



# Carbon Taxes to Move Toward Fiscal Sustainability

WILLIAM D. NORDHAUS

**A**long with most other high-income countries, the U.S. faces a major increase in the government debt relative to GDP. The most recent report of the Congressional Budget Office (CBO) in June 2010 estimated that the debt-GDP ratio will be between 65 and 72 percent in 2015 under alternative assumptions about the baseline fiscal policy. The debt ratio is increasing rapidly as a result of the collapse of revenues in the current extended downturn. In order to address this issue, the federal government has established the National Commission on Fiscal Responsibility and Reform. This group has been charged with “identifying policies to improve the fiscal situation in the

---

*William D. Nordhaus is Sterling Professor of Economics at Yale University.*

© Berkeley Electronic Press

medium term and to achieve fiscal sustainability over the long run.”

The Commission has heard many proposals for increases in revenues. Most involve standard sources such as income, consumption, or company taxes. I would like to discuss a different focus, which is the use of environmental taxes. I will concentrate here on the fiscal and economic advantages of a carbon tax.

## A ONE-HANDED PROPOSAL

**H**arry Truman is reported to have complained that he didn’t know a one-handed economist. His advisers were always saying, “On the one hand, on the other hand.” This is a one-handed proposal for a carbon tax. Simply put, there is no better fiscal instrument to employ at this time, in this country, and given the fiscal constraints faced by the U.S.

A carbon tax is a levy on emissions of carbon dioxide into the atmosphere; the term ‘carbon tax’ is shorthand for a carbon dioxide tax or CO<sub>2</sub> tax. The major source of carbon dioxide is the combustion of fossil fuels. The most efficient way to levy a carbon tax is on the carbon content of fossil fuels at the point of first sale or purchase. There should be no exemptions. I propose a schedule for the carbon tax rate below.

The desirable features of any tax are that it raises revenues in a manner that has minimal distortionary effect on the economy and reinforces other objectives of national policy. The following are the major reasons that a carbon tax meets these objectives. I will provide these in a summary form. The background literature provided below explains these in greater detail.

The Economists’ Voice September, 2010

- A carbon tax can raise a substantial amount of revenue over the coming decades.
- It is an instrument that has been used in other countries and is well understood.
- It is virtually the only tax under consideration that will increase economic efficiency because it reduces the output of an undesirable activity (carbon dioxide emissions). Every other tax that is under discussion will reduce economic efficiency.
- The carbon tax will move a long way toward implementing Congress's and the Administration's goals for climate change policy. The necessary condition for slowing climate change is to increase the price of carbon emissions. The carbon tax does this in a straightforward and transparent manner.
- A carbon tax will help meet international commitments that the U.S. has undertaken to reduce its carbon dioxide and other greenhouse gas emissions.
- A carbon tax will have substantial public health benefits because it will reduce harmful emissions, particularly those associated with burning coal.
- A carbon tax can buttress or replace many

inefficient regulatory initiatives and will thereby provide yet another improvement in economic efficiency.

- A carbon tax could supplement or replace the cap-and-trade approach to limiting emissions. From a fiscal point of view, it has the distinct advantage of scooping up the 'rents' that would accrue to those who receive free allocations of emissions permits under that plan.

Recent studies in economics have estimated the carbon tax that would be necessary to balance the economic costs of reducing carbon dioxide emissions with the gains in reducing the damages from climate change. The optimal carbon tax rises over time in real terms because damages rise with higher temperatures and a larger economy. Depending on the model and the objective, the optimal global carbon tax in current prices in 2015 would be between \$12 and \$25 per ton of carbon dioxide. The appropriate tax should rise about 6 percent per year in real or inflation-corrected terms to reflect the increasing cost of future emissions.

This level of tax would be justified purely on environmental grounds. There is no formula that would tell how much might be added for

purposes of raising revenues, but my judgment is that the upper end of the range just cited would serve a good balance of environmental and macroeconomic objectives. A reasonable approach would be a carbon tax in 2015 of \$25 per ton of carbon dioxide equivalent, levied on all sources of carbon dioxide emissions. This would be phased in as the economy returns to full employment.

To understand how a carbon tax would look on the ground, consider the prices of electricity and gasoline as examples. The average U.S. household consumes about 12,000 kilowatt hour (kWh) of electricity per year at an average price of about \$0.10 per kWh. If this electricity is generated from coal, that would lead to about 12 tons of carbon dioxide emissions. If the carbon price were \$25 per ton of carbon dioxide, this would increase the annual cost of 12,000 kWh of coal-electricity purchases from \$1,200 to \$1,500. By contrast, the costs of nuclear or wind power would be unaffected by a carbon tax because they use essentially no carbon fuels.

Most people are surprised to learn that the effect on gasoline prices is relatively small. The \$25 carbon tax would raise gasoline prices only 7 cents a gallon. The reason for the

difference between coal-electricity and gasoline is that the former has a high carbon content per dollar of expenditure, while the latter has relatively little.

#### POINTS OF INTERPRETATION

**I** add several points of interpretation and practicality.

First, the carbon tax has the advantage that its optimal structure is back-loaded. That is, the optimal environmental tax rate rises over time, and the revenues also therefore rise rapidly over time. This is particularly helpful in the current macroeconomic situation because it would not be wise to introduce a sharp increase in taxes while the economy is mired in a deep recession.

