



Making Budgets Green

Leading Practices in Taxation
and Subsidy Reform

IISD



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Foreword

Success stories are badly needed as a guide for implementing taxation and subsidy reforms. IISD believes, that such reforms can make good environmental sense as well as producing economic benefits. We want to put practical knowledge about how to do so in the hands of public sector administrators at all levels of government. Particularly in the hands of finance officials. They are given the tasks of holding costs in line while demonstrating the environmental, economic and social effectiveness of new fiscal measures. We have well developed theory about how market based approaches can deal with such issues. But case experience is in short supply.

This report provides a concise review of 23 cases of national and local initiatives of environmentally-based fiscal policies. It provides guidance to officials at municipal, state or province and national levels on measures that appear to be working and why. A companion book entitled *Green Budget Reform: An International Casebook of Leading Practices* provides much more information about each case, published by Earthscan, London 1995.

IISD drew upon leaders in this field from five organizations in Europe and North America. The cases were personally selected based on their extensive knowledge about efforts to address the role of taxes and subsidies in environment and sustainable development. We are indebted to all members of the team for the high levels of enthusiasm and participation at both the design and implementation stages of the work.

IISD's project on Government Budgets examines one of the most significant aspects of sustainable development – how decisions about taxes and subsidies can help achieve sustainable development. We believe the framework for assessing such decisions needs to be examined. That is our next challenge.

Arthur J. Hanson
President and CEO
International Institute for Sustainable Development



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The case studies herein are condensed from the full case studies published in *Green Budget Reform: An International Casebook on Leading Practices* (EarthScan, London, 1995). We thank the contributors both for their efforts and for the insights and knowledge they brought to the project.

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Why should policy-makers in Government and elsewhere be concerned with green budget reform?

Because government budgets are more than just tables of dry numbers. Any decision-maker will confirm how politically charged they can be, because implicit in all budgets are decisions about appropriate allocations of government resources. For a given amount of tax revenue, social programs compete with items like infrastructure development, military spending and debt servicing for fiscal priority. And when you consider that in North America alone, the Canadian and US federal governments raise and spend US \$1.6 trillion every year, the flows involved are far from trivial.

But budgets carry information about more than just the division of tax dollars between different programs. As environmental problems grow alongside consumption, pollution and population levels, it becomes increasingly clear that budgets have impacts on nature. This is particularly evident when budgets *over-allocate* natural resources, causing the carrying capacity of biological systems to be exceeded or non-renewable resources to be diminished. It is widely agreed in the West that many of our environmental problems arise as 'negative externalities' of an economic system which takes for granted — and thus undervalues — many aspects of the environment. Fresh air and clean water are but two examples of goods which go largely unpriced today.

Government budgets also set the stage on which other agents in the economy must perform. Taxes, subsidies and other budget innovations serve to constrain, stimulate or otherwise channel economic behaviour. Unfortunately, too many policies still work counter to, or are disconnected from, the wider goal of long run sustainability. For example, France's longstanding tax on undeveloped land actively encourages the conversion of unused natural habitat to 'productive' purposes (see Chapter 10). Instead, policies, taxes, subsidies and other budgetary mechanisms should harness economic behaviour that is at once socially and environmentally sound.

Making Budgets Green is about ideas for turning government budgets into more effective mechanisms of sustainable development. If governments are in the

business of fostering the lasting and constructive development of nations, then their budgets must balance more than columns of numbers. They must achieve aspects of sustainability. Unless economic concerns are integrated with social and environmental considerations, sustainable development that treats future generations equitably will remain elusive.

How can this book be helpful to policy-makers?

This volume is a companion guide to IISD's longer study, *Green Budget Reform: An International Casebook of Leading Practices*, edited by Robert J.P. Gale and Stephan R. Barg with Alexander M. Gillies and published by Earthscan, London in 1995. The pages which follow contain highlights from twenty-three case studies of green budget reform across North America and Western Europe. The case studies are reproduced in full in *Green Budget Reform*. As one of the first systematic attempts at assessing the track record of recent green fiscal reforms in the West, it is very much on the leading edge of environment and development policy.

What have been some of the major experiences in North America and Western Europe with green budget reform to date? Have they been successful? What lessons have been learned? These are the questions addressed in these pages. Their relevance to policy-makers could hardly be over-emphasized. Green budget reform is a new field with large information gaps. Experiences with practical implementation are at a premium, as are dispassionate assessments of these experiences. This state of affairs, characterized by more questions than answers, is completely understandable given that such reforms really only began to be instituted in any significant number during the last decade. We attempt to fill in some of the blanks.

In order to be most useful to policy-makers, the chapters are organized in a standardized, easy-to-follow format. Each reform policy is first outlined briefly. The main policy elements are described, and wider policy issues are discussed. Key lessons, results and the policy history are highlighted for easy readability, and graphs and tables are added where helpful in illustrating specific experiences with different policies.

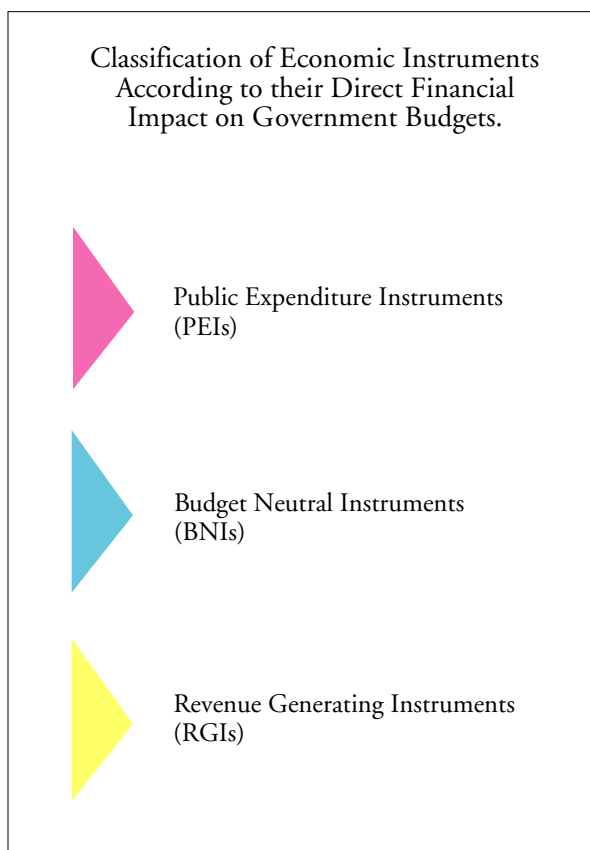
In order to streamline the analysis somewhat, we have sorted the cases using a rough-and-ready classification which highlights the revenue-generating nature of each policy package:

Public Expenditure Instruments (PEIs) cost governments money. They show up as spending allocations in budgets. Compensation payments and subsidies are only two of many possible examples. PEIs are coded using a magenta arrow next to the chapter title.

Budget Neutral Instruments (BNIs) neither cost nor generate money for governments. They simply redistribute it. 'Feebate' programs, which combine charges with a rebate mechanism, are a common example. BNIs are coded in blue.

Revenue Generating Instruments (RGIs) raise money for government budgets. Pollution taxes, charges and levies generally fit into this category. RGIs are coded in green.

Figure 1



It should be mentioned that because the subject matter of the case studies is new and in a very real sense still being formed, certain details will invariably go missing and statements may be open to debate. The nature of the material and the compactness of presentation mean that the lessons extracted in particular should be taken

more as propositions than proofs. As we begin to delve into what constitutes good green budget reform, a myriad of questions suggest themselves. And as the floodgates of change open in the fiscal arena, we must simply 'go with the flow' as best we can. It is best to think of this guide as a first run through green budget reform, imperfect but adventurous, like much of today's literature on the new 'information highway'.

Rough edges notwithstanding, however, policy-makers interested in fashioning fiscal reforms of their own should be able to extract tangible benefits from these case studies. Moving from a vague desire to integrate fiscal policy and sustainable development, to actual and successful implementation is a formidable challenge. Our casebook aims to make this task a little easier by providing structured descriptions of actual experiences with newly introduced economic instruments.

But readers must remember that economic instruments are extremely sensitive tools, the appropriateness of which depends on the situation. Just as surgeons do not make a habit of closing their eyes at the operating table, so policy-makers should not apply economic instruments blindly. They must understand the wider policy context surrounding any new initiative, to fashion a set of policies which matches conditions on the ground. Just because a combination of economic instruments and regulations is successfully applied somewhere, one must not assume that it can be applied elsewhere in a wholesale manner. The policy ideas contained in this volume should be adapted or mixed together as needed to fit the demands of different situations.

What are the main lessons of the case studies?

A number of points stand out. First, green budget reforms can be highly effective. Second, success tends to be enhanced when different policies are designed in a complementary fashion. Third, markets can be harnessed to drive technology and economic development. Fourth, the importance of political considerations should not be underestimated. Fifth, a wide array of design elements can help improve policy results.

What follows in Figure 2 is a key to some of the main policy lessons gleaned from the case studies. They are organized under the general headings described above, although in some cases there exists some overlap. Each lesson is tied to the chapter or range of chapters in which it emerges, to allow readers to concentrate on those areas of most interest to them.

We hope you find *Making Budgets Green* full of good ideas that policy-makers around the world can adapt to the lives of their peoples!

Figure 2

Green budget reforms can be very effective.

Subsidies can be a powerful tool for achieving environmental policy goals (Ch. 2 – *Tax Credits and the Development of Renewable Energy in California*, and others).

Taxes can also be a powerful tool for achieving environmental goals (Ch. 13 – *Tax Tools for Climate Protection: The US Ozone-Depleting Chemicals Tax*, and others).

Budget-neutral economic instruments may be suitable for reducing pollution without harming industrial competitiveness or raising industry opposition (Ch. 11 – *The Nitrogen Oxide Charge on Energy Production in Sweden*).

Negative impacts of environmental taxes on competitiveness can be offset by border adjustments, although hostility toward protectionist measures in trade circles may make this an unpopular solution (Ch. 13 – *Tax Tools for Climate Protection: The US Ozone-Depleting Chemicals Tax*).

The polluter pays principle is capable of generating both wide acceptance and positive results (Ch. 14 – *The System of Water Charges in France*).

Environmental concerns can be integrated into development policy (Ch. 23 – *The Louisiana Environmental Tax Scorecard*).

Policy successes tend to be greater when different policies are designed to complement each other.

Tax and regulatory measures can enhance each other (Ch. 13 – *Tax Tools for Climate Protection: The US Ozone-Depleting Chemicals Tax*).

Tax changes and emissions standards, for instance, work best in parallel (Ch. 5 – *Tax Differentials for Catalytic Converters and Unleaded Gasoline in Germany*).

Inconsistent policies can dampen the intended effects of particular policies, making desired impacts harder to achieve (Ch. 6 – *Replenishing the Prairies: The Canadian Permanent Cover Program*).

Fiscal incentives and regulations on one hand and institutional reform on the other can also complement each other (Ch. 2 – *Tax Credits and the Development of Renewable Energy in California*).

Markets can be harnessed to drive technology and economic development.

Tax credits can serve both environmental and economic development goals by accelerating the commercialization of promising technologies (Ch. 2 – *Tax Credits and the Development of Renewable Energy in California*).

Market-driven technological advance can drastically increase the environmental effectiveness and decrease the environmental cost of large green taxes (Ch. 13 – *Tax Tools for Climate Protection: The US Ozone-Depleting Chemicals Tax*).

Political considerations are important.

Laying a solid foundation for economic instruments in political circles prior to their formal introduction can repay handsomely later in terms of public support (Ch. 4 – *The Tax for Fuel Conservation in Ontario*).

It is difficult to justify a revenue-neutral tax when a government is running a large deficit (Ch. 4 – *The Tax for Fuel Conservation in Ontario*).

The impetus to correct old, outdated policies can sometimes be gained by framing change in light of new and emerging demands in the political arena (Ch. 7 – *The Reform of the European Union Common Agricultural Policy*).

The effectiveness of taxes and price signals in shifting behaviour can be enhanced if people feel they have choices (Ch. 9 – *Dutch Policies Aimed at Diminishing Mineral Releases in Agriculture*, and 16 – *Iowa's 1987 Groundwater Protection Act*).

Policy-makers should be wary of implementing unsustainable policies because they may have unusual staying power and be difficult to remove once introduced (Ch. 10 – *The Tax on Undeveloped Land (TUL) in France*).

Achieving environmental goals without suffering severe economic dislocations sometimes requires that concerted international action be taken (Ch. 12 – *Carbon Dioxide Taxes in Sweden*).

Politically popular justifications for new policies may not always be readily justifiable on economic grounds (Ch. 19 – *A Possible Landfill Levy in the UK: Economic Incentives for Reducing Waste to Landfill*).

Figure 2 (continued)

<p>Attempts to change the <i>status quo</i> can meet with political resistance (Ch. 21 – <i>The User Pay Waste Management Initiative in the Victoria Capital Regional District, British Columbia</i>).</p> <p>Success depends on political sensitivity as well as a supportive political environment (Ch. 23 – <i>The Louisiana Environmental Tax Scorecard</i>).</p> <p>An atmosphere of stability and certainty can enhance the effectiveness of fiscal incentives (Ch. 2 – <i>Tax Credits and the Development of Renewable Energy in California</i>).</p> <p>Other design issues which should be considered include:</p> <p>Good budget reform requires careful consideration of the interaction between a tax subsidy and the broader tax system (Ch. 2 – <i>Tax Credits and the Development of Renewable Energy in California</i>).</p> <p>Government subsidies can be introduced as temporary measures and be phased out when wider policy goals are achieved (Ch. 3 – <i>Wind Energy in Denmark</i>).</p> <p>Timing is important. For example, a recession is a poor time to introduce a new tax (Ch. 4 – <i>The Tax for Fuel Conservation in Ontario</i>).</p> <p>There is always room for improvement (Ch. 4 – <i>The Tax for Fuel Conservation in Ontario</i>).</p> <p>Revenue-neutrality need not be achieved with a single instrument alone, as it can also be achieved with an array of economic instruments (Ch. 5 – <i>Tax Differentials for Catalytic Converters and Unleaded Gasoline in Germany</i>).</p> <p>Tax exemptions and other subsidies seem to have a psychological or behavioural effect that is significantly greater than the direct pecuniary benefits alone would suggest (Ch. 5 – <i>Tax Differentials for Catalytic Converters and Unleaded Gasoline in Germany</i>).</p> <p>Doing 'too much' need do no harm, although the same results might be achieved more economically with fewer policy measures (Ch. 5 – <i>Tax Differentials for Catalytic Converters and Unleaded Gasoline in Germany</i>).</p> <p>'Policy overkill' should be avoided, however, so as not to unfairly penalize certain groups in society (Ch. 19 – <i>A Possible Landfill Levy in the UK: Economic Incentives for Reducing Waste to Landfill</i>).</p>	<p>Persistence pays and commitment counts (Ch. 5 – <i>Tax Differentials for Catalytic Converters and Unleaded Gasoline in Germany</i>).</p> <p>Policies that do not address problems in a comprehensive manner risk providing inadequate environmental protection (Ch. 9 – <i>Dutch Policies Aimed at Diminishing Mineral Releases in Agriculture</i>).</p> <p>Policy design should take into account the potential impact a new policy may have on the fundamental ability of the policy to continue functioning in the future (Ch. 15 – <i>Levy on Surface Water Pollution in the Netherlands</i>).</p> <p>The indirect benefits of educational and demonstration policies can be significant (Ch. 16 – <i>Iowa's 1987 Groundwater Protection Act</i>).</p> <p>Effective resource taxes often require a competent administrative framework (Ch. 17 – <i>Water Taxes in Germany</i>).</p> <p>Policy creation through decentralized experimentation can ultimately lead to stronger results (Ch. 17 – <i>Water Taxes in Germany</i>).</p> <p>The efficiency commonly attributed to economic instruments may be lost if a levy is applied uniformly in all cases (Ch. 19 – <i>A Possible Landfill Levy in the UK: Economic Incentives for Reducing Waste to Landfill</i>).</p> <p>Sunken costs can impede innovation (Ch. 21 – <i>The User Pay Waste Management Initiative in the Victoria Capital Regional District, British Columbia</i>).</p> <p>Innovative solutions to social problems can be integrated into green budget reforms (Ch. 22 – <i>SARCAN: Promoting Recycling and the Employment of Disabled People in Saskatchewan</i>).</p> <p>More specific lessons concerning different sectors include:</p> <p>Energy/Automotive -</p> <p>A decentralized energy supply can function successfully alongside a more centralized energy system (Ch. 3 – <i>Wind Energy in Denmark</i>).</p> <p>A feebate program can improve the average fuel efficiency of new cars significantly (Ch. 4 – <i>The Tax for Fuel Conservation in Ontario</i>).</p>
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Figure 2 (continued)

<p>Agriculture -</p> <p>'Decoupled payments' can bring substantial environmental benefits by replacing production-tied payments with compensation for conservation management initiatives (Ch. 8 – <i>Environmentally Sensitive Areas in the UK: Economic Incentives for Sustainable Farming</i>).</p> <p>Water -</p> <p>Water charges can make users fully aware of the value of water resources in general and of the costs of water pollution in particular. They also send a signal that Government is not responsible for bearing the inexorably rising costs of water treatment (Ch. 14 – <i>The System of Water Charges in France</i>).</p> <p>Water resource taxes more accurately reflect true ecological costs when based on water origin rather than on total usage (Ch. 17 – <i>Water Taxes in Germany</i>).</p> <p>Waste Management -</p> <p>Despite a certain degree of success with recycling credit schemes, recycling credits are not the only tool of waste management policy. Better waste management can only come about with integrated waste management systems (Ch. 20 – <i>Recycling Credits in the UK: Economic Incentives for Recycling Household Waste</i>).</p> <p>Alternatives to traditional waste disposal should exist before a user pay system is implemented (Ch. 21 – <i>The User Pay Waste Management Initiative in the Victoria Capital Regional District, British Columbia</i>).</p> <p>Illegal or irresponsible dumping can be minimized if anticipated (Ch. 21 – <i>The User Pay Waste Management Initiative in the Victoria Capital Regional District, British Columbia</i>).</p> <p>A pay-by-volume does not create all the appropriate incentives (Ch. 21 – <i>The User Pay Waste Management Initiative in the Victoria Capital Regional District, British Columbia</i>).</p> <p>Practical limitations exist to a user pay system (Ch. 21 – <i>The User Pay Waste Management Initiative in the Victoria Capital Regional District, British Columbia</i>).</p> <p>Concerted national and international effort is needed to address issues like over-packaging and markets for recycled materials, irrespective of how successful a local waste management initiative might be (Ch. 22 – <i>SARCAN</i>:</p>	<p><i>Promoting Recycling and the Employment of Disabled People in Saskatchewan</i>).</p> <p>Environment and Development Policy</p> <p>The emissions to jobs ratio can be a useful tool of development policy (Ch. 23 – <i>The Louisiana Environmental Tax Scorecard</i>).</p> <p>The tax system can be effectively used to convey social values (Ch. 23 – <i>The Louisiana Environmental Tax Scorecard</i>).</p> <p>Integrating economic instruments into an existing tax system is a relatively uncomplicated means for both firms and governments to create incentives for environmentally friendly activities (Ch. 24 – <i>Accelerated Depreciation of Environmental Investments in the Netherlands</i>).</p>
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2

Tax Credits and the Development of Renewable Energy in California

The Policy in Brief

Economic Instrument: Tax credits for renewable electricity generation

Problem: The environmental problems of relying on fossil fuels and nuclear power generation, and the need for enhanced energy security by diversifying supply

Goal: To stimulate solar, wind, geothermal, biomass and other renewable electric generation technologies

Description: An innovative policy framework combining regulatory and fiscal inducements has made California's renewable energy sector the most successful in the world

Administering Institutions: Various US federal and Californian agencies

Key Stakeholders: Federal and state governments, electric utilities, energy users, renewable energy developers and the environmental community

An Overview

California leads the world in non-conventional renewable electricity generation. This enviable position was, in large part, due to a combination of tax credits and regulatory reforms designed to stimulate renewable energy production. Renewable electric generation in California has benefitted from federal and state tax credits and a state property tax exemption. Introduction of the credits was primarily motivated by energy security concerns, but support for their continuation in the 1980s and 1990s has increasingly been based on environmental concerns. Credits have been available for both electric and non-electric applications of renewable energy including commercial and residential uses, but this case examines only the commercial electricity sector.

