The Dutch Green Tax Commission

A summary of its three reports 1995-1997

March 1998

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1 Introduction

The Dutch Green Tax Commission was set up in March 1995 in response to parliamentary requests made during the debate on the second National Environmental Policy Plan. Its mandate was very broad and so was its composition. The Commission was asked to evaluate all practical possibilities that could be implemented nationally for using taxes to further environmental quality and sustainable economic development. Members came from the environmental and fiscal professions, several government departments, organizations of employers, and included some former MP's. The Commission was chaired by Mr. Jacob van der Vaart of the Ministry of Finance.

This paper presents a summary of the three reports of the Dutch Green Tax Commission of September 1995, March 1996 and November 1997. All reports were presented to the State Secretary of Finance, Dr. W.A. Vermeend, who created the Commission, and sent by him to Parliament. In the period March 1996 -November 1996 the Commission was inactive.

The tax plans for 1997 and 1998 contained several provisions based on the first two reports of the Commission. These are highlighted briefly in this summary. The third and final report of the Green Tax Commission was presented to Dr. Vermeend on November 12, 1997. On December 11, 1997 a White Paper was sent to Parliament outlining options for a major tax reform, adapting the Dutch tax system to the challenges of the 21st century. This tax reform includes a shift of about 0.6% of GDP from the income tax to environmental taxes. This proposal is based on the third report of the Commission. Decision-making is left to the next cabinet after the May 1998 general elections. The third National Environmental Policy Plan which appeared February 1998 also incorporates many of the recommendations of the third report. Appendix 1 outlines the main green elements of the White Paper “Taxes in the 21st century; an investigation”.

1.1 Program of work

The Commission followed more or less a tax-by-tax procedure. Every existing national tax was assessed for its possibilities to work better for the environment, taking into account the already existing green elements in these taxes. The Commission also picked up ideas advocated by others and operationalized them where necessary. The treatment of car use in the income tax is dealt with in the first report, and is taken up further in the second report. Both the first and the second report deal with the possibilities for greening the existing taxes on the purchase, possession and use of private cars. The second report's core is a broad-based investigation of the possibilities for new environmental taxes with a potential for significant revenue, and of the options to make such taxes more effective.

The third report investigates possibilities for greening taxes that are not covered in the first two reports of the Commission. The most important tax covered is VAT; the tax on acquisition of real estate is also dealt with. Agriculture is another core subject of the third report; all taxes are evaluated for their potential to further more sustainable agricultural practices. The Commission evaluates its own approach to greening taxes, and makes recommendations for further work for the longer term. Smaller items in the third report concern options for emulating the Belgian system of product taxes and the introduction of two new schemes for environmental tax credits in the income tax.

An important link exists between the third report of the Green Tax Commission and the White Paper to Parliament which sketches possibilities for tax reform with an eye to the 21st century. An important element in this outline for a potential tax reform is a shift from direct taxes on income and profits to indirect taxes on consumption, including environmental taxes. Such a shift is proposed to make the tax system more "robust", because indirect taxes provide stable income for the State, both over time as well as in terms of fewer possibilities for tax evasion than taxes on income or profit. At the same time, current relatively high taxes on labor could be reduced, making the Dutch tax system more competitive internationally. The Dutch Green Tax Commission was asked to develop proposals for green taxes that were consistent with the overall goals of the tax reform for the 21st century. To do so, the Commission returns in its third report in more detail to energy taxes, already discussed in its second report, and discusses the possibilities for taxes on land use and air traffic. In keeping with its second report it analyzes the environmental benefits of higher energy taxes in combination with the additional environmental benefits of devoting part of the revenue for positive environmental incentives.

The Commission has chosen a time frame of about 3 years for the first two reports; its focus is on tax measures that could be implemented within this time limit, and could define the work on green taxation under the present cabinet. The third report takes a longer perspective.

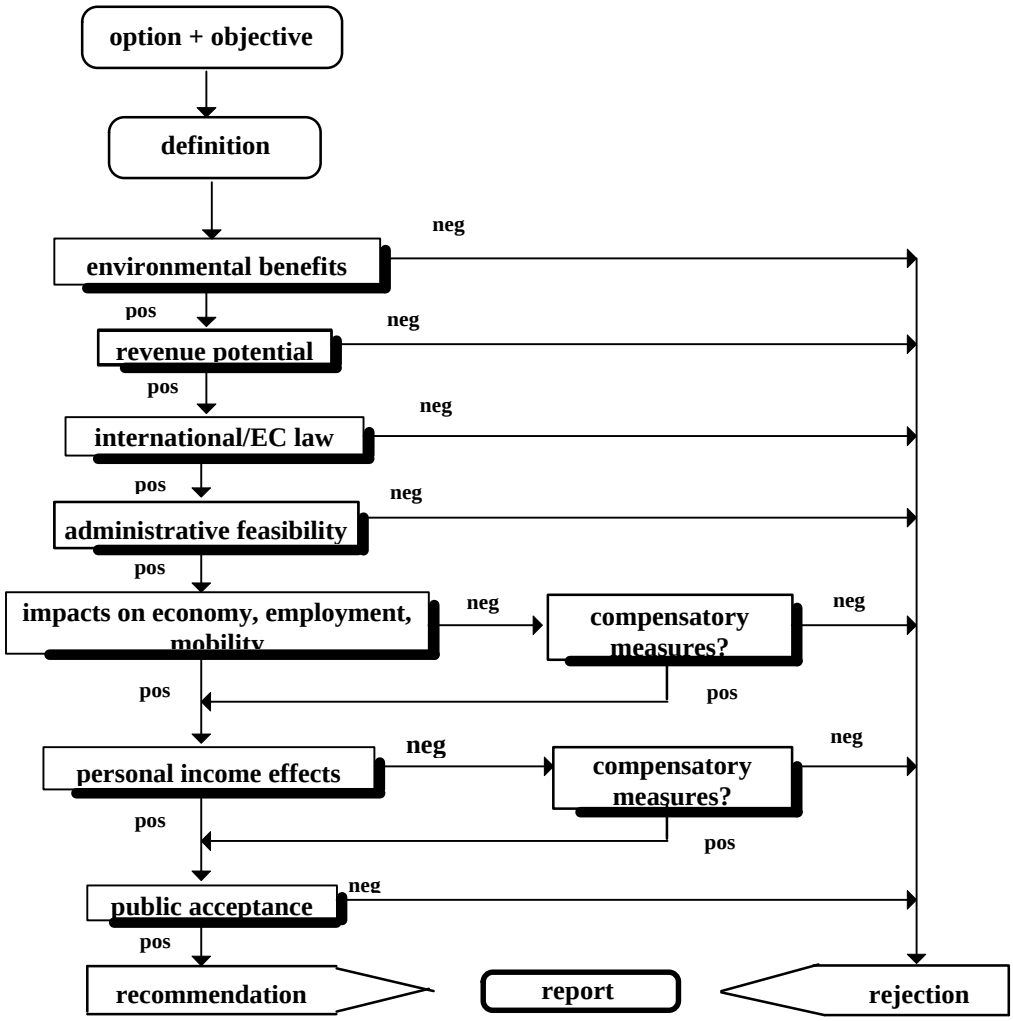
1.2 A stringent check list

The Commission has chosen a very stringent check list for evaluating the potential of green tax options. The most important criterion is demonstrable environmental benefits. It will only recommend tax measures if a resulting environmental improvement of some magnitude can be reasonably argued, preferably by means of quantification. Both the economic and environmental planning agencies of the government have supported the Commission with analyses to this end. The Commission limits its focus to "real" taxes, which flow into the general revenue. Measures have to be feasible under current international law, be simple to carry out, have no adverse effects on the economy as a whole, be more or less income neutral and have -partly as a consequence of positive scores on the other check points- a good chance for public support. Figure 1 presents the checklist graphically.

In its third report the Commission looks back on about two years of work with applying its check list. The check list is found to be a useful tool, particularly in helping to focus attention on all relevant points for debate in a group as diversified in composition as the Dutch Green Tax Commission. At the same time the Commission concludes that lack of information makes applying the model far from easy. Although there is a great deal of literature on the effects of green taxes in general, it is still difficult to bring together all relevant material for a concrete proposal. The Commission finds in particular that insights into the concrete behavioral changes to be expected at the micro level are lacking. Too often, the environmental impacts of green taxes are only derived from macromodels, based on general elasticities. The Commission argues that at current levels of green taxes, the behavior of many economic actors will not change as the price impacts created do not really change the ratio between costs and benefits of alternatives to their current choices. Often, the ultimate environmental benefits flow from behavioral changes of specific groups for which such ratio's do change. It is then important to assess beforehand for which groups this is the case and to tailor the green tax measure to these groups, by setting the tariffs or by introducing positive incentives for them. In this manner, at least a minimum for the

environmental impact can be set. A clearer view of the concrete changes in behavior which can realistically be expected would also help in evaluating the benefits of green tax measures later on. Simply stated, one could count the types of investments made by households and firms and see if they add up to the expected level. If one only has model predictions at a macro level, one can only assess later on with the same model by how much f.i. energy use would have risen, if energy taxes had not been raised. This adds no credibility to the green tax measure.

Figure 1 Check list of the Dutch Green Tax Commission



2 Long term perspective

2.1 A pragmatic approach

The Commission draws on work of others to conclude in its third report that green taxes would amount to about 30% of total taxes if rates were set at levels that would accomplish current environmental goals, most importantly a reduction of CO_2 emissions by about 1% per year. Taxes on energy and energy consuming activities such as road and air traffic would make up 80 to 90% of the total revenue from such green taxes. The Commission warns,

however, against taking such a figure as a target for national policy, even if a strong international trend towards greening tax systems were to exist. Green taxes have many interesting fiscal qualities, such as low perception costs and low risks of fraud and tax evasion. In a world where capital is internationally mobile and labor becomes ever more so, taxes such as energy taxes ensure tax income for the country where production and consumption take place; options for relocating tax obligations to another country do not exist. Green taxes, however, also have an inherent disadvantage from a tax perspective if they are effective; their tax base grows less rapidly than national income, and therefore than taxes that are tied to national income, such as income and profit taxes and taxes on general consumption, such as VAT. The percentage of green taxes in the total tax base will always have a tendency to diminish.

The Commission advocates a pragmatic and incremental approach to greening the tax system further, involving small steps that are economically feasible and environmentally effective. The Netherlands is perceived as being a front-runner in this field, with green taxes making up about 14% of total national taxes, about 3.2% of GDP, and a wide variety of positive fiscal incentives in place.

2.2 Positive incentives

The Commission applied a stringent check list throughout its work to define such pragmatic steps (see Figure 1). In applying this check list, the Commission considers taxing environmentally "bad" behavior equivalent to rewarding environmentally "good" behavior. In its third report the Commission discusses alternatives for this pragmatic approach, such as proceeding from a more fundamental outlook that environmental costs should be reflected in prices. It concludes that such alternative approaches, although very different in the point of departure, will often lead to the same outcomes for policy in the short term, given economic and political constraints.

In its second report the Commission underlined the importance and effectiveness of positive fiscal incentives as a complement to green taxation. In its third report the Commission reiterates this opinion. The findings in the third report for concrete proposals for energy taxes, coupled to spending part of the revenue on positive incentives, underline the case-wise effectiveness demonstrated in the Commission's second report. As long as tax levels have to remain fairly low due to international competitiveness, positive fiscal incentives appear to be an effective way to substantially increase the environmental benefits of raising tax levels. Using part of the revenue of green taxes for such positive incentives is presented as a way for Dutch society to take national environmental policy further ahead of international trends, by leveling costs between those who actually do take measures and those who do not. In this manner, Dutch society as a whole pays its own bill for being environmentally progressive without losing sight of the areas where measures can be taken most economically.

2.3 Greening taxes requires effort

The Commission recommends stepping up the Dutch civil service capacity for research and policy making in the area of greening the tax system. Its findings concerning the relative lack of operational data and the importance of targeting the measures correctly to ensure high environmental benefits at the lowest costs for the taxpayer lead to this conclusion. It also argues that some form of follow-up to the Green Tax Commission is worth considering, particularly as a forum for continuing the dialogue among the many disciplines and

organizations represented. The current Green Tax Commission ceased to exist with the publication of its third report.

3 Income tax and car use

3.1 Commuting

Currently, the cost of commuting is deductible from the income tax, up to certain limits defined by the costs of alternative public transport. Removal of this deduction possibility has long been advocated by environmentalists. The Commission ultimately found very little environmental benefits from such a measure, based on thorough research by the environmental planning agency. It would be a major tax shift with at best 0.1 Mton reduction of CO_2 emissions in the long run. This result is explained by the low average cost increase, the limited share of commuter traffic in overall traffic (25%), low elasticities and the absence of any effect on increased fuel efficiency of cars. The Commission recommended in its first report instead to focus attention on making the existing possibilities for deduction of the costs of commuting by public transport, which are more favorable than for cars, accessible to more people by relaxing constraints.

This latter recommendation was implemented in the 1997 tax act and further measures were part of the 1998 tax plan, increasing the differential in favor of commuting by public transport by Dfl. 200 a year. Incorporating the deduction into a general labor tax credit is considered in the White Paper “Taxes in the 21st century”.

3.2 Company car

Those who have company cars that can also be used privately are taxed under the income tax at an amount equal to 20% of the value of the car, which is considered as taxable income (on average 8,000 guilders annually). The first report deals with this arrangement. Again, the Commission found no strong environmental arguments for raising the percentage of 20 by more than a few percentage points; the current treatment in general already favors smaller cars that make limited mileage. The Commission recommended in its second report stimulating company car owners to use public transport for part of their business travel by granting them a tax benefit of 5% of the value of their car with a maximum of 2,000 guilders, if they can demonstrate 5,000 kilometers of public transport use. The White Paper “Taxes in the 21st century” sketches options for taxing company cars as payment-in-kind.

3.3 Business use of private car

Employers may reimburse employee use of private cars for business purposes tax free up to a legal limit per kilometer driven. The amount stood at 60 cents in 1996, and was raised annually by the same percentage as the public transport tariffs. The Commission found this system to be too favorable for the average car user, given that public transport prices have risen much more than car costs due to privatization efforts. In many cases, the current legal limit exceeds full car costs. It was recommended in the first report to freeze the amount at current levels. A minority of the Commission preferred a reduction to about 30 cents, reflecting variable (fuel) costs. In the tax act for 1997, the amount has been frozen at 60 cents, and this was maintained in the 1998 tax plan.

3.4 Teleworking, carpooling

The Commission looked into possibilities for fiscally encouraging teleworking and carpooling. Teleworking was found to be actually discouraged by current law, because of stringent rules covering the deduction of the costs of operating a work room or study at home. Carpooling is fiscally stimulated, but until 1998 fairly ineffectively. The Commission reported these finding in its second report. The 1998 tax plan introduced a more favorable arrangement in the income tax for deducing the costs of commuting by carpooling and the costs of home equipment for teleworking, solving the problems the Commission had indicated.

4 Car taxes

4.1 Current situation

The Netherlands levies a tax on the purchase of a new private car, with effective rates of about 25%, has an annual vehicle tax with a weight and fuel type dependent tariff, and excises on all motor fuels, high on gasoline (about 1.23 guilders per liter), lower on diesel (about 0.71 guilders per liter) and even lower on liquified petrol gas (LPG; 0.13 guilders per liter). The only explicit green element in these taxes was until 1997 a slightly higher excise for leaded gasoline, but this is losing its importance because of the strongly declined market share of this fuel. As of late 1996, most leaded gasoline had been replaced altogether by alternatives.

4.2 Excise rates

Fiscal methods to encourage more sustainable transport were investigated in the Commission's second report. The Commission found the simple route of raising excise levels to be most effective, because of assumed high elasticities of fuel use, set at -0.5 by the environmental planning agency, twice as high as the elasticities of kilometers driven. Increases in excise rates as already foreseen in the second National Environmental Policy Plan, by some 60 cents by 2010 for gasoline, go a long way in reaching the planned 10% reduction in CO_2-emissions from car use by 2000.

The Commission made no recommendations for further increases of excise rates, as it is already standard policy to raise excises and lower annual vehicle taxes if the excise rates in neighboring countries make this possible without large cross-border effects. The only exception to this is the recommendation to investigate further the abolishment of the very low excise rate for diesel used by agricultural vehicles and other similar mobile sources, which at the moment are subsidized implicitly by some 360 million a year, if one takes the excise rate of diesel for cars as a reference.

Excise rates for gasoline resp. diesel were raised on July 1, 1997, by 11 cents a liter resp. 5 cents a liter (1997 tax act). A lower rate was introduced for diesel used by heavy trucks. At the insistence of Parliament, the automatic indexing of excise rates for inflation by January 1, 1998, as required by law, has been passed over by special law. Instead, annual vehicle taxes were raised to cover the lost revenue.