Second, the U.S. should work with other countries so that all major countries can introduce an internationally harmonized tax on carbon dioxide emissions. Such an approach will maximize the environmental benefits in curbing global warming and reduce the dangers of triggering trade wars revolving around different global warming policies.

Third, the issue of how rapidly to introduce the tax is an important one. A carbon tax has a relatively narrow base and would have a

major impact on carbon-intensive industries. For this reason, it would be wise to phase the tax in gradually, perhaps over a five-year period. A gradual introduction is far preferable to the alternative of providing exemptions to the heavily affected industries. A low but universal tax is more efficient than a high but narrow tax.

Fourth, there will be concerns that a carbon tax will damage the economy. We should always ask, “Compared to what?” The advantage of a carbon tax along the lines sketched here is that it improves the long-run sustainability of both the fiscal system and the environment relative to other options.

Fifth, there is no doubt that a carbon tax will disadvantage particular sectors or firms—those that are in highly carbon-intensive sectors. But it must be emphasized that the whole purpose of a carbon tax is to reduce the output of products that are carbon-intensive. Prices must rise in these sectors to ensure that consumers change their consumption patterns and that firms choose low-carbon technologies or invent new ones. There may be cases where severe hardships will occur, such as for coal miners. In this case, it would be useful

to craft transitional measures that will help workers and communities adapt to a world of high carbon prices rather than to shield them from the high prices and delay the transition.

Sixth, from an environmental point of view, it is necessary that the tax be stable, consistent, predictable, and durable. It should be a fiscal structure that the U.S. is committed to, so that businesses can rely upon it for long-term planning purposes. This is particularly important for electric utilities and other very large long-term capital projects.

Finally, should we be concerned about the regressivity of a carbon tax? Again, we must ask, compared to what? Existing research on this topic suggests that it has approximately the same distributional impact as a value-added tax or as the current payroll tax associated with social security. It has the same impact on energy prices as a cap-and-trade plan, but it allows the government to capture the revenues. A carbon tax is likely to be much less regressive than the impacts of global warming. Note as well that conspicuous consumption in gas-guzzling private jets, megayachts, and first-class travel will be subject to a big carbon tax levy.

**Table 1**  
**Projected Carbon Tax Revenues**

Year	Tax rate (in \$/ton CO <sub>2</sub> )	Emissions (in billions of tons CO <sub>2</sub> )	Revenues (in billions of current \$)	Revenues (in percent of GDP)
2005	0.0	6.1	0	0.00
2015	25.0	4.9	123	0.63
2020	39.7	4.6	184	0.74
2025	63.0	4.5	282	0.91
2030	89.8	4.3	386	1.00
2035	128.1	4.1	528	1.09

Assumptions:

1. Inflation at 2.5 percent per year
2. Long-term real GDP growth at 2.5 percent per year

#### IMPLICATIONS FOR REVENUES AND THE FEDERAL DEBT

A carbon tax can produce substantial revenues in the coming years. Based on my emissions projections, the recommended carbon tax would yield \$134 billion of current revenues in 2015, equal to about 0.6 percent of GDP. The calculations are shown in Table 1. Because the tax rate is rising sharply, the revenues would also increase substantially over time.

Recall the charge to the fiscal commission to improve the fiscal situation in the medium term and to achieve fiscal sustainability

over the long run. Some have focused on the short-term objective of targets for the federal deficit in 2015. While specific flow or deficit targets are useful guidelines, the ultimate target is to reduce the trend of net federal debt. This is best measured by the impact of a proposal on the net present value of taxes or spending.

We can appraise the carbon tax in terms of its impact on the net debt. The Congressional Budget Office (CBO) in its last full report in June 2010 projected that the baseline net government debt at the end of FY 2015 will be between 65 and 72 percent of GDP depending

upon the scenario (extended baseline and alternative fiscal, respectively). The present value of tax revenues from the carbon-tax proposal presented here is 15 percent of GDP through 2030 and 35 percent of GDP through 2050. (These are calculated at a nominal discount rate of 5 percent per year, which is the CBO estimate of the long-term government-borrowing rate). Over the medium term to 2050, then, a carbon tax can make a substantial contribution to fiscal balance.

Letters commenting on this piece or others may be submitted at [submit.cgi?context=ev](http://submit.cgi?context=ev).

#### REFERENCES AND FURTHER READING

**Nordhaus**, William (2008) *A Question of Balance: Weighing the Options on Global Warming Policies*. New Haven, CT: Yale University Press.

<http://yalepress.yale.edu/book.asp?isbn=9780300137484>.

**Nordhaus**, William (2010) "Economic aspects of global warming in a post-Copenhagen environment," Proceedings of the National Academy of Sciences (U.S.). <http://www.pnas.org/content/early/2010/06/10/1005985107>.

**Metcalf**, Gilbert E. and David Weisbach, “The Design of a Carbon Tax,” Harvard Environmental Law Review, Vol. 33, 2009.

[http://www.law.harvard.edu/students/orgs/elr/vol33\\_2/Metcalf%20Weisbach.pdf](http://www.law.harvard.edu/students/orgs/elr/vol33_2/Metcalf%20Weisbach.pdf).

**Congressional Budget Office**, The Long Term Budget Outlook, June 2010. [http://](http://www.cbo.gov/ftpdocs/88xx/doc8877/12-13-LTBO.pdf)

[www.cbo.gov/ftpdocs/88xx/doc8877/12-13-LTBO.pdf](http://www.cbo.gov/ftpdocs/88xx/doc8877/12-13-LTBO.pdf).