These credits function like a regular investment tax credit. They reduce the income tax liability of individual and corporate taxpayers who invest in eligible renewable energy projects. With a credit rate of 10%, a taxpayer

who invests \$10,000 receives a \$1,000 income tax credit. Federal credits reduce federal income tax payments, and state credits reduce state tax payments. Typically, credits are only available if tax is actually owed in the current year, but can be carried forward or back to reduce a future or past year's tax liability. A different type of credit, this time based on production, was introduced in the 1992 National Energy Policy Act. The production credit promoted wind and biomass electricity generation across 10 year blocks of time. The 1992 Act also made permanent the 10% investment credit for solar and geothermal electric generation.

During the early 1980s, income from solar and wind energy development was subsidized rather than taxed. This resulted from the combined effect of the federal and state credits together with various other generous tax breaks available at the time. In addition to tax credits, solar electric generating plants in California have benefitted from a state property tax exemption, adopted in 1980, which further lowers their tax burden. Substantial investment therefore was attracted to renewable energy in California. This included several well-publicized wind energy projects of dubious technical merit developed by tax shelter experts. The federal Tax Reform Act of 1986 repealed numerous special breaks and loopholes in the national tax code that had led to widespread tax shelter activity throughout the economy. The federal and state tax credits promoting renewables reached a plateau between 1981 and 1986 in the size of credits and the number of technologies covered.

Most electricity in the US is generated by integrated electric utilities that also transmit, distribute and sell power within exclusive service territories. With the 1978 passage of the national Public Utilities Regulatory Policies Act (PURPA), this traditional monopoly over generation has eroded somewhat. PURPA required utilities to buy power from independently owned renewable energy plants and cogeneration facilities at a price equal to the utility's own cost of meeting the same energy need.

California moved more aggressively to implement PURPA than any other state. The California Public Utilities Commission (CPUC) reduced the regulated profit rate of Pacific Gas and Electric, the state's largest utility, as a penalty for early resistance to PURPA

Policy History at a Glance

1976	1978	1980	1986	1992
California credits for renewable energy first introduced	Federal credits introduced under Carter's National Energy Plan; PURPA reduced monopoly power	California property tax exemption for solar plants	Tax Reform Act removed numerous federal tax loopholes	Federal production credit for wind and biomass energy introduced in National Energy Policy Act

requirements. This action prompted California's three investor-owned utilities to cooperate in earnest with the fledgling renewables industry. The CPUC also facilitated development of several standard power purchase contracts ensuring that small developers could obtain reasonable terms from the larger utilities at greatly reduced transaction costs.

Policy Issues

California's development of wind and solar power is especially notable, though these two resources still account for only a small share of the state's power supply. Wind and solar resources could potentially make a major contribution to meeting future energy needs in both developed and developing countries. However, the technologies for harnessing these resources are generally

less mature than other renewables technologies. In the early 1980s, wind and solar electric generation did not exist anywhere on a significant commercial scale. A decade of commercial development in California brought major improvements in performance and cost-effectiveness that could not have been achieved in the laboratory alone.

Some Further Reading

Johansson, T.B. et. al. (ed.) (1993). *Renewable Energy: Sources for Fuels and Electricity*, Washington, DC, Island Press.

Lotker, Michael (November 1991). *Barriers to the Commercialization of Large-Scale Solar Electricity: Lessons Learned from the LUZ Experience*, Scandia National Laboratory.

Results:

- Renewable electricity generation in California nearly quadrupled over the decade, from 1983 to 1992. In 1983, most of the non-hydro renewable power supplied to the California grid came from utility-owned plants at the Geysers geothermal field. In the subsequent decade, generation from all four renewable sources grew substantially. Non-utility generators produced all of the new biomass, wind and solar power, and most of the new geothermal power.

	1983		1992	
	mill. kWh	Percent	mill. kWh	Percent
Geothermal				
– utility	6,341	3.2%	9,441	3.8%
– non-utility	697	0.3%	7,050	2.9%
Biomass	731	0.4%	7,362	3.0%
Wind	52	0.0%	2,707	1.1%
Solar	2	0.0%	700	0.3%
Total	7,805	3.9%	27,260	11.1%

Figure 1. California Renewable Electric Generation by Fuel Type, 1983 and 1992. (Generation for each fuel type shown as percentage of total state power supply, including imports. Data from Electricity Resource Planning Office, California Energy Commission.)

- By 1992, 11% of California's electricity came from non-hydro renewables, compared with just 4% in 1983. The 1992 US average was much lower, standing at only 0.4%.
- By 1992, California had an installed wind capacity of 1,655 megawatts, compared with 455 megawatts in Denmark, the next largest wind energy producer. This capacity is expected to nearly double following the utility resource auctions conducted in 1993.
- New wind turbines developed in California today are fully cost competitive with conventional fossil fuel power plants. Significant advances in commercial solar electric generation were also achieved.
- In just six years, one company called LUZ reduced the cost of solar thermal electricity from \$0.25/kWh for its first plant to \$0.08/kWh for the ninth plant.

Lessons:

- Tax Subsidies can be an effective environmental policy tool.
- Good policy design requires careful consideration of the interaction between a tax subsidy and the broader tax system.
- Fiscal incentives, regulations and institutional reform can complement each other.
- Tax credits can serve both environmental and economic development goals by accelerating the commercialization of promising technologies, such as wind turbines and solar thermal units.
- A stable policy atmosphere enhances the effectiveness of fiscal incentives.

3 Wind Energy in Denmark

The Policy in Brief

Economic Instrument: Wind turbine investment subsidy, electricity tax repayment and funding for research and development in wind technology

Problem: Energy production from non-renewable or polluting sources

Goal: 10% of national energy production from wind power by the year 2000

Description: Denmark's wind energy program is a leading example of how government support can make an alternative energy source commercially viable. Subsidies for privately owned wind turbines stimulated demand and created a customer base for a wind energy industry, while government funded R & D led to more reliable and cost effective wind turbines. The program created a thriving new industry in wind turbines

Administering Institutions: Ministry of Energy and National Energy Research Centre

Key Stakeholders: Ministry of Energy, National Energy Research Centre, power generating companies, private investors including some 50,000 Danish families

An Overview

Denmark has, within the last 15 years, invested more in wind energy than any other European country. This is consistent with Denmark's long tradition of using wind as an energy source. The first wind turbine which generated electricity was built in 1891. Today's wind energy program is part of an overall energy plan published in 1976. The main objective of investing in wind energy in 1976 was to make Denmark less dependent on imported energy supply. Subsequently, environmental arguments have become increasingly important.

An investment subsidy introduced in 1979 covered 30% of investment costs in wind turbines, subject to approval by the National Energy Research Centre. The investment subsidy was not only a stimulus for the construction of wind turbines but also a stimulus for market forces to better develop a wind turbine industry. Wind turbines became an attractive investment, and manufacturers enjoyed a customer base of 200 to 300 wind turbines per year. By 1989 government support was no longer necessary to make private investment in wind turbines attractive, and the subsidy was abolished. Small- and medium-sized wind turbines quickly became reliable and cost-effective. Technological problems associated with large wind turbines were more complicated than expected, however, and large wind turbines (1,000 kW or more) are still not commercially viable due to technical problems. Subsidies were only used to stimulate the development of privately owned wind turbines. No direct financial support was given for wind power investments to the larger power generating companies, though support was provided indirectly for

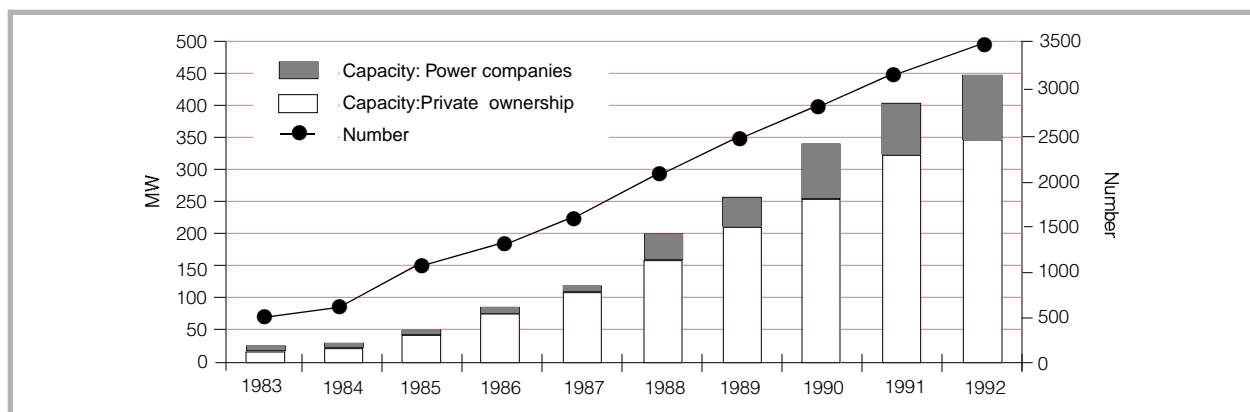


Figure 1. Wind energy: Accumulated capacity and number of turbines (Source: Energy Trends)

Policy History at a Glance

1979

30% subsidy introduced for wind turbine investments

1985

Power generating companies agreed to install 100 MW wind power by 1990

1989

30% subsidy removed

Dec 1991

Power companies' goal reached, another 100 MW planned

research and development. At present, privately owned wind turbines represent about 80% of the installed capacity.

One of the main drawbacks of wind energy is, of course, that electricity can only be produced where there is wind. In Denmark this problem was avoided by connecting the private wind turbines to the national grid, allowing fluctuations to average out and so provide a constant supply. The requirement that only wind turbines approved by the Test Station for wind turbines at the National Energy Research Centre could be granted the subsidy speeded up the development of wind turbines for private ownership, including both small- and medium-sized wind turbines. The Test Station became a technological centre where manufacturers and others could get advice, leading to larger, more reliable and more cost-effective wind turbines.

Electricity produced from wind energy is currently not only environmentally friendly but also competitive in price to conventionally generated electricity.

Policy Issues

The success of the Danish wind energy industry is due to a number of factors in addition to government support. These include rapid technological development and public support. In order to become a success, a new technology has to become commercially attractive within a reasonable time period. Otherwise people will lose interest and the customer base will disappear. This occurred with solar energy in Denmark. With wind technology, however, people's expectations were met.

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- Results:*
- Temporary government support created a competitive industry through the development of a new technology — wind turbines.
 - By the end of 1992, 3,430 wind turbines were generating nearly 3% of Denmark's electricity. Denmark is responsible for more than 60% of Europe's total wind-generated power. Only California is comparable.

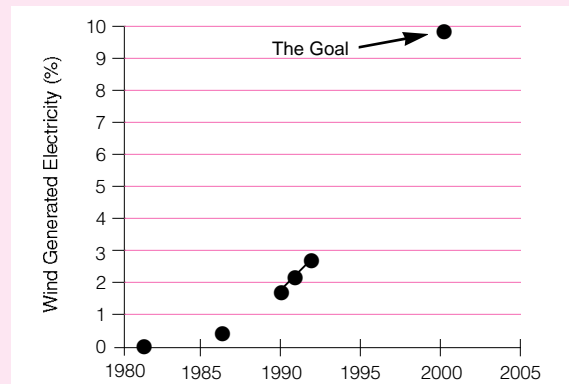


Figure 2. The percentage of wind generated electricity (source: Christensen, Wind power)

- Increased use of electricity from wind turbines has reduced demand for conventional power plants. Every kWh of energy produced by a wind turbine reduces pollution from coal-fired plants by 5-8 grams of sulphur dioxide, 750-1,250 grams of carbon dioxide, 3-6 grams of nitrogen oxides, 0.275-0.470 grams of particulate and 40-70 grams of slag and fly ashes.

- Lessons:*
- A decentralized energy supply can be successfully implemented alongside a centralized energy supply system.
 - Government subsidies can be introduced as temporary measures, being phased out when wider policy goals are achieved.
 - Environmental goals that can be met by the development of new technology are also economic development opportunities.

4

The Tax for Fuel Conservation in Ontario

The Policy in Brief

Economic Instrument: Consumption tax and tax rebate

Problem: The high environmental impact of the automobile, specifically as fuel consumption contributes to air pollution

Goal: Environmental protection, energy conservation and increased revenues

Description: 'Feebate' scheme to reward or penalize fuel conservation behaviour when purchasing new cars

Administering Institution: Ontario Ministry of Finance

Key Stakeholders: Car purchasers and manufacturers, and the provincial government

An Overview

Ontario's Tax for Fuel Conservation (TFC) evolved through a number of stages. In 1989 the Ontario government (Liberal) introduced an earlier tax on car purchases — the Tax on Fuel-Inefficient Vehicles (TFV). The tax varied in proportion to highway fuel consumption ratings above a base level of 9.5 litres per 100 kilometres. In 1991 the newly elected government (New Democratic Party) amended the TFV by doubling its rates, extending coverage to 250 car models representing about 12% of passenger cars, lowering the threshold at which the tax is applied, and including sports cars for the first time.

Opposition resulted in modifications to the tax as follows: tax rates for cars in the 8.5 to 9.5 litres per 100 km range were lowered; tax rates for sports cars were reduced by around two-thirds, and a \$100 rebate was introduced for the most fuel-efficient cars (defined as those below 6 litres per 100 km). This last element made Ontario's tax the first automobile feebate scheme in North America. The new tax was renamed the Tax for Fuel Conservation (TFC).

Experience with the TFC suggests a number of possible improvements:

- The tax brackets should be further differentiated. Currently the tax is a flat \$75 over almost 90% of car purchases. It does not, therefore, influence the bulk of the market.
- The tax should be advertised more. Currently most car buyers only learn of the tax after they have made the decision to purchase a car.
- Both the refund and tax rate should be larger if they are to provide sufficient financial incentive to change purchasing behaviour. Currently they represent only a small fraction of a new car's purchase price — less than 1% in the case of the rebate, for example.
- Rates should also be broadened to include light trucks and vans.

Policy Issues

Nearly all of the feebate's impact comes from changes implemented by manufacturers. This suggests that feebates applied at the provincial or state level could have a limited impact because they may not be sufficient to lead manufacturers to make the necessary investments in new technology. Through a feebate, a small jurisdiction may succeed in changing consumers' behaviour but it may not succeed in changing manufacturers' behaviour. California and perhaps New York, because of their size, are possible exceptions. If this analysis is correct, a more effective feebate program could be designed at the national level or for the industry as a whole.

Wider economic trends make it difficult to quantify the precise relationship between the TFC and observed changes in auto sales. For example, the economic recession in Ontario, together with an increase of 3.4 cents per litre in provincial gasoline excise taxes since April 1991, hamper our ability to draw firm conclusions.

Policy History at a Glance

1989

Tax introduced on fuel-inefficient new car sales, the TFV

1991

Modified TFV — doubled rates extended coverage, incl. sports cars

Jun 1991

Name changed to TFC, some rates reduced, \$100 rebate added

Further differentiation of TFC incentives proposed

The TFC has, nonetheless, set a precedent in policy circles. The state of Maryland has implemented a similar feebate scheme, and Californian politicians are considering a comparable initiative based on air emissions in addition to fuel-efficiency ratings.

International trade implications must also be considered. For example, European car manufacturers have expressed concern that the tax discriminated against them. This raises the question of the extent to which a jurisdiction can introduce an environmental measure without negative trade repercussions.

The Ontario government paid a high political price for introducing the fuel tax, in terms of broad criticism from the car industry, labour and even environmental groups. These reactions underscore the importance of developing a strong political constituency for 'green' taxes. Without such a constituency in place, governments may see the introduction of green taxes as being too politically risky, particularly when compared to well-tried regulatory approaches. A full feebate scheme would make this easier.

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- Results:*
- Since the TFC came into effect in 1991, there appears to have been a shift in consumer purchases toward smaller, more fuel-efficient cars.
 - Between 1983 and 1991, the market for fuel-efficient cars was fairly flat, averaging about 2.4% of car sales in Ontario. The market for inefficient cars (averaging more than 9 litres per 100 km), on the other hand, declined from 36 to 5% of sales.
 - The sale of fuel-efficient cars as a percentage of total car sales increased from 2.6% in 1990, to 5.3% in 1991, to 7.4% in 1992.
 - The TFC raised \$30 million in government revenues in 1992.
 - Some of the fuel savings may be lost as a result of increased travel.
 - Some consumers benefit from feebates.
 - Manufacturers' profits may fall as factories struggle to retain market share by increasing expenditures to improve fuel efficiency. The impact on manufacturers will vary depending on the average fleet efficiency of their cars.

- Lessons:*
- The introduction of product charges can have widespread political repercussions. Laying a solid foundation for economic instruments in political circles prior to their formal introduction can repay handsomely later in terms of public support.
 - It is difficult to justify a revenue-neutral tax when a government is running a large deficit.
 - Timing is important. A recession is a bad time to introduce a new tax.
 - A feebate program can improve the average fuel efficiency of new cars significantly.
 - Refinements can still be made to Ontario's Tax for Fuel Conservation to make it more effective. Fortunately, feebates are inherently more flexible than command and control legislation.

Tax Differentials for Catalytic Converters and Unleaded Gasoline in Germany

The Policy in Brief

Economic Instrument: Cash subsidies and grants and a tax repayment for catalytic converters, combined with taxes on leaded gasoline and cars without catalytic converters

Problem: Air pollution from road traffic was hurting Germany's forests

Goal: The reduction of vehicle emissions, including carbon monoxide, unburnt hydrocarbons and nitrogen oxides, and the acceptance of the catalytic converter as the new technical standard for passenger cars

Description: A feebate scheme incorporating tax differentials favouring compliance with low emissions standards, tax exemptions on cars registered with catalytic converters, and cash incentives for retrofitting existing cars with catalytic converters

Administering Institutions: German federal government and German *Länder* or states

Key Stakeholders: German federal government, EU, car owners, and German *Länder*

An Overview

Catalytic converters — which only run on unleaded fuel — have provided the German federal government with an opportunity to play a leadership role within the EU in lowering vehicle emissions.

Germany's transition to catalytic converters and unleaded gasoline required EU approval for both legal and practical reasons. Agreement was obtained with the Luxembourg Compromise of June 1985, clearing the way for the implementation of a number of program initiatives decided by the German federal government in the autumn of 1983. These included:

- 1) Tax differentials in favour of unleaded gasoline
In 1985, the federal government amended the Federal Act on the Taxation of Fuels and

introduced tax differentials in favour of unleaded gasoline, starting from January 1, 1986. The initial tax differential was 0.04 DM per litre, but was subsequently raised to 0.10 DM per litre to provide an inducement great enough to change consumer behaviour. The German fuel tax accounts for roughly two-thirds of the price of gasoline, and the federal government receives the revenues of the fuel tax. Despite great success in the growth of the unleaded gasoline market — now on the order of 90% of all gasoline purchases for passenger vehicles — the differential has not been reduced. This induces car owners equipped with catalytic converters to stick with unleaded gasoline.

- 2) Tax incentives to promote catalytic converters

Car owners in Germany pay an annual tax under the Federal Act on the Taxation of Motor Vehicles of 1979. In order to promote catalytic converters, the federal government (a) introduced tax differentials for low and reduced emission vehicles, (b) exempted new cars equipped with catalytic converters from the car tax for a certain period of time. Although the tax is regulated by a Federal Act, it is the *Länder* which receive the tax revenues and administer the tax. This is done under a revenue-neutral framework.

- 3) Subsidy to convert older cars.

The government offered cash for retrofitting existing cars with catalytic converters.

The annual tax for passenger cars, calculated according to the capacity of the engine, was given an added wrinkle. From January 1, 1986, onward, cars were divided into one of three new tax sub-categories — for low, reduced and regular emissions. The comparatively high car tax on diesel-engined passenger cars was intended to offset the comparatively low fuel tax on diesel. Though diesel-engined cars require less fuel, they cause air pollution from soot particle emissions.