4.3 More and heavier cars

The number of kilometers driven with private cars has increased by about 20 billion over the past 10 years, bringing the total to about 85 billion. The Commission points out in its second report that statistically 80% of this increase is explained by an increase in the number of cars rather than by higher mileage per car. Moreover, the average weight of newly purchased cars has risen in the same period by some 150 kilograms, bringing the average weight from 890 to 1,040 kilograms, with adverse effects on fuel efficiency. This latter trend alone accounts for an increase of about 1 Mton emission of CO_2. The Commission recommends in this light not to neglect the possibilities for greening the taxes that influence car purchasing behavior, be it the purchase tax or the annual vehicle tax. From this follows its advice not to carry "variabilisation", the raising of excises with a compensating reduction of vehicle taxes, too far.

The excise raise of July 1, 1997 has been compensated by a reduction of annual vehicle taxes with a weight-independent, equal amount per car, favoring smaller and more fuel-efficient cars. The raise in vehicle taxes by January 1, 1998 leaves cars up to 850 kg unaffected and is proportional to current tax rates, penalizing larger cars.

4.4 Fuel efficient cars

The Commission proposes in its first report reducing the purchase tax by 1,500 guilders for those who buy a car which is very fuel efficient in its weight class. Very fuel efficient is defined as 10% more efficient than average, leading to a set of standards in terms of liters per 100 kilometers, different for gasoline than for diesel, and slightly increasing with weight up to 1,300 kilograms. These standards should be maintained, the Commission argues, for about 3 years and then tightened, until an average of 5 liters/100 kilometers for gasoline cars is reached (4.5 liters for diesel). In a first step, standards should be set to bring the current average of fuel use of newly sold gasoline-powered cars in the Netherlands down from about 7.2 to 6.5 liters/100 km. A higher tax reduction of about 2,500 guilders is proposed for cars that meet a weight-independent criterion of about 6.0 liters/100 km. This measure is expected to cost about 50 million guilders a year, with environmental benefits in the order of 0.1 Mton CO_2 reduction.

Implementing this proposal became possible after the fuel use of all newly sold cars was registered under new EC rules, which went into effect for all cars in 1996. Preceding fuel use numbers still reflect old measuring standards. Implementation of the spirit of this recommendation was proposed as part of the 1998 tax plan (discount of Dfl. 1,250 for cars that are very fuel-efficient in its size-class and of Dfl. 2,500 for cars meeting EU goals for 2005 (5.0 liter per 100 km for petrol and 4.5 liter for diesel). Parliament, however, rejected the proposals.

4.5 LPG

The Commission proposed in its second report a significant fiscal incentive for the use of LPG cars, if equipped with the latest technology, bringing emissions down by about 30% if compared to a state-of-the-art gasoline powered car. LPG cars pay a special surcharge on the annual vehicle tax to compensate for the very low excise rate. This surcharge was about 1,100 guilders annually in 1996 for a car of average weight and the Commission proposed reducing it by 400 guilders. This would bring the annual vehicle tax for LPG cars below the annual vehicle tax for diesel powered cars, where the situation is now the reverse. The

Commission expected this measure to have a significant effect on the declining trend in LPG use, and possibly on the environmentally unfavorable upward trend in diesel use in private cars. The proposed measure was expected to cost about 120 million Dutch guilders, creating 0.25 Mton CO_2 benefits. If successful in the long run, LPG could account for 25% of kilometers driven, raising the costs to some 300 million guilders with 0.5 Mton CO_2 emission reduction.

The excise rate on LPG was low in 1996 to avoid substitution effects with LPG for heating purposes, which is not taxed under the excise law. Such substitution creates a safety risk, and would render the excise on motor fuel LPG less effective. Since 1996, however, LPG for heating purposes is taxed with a new energy tax of about 6 cents per liter. The Commission suggested in its second report a parallel raise of the excise rate on motor fuel LPG of about 8.5 cents per liter, compensated by further lowering the special LPG surcharge in the annual vehicle tax by 240 guilders a year in order to discourage high mileage. The 1997 tax act reduced annual vehicle taxes for LPG somewhat less than proposed, financed by a 8 cents/liter excise raise. The declining trend in LPG use, however, seems to have continued for a while. Early 1998 first indications of improving sales surfaced.

4.6 Vehicle tax

The annual vehicle tax is currently related to vehicle weight and should already have an impact on consumer preference for smaller cars. Clearly this effect is not strong enough given current trends. The Commission found a strong and linear correlation between vehicle weight and fuel use, suggesting a 0.4 increase in the fuel use in liters per 100 kilometers with every 100 kilograms in weight increase. The Commission proposes in its second report strengthening the correlation between the tariff of the vehicle tax and vehicle weight, in such a way as to double the already existing cost effect of the decreasing fuel efficiency with weight. The Commission proposes leaving the tax for a 800 kilogram car unaffected and raising the tariffs for heavier cars. The proposed new tariff would increase by about 130 guilders for every 100 kilograms of weight (included an average surcharge by the provinces). This measure is proposed in its own right, but also to compensate the treasury for the Commission's recommendations in the second report that cost money. It would generate about 70 million guilders. In the long term the Commission sees possibilities for fuel use as a new tax base for the vehicle tax.

4.7 Diesel

The excise on diesel is lower than the excise on gasoline, historically to benefit the road trucking industry. The use of diesel in private cars has, however, profited from this differential and has risen steeply. Under current conditions, diesel is the least environmentally preferable motor fuel. Private diesel cars pay a special surcharge on the annual vehicle tax, just like LPG cars. The Commission found this surcharge in 1996 to be about 240 guilders a year lower than the benefits from the lower excise rate, and proposes in its second report to raise the special surcharge by about 80 guilders, generating about 50 million a year to pay for other green tax measures. In this way the use of diesel can be discouraged for private cars without affecting the road trucking industry. The diesel excise raise of July 1, 1997 in the 1997 tax act is smaller than the gasoline excise raise, making the relative tax benefits for diesel larger than calculated for 1996.

4.8 Cleaner cars and fuels

The Commission found at the time of its second report no suitable measures for fiscally stimulating cleaner private cars and trucks, or the market introduction and use of cleaner fuels, mainly because of constraints set by current EC law. The Commission did recommend adapting current Dutch law to provide for the authority to regulate such measures by decree of the State Secretary of Finance, in order to be able to incorporate opportunities provided for by new EC law much faster than possible at the moment. In the near future, this would be helpful to set up lower vehicle taxes for so-called EURO III trucks or lower excise rates for gasoline with low benzene content.

The Commission recommended in its first report exempting electric cars under the car purchase tax, which has an effective rate of about 25% of car price. Electric cars were exempted from the purchase tax in the 1997 tax act. An extension to all hybrid electric cars is part of the 1998 tax plan.

5 New environmental taxes

5.1 Current situation

The Netherlands has 5 environmental taxes, generating about 4 billion guilders, some 2.5% of annual tax revenue. Two of those are energy taxes, both based on 50% energy content/ 50% CO_2 component. One energy tax, the *general fuel tax*, exists in some form or another since 1988, and covers fossil fuels used in combustion, at a fairly low tariff. The other energy tax, the *regulatory energy tax*, was introduced in 1996 and covers non-transport energy use by small users; the tax base is for instance limited to 170,000 m^3 of natural gas and 50,000 kWh electricity per user. This is equivalent to about 40% of all non-transport energy use used in combustion. The small use energy tax has a steeper tariff than the general energy tax. For example, natural gas is taxed at about 2.5 cent/m^3 in the general energy tax and at about 10 cents/m^3 in the small use energy tax. For the first 170,000 m^3 of natural gas, the energy taxes together amount to about 66 guilders per ton CO_2. Besides the energy taxes there are also a tax on uranium-235, a tax on groundwater extraction and a tax on waste offered to landfill sites.

5.2 Few options for new taxes

The Commission was explicitly asked to scan for more possibilities for environmental taxes. It did so in its second report by taking on board all possibilities that had been advocated in the past by any interested party. It applied its stringent check list to all of them and found in many cases no demonstrable environmental benefits. Other options fell through because of inoperability or inconsistency with policies already in place to tackle the environmental problem at hand.

5.3 Pesticides and surface mining

In the end, two options for new environmental taxes were recommended in the second report as deserving serious further research. One is the inland extraction of surface minerals such as sand and gravel, the other the use of agricultural pesticides. In the case of surface minerals a fair amount of substitution to mining sand in the North Sea could be expected based on cost considerations, saving about 125 ha of landscape a year. Taxing agricultural pesticides was assumed to lead to strong reactions based on high elasticities, providing at least 50% of the reduction needed to reach the policy targets in this area (a reduction of 35% in the use of pesticides by 2000). Tax rates were proposed to be in the order of 4 guilders per ton of extracted minerals and 5 guilders per kilogram of active ingredient of pesticides. Both taxes together would generate about 400 million guilders. These new taxes are options within the Dfl. 4.2 billion tax shift towards environmental taxes proposed in the White Paper "Taxes in the 21st century".

5.4 A tax on conversion of land use

Space is a relatively scarce commodity in the Netherlands, especially "green" space not used for buildings and roads. In its second report, the Dutch Green Tax Commission recommended research into the concept of taxing the conversion of land from "green" to built-up. It noted that the revenue could be substantial, but felt it was impossible to evaluate the environmental merits within the time available for the second report. Prompted by the link made between the third report and the study into shifts from direct to indirect taxes in the context of tax reform for the 21st century, the Commission undertook the recommended research itself, with the explicit aim of being able to qualify further work on such a tax as promising or not in its third report.

The study commissioned for this purpose finds that tax levels would have to be fairly high if such a tax were to have significant effects. Two models for the tax are developed. In both models, the tax would be levied per m^2 at the time of conversion. The models differ in the definition of the moment conversion is assumed to take place. In one model conversion occurs if "raw" land, that is land not yet prepared for building on to, is bought for the purpose of building on to. The tax would be levied at this time. In most cases, this would be agricultural land bought by towns for residential or commercial development. In the second model, conversion takes place if land already prepared for building is further developed with housing or industry. The tax would be levied at this later time. In the Netherlands, this would be mostly land offered by the towns, who control spatial planning, to urban developers. The difference between the models is that in the first case, the tax would only have an effect if spatial planning in the Netherlands would be largely liberalized, in order to make it possible for landowners to react to the new price impacts of the tax. If landowners would not be induced to withdraw land from the market if part of the tax burden could not be shared with the prospective buyer (the elasticity of supply were to be extremely low), the tax would have no other effect than taking away money from the landowners. In the second model, it would be more natural to assume that the tax burden is carried by the buyers.

Agricultural land sold for building purposes typically costs about Dfl. 30 per m^2, while developed land, ready for building on, typically costs Dfl. 130 per m^2. The Commission finds that a tax level of at least Dfl. 25 per m^2 would be necessary to generate a significant environmental impact. This would make it profitable to buy land with moderately polluted soil instead of land that has clean soil. The costs of soil clean-up would be compensated by

the fact that polluted land would be free of the tax. At these tax levels, the tax would generate annual revenue of about Dfl. 1 billion. Other environmental impacts, such as encouraging building underground, would require much higher rates.

The Commission finds that relatively little is known about the price elasticities of supply and demand for land. CPB Netherlands Bureau for Economic Policy Analysis (CPB) figures indicate a demand elasticity of -0.3 tot -0.55 for land prepared for building, other sources present much lower estimates -not developed specifically for the Netherlands. The study commissioned by the Commission estimates the elasticity of supply as positive, but extremely low. If the tax were to be levied on "raw" land, these supply elasticities would have to be "raised" to at least 1 to 2 by liberalizing spatial planning in order for a tax to have an effect.

Assuming a price elasticity of demand of about -0.3, and if appropriate given the model of the tax, a price elasticity of supply of around 1, a tax of Dfl. 25 per m^2 would reduce conversion of "green" land into built-up land by about 5% per year, with annual revenue of about Dfl. 1 billion. A rate of about Dfl. 85 per m^2 would increase the price of land ready for building by about 50% and reduce annual conversions by about 15%, raising Dfl. 2.7 billion a year.

The Commission concludes from its analysis that given the high rates of the tax necessary to have an effect, such a tax should be evaluated primarily from the perspective of land use planning, and not for its environmental benefits. Although the calculations based on elasticities give an impression of the size of the possible effects, much remains unknown about the more concrete measures market parties would take to bring about an overall reduction in conversions of green land to built-up land. Some of these measures might not necessarily be evaluated positively from a more general, non-environmental viewpoint. The Commission concludes that an evaluation of such a tax falls outside the scope of its mandate.

5.5 Taxing air traffic

The Commission undertakes in its third report an analysis of the environmental impacts and the revenues which would be generated by taxing air traffic more in line with other modes of transport. It focuses its attention on a model in which air traffic within the European Union would be taxed with an excise duty on kerosene at the same level as the Dutch excise on diesel (Dfl. 0.7083 per liter) and with a VAT rate of 17.5% on air tickets, the standard VAT rate in the Netherlands. Only flights c.q. passengers originating within the Union and with a destination within the Union would be taxed; transfers from an origin outside the European Union through a European airport to another European airport would not be taxed. The idea here is that travel within the European Union would be treated as domestic travel. The Commission undertook this study just to assess the effects of such a tax system, knowing full well that it could not be implemented under current international law.

The latest scenario's for the growth in traffic through the Dutch national airport show possibilities for an increase in the number of passengers from about 25 million in 1995 to almost 100 million in 2020. Currently, the ceiling on growth for Amsterdam Airport, which is based on environmental considerations, is 44 million passengers; this "environmental

lock" is the subject of ongoing debate. The Commission makes its estimates proceeding from the high growth scenario.

Taxing air traffic within the European Union according to the model studied would primarily effect non-business passenger traffic for which relatively high elasticities are assumed, in the order of -1 to -1.4. The overall effect of the tax would be about 10 to 15% fewer passengers in 2020. Given the assumed growth to possibly 300%, this effect is relatively small. To estimate the revenue for the Netherlands, it is assumed that VAT on return flights would be shared 50-50 between the countries of origin and destination, and that excises on all kerosene taken on board at the Dutch national airport for European flights would flow into the Dutch treasury. The estimates of revenue under current conditions come to Dfl. 255 million in VAT en Dfl. 430 million in excises, increasing to Dfl. 760 and Dfl. 1,060 respectively by 2020 in a high growth scenario. The overall environmental effect is estimated at 1 to 2 Mtons of reduced CO_2 emissions by 2020, with total revenue of about Dfl. 1.8 billion for the Netherlands. This means that taxing air traffic in this manner would have environmental effects per guilder revenue raised in the same order of magnitude as general energy taxes. Ticket prices would rise by about 45%, about Dfl. 100 to 500 on return tickets within the European Union. This would significantly change the price differential with European high speed trains.

The Commission concludes that taxing air traffic in this manner would be a good method for shifting the tax burden from direct taxes on labor towards indirect taxes. The option of taxing air traffic on a European scale is clearly worth pursuing, along with undoubtedly more effective variants on a global scale. Levying VAT alone would be an interesting option with revenue of Dfl. 250 mln and an effect on CO_2 emissions of -0.5 Mton.

5.6 NO_X emission charge

The Commission expressed in its second report a strong interest in the system that Sweden operates to curb NO_X emissions. It was felt that building a correction into the energy tax for the amount of NO_X emitted per unit of energy use, could contribute substantially to help the Netherlands meet its policy goals in this area, together with those for CO_2 recognized as the ones most unlikely to be met with current policies. The Commission recommended exploration of this possibility, naming a potential 60,000 tons of NO_X as possible benefits. Total emissions of NO_X are about 575,000 tons, the policy target for 2010 is about 250,000 tons. The Ministry of the Environment launched a study into this option. At present, preference is given to other instruments to meet the NO_X targets.

5.7 Belgian-type ecotaxes

The Commission looks in its third report into the system of product-oriented ecotaxes operated in Belgium, to assess if it would be worthwhile to introduce a similar system in the Netherlands. The Commission notes that in the Belgian system an almost ideal balance is struck between taxing and rewarding, as advocated by the Commission in its second report. A sector or a particular firm can be totally exempted from the tax for a given year, if certain thresholds for recycling or other environmental standards have been met the preceding year. The Commission also concludes that the standards set for this system are currently being met in the Netherlands by other means, such as voluntary agreements with industry. It therefore feels it at this time unnecessary to emulate the system in the Netherlands given the

administrative complexity of the system. The tax revenue is far exceeded by the administrative costs for the tax authorities alone.

6 Expanding existing taxes

6.1 Groundwater tax

The Commission looks in its second report at expanding the current taxes on groundwater extraction and landfilling. The groundwater tax is primarily expected to stimulate more efficient use of water in those areas of Holland which use groundwater for drinking water, covering about 70% of drinking water use. Elasticities are assumed to be low, in the order of -0.1, but the effect one can expect from that nevertheless constitutes a significant contribution (almost half) to the modest policy goals. The Commission studied options for expanding the tax base to extraction of surface water, but found this option less preferable than raising the groundwater tax further (currently at about 34 cents/m^3, at price levels of about 1.50 guilders per m^3), given that the price of drinking water from this source is still well below the price of drinking water from surface water. The Commission did recommend raising the current lower tariff for groundwater extraction by industry (other than the water companies) to the normal level, expecting a large degree of substitution from such extractions to supply of low-quality water by the water companies for industrial use.

