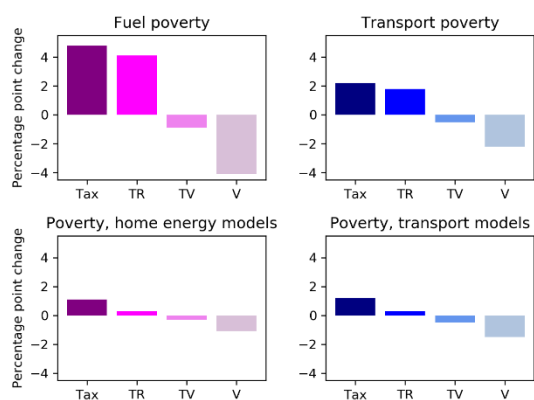


**Fig. 2. GHG reductions from the different policy schemes.** Tax = tax models, without compensation. TR = Tax and rebate, TV = Tax and voucher, V = “voucher only” model (no prior tax). Per cent reductions of each scheme relative to initial home energy and motor fuel CO<sub>2e</sub> for all 27 countries. Both panels show that the additional investments in green infrastructures in the voucher schemes would achieve considerably higher emission reductions compared to tax and “tax and rebate” schemes without such investments.



## Green vouchers reduce fuel and transport poverty

The green vouchers schemes reduce fuel and transport poverty, while the carbon taxes and the tax rebate schemes increase fuel and transport poverty. This study adopted the ‘low income, high cost’ definition of fuel and transport poverty (Hills, 2012; Mattioli et al., 2017). This definition has two components: the expenditure and the income component. The carbon taxes increase households’ expenditure on home energy and motor fuels, and this is not addressed by the tax rebates which only affect people’s incomes. In contrast, the green vouchers reduce households’ expenditure on home energy and transport and hence lift more households out of fuel and transport poverty.



**Fig. 3. Changes in fuel and transport poverty.** Tax = tax models (without compensation), TR = tax and rebate models, TV = “tax and voucher” models, V = “voucher only” models (no prior tax). Percentage point changes in fuel or transport poverty and poverty, compared to a baseline without taxes or compensations, resulting from each of the four models. Results show that carbon taxes and taxes with rebates increase fuel and transport poverty, and overall poverty, in all countries, and that

the “voucher only” models achieve greater reductions of all types of poverty than the “tax and voucher” models.

## Implementation of schemes

Cash compensation would be easier to implement and cheaper than the provision of free green electricity and public transport because the latter would rely on additional investments to expand renewable electricity generation and public transport to meet increased demand.

Our study estimates that this would cost an average of around 0.3% of GDP across the 27 European countries included in the study. In the longer term however, this cost is likely to be balanced by savings from reduced expenditure on climate change related economic, infrastructure and health damage.

## Policy recommendations

Based on the study presented, we recommend:

Carbon or energy taxes on home energy (e.g. electricity, gas) should be combined with compensation schemes that address regressive distributional impacts in all European countries.

Carbon or energy taxes on motor fuels should be combined with compensation schemes to address regressive distributional impacts in countries where such taxes are regressive, but this may not be necessary where taxes are progressive or neutral such as in Bulgaria, Croatia, Czech Republic, Greece, Hungary, Lithuania, Latvia, Poland, and Romania.

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In-kind compensation for regressive impacts of carbon taxes, for instance by providing free renewable electricity and free public transport to everyone in society, should be the preferred option because of its potential to achieve

higher emission reductions, and to reduce fuel and transport poverty.

## Further Information

Open access to the article: Büchs, M., O. Ivanova and S. V. Schnepf (2021). "Fairness, effectiveness and needs satisfaction: new options for designing climate policies." *Environmental Research Letters* 16 (2021): <https://iopscience.iop.org/article/10.1088/1748-9326/ac2cb1>

Video abstract of the article: <https://youtu.be/n7ZPp27Wzbc>

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