The most striking feature of the federal government's program on catalytic converters was the temporary exemption from the car tax granted to anyone registering a new, catalytic-converter-equipped car. Initially these exemptions were high — up to DM 3,000 per car — to encourage car owners to buy the new and expensive converters. The tax exemptions were necessary

Policy History at a Glance

Fall 1983

German federal government created the framework for a program regulating catalytic converters and unleaded petrol

Jun 1985

Luxembourg Compromise at EU level, marking the implementation of the national program

Mid-1990s

Positive results achieved after ten years

initially in order to persuade car owners to bear the larger, lump-sum costs of retrofitting their cars. With subsequent technological progress and economies of scale, however, the tax exemption eventually fell to DM 1,100 by January 1, 1988, and was abolished entirely in July 31, 1991 to reflect the fact that by then 97% of all newly registered cars had catalytic converters.

The third element of the federal government's program to promote catalytic converters consisted of direct cash payments to car owners who retrofitted existing cars with catalytic converters. This effectively made the program a 'feebate scheme', having both charge and rebate elements, during the period it operated between January 1, 1986 and July 31, 1992.

Policy Issues

The success of the German program is largely attributable to consistent, well-thought-out policy measures that are workable, have few loopholes and are widely perceived as fair both among the public and across the federal and *Länder* levels of government. Revenue-neutrality was a key factor here, in both enhancing the program's credibility and easing political tensions associated with the introduction of new tax measures. Germany created sufficient tax incentives for the introduction of regulated catalytic converters and unleaded gasoline, and now leads Europe — together with Denmark and The Netherlands — in pushing for stricter vehicle emissions standards. Furthermore, the policy measures introduced in Germany were easy for

the public to understand and act on when shopping for a new car.

The case study further suggests that fiscal instruments (tax changes) and command-and-control legislation (emissions standards) work best in parallel. The tax incentives for catalytic converters induced people to buy environmentally-friendly cars; this in turn induced the car industry to produce environmentally-friendly cars and maybe even to outperform the competition on the 'green' front. Following the reaction of the market, the government was able to set tighter standards on emission limits without meeting opposition.

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- Results:*
- As of September 1, 1993, more than 40% of all registered petrol-engined passenger cars (including 97% of all newly registered cars) in Germany were equipped with regulated catalytic converters.
 - The market share of unleaded petrol has reached around 90% of all fuel purchases for passenger cars. As such, it is the highest market share in all of Europe.
 - Roughly 2 million cars were retrofitted with catalytic converters between 1 January, 1986 and 31 July, 1992.

- Lessons:*
- Revenue neutrality was a key factor for the success of the German program — not just with the public but with policy makers in the *Länder* administrations also. This overall budget neutrality was not achieved with a single instrument, but with a wide array of economic instruments.
 - Tax exemptions seem to have a psychological effect on taxpayers that is out of proportion to the benefits received.
 - Fiscal instruments (tax changes) and regulations (emissions standards) work best in parallel.
 - Doing "too much" does no harm, although it is possible that the same results might have been achieved with fewer expenditures.
 - Persistence pays and commitment counts.

Replenishing the Prairies: The Canadian Permanent Cover Program

The Policy in Brief

Economic Instrument: Cash subsidies and grants

Problem: Soil and habitat degradation on Prairie agricultural land from such practices as row crop monoculture and summer fallowing combined with tillage for weed control. Currently over 60% of Prairie cropland is planted under monoculture and over 25% is in summer fallow. A 1990 government study suggested that 35 species of birds, fish, mammals and reptiles and over 300 species of plants are threatened because of Prairie habitat loss to agriculture

Goal: The reduction of soil deterioration on high risk lands under cultivation

Description: The program is directed at lands where annual cultivation is causing long term soil damage and where modified farming practices cannot reduce the on-going deterioration. The program provides financial assistance to convert such land to permanent cover

Administering Institutions: Prairie Farm Rehabilitation Administration (PFRA) in Western Canada, Agriculture Canada in Ontario (until 1994)

Key Stakeholders: Farmers, PFRA, Agriculture Canada, Provincial governments and environmental groups

An Overview

The Permanent Cover Program (PCP) is an off-shoot of the federal-provincial National Agricultural Strategy (NAS) of 1986. Run under the auspices of the National Soil Conservation Agreements, the PCP provides funds for converting lands at risk of soil degradation by planting perennial forages for hay or pasture, or trees for recreation or wildlife.

Applicants enter into long-term contracts for 15 or 21 years to ensure that the conversion is long-lasting. Eligible components can include: buffer strips of grass along watercourses and wetlands, with or without trees or shrubs; the retirement of flood plain land from agricultural production; block plantings of trees on

highly erodible uplands, and tree windbreaks. The PCP was extended for three years with \$50 million earmarked for PCP 2 under the Farm Support Adjustment Measures Program of April 1991.

Payments per acre vary between PCP 1 and PCP 2 and between the provinces. Ontario and to some extent also British Columbia and Alberta tend to have higher rates than Saskatchewan and Manitoba. The Prairie Farm Rehabilitation Administration, which administers the program in the western provinces, began offering fixed sums under PCP 2 in an attempt to simplify procedures and minimize the potential for treating similar cases differently. In Manitoba and Saskatchewan, the program now offers \$40/acre per year for 10-year and \$70/acre for 21-year agreements. In Alberta and British Columbia, however, the program offers \$50/acre for 10-year and \$85/acre for 21-year agreements — to reflect higher land values. Ontario has a different, more complicated system, in which the rates depend on local land rental values and the time and materials required to plant the land into permanent cover and maintain it. Ontario program costs for a 15-year contract have ranged from \$500 to \$3,000/acre, in any case many times higher than in the Prairies. Though the social value of caring for fragile land out of production is probably higher in densely populated Ontario than in the spacious Prairies, it is not clear that the program allocations between provinces reflect any such appraisal of the relative social value of environmental improvements.

Policy Issues

Currently the impact of the PCP is blunted somewhat by inconsistent government policies elsewhere in the agricultural sector. As in most other countries, there is extensive Canadian government participation in the agri-food business, in the form of regulatory activities, taxation and expenditure policies, commercial initiatives, research, market development, and involvement in matters of international trade and commerce. Many studies over the past 10 years have concluded that a number of the policies and programs at the federal, provincial and municipal levels have negative impacts on agricultural land in particular and on the environment in general. Unfortunately, this conflict between traditional commodity-focused price support and programs designed to remedy environmental damage has many international parallels. In the United States both

Policy History at a Glance

1986

Federal-provincial National Agricultural Strategy developed

Apr 1991

Second phase of the program, PCP 2, planned

Mar 1995

End of PCP 2 estimated to mark the cumulative conversion of 1.2 million acres to permanent cover

the National Academy of Sciences and the Natural Resources Defense Council have identified agricultural and tax policies that discourage or even prevent the adoption of more environmentally sensitive agricultural practices. Similarly in 1989 members of the Organization for Economic Co-operation and Development (OECD) recognized the fact that traditional price support programs provide disincentives for diversification and for local and environmentally sensitive practices. US and Canadian policies are under review and both governments have announced that their agricultural income support policies will be revised extensively, in part to address trade considerations and in part to address environmental concerns.

The PCP could become more cost-effective. If the government's payments to farmers were to change over to a decoupled basis so that they were not dependent upon cropped acreage, there would be an even greater incentive for conversion. Farmers would decide whether or not to convert based only on the actual productivity of the land. The incentive payments to convert marginal land would only have to offset net cash income less the receipts from government on a per acre basis.

In 1990, the Federal-Provincial Agricultural Committee on Environmental Sustainability defined sustainable agriculture as "agri-food systems that are economically viable, and meet society's need for safe and nutritious food, while conserving or enhancing natural resources and the quality of the environment for future generations." The PCP represents an important effort on the part of the federal and provincial governments to move in the direction of that principle. Until existing agricultural subsidies are replaced, however, the full implications of the objective will not be realized.

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- Results:*
- By March 31, 1995, Agriculture Canada estimates that 1.2 million acres of marginal agricultural land will be converted to permanent cover under both phases of the PCP.
 - The PCP has been a cost-effective method of removing at least some marginal land from agricultural use, according to government and university studies.
 - However, PCP 1 and PCP 2 together have only managed to remove 1.2 million of the 20 million acres of cultivated land classified as marginal (Classes 4 and 5) in the Canadian Prairies.

- Lessons:*
- Inconsistent policies can dampen the intended effects of particular policies, making desired impacts harder to achieve. The relatively small scale on which the PCP operates is not enough to overcome the substantial incentives for high volume production on the prairies.

The Reform of the European Union Common Agricultural Policy

The Policy in Brief

Economic Instrument: Compensation payments and subsidies

Problem: An EU-wide agricultural policy that reflected post-war concerns such as food shortages, rather than the current-day reality of food production surpluses and environmental degradation due to over-intensive farming

Goal: Socio-economically, to reduce production and guarantee farmers' incomes, and environmentally, to encourage sustainable farming practices and afforestation

Description: In essence, the reform involves the transition from a price support policy to an income support policy. This involves the introduction of compensation payments to counteract lower institutional price guarantees, subsidies for environmental initiatives such as set-aside and extensification, and financial aid for early retirement

Administering Institution: European Agricultural Fund for Guidance and Guarantee (FEOGA)

Key Stakeholders: Farmers, FEOGA, EU, environmentalists, farmers organizations

An Overview

For decades the Common Agricultural Policy (CAP) has ridden roughshod over the better judgment of European policy analysts, and recent reforms constitute an attempt to inveigh the CAP with new sense. The historical underpinnings of the CAP, outlined in the 1957 Treaty of Rome, reflect the post-war concern of recapturing food security. But the Common Market Organization (CMO)-administered mechanism introduced to achieve this goal proved to be almost too successful. Generous compensation payments tied to agricultural production prompted enormous increases in outputs. By the 1970s farms had made great strides in productivity and technological advancement. Surpluses appeared, which helped inflate agricultural expenditures for FEOGA-administered compensation payments to an enormous percentage of the EU budget. As a result of this trend, surpluses in the early 1990s were estimated — against a base of production required for EU self-sufficiency — at 30% for sugar, 21% for cereals, and 12% for butter. The CAP was also criticized for encouraging agricultural production on marginal and environmentally-sensitive lands, and for being inequitable, rewarding 'professional' farmers and penalizing 'family' farmers, due to the solitary emphasis on production-tied compensation.

Some reforms were undertaken between 1984 and 1988, including milk production quotas. More extensive reforms were proposed in July 1991 and adopted by the Council of Ministers of the European Parliament in May 1992. These MacSharry Reforms, named after the European Commissioner for Agriculture, Ray MacSharry, sought to break with the logic of inexorably rising production, while at the same time adjusting to the international trend toward freer agricultural markets.

The idea now is to manage production by the gradual reduction of institutional prices in such commodities as cereals, oilseeds and proteins. To maintain farmers' incomes, a new scheme of direct financial aid to supplement income has been established. This aid is only granted on condition that certain measures, such as set-aside or extensification, are undertaken. Alongside

Policy History at a Glance

1957	1962	1973-1984	1984-1988	May 1992
Treaty of Rome establishing the principle of the CAP	First CMOs involving price support and internal market protection	Farm modernization, increased production and agricultural surpluses	Some CAP reforms including introduction of production quotas	MacSharry Proposals adopted: compensation payments decoupled from production, environmental subsidies introduced

this structural reform, accompanying measures include financial aid for early retirement, afforestation and the adoption of other 'agri-environmental' measures. Set-aside and extensification subsidies are mainly intended to control and reduce the quantity of agricultural goods produced, while agri-environmental aid is widely seen as encouraging the more proactive involvement of farmers in environmental planning. On the latter point, Chapter 8 on Environmentally Sensitive Areas (ESAs) is also relevant.

The MacSharry Reforms have caused a redefinition of the role of the farmer in the countryside. He is no longer to be considered only as a producer of foodstuffs, but also as a sort of gardener, useful in developing and conserving rural areas. Incentives are now in place for farmers to optimize their profits by looking beyond mere output, toward wider concerns of sound land stewardship.

Policy Issues

The recent CAP reforms were helped along by a couple of external developments. First, the fact that agriculture was included in the GATT negotiations from 1986 onward strongly increased external political pressures in favour of freer trade and a reduction in the high price supports provided under the CAP. Second, the rise of the environmental movement during the 1980s helped facilitate the streamlining of economic inconsistencies which had grown in the former system.

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Results: • It is still too early to draw any firm conclusions about the success of recent CAP reforms. The end result is likely to depend on the quality of the implementation strategies adopted by the many actors involved. A preliminary assessment of the reform is scheduled for 1996, along with further possibilities for adapting the rules.

Lessons: • The impetus to correct old, outdated policies can sometimes be gained by framing changes in the light of newly popular policy demands. Thus, in greening itself, the new CAP has managed to kill two birds with one stone.

8 Environmentally sensitive areas in the UK: Economic incentives for sustainable farming

The Policy in Brief

Economic Instrument: Subsidy for sustainable farming

Problem: Environmental damage caused by intensive agriculture and drainage schemes, including drainage of wetlands (on the order of 150,000 acres a year in the 1970s and early 1980s), eutrophication of water bodies and loss of hedgerows, trees and amenities

Goal: More sustainable farming practices

Description: Subsidy payments to farmers in designated areas of special biological, landscape or historical interest. Farmers voluntarily agree to farm less intensively or undertake prescribed conservation practices, in exchange for a fixed annual per hectare payment

Administering Institution: Ministry of Agriculture, Fisheries and Food (MAFF), UK

Key Stakeholders: Farmers, MAFF, nature conservation bodies charged with administering the many Sites of Special Scientific Interest (SSSIs) within Environmentally Sensitive Areas (ESAs), and the EU

What are “ESAs”?

MAFF defines ESAs as areas:

1. Of national environmental significance;
2. Whose conservation depends on the adoption, maintenance or extension of a particular form of farming practice;
3. In which there have occurred or there is a likelihood of changes in farming practices that pose a major threat to the environment;
4. Which represent a discrete and coherent unit of environmental interest; and
5. Which would permit the economical administration of appropriate conservation aids.

Source: MAFF, 1989

An Overview

The idea of economic incentives to encourage less environmentally damaging farming was first introduced into UK legislation by the 1981 Wildlife and Countryside Act. This allowed compensation to farmers for reducing activities damaging to the environment, primarily on SSSIs. The management agreement scheme was hampered, however, by unclear responsibilities for its financing, a lack of funds at the Department of the Environment (DOE), and negotiation difficulties with farmers.

An alternative, three-year experimental scheme was introduced in May, 1985 by the Countryside Commission in the Norfolk and Suffolk Broads — namely the Broads Grazing Marshes Conservation Scheme (BGMCS). Unlike the previous Act, the BGMCS was financed by MAFF and the Countryside Commission, rather than the DOE. The BGMCS also provided income support to farmers for applying traditional methods such as grazing by beef cattle, thereby reducing pressure to drain the land for conversion to arable farming. The Scheme proved highly popular: it enjoyed a 90% participation rate across its initial area of introduction.

In 1985 the then EC also gave authorization to a broader application of the ESA idea through Article 19 of the structural regulation (EC 797/85), permitting member states to pay aid to farmers in suitably designated areas of high conservation value. The aim was to encourage better farming practices. The ESA scheme was subsequently written into UK legislation with the 1986 Agriculture Act, giving MAFF full responsibility for the ESA payments.

ESA agreements initially designated two tiers of management and payment. Payment rates vary between the different ESAs but each takes account of the actual and potential profits that farmers in the ESA lose by following the prescribed management scheme, as well as the extra work that the scheme entails. Each ESA agreement regulates drainage, grazing and fertilizer use, and stipulates the maintenance of conservation features such as hedges and traditional barns. MAFF reserves the right to monitor each ESA with aerial photos and ground inspections. Following monitoring and evaluation reports in 1991 and 1993, three additional tiers were added, and new management options arose such as ten-year agreements and capital grants for

Policy History Time Line

1981	1985	1987	1988	Dec 1991	Mar 1994
SSSI-related payments to farmers	BGMCS experiment	First implementation of ESAs	ESA scheme extended	317,000 ha under ESAs, involving 4,615 farmers	1 m ha being brought under ESAs, an area equivalent to about 10% of English farmland

conservation plans, the latter including the protection of historical features, the restoration of marshes, the construction of water penning structures and the planting of trees. The grants usually cover 60 to 80% of capital costs and are paid if the work is carried out within two years, subject to proof of payment and MAFF inspection. Thus the division of payment tiers for one particular ESA, the Broads, is as follows:

Tier	Conservation Management Type	Annual payment (pounds sterling/ha)
I	landscape	125
II	landscape & wildlife	220
III	aquatic ecosystem	250
IV	arable-to-grassland conversion	200
V	grass buffer between field & ditch	280

Policy Issues

After decades of agricultural policies that exerted a net negative impact on the environment, the momentum of policy only recently shifted toward better stewardship practices. Nationally, grants from MAFF for drainage created incentives for the destruction of many wetlands and thus large ecosystem losses. From 1970 to 1980, the area affected each year by such grants quadrupled to 100,000 ha, making drainage the second largest component of grant-aid, after construction of farm buildings, in 1980-1981. Fortunately, the threat posed by new drainage schemes diminished markedly in the late 1980s and early 1990s, and drainage grants from MAFF are now virtually impossible to obtain.

Internationally, the Common Agricultural Policy (CAP) of the EU long provided open-ended and high price guarantees in agricultural markets, thus encouraging farmers to increase food production through intensive practices. Though born of and suited to the post-war situation of the 1950s, when food was scarce, the CAP quickly became a victim of its own success as food production and surpluses rose to dominate EU budget expenditures in the following decades. However, with recent CAP reforms aiming to decouple payments from production while linking them to conservation practices, up to 25% of ESA costs may now accrue to the EU. In a novel policy shift, European farmers are now paid to “produce” countryside and amenity commodities. Not only does this admirably address environmental concerns, but it suggests a solution to the problem of agricultural over-production that has been dogging the West since the 1960s. ESAs provide policy makers around the world with tangible examples of how agricultural support can be linked to sustainable farming practices and of how the traditional policy stalemate between farmers and conservationists can be bridged.

Some Further Reading

Friends of the Earth (FOE) (1992). *Environmentally Sensitive Areas: Assessment and Recommendations*, FOE, London.

Ministry of Agriculture, Fisheries and Food (MAFF) (1989). *Environmentally Sensitive Areas: First Annual Report as required Under Section 18(8) of the Agriculture Act 1986*, MAFF, London.

Ministry of Agriculture, Fisheries and Food (MAFF) (1993). *Our Living Heritage, Environmentally Sensitive Areas*, MAFF, London.

Ministry of Agriculture, Fisheries and Food (MAFF) (1993). *ESA Monitoring Report 1992* (for the Suffolk River Valleys, the Test Valley, Breckland, the Shropshire Borders and the North Peak), MAFF, London.

- Results:*
- ESA payments are rising sharply, indicating high farmer participation in the scheme.
 - Farmers maximize their joint product (food plus conservation plus amenity), not just their food production.
 - Nitrogen applications have decreased from 35 to 100% in many ESAs.

- Lessons:*
- Appropriately designed policy instruments can have a significant impact on behaviour, even when they work counter to many existing policies.
 - ‘Decoupled payments’ can bring substantial environmental benefits by replacing production-tied payments with compensation for conservation management initiatives.