6.2 Waste tax

Expanding the tax on waste offered for landfill to waste offered for incineration was similarly found to be less meaningful at the time of the second report than raising the tariff of the landfill tax further. All substitution from dumping or burning of waste to recycling that is at this time economically feasible was judged to be already strongly supported by the current tax levels of about 30 guilders a ton on landfill waste and by the market prices for incineration, which are higher than for landfilling. The landfill tax aims to stimulate substitution from landfill to incineration, the latter being the preferred policy option. At current tax levels it seems to fall slightly short of doing so, due to the commercial interests of landfill operators. An increase in the landfill tax for combustible waste to about 64 guilders per ton is part of the 1998 tax plan; electricity generated from the organic waste fraction in waste incinerators is to be free of the regulatory energy tax.

6.3 Indexing for inflation

The Commission proposed in its second report financing positive incentives by indexing the environmental taxes for inflation. This indexing is currently done for the excises on gasoline and diesel. Over a period of 5 years indexing environmental taxes would free about 400 million guilders for positive incentives, which could induce reductions in emissions of CO_2 by 2 Mtons and reductions in groundwater extraction by 100 million m^3. The indexing itself would reduce CO_2 emissions, according to the environmental planning agency, by an additional 0.4 Mton. These results can be favorably compared with the expected results of the small use energy tax (1.3 Mton CO_2) or the groundwater tax (about 50 million m^3). Total emissions of CO_2 in the Netherlands are about 180 Mtons, total groundwater extraction is about 1,000 million m^3. The cabinet announced its intention to start indexing by 1999 in the White Paper on Environment and Economy of June 1997, and also in the White Paper "Taxes in the 21st century" and the third National Environmental Policy Plan.

6.4 No effect, no tax

The Commission feels strongly that existing environmental taxes should not tax behavior that should not or cannot be changed to avoid the taxes. It therefore recommends prolonging a zero tariff for the landfill tax on polluted sludge from dredging rivers and waterways and introducing a zero tariff in the landfill tax for freed asbestos. Legislation for sludge in conformity with the recommendation has been sent to Parliament. The other recommendations have been taken up in the evaluation of the environmental taxes concerned and the cabinet has decided to act accordingly. The zero rate for asbestos was part of the 1998 tax plan.

6.5 An environmental tax credit

The Dutch income tax has allowed free depreciation of environmental investments listed by ministerial degree since 1991. Only investments that are not common practice can qualify for the list, the Environment List, which is updated every year. The scheme had a slow start, but the amounts of investments honored will have run up to Dfl. 3.5 by the end of 1997. Over 1997 alone, more than Dfl. 1.0 billion of environmental investments was freely depreciated (usually, by depreciating all at once).

The Commission notes that the effectiveness of the scheme has probably declined somewhat over the years despite its increased use. The financial gain from free depreciation is dependent on the interest rate, and this has gone down from 9% in 1991 to 2.8% in 1996. The financial gain from free depreciation has developed as in Table 6.1.

Table 6.1 Advantage of free depreciation of environmental investments

regular period of depreciation	advantage 1991	advantage 1996
in years	as % of investment costs	
5	5.4	1.9
10	9.6	3.9
15	14.6	6.1
20	17.4	7.8

The Commission recommends extending the scheme by adding an environmental tax credit of 5 to 10% to the most important items on the Environment List. Such a scheme already exists for energy saving investments (the energy investment tax credit) since 1997. The White Paper “Taxes in the 21st century” incorporates this proposal.

7 Energy taxes

7.1 Introduction

The Commission concluded in its second report from its research into new environmental taxes that basically only energy taxes fit the bill of having demonstrable environmental effects and of having the potential of being large revenue raisers. Elasticities are assumed to be in the order of -0.3, high enough to have effects on environmental behavior and low enough to leave extra revenue from further tax increases. The Commission found the environmental effectiveness of both existing energy taxes to be about the same; the choice between going further down the road of small use energy taxes or returning to lower tariff general energy taxes could be made on other grounds. The Commission estimated that about 1 to 1.5 Mton of CO_2-reduction could be expected for every billion of raised energy taxes.

7.2 Effects require large raises

The Commission studied in its second report on a case by case basis, without being exhaustive, which raises in energy taxes would make certain energy saving investments by households or industry cost-effective for the energy users, this not being the case at current tax levels. In general, it found such tax hikes to be very high indeed, running up to 90 cents per m^3 of natural gas, for instance. The consequence would be an enormous increase in general revenue, in the order of 20 billion guilders. Since greening of the tax system is supposed to be tax neutral, this would lead to a major problem in finding reductions in other tax levels to reach an acceptable, more or less income neutral result. The Commission did not study how to accomplish this, but it is well known that this would be difficult. The small use energy tax introduced in 1996, for which this was done, made this quite clear. There are, for example, always energy users that pay the energy tax but cannot be "reached" by lowering other taxes, for instance non-profit organizations.

7.3 Revenue recycling as a problem

The Commission, in summary, perceived in its second report the recycling of revenue of energy taxes or environmental taxes more as a problem in itself than an additional benefit from environmental taxation. It therefore studied other options to increase the effectiveness of environmental taxes not so much by raising them, as refining them. If one raises the energy tax considerably, a number of energy saving options become cost-effective. In general, however, many more persons and companies would pay the tax than actually respond to it by implementing those newly profitable options, simply because these options are not open to them. One taxes millions of people, in order to get a reaction of perhaps a 100,000 persons, one could say. The Commission looked into ways to tailor the taxes more to get these 100,000 to react, without creating the problems of major recycling of revenue to the millions. It found that one could do so by introducing positive incentives within the environmental taxes itself.

7.4 Positive incentives within environmental taxes

All current environmental taxes in the Netherlands make certain intermediary organizations the taxable person. The small use energy tax (the regulatory energy tax) is due by the energy companies, the ground water tax by the water companies. These companies pay the tax to the government and choose their own way to raise the prices of their products to compensate. The Commission proposes in its second report enlisting the help of these same intermediaries to implement positive incentives, thus keeping the system manageable for the tax authorities, in the following way. The government would draw up a list of types of investments that would be eligible. The same list would define a percentage of the investment costs that would be eligible for tax deduction. These percentages would be calculated to make the listed investments cost-effective. The client of the energy or water company, after having invested in such a listed measure, would send proof of that to the company. The energy or water company would then reduce the environmental tax that the client is due on its remaining purchases, to zero if appropriate, until the eligible part of the investment is completely offset. The result would be that one has to pay energy tax, but could avoid that at least temporarily by acting to save energy.

The energy and water companies themselves could also be eligible for offsetting part of their environmental tax due to the government, if they invested in listed techniques. The energy companies could thus be strongly encouraged to invest in space heating systems, and the water companies in systems providing lower quality water for certain industrial uses, prepared from surface water by less energy and chemical intensive methods than water meeting drinking water standards.

The Commission found that implementing such a system could create quite substantial environmental effects with very modest tax shifts. To accomplish a reduction of CO_2 emissions by 1 Mton one would have to raise the tax revenue by some 1 billion a year, the same effect could be had by a much more modest tax shift of only one fifth of that amount if one used that money for positive incentives. Similar comparisons were made between raising the groundwater tax and introducing positive incentives. The third report follows up on this discussion (see paragraph 7.7).

An overall advantage of building positive incentives into the environmental taxes themselves, as compared to other options such as tax incentives in the income tax, would be that those who pay the tax can also all be rewarded. Non-profit organizations, for instance, can invest in listed techniques as well as industry. Furthermore, these positive incentives can be tailor-made to provide just the cost-effectiveness that is necessary and sufficient. Other existing green tax elements, such as the existing schemes for free depreciation of environmental investments, and the income-tax-free income from deposits in green funds (which funds undertake to invest only in green projects), lack this precision, providing more or less an implicit subsidy of some percentage points of the invested sum, independent of - for instance - the internal rate of return that would already flow from energy saving, or the degree to which the investment is not cost-effective without an implicit subsidy. Positive incentives within environmental taxes could, by contrast, be set at any desired level of implicit subsidy rates.

7.5 Employment effects

At the request of the Commission, CPB Netherlands Bureau for Economic Policy Analysis (CPB) made new calculations for the second report of the employment effects of further greening the tax system by a modest further step-up of the small use energy tax by 1,000 million guilders on an annual basis. They were found to be negligible, as were the effects on all other macro-economic variables. Employing other models specifically tailored to evaluate tax measures, CPB argued that positive employment effects from tax greening schemes can only be created by recycling the revenue in a non-income neutral way, for instance by widening the gap between income from labor and income from social security benefits. The Commission felt that this would only undermine public support for tax greening efforts. It suggested not advocating tax greening with double dividend arguments, but primarily with environmental arguments, focusing on a strong single dividend, i.e., clear and demonstrable environmental benefits. The recommendations for positive incentives within environmental taxes reflect this approach too. More employment results were obtained for the third report for higher raises of energy taxes. (see paragraph 7.6).

7.6 Variants for energy tax raises, third report

The Green Tax Commission asked CPB Netherlands Bureau for Economic Policy Analysis (CPB) for its third report to study possible further raises of the Dutch energy taxes, assuming no comparable measures in other countries. CPB is the official government institute for economic analysis, which runs a variety of macro- and meso-economic models of the Dutch economy and issues projections and scenario's for the development of the Dutch economy in a broad sense, both for the short, medium and long term. The constraint for the study set by the Commission was that the tax raise should have no significant adverse economic effects.

CPB worked out two variants, both of which increased the revenue raised by energy taxes by 3.4 billion guilders on an annual basis. The Netherlands currently has two energy taxes, the general fuel tax and the regulatory energy tax. The general fuel tax covers all energy inputs; rates are set on a 50% carbon content and 50% energy value basis. The rates of the general fuel tax are fairly low but are applied with practically no reductions or exemptions. The only important exception is natural gas use in excess of 10 mln m^3 per year, which is taxed at a lower rate. The regulatory energy tax covers primarily gas and electricity. The first 800 m^3 of gas and the first 800 kWh of electricity per user per year are not taxed, nor is gas use above the threshold of 170,000 m^3 or electricity use in excess of 50,000 kWh per year. The rates are quite a bit higher than those of the general fuel tax.

In variant 1, CPB doubles both the general fuel tax and the regulatory energy tax. In variant 2 the regulatory energy tax is tripled for use up to 5,000 m^3 of gas and 10,000 kWh of electricity, with no changes in the general fuel tax. Table 7.1 gives an overview of the current tax levels and the rates in both variants for some energy components. As can be seen, neither variant assumes an extra tax on large use of gas above 10 mln m^3, since CPB concluded that such a raise would be incompatible with the constraint of no adverse economic effects. The main difference between the two variants is the distribution of the tax burden. Variant 2 concentrates the tax burden as much as possible on private households; 75% of the tax burden falls on households. In variant 1 55% of the tax burden falls on households.

Table 7.1 Current tax levels for natural gas and electricity and levels set in two variants

	current	variant 1 ("spread")	variant 2 ('very small use")
natural gas	***Dfl/m^3***		
0-800 m^3	0.02155	0.0431	0.02155
800-5000 m^3	0.11685	0.2337	0.30745
5000-170,000 m^3	0.11685	0.2337	0.11685
170,000-10 mln m^3	0.02155	0.0431	0.02155
>10 mln m3	0.0141	0.0141	0.0141
electricity**)	***Dfl/kWh***		
0-800 kWh	0.005	0.01	0.005
800-10,000 kWh	0.0345	0.069	0.0935
10,000- 50,000 kWh	0.0345	0.069	0.0345
>50,000 kWh	0.005	0.01	0.005
revenue	***10^9 Dfl/yr.***		
	3.6	7.0	7.0

*) The general fuel tax does not tax electricity directly. For reasons of comparison the tax on inputs into the electricity production is translated into a tax on output of electricity.

In variant 1, Dutch energy prices (other than motor fuel prices) would rise by about 15%. For industry, prices of gas and electricity would rise to about the average of the prices in Belgium, Germany and France. In variant 2, prices for very small use of energy would rise by about 25 to 30%.

CPB estimates that both variants would reduce CO_2 emissions from the Netherlands by about 4 tot 5 Mton in 2020 compared with a reference scenario; variant 1 does slightly better than variant 2 (5.1 vs. 4.6 Mton). Energy use would be about 2% lower in 2020 compared to the reference scenario. CPB's so-called "Global Competition" scenario is used as a reference. It assumes fairly high economic growth in the Netherlands of about 3.3% per year and annual growth in CO_2 emissions of about 1%. The emission reduction resulting from raising energy taxes by 3.4 billion Dfl would then be sufficient to offset the growth over 2 tot 3 years. The new outcomes confirm the Commission's "rule of thumb" noted in its second report, namely that a 1 billion Dfl raise in energy taxes generates 1 to 1.5 Mton of CO_2 emission savings.

CPB characterizes the economic effects of both variants as "very small", assuming that public acceptance of the combination of raising energy taxes and recycling the revenue into a reduction of taxation of labor is sufficient to prevent unwarranted demands for pay raises during wage negotiations. The employment effect is estimated at 0%. Table 7.2 gives the main results of the macro-economic analysis. As can be seen, variant 1 scores a little better economically than variant 2, even though variant 1 places a higher initial tax burden on industry. This is partly explained by the fact that in variant 1 a larger part of the initial tax burden is recycled back into taxes and premiums paid by employers, which in CPB models limits the upwards impact on wage and price trends.

Table 7.2 Macro-economic results in 2020 of two variants for raising Dutch energy taxes by 3.4 billion Dfl combined with an equal reduction of taxes on income from labor.

	variant 1	variant 2
	accumulated change compared with reference scenario	
	%	
wage level firms	0.1	0.4
price private consumption	0.8	1.2
price export, excl. energy	0.2	0.2
volume private consumption	-0.2	-0.3
volume private consumption excl. energy	0.1	0.1
volume investments excl. housing	0.1	0.1
volume export excl. energy	-0.2	-0.2
volume GDP (factor costs)	-0.1	-0.1
volume GDP excl. energy	0.0	0.0
employment	0.0	0.0
	% of GDP	
tax burden	0.1	0.1
of which households	-0.2	-0.3
of which indirect taxes	0.3	0.3

CPB also estimates the effects on gross production per sector of industry. Outside of the energy sectors the accumulated impact in 2020 varies between -0.4% for the chemical industry and +0.5% for the construction industry in variant 2. The impacts per sector of industry are generally smaller in variant 1 with chemicals at -0.3% and construction at +0.2%. CPB does not recalculate the impact on personal income but refers to work done for the regulatory energy tax. Calculations made by the Ministry of Finance in the framework of the outline for a tax reform for the 21st century show that it is possible to tailor income tax relief in such a way that there is no impact on personal income of households in any income group (see also Appendix 1).

Table 7.2 shows an increase in the tax burden of 0.1% GDP, even though CPB assumes a complete recycling of the revenue in energy taxes. Energy savings resulting from the tax incentive reduce State income from domestic gas sales. CPB assumes that taxes are raised to compensate for this loss of revenue. Government profits on domestically sold gas are thus replaced by taxes, but this involves no "real" additional financial burden on the taxpayer.

The Dutch Green Tax Commission does not reach a unanimous opinion in its third report on the energy tax increases that were studied. In general, the Commission states that priority for positive incentives flows more naturally from its second report than a further increase of energy taxes. It points out that the last raise in energy taxes occurred very recently and that its impacts have not yet been evaluated carefully, which might favor waiting with further raises. The Commission also points out that it is hard to evaluate the income effects of the variants studied. These effects on personal income are difficult to assess because basic features of the income tax are subject to change in the context of the outline for a reformed income tax for the 21st century. Equally, the impacts on industry are better analyzed in the context of such an overall tax reform. If in the context of such a tax reform a shift from

direct taxation to taxes on consumption is deemed worthwhile, then a *majority* of the Commission feels that a raise in energy taxes, to a maximum of Dfl. 3.4 billion, has merits, and has more merits - through its environmental benefits- than the main alternative, raising VAT. A *minority* of the Commission feels differently, and favors a standstill in the area of energy taxes, pending information about the impact of current energy taxes and elaboration of other policy instruments for encouraging energy savings.

7.7 Positive incentives in the energy taxes, third report

In its second report, the Commission drew attention to the effectiveness of positive fiscal incentives for environmental investments. It proposed a scheme for building such incentives into the environmental tax laws. The core of the proposal was that a taxpayer investing in listed environmental techniques would build up a tax credit to be deducted from his energy tax bill. The tax credit could be set at a specific percentage of the investment costs for each listed technique, in such a way that the technique became profitable for the investor through the combination of the tax (increasing the value of the energy savings) and the positive incentive (lowering the costs incurred). The government would draw up the lists periodically and the operation of the scheme would be in the hands of the energy distribution companies, who also collect the tax through the energy bills sent out to their customers. In its second report the Commission worked out a few examples (such as district heating) for which the tax levels would have to rise enormously to create the same environmental benefits as the combination of taxes and positive incentives.

