

# The energy calculator

Germany wants to make the transition to an environmentally-friendly energy supply. But the shift to a sustainable system also calls for drastic economic policy measures, for instance the introduction of a carbon pricing. Energy management expert Christoph Böhringer uses sophisticated mathematical models to study the impact of such measures. His work is producing interesting insights which, among other things, have the potential to make the discussion about the future energy supply more concrete and objective



**Y**ou don't have to study business and economics from the outset to become a professor of economic policy. "As a student I was more interested in engineering and IT – I only attended the introductory lectures for economic and business studies," says Christoph Böhringer. But as a student of industrial engineering at the University of Karlsruhe, Böhringer also learned the basics of applied economic policy analysis using computer-aided simulation models.

### The economic world in a model

Mathematical model calculations and simulations are still the focus of his research today. Böhringer and his colleagues at the department of economic policy are currently using these methods to quantify the impact on businesses and consumers of economic policy interventions such as carbon pricing or phasing out coal. But the simulation analyses are not restricted to energy and climate policy measures. They also cover other areas of economic policy such as trading and taxation policy – a current example is the analysis of the trade conflict between the US and China.

The core of his research may sound abstract but it has real political implications: "What I do is commonly described as 'numerical simulation'," Böhringer says. It allows him to apply textbook scenarios to real economies to simulate the effects of specific economic policy interventions on prices, as well as on the supply and demand behaviour of consumers, trade or industry. He is currently studying the potential impact of the German state's carbon pricing policy, which entails charging industrial companies or private individuals for the climate-damaging carbon emissions they produce through their consumption of gas, coal and oil. The payer might be a company that uses electricity which is partially pro-

duced by coal, or a private individual who heats their home with natural gas or consumes kerosene through air travel. Carbon pricing is meant to raise awareness among consumers of the cost of the environmental damage they cause and encourage them to adopt more environmentally friendly behaviour.

"With the climate package it passed in September, the German government plans to introduce carbon pricing in the agricultural, transportation and building sectors, which are currently not covered by the European Emissions Trading System. However, the envisaged price plan for CO<sub>2</sub> for the next ten years is set too low to achieve the ambitious national targets by 2030," Böhringer says. In his eyes, achieving socio-political acceptance of higher carbon prices will require a climate policy that is socially compatible. However, critics warn that high CO<sub>2</sub> prices would be unfair and immoral as they would place a bigger burden on people with lower incomes than on the wealthy. For high earners, a tax on petrol, oil, electricity or air travel would be less painful than for those who have to count every penny.

### Revenues are to be redistributed among the population

The topic is being hashed over again and again on talk shows. Böhringer prefers to let the facts speak for themselves. Using his model-based calculations, he has come up with a tax model that would be less hard on the poor. "The task is to reduce the regressive impact of higher carbon pricing, in other words to diminish the effect whereby lower income earners who have comparatively high energy costs are hardest hit." This can be achieved with a CO<sub>2</sub> tax reform in which part of the revenue generated by higher carbon pricing is paid back to households in a lump sum: a fixed sum would be reimbursed per capita, and this rebate would be more substantial

relative to income for those with lower incomes compared to those with higher incomes. This would reduce or even cancel out the regressive impact of higher carbon prices without detracting from the steering effect of carbon pricing in terms of cutting carbon consumption.

### People must pay for producing emissions

Greenhouse gas emissions need to be cut drastically if we are to avoid a climate catastrophe. This means there is no alternative to considerably increasing the prices for industrial activities that are harmful to the environment. According to Böhringer, however, it is essential that CO<sub>2</sub> is reduced in the most obvious areas of consumption – for example heating oil or petrol – and that measures are taken to cushion the impact on low earners. The CO<sub>2</sub> tax reform outlined above would ensure precisely that.

For Böhringer, designing a sustainable energy sector has always been an important topic. In his dissertation he programmed a database for the Mannheimer Versorgungs- und Verkehrsgesellschaft, one of Germany's leading energy suppliers, with which the district heating network can be coordinated for increased energy-efficiency. After completing his Diplom degree in Karlsruhe, Böhringer moved to the Institute for Energy Economics and Rational Energy Use at the University of Stuttgart in the early 1990s to do his PhD, and wrote his thesis on CO<sub>2</sub> taxes and coal phase-out.

### Well positioned in the green energy sector

He notes that what influenced him most during his doctoral studies was a study year abroad at the University of Colorado Boulder under Professor Thomas F. Rutherford. "Rutherford is known around the world as the pope of numerical equilibrium

analysis. I learned so much from him and we continue to collaborate in the field of applied economic research." Böhringer's expertise in numerical simulation analyses for economic policy proved to be the ticket to his later career. After his PhD, he moved to Mannheim and the Leibniz Centre for European Economic Research (ZEW), where he was made head of the "Environmental and Resource Economics, Environmental Management" Research Department. In 2004, he was given tenure at the University of Heidelberg, before finally transferring to Oldenburg in 2007. "The economics department is small here, but its reputation is impressive. And Oldenburg has always been particularly well positioned in environmental economics." Since 2012, Böhringer has been a member of the "Commission of Experts for Research

and Innovation" (EFI) – a think tank established by Angela Merkel in 2008 to advise the government on key questions relating to research and innovation policy.

Carbon dioxide will continue to be the focus of his work in the future. Böhringer is currently coordinating the project "Carbon Pricing after Paris" together with the Kiel Institute for the World Economy and Stanford University. The project brings together renowned research teams from various continents to work out how to achieve the greenhouse gas reduction targets agreed at the UN Climate Change Conference in Paris through coordinated and appropriate carbon dioxide pricing. As with other global challenges, the key to solving the greenhouse gas problem lies in close international collaboration. (ts)



Christoph Böhringer, Professor of Economic Policy at the University of Oldenburg, has been a leading economic policy researcher in the German-speaking world for many years.

## Infobox

### Carbon pricing: the German government's plans

The centrepiece of the German government's climate protection programme is "carbon pricing for transport and heating" from 2021. Under the EU's Emissions Trading System, carbon pricing already applies for the energy sector and for energy-intensive industries, but in Germany it will also apply in the transport and building sectors. The German government plans to reinvest the revenues in climate protection measures or pass them on to the public in a form that has yet to be specified.

The national emissions trading system (nationale Emissionshandelsystem – nEHS) will be launched in 2021 on the basis of a fixed-price system, meaning that the per tonne price of CO<sub>2</sub> will be fixed and set by the state. Certificates will be sold to companies that trade in heating or motor fuels. Thus companies producing heating oil, liquid gas, natural gas, petrol or diesel will need to purchase a certificate – allowing them to cause pollution – for each tonne of CO<sub>2</sub> that these fuels produce when consumed.

The fixed price will start out at ten euros per tonne and increase to 35 euros per tonne of CO<sub>2</sub> by 2025. From 2026 onwards, the price will reflect the market price provided it lies somewhere between the stipulated minimum and maximum price. According to the German government, the total amount of certificates issued across Germany will then generate enough funds to meet the requirements for achieving German and European climate targets.

Source: The homepage of the German government (current as of: 30 October 2019)