Financial Year	ESA Expenditures (millions pounds sterling)
1991/2	11
1995/6	43 (estimated)

Dutch Policies Aimed at Diminishing Mineral Releases in Agriculture

The Policy in Brief

Economic Instrument (proposed): A regulating levy on mineral releases, with compulsory mineral accounts

Problem: Acidification and eutrophication of the environment due to mineral losses from animal manure and fertilizers on farms

Goal: Reduction of mineral releases in agriculture

Description: An evolving set of policies that began with fixed standards and levies on nitrogen, and is moving toward more sophisticated measurements and charges for flows of minerals including phosphorus

Administering Institutions: Ministries of Agriculture and Environment

Key Stakeholders: Livestock farmers, livestock industry, Ministries of Agriculture and the Environment and the Dutch Centre for Agriculture and the Environment (CLM)

An Overview

Current Dutch policies aimed at curbing mineral releases include:

- A ban on the growth of manure production per farm over and above a basic level calculated on the basis of standard allowances for different species of animals;
- Regulations as to spreading of manure for different crops at different times of year;
- A fixed levy for superfluous manure based on the number and type of animals relative to a farm's surface area; and
- Rules relating to manure storage and animal accommodations, to be implemented in stages, with the objective of reducing ammonia emissions

Unfortunately, current policy measures have many problems, not the least of which is that their

environmental objectives are not being achieved. They are not as cost-effective as they could be. They ignore minerals other than phosphorus, together with all those which originate from artificial fertilizers. They provide insufficient incentive to reduce actual mineral losses on the ground. They are seen as inequitable, because they do not reward farmers for 'leading the way' on reductions in any given farm situation. Finally, even if existing measures were intensified in order to achieve the environmental objectives, ordinary farm operations would likely be so hampered as to make this an unattractive policy option.

A number of improvements have been suggested to make the policies more inclusive, customized and incentive-oriented. First, artificial fertilizers should be included, along with nitrogen use. Second, variable payments should be instituted based on the actual quantities of minerals used (rather than just livestock numbers). Third, the specific circumstances of individual farms should be considered. Fourth, a compulsory mineral accounting system should be introduced as a basis upon which to streamline and facilitate an equitable mineral reduction policy.

The idea of compulsory mineral accounts was proposed by the Ministry of Agriculture, Nature Conservation and Fisheries in June, 1993. Starting dates suggested for using the mineral accounts as a management tool, and later as a regulating instrument, were 1995 and 1996 for the livestock rearing sector and 1997 and 1998 for the agriculture and horticulture sectors, respectively. Such compulsory mineral accounts would represent an enormous improvement. With their aid, both the supply and the disposal of minerals as well as the difference between the two — that is, the mineral losses into the environment — could be registered. The system can be used to map the losses due to the use of animal manure as well as the losses when fertilizers are used. Thus the opportunity arises to integrate to a large extent the approach to the problem within the agricultural and livestock sectors.

An investigation into the manner in which mineral accounts can be used as a regulating instrument was undertaken by the CLM. Its basic accounting framework is:

$$\text{mineral supply} - \text{mineral disposal} = \text{loss into the environment}$$

Mineral supply includes the number of kilograms of

Policy History at a Glance

Jun 1993	1994	1995	1996	1997	1998
proposal for mineral accounts	pilot projects on mineral accounts	use as livestock management tool?	use as livestock regulating instrument?	use as agriculture management tool?	use as agricultural regulating instrument?

nitrogen and phosphorus in: animals (alive or dead), concentrates, roughage, fertilizers, animal manure, deposits, net mineralization, nitrogen-compounding by papilionaceous flowers, seeds, young plants, compost and sludge. Mineral disposal includes: animals (alive or dead), milk and dairy products, eggs, other animal products, animal manure, vegetable products and vegetable waste. In choosing these items of supply and disposal, the CLM attempted to emphasize fairness, sensitivity to fraud and an item's scope. The system does not involve a great deal of extra work for farmers, as most items are already being recorded in existing operating accounts, or else tend to remain fairly constant. Fraud is discouraged in a number of ways, such as by cross-checking deliveries between farmers as well as deliveries across the industrial chain. The submission of an auditor's report on the mineral statement is also encouraged. The levy for mineral losses is expected to be between 1 and 2.50 guilders per kilogram for nitrogen and between 1 and 5 guilders for phosphorus. The levies for nitrogen and phosphorus should be proportionate to the volume of losses of these minerals into the environment. It is also intended to have the revenues flow back into the agrarian sector, for example by developing a system granting subsidies to farms with relatively low emissions.

One major advantage of the proposed new levy system is that farmers 'leading the way' in mineral reductions are no longer punished. Another advantage is that measures will become more cost-effective, due to the fact that the farmers themselves decide what measures are most suitable in tackling the mineral losses within their operations as efficiently as possible. Thus they are given an incentive to balance the costs related to the various measures, against the decrease in mineral losses and the resulting decrease in levies to be paid. In this way the system promotes the most cost-effective measures. The reductions in mineral losses can be achieved by a diversity of measures, all of which show up in the mineral balance sheet as a mineral loss. Examples of possible measures include:

- Computer-controlled feeding of animals;
- Reduction of the mineral content in animal feed;

- Construction of low-emission stables; and
- Mixing manure with the soil, resulting in less ammonia evaporation and more nitrogen availability for crops

Policy Issues

The Dutch experiences with reducing mineral losses in the agricultural sector carry important information for policy-makers abroad. This is particularly true for foreign governments planning to introduce a system of compulsory mineral accounts or a regulating levy on minerals. Key points to note include:

- The system discussed is suitable for tackling mineral losses in both the agricultural and livestock-rearing industries; and
- Mineral accounts can be used to map not only mineral releases but also mineral deficits. For this reason countries that import few minerals and export much food or animal feed have also shown an interest in the system.
- The Netherlands enjoy a leading position with respect to policies aimed at reducing mineral losses into the environment;
- Though the problem may be considerable in the Netherlands, it is certainly not limited to the Netherlands alone;

Some Further Reading

CLM (1990). *De Mestwetgeving: Evaluatie en Voorstellen voor nieuw Beleid*, CLM.

CLM (April, 1993). *Regulerende Heffingen en Premies op Mineralenoverschotten van land-en Tuinbouw*, CLM-110-1993.

Rijksinstituut voor Volksgezondheid en Milieuhygiëne, (RIVM) (1993). *Nationale Milieuverkenning 1993-2015*, RIVM.

For further information, please contact: Centrum voor Landbouw en Milieu (CLM), Amsterdamsestraatweg 877, Postbus 10015, 3505 AA Utrecht. Tel: 31-30 441301, Fax: 31-30 441318

Results:

- Pilot projects suggest mineral accounts are a workable and useful management tool for mapping and reducing mineral losses at the farm level.
- Mineral reductions below current levels are predicted if the CLM's policy proposals are adopted. Decreases are expected on the order of 50% for nitrogen and between 20 and 40% for phosphorus.

Lessons:

- Providing choices for people to participate in a policy can increase the efficiency of its implementation.
- Good policy design matters. Past experience shows that policies that do not address issues comprehensively are unlikely to provide adequate environmental protection.

The Tax on Undeveloped Land (TUL) in France

The Policy in Brief

Economic Instrument: Land Tax

Problem: A policy that works directly against nature preservation and thus sustainability

Goal: Reform of the tax on undeveloped land so as to remove the incentive to destroy natural ecosystems

Description: The TUL is a local, direct tax collected to finance sub-national authorities (at regional, *département* or *commune* levels). It is essentially a tax on rural land. Along with a tax on developed property, it constitutes one of the two property taxes within the French fiscal system

Administering Institutions: Local authorities and the General Directorate for Taxes

Key Stakeholders: Local authorities, the General Directorate for Taxes, environmental groups, farmers' organizations and the Ministries of Agriculture and the Environment

An Overview

The French Tax on Undeveloped Land (TUL) is an example of a policy which has caused great damage to the rural environment, but which has nonetheless proved remarkably difficult to reform in any significant measure. Hopefully, changes now afoot in the mid-1990s will change all of that.

Since the first half of the nineteenth century, the TUL has existed in France as a tax on capital calculated on the rentable (and not market) value of property. Taxes on capital have a predominantly economic justification - to encourage the optimum distribution of the factors of production. By increasing the cost of holding assets, the tax on capital penalizes unproductive property. It is in the interest of economic actors therefore to select their assets for greater short-term profitability. However this economic justification for taxing capital, while understandable for productive property, is proving unsuitable for natural areas that are of particular

environmental value since they are used less intensively. For local authorities, the TUL functions as a fiscal instrument for the economic development of natural areas rather than for their conservation and ecological management.

The assessment of undeveloped land is differentiated on the basis of the type of land. Land is classified into seven groups and a number of subgroups, and tax rates are then applied according to the type of land use — agricultural, forestry or urban. The tax is calculated by multiplying the land register income by the rate established by the *commune*. This rate varies across the *communes* depending on their individual budget requirements. The land register income which acts as a tax base is equal to the rentable value of this property minus a flat-rate amount of 20%. The basis for the tax has been adjusted, first by periodic updating between 1970 and 1980 and second, since 1981, by an annual flat-rate increase of rentable values using a coefficient specifically established for this purpose. Local authorities determine the tax rates and the General Directorate for Taxes administers and manages the tax for local authorities.

The TUL has created many problems. First, it is a source of inequality. Immovables such as real estate are taxed twice as heavily as movables such as cars, while farmland is taxed twice as heavily as land for development or property. Between 1980 and 1989, the TUL rose 303%, compared with the tax on developed land (TDL) which rose only 207%. Second, by being premised on rentable rather than market value, neither income nor market value nor real rent are reflected. When profit margins are low, the tax can be prohibitively costly, especially as the problem tends to be exacerbated by the fact that rentable value is used as a basis for several other contributions which finance various budgets. Third, the land tax system does not sufficiently take into consideration differences in economic profitability that exist between developed and undeveloped land. Tax on capital at around 2% creates a direct incentive to sell or transform land with a return rate of less than 2%. Unfortunately, return rates on rural land below 2% are common. Fourth, despite the fact that there is some differentiation in tax rates based on the type of land, these are relatively small. As a result, with undeveloped land that draws low returns it is unfortunately in the landowner's interest to intensify production in an effort to boost the rate of return. Non-

Policy History at a Glance

First half of the 19th century	1959	Late 1980s & early 1990s	Mid-1990s
Basic structure of TUL introduced	Minor reorganization	Some smaller reform measures adopted	Overall reform imminent

intensive, less productive land uses are penalized, including woodlands and wetlands. It is clear that the classification on which the TUL is based ignores environmental goals. In particular, sensitive and rare ecotypes are not considered in the existing categories.

Three main focuses for implementing the TUL reform are commonly identified:

1. The overhaul of the system of exemptions to include environmental considerations;
2. A significant reduction in the TUL to be paid; and.
3. General reform of the basis for calculation to better reflect local economic and ecological realities.

Although no overall reform has as yet been implemented, a number of smaller corrective measures have recently been adopted. These include the Act of 1990 on the Review of Land Register Assessments, the Water Act of 1992, and certain provisions of the 1989 and 1992 Finance Acts. Concerning the overhaul of the exemption system, the 1989 and 1992 Finance Acts abolished certain exemptions and subsidies detrimental to the environment. Concerning the TUL reduction (tax relief), the 1992 Finance Act sets out the dismantling of the *département* and regional TUL payments. It establishes that as of 1993, farm property will be exempt from the regional TUL payments as well as from one-third of the *département* portion. The latter exemption will increase to five-ninths in 1994, seven-ninths in 1995 and 100% from 1996 onward. And concerning the general reform of the basis for calculating the TUL, the Act of 1990 on the General Review of Land Register Assessments establishes a new type of land classification which is better suited to the realities of farming than the previous classification laid down in a 1908 circular.

Policy Issues

It should be kept in mind that tax reforms alone are not sufficient to achieve significant results with regard to conserving natural areas of high biological value. Fiscal instruments are only one aspect of an overall policy for the management and conservation of natural areas with high ecological value.

Some Further Reading

Sainteny, Guillaume (March, 1991). *La fiscalité des espaces naturels: Essai de diagnostic et propositions de réformes d'après l'exemple des zones humides*, Ministère de l'environnement.

Sainteny, Guillaume (November, 1993). *La fiscalité des espaces naturels*, Litec.

Soria, Olivier (September 1993). *La fiscalité environnementale: sur la base des cas des zones humides*, Rapport pour le Ministère de l'environnement.

- Results:**
- Since 1992, there has been a significant reduction in the amount of TUL taxes imposed and therefore in the proceeds generated from the tax. This is a result of the successive dismantling of various components of the tax, including its regional and *département* portions.
 - Although land tax relief pursues predominantly economic and social objectives, it definitely has an impact on the environment. With a reduction in the tax burden on undeveloped land, the economic incentive to increase return rates on the least productive and marginal land is decreased.
- Lessons:**
- Policy makers should be wary of implementing unsustainable policies because they may have unusual staying power and be difficult to remove once introduced.

The Nitrogen Oxide Charge on Energy Production in Sweden

The Policy in Brief

Economic Instrument: Emissions charge and feebate

Problem: Acidification of soil and water due to nitrogen oxide emissions. Acidification has damaged ecosystems and completely wiped out sensitive organisms in at least 15,000 lakes in southern Sweden. Some 20% of forest land is so acidic that the forests have been damaged

Goal: Reduction of air pollution from nitrogen oxide emissions without distorting the competitiveness of industry

Description: The Swedish nitrogen oxide charge is a leading example of how an economic instrument can be used to reduce pollution without distorting an industry's competitiveness. The charge is SEK 40 (US \$4.80 at the August 1993 exchange rate) per kilogram of nitrogen oxide emitted, and the revenue from the charges paid by liable operations is redistributed among the plants in proportion to their energy production. The charge on nitrogen oxides began on January 1, 1992

Administering Institution: Swedish Environmental Protection Agency (SEPA)

Key Stakeholders: SEPA, large and small combustion plants, and other energy producers

An Overview

Combustion plants produce energy — electricity and heat — by burning different kinds of fuel. But during combustion, air-polluting compounds such as nitrogen oxide (NO) and nitrogen dioxide (NO₂), collectively termed nitrogen oxides (NO_x), and sulphur dioxide (SO₂) are released. Since January 1, 1992, large combustion plants have paid an environmental charge on NO_x emissions. 'Large' plants are defined as having a capacity of 10 MW or more and an annual energy

production exceeding 50 GWh. Smaller combustion plants are not liable because of the higher relative cost of continuously measuring the emissions. The charge of SEK 40 (US \$4.80) per kilogram of NO_x is not a tax. Instead it is redistributed among liable plants in proportion to their energy production. As a result, plants which produce much energy relative to their total emissions benefit, while those with a low ratio of energy to emissions lose. Some plants earn money from this system while others underwrite it.

Most of the liable combustion plants are found in energy production, that is, heating and power plants. The pulp and paper industry, the chemical industry and the metal industry also have combustion plants for energy production. Waste incineration plants producing energy are similarly liable for the charge. There is a wide variation in net payment (charge minus refund) within the industries, as Figure 1 shows. For example, energy production plants range from making a net payment of SEK 10m (\$1.2m) to receiving a net income of SEK 14m (\$1.7m). In 1992, approximately SEK 100m (\$12m) was redistributed.

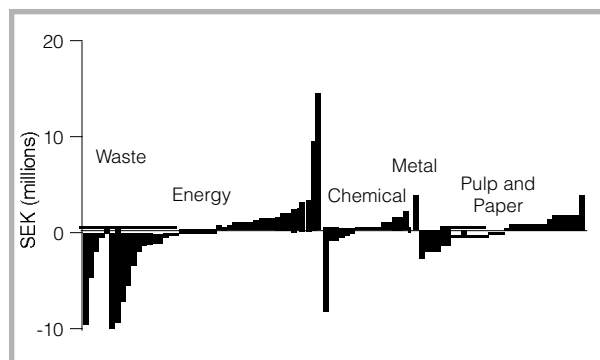


Figure 1. The net NO_x charge payment per liable plant and industry (Source:SNV PM 930430)

The refund system was necessary in order to achieve a fair system. The competition between small (non-liable) and large (liable) combustion plants would have been distorted if the charge was not refunded to the liable plants. The fact that the charge is refunded and thereby only has an environmental purpose has facilitated acceptance of the charge. A positive side effect is that less polluting plants are favoured economically and thus given a competitive advantage. The refund system has contributed to the considerable success of the charge.

Policy History at a Glance

1990

Parliamentary decision

1992

Implementation of Swedish NO_x charge on large combustion plants

Best expectations of the policy exceeded

Many companies started NO_x-reducing projects as soon as a parliamentary decision was taken in 1990, in order to have as low emissions as possible when the charge came into force in January, 1992. The management and the operators at the plants have become more focused on reducing NO_x. At one plant the operators are given a salary bonus if NO_x emissions are low.

Though the combustion plants are given an economic incentive to reduce their emissions, they are not forced to do so by regulation. It is up to the individual plant to decide. Companies can choose whether to reduce their NO_x emissions or pay the charge. Generally speaking, the liable plants have a greater incentive to seek ways to reduce emissions than any government body. It is

therefore much more efficient to leave it to the liable group to formulate individual responses to the charges.

Policy Issues

The Swedish NO_x charge system seems suitable for reducing emissions from combustion plants for energy production in other countries. The system has proved to be very successful. It is regarded as a fair system. Considerable cost-effective reductions in emissions have been achieved at the liable plants.

Some Further Reading

Swedish Ministry of the Environment (1991). *Economic Instruments in Sweden with Emphasis on the Energy Sector*, Stockholm.

- Results:**
- NO_x emissions were 35% lower in 1992 than in 1990. By 1993, total reductions rose to 44% of 1990 levels.
 - The number of combustion plants with NO_x-reducing technologies increased by a factor of about 16 between 1982 and 1994, and further installations are planned. Figure 2 provides a more detailed picture.

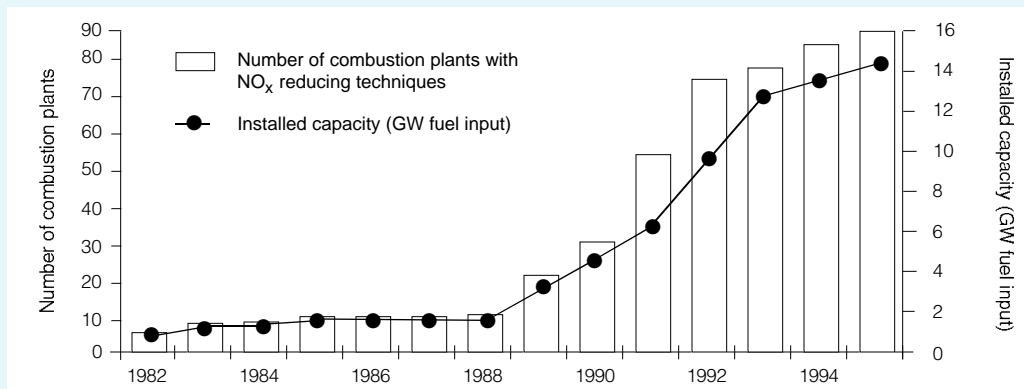


Figure 2. Present and planned installations of NO_x reducing techniques (Source:SNV Report 4152)

- NO_x emissions have decreased much more rapidly than expected. Thus the target for 1995 of a 35% reduction from 1990 levels was already achieved in 1993.
- Emissions reductions have been achieved in a cost-effective manner for both individuals and society.
- The average cost to reduce one kilogram of NO_x is SEK 10 (\$1.2). Thus the charge of SEK/kg-NO_x has provided a substantial economic inducement to reduce emissions. For many plants, installing NO_x-reducing technologies has proved profitable.
- Though the overall effect of the policy on society is difficult to estimate, the Swedish Environmental Protection Agency has estimated the net benefit to be on the order of at least 250 million (\$30 million).

Lessons:

- Budget-neutral economic instruments can be used to reduce pollution without harming industrial competitiveness or raising industry opposition.
- Political acceptability of an otherwise unacceptably high charge can be achieved if the income from the charge is rebated to relevant parties.

The Policy in Brief

Economic Instrument: Carbon dioxide tax

Problem: Emissions of greenhouse gases which may induce global warming

Goal: Reduce or stabilize CO₂ emissions, generate revenue for the national budget and serve as a model for applications internationally

Description: A tax on CO₂, levied primarily on fossil fuels including oil, coal, natural gas, LPG and gasoline. Part of the wider energy taxation system, the tax is generally higher for the household sector than for the industrial one so as not to hamper competitiveness on international markets

Administering Institution: National Tax Board (Sweden)

Key Stakeholders: Industry and consumers

An Overview

Economic instruments have become increasingly important in Scandinavian environmental policy. The carbon dioxide (CO₂) tax within the energy taxation system in all the Scandinavian countries is a prime example. Each country introduced its CO₂ tax or taxes at different times, at different tax levels, with different sets of exceptions. The policy history time line below shows the progression of carbon taxes in Scandinavia, revealing that the Finnish CO₂ tax is both the first and lowest, the Swedish tax the highest and the Danish industrial tax the latest.