In its study for the third report of the options for raising energy taxes by 3.4 billion Dfl., the Commission asked CPB to calculate the environmental benefits if about Dfl. 0.5 billion (15%) of the revenue was not recycled into lowering taxes on labor, but into a scheme for positive fiscal incentives for energy saving and renewable energy. Constraints from available models and time made it impossible to analyze the scheme exactly as proposed. In particular the selectivity of the method (a tax credit as a technique specific percentage of investment costs) exceeded the constraints at this time. CPB ultimately worked out two options in cooperation with other institutes. In the first, all energy saving techniques receive a 20% tax credit. In the second, only those techniques with the highest energy saving potential per tax guilder spent receive a 40% tax credit.

The calculations underline the value of both the positive incentives as such and the value of being selective. The environmental benefits of limiting the positive incentives to a carefully selected list of techniques at a level of 40% are about twice the level of benefits from a generic 20% for all techniques, at lower costs for the taxpayer. The selective scheme would cost 490 mln in 2020, while the generic scheme would cost 730 mln. The selective “positive” scheme could double the effect of the “negative” taxes, so that raising the energy taxes by Dfl. 3.4 billion could reduce CO_2 emissions by 10 Mtons, as compared to a 5 Mton reduction with the taxes alone. CPB warns, however, that information constraints would make it unlikely that the government could make the scheme of positive incentives work to its theoretical potential. It states that the results of Dfl. 500 million in positive incentives could be between 2 tot 5 Mtons of CO_2, with the extremes less likely than intermediate values. As stated before, the energy tax raise of Dfl. 3.4 billion would have an effect of 4 to 5 Mtons of CO_2, so that in any case the additional environmental effect of using 15% of the revenue for positive incentives would be substantial by comparison. In the opinion of CPB, cited in the third report, the environmental effects of the positive incentives would be largely

the same if the positive incentives were not coupled to a raise in energy taxes of Dfl. 3.4 billion, but f.i. to a raise equal to the money spent on positive incentives. The loss of tax revenue due to a selective positive incentives program is roughly proportional to Dfl. 100 per avoided ton of CO_2 emission. The Commission has made recommendations for positive incentives in other areas amounting to a loss of tax revenue of Dfl. 500 per ton of CO_2, so that the "500 mln scheme" comes out relatively well.

The Commission notes that the Dutch government has already introduced a number of positive incentives, albeit not according to the model the Commission outlined. From 1997 on, Dutch enterprises can take an energy investment tax credit in the personal and corporate income taxes of 40% or more of the investment costs for a great number of listed techniques. The Commission points out that building the positive incentives into the environmental taxes could make the personal and corporate income taxes simpler, and feels that in any case continuing research into an optimal combination of careful spending of taxpayer's money with the creation of environmental benefits is warranted. The Commission does point out that none of the current positive fiscal environmental incentives is available to private households and recommends more attention for this group.

7.8 The structure of Dutch energy taxes

The Commission notes in its third report that the legal system for the Dutch energy taxes is fairly complicated, as there are excises, the general fuel tax, and the regulatory energy tax, each with its own method of collection and with different taxable persons. The Commission advocates integrating at least the two energy taxes, which would make it possible to apply the positive incentives to the whole tax burden.

8 Greening VAT

8.1 A reduced rate for environmentally friendly products

In Dutch politics, VAT is often promoted as a means to create a price differential between environmentally "good" and "bad" products and services. Currently, European law precludes using VAT in this manner. Annex H of the European VAT directive limits the types of products and services to which a low VAT rate can be applied. No environmental arguments played a role when this Annex was drawn up. Other problems can also arise. For instance, the European Commission recently vetoed a Dutch plan to apply the low VAT rate on "green electricity", that is electricity produced from renewable energy sources, because such electricity can not be physically distinguished from normal electricity at the point of delivery to the consumer.

The Dutch Green Tax Commission commissioned for its third report a study to gain insight into the environmental benefits which would arise if European law were changed to make it possible to differentiate VAT rates according to environmental merits. About 25 different products and services were selected for the study, based on an a priori estimate of the likelihood that a low VAT tariff for the environmentally friendly version of the product would have an effect. This meant a focus on products which are bought largely by final consumers who bear VAT and for which the price differential between the standard product and its environmental alternative is not excessive. Calculations were made of market responses if

the standard product were to be taxed at the standard VAT rate of 17.5% and its environmental alternative at the reduced rate of 6%.

The findings were discouraging, in the sense that environmental benefits were fairly small relative to a large revenue loss of about Dfl. 1 billion. The standard VAT rate would have to be raised by about 0.35%-point to finance the scheme. The Commission carries out a more detailed analysis for a subselection of 11 products, for which the ratio between revenue loss and environmental effects was relatively favorable or the environmental benefits relatively high. Table 8.1 provides some details.

In its further analysis of the products listed in Table 8.1, the Commission concludes that a low VAT rate would be difficult to administer in many cases, in particular in the cases where the environmental merit of the eco-product is not "measurable" in the product itself, but can only be inferred from the production process, such as is the case for flowers and green electricity. In other cases, the market share of the environmental product turns out to be quite high already, explaining the large revenue loss, such as for fully recycled paper. The Commission also finds that in many cases there is an alternative to a low VAT rate to generate the same environmental impact. Examples include a tax on non-organic solvents as an alternative to a low VAT rate on organic solvents, and a positive incentive in the energy taxes for green electricity as an alternative to the low VAT rate, a solution carried out in the 1988 tax plans. The relative lack of effectiveness of a low VAT rate would then not be a real loss of options.

Table 8.1 Most interesting options for further analysis of the effects of a reduced VAT rate

Product	Loss of tax revenue mln Dfl/yr.	Environmental benefits by 2000	Unit of environmental benefits
High efficiency boilers	57.5	-39.2	kton CO_2
Solar collectors	6.9	-7.5	kton CO_2
Green electricity	4.6	-115.7	kton CO_2
High insulating glass	98.5	-141	kton CO_2
subtotal energy	*167.5*	*-303.4*	*kton CO_2*
Water based paint	138.0	-5.6	kton VOC
Nickel metalhydrid batteries	2.0	+10%-pt.	market share
Organic solvents	0.06	+10%-pt.	market share
Eco-flowers	16.8	-0.021	mln kg
Eco-timber	6.0	+3.700	ha rain forest
6-liter toilet	0.5	-1.2	mln liter water
Fully recycled paper	250.8	-302.2	kton waste
total	581.66		

Note. VOC stands for volatile organic compounds. Eco-flowers are flowers grown organically. Eco-timber is mostly Scandinavian timber as a substitute for rain forest timber. The 6-liter toilet is the alternative for the standard variable 6-9 liter toilet.

A low VAT rate seems most effective for larger energy saving products, such as high efficiency boilers and solar collectors, because the benefits of the low VAT rate are enjoyed in the year of purchase, where as the benefits from energy saving build up slowly over time. The Commission points out that it would be difficult to give member states freedom of choice for a low VAT rate for such products by amending Annex H. These are products for which cross border shopping is a real option, given the overall price impact. The

Commission recommends that the Netherlands change its focus from getting Annex H amended for a wide variety of products to getting agreements on a low VAT rate for a few selected products applied uniformly across the Union. This would enlarge environmental benefits to a European scale and avoid cross border effects.

The Commission does point out that in the longer run, VAT might incorporate more environmental provisions. Currently, the low VAT rate is reserved mostly for food and other necessities of life. This is often seen as compensation for the degressive effects of VAT on income distribution. At least in the Netherlands, this rational behind the low VAT rate is gradually losing weight, since VAT affects income distribution almost proportionally. If this were to be the case across Europe, it might become possible to apply the low VAT rate for other reasons, such as environmental reasons. The scope of the low VAT rate would then simply reflect societal choices in apportioning the VAT tax burden, made for many reasons. Such a widening of the choice process would become more likely, if a trend from direct taxes to indirect taxes were to take place. The number of exemptions and reduced tariffs often increases if the tax at issue becomes generally higher. A higher VAT to compensate for lower taxes on labor will probably be no exception to this phenomenon.

8.2 Agricultural inputs

Pesticides, fertilizers and feed are taxed at the reduced VAT rate in the Netherlands. This is seen as peculiar from an environmental viewpoint, since these products can cause more problems for the environment than others. The Commission looks in the third report into the possibility of reclassifying these products to the general VAT rate of 17.5%. The Commission wants to find out if this would improve the price signal to farmers to reduce use of these products. The answer to this question is not straightforward, given the existence of the so-called flat rate scheme for farmers.

At present, about 75% of Dutch farmers use this special optional arrangement for farmers under the VAT regime. Under this flat rate scheme they are not reimbursed for incurred VAT, and they do not have to charge VAT on their sales. This makes life easier for the farmer because he has no administrative VAT obligations. Instead, commercial buyers of farm products can deduct a flat rate of prices paid for purchases from such farmers from their VAT obligations. The flat rate is presently 5.6% and is applied uniformly on all purchases from farmers under the flat rate scheme. This percentage is calculated to reflect the average VAT incurred by farmers under the flat rate scheme.

If pesticides, fertilizer and feed were to be VAT-rated at 17.5%, the flat rate would normally be raised to reflect the increased average VAT present in farmers' prices. Calculations show that a VAT rate of 17.5% on feed would have a substantial effect of almost 2%-pt on the flat rate raising it above the reduced VAT rate for final consumers of 6%. This would open the door for fraud by using this differential through sale and resale of agricultural products. This option is excluded from further study.

Reclassifying pesticides and fertilizer to the general VAT rate of 17.5% would raise VAT revenue initially by about Dfl. 140 mln. If the flat rate were to be raised accordingly, it would amount to just under 6%. An analysis of the effects per agricultural subsector shows that this would lead to a substantial redistribution of income away from crop farming towards intensive animal husbandry, since the latter subsectors would not be affected by the

higher VAT rates but would profit from the higher flat rate over their relatively large sales. The Commission concludes that reclassifying pesticides and fertilizer to the general VAT rate of 17.5% is only advisable if this is done without raising the flat rate, which is allowed under EC law, and instead a method is found to redistribute the extra revenue among farmers independently of their sales volumes. In that case, the Commission finds the cost effects of the raised VAT rate to be beneficial for farmers with a low input of these products per hectare of land and unfavorable for excessive users, with annual effects of -3,000 Dfl for low users to +5,000 Dfl for high users.

8.3 Meat

Given the environmental impacts of the Dutch pork industry in particular, environmental groups proposed raising the VAT rate on pork to the general rate at least temporarily and using the revenue for a fund to help restructure this sector. The Commission was asked to evaluate this idea. The Commission rejects the proposal in its third report, for administrative reasons and with the argument that a sector in the process of restructuring would not be well served by raised consumer prices.

8.4 Drinking water

The Netherlands has had a tax on groundwater extractions since 1995, with the aim of restraining over-use of this environmental resource by encouraging water savings. At the same time, drinking water is taxed at a reduced VAT rate. The Commission finds these price signals to be contradictory, and recommends in the third report application of the normal VAT rate to drinking water. This would make about Dfl. 250 million available for a shift from direct to indirect taxes. Additional water savings are reported at 5 to 10 mln m^3 annually.

8.5 Soil sanitation

The Commission was asked to evaluate the case for a reduced VAT rate on soil sanitation services, at present not possible under EC law. Given the specifics of Dutch government funding of soil sanitation, this is not recommended in the third report.

8.6 Government waste services

Towns that hire a private waste collector for collecting household waste in their community incur VAT which is not deductible. Towns that operate their own waste collection as a government service are exempt from VAT. In its second report, the Commission concluded that private waste collectors suffered a competitive disadvantage of about Dfl. 100 mln from this different treatment. In its third report, the Commission finds that the best solution to this situation would be to treat government run waste services as taxable under VAT, raising about Dfl. 100 mln for reducing direct taxation.

8.7 Small businesses

The Commission notes in its third report that many specialized services in the environmental area are labor intensive and cannot profit in the start-up phase from the current Dutch VAT arrangement for small businesses. The Dutch scheme defines “small” as having a low net VAT payment. This means that firms with a large turnover of Dfl. 500,000 can be classified as small if they trade at a low margin in products for which they incur VAT, whereas a second-hand shop which has no input-VAT would soon be too big for the scheme. If no

input-VAT can be deducted, about Dfl. 24,000 of sales will make a second hand shop or a guarded bicycle stand ineligible for the scheme. As it stands, the Dutch arrangement "punishes" labor intensity. The Commission recommends eliminating this disadvantage for small, labor intensive shops. Other countries define small by the size of sales, and notably the UK has much higher limits than follow implicitly from the Dutch scheme (Dfl. 117,500 in the UK as opposed to Dfl. 24,000 in the Netherlands).

9 Agriculture and forestry

Many fiscal proposals have been floated to encourage farmers to switch to more sustainable methods. Some envision taxes on inputs, some special treatment under the excises or VAT for the products of organic farming, others aim at encouraging farmers down the environmental road by providing credits in the income tax. In its third report the Commission sorts through all of these proposals to find the most simple and effective ones. Three cases are studied relatively in-depth: organic farming, farmers switching to forestry, and farmers who are ahead of the average farmer in limiting the use of nutrients. To assess the impact of different fiscal measures, an analysis is made of the income from farming of such environmental front-runners as compared to average income from farming, and of the costs and benefits that explain this differential.

9.1 Organic farming

At present, organic farming is a relatively small affair in the Netherlands; less than 1% of farm land is farmed organically. It is official government policy to increase this share. Private organizations ask for a midterm goal of 10%. The Commission finds that in most cases organic farming generates higher income than traditional farming. Prices paid by interested consumers today are fairly high, far outweighing extra costs incurred by organic farming. Prices paid to farmers for organic crops and vegetables are around 180 to 200% of prices for standard products, and prices for organically produced milk about 15% higher than "standard" milk. Organic farmers also benefit from the Dutch scheme for green investments, under which organic farmers can finance their operations with money from a green fund at rates that are about 1.5%-pt under the going market rate. Given the large amount of borrowed capital involved in farming, this rate differential has an important effect on income.

The Commission reports the environmental effects of a switch to 10% organic farming as a reduction of around 5% in the use of pesticides and fertilizer (-0.5 mln kg of pesticides, measured by their active ingredient, and -30 mln kg less net nitrogen loss to the environment). There would also be a positive employment effect of around 1,000 to 2,500, given the labor intensive nature of organic farming. In the opinion of the Commission, this would be a reasonable basis for encouraging more organic farming, although their are also disadvantages such as less production per area of land.

Given its analysis of the current income situation, the Commission sees no great urgency for more fiscal stimuli for organic farming. However, it also carries out an analysis of the future situation in which the price differential between organic and regular farm products would be smaller, which would have to happen if a larger supply of organic products should find its way to consumers willing to pay the price. If the price differential were to disappear, organic farming would become impossible. Given the essential nature of organic farming, the costs would remain about the same and the value of sales would decline sharply. The Commission

studies a situation where the price differential balances out at +20% for organic crop farming, +50% for organic vegetables, and + 6.5% for organic dairy products, being the lowest levels at which a positive income can be made. Income from organic farming would be lower than income from regular farming in this situation. Table 9.1 presents an example for crop farming, in this case potatoes, wheat, sugar beets, onions, peas and carrots.

Table 9.1 Income from organic farming compared with income from regular farming, assuming a price differential of +20% for organic products

	crop farming, 46 ha	
	regular	organic
benefits (sales)	347,000	392,000
costs,	302,000	353,000
of which		
fertilizer	16,000	-
pesticides	31,000	-
distribution	1,000	22,000
hired labor	-	47,000
paid interest	19,000	19,000
income	45,000	39,000

The Commission utilizes tables as Table 9.1 throughout its analysis of fiscal options for agriculture to estimate the effect of different options. Table 9.1, for instance, makes it possible to evaluate the effect of a low VAT rate for organic products, affecting the level of benefits for the organic farmer; the effects of taxes on pesticides and fertilizer or raising the VAT rate on them from 6 to 17.5%; the effects of reducing taxation of labor; and the effects of the lower interest rate from green funds. All these options can be translated into effects on relative income for the organic farmer, making it possible to formulate expectations about the behavioral reactions, insofar as these are sensitive to financial considerations.

The Commission finds that no single fiscal option does well in all situations, with the exception of the already existing green investment scheme and the application of the general VAT rate to pesticides and fertilizer. Most options in the range of indirect taxes (such as a low VAT rate for eco-products, a low excise on beer made from organically produced barley, a low excise rate for soft drinks with sugar from organic farming) are found to be the least attractive, being either administratively complicated, impossible under EC law, or simply ineffective. The Commission estimates that in a situation of reduced price mark-ups for organic products, about Dfl. 25 mln annually could be required in government subsidies to sustain organic farming at 10% of farm land.

9.2 From farming to forestry

It is Dutch policy to try to get farmers in certain areas to switch to forestry for a number of reasons, among others to provide for a more pleasant landscape. A goal of 30,000 ha of additional forest by 2020 has been set and a subsidy program run by the Ministry of Agriculture, Nature and Fisheries provides financial support to farmers participating in the program. The core of the subsidy program is an allowance of Dfl. 1,200 to 1,590 per ha of new forest for 20 years.

