



Natural Capital Accounting in Action

Sweden's carbon accounting informs its carbon tax policy

As Swedish policymakers put together a climate bill, they relied on economic models to pinpoint policies that would reduce greenhouse gas emissions while minimizing costs to GDP, employment and growth. At the heart of this analysis was Sweden's sector-by-sector accounting of CO₂ emissions and energy use, in parallel with standard economic accounts. The emissions and energy accounts enabled detailed modeling of alternative proposals, which led to a finely tuned policy package with significant cost savings.

Sweden has long been a climate policy pioneer, adopting its first carbon tax in 1991. But a parliamentary group commissioned in 2008 to propose a timetable and strategy for slashing the country's greenhouse gas emissions, faced uncharted territory.

The new Climate Committee had to work out how to slow pollution without harming the economy. Which strategy would be most effective: should the emissions cuts be within Sweden's borders or should Sweden pay for reductions in other countries? How much could the country increase taxes in the already heavily taxed transport sector? And how would the Swedish economy as a whole respond to targets for 25, 30 or 40 per cent lower emissions by 2020?

A central factor was the amount of emissions from each economic sector, and fortunately the government had this data. Sweden has been compiling 'CO₂ emission accounts' for all sectors since 1993. It was one of the first countries to adopt the System of Environmental-Economic Accounting, a method for tracking environmental impacts that uses the same classifications as the System of National Accounts.

Integrating environment and economy

Using national accounts categories to gather data on greenhouse gases adds value compared to general environmental statistics because the emissions are linked to specific economic activities. The

In brief

- Sweden has been compiling 'CO₂ emission accounts' for all economic sectors since 1993.
- The accounts are categorized in the same way as national economic data, helping researchers to model the economic impacts of policies aimed at reducing emissions.
- Such modeling has shown the government how to improve the cost-efficiency of a proposed carbon tax policy. The new policy is expected to save 700,000 tonnes more CO₂ annually while costing the economy 25% less than the original proposal.

“ *The emissions accounts are very useful in our daily work. Our model [based on the accounts] is used in most climate policy analyses commissioned by the government.*”

Eva Samakovlis, head of research, National Institute of Economic Research (NIER), Sweden

data can be plugged into models to assess the economic effects of environmental policies.

The Climate Committee based its discussions in part on macroeconomic models of a type known as computable general equilibrium (CGE) models, relying on fairly disaggregated statistics. Labor, capital and monetary value of materials are all included as separate inputs in 25 economic sectors, along with taxes and subsidies. The committee reviewed CGE modeling studies of different emissions targets. By combining the CO₂ accounts data on the carbon intensity of industries with other national accounts data, it was possible to assess impacts of greenhouse gas cuts on the national budget, GDP, employment and sector-by-sector growth.

Would emissions cuts affect exports?

A key concern was damage to the export industry, as Sweden's small, open economy is highly dependent on trade. The modeling considered whether putting a domestic price on carbon would affect exports. The resulting GDP changes were important in determining how much to reduce Swedish emissions as opposed to supporting decarbonization overseas.

The government then asked the National Institute of Economic Research (NIER) to evaluate the Climate Committee's policy proposals and provide additional analysis. The model developed includes more detail on use of different energy sources (electricity, fossil fuels and wood) in each economic sector. This allowed for more refined analysis of the costs and economic consequences of carbon taxes, fuel standards and energy efficiency policies.

More cost-efficient policy

By accounting for emissions and energy, Sweden gained a stronger evidence base for policy and significant cost savings. For example, NIER's modeling based on the accounts led to changes to the carbon tax policy proposed by the Climate Committee. NIER recommended broadening the



 Iggesund, Sweden (netzanette/Flickr)

range of industries affected, among other factors. The researchers estimated that the changes could lower emissions about 50 per cent more — avoiding an extra 700,000 tonnes of CO₂ — while reducing costs by nearly one quarter. If the improved carbon tax were combined with emissions cuts overseas, the cost would fall ninefold, saving US\$1.1 billion.

These kinds of calculations can only be done if a country's environmental and economic statistics are integrated. "If we didn't have the emissions and energy accounts, we couldn't use the general equilibrium models," explains Samakovlis. "And without the general equilibrium perspective, we miss the interaction effects that occur in the economy."

An increase in the carbon tax was incorporated into the government's 2009 climate bill, along with other recommendations from NIER. The legislation, now in effect, promises that greenhouse gas emissions from part of the economy in 2020 will be 40 per cent below 1990 levels. So far, emissions have fallen by 10 megatons annually, around half of the reduction needed to reach the target. And the same CO₂ and energy accounts that shaped Sweden's climate plan will also help keep it on track. Economic projections from NIER's model are used by other Swedish agencies to produce regular forecasts of energy use and emissions.

What is natural capital accounting?

A set of objective data showing how natural resources contribute to the economy and how the economy affects natural resources. The accounts are an extension of the System of National Accounts. Natural capital accounting integrates natural resources and economic analysis, providing a broader picture of development progress than standard measures such as GDP.



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