The CO₂ tax is least suitably applied to energy-intensive industries (for instance, pulp and paper, and iron and steel) which must compete on international markets. This is because a high CO₂ tax rate would hamper competitiveness if similar measures were not also taken abroad. For a small country like Sweden, highly dependent on international trade, special rules had to be established to safeguard the international competitiveness of Sweden's energy-intensive industries, international aviation and shipping included. Tax

abatement rules were thus introduced for energy-intensive industries, causing the industries most vulnerable to increased energy taxes to be unaffected until 1993, when a new energy taxation system was introduced.

Of the Scandinavian CO₂ taxes, the Swedish one is the leading example of the 'greening' of the taxation system. Not only are the tax rates high, causing total energy taxation to increase considerably, but the revenue generated is used to decrease taxes on labour. The CO₂ tax was accompanied by a reduction in the general energy tax, as well as a tax on sulphur and a value-added tax on energy. When the Swedish CO₂ taxes were first introduced in January 1991, their rates varied according to the average carbon content of different fossil fuel types, but they were applied equally across "basic" users (households and non-manufacturing industries) and industries (mining, manufacturing and horticulture). In January 1993, however, the industry rate was reduced to one-quarter of the (now modestly increased) basic rate. The only exceptions are for gasoline and LPG (motor fuel), which share identical basic and industry tax rates along lines similar to those in the EU.

Policy Issues

Domestically, CO₂ taxes should be integrated into wider energy taxation policies in order to be effective. There is little point penalizing CO₂ production with a tax if at the same time it is encouraged by other energy policies. This just sends mixed signals and reduces the likelihood of positive results.

Internationally, complementary taxes abroad are necessary if the end goal of reduced CO₂ emissions is to be achieved on a global scale. Successful reductions in Sweden are like a drop in the global bucket when one considers that the country's current CO₂ emissions represent only 0.3% of the global figure. Without global agreements and coherent multilateral action, there is a further danger that emissions could simply be transferred from one country to another as major CO₂ producers move to countries that do not charge the pollution taxes. Net global emissions, and the resultant atmospheric warming, might therefore remain unimproved.

Economic instruments are in most cases more cost-effective than environmental regulations. This is because

Policy History at a Glance – Sweden and Scandinavia

Jan 1990	Jan 1991	May 1992	Jan 1993	1993
Finnish CO ₂ tax - \$3.3/t coal (lowest*)	Swedish CO ₂ tax - \$75/t coal (highest*)	Danish CO ₂ tax for private users	Swedish CO ₂ tax differentiated into basis and industry rates	Danish CO ₂ tax for industry

* using the First Quarter 1991 exchange rate

those for whom it becomes more cost-effective to change their energy consumption patterns will do so. Economic instruments focused on reducing emissions are most suitable where emissions sources are small and numerous, especially if it does not particularly matter where specific reductions are achieved, as long as the overall goal is met. Environmental taxation provides an economic incentive to develop less polluting techniques. It may also enable the State to reduce other taxes - on labour in Sweden, for instance.

Sweden has shown that a high CO₂ tax can be introduced for households and non-manufacturing industries. But internationally-coordinated solutions are needed for energy-intensive industries. The CO₂ tax increases the competitiveness of renewable energy sources and gives incentives for energy conservation.

Introducing a CO₂ tax should not provide any administrative problems in countries where taxes on energy already exist.

Some Further Reading

Swedish Environmental Protection Agency (1992). *Strategies to Prevent Climate Changes*, SEPA Report 4186.

Swedish Ministry of the Environment (1991). *Economic Instruments in Sweden with Emphasis on the Energy Sector*, Stockholm.

- Results:**
- CO₂ emissions are falling. Swedish emissions have been reduced from about 100 million tonnes in 1970, to 80 million tonnes in 1980, to 60 million tonnes in 1990, after which emissions are expected to stabilize. Emissions from combustion processes for energy production are falling, while the contribution from the transportation sector is rising. Figure 1 shows the reductions in Sweden's emissions between 1970 and 1991.

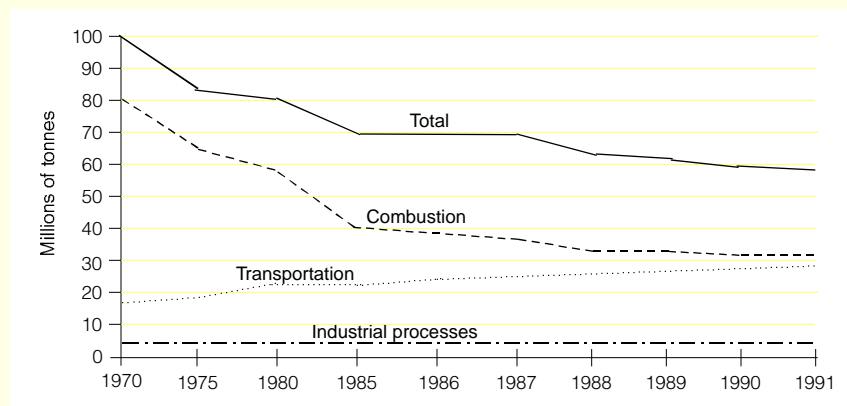


Figure 1. Emissions of carbon dioxide in Sweden 1970-1991
(Source: Prop. 1992/93:179)

- Revenues are rising. In 1992 the Swedish CO₂ tax generated revenues of about SEK 9,000 million (US \$1,100 million, at the August, 1993 exchange rate). The new energy taxation system introduced in January 1993 is expected to increase revenues by a further SEK 610 million (\$74 million) per year. About SEK 500 million is earmarked for environmental projects in the areas of energy efficiency, renewable energy sources and environmental support for the Baltic region.
- Demand for biofuels is rising. Biofuels have become increasingly popular, due to the greater competitiveness they have derived from being exempt from the CO₂ tax. A number of coal-fired district heating plants recently switched over to wood chip biofuels to take advantage of the new situation.

- Lessons:**
- CO₂ taxes can effectively reduce emissions without serious economic dislocations only if concerted international action is taken.

Tax Tools for Climate Protection: The US Ozone-Depleting Chemicals Tax

The Policy in Brief

Economic Instrument: Production tax on use or sale

Problem: The production of ozone-depleting chemicals (ODCs) — primarily chlorofluorocarbons (CFCs) — poses a threat to the stratospheric ozone layer, which protects life on Earth from harmful ultraviolet radiation

Goal: Significant reductions in the production of ODCs

Description: A tax on environmentally hazardous ODCs, intended to directly discourage production by increasing their prices. It is the most significant instance of a classic environmental tax in the US and a key component of the US ozone protection policy. It has played a central role in stimulating reductions in the production of ODCs well beyond those required by the Montreal Protocol and the subsequent London Revisions. Its innovative features make it a useful model for others attempting to design major environmental taxes, while it has also been a significant source of revenue for the federal government

Administering Institution: US Federal government

Key Stakeholders: Federal government, US Environmental Protection Agency (EPA), ODC producers

An Overview

The ODC tax is a tax on listed chemicals applied at a rate proportional to their potential for depleting the ozone layer. The tax is imposed on the sale or use of the chemicals by manufacturers or importers. For each chemical covered, the tax is calculated by multiplying three numbers — the number of pounds produced or imported, the base tax amount per pound, and an ozone-depleting factor which estimates the potential for depleting the ozone relative to CFC-11. The ozone-depleting factor is an estimate of both the magnitude of the ozone-depleting effect while the chemical is present in the stratosphere and the persistence of that effect over time.

As passed in 1989, the tax applied to eight chemicals. An additional twelve chemicals were added by the Omnibus

Reconciliation Act of 1990. The tax rate, originally \$1.37 per pound, was increased by the National Energy Policy Act of 1992 and is now set at \$5.35 per pound for 1995. After that, the tax rate is set to increase by an additional \$0.45 per year. So, for instance, the tax rate in 1996 will be \$5.35 plus \$0.45, or \$5.80, the tax rate in 1997 will be \$6.25, and so forth. In keeping with the environmental purpose of the tax, ODC production is excluded from the tax if it is used as a feed stock and consumed in manufacture or if it is recaptured and recycled at the end of the manufacturing process. Other exceptions and exemptions to the basic tax include a reduced burden on CFCs used in the manufacture of foam insulation or medical sterilants and a phase-in for halons. There was a floor stock tax imposed on existing stocks of ODCs held when the tax came into force in 1990.

When the ODC tax was first considered there was concern about the impact of the tax on the competitiveness of US industries that manufactured ODCs or used them to manufacture other goods. In response, Congress included a border adjustments tax to offset any competitive impacts. Imports and exports of ODCs themselves were taxed in accordance with the destination principle, that is, imports were subject to the tax on import and any tax paid on exports was rebated. This provision protected the domestic market from predation by foreign producers without a comparable tax provision, and allowed exports to compete on a level playing field with other nations that had not adopted a tax. Products containing ODCs or manufactured with but not physically incorporating ODCs are subject to a tax on import equal to the tax that would have been paid had the product been manufactured in the US. The tax is based on the manufacturer's actual use of ODCs or, where actual use is unreported, on an imputed use.

Policy Issues

The US implemented both regulatory production caps and the ODC tax at about the same time. Despite the fact that the caps were set well below the level of the EPA's business-as-usual forecast, actual production consistently remained below two-thirds of the target levels. It seems unlikely that, absent the tax, major reductions in production beyond those required by regulation would have occurred. In addition, it is hard to understand why, absent the tax, CFC producers would forego the profits associated with the full allowed production. Economic theory suggests that the shortage induced by a production cap, such as that imposed by the EPA regulations, will drive up the price of a regulated commodity, producing windfall profits. The conclusion that the tax had the greatest influence is further bolstered by examining the production history of the two most important CFCs, CFC-11 and CFC-12. Dramatic

Policy History at a Glance

1987	1989	1990	Dec 1992
Montreal Protocol setting targets for five ODCs	Omnibus Budget Reconciliation Act of 1989, adding eight chemicals	Omnibus Budget Reconciliation Act of 1990, adding 12 chemicals	National Energy Policy Act increasing ODC tax rate

declines in production were simultaneous with the imposition of the tax. The same pattern occurred with methyl chloroform, which was added to the list of controlled chemicals by the London Revisions and targeted in the US by the tax and caps in 1991.

The experience of the US ODC tax carries a number of lessons: First, taxes can be a powerful tool for achieving environmental goals. If the reduction below the allowed production cap is attributed to the impact of the tax, as seems plausible, then the tax and not the caps was the primary instrument of US ozone reduction policy. A particularly potent feature of the ODC tax is that it was designed to increase in a predictable fashion over time. This increase focused the attention of industry researchers and industry on the advantage of ODC conservation measures.

Second, tax and regulatory measures can enhance each other. The knowledge that production of these chemicals was to be phased out provided certainty that a market for replacement chemicals would exist and, together with the tax, stimulated an aggressive program of development and commercialization of such substitutes. The caps prevented the industry from regarding the tax as simply another cost of business to be passed on to purchasers, while the tax sent the signal that there were economic rewards from phasing out production of ODCs faster than the regulations required. It is also worth noting that the EPA took an aggressive role in promoting research on alternatives to CFC production and disseminating the results of that research. Thus it seems clear that the tax, regulatory and research measures together caused a more powerful response than any of the three alone would have. The success of the ODC tax suggests that the potential for such synergies should be explored in other contexts, such as the combination of toxic chemical taxes and emission standards, electricity taxes and appliance efficiency standards or gasoline taxes and vehicle fuel economy requirements.

Third, negative impacts of environmental taxes on competitiveness can be offset by suitable border

adjustments. The border adjustments adopted in the ODC tax demonstrate one way in which environmentally responsible nations can protect their industries from predation by nations that do not enact such taxes. The US experience with border adjustments on ODCs embodied in manufactured goods demonstrates a mechanism whereby such adjustments can be implemented without imposing undue administrative or compliance burdens. The border adjustments on the ODC tax may offer a useful model for other major environmental taxes, such as the proposed European carbon/energy tax.

Fourth, market-driven technological advance can drastically increase the environmental effectiveness and reduce the environmental cost of large environmental taxes. The technology-forcing role of environmental taxes is often overlooked in conventional economic analyses of environmental taxes, which typically assume that technology is fixed. But in the ODC case, the development of new technology was crucial. Instead of the social costs of environmental control increasing steadily with time, the EPA has found that CFC substitutes expected to be in use by 2000 will likely be cheaper than the CFCs they replace, providing a net social benefit. Under these circumstances, environmental policies can stimulate technological progress that may actually improve the competitive position of companies subject to environmental constraints.

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- Results:**
- Production of the most important ODCs has fallen to less than half their pre-tax level. Between 1990 and 1992, ODC production was consistently well below the level allowed by caps set by the Montreal Protocol. For the five CFCs originally covered by the agreement, for example, production never exceeded 65% of the allowable level. Furthermore, actual production as a percentage of the caps fell somewhat.
 - US production of the same five CFCs has fallen faster than world production. This represents a dramatic reversal of the situation before the tax was introduced in 1990.
 - The cumulative difference between the actual production of the CFCs covered by the Montreal Protocol and that allowed under the caps was about 290,000 metric tonnes of CFC-11-equivalent production. This represents a reduction more than twice as great as initially planned when the production caps were agreed.
 - The tax has been a valuable source of revenue for the federal government. Annual revenues started at \$360 million in 1990, and have risen steadily to more than \$1 billion in 1994.

Lessons:

- See *Policy Issues*

The Policy in Brief

Economic Instrument: Pollution and use charges, in tandem with an offset subsidy for waste water treatment

Problems: Water pollution, and water resources being taken for granted by citizens

Goal: To make polluters pay for water pollution, and to provide financial aid for those treating waste water

Description: A system of water charges and offset subsidies established in the sixties, which has become the backbone of water pollution control in France. It enjoys both wide acceptance and impressive results

Administering Institutions: River Basin Agencies

Key Stakeholders: River Basin Agencies, Water Commission, all water users and polluters

An Overview

The French system of water management, developed in the sixties, is based on the polluter pays principle and its success is now well-established. France's Water Act of 1964 (number 64/1245) created a framework for water charges to be administered by public establishments at the level of river basins. A subsequent decree of 1966 (number 66/700) established that charges may be levied on public or private groups or individuals if they:

- Contribute to the deterioration of water quality;
- Extract water for use from natural sources; or
- Alter a river basin's aquatic environment.

Subsidies for measures aimed at improving or safeguarding water quality may also be granted to private or public concerns. A compensation system, known as the subsidy for waste water treatment, was introduced to offset the water pollution charge for those persons or bodies who treat waste water before discharging it into rivers and lakes. This measure was

intended to act as an economic incentive for polluters to take steps to avoid the deterioration of water quality.

The total sum of the water charges to be levied and collected by each river basin agency is set out in a 'pluri-annual intervention program' geared toward developing water resources and reducing pollution. The program establishes all expenditures to be met by each agency within a fixed time frame, that is, for the duration of the intervention program. The amount is fixed according to the expenditure required by each river basin agency to achieve the priority objectives and targets set for the period in question. The water charges system is managed by the six water basin agencies and covers the whole of France. The water basin agencies establish the water charges to be collected based on a compulsory declaration made to them by all persons or bodies liable for the charge. The water charges can be divided into two groups — pollution and use charges.

Pollution charges are levied each year on the basis of the average daily quantity of pollution generated during the month of maximum discharge. Several pollutants are taken into account in assessing domestic and industrial water pollution levels, including suspended solids, oxidizable substances and nitrogen. For industrial establishments the pollution generated is either measured or estimated at a flat rate. The pollution charge is collected directly by the River Basin Agencies from organizations generating more pollution than would normally be generated by 400 average inhabitants. Pollution charges for domestic and assimilated waste are added to the price of water calculated in each urban or rural district.

Use charges were implemented by the River Basin Agencies for the purpose of quantitative management of water resources. Public and private bodies or individuals are liable to pay this charge for extracting water or altering the aquatic environment.

Policy Issues

A more traditional solution could have been found to the problem of increased investment costs involved in securing and transporting sufficient quantities of water to satisfy demand: a new general tax levied on all citizens alike. This solution was ruled out, however, because from an economic point of view it would not have been effective. Under the influence of certain leading economists, the economic idea of water

Policy History at a Glance

Dec 1964

Water Act, establishing six regional agencies

Sep 1966

Water management charges and subsidies outlined

1968

First water charges levied

1969

First water charges collected

management rose in prominence. A popular view was that investment policy for pollution control had to be based on the internalization of water costs at river basin level.

In France, industry and other economic players are widely opposed to outright regulation. Politically, a system of water charges was much more acceptable, giving greater choice to water users in handling the charges. For instance, a company might decide to treat its waste stream and so reduce its charges, or it might decide to absorb the cost of the charge because treatment is too expensive.

France's success with water charges has prompted many countries to consider adopting similar policies elsewhere.

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- Results:**
- In 1992 the total sum of water charges collected by the River Basin Agencies amounted to 4.840 million FF. In 1993 this sum increased to 6.456 million FF.
 - The water charges system has had a positive effect on the natural environment. In the Artois-Picardie river basin, for example, industrial pollution discharges dropped by around 40% between 1975 and 1983. Figure 1 shows the yearly changes, using 1975 as a base year.

Year	Suspended Solids	Oxidizable Substances	Inhibitory Substances
1975	100.0	100.0	100.0
1976	91.7	84.6	95.5
1977	93.9	88.0	87.8
1978	83.0	83.9	102.2
1979	87.5	82.0	89.3
1980	89.4	81.0	85.9
1981	73.9	73.9	71.1
1982	63.6	64.8	82.4
1983	61.4	63.0	61.9

Figure 1. Industrial pollution discharges in the Artois-Picardie river basin area, 1975- 1984, expressed as a percentage of 1975 levels (Source: Ve Programme d'intervention de l'agence de l'eau Artois-Picardie, 1987-91).

- Total groundwater extraction dropped by about 15% between 1970 and 1989. Whereas industry reduced extractions by an impressive 55%, municipalities unfortunately increased theirs by 42%. The latter result is largely due to the installation of modern conveniences such as toilets, dishwashers and washing machines. Figure 2 captures more details.

User Groups	1970	1975	1980	1983	1985	1986	1988	1989
Industries	326	256	215	187	180	175	153	147
Municipalities	234	257	283	316	319	318	322	332
Total	560	513	498	503	499	493	475	479

Figure 2. Groundwater extractions by User Group, 1970-1989 (in millions of m³). (Source: VI^e Programme d'intervention de l'agence de l'eau Artois-Picardie, 1992-96).

- Lessons:**
- Water charges make water users fully aware of the value of water resources in general and of the costs of water pollution in particular. They also send a signal that the State is not responsible for bearing the increasing costs of water treatment.
 - The polluter pays principle is capable of generating both wide acceptance and positive results.

Levy on Surface Water Pollution in the Netherlands

The Policy in Brief

Economic Instrument: Tax levy and licence provisions

Problem: Water pollution from oxygen-demanding and heavy metal discharges

Goal: The collection of revenue for government-run water quality management initiatives

Description: A levy imposed on private households and companies alike, based on the 'polluter pays' principle. It was introduced in the early 1970s to fund the costs of government authorities for water quality management

Administering Institutions: Ministry of Water Management and various regional water boards

Key Stakeholders: Water boards, water users and polluters

An Overview

The levy's original objective was to raise funds for the central purification of surface waters by government authorities. The reality, however, has been that companies have dramatically modified their discharges in response to the levy.

The levies are administered by regional water boards across the Netherlands and their rates vary widely. In 1992, for instance, the highest rate was 120 guilders while the lowest was 42 guilders. The variation reflects differences in:

- *Water quality objectives.* Within water catchment areas, for example, standards are more stringent.
- *Investment costs.* For example, water boards whose construction costs for sewage water treatment plants have already been depreciated are able to function at a lower cost level.
- *Waste volume.* For larger volumes of relatively concentrated pollutants, the costs are comparatively low.