The Dutch Green Tax Commission investigates in its third report if there is sufficient reason to increase the reward for the farmers involved for the potential of the new forest to remove CO_2 from the atmosphere. Calculations are based on the assumption that poplars remove on average 10 ton of CO_2 per ha per year. Farmers derive only a very small income from poplar forestry. Sales of wood amount to Dfl. 526 per ha and costs (excluding labor) to Dfl. 102, giving an income of Dfl. 424 per ha, whereas regular farming in most cases generates an income of at least Dfl. 1,000 per ha.

The Commission compares income for farmers considering participating in the forestry program according to the same format as Table 9.1. For the option of continuing with regular farming the benefits and costs are taken of a farm that is typical of the regions where the 30,000 ha of additional forests are desired. Calculations are made for 2 options, in which the farmer would switch either 50% or 90% of his land to forestry. The income comparison takes into account that income from forestry, including income from forestry subsidies, is exempt from the income tax.

The Commission finds that in the western part of the country (the urban area called the "Randstad") a switch to forestry would mean a large loss of income for the farmer. In other regions the income loss would be either small or there would be an increase in income. The outcome depends largely on the profitability of regular farming per region. The Commission concludes that the subsidy program would have to be increased by about Dfl. 25 million annually in order to meet the goal of 30,000 extra ha of forests on farm land. Environmental benefits are estimated at 0.3 Mton of CO_2 removed annually, leading to an estimated Dfl. 80 loss of tax revenue per ton of CO_2, a favorable figure. Including the costs of the already existing subsidy program, this number would be Dfl. 165. The Commission compares these numbers with the implicit tax rate of existing energy taxes per ton of CO_2, amounting to about Dfl. 65. Rewarding poplar forestry for its potential to remove about 10 tons of CO_2 per ha would amount to a subsidy of Dfl. 650 per ha according to this figure.

9.3 Rewarding low nitrogen loss

The Commission was asked to evaluate a scheme for rewarding farmers who reduce their nitrogen losses beyond current legal limits. Nitrogen losses are defined as the net input of nitrogen into the environment. For grass land, the current legal limit is 300 kg N/ha. If nitrogen losses exceed this legal limit, the farmer has to pay a charge of Dfl. 1.5 per ha per kg above the legal limit. Farmers have to keep accounts of their nitrogen inputs, such as contained in fertilizers and feed, and of all nitrogen removed from their land, such as through manure removal and crop uptake, to calculate their losses to the environment. This accounting system is legally prescribed and will be mandatory for all farmers by 2002.

The reward system would add a positive incentive to the "negative" charge system, a combination the Commission generally advocated in its second report. The Commission analyzes in its third report the potential effects of a scheme in which farmers with nitrogen losses of 50 kg/ha under the legal limit would receive Dfl. 150 per ha and farmers with nitrogen losses of 100 kg/ha under the legal limit would receive Dfl. 300 per ha. To this end, the Commission obtained data on the number of farmers operating in different classes of nitrogen loss. Extensive research had already been done on the additional costs for farmers to bring nitrogen losses down from the legal limit to thresholds of 50, resp. 100 kg/ha under the legal limit. A great number of measures are possible to accomplish this, but typically

they would reduce farmer's income by Dfl. 75 per ha in order to undercut the legal limit by 50 kg and by Dfl. 200 for undercutting by 100 kg. A common denominator of all measures leading to these reduced nitrogen losses is that they do not involve investments, but operational costs or loss of revenue from reduced productivity.

The Commission concludes from the numbers provided that the positive incentive scheme has a good chance of accomplishing its goals. The scheme would lead to a loss of tax revenue of about Dfl. 50 million and environmental benefits of around 10 mln kg less nitrogen losses.

9.4 Sustainable enterprise tax credit

The Commission concludes from the three examples studied (organic farming, forestry on farmland, nitrogen losses) that a good case can be made for more positive incentives for more sustainable agriculture. However, a great variety was also found in the levels of required positive incentives, spread over regions, types of farming, and times these would become indispensable. No single fiscal solution could be found to incorporate this variety. Common denominators were that in all cases rewarding farmers directly seemed to be the best solution, and that in all cases the loss of income was not tied to investment costs. The latter fact means that existing fiscal incentives, such as free depreciation of environmental investments and the tax credit for energy investments, can not be applied. The only exception here was the green investment scheme, supplying farmers with money more cheaply than the going market rate. This scheme already applies to organic farming and the Commission makes several recommendations to extend the scheme, for instance to the distribution channels of organically grown products and to farmers switching to forestry.

The Commission suggests that a subsidy program might be a good solution for the incentive schemes investigated and recommended. However, in its work the Commission noted that the farmers involved generally prefer fiscal solutions. Fiscal solutions are seen as more "secure" and automatic, being tied to annual tax reporting. The Commission states that a fiscal solution is possible if it is accepted that it is basically a subsidy through fiscal channels, having the same flexibility and speed of adaptation to new situations as subsidies. The fiscal arrangement would have to be laid down in the law in a fairly open manner, providing for a wide margin of implementation by the executive branch of the government, for instance by way of a ministerial order. There are precedents for this. The clauses in the income tax law for the free depreciation scheme, the energy investment scheme and the green investment program are all not much more than an empowerment of and reference to ministerial degrees.

For a fiscal solution the Commission favors introduction in the income tax of a scheme of tax credits for sustainable modes of entrepreneurial activities, termed the "sustainable enterprise tax credit". It would function alongside the existing schemes, and reward enterprises with environmental programs at the forefront of their sector of industry or agriculture. It would function in situations where this would mean higher costs or lower sales not resulting from investments, as these are already covered by existing fiscal programs. The Commission feels that such a sustainable enterprise tax credit could only be managed by the tax authorities if the sector of industry or agriculture set up a certification process under which the environmental front runners would be certified and regularly checked. The certificate would then be submitted with the tax returns. Such a system is

already in place for organic farmers (the EKO qualification), and for farmers with low nitrogen losses the mandatory accounting system can provide the same function. In other cases, the practicability of a certification process needs to be evaluated.

Although the Commission arrives at its proposal for a sustainable enterprise tax credit by studying examples in agriculture and forestry, is does not limit its recommendation to these sectors. Other sectors of industry could qualify equally, if it were found that standards for being a front runner could be set and certified, and that the costs of being ahead environmentally did not flow from increased investments. The Commission notes that for agriculture the sum of the losses of tax revenue for all three cases studied would be less than the potential extra tax revenue from raising the VAT rate on pesticides and fertilizer.

10 Tax on acquisiton of real estate

The tax on acquisition of immovable property in the Netherlands is 6% over the transfer price, unless VAT applies. This so-called transfer tax generates about Dfl. 3.5 billion annually. About 70% of the tax burden falls on households buying homes that are not newly built, in which case VAT would apply. The tax is levied through the notaries who draw up the act transfering ownership.

The Dutch Green Tax Commission looks in its third report into the possibility of exempting buyers from this transfer tax if the new house is much closer to the place of work. Commuting distances in the Netherlands are gradually increasing, and the new exemption might reverse this trend. The average commuting distance was 12.5 km in 1982 and rose to 15.2 km in 1994.

The Commission commissioned a study to assess the effects and costs of the proposed exemption. Only a partial analysis was made, in which the potential impact of the tax relief on house prices was set aside; it was assumed that the tax relief would benefit the buyer. If the transfer tax were to be lowered more generically, one might expect the profits to accrue to current house owners too, who could raise asking prices. The study was directed at households that could reduce their commuting distances by at least 20 km. When more than one partner in the household worked outside the home, the household was only taken as part of the potential target group for the exemption if -by and large- both partners worked in the same region. It was found that around 400,000 households could qualify for the exemption if they decided to move (out of a total of about 6,000,000 Dutch households). All these data could be derived from existing data bases. Taking into account that the supply of houses closer to work is a constraint, the target group was reduced to about 240,000 households.

It was found that on average, house owners have 1.4 km longer commuting distances than renters, comparing households that are similar in terms of size, income, age etc. The researchers estimate that about 0.7 km could be ascribed to the transfer tax, which reduces willingness to move house. The researchers estimate that home owners occupy the same house about 1 year longer than house renters, comparing similar households. The Commission concludes from these numbers that an abolishment of the whole tax would not be a worthwhile measure if taken for environmental reasons. The loss of tax revenue would be enormous for a small environmental profit.

Using the above numbers, the researchers estimate the effect of an exemption at about 0.7% of total commuting traffic with environmental profits of around 0.1 Mton of CO_2. The loss of tax revenue would be at least Dfl. 45 mln annually, making this a fairly 'expensive" incentive with a loss of tax revenue of Dfl. 560 per ton of CO_2. There is however great uncertainty in the numbers, since it is not known how many households already move more than 20 km closer to the work place every year. If estimates for these numbers are figured in, loss of tax revenue could run up to Dfl. 2,500 per ton of CO_2 or more.

The Commission concludes that an exemption as described is not a viable option because of the administrative complexity and the unfavorable ratio between loss of tax revenue and environmental benefits. The Commission does conclude that a further analysis of the transfer tax would be worthwhile, since its analysis showed that for such a relatively large tax, which falls heavily on the small group annually affected, not a lot is known about its effects on the economy and the housing market. As an alternative to the exemption under the transfer tax to stimulate smaller commuting distances by moving closer to work, the Commission suggests introducing a tax credit in the income tax. A possibility is to grant taxpayers the right to deduct the special allowance for commuting costs (a flat rate, distance-dependent) for three more years at the distance before moving.

11 Summary of proposals

11.1 First report

The first report of the Commission deals with only a few subjects in response to specific priorities derived from ongoing work in other areas. Three subjects are dealt with: the treatment of travel costs in the income tax, encouraging purchasing very fuel efficient cars and the environmental benefits of the groundwater tax. Some of those subjects were further elaborated in the second report. Table 11.1 lists the recommendations of the first report on subjects not returning in the second report.

11.2 Second report

The Commission split its recommendations in the second report into two groups. A number of proposals were felt to be fully researched and were recommended unconditionally. These proposals include the indexing of existing environmental taxes for inflation, the use of the proceeds from indexation for introducing a system of positive incentives within the environmental taxes, raising the rate of the groundwater tax for industry to the standard level, all proposals for the treatment of car use in the income tax, the proposals for incentives for LPG and very fuel efficient cars in the vehicle taxes, the disincentive for diesel and strengthening the weight dependency of the vehicle tax. This package was deemed to be tax neutral; small tax raises for many finance large cuts for some who act environmentally. In total, this package requires a tax shift of about 600 million guilders over a period of 5 years and could curb CO_2 emissions by about 3 Mton and groundwater extraction by about 100 million m^3, next to other not quantified effects on emissions of particulates and NO_X. This package is summarized in Table 11.2.

The second package in the second report is made up of measures that in the view of the Commission were promising, but required further research. It consists of the introduction of taxes on agricultural pesticides and surface minerals, raising the existing taxes on landfill waste, groundwater extraction and energy by 25% to 50%, and abolishing the low excise rate for agricultural vehicles. This package would generate about 2 billion guilders, available for lowering other taxes, in some cases with a special emphasis on specific groups. The resulting tax shift would be about 1% of total tax revenue. Environmental benefits could be some 1.5 Mton less emissions of CO_2, 125 ha/yr landscape protection, 30 million m^3 preserved groundwater and 60,000 tons avoided NO_X emissions. These conditional recommendations are summarized in Table 11.3. The third report returns to energy taxes in more detail.

In its second report, the Commission summarized its recommendations as follows. "The Commission feels that greening the tax system requires a good balance between rewards and penalties. Rewarding environmentally sound behavior now needs to be strengthened to attain that balance. The Commission recommends building positive incentives into the environmental taxes; investing in the environment would then pay off in lower taxes. The Commission proposes to use the revenue from indexing environmental taxes for inflation fully to that purpose. The Commission proposes substantial fiscal rewards for the use of LPG, the purchase of a very fuel efficient car and using public transport instead of a company car. Partly to finance these firm rewards, limited increases in the vehicle tax for larger gasoline and diesel powered cars are proposed, with lower vehicle taxes for the smallest cars.

The Commission indicates which options are worth pursuing to shift taxes on labor to environmental taxes, in the order of 1% of total tax revenue. The number of meaningful options is limited in the opinion of the Commission. In the longer run such a shift is primarily dependent on political and public acceptance of raising energy taxes; this is a finding, not a plea. The Commission recommends focusing on a strong environmental dividend from such a tax shift and not overestimating the chance for a double dividend for both environment and employment."

11.3 Third report

The Commission's recommendations from this report are summarized in Table 11.4 and Table 11.5. A distinction is made between a few more general recommendations and those requiring further study, on the one hand, and recommendations that are, in principle, capable of being quantified, on the other. For the sake of completeness, the Commission has included two charts in its third report with a summary of all of the recommendations and conditional recommendations from the first and second reports. Table 11.6 summarizes some of the more general recommendations. Table 11.7, which lists specific recommendations, briefly sets forth which recommendations have, in the meantime, been incorporated into government policy. Not all of these have been set down yet in adopted legislation. Included as incorporated are those items announced in the White Paper on Environment and Economy as tax proposals for implementation in 1998 or thereafter.

The summary of the recommendations from the Commission's first and second reports leads the Commission to the conclusion that a reasonably large number of these recommendations have been incorporated into government policy. There is only one case (further enlargement of the tax advantage for diesel passenger cars by excise tax measures as of July 1, 1997) in

which the Cabinet took a different line than the Commission. On the basis of this overview, the Commission concludes that its pragmatic approach is capable of bringing results.

11.4 Exploring the tax system of the 21st century

The Commission states in its third report that it assumes that the possibilities it has sketched for implementing new ecotaxes and increasing existing green taxes, with respect to which the government has not yet taken a standpoint, will be seriously considered in the context of tax system reform with a view to the 21st century, and the third National Environmental Policy Plan 1998. In addition to increasing energy taxes in order to reduce income tax, which a majority of the Commission favored, the lists of recommendations from the three reports set forth approximately 1.4 billion guilders worth of other options for increasing ecotaxes that have a good chance of success. A cautious estimate is that approximately one-half of that, Dfl 0.7 billion, would perhaps be available for a reduction in income tax.

Finally, the Commission urges that more attention be paid to proposals for rewarding environmentally-friendly behavior, especially for those households left by the wayside under currently existing arrangements.

As Appendix 1 shows, many of the Commission's recommendations feature in the White st century; an investigation", which was sent to Parliament in December of 1997. The third National Environmental Policy Plan takes all recommendations on board for study and evaluation and expresses the raise of energy taxes by Dfl. 3.4 billion, a package of Dfl. 0.5 of positive fiscal incentives and indexing of all environmental taxes as of 1999 as cabinet intentions.

Table 11.1 Summary table first report (not taken up in second report)

	Treasury 10^6 Dfl.	Environment
• Increase and extend incentive for commuting by public transport in income tax	p.m.	- 0.1 Mton CO_2
• Assess the private use of business cars for the income tax assuming use of a medium-sized, fuel-efficient car	p.m.	- 0.2 Mton CO_2
• Freeze deduction of business use of private cars at current levels (60 cents/km)	p.m.	p.m.
• Simplify and step up advantages for carpooling under the income tax	p.m.	p.m.
• Free electric cars of the car purchase tax (effective rate ca. 25%)	p.m.	p.m.

