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Research themes: Energy

Pricing the real cost of energy

While energy pollution may be visible to everyone in their daily lives, the economics underlying the causes and solutions are not so obvious. Energy prices need to be calculated according to their full social costs. This will create opportunities to both improve health and reduce climate change

Access to energy is a fundamental issue for any country – both developed and developing – that does not have its own domestic natural resources. In countries such as Pakistan and Nigeria the lack of a direct supply of energy costs them 2% of GDP so it is clearly a major issue for growth.

Energy is one of the four overarching themes for the International Growth Centre and Professor Michael Greenstone, the research director of that programme has been setting out his thinking during the [IGC's Growth Week](#).

The challenge is to identify how to tackle those obstacles and bring all countries up to their full growth potential. While pollution may be visible to everyone in their daily lives, the economics underlying the causes and solutions are not so obvious.

Economics tells us that every day people make choices based on their personal preferences, their utility function and the relative prices of the options available to them. This is just as true for pollution as it is for purchases of bread and butter.

But energy is clearly critical for economic growth. There is a powerful correlation between the average amount that people spend on energy and the GDP per capital.”It is very difficult to achieve high levels of income – if not impossible – without lots of energy,” Professor Greenstone notes.

Power problems

At the same time too many people have problems accessing energy. In some parts of Africa and Asia just one in 10 people has access. While the average American consumes 13,246 kilowatt hours of energy a year, someone in Bihar state in India consumes 122kWh.

To put that in some sort of context, it takes 131 KWh to use a 60 watt bulb for six hours per day for a full year. It is therefore not hard to see that it is in developing countries that energy consumption is likely to grow fastest.

But without taking other measures an increase in growth will simply add to climate change. “Between 2010 and 2040 there will be a doubling of carbon emissions in developing

will be a doubling of carbon emissions in developing countries,” Professor Greenstone says, contrasting it with just 20% in OECD member states.

The danger is that fossil fuels are projected to provide most of that growth in energy consumption. The reason this is dangerous is that fossil fuels are particularly noxious in terms of climate change.

Opinions are useful but economists need data to be able to prove their point. In this case China set up a real life experiment when it drew an arbitrary line across the country and allowed coal-fuelled burners in the colder territories to the north of the line but not in the warmer regions to the south.

Analysis by Professor Greenstone showed a clear gap in life expectancy between the two regions – equivalent to about five years’ difference. “What is important and helps build the case is that all this increase in excess mortality is coming through via cardio-respiratory causes of death,” Professor Greenstone says.

Life expectancy

Astonishingly that five-year difference translates into a loss of 2.5 billion life years in northern China if one simply multiplies that by the population. But China is not the only country with air pollution problems. A similar analysis for India puts that loss at 2.1 billion life years. “These are not trial figures,” Professor Greenstone says. “They are as ubiquitous as the air. What is in the air is dramatically shortening the lives of many hundreds of millions of people.”

The forecasts for the expected rises in temperature and the impact on vulnerable regions are now very well known, not least due to the work by (Lord) Nicholas Stern of the LSE and his review commissioned by the UK Government in 2006. As Professor Greenstone puts it: “The world is going to get a whole lot hotter.”

If temperatures do rise as sharply as the forecasts indicate, research shows higher temperatures will reduce agricultural yields and increase mortality rates – to highlight just two outcomes.

One answer is to stop using fossil fuels. Yet even a back-of-the-envelope calculation, keeping temperature increases at 2 deg C requires people emitting “only” 1,000 gigatonnes of CO₂. But since 3,600 tonnes are already in the atmosphere, that requires all of us leaving the remaining fossil fuels in the ground. Some chance! The world has a poor record on leaving fossil fuels in the ground.

Global project

Restraining climate change is going to have to be a global project. So far, however those efforts have achieved minimal rewards. Some developed countries have taken steps to limit their emissions by setting targets and embracing instruments such as carbon markets. But any mitigation strategy will require large and expensive reductions in emissions from developing countries.

Yet to ask fast growing countries to take the necessary action to reach the 2 deg C target and save future generations from climate change would involve asking the current generation to sacrifice a large amount of wellbeing. For China alone this amounts to a loss to GDP of \$51 trillion.

So how can economics help? If it is the case that the excess of pollution is due to flawed pricing policies for energy then the answer is to mend those deficiencies. For starters, energy companies in developing countries often fail to collect the revenue due to them. It then falls to general taxpayers to fill the shortfall.

The large energy subsidies handed out by developing countries fail to benefit the poorest people. The world spends as much as \$60 billion a year on energy subsidies yet only 6% of natural gas and 9% of electricity subsidies reach households in the bottom 20% of the income bracket.

The result is that the price of energy is too low, the subsidies put a strain on government budgets and they create inequality for subsidizing rich and higher income users. But the real failure is that governments fail to price neither climate change nor the damage that pollution inflicts.

While an existing coal plant costs just US¢3.2 to produce one kWh of electricity, it costs US¢12.2 for a solar power facility – despite the fact that the latter produces zero carbon emission or particulates. If the government could force producers to pay the costs nuclear would immediately start to look competitive. “These distorted prices are forcing us to choose fossil fuels,” Professor Greenstone says.

Social costs

What are the policy implications? The first step is to increase collection of energy charges from users. At the same time governments should phase out universal subsidies and replace them with smarter systems that target the people that need help the most.

Basic economics says that when the price is too low, people with money will buy too much of it. If petrol in Venezuela, for example, costs US¢6 a gallon then people will make journeys they would not do if it were priced at European levels of US\$4.

Energy prices need to be calculated according to their full social costs. This will create opportunities to both improve health and reduce climate change. “The challenge for the IGC and those of us in research is to take those recommendations and fine tune them to the particular setting in particular countries,” Professor Greenstone says.