Each water board calculates its levy rates by dividing the total of its estimated annual costs for water quality management by the estimated volume inhabitant equivalents (IEs) to be discharged. 'IEs' are the units used for measuring the amount of oxygen-demanding

discharges, such that one IE reflects the average amount discharged by one household member. Only large companies pay the levy according to the actual level of emissions measured; families and small companies pay a standard amount, which lessens the incentive involved.

Levy rates have risen markedly. On average, levy rates doubled from 36 guilders in 1980 to 73 guilders in 1993. A major cause of this increase is that the volume of pollution discharged by manufacturers dropped. Fixed costs of sewage water treatment plants therefore have to be distributed over an ever-decreasing number of IEs. The rise in rates in turn creates an incentive for yet more companies to start purifying their sewage water. And so the upward spiral continues.

Policy Issues

The use of a levy as an instrument for decreasing surface water pollution offers a number of advantages over more direct means such as licensing and monitoring. Levies are less labour-intensive. Enforcing licence provisions is complicated by the practical difficulty of gathering evidence. The levy has proved to be effective from the perspectives of reducing pollution and minimizing social costs. The levy allows companies to choose whether to implement a waste reduction initiative. Where treatment is relatively expensive, companies are likely to opt for paying the levy; otherwise they may treat the waste water themselves. As a result, the total financial costs incurred in achieving a given pollution reduction will be minimized, compared with a system forcing all companies to reduce discharges to a fixed standard. Nevertheless, direct regulations governing discharges still have a role to play. As a case in point, consider highly toxic substances. For such items whose discharge has far-reaching negative consequences, a ban is more suitable than a levy.

Lingering problems with the Dutch levy suggest a number of refinements for policy makers abroad to consider before introducing similar policies. These include:

- Redistribution of at least some levy funds to companies, to increase acceptance and contribute to investment costs;
- Lessening of regional variations in levy rates, to remove price- and competition-distorting effects;
- Added incentives for households and small companies to reduce emissions; and
- Special treatment of companies for whom treatment would be extremely difficult or costly.

Policy History at a Glance

1970s

Water boards introduced large purification plants and introduced a levy on discharges

1990

Dramatic decline in discharges

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- Results:*
- In reaction to the levy, and in order to reduce its costs, companies started to introduce cleaner production techniques and in-house waste water treatment.
 - The discharge of the most important pollutants dropped dramatically between 1975 and 1990. Figure 1 shows the decline in oxygen-demanding discharges, in manufacturing especially, while Figure 2 shows the decrease in heavy metals discharges.

	1975	1980	1985	1988	1989	1990
Households	13.7	14.1	14.5	14.8	14.8	14.9
Agriculture	0.2	0.1	0.1	0.0	0.0	0.0
Manufacturing	15.3	9.7	5.9	6.0	5.7	5.7
Other companies	3.9	4.1	3.8	3.8	3.8	3.9
Total discharge	33.1	28.0	24.3	24.6	24.3	24.5
- treated by s.t.p.'s	12.0	16.5	18.4	20.5	20.5	20.8
- effluent from s.t.p.'s	4.0	4.0	3.9	5.9	5.1	4.9
Net load upon surface water	25.1	15.5	9.8	10.0	8.9	8.7

Figure 1. Discharge of oxygen demanding materials in waste water, by origin and destination (millions of IE's) (Source: CBS 1990. "S.t.p.'s" are sewage treatment plants).

Metal	1976	1980	1985	1988	1989	1990	reduction %			
							1985-1990	1995	2000	2010
Cadmium	29.5	19.6	17.7	6.1	4.1	3.7	79	90	90	90
Mercury	2.9	0.9	0.4	0.5	0.5	0.5	-25	25	50	70
Chromium	373	151	109	92	86	22	80	85	85	85
Copper	88	60	30	30	30	27	10	50	50	80
Lead	113	121	33	21	22	23	30	65	65	70
Nickel	65	72	36	24	26	22	39	50	50	80
Zinc	782	565	192	127	136	111	56	65	65	80

Figure 2. Discharges of heavy metals by industries (1000 kg) (Source: CBS 1990a, VROM/COMPRIMO).

- The significant costs of measuring discharges make continuous measurement and regulation economically feasible for larger companies only. Though smaller companies and private households tend to pollute less, fixed standards for calculating their levies eliminate incentives for lowering discharges in this group.
- In practice, the levy turned out to be a strong incentive for companies to tackle the problem of water pollution at its source. A survey carried out among 150 larger companies showed that 66% of companies that took measures to curb discharges as a result of the policy claimed the levy to be the main reason. The licence provisions, in comparison, were mentioned as the main reason by only 24% of these companies.
- Few operating problems were encountered in implementing the levy.

- Lessons:**
- Policy design should take into account the impact a new policy may have on future revenue streams, and on the ability of the policy to continue functioning in the future.

Iowa's 1987 Groundwater Protection Act

The Policy in Brief

Economic Instrument: User fees and taxes

Problem: The pervasive use of agro-chemicals causing significant water pollution

Goal: The modification of attitudes and behaviour toward more sustainable use of agro-chemicals and the protection of Iowa groundwater

Description: A non-regulatory approach that stresses education, demonstration and technical assistance, rather than large price signals, standards or elaborate enforcement mechanisms. The Act combines voluntary elements with user-fee-based revenue generation

Administering Institutions: Department of Natural Resources (DNR) and Department of Agricultural Land Stewardship (DALS)

Key Stakeholders: Farmers, pesticide dealers and manufacturers, and water users

An Overview

With passage of the 1987 Iowa Groundwater Protection Act, the State articulated a comprehensive policy regarding groundwater contamination. The Act established a scheme to raise revenue in three ways: pesticide manufacturing registration fees, pesticide dealer licensing fees, and fertilizer taxes. See Figure 1.

The Act dedicates revenues as follows:

- 6% to the State Hygienics Laboratory to assist with the testing of private, rural water supplies;
- 9% to create and fund a Center for Health Effects of Environmental Contamination;
- 13% to DALS for demonstration projects regarding agricultural drainage wells and sinkholes;
- 35% to create and fund the Leopold Center for

Who Pays?		
Who	What	Rate
Pesticide Manufacturers	Registration Fee	20% of gross annual sales*
Pesticide Dealers	Licensing Fee	1% of gross annual sales
Fertilizer Purchasers	Tax	\$.75/ton at 82% Nitrogen content

* Ranging from \$250 minimum to \$3000 maximum

Figure 1. User Fee and Tax Assessments under the 1987 Iowa Groundwater Protection Act.

Sustainable Agriculture at Iowa State University. The Center's work has received wide acclaim for translating research into practical, on-the-farm applications; and

- 37% to DNR for administration costs and grants related to the testing and closure of private wells.

In addition to these tax and fee revenues, Iowa's educational, research and demonstration programs rely on other funding sources. Iowa received a total of \$8.5m between 1986 and 1992 for the support of two state agencies — DNR and DALS — to administer the Act's provisions.

Policy Issues

The Iowa approach must be praised for generating high acceptance among farmers. Taxes of a sufficient magnitude to reduce chemical use through the price signal alone would face profound political and practical obstacles in Iowa. Moreover, as the State legislature recognized, a tax would not be effective in shifting behaviour if farmers did not believe they could maintain yields using fewer chemicals.

Despite limited reach, Iowa's fiscal and educational approach represents a significant first step. It is both a clear statement of public goals — that the State is interested in protecting groundwater — and an important use of the tax system to reflect what is considered desirable behaviour. In addition, the approach represents an innovative application of the

Policy History at a Glance

1978	1979	1987	1990
Routine groundwater checks first detected nitrogen & pesticides in Iowa wells	Formation of multi-stakeholder committee, later named the Iowa Consortium on Agriculture and Groundwater Quality and obtained funding for educational programs	Iowa enacted Groundwater Protection Act	Educational program participants registered declines in nitrogen use as compared to non-program farmers

'polluter pays' principle. Whereas funds raised from taxing polluters are typically used to cover either the costs of administering regulatory programs or cleaning up pollution after the fact, Iowa has adopted a unique strategy. Revenues collected through taxes are still dedicated to the program goal, but embrace a novel tactic — *preventing* pollution.

The challenge in Iowa is how to modify the fiscal and educational approach now that earlier non-tax and -fee funding has dried up. With current fertilizer tax rates being so low the price signal could be strengthened over time. Fees and taxes remain an attractive solution because of the direct relationship between the use of chemicals and the effects on groundwater.

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- Results:*
- Preliminary findings indicate that this non-regulatory policy has already achieved significant positive results as measured by changes in attitudes and levels of agro-chemical usage.
 - Though the education and demonstration programs were expected to reach only 2 to 3% of Iowa's farmers directly, the resultant behavioural changes have proved more significant.
 - Between 1986 and 1991, nitrogen fertilizer application rates on corn fell 8% in Iowa, compared with a regional average decline of 5%. The one state that registered a greater percentage reduction, Indiana, started at a much higher per acre baseline application rate (157 pounds per acre compared to Iowa's 131) and its current per acre rate (135) remains higher than Iowa's 1986 rate (131). Figure 2 shows the details.

State	1986	1987	1988	1989	1990	1991	Change 1986-1991
Iowa	131	132	139	128	127	120	-8%
Illinois	156	161	163	160	164	159	+2%
Nebraska	141	135	142	145	144	135	-4%
Minnesota	107	121	118	115	113	110	+3%
Indiana	157	136	146	133	139	135	-14%
Average	138	137	141	136	137	131	-5%

Figure 2. Rate of Nitrogen fertilizer application to corn crop in the five top corn producing states and regional average, 1986-1991 (in pounds per acre). (Source: U.S. Department of Agriculture, *Fertilizer Use and Price Statistics*,

- A 1990 survey conducted as part of the Integrated Farm Management Demonstration Program (IFMDP) found that since 1985, 77% of program participants who had made changes in nitrogen management decreased their application rates, as compared to only 45% of all farmers statewide.
- Farmers who are neighbours to program participants benefit indirectly. A 1990 survey found that since 1985, 70% reported decreasing nitrogen application rates, as compared again to only 45% of all Iowa farmers. The numbers suggest that Iowa's program benefits from significant diffusion of educational and demonstration information, beyond the 2 to 3% of farmers with direct program contact.

Lessons:

- The effectiveness of taxes and price signals in shifting behaviour can be enhanced if people feel they have choices. The role of educational programs should not be underestimated here.
- Indirect benefits of educational and demonstration policies can be significant.
- Tax designers should take public perceptions as well as marginal financial impacts into account in their designs.

The Policy in Brief

Economic Instrument: Resource tax

Problem: An undervalued water resource due to ignorance of many environmental externalities

Goal: The reduction or modification of water extraction activities and the creation of a relatively stable revenue source

Description: A cluster of similar but slightly differing water tax policies across a number of German *Länder* or states. In order to overcome the manifold practical difficulties that follow from the fact that no standard method exists to assess the value of water in the natural environment, the German water taxes were all based on a highly practicable approach. Desired outcomes or standards were defined, and then tax rates and tariff structures were set to achieve the required results, with modifications arrived at in the political process

Administering Institutions: German *Länder*

Key Stakeholders: German *Länder*, ground and surface water users

An Overview

Water prices are usually and traditionally derived on the basis of the costs of extracting water from the natural hydrological cycle, and of water treatment, transport and distribution. The true value of the water resource — for human activities as well as for supporting natural ecosystems — generally remains unmeasured. Where prices deviate from cost levels, they tend to be lower, causing excessive levels of water use.

Such was the case in Germany. On January 1, 1988, however, Baden-Württemberg became the first German state to attempt to redress this imbalance. It established the ‘water penny’ tax in an effort to exercise *Länder*-level control over water management, that is enshrined in the Constitution of the Federal Republic of Germany. Although the *Länder* are independent political entities where water management is concerned, the development of policy initiatives tends to be interdependent. An intensive exchange of information allows

each state to benefit from the experiences of others. Different *Länder* soon followed Baden-Württemberg’s lead: the city states of Hamburg and Berlin in 1989; Hesse, Lower Saxony, Bremen and Mecklenburg-Western Pomerania in 1992, and Saxony and Sleswick-Holstein in 1993. All remaining *Länder* are now preparing similar legislation, with Brandenburg, Saxony-Anhalt and Thuringia being at advanced stages.

Unfortunately there is no simple classification of the specific economic instruments adopted by the different *Länder*. Their fiscal, financial and incentive functions are combined and often inseparable. Nevertheless, Figure 1 attempts to highlight the main elements of the different water taxes.

In line with the general development of environmental policy away from direct regulation by prohibitions and prescriptions and toward greater use of economic instruments, water resource taxes were introduced not as alternatives to direct instruments but as complements to them. Direct regulation and the water resource taxes are linked since the taxes are levied, as a rule, only in cases where a permit or licence is required. In some cases, the taxes are levied not on the amount of water actually extracted but on the quantity for which a permit has been given. Furthermore, where metering is not feasible and taxation is based on estimates, information obtained through licensing procedures will often be used to assess the water resource tax.

The taxes are usually set by the same public agencies responsible for granting extraction licences or permits. From an administrative point of view, direct regulation and economic instruments are designed to work in tandem. It should be taken into account, however, that because of the strong link between water resource taxes and direct regulation, success might well be dependent on a developed legalistic tradition in public administration and environmental policy.

Policy Issues

On the whole, economic instruments have been augmented by improvements in water management and institutional capacity-building as a result of the tax introductions. Overall, success may depend on strong links between economic incentives and administrative control.

The low price elasticity of water demand (that is, the modest reductions in water use caused by price increases) means that differential water taxes alone are not expected to cause dramatic changes in water use. In theory, differentiated water tax rates can be an efficient tool in providing incentives to change water extraction patterns. Different tax rates are more appropriately applied to different origins of water than water uses, however, because the use to which water is put has little bearing on the ecological cost of its extraction. Unfortunately, most *Länder* differentiate tax rates on the basis of water use,

Policy History at a Glance

pre-1987	1987	1989	1992	1993	1994
Water protection legislation widely regarded as ineffective	Baden-Württemberg introduced the ‘water penny’ tax	Hamburg and Berlin followed	Hesse, Lower Saxony and Mecklenburg-Western Pomerania followed	Saxony, Sleswick-Holstein followed	Most other <i>Länder</i> preparing similar policies

Baden-Württemberg

Rate based on quantity of water extracted. Tax on ground and surface water extraction. Tax revenues directed toward compensation payments to farmers for restrictions on fertilizer use in water catchment areas. Tariffs differentiated according to origin of water (surface or ground) and water use (public water supply, heat pumps, cooling, irrigation, other). As the first water tax, it served as a model for other *Länder* policies. Rebates up to 90% for water-intensive agriculture, forestry and industrial enterprises, conditional upon water-saving measures and minimized groundwater use. Public interest rebates also possible.

Hamburg

Tax on groundwater extraction only. Rate based on extraction rights held by users. A basic fee entitles users to extract a standard quantity of water which, if exceeded, causes the fee to rise to a level corresponding with actual water use. Fees have increased twice since introduction.

Berlin

Groundwater only. Applicable since January 1, 1990. Uniform tax rate (that is, no differentiation according to origin or use). Few exemptions or reductions. Closest to 'ideal' resource tax.

Hesse

Groundwater only. Differentiates among various uses like Baden-Württemberg. Relatively high unit rates.

Lower Saxony

Ground and surface water. Seven different rates which depend on origin and use. Similar to Baden-Württemberg.

Bremen

Groundwater only. Identical tariff structure to Lower Saxony in this area, but with fewer exemptions.

Mecklenburg-Western Pomerania

Ground and surface water similar to Lower Saxony.

Saxony

Ground and surface water similar to Lower Saxony.

Sleswick-Holstein

Allows taxes to be offset by investments in the substitution of ground with surface water, or in water-saving measures which reduce consumption by 20% or more. By the end of 1993, taxes were only applied to groundwater.

Brandenburg, Saxony-Anhalt, Thuringia and Other *Länder*

Similar to Sleswick-Holstein. Relatively low unit rates. Increased level of legislative complexity.

Figure 1: Water Taxes in the German *Länder*

thereby reducing the environmental effectiveness of a resource tax.

The experience of Germany's *Länder* with water resource taxes could be instructive abroad even though water scarcity is not prevalent in Germany, despite its high population density and level of industrialization.

Some Further Reading

Gesetz über die Erhebung einer Gebühr für Grundwasserentnahmen (Grundwassergebührengesetz) (Act Relating to the Imposition of a Fee for Groundwater Extraction) (26 June, 1989). *Hamburgerisches Gesetz- und Verordnungsblatt I*, no.24 of 30 June, 1989, pp. 115-116.

- Results:**
- In Hamburg between 1989 and the end of 1993, more than a third of all water rights held by users were renounced. This amounted to a surrender of rights to 103.8 million cubic metres of water per annum.
 - Although it has been only a few years since the first introduction of water resource taxes in the German *Länder*, the experience so far is very positive. Such taxes contribute to capacity-building, prove to be environmentally effective in changing extraction patterns and reduce the amount of water used. Through careful introduction and subsequent changes in unit rates they appear able to provide sustainable revenue, thus combining incentive and fiscal functions.

- Lessons:**
- Effective resource taxes often require a competent administrative framework.
 - Policy creation through decentralized experimentation can ultimately lead to a stronger end result.
 - Water resource taxes more accurately reflect true ecological costs when based on water origin rather than on total usage.

The Policy in Brief

Economic Instrument: Landfill tax

Problems: A 50% increase in household waste between 1960 and 1990; 6000 illegal dump sites; waste disposal facilities at saturation point, and public opinion firmly opposed to new or expanded landfill sites

Goal: The extensive reform of the French waste management policy, including means of making waste management self-financing, and the exclusive acceptance of final waste in landfill sites by 2002

Description: An ambitious policy intended to streamline French waste management, making it more efficient by increasing waste recovery and fiscal self-sufficiency

Administering Institution: National Agency for Environment and Energy Management (ADEME)

Key Stakeholders: ADEME, and waste collection, treatment and disposal operators

An Overview

By the end of the 80s, French waste management policy appeared exhausted in the face of growing demands on the waste system. A new Act in 1992 (No. 92-646) attempted to address the problem by introducing a landfill tax which directly or indirectly concerned all those involved in collection, treatment and disposal.

All persons or legal entities operating a household and assimilated waste landfill site — whether they have been granted authorization or not — are liable to pay the tax. This applies as long as the site is not exclusively used for internal waste. Those landfill sites managed by companies to stock their own waste are exempt from the tax, as are community refuse return and sorting centres and transfer sites. The tax is applied to all waste entering landfill sites with Prefectoral authorization to take such waste. The site operator is liable to pay the tax. Around

6,500 landfill sites are affected — 500 authorized sites with a capacity of over 10 tons per day and some 6,000 illegal dump sites. The volume of waste affected by the tax is around 17.5 million tonnes. This includes 9 million tonnes of household waste, 7 million to 8 million tonnes of harmless industrial waste stored in Class II landfill sites, and 0.7 million tonnes of harmless industrial waste stored in Class I landfill sites.

The tax has been established at 20 FF per tonne of waste entering the site with a minimum charge of 5,000 FF per site per year. To break even, a site must receive at least 250 tonnes of waste each year. There is a 50% increase in the rate for waste from outside the area covered by the household and assimilated waste disposal plan, which covers each *département*. The tax is payable quarterly for facilities authorized to receive more than 20,000 tonnes of waste per year, and annually otherwise. All persons or legal entities liable to pay the tax send ADEME notification (in the form of a declaration) of tonnage delivered along with the tax payment due. Operators of household and assimilated waste landfill sites are required to keep a register in which for each waste consignment delivered the following is to be recorded: tonnage and type of waste, place of origin and identity of the producer, date and time of delivery, name of transporter, and registration number of the delivery vehicle. ADEME is in charge of verifying the declaration and collecting the tax. The landfill tax payments received by ADEME are fed into the Modernization Fund for Waste Management (MFWM), instituted by a decree of March 1993 (number 93-744) and administered by ADEME. The aim of the MFWM is to promote innovative means of waste treatment and to equip local authorities with necessary funds. This involves four main objectives:

- Financial aid to develop innovative technology for household and assimilated waste treatment;
- Financial aid to install waste treatment facilities, especially those which make use of innovative technology;
- Financial aid to local authorities on whose territory a new treatment plant for household and assimilated waste is built; and
- Financial aid for upgrading public landfill sites and restoring contaminated sites.