Table 11.2 Recommendations second report

	Treasury[1)] 10^6 Dfl	Environment[1)]
• Offsetting costs of listed, nearly profitable environmental investments against environmental tax burden	- 400	2.0 Mton CO_2 - 100 mln m^3 groundwater extractions
• Indexing environmental taxes for inflation	+ 400	- 0.4 Mton CO_2
• Gradual increase of groundwater tax for industry and agriculture to normal levels; use of proceeds for positive incentives	(+40) (-40)	- 100 mln m^3 groundwater extractions
• Exemption for asbestos under waste disposal tax	-2.5	avoid reduction removal rate
• Extend exemption for dredging sludge under waste disposal tax until 2000	0	(clarity; no effects of tax)
• Remove exemption for organic waste under waste disposal tax	0	(removal of market distortions)
Total environmental taxes	*-2.5*	*- 2.4 Mton CO_2* *- 100 mln m^3 groundwater*
• Reduce annual vehicle tax for LPG cars with latest technology by Dfl 400/yr	- 120	- 0.25 Mton CO_2 - less emissions of particulates and NO_x
• Increase LPG excise by 8.5 cent/liter; reduce annual vehicle tax for LPG by Dfl 240	0	disincentive for high mileage
• Reduce current fiscal advantage diesel by a third; increase annual vehicle tax by Dfl 80 a year	+ 50	small disincentive growth diesel use; incentive for LPG use as alternative
• Tie weight-dependent annual vehicle tax closer to average fuel use increase (700 kg: - Dfl 30; 800 kg: + Dfl 0; 900 kg: +Dfl 28; 1300 kg: + Dfl 40 a year)	+ 70	double incentive for fuel efficient cars
• Environmental deduction of 5%-punt off taxation of private use of business cars within income tax (currently at 20% of car value) with a maximum of Dfl 2,000 if at least 5,000 km/yr use of public transport is demonstrated	-45	- 0.1 Mton CO_2 more business travel by public transport
• Premium of Dfl 1,500 vehicle purchase tax for cars with 10% more fuel efficiency than weight class average	-50	- 0.1 Mton CO_2
Total transport	*- 95*	*- 0.5 Mton CO_2*

[1)] Calculated for about 5 years after implementation

Table 11.3 Conditional recommendations second report

	Treasury 10^6 Dlf	Environment
• Introduce surface minerals tax (sand and gravel) (Dfl 4 per ton)	+ 250	- 125 ha/yr less inland surface mining; incentive for recycling
• Introduce pesticides tax agriculture; tariff Dfl 5 per kg. active ingredient; similar for industrial uses	+ 100 à 150	ca. 50% contribution to policy target 2000
• Recycling pesticides tax to sector through positive incentives	- 100 à - 150	speeding up more efficient application techniques
• Introduce tax on waste incineration (tariff Dfl 29.20/ton) + increase tax on landfill by same amount	+ 175	incentive for recycling - >0.2 Mton CO_2
• Raise one of either energy taxes by ca. 50% or both by ca. 25%	+ 1,000	- 1.25 Mton CO_2
• Increase groundwater extraction tax by 50% (17 cents/m^3)	+ 150	30 mln m^3 groundwater extractions - 0,1 Mton CO_2
• Increase landfill tax by 50% (ca. Dfl 15/ton)	+ 75 à 150	assure switch to incineration and recycling
• Free depreciation of LPG equipment in cars	p.m.	additional incentive for LPG use in business cars
• Increase diesel excise for non-transport use to general level	+360	incentive for more fuel efficient use
• Introduce NO_X-emission tax for large combustion installations; recycle proceeds on the basis of energy production or use to same installations	(0)	- 60 kton NO_X
Total (available for reducing other taxes)	*+ 2,010 à 2,085*	*- 1.5 Mton CO_2* *- 125 ha/yr inland surface mining* *- 30 mln m^3 groundwater extractions* *- 60 kton NO_X*

Table 11.4 General Recommendations - Third Report

- Reinforce the policy and research capacity for greening taxes within the central government and provision for a continuation of the dialog initiated within the Green Tax Commission
- Reassess the feasibility of financing subsidies out of environmental taxes
- Study the consequences of rate adjustments of the real estate transfer tax
- Aim efforts at European harmonization of a reduced VAT rate for certain energy-efficient consumer products in the public eye
- Undertake a European-scale study of the scope of effect of VAT rate reductions based on grounds other than income effect, including the environment and labor intensity
- Examine a restructuring of the VAT scheme for small business aimed at eliminating the detriment to labor-intensive businesses
- Study the effects of imposing a tax on acidifying emissions
- Examine coupling the use of organic sugar in soft drinks with a reduction in the applicable consumer tax
- Research the feasibility of integrating energy taxes

Table 11.5 Quantifiable Recommendations - Third Report

	Treasury[1)] 10^9 Dfl.	Environment
• Increase in energy taxes and decrease in income taxes (*majority of Commission*)	3.4 to 5.1	-5 to -7 Megatons CO_2 -3.5 to -5 kilotons NO_X
• Incentives for energy-efficient investment by businesses and households	-0.5	-2 to -5 Megatons CO_2
• Increase in the VAT rate for pesticides and fertilizer; with revenue returned to the agricultural sector by means that will not affect the current flat rate scheme for farmers	(0.14)	*PM*
• Reclassification of water to general VAT rate	0.25	-5 to -10 milion m^3 water consumption
• Elimination of the VAT exemption for municipal waste removal services	0.1	*PM*
• Partial return of revenue to floriculture sector based on environmental factors, if EU law forces application of general VAT rate	[0.25]	>-0.02 kilotons pesticides
• Imposition of VAT and kerosene excise tax on intra-European air travel (international)	[0.7 to 1.8]	-1 to –2 Megatons CO_2
• Tax on solvents and non-sustainably produced timber (probable success rate)	[0.17]	-5.6 kilotons VOC +3,700 hectares tropical rainforests
• Sustainable enterprise income tax credit for certified environmentally-friendly agricultural businesses (expandable to other sectors)	-0.1	-30 to –40 milion kilograms pesticides -0.05 milion pesticides
• Bringing farmers who engage in forestry under green investment scheme (expandable)	*PM*	*PM*
• Bringing processing of organic products under green investment scheme	*PM*	*PM*
• Rewarding forestry for CO_2 absorption	-0.025	-0.3 Megatons CO_2
• Incentive within the travel expenses deduction for relocation closer to the workplace	≈0	-0.1 Megatons CO_2
• Top up free depreciation for environmental investments (✌VAMIL✍) with credit of between 5% and 10% for environmental investments	*PM*	*PM*

[1)]Figures in parentheses are based on the presumption that the revenue will be returned to the same sector. Square brackets indicate figures that would require changes in international law or that the Commission was unable to estimate with greater precision.

Table 11.6 Summary Recommendations - First and Second Reports

- Establish a clear check list for greening taxes and make the likelihood of a beneficial impact on the environment a minimum prerequisite
- Maintain, in the context of greening taxes, a good balance between ✌burden✍ and ✌reward✍
- Incorporate ✌reward✍ wherever possible into the environmental taxes themselves, in order to achieve ✌tailor-made✍ solutions and a more universal range (the payer of tax should also be rewarded)
- A coordinated European increase in excise tax would have the greatest effect of limiting mobility
- Exercise caution in reducing motor vehicle tax; use this tax to reward cleaner automobiles

Table 11.7 Summary of Quantifiable Recommendations - First and Second Reports (not incorporated in Third Report)

	Treasury	Policy
• Broadening and increase of income tax public transportation credit	*PM*	✓
• Link kilometer reimbursement to car use costs	*PM*	✓
• Freeze level of kilometer reimbursement for automobiles	*PM*	✓
• Encourage carpoolers and tele-commuters	*PM*	✓
• Exemption of purchase tax ('BPM") for electric cars	*PM*	*
• Incentives in environmental taxes	-0.5	✓
• Adjust environmental taxes for inflation	0.4	✓
• Bringing groundwater taxes for self-extracted water to the same level as those for public waterworks; use revenue for incentives	(0.04)	✓
• Exempt asbestos from waste tax	-0	✓
• Extend waste disposal tax exemption for dredging waste	0	✓
• Eliminate exemption for biologically-degradable garbage	0	✓
• Reduce motor vehicle tax for cleanest LPG automobiles	-0.12	✓
• Increase LPG excise tax; reduce motor vehicle tax for LPG	(0.12)	✓
• Increase diesel surcharge motor vehicle tax	0.05	
• Less gradual progression in motor vehicle tax rates	0.07	**
• Environmental credit in income tax on company cars	-0.05	
• BPM discount for extremely energy-efficient automobiles	-0.05	✓
• Reward cleaner automobiles through motor vehicle tax	*PM*	*PM*
• Tax on surface mining	0.25	
• Tax on pesticides; revenues redirected to sector on environmental basis	(0.15)	
• Increase waste tax on garbage dumping	0.15	***
• Impose waste tax on incineration	0.175	
• Increase groundwater tax	0.15	
• Free depreciation LPG automobiles	*PM*	
• Increase diesel excise tax on movable machinery and equipment	0.36	
• Refine fuel tax in terms of NO_X emissions	(0.25)	

* This recommendation has not yet been implemented in this form. Separately from this recommendation, an additional incentive for energy-saving investments has been included in the income tax starting in 1997, in the form of the Energy Investment Tax Credit (EIA).

** This recommendation has not been implemented in this form, but the excise tax increase that entered into effect on July 1, 1997 is linked to a reduction in motor vehicle tax for that favors smaller and more efficient automobiles.

*** This recommendation has not been implemented in this form, but the tax proposals for 1998 provide for an increase for combustible waste. This is in line with the Commission's pleas for an increase in the environmental impact of environmental taxes.

Appendix 1

Green taxes in the White Paper "Taxes in the 21st century, an investigation"

Introduction

The White Paper deals with a wide variety of tax subjects. The main focus is on the income tax. In the final chapter, three main options for changing the income tax are presented. All three options proceed from a base variant, in which Dfl. 10 billion is used to finance a reduction in income tax rates. About Dfl. 7.5 billion of this is raised from taxes on consumption, of which 3.7 as environmental taxes and 3.9 as VAT (raising the general rate from 17.5 to 19%). The remaining 2.5 billion concerns measures within the income tax, and is generated by broadening the income tax base. Of this 2.5 billion, about 0.5 billion could be found by incorporating the current distance-related standard deduction for the costs of commuting into a more general labor tax credit. Tax-free reimbursement of the costs of commuting by public transport, however, might remain possible. The White Paper also outlines options for taxing private use of company cars more fully as payments-in-kind. This synopsis focusses on Chapter 7 of the White Paper, dealing with the options for greening the tax system.

The benefits of green taxes

The White Paper outlines two main advantages of green taxes. An obvious one is the incentive effect for the environment. Very important in the context of the tax reform is secondly - or perhaps firstly- the potential to make the tax system more "robust". Compared with income taxes, consumption taxes offer fewer possibilities for fraud or tax evasion. Over time, they provide for a relatively stable income, as consumption taxes are less sensitive to cyclic fluctuations in the economy than taxes on income or profits. Environmental taxes in particular have the advantage that they are by necessity paid *in* the Netherlands at the time of and in proportion to production or consumption *in* the Netherlands. Most environmental taxes have low perception costs. The focus of the White Paper is on environmental taxes that offer a solid tax base, even if the desired incentive effect is active.

The White Paper does not consider raising excises on motor fuels to finance income tax reform, as it is impossible to predict when they can be raised without loss of revenue to cross border consumption. Coordinating such excise rates with the neigbouring countries (Germany and Belgium) is neccessary.

Employment effects

The White Paper attributes no employment effects to a shift from labor taxes to consumption taxes, if the effects on the income distribution are to be balanced. Employment effects result only if the shift is made in such a way that net income from labor benefits more than income from social security payments. Table 1 illustrates this, based on calculations by CPB Netherlands Bureau for Economic Policy Analysis.

Table 1 Economic effects of shifting Dfl. 3.9 billion from taxes on labor to taxes on consumption (+1.5% VAT rate; 0.5% of GDP)

share of shift used to lower:			
income tax rate of first bracket	50%	100%	50%
tax-free deductable for all	50%		
tax credit for workers			50%
calculated macro-eoconomic effects			
wage price level	+0.0%	-0.2%	-0.8%
consumption prices	+0.6%	+0.5%	+0.0%
volume prvate consumption	-0.3%	+0.0%	+1.1%
volume production market sector	-0.3%	+0.1%	+1.1%
employment market sector	-12,000	+7,000	+49,000
purchasing power			
minmum social security	+0.7%	-0.1%	-0.6%
modal income from labor	+0.4%	+0.9%	+0.8%

Current situation

In 1998, green taxes have a share of about 14% in total revenue from national taxes (3.2% of GDP). Local green taxes have a share of about 50% in local taxes[1]. Table 2 summarizes the national figures. Numerous positive incentives also exist, including free depreciation of environmental investments under the income tax, a tax credit of 40% or more for energy saving investments, income tax free status of income from investments in green funds, and exemption from the regulatory energy tax for electricity produced from renewables.

Table 2 National green taxes 1998 (billion Dfl.)

excises on motor fuels	11.8
taxes on cars	8.3
environmental taxes	4.0
total green taxes	24.1
total national taxes	177.7
GDP	752.2

Proposals for a further shift

The White Paper outlines possibilities for a Dfl. 5.1 billion tax raise in environmental taxes. Table 3 provides an overview of the proposals. Energy taxes could be raised by Dfl. 3.4 billion, an option derived from the third report of the Green Tax Commission. In keeping with this report, Dfl. 0.5 billion of this revenue (15%) is not used to lower income taxes, but for positive incentives for investments in energy saving by households and industry. No final choice is made for a specific variant for raising energy taxes. Of the total raise of Dfl. 3.4 billion, Dfl. 0.9 billion is set aside for compensating industry for its share in the tax burden. The recommendations of the Green Tax Commission in its third report concerning the introduction in the income tax of a sustainable enterprise tax credit and extending the free depreciation of environmental investments into an environmental tax credit are to be assessed for this purpose.

[1] Local government is paid mostly from national general revenue.

Table 3 Making Dfl. 3.7 billion of green taxes available for reducing income taxes

Energy taxes	3.4		
Other environmental taxes	0.7		
Indexing environmental taxes for inflation	0.4		
VAT on environmental taxes	0.6		
Positive incentives for energy saving		-0.5	
Compensating industry		-0.9	
Subtotals	5.1	-1.4	
Total available for reducing income tax			3.7

Other environmental taxes than energy taxes would generate Dfl. 0.7 billion. The composition of this package is not final. The possibilities for a tax on pesticides and a tax on surface minerals (sand and gravel), raising existing environmental taxes on groundwater extraction and landfilling, raising the excise rate on diesel used outside transport, and raising VAT on water, pesticides and fertilizer from the reduced rate to the general rate will be investigated. All these options are discussed in the reports of the Dutch Green Tax Commission.

Environmental benefits

The White Paper summarizes the environmental benefits of the proposed green tax measures, taking the reports of the Green Tax Commission as a basis. The overall impacts on CO_2 are estimated to compensate for the growth of these emissions otherwise to be expected in about 4 years. Table 4 gives the details. Reducing car mobility as outlined in this table covers the impacts of the proposals within the income tax for changing the treatment of commuting expenses and of the company car.

Table 4 Environmental impacts of greening the tax system in the near future

Raising and indexing energy taxes, reducing car mobility	-5 à -6 Mtons of CO_2
	-3.5 à -5 ktons of NO_x
Positive incentives energy saving and renewable energy	-2 à -5 Mtons of CO_2
Price incentives water	-30 à -100 mln m^3 groundwater use
Price incentives agriculture	-30 à -40 mln kg nitrogen losses
	-1 à -5 mln kg of pesticides

Income effects

The White Paper reports the income effects of the shift to green taxes for two variants for reducing the income tax. In variant one, only the income tax rate for the first bracket (currently 36.35%) is reduced, in variant 2 the reduction of the rate is about half the number for variant 1 and in addition the income tax free allowance for all is raised. The White Paper presents the effects as a total for the shift to green taxes and the shift to VAT. The shift to VAT has an almost proportional effect on the income distribution; for most income categories, the impact is around -1% of net disposible income. Table 5 summarizes the income effects. The income effects of green taxes are degressive, as can be seen from the second column of table 5, taking into account that all numbers reflect about a -1%-point effect of raising VAT. This degressive effect cannot be eliminated by reducing the rate of the income tax, as can be seen from the third column of table 5. Such a measure tends to reinforce the degressive effect, even though only the rate of the first tax bracket is targetted. To obtain a more equitable outcome one needs to raise the general deductable (column 4), which can be taken double by single income, multiperson households. The fact that all presented income effects in the latter case are positive is explained by the fact that about Dfl. 0.8 billion revenue is recycled

back into the income tax but not included in the income effects of indirect taxes. This concerns the amount of VAT resting on government bodies and the revenue from indexing environmental taxes for inflation.

Table 5. Effects on net disposible income of raising VAT by Dfl. 3.9 billion and environmental taxes by Dfl. 5.1 billion and combined effects with two methods for lowering income taxes

	Effect indirect taxes	**Combined effect indirect taxes and income tax reductions**	
Rate first bracket		-3.1%	-1.6%
Tax free allowance			+ Dfl. 800
employees (general)			
minimum wage	-2.7%	+0.1%	+0.0%
modal income	-2.4%	+1.4%	+0.3%
twice modal income	-1.9%	+0.6%	+0.0%
employees (single income, multiperson households)			
minimum wage	-2.4%	-1.1%	+0.2%
modal income	-2.3%	+0.2%	+0.3%
twice modal income	-2.1%	+0.2%	+0.3%
retired			
single			
state pension	-2.3%	-1.3%	+0.4%
Dfl. 40,000	-2.4%	+0.0%	+0.1%
Dfl. 80,000	-2.1%	+0.4%	+0.2%
married			
state pension	-2.6%	-1.4%	+0.3%
Dfl. 40,000	-2.4%	-0.4%	+0.3%
Dfl. 80,000	-2.1%	+0.6%	+0.6%

The income effects of indirect taxes are derived from statistics on the burden of these taxes per decile of the distribution of disposible income. They are then attributed to the household categories in table 5 solely on the basis of average disposible income. The income effects of the Dfl. 3.9 billion VAT raise vary from -1.2% for the 10% of households with the lowest average net disposible income to -1.0% for the highest decile. The income effects of raising energy and environmental taxes by Dfl. 5.1 billion vary from -1.9% for the 10% of households with the lowest average net disposable income to -0.9% for the 10% of households at the other end of the income spectrum. This includes the effects of VAT on these environmental taxes but not the effects of 0.9 billion of these environmental taxes assumed borne by and compensated to industry. In the White Paper, the last column of table 5 is taken over into the base variant. A disadvantage of raising the general deductable[2], addressed in the White Paper, is its negative effect on employment (see also table 1). Employment gains from lowering the tax rate by 1.6% are balanced by employment losses from raising the deductable. The White Paper discusses several options for a more integral

[2] The tax free allowance is currently about Dfl 8,500 per taxpayer and is subtracted from taxable income before the rates are applied.

tax reform, bringing together the options for shifting and greening the tax base with other elements of reform. It is outside the scope of this synopsis to summarize this.

Appendix 2

A complete translation of chapter 2 of the Commission's third and final report.

The continuing challenge

With this third report, the Green Tax Commission concludes its activities. It has, in large part, complied with its assignment to analyze the potential for improving the environmental impact of every form of tax. The Green Tax Commission has been prevented, by lack of time, from examining a few areas, such as local taxation.

This third report most decidedly does not mean that all efforts towards the greening of the tax system can be deemed completed. Not only do many of the Commission's recommendations require further analysis, elaboration, and the determination of an ultimate position; in addition, conceptualizing the greening of the tax system is a long-term proposition, in which developments in environmental policy and tax policy continually shape new requirements and possibilities.

The final picture in a state of flux

Green taxes could, in the long term, assuming global development in this direction, perhaps constitute a 30% share of all Dutch taxes. Taxation of energy consumption in all sectors of society would make up the lion's share of this percentage. In the short term, and in the apparent absence of a broad international trend in the direction of greener taxes, the Netherlands can, with its current share of nearly 14%, probably already be considered a front runner. This is certainly true for the variety of positive environmental tax incentives that have been implemented in the past few years. Caution is therefore called for with respect to any additional domestic measures.

The Commission warns against using as a target goal the percentage of total taxes formed by green taxes. As a result of a successful environmental policy, the bases for these taxes will show a consistent downward trend, attributable to that policy's goal of separating economic growth from an increase in environmental pollution. In any event, if environmental policy is successful, the bases for these taxes will increase less rapidly than the bases of taxes that increase more or less automatically as a result of economic growth, such as income tax, corporate tax and VAT.

Greening of taxes requires research

The Commission prefers, for the short term, a pragmatic approach, in which the use of the tax system to achieve environmental goals depends on whether such use can be expected to be effective. It has examined proposals according to its own check list, which appears to provide a reasonably satisfactory model. It has, however, proven extremely difficult in practice to subject potential greening options to a thorough examination, because of a lack of specifically- tailored information. In certain cases, essential information concerning the behavioral responses of businesses and individuals proved to be absent or difficult to obtain and, in any case, open to much discussion. A thorough approach, however, requires careful attention to both the desired consequences of green tax measures, and of those consequences to be avoided, in the interest of the Netherlands' competitive tax position. Specific attention

must be focused on "micro-level" responses: those at the level of homogeneous groups of persons and business enterprises, in order to achieve the effectiveness that is capable of being achieved.

After the Commission

The Commission has served the temporary and limited function of providing an impetus for the greening of the tax system. Essential to the Commission results was the internal dialog among members from different disciplines and with different backgrounds. Disciplines covered a broad range, including tax, economics, and the environment, as did members' backgrounds, which included academia, politics, non-governmental organizations and government departments. In addition, there were numerous other persons who submitted proposals to the Commission. The Commission is of the opinion that the State Secretary for Finance has shown daring in establishing such an open platform for dialog. This dialog deserves to be continued after the expiration of the Commission's mandate. The exchange of information among different countries also deserves attention. The Commission therefore recommends following up on these needs and, particularly in light of the acknowledged need for in-depth studies, making personnel and financial resources available at the governmental level.

The subsidies alternative

The Commission rarely devoted much time to addressing the question whether a tax-centered response to environmental concerns was superior or inferior to other policy approaches, such as rule-making or voluntary compliance. Here too, it recommends a pragmatic approach; if, after careful review, a tax-based solution appears to work, it should be considered. It was clear to the Commission that a tax-based approach providing positive financial incentives is perceived by interested persons as more "certain," and therefore preferable to other approaches. The Commission nevertheless recommends that the use of subsidies, financed through environmental taxes, be given more weight in determining policy, in part because of its greater potential for selectivity and for reaching the desired target group.

Green funding of income tax reduction

Energy taxes

A majority of the Commission is of the opinion that increasing energy taxes by between 3.4 and 5.1 billion guilders would be the most obvious short-term option for contributing to the financing of a reduction in wage and income taxes, with a view to tax reform in preparation for the 21st century. This increase would not apply equally to large-scale energy consumption. If, in accordance with the recommendations made by the Commission in its second report, between 10 and 15% of the revenues from this increase (500 million guilders) were set aside for positive and selective environmental incentives incorporated in these taxes, by 2020, an environmental benefit of between 7 and 12 megatons CO_2 and from 3.5 to 5 kilotons NO_X could be expected from this shifting of tax. Research by CPB[3] indicates, in the opinion of the majority of the Commission, that the economic effects of such a limited unilateral domestic measure would be negligible.

[3] CPB Netherlands Bureau for Economic Policy Analysis.

In the absence of a broader European context, a minority of the Commission finds insufficient grounds for an increase in energy tax. These members find the effectiveness of increasing these taxes too limited when weighed against other potential alternatives, such as long-range agreements on energy savings between business and government, and point out that the latest of such increases has taken place only recently, and its results have yet to be adequately evaluated. In addition, these members are concerned about the economic effects of further increases in energy taxes. They believe in particular that CPB has underestimated the effects of shifting the burden at the sectorial level. They expect additional increases in energy taxes to be passed on by employees in the form of salary demands, with troublesome economic consequences. They fear that additional increases in energy taxes will give foreign investors the impression that the Netherlands continues to take risks in this area, which would have a negative effect on the investment climate.

The Commission believes that a definitive decision on increasing energy taxes can only be taken in the broader context of reforming the tax system for the 21st century. Its impact on the purchasing power of citizens depends, for example, to a large degree on whether this reform is accompanied by a net alleviation of taxpayer burden. The methods available for recycling tax revenues, and the accompanying net effect on purchasing power will depend on the reform of the entire system. The requisite integral analysis of an increase in energy taxes and a recycling of the revenues within a reformed tax system, together with a measure of net reduction of taxpayer burden, can only be made by the Ministry of Finance in conjunction with the reform of the entire tax system. The Commission believes that attention must be paid to the effect on the purchasing power of the elderly and of lower-income households in situations where they currently consume energy at relatively high rates. The reform of the whole tax system will determine, inter alia, whether further greening of the tax system is generally accepted, how this will affect the business sector, and what impact it will have on the investment climate.

Tax on conversion of land use

The Commission analyzed the imposition of a tax on the elimination of open spaces, after having explored it briefly in its second report. The environmental benefit of such a tax, in particular with respect to soil decontamination (assuming that polluted land will be exempt from the tax) and on the retention of green spaces in the Netherlands through more efficient use of space arises only at relatively high rates, in the neighborhood of Dfl 25 per m^2. If the tax were imposed on undeveloped land, effects could be expected only on the assumption that there will be an extensive liberalization of land use policy in the Netherlands, making sellers of land responsive to price incentives. At these rates, the proceeds could be considerable (in the neighborhood of Dfl 1.0 billion per year) and the efficiency of land use could increase by 5% or more. Effective taxation of land space therefore requires relatively high rates and, in certain forms, significant liberalization of land use policy. The consequences of these assumptions can be determined only through extensive additional research, with a strong emphasis on spatial planning aspects. The Commission is therefore of the opinion that such a tax must first be examined from a vantage point other than that of environmental policy, i.e., that of spatial planning policy. The determination of whether this or a similar type of tax could be a useful instrument of land use policy falls, however, outside the scope of the Commission's mandate.

Taxation of intra-European air traffic

The Commission attempted to analyze the effects on the national treasury and the environment of a more “normal” tax treatment of aviation. In doing so, it looked in particular at the possibility of having the European Union amend international treaties so that the interior of the Union constitutes a single domestic airspace in which flights would normally be subject to kerosene excise tax and VAT of 17.5% of the ticket price. On the basis of the current situation, this tax treatment could be expected to yield approximately Dfl. 0.7 billion for the Dutch treasury. If, as predicted in some of CPB’s most recent scenarios, aviation experiences dramatic growth, the contribution to the Dutch treasury could reach 1.8 billion guilders in 2020.

The environmental benefit of such a tax treatment of air traffic amounts to between 1 and 2 megatons of CO_2 and is therefore reasonably good. It corresponds in scope per guilder taxed with the results of other taxes on energy-consuming activities. Curbing aviation in an intra-European context could reduce the number of passengers at national airports by between 10 and 15%, to be compared with a potential growth by 2020 of between 100 and 300%. All in all, the positive effects on the treasury are somewhat greater than those on the environment. An intra-European variant such as this would certainly contribute nicely to the shift from direct to indirect taxation. Even simply imposing VAT on intra-European air traffic would generate the not insignificant sum of Dfl. 0.25 billion. The Commission therefore recommends that the possibility of an intra-European variant not be ignored in international negotiations, in addition to considering more environmentally-effective global variants.

A greener VAT in a new light

The limits of a selective approach

The Commission did not take turnover tax into consideration in its earlier reports. For this third report, the Commission examined the incentive of placing environmentally-friendly goods and services in a reduced VAT rate category, with the more usual alternatives remaining under the basic rate of 17.5%. The research focused specifically on 25 products and services with respect to which there was already good reason to expect that the tax incentive and resulting environmental benefit would be worthwhile.

Although no generally applicable conclusions can be drawn from this study - it remains possible that a potential product was neglected or will come onto the market subsequently - the Commission feels that the gist of this study’s findings is that there is only a limited perspective for such greening of VAT at the level of specific products and services. The beneficial effect is relatively small, making the loss to the treasury relatively high. Taken together, the estimated tax loss for all of the products and services studied amounts to nearly 1 billion guilders per year. The fact that VAT is less amenable to being used for environmental purposes does not constitute a real drawback. The Commission’s study demonstrates that there are, in most cases, good prospects for using specific ecotaxes as a more effective and less expensive alternative for achieving the desired environmental benefit. This applies to both increasing the cost of less environmentally-friendly products, as well as rewarding the purchase of environmentally-friendly products.

Implementation problems

In some cases, the positive environmental aspects of a product are not immediately measurable in the product itself, but arise out of the manner in which it is produced. This applies, for example, to organically-grown agricultural products. The European Commission's recent decision rejecting a reduced VAT rate for "green" electricity, on the grounds that at the time of purchase it is indistinguishable from ordinary electricity, renders it even more difficult to allocate or achieve a reduced rate for such products in the European context. This could also raise problems in the context of the WTO. Another possibility is that the positive environmental aspects are discernable with respect to the product itself, but the product still does not merit being promoted, because this is not in keeping with an optimal approach to solving the environmental problem at hand.

A different interim approach

The Commission concludes from the foregoing that for the medium term, continuation of the current policy of seeking primarily national authority for addressing environmental concerns through VAT could be less fruitful than assumed, and might involve the additional risk of failing to take sufficiently timely account of alternative domestic tax solutions.

In the European context, attention could be focused *in the medium term* on temporary, coordinated European VAT rate reductions for a *limited* number of products in the public eye, rather than seeking broadening national authority to decide on a low rate for a wide range of products and services. The Commission has in mind here specific, technically identifiable household appliances which could considerably improve the environment if their market share were to increase, and which would be significantly affected by a reduction in VAT, because the effect on the price would be enjoyed immediately at the time of purchase. From the examples studied, one could consider, for example, high-efficiency boilers or solar hot water heaters. Problems with technical implementation would also be relatively small for such large appliances.

These are, however, products that would invite cross-border shopping if a neighboring country applied a lower rate while the consumer's own country retained the standard rate. The financial advantage is, after all, high when it comes to such relatively expensive products, and individuals can freely make such purchases in other member states, rather than in their own country. Member states would therefore not be inclined to leave the VAT rate for such products to the discretion of the individual member states. Subjecting certain of these products to the reduced rate throughout the European Union would eliminate this cross-border effect and extend the environmental benefit to the whole of Europe.

A more general approach in the longer term

In the longer term, one could expect that in all the EU member states VAT and - in more general terms, indirect taxes - will constitute a larger share of the tax structure. Across the EU, the general VAT tariff will show a tendency to increase. This fits into the plans of the European Commission to shift the burden of taxation from labor to consumption and the environment. It seems very likely - and almost inevitable - that higher basic VAT rates will lead to a renewed discussion on the currently rather limited scope of the lower rate. In general, it is after all true that the heavier the perceived burden of a certain tax, the greater the inclination seems to be to introduce exemptions and reduced rates for specific cases.

The Commission is therefore of the opinion that it would definitely be worthwhile to conduct a study at the European level - involving the southern member states as well - of a longer-term goal of developing a "greener", but workable, VAT rate structure, in which different approaches to weighing environmental concerns are taken into account. The allocation of different types of consumer expenditures between the reduced and standard rate could be used to express the type of expenditure that society as a whole would like to encourage over others by keeping the indirect tax burden lower. A reduced rate on, e.g., bicycles or certain labor-intensive environmentally-friendly services would fit well into such an approach.

Meat, soil sanitation, waste services

The Commission sees no need for a higher VAT rate on meat. In addition to posing problems of implementation, such a measure can be expected to have a negative effect on the much-needed reform of the meat industry, by reducing the market. Nor does the Commission see any reason to reduce the VAT rate for soil decontamination, because one may elect, in certain situations, to increase the amount of government subsidies for soil sanitation in the knowledge that the government will receive back the VAT charged on decontamination services thus subsidized by the government. The Commission acknowledges that applying the standard rate to private providers of garbage removal services, while exempting municipal providers from VAT, distorts competition, resulting in a detriment to the private service provider of approximately Dfl 100 million per year. The Commission does not recommend applying a reduced VAT rate to private providers of garbage removal services in order to eliminate this distortion. It does, however, recommend bringing municipal garbage removal services into the VAT system at the standard rate (revenues of approx. Dfl 0.1 billion year), in order to eliminate the existing distortion of competition with private providers, without negative budgetary consequences.

Water and floriculture

In the context of the shift from direct to indirect taxes, the Commission believes that it would be environmentally beneficial to bring water under the standard rate, resulting in revenues of approximately Dfl 0.25 billion guilders and an estimated additional savings of 5 to 10 million m^3 of water per year. It is conceivable to the Commission that further developments in European legislation will ultimately force floriculture to be reassigned to the standard rate, with annual revenues of approximately Dfl 0.25 billion as well. An environmental benefit could be achieved, in that case, by reserving a portion of this revenue for incentives aimed at reducing the use of pesticides in floriculture.

Pesticides and fertilizers

The Commission takes the view that it would be possible to move pesticides and fertilizers from the reduced rate to the standard rate, provided that there is an environmentally-sound basis for returning the resulting revenue of approximately Dfl 140 million to the agricultural sector, i.e., without increasing the VAT flat rate for agricultural products. In the latter case, the revenue would be pumped back in proportion to production value, resulting in an uneven redistribution among the various agricultural sectors, which would not send the correct environmental signal. Bringing pesticides and fertilizers under the standard VAT rate would end sending the wrong signal emanating from a reduced VAT rate on known environmentally harmful products. Its effect would, in the case of pesticides, also be felt by private individuals. It would simplify the imposition of VAT on fertilizers, because there would no

longer be any need to distinguish between products intended for personal use and those intended for agricultural use. The measure would form an effective incentive for most agricultural enterprises to produce more ecologically. A single member of the Commission felt that there were insufficient grounds for further examining moving pesticides and fertilizers to the standard rate.

Small businesses

The Commission recommends looking into whether a different approach to the VAT treatment of small business could be advantageous to labor-intensive enterprises, such as small second-hand shops, repair shops and bicycle parking facilities. Under this different approach, eligibility for VAT treatment as a small business would no longer depend on the net amount of VAT payable, but rather on the amount of turnover. Unlike the current scheme, this would not be disadvantageous to labor-intensive businesses.

Support for green agriculture and forestry

Direct incentives for farmers

The Commission is of the opinion that agri-businesses that set the example in the changeover to more ecological means of production should be rewarded financially. From an environmental viewpoint, switching from agriculture to forestry also deserves more financial support. On the basis of its examination, the Commission takes the view that this financial support can best be implemented in the form of direct incentives to the farmer. Based on its review, the Commission concludes that tax measures in the area of consumer pricing, by means of VAT or excise tax, would either be ineffective, complicated, or prohibited by European law.