Policy History Time Line

Jul 1975	1989	Jul 1992	Mar 1993	Apr 1993	Jun 2002
First major policy on waste disposal and material recovery	Existing waste policy exhausted its potential	Landfill tax on assimilated and household waste introduced	MFWM established, financed by landfill tax payments sent to ADEME	Landfill tax entered into force	Landfill tax will end and only final waste will be accepted at landfill sites

Type of Aid	Millions of FF	%
R & D	42	22.4
Site remediation	10	5.3
Aid for local authorities (5 FF/t)	4	2.1
Aid for waste management projects (technologies and accessories: plans, studies, training)	132	70.2
including:		
– harmless industrial waste/rubble	27	14.3
– municipal waste	105	55.9
Total	188	

Figure 1. Estimated distribution of MFWM funds for 1993 (Source: ADEME).

Figure 1 shows the estimated distribution of MFWM funds for 1993.

Policy Issues

The landfill tax is only one instrument of a wider waste management policy. Other critical elements include strong political willingness, a reinforced legislative framework and a clear strategy for supporting technological research. If the aim of the 1992 Act — to put an end to direct disposal in landfill sites and ensure that only final waste enters them by 2002 — is to become a reality, then considerable challenges still lie ahead. These include the creation of the equivalent of 160 treatment/recycling facilities, each covering a number of *communes*. This involves a doubling of the current number of high capacity plants, and an improvement in processes for incinerating and composting. Without research and development into cleaner processes, the authorities are likely to come up against opposition to new waste treatment plants by local inhabitants — the NIMBY or Not In My Back Yard syndrome. It should be emphasized that establishing landfill sites exclusively for final waste means that processes to solidify, stabilize, or otherwise render inert, all residues from treatment facilities will have to be developed. Before the tax can be used in an

exclusively preventative fashion, significant allocations must be directed to restoring old contaminated landfill sites.

Some Further Reading

Agence de l'environnement et de la maîtrise de l'énergie (ADEME) (April, 1993). *La taxe sur la mise en décharge*, an information document and practical guide.

ADEME (October, 1993). *Les déchets en France*.

ADEME, *Taxe sur le stockage des déchets : Pourquoi et comment? Fond de modernisation de la gestion des déchets — Comment bénéficier d'une aide financière?*

- Results:**
- The landfill tax should generate between 350 and 400 million FF for the MFWM.
 - The tax acts as both an incentive and a deterrent due to the fact that it is redistributed in the form of financial aid to support research on cleaner disposal processes, while it also provides a financial impetus to reduce waste.
- Lessons:**
- No substantive assessments have as yet been made of the overall policy. Some skepticism has been expressed, however, regarding the potential of the landfill tax to raise sufficient revenues to become a going concern and achieve its ambitious aim.

A Possible Landfill Levy in the UK: Economic Incentives for Reducing Waste to Landfill

The Policy in Brief

Economic Instrument: Tax levy

Problem: Excessive solid waste

Goal: A reduction of solid waste flows to landfill sites; the collection of revenues for financing environmental initiatives; the raising of UK landfill costs in line with other EU rates, and the internalization of externalities into waste costs

Description: A uniform levy for solid waste, possibly on par with the average external costs of landfill

Administering Institution: Preferably the waste disposal industry, acting under a voluntary scheme. Free-rider problems may plague this approach, however

Key Stakeholders: The waste disposal industry as represented by the National Association of Waste Disposal Contractors (NAWDC), Department of the Environment (DOE)

An Overview

Discussion of the UK landfill levy still remains at the planning level. The UK government appears committed to implementing some form of waste reduction policy, but its precise form has still to be decided. In 1990, the Environmental Protection Act and publication of the Environmental White Paper set the UK Government's agenda as follows: encouraging the minimization of waste, tightening waste disposal standards, and promoting recycling of as much waste as possible, including the recovery of energy. A target for recycling of 25% of household waste was set.

In 1991 the Advisory Committee on Business and the Environment recommended that the price of landfill be increased significantly to levels obtained elsewhere in the EU. As a result the Government agreed to further investigate landfill pricing and the possible use of economic instruments. In 1992 a report looking at a range of economic instruments concluded that the

internalization of externalities (from waste disposal) would reduce the amount of waste going to final disposal either through recycling or waste minimization. The conclusion was that this could be achieved most simply via collection or disposal charges.

In order to keep administrative costs down, a uniform levy is sometimes proposed, even though external costs and benefits vary from one landfill site to another. A uniform levy would not provide any incentive to improve operational standards or minimize environmental impacts, as there is no built-in reduction in the levy for landfills with lower external costs. Taking the landfill sector of the waste management industry alone, the dynamic efficiency claimed to be one of the advantages of economic instruments — that is, the incentive to reduce environmental impacts over time — would be lost.

Policy Issues

The UK may stand to benefit from the experiences of Denmark and France, both of which already have landfill levies. In both countries, a landfill tax is seen as a way of raising revenue (in France, for funding research on waste management), while promoting waste reduction, recycling and incineration at the expense of landfill. Denmark introduced a landfill and incineration tax in 1987, at DKK 40 (around US \$6 — August 1994 rate of exchange) per tonne of waste. This has subsequently been increased to DKK 195 (US \$29.10) per tonne for landfill and DKK 165 (US \$21.70) per tonne for incineration. France only recently, in 1992, introduced a landfill tax of FF 20 (US \$3.40) per tonne of waste. It is described in further detail in Chapter 18.

During interviews with affected parties, the waste industry — that is, waste disposal contractors and local waste authorities — expressed hostility toward the introduction of a landfill levy. It was felt that a landfill levy would penalize one disposal option unjustifiably and would be based on the political dogma that landfill is 'bad' and ought to be taxed — a position the industry believes has no technological, financial or moral justification. Furthermore, many respondents from the waste industry did not believe a levy would actually result in significant increases in recycling and incineration; it would therefore merely be a revenue-raising tax. Instead, many — especially large waste

Policy History at a Glance

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Date and design of first implementation are still under consideration

disposal contractors — were favourably disposed toward stricter standards for landfill operation. This would increase costs, bringing UK costs into line with those of other EU Members, and also internalize some of the external effects associated with landfill. But as stricter standards are due to be imposed anyway, they feel that a levy in addition would be unwise.

The proponents of a landfill levy are generally concerned about unfair competition between landfill on one hand and recycling and incineration on the other. This they see as arising from the lower landfill costs in the UK. A worry is that nobody really knows what happens in a landfill, especially after it has been filled for some time. They argue that it would be more sensible to recycle the fraction of the waste stream which it is economical and practicable to recycle, to incinerate and recover the energy from the combustible waste stream, and to landfill only the stabilized ashes and remaining, inert, waste. Germany and the Netherlands were given as examples of countries where high landfill costs and high recycling rates suggest a direct correlation between landfill costs and recycling rates. A landfill levy, proponents argue, would increase landfill costs, thereby increasing recycling and incineration and decreasing the potential danger of landfilled waste. Growing difficulties in obtaining planning permission for incinerators, however, suggests that for the time being at least, UK waste disposal efforts will continue to focus on landfills.

Some Further Reading

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Coopers & Lybrand (1993). *Landfill Costs and Prices: Correcting Possible Market Distortions*, HMSO, London.

Environmental Resources Limited (1992). *Economic Instruments and Recovery of Resources from Waste*, HMSO, London.

National Association of Waste Disposal Contractors (NAWDC) (1993). *NAWDC Comments on 'Landfill Costs and Prices'*, NAWDC, London.

UK Government (1990). *This Common Inheritance - Britain's Environmental Strategy*, HMSO, London.

- Results:*
- Research shows that the behavioural effects of a levy at the £5 to £8 per tonne level would be relatively small. Even a levy at the £20 level is expected to result in maximum recycling rates for household waste of around 12%, compared with the current 5%.
 - External costs on the environment for new landfills with energy recovery are estimated at £1 to £2 per tonne of waste; for old landfills without energy recovery at £3 to £4 per tonne, while external benefits of incineration with energy recovery are estimated at £2 to £4 per tonne. The DOE indicated that these results would be consistent with a landfill levy in the range of £5 to £8 per tonne of waste.

- Lessons:*
- Politically popular justifications for new policies — in this case 'landfill is bad, recycling and incineration are good' — may not always be readily justifiable on economic grounds.
 - The efficiency which is attributed to economic instruments may be lost if a levy is applied uniformly in all cases, independent of the environmental performance of individual landfills.
 - Introducing tougher waste disposal standards and a levy might result in a situation of policy 'overkill'. As stricter standards are currently being implemented anyway, landfill costs will increase as environmental costs are internalized — even without the added levy. In introducing both measures, policy makers should be careful not to penalize landfill operations more than can be reasonably justified. Special attention should be given to the problem of 'phasing in', in which only operators of newly licenced landfills would bear the full cost of stricter standards. Applying the same levy to them as to 'dirty' older landfills would unfairly distribute the costs involved.

Recycling Credits in the UK: Economic Incentives for Recycling Household Waste

The Policy in Brief

Economic Instrument: Credit payment

Problem: Burgeoning solid waste and inefficient resource use due to uninternalized disposal costs, including transportation

Goal: A comprehensive, integrated and streamlined waste management policy, encompassing waste reduction, re-use and recycling

Description: Disposal cost savings due to recycling are transferred from the disposal authority to the groups who collect waste for recycling. Most local authorities made the switch; others, such as Sheffield, kept their old recycling schemes

Administering Institutions: Municipal authorities, including Waste Disposal Authorities and Waste Collection Authorities

Key Stakeholders: Waste Disposal Authorities, Waste Collection Authorities, third party waste collectors such as the Salvation Army and Save-a-Can, recyclers

An Overview

The purpose of the recycling credits system was spelt out in a 1991 Touche Ross report: “The recycling credit is seen as a means of rewarding individual local authorities and third parties for their initiatives in recycling. The rationale of the credit is that if a local authority or third party has enabled a saving to be made in disposal or collection cost as a result of separation of waste for recycling, then it should be rewarded in direct proportion to that saving.”

The UK Environment Protection Act of 1990 defined two types of payments — collection credits to be paid by Waste Collection Authorities (WCAs), and disposal credits, to be paid by Waste Disposal Authorities (WDAs). Collection credits are paid by WCAs to third parties such as businesses or charities who collect waste, on the grounds that this reduces the physical amount

which has to be collected and so creates economic savings in terms of lower collection costs. However, a WCA may refuse to make any payments when it has its own recycling collection scheme. Milton Keynes City Council, for example, is a WCA that conducts a door-to-door collection and recycling scheme and does not allow third parties to collect waste for recycling, as this would reduce the collectable supply of waste available to them, and increase the unit cost of their scheme. Credits are calculated as a percentage of the costs of waste collection, including transport of the waste from households to transfer stations or a final disposal point, capital and operating charges of vehicles, labour, supplies such as sacks and bins, and administrative and supervisory expenses.

Disposal credits, on the other hand, are paid either to WCAs which run local recycling schemes or to third parties. Disposal credits are set at half the long-run marginal cost of a WDA’s most expensive waste disposal method. The logic here is that in the short run many costs are fixed but that in the long-run the most expensive disposal method would be the first to go. As Figure 1 indicates, the size of the disposal credits varies depending on the location of the disposal authority. As one might expect, disposal is most costly in core city areas, where land is expensive and waste generation is high. After one year of operation, the average disposal credit across the UK was £10 according to the County Surveyors’ Society.

Recycling credits are not a subsidy *per se*. They give a signal to the market about the true financial costs of waste collection and disposal, to compare against the costs of the alternative — recycling. But they have no effect on the central government budget since the system is entirely run by local authorities. Nor do they represent a net increase in financial flows. They simply transfer savings in disposal costs to recyclers.

Policy Issues

The main problem with recycling credits at present is that they are too low. This is largely because in the short term, most local authorities are locked into fixed contracts for waste collection and disposal as a result of competitive tendering to private contractors or a Local Authority Waste Disposal Company introduced in the

Policy History at a Glance

Pre-1990	1990	Apr 1992	Apr 1994	Today
Somewhat arbitrary rebates given by municipal authorities for recycling (mainly paper and glass)	UK Environment Protection Act emphasizes the economic-incentive-based approach	Recycling credits outlined in the 1990 Act came into effect	Size of recycling credits more than doubled	Less than 5% of the UK’s household and small business waste is currently recycled. The proportion in industry is much higher

Type of Waste Disposal Authority	Magnitude of Disposal Credits per tonne (£)
An inner London WDA	34.52
The City of London	34.52
An outer London WDA	29.28
The Council of a metropolitan district	23.02
Any other WDA	16.74
	where the authority incurs any transport costs and
	9.42
	in other cases

Figure 1. Representative sizes for disposal credits (Source: Statutory Instrument No. 522, 1994).

1990 Act. So while savings from collection costs due to recycling are realized by the contractors, they are not passed on to WCAs until new contracts are negotiated. The credits are also generally too low to provide an incentive for the development of new third party collection schemes. Third party schemes also suffer from a lack of publicity and from minimum tonnage and payment restrictions. Monitoring has been another problem as the system is potentially open to mismanagement if those collecting waste never actually recycle it. As a control mechanism, each local WDA registers recyclers, who must then produce receipts as proof before any credit payment can be made. This prevents repetitive entries through the issue of double

receipts. Despite potential difficulties with monitoring, most local authorities found the administrative cost of the scheme less than they had feared.

The recycling credits policy of the UK still has a long way to go. In 1993/1994, the tonnage of recycled household waste represented only 5% of total recyclable household waste. In its proper context, recycling credits must be seen as part of a more extensive waste management policy rather than as a single solution. Other key initiatives include waste reduction at source, and market creation for recycled materials.

Some Further Reading

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Friends of the Earth (1991). *Recycling Officer's Handbook*, Friends of the Earth, London.

Touche Ross (1991). *Waste Recycling Credits: Systems and Mechanisms*, HMSO, London.

Turner, R.K. and Powell, J.C. (1991). Toward an Integrated Waste Management Strategy, in *Environmental Management and Health*, Volume 2, pp. 6-12.

MEL Research (1994). *Review of the Recycling Credits Scheme*, Report to the DOE, HMSO, London.

- Results:**
- Recycling credits in the first year of operation amounted to around £2.6 million. These were paid on 445,000 tons of recycled materials, representing 60% of all recycled materials in the UK. Without the system, local authorities believe recycling would be much lower.
 - In the short run, a 10% reduction in waste collection would reduce collection costs by no more than 2%, owing to large fixed costs. In the long run, however, collection costs would stand to be reduced much more significantly.
 - Preliminary monitoring showed that by late 1993 all county councils paid disposal credits to WCAs. Two-thirds of local authorities also paid disposal and collection credits to third parties.
 - The credits have raised the profile of recycling. In the case of London, the system has also created competition between boroughs to achieve the highest level of recycling.
 - Total recycling credits paid by local authorities more than doubled between 1992 and 1994.
- Lessons:**
- Despite the success of the recycling credit scheme in the UK, recycling credits are not the only tool of waste management policy. Better waste management can only come about with an integrated waste management system.

The User Pay Waste Management Initiative in the Victoria Capital Regional District, British Columbia

The Policy in Brief

Economic Instrument: User fees for household waste management and tipping fees

Problem: Canadians produce more solid waste per capita than any other people in the world. This has led to growing pressure for — and opposition to — new landfills

Goal: The reduction of per capita waste levels by 50% from 1989 to 1995, and the creation of a state-of-the-art landfill operation

Description: A combination of increased tipping fees and individual user pay requirements involving restrictions on the quantity of garbage that will be collected. These were implemented in the Capital Regional District (CRD) of British Columbia over the last five years, and further refinements were recently added

Administering Institutions: Municipalities

Key Stakeholders: Households, municipalities, and recyclers

An Overview

In 1990 the CRD, which comprises over 300,000 inhabitants, determined that its landfill site was virtually full. Only by the CRD committing itself to an extensive program to divert waste would the public endorse the expansion of the landfill site over an adjacent lake. The CRD also had to assure the public that there would be no pressure to expand or relocate again for at least 25 years.

The CRD's overall objective of a 50% per capita waste reduction by 1995 was more ambitious than counterpart national and provincial schemes. The scheme has five main elements:

- The tipping fee for using the landfill was raised from \$10.50 (Cdn) per tonne in 1988 to \$75 per tonne in 1993. An increasing number of items were banned and higher tipping fees for selected substances, such as gypsum wallboard and asbestos, were instituted.

- The efficiency of the landfill operation has been improved so that the allowable ratio of garbage to daily cover is now 6:1 — twice what it was five years ago.
- Within the four core municipalities, each household is charged a basic annual fee of \$100 to \$140 for the collection of the equivalent of one can or bag of garbage per week.
- The municipalities charge additional fees, ranging from \$1.50 to \$2.50 for each extra can or bag. Residents must purchase a garbage sticker to affix to the extra can or bag.
- The CRD provides a wide range of recycling services and educational programs to help residents reduce their garbage. These programs include: a regional blue box program; staffed municipal drop-off depots (for corrugated cardboard, boxboard, mixed paper, junk mail, magazines, catalogues, telephone books and pourable plastic bottles); a backyard composter distribution program that provides subsidized composters; a composting and organic gardening demonstration centre; centralized yard and garden composting facilities, and a salvage area and multi-material recycling drop-off facility at the Hartland Landfill site. The cost of these initiatives is funded by increased tipping fees.

Experimentation with pay-by-weight and increased sorting initiatives has also gained increasing prominence.

Policy Issues

Victoria's experience with a user pay system carries a number of lessons:

- Alternatives to traditional waste disposal should exist before a user pay system is implemented. If there are no alternatives — such as recycling or incineration or reuse — then households have little choice but to absorb higher disposal costs. Following the introduction of Victoria's user pay scheme, the public immediately demanded that recycling opportunities be expanded beyond a simple blue box program. As a result, a new policy now exists to ensure that appropriate diversion opportunities are in place before additional waste reduction opportunities are implemented.

Policy History at a Glance

Jan 1992

Introduction of the user pay scheme

1995

Target date for 50% per capita waste reduction

- Illegal or irresponsible dumping can be minimized if anticipated. As an example of the former case, Victoria and more than 100 cities experienced an increase in illegal dumping after tipping fees were raised. In the latter case, companies and institutions with large waste or recycling bins suddenly found themselves flooded with other people's unwanted garbage. The added time and cost required to lock or otherwise guard containers have in a number of instances almost doubled disposal costs.
- Efficiency becomes very important. Increased tipping fees may not be sufficient to cover the increased disposal costs related to a user pay system. When markets for recycled products are absent, for instance, governments can find themselves saddled with an expensive new disposal problem. Toronto's mountains of cans, bottles and paper are a testament to the dilemma. Curbside pick-up and co-collection are two cost-saving initiatives now being tried.
- Attempts to change the *status quo* can meet with political resistance. A motion to change collection from weekly to biweekly service was defeated due largely to lobbying from the Canadian Union of Public Employees local, concerned over job losses. CRD staff expect that similar concerns will have to be accounted for when trying to introduce additional efficiency measures in the future.
- Pay by volume does not create all the appropriate incentives. It creates an incentive to reduce the volume of garbage — but not below a one can per week standard. Weight would be a more refined measure than volume for assessing user payments. However, such a system demands appropriate machinery and accounting technology, which can be expensive. The Oak Bay municipality is experimenting with such a system.
- Practical limitations exist to a user pay system. Theory suggests that users should be charged the

full costs of collection and disposal of their garbage. Garbage is, however, somewhat of a public good. Although its disposal imposes costs on the entire community, no-one has the incentive to redress the problem individually. Municipalities are simply expected to take care of garbage collection and disposal out of their revenue stream. Direct costing of household garbage therefore carries the political risk of a public backlash.

- Sunken costs can impede innovation. Considerable investments in blue box collection trucks, for example, restrict the scope for experimentation with other collection methods, such as the pay by weight and co-collection schemes.
- The problem of packaging must be dealt with separately. Studies conducted by the Ontario Ministry of the Environment and the US Environmental Protection Agency have found that packaging comprises one-third of all residential waste. Packaging decisions tend to be made at national and international levels. The problem should therefore be addressed at those levels.
- Regulations and other incentives are required to ensure material and energy efficient production.

Some Further Reading

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- Results:*
- The Region estimates that the user pay program achieved an 18% reduction in garbage collected from the core municipalities during 1992. By Fall 1993, the Region as a whole was diverting approximately 22% of its waste.
 - Pilot projects in the Oak Bay municipality have diverted almost 50% of all residential waste from volunteer households.
 - The results show that local governments can significantly reduce waste destined for the landfill.

Lessons: • See *Policy Issues*.

SARCAN: Promoting Recycling and the Employment of Disabled People in Saskatchewan

The Policy in Brief

Economic Instrument: A deposit refund scheme

Problem: Low recycling rates in Saskatchewan and low job opportunities for disabled people

Goal: Increased recycling and the employment of disadvantaged people

Description: A beverage container recycling program that began with aluminum cans and has now expanded to include all ready-to-serve beverage containers except milk cartons. Aside from its environmental benefits, the program provides considerable employment benefits to disabled people

Administering Institution: Saskatchewan Association of Rehabilitation Centres (SARCAN)

Key Stakeholders: Households, SARCAN, Saskatchewan Ministry of Environment and Public Safety

An Overview

SARCAN operates under a deposit refund scheme authorized by the Saskatchewan Litter Control Act. A refundable deposit and a handling fee are paid by the consumer to the retailer, and are passed through the distributor to the Government. When the consumer returns the container to a SARCAN centre, SARCAN refunds the deposit and claims the deposit from the government. The government also pays SARCAN all the handling fees that are collected.

Over time SARCAN has invested in its own processing equipment, and now runs and operates three multi-material processing centres in Saskatoon, Regina and Biggar. Aluminum containers are compressed into 11 kilogram bisquettes, each of which contains an average of 640 crushed cans. Bimetal cans are compressed into larger, 590 kilogram bales. Plastic is sorted by colour and baled. Glass is sorted by colour and crushed. All this work is done on site, and primarily by disabled employees.

In 1992, the Saskatchewan Minister of Environment and Public Safety raised the handling fees to \$.05, \$.06 and \$.07 for aluminum, PET and glass containers respectively. She also raised the deposit refunds. Finally, on July 1, 1992 she added all other steel, bimetal and plastic containers to the system.

Policy Issues

The large area and low population density of Saskatchewan represents a major challenge facing the SARCAN operation. Saskatchewan is about 570,000 square km in area but has a population of just less than 1 million. Although approximately 35% of its population lives in the two major cities of Regina and Saskatoon, and 70% of its population lives within a 50-kilometre radius of the 15 largest urban centres, the rest of the population is spread over a very large area with one of the lowest population densities in North America. To address this problem, 66 recycling centres now operate in 62 communities.

By employing a large number of disabled people, SARCAN is relieving the government of a considerable financial burden. SARCAN staff are proud of the fact that SARCAN is premised on the 'three Es'—employment, environmental protection and economic development. Most workshops for disabled people in North America do not pay their clients a regular salary. Most pay only a training allowance which supplements the social assistance payments that the workers continue to collect. Typically, these payments do not come close to approximating even a provincial minimum wage. By contrast, SARCAN takes its staff off provincial allowances by paying more than minimum wage. SARCAN also provides a pension and benefits plan to all employees. Because many of its staff are living independently for the first time, SARCAN is also in the process of designing a number of counseling programs, designed to help its employees overcome many of the challenges of looking after themselves. An important additional benefit of the program is that it brings the public into contact with disabled people in a setting in which the disabled workers can demonstrate their capabilities. The program thus engenders pride in the workers and appreciation and respect on the part of the general public.

Some wider questions have not yet been addressed in this discussion. Is recycling through a deposit refund

Policy History at a Glance

May 1988	Nov 1988	Nov 1990	May/Jul 1992	1994
Deposit-refund scheme began under SARCAN, 30 recycling centres opened, aluminum cans first accepted	Non-refillable PET plastic bottles accepted	Glass and liquor bottles accepted	Handling fees and deposit refunds raised, wide range of other containers added	36 more centres than in May 1988

scheme superior to curbside recycling? Do the social benefits of government-run recycling programs like SARCAN outweigh the potential social benefits of private sector initiatives which might encourage industries to 'take ownership' of the recycling issue? Should environmental policy even focus on recycling when more direct aims such as reduction and re-use might be preferable? These debates will not be resolved here but should nonetheless be flagged for future consideration.

The experience of SARCAN highlights the inherently limited ability of provinces to address waste management issues — no matter how innovative and

successful their initiatives. Residential waste still comprises less than half of non-hazardous solid waste. In order to change packaging decisions and marketing strategies, in order to foster markets for recycled materials, and in order to change consumer behaviour, concerted national and international effort is needed.

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- Results:*
- Increased handling fees have meant that SARCAN's operating revenue is now close to \$10 million a year
 - Plastic and glass bottle recycling have increased dramatically since the time of their introduction. Aluminum cans have also increased somewhat, although this is sometimes concealed in year-to-year variations. Figure 1 shows the situation between 1988 and 1993.

Year	Aluminum	Plastic	Glass
1988-89	846 ²	30 ³	N/A
1989-90	1,307	321	N/A
1990-91	972	613	676 ⁴
1991-92	1,052	1,176	3,106
1992-93	1,361	1,389	5,900
Total	5,539	3,529	9,682

Figure 1. Materials recycled (tonnes) by SARCAN from 1988 to 1993¹

- Notes:
- ¹ Does not include contract processing.
 - ² June 1988 to March 1989.
 - ³ November 1988 to March 1989.
 - ⁴ November 1990 to March 1991.

- SARCAN now employs 239 people of whom about 191 have disabilities. SARCAN is one of Canada's largest employers of disabled people.
- The 1992/1993 data indicate that increased deposit refund rates significantly increased return rates. Prior to July 1992 return rates were approximately 84% for aluminum cans, 76% for plastic bottles and 49% for glass containers. A year later, the return rates for all beverage containers rose to a steady 92%, which approximates the historic return rate of beer bottles in most Canadian provinces.
- SARCAN represents an innovative and successful combination of environmental and social policy objectives. The program enjoys considerable political support and, judging from the high return rates and the minimum public opposition to the recent deposit-refund hike, the support of the Saskatchewan community.

- Lessons:*
- Concerted national and international effort is needed to address issues like over-packaging and markets for recyclables, irrespective of how successful a local waste management initiative might be.
 - Innovative solutions to social problems can be integrated into regional recycling policies.

The Louisiana Environmental Tax Scorecard

The Policy in Brief

Economic Instrument: A mechanism for focusing the state's investment incentives on businesses with sound environmental records, based on the removal of tax credits

Problem: The harmonization of environment and development goals

Goals: Channeling economic development toward environmental sustainability with a unified tax measure sensitive to both environment and development, and raising revenue for the state budget

Description: A composite 'environmental' score of an industry's overall contribution to the quality of life, measured in both economic and environmental terms, is determined. This score is then translated into a percentage for removing an existing tax credit granted to businesses. The simplicity and visibility of published scores lend themselves to easy understanding in the business community, media and general public - and to a degree of compliance far greater than the financial incentive alone would suggest

Administering Institutions: Louisiana Departments of Environmental Quality and Economic Development

Key Stakeholders: Louisiana Departments of Environmental Quality and Economic Development, business, the media and general public

An Overview

Louisiana is a relatively poor state with a history of severe environmental problems. It has an industrial base largely consisting of extractive industries such as petrochemicals and paper. The state therefore needs urgent attention to both its environmental and economic goals.

The Scorecard was a highly innovative effort at coordinating environment and development policies. Points were assigned, from 50 to 100, for environmental compliance, a low toxic emissions to jobs ratio, and a variety of contributions to State environmental and economic health. These then translated into percentage deductions from tax exemptions on industrial equipment and structures, so that a firm with a bad record (a low score) could lose up to half its tax exemptions. Firms with less than perfect scores could still gain bonus points based on a number of indicators, including the development of pollution reduction plans, recycling initiatives, use of local materials, new jobs in high unemployment areas, or diversification of the state industrial base. Figure 1 shows the structure of a typical Scorecard, along with the maximum points attainable and averages for the petrochemical industry.

Type of Point	Maximum Points	Average All Facilities	Average Petrochemical
Basic	50	50.0	50.0
Compliance history	25	24.4	23.5
Emissions per job	25	19.1	11.8
Bonus points			
Emission reduction 1986-89	no max.	0.8	2.6
Emission reduction, future	15	0.2	0.5
Recycled material	5	0.2	0.3
Recycling or bulk product company	10	0.0	0.0
Industrial diversification	10	0.2	0.0
Jobs in high-unemployment areas	15	0.1	0.0
Total bonus points	55	1.5	3.5
Total points	100	94.9	88.6

Figure 1. Environmental Scorecard: Maximum possible and average points for all facilities and petrochemical facilities, by type of point. (Source: Louisiana Department of Environmental Quality. Reported in Thomas J. Hilliard, "Report Card on Louisiana's Environmental Tax Scorecard," State Tax Notes, Feb. 3, 1992.)

Twelve firms submitted such plans, lowering their scores by 4.4 to 15 points. Approved emissions reduction plans committed these firms to a reduction of 36.3 million pounds of toxic chemicals, 8.2% of the total State emissions in 1991. In addition, the companies

Policy History at a Glance

1936

Louisiana industrial tax exemption program enacted
Tax Scorecard introduced

1988

Louisiana's Department of Environmental Quality began designing the Environmental Scorecard

Apr 1991

Louisiana Environmental Tax Scorecard enacted after Department of Economic Development approval and a public hearing

Late 1991 – early 1992

Scorecard was a political casualty of a new administration, perhaps less committed to environmental goals and responding to remnant pockets of industry opposition. Program officially ended in Feb. 1992

committed to cuts in emissions of criteria pollutants totaling 141.8 million pounds. Because the cost of the emissions reduction plans typically exceeded the economic benefit from the credit, it is likely that educational as well as economic factors came into play. The pressure of public opinion combined with the desire to appear as a good corporate citizen no doubt contributed to the more sizeable improvements observed.

Policy Issues

Many lessons were learned from the experience with the Scorecard:

- **Environmental concerns need to be integrated into development policy**

The Scorecard program is particularly innovative in having a scoring mechanism that embodies a balance of environmental and development concerns. Communities using the scorecard approach can fine-tune that balance to reflect their own particular values and environment and development needs.

- **The emissions to jobs ratio can be a useful tool of development policy**

When a firm places a stress on the environment disproportionate to the number of people it employs, it limits the potential for employment growth for the rest of the economy. It is important for development that companies be discouraged from appropriating an unfair share of the environment's absorptive capacity. The Scorecard embodies this principle by basing 25 of its 50 initial points on a firm's ratio of pollution emissions to jobs. Fortunately state-to-state comparisons show that firms can remain competitive and still adjust to stricter emissions standards.

- **The tax system can be effectively used to convey social values**

Summarizing a firm's performance in a single, comprehensible measure may well have been the Scorecard's greatest success.

- **Success depends on a supportive political environment and political sensitivity**

As it happened, the Louisiana Scorecard was a political casualty of a change in administration. Industry opposition focused particularly on the application of tax exemptions to facilities begun before the Scorecard came into being. "The thing that killed it was that they made it retroactive... . If they hadn't done that, I think we would still have it today," said R. Paul Adams of the Department of Economic Development, who was co-administrator of the Scorecard program with John Glenn. Although the program was short-lived, it was widely acclaimed and continues to draw interest.

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Results:

- The scorecard proved an effective, high-profile device for focusing public awareness on the environmental performance of firms, and communicating to firms a social judgment of acceptable standards of environmental behaviour. The scores of major firms — translated into grades from A to F like on school report cards — were widely reported in the press, setting off fierce competition for lower scores. Telephone calls flooded into the Louisiana Department of Environmental Quality asking how many points would be available for various pollution reduction activities. In a master's thesis reviewing the scorecard, Robert Moreau of the Louisiana State University Institute for Environmental Studies recounted,

One locally based petro-chemical manufacturer received a preliminary score of 76. Company management had previously stated that their high release of SARA Title III toxic chemicals (most notably ethylene dichloride, methyl isobutyl ketone, acetone, toluene, n-Nitro DPA and methanol) could in no way be further reduced. However, after receiving an initial score of only 76, the company came up with a reduction plan one week later that would reduce releases of the above-stated emissions by approximately 85%. This entitled the company to 15 bonus points.

Statistical analysis suggests that the economic incentives led to a clear reduction in toxic releases. A regression analysis proved significant at the 5% level.

Lessons:

- See *Policy Issues*

Accelerated Depreciation of Environmental Investments in the Netherlands

The Policy in Brief

Economic Instrument: Accelerated depreciation on a select group of investments

Problem: Environmentally unfriendly technologies, along with prohibitive replacement costs

Goal: The replacement of environmentally unfriendly technologies with more benign ones

Description: The Accelerated Depreciation of Environmental Investments Measure (VAMIL) offers the opportunity to apply accelerated depreciation on certain innovative environmentally-friendly operating assets. Apart from having favourable effects on the environment, the measure is an incentive for the development and supply of environmental technologies in The Netherlands

Administering Institutions: Bureau Vervroegde Afschrijving en Milieu, Ministry of Finance and Department of Environmental Investments (VROM)

Key Stakeholders: Bureau Vervroegde Afschrijving en Milieu, VROM and companies (mainly small and medium sized)

An Overview

The VAMIL measure has been in effect since September 1, 1991. It is a tax facility offering companies the opportunity to apply accelerated depreciation on environmentally-friendly operating assets. If the asset is operational and fully paid for, it even allows depreciation of the full purchase price in the year an asset is acquired. This provides an attractive liquidity and interest gain for these companies. Eligible operating assets appear on a special 'VAMIL list'. The measure is not aimed at a specific environmental problem or region, but has a very wide operating ambit. The 1993 list, for example, contained elements aimed at reducing water, soil and air pollution, noise emissions, waste production and energy use.

To be eligible for the VAMIL list, operating assets should:

- Be clearly defined for fiscal purposes;

- Have relatively good environmental impacts;
- Not yet be widely accepted in The Netherlands;
- Have no negative side effects, such as excessive energy use; and
- Have a substantial potential market.

Periodically — in principle, once every year — the VAMIL list is replaced by a new one. Adaptations include the removal of operating assets that have become widely accepted and the addition of new environmentally-friendly technologies. As compared to the 1992 list the 1993 list grew from some 180 to approximately 280 operating assets. The list is prepared by VROM's Department of Environmental Investments. It is hoped that eventually the VAMIL list will correspond to approximately 30% of all investments in environmentally-friendly operating assets.

All companies and persons liable to pay income or corporate taxes in the Netherlands can make use of the measure. However, the measure aims mainly at small- and medium-sized companies. The government determines a budget for the VAMIL measure once every year, setting an upper limit for tax allowances. The budget does not reflect government expenditures, as the reduced tax revenue in a given year is followed by increased tax revenue in later years. Therefore the cost to the government consists only of lost interest. In 1992 the budget for the measure amounted to 80 million guilders and this amount increased to 120 million guilders in 1993. Additional costs necessary to make the asset operative are also eligible for accelerated depreciation. If an asset is developed and produced within a company, own-production costs can be depreciated in an accelerated manner.

Policy Issues

Providing a fiscal incentive was chosen as it offers a number of advantages over subsidies or other measures. The most important advantage of a fiscal measure is its simplicity for both applicants and the authorities. This simplicity is achieved because the measure fits in with the ordinary accounting systems of companies and authorities for payments of income and corporate taxes. The companies do not have to submit an application. Should a company wish to make use of this measure, it simply sends in a short form. An auditor's report is added. The materials are sent to a bureau established especially for the measure. The Bureau Vervroegde Afschrijving en Milieu manages the execution of the measure. It processes the information and keeps track of the sums involved in the related investments, as well as

Policy History at a Glance

Sep 1991	1992	1993
Depreciation-accelerating VAMIL measure introduced	180 eligible operating assets on VAMIL list	280 eligible operating assets. 120 million guilders budget

their impacts on the overall VAMIL budget. A second important advantage is that the measure stimulates — but does not stipulate — the choice of operating assets. This means that efficient market forces are not affected.

Fixed budgets were chosen instead of open-ended schemes in order to keep government costs under control. Previous experience with a general measure granting subsidies on investments had shown that an open-ended measure can be a victim of its own success. Costs related to the grants eventually exceeded the State's capacity to pay. It is expected that the budgets for the VAMIL measure, though limited, are ample and that in the future all deserving applications will be accepted.

The VAMIL measure is just one of a group of measures aimed at stimulating environmentally-friendly technologies. Subsidies are also available for feasibility studies, pilot projects and demonstrations.

Fortunately, accelerated depreciation can be easily built into existing taxation systems. Measures similar to the Dutch VAMIL measure are therefore highly suitable for a wider application in all countries wishing to pursue a balanced environmental policy that disturbs market forces as little as possible.

Some Further Reading

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Ministry VROM/DGM (June, 1993), Accelerated Depreciation on Environmental Investment in the Netherlands

- Results:*
- The first signs are that the VAMIL measure, which became effective on September 1, 1991, enjoys reasonable popularity. However, it is still too early to form a final opinion of the measure's success. In the last four months of 1991 claimed investments amounted to 95 million guilders. In 1992 the amount was 141 million guilders. The estimate for 1993 is 250 million guilders.
 - Figure 1 reflects developments in the number of applications. It shows that the number of applications dropped in 1992, as did their total amounts. This is partly due to the decrease in the general investment level within Dutch industry in 1992. It is expected, however, that the extension of the list in 1993 will lead to an increase in both applications and related investment amounts.

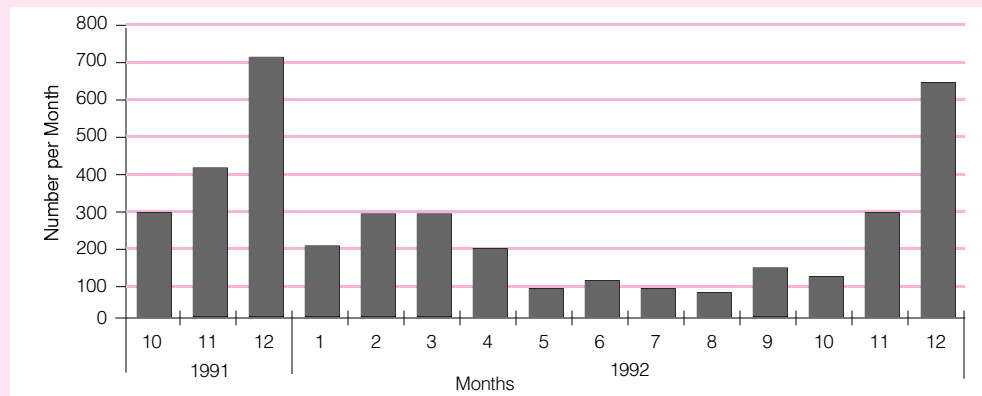


Figure 1. Number of investments per month under VAMIL, 4th Quarter, 1992.

- Accelerated depreciation of investments in innovative environmental technologies does not only stimulate the use of environmentally-superior operating assets, but also the development of new environmental technologies. The VAMIL measure thus offers the opportunity for building a competitive lead for Dutch industries in the strategically attractive area of environmental technology.

- Lessons:**
- Integrating economic instruments with an existing tax system is a relatively uncomplicated means for both firms and governments to create incentives for environmentally friendly activities.



Further References on Green Budget Reform

The following references have been assembled for those interested in general background reading on green budget reform. Together with *Making Budgets Green*, they represent a good starting point for policy-makers interested in starting down the path of sustainable policy design.

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