The benefits of ecological farming

Switching just 10% of farm land to organic agriculture would, in comparison with the current situation, result in a reasonable environmental benefit of an approximately 0.05 million kilogram reduction in the use of pesticides, and an approximate reduction in nitrogen loss of 30 million kilograms, nearly 5% of the national target. Employment could increase by between 1,000 and 2,500 jobs. In the current situation, organic farming is already an attractive option from an income standpoint; compared with ordinary produce, organically-grown produce often brings the farmer a high premium price. If the market for organically-grown produce were to increase, competitive forces would reduce this mark-up considerably, although research indicates that organic farming nevertheless ultimately requires higher consumer prices. Another consideration is that expanding organic farming means that land will have to be used that is not ideally suited to this purpose, resulting in less favorable income.

Green investment tax incentive

On the basis of its review, the Commission concludes that the advantages arising out of the green investment scheme[4] have a significant influence on the competitive position of organic businesses vis-à-vis ordinary businesses. The interest advantage carries a lot of weight, because of the relatively large amounts of capital borrowed by farmers. The market position of organic farms is often determined in large part by the market position of the distribution

[4] The green investment scheme exempts from income tax benefits from deposits in green funds. A green fund invests at least 70% of its capital in green projects.

channels for its products. For an organic dairy farm that supplies an organic cheese factory, sales of milk will, for example, depend on the cheese factory's expected or anticipated sales. Because of their inherently small scale, these sales and processing channels are relatively expensive. The Commission therefore recommends including ecologically-oriented agricultural processing enterprises under the green investment scheme.

A general system of rewards

In a transitional period, a direct financial incentive for organic farming could be necessary in order, when there is a decline in prices, to compensate for the inherent reduction in productivity attributable to this extremely environmentally-friendly method of production. At a share for organic farming of 10%, this would require support in the neighborhood of 25 to 40 million guilders per year, in addition to the incentives for "green" investment. A system of direct financial support could be expanded to cover non-organic farms, such as farms that achieve significantly lower nitrogen losses to the environment than legally prescribed. The Commission believes that rewarding farmers who achieve levels of nitrogen losses that fall below the current legal requirements by between 50 and 100 kilograms per hectare would complement the disincentive that currently arises under the existing charge system operated by the Ministry of Agriculture (known as MINAS). Assuming a per hectare compensation of between Dfl 150 and Dfl 300, one could expect the environment to benefit from a reduction in nitrogen losses of 10 million kilograms. The loss to the budget would be about Dfl 50 million per year. One could also imagine extending this further, to ecological land management, including activities aimed at making such plots of land accessible to private citizens.

A specific arrangement for the abovementioned agricultural enterprises, in addition to the already existing arrangements such as arbitrary depreciation and the energy investment tax credit can be justified on the basis that the costs incurred by environmental trailblazers are not usually linked to capital investments, which is what the existing arrangements aim at. The Commission was able to verify this with respect to organic farming, forestry and trailblazers in limiting nitrogen losses; in other cases it has yet to be examined. The Commission recommends that the amount and scope of this incentive system be thoroughly verified and regularly adapted, as there is a high risk of paying excessive incentives.

Reward CO_2 absorption through forestry

On the basis of its review, the Commission concludes that agricultural enterprises that switch, in whole or in part, to forestry could effectively be supported by bringing the entire operation (including any remaining agricultural component) within the green investment scheme. This is true given that the limited income from forestry is, in all cases, already exempt from income tax. In addition, in view of the importance of CO_2 absorption by forests, the Commission feels that it would be reasonable to fund an incentive out of energy tax revenues in order to support forestry. Where the Netherlands currently taxes CO_2 emissions of one ton at approximately Dfl 65, an equivalent incentive to forestry for the absorption of that same ton of CO_2 amounts to per hectare aid of approximately Dfl 650. For 30,000 hectares of forests on agricultural land (a policy target), the total aid would amount to around Dfl 25 million, with a benefit to the environment of approximately 0.3 Mton CO_2. The Commission limits its recommendations to the scope of desirable forestry in the Netherlands that, for a number of reasons, has already been laid down in policy, and does not purport to assert that forestry in the Netherlands is a particularly good option for CO_2 policy.

Sustainable enterprise tax credit

The direct financial support for environmentally-friendly farmers and those who engage in forestry could take the form of subsidies, in view of the variation in the effective amount per hectare as a function of time, region, type of ground, and type of enterprise. A tax solution is also conceivable, in the form of a sustainable enterprise income tax credit. The Commission acknowledges that the parties concerned often prefer a tax solution, because of its perceived certainty, and because a tax deduction is enjoyed in the context of the automatically-recurring tax return. A sustainable enterprise tax credit could be implemented if enterprises were to be certified on an annual basis by other administrative authorities (such as exist for organic farming and the charge system for nitrogen losses), allowing them to attach to their returns a declaration that they fall within a particular environmental category and therefore qualify for a particular level of sustainable enterprise tax credit. One must keep in mind that this amounts to a tax-type subsidy that must be adapted regularly and diversified by type of enterprise, in line with the model of such existing arrangements as arbitrary depreciation.

Scope of sustainable enterprise tax credit

The Commission does not have complete insight into whether a sustainable enterprise tax credit would be a viable tax solution for the farmer who switches to forestry. This will depend on whether the farmer has sufficient income from sources other than forestry to take advantage of a profits deduction. This could be income from work outside of the agricultural or forestry enterprise, because forestry is not a labor-intensive activity. An alternative is an incentive system under the Environmental Taxes Act. The Commission is of the opinion that further study is required in order to determine whether a sustainable enterprise tax credit could be applied to business sectors other than agriculture. A branch of these industries would have to take the initiative in this respect of developing a certification system for environmental pioneers. An ongoing review would be necessary of the extent to which existing or future tax-based environmental facilities for investments are already capable of achieving the desired goal.

Organic sugar in soft drinks

The Commission recommends investigating whether a reduction of the consumer tax on soft drinks, which has been advanced in the Second Chamber of Parliament, could lead to an offer by the soft drink industry to use more organic sugar. Sugar forms an exception among organic products, in that there is presently no mark-up for organic quality.

Environmental investment tax credit and other matters

From free depreciation to tax credit

The Commission advocates making the incentive created by the free depreciation for environmental investments (known as VAMIL) more flexible. Since its inception, the interest benefit of this arrangement to the business owner has declined sharply, and the relative advantage of environmental investments over other investments has declined, due to the extension of arbitrary depreciation to other types of investments. The Commission urges that this oldest and best-known environmental tax facility be reinforced by adding a credit of between 5% and 10% for certain means of production selected from the Environmental List.

Real estate transfer tax requires further research

The Commission had a study done of the effectiveness of a specific exemption from the transfer tax on real estate for relocations that significantly reduce the distance between home and work. On the basis of this study, the Commission's conclusion is negative. This would almost certainly involve a complicated arrangement, coupling a small environmental improvement (in the neighborhood of 0.1 Mton of CO_2) with a relatively large loss of tax revenue (in excess of Dfl 100 million).

The Commission expressly recommends that further study be undertaken of the effects of reducing transfer tax rates or eliminating this tax entirely, weighing these against the effects of alternative tax sources. The transfer tax imposes a relatively heavy burden on a limited number of households each year, and the revenue can fluctuate significantly in tandem with the housing market, whereas widely-spread taxes with relatively low rates and stable revenues would clearly improve the tax system. Business relocations that are good for the environment also face the relatively heavy burden of the transfer tax. The effects on the residential real estate market, the labor market, and the choice of business location merit a study with a broader perspective than the Commission could provide. The scope of this tax certainly justifies further research into these largely unknown effects.

Tax bonus for relocation

The Commission points to an alternative to using a selective exemption from real estate transfer tax as an incentive for moving closer to one's work. One could imagine a limited bonus arrangement within the income tax, perhaps linked to the reduction in deductible travel expenses. One could allow a taxpayer who moves, thereby falling into a lower level of deductible travel expenses, to continue to take his "old" deduction for a period of two or three years, or to grant him an equivalent lump-sum as a bonus. In that case, the scheme would be self-financing, if it caused taxpayers to relocate, and the risk of unjustified payments to persons who relocate for other reasons would be limited. In addition, an arrangement of this type could also be applied to tenants.

Belgian product taxes

In its second report, the Commission primarily explored which ecotaxes would combine a significant contribution to the treasury with a reasonable benefit to the environment. This third report looks further, at smaller-scale taxes whereby the environmental impact is the most important factor. For this purpose, it has primarily documented the system of product taxes that has been implemented in Belgium. The Commission is of the opinion that this system strikes a nearly optimal balance between "penalties" and "rewards". If a sector meets certain recycling or collection goals, the entire sector will be exempt from this tax the following year. Individual businesses can also qualify for exemption on the basis of their own figures reflecting collection and recycling percentages. In other areas, the system has a prohibitive effect on the supply of certain products (such as PVC packaging for beverages).

The Commission notes, however, that the Belgian system is relatively complicated: the implementation costs at the government level alone far exceed the revenue to the treasury. To the extent a comparison can be made, even without such taxes Dutch policies result in comparable or even better collection percentages. On the basis of the foregoing, the Commission concludes that there is no immediate reason to introduce a system of small-

scale product taxes in the Netherlands. The current system of removal contributions[5] provides whatever incentive may be needed, outside of the tax sphere.

Re-gauging the potential for ecotaxes

With respect to ecotaxes, the Commission notes that the matters explored in its second report do not result in eternally valid conclusions. Options that, in the second report, were viewed as having less potential, may return to the foreground as a result of new developments in policy. This can be illustrated by looking at the Commission's findings concerning VAT. A reduced VAT rate for water-based paint and sustainably produced timber could result in a significant substitution of the usual products with these more environmentally-friendly products. This is, at the present time, not permitted under European law. If from the viewpoint of environmental policy, this substitution were to be considered sufficiently important, a fresh look could be taken at the alternative of imposing a tax on solvents and on timber that has not been sustainably produced, with revenues of around Dfl 175 million. The Commission was not, however, able to test these possibilities by subjecting them to its check list.

Taxes on acidifying emissions

Because an expected report by the environmental planning agency (RIVM) was not made available on time, the Commission did not have the opportunity to look further into the taxation of acidifying emissions and its potential contribution to the financing of a reduction of other taxes. The Commission recommends further research in this area.

Structure of energy taxes

Finally, the Commission is of the opinion that as a prelude to the 21st century, there is every reason to re-examine the complicated structure of existing energy taxes and, to the extent feasible, to integrate the legislation in this area. An additional advantage of integrating the various taxes is the ability to apply environmentally-oriented exemptions and other incentives to the totality of the taxes.

[5] A removal contribution is paid by a consumer when buying , e.g., a new car. Disposal of car wrecks is paid for from the funds generated by these contributions.

Appendix 3

CPB report Greening taxes and Energy

Working document

No. 96

Greening Taxes and Energy
Effects of increased energy taxes and selective exemptions

CPB Netherlands Bureau for Economic Policy Analysis, The Hague, June 1997

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Preface

Research into energy taxes is almost becoming a tradition for CPB. Early in 1992, it published a study of various forms of energy taxes, and in 1993 it examined the effects of a tax on small consumers, which has since been implemented[6].

The present study analyzes the effects of an increase in existing energy taxes. This analysis forms part of the new long-term survey being carried out by CPB in collaboration with other institutions. The main report of the long-term study is being published simultaneously with this working document.

An important contribution to this study was provided by the Netherlands Energy Research Centre (ECN), in the form of calculations on energy conversion and on selective exemptions from the taxes (Chapter 5). The National Institute for Public Health and Environment (RIVM) calculated the effects on energy consumption for transport. The RIVM is also responsible for the figures relating to emissions.

This Working Document has been compiled by Mr. C.C. Koopmans, assisted by Messrs. W. Groot, R.M. van Opstal and M.W.A.M. Vromans. Contributions were also supplied by Messrs. P. Boonekamp (ECN) and E. Honig (RIVM).

F.J.H. Don
Director

[6] See CPB, Economische gevolgen op lange termijn van heffingen op energie (Long-term economic effects of energy taxes; in Dutch), Working document No. 43, The Hague, 1992; CPB, Effecten van een kleinverbruikersheffing op energie bij lage en hoge prijsniveaus (Effects of a small-consumer tax on energy at low and high price levels; in Dutch), Working document No. 64, The Hague, 1993. The small-consumer tax has been officially named 'Regulerende Energiebelasting' in Dutch (REB; regulatory energy tax).

Summary

In co-operation with the ECN (Netherlands Energy Research Centre) and the RIVM (National Institute for Public Health and Environment), CPB has studied the consequences of increasing existing energy taxes. This study was requested by the "Green Tax Commission" (also known as the Van der Vaart Commission), and is part of the process of formulating a new tax system for the 21st century. An essential element of the contemplated increases in energy taxes was that they be 'economically compatible': with no, or at any rate very little, impact on the competitiveness of Dutch firms, and no serious effects on purchasing power. The study was performed as part of the new long-term survey being carried out by CPB in collaboration with other institutions.

Two tax variants were developed. The first involved doubling both the Regulatory Energy Tax (REB) and the General Fuel Tax embodied in the Environmental Taxes Act (WBM; *Wet belastingen op milieugrondslag*), except for very large consumers. This leads to price increases of approximately 15% for households and small businesses. In the second variant, the REB is tripled for very small consumers (households in particular), resulting in price increases of between 25 and 30% for this group. Both variants would yield approximately Dfl. 3 ½ billion per year. In the first variant, 55% of this is borne by households, while in the second variant that figure is 75%. These revenues flow back to households and businesses in the form of lower income tax rates and employers' contributions.

In the long term, the tax variants would, respectively, reduce family energy consumption by approximately 5% (variant 1) and 8% (variant 2). Variant 1 would have an additional effect of approximately 3% on energy consumption by non-industrial businesses. In terms of total Dutch energy consumption, the effect of both tax variants would be approximately 2%. By 2010 and 2020, this would result in a reduction of Dutch CO_2 emissions by 4 to 5 megatons (approximately 2%).

Outside of the energy sphere, the macro-economic effects are very slight. The employment effect for both variants is 0.0%. The GDP (excluding energy) is the same in the variants as in the basic track. The effect on individual industrial sectors is also limited: the effect on manufacturing output in 2020 is between -0.4 and +0.4%. The effect on purchasing power has not been specifically calculated, but is, for variant 1, probably somewhere between - ½ and + ½%. The purchasing power effect for lower incomes would, moreover, be improved by revenue flowing back, in part via the personal tax allowance. These results reflect average households; the actual effects on specific households may be greater, both in positive and negative terms.

The effect of these taxes would be magnified by accompanying them by exemptions for businesses and households that invest in energy conservation or sustainable energy. An attempt could be made to maximize the effect by exempting only 'favorable options' (i.e., investments that are on the verge of becoming profitable). This could, however, prove difficult in practice, because the government lacks sufficient information. Assuming annual spending of Dfl. 500 million, the macro-economic effects remain limited and the CO_2 effect of the taxes rises from 4 - 5 megatons to 7 - 10 megatons. The lower and upper limits are less likely than the intermediate values.

The findings of the study indicate that it would be feasible to double existing energy taxes, or even to triple them for 'very small consumers", without causing major economic effects, provided, first, that very large energy consumers are spared; second, that the tax revenues flow back to the taxpayer either entirely or in large part; and third, that both the tax and the shifting back of revenue are acceptable to the general public.

1 Introduction

At the request of the State Secretary for Finance, the Green Tax Commission (Van der Vaart Commission) has undertaken an investigation of the greening of the tax system, as part of efforts to design a new system of taxation for the 21st century. In this context, the Commission has asked CPB, ECN and RIVM to look into the effect of increasing energy taxes, including the use of incentives[7]. The Commission's point of departure is that these taxes be economically responsive, with no, or at any rate very little, impact on the competitiveness of Dutch firms, and no serious effects on purchasing power. This report attempts, within this framework, to formulate concrete increases in energy taxes, and to assess their effect on energy consumption, CO_2 emissions, competitiveness and purchasing power.

The calculations are based on the scenarios developed for the new Long-term Study 1997 (LT-97). The main findings of the LT-97 study will be published in July 1997;[8] the calculations made for the Green Tax Commission will be included as "variants" in that publication.

As part of the energy sub-project of the LT-97 study, CPB works jointly with the ECN and the RIVM. CPB formulates scenarios for economic development and the resulting energy demand. ECN performs highly disaggregated calculations of energy demand; these are then broadly co-ordinated to the more aggregated CPB findings. ECN then calculates the effect on the energy conversion industry (including power stations and oil refineries). RIVM is responsible for providing figures on energy demand in the transport industry, and for assessing environmental impact.

Chapter 2 of this report describes the LT-97 scenarios. The methodology of the study is discussed in Chapter 3. Chapter 4 sets forth the effect of the increased taxes. Chapter 5 examines incentives, and Chapter 6 contains the study's conclusions.

2 Long-term Study 1997

General

CPB is in the process, in co-operation with other research institutions, of making a new long-term survey for the period 1995-2020. This study, hereinafter referred to as LT-97, focuses on four key themes: energy, environment, mobility and space. Given the large uncertainties surrounding long-term development, three scenarios are being developed. For this purpose, five major determinants have been distinguished: international economic and political developments, demography, socio-cultural factors, technology and the economy.

[7] Programme of Work for the Third Report of the Van der Vaart Commission, 29 November 1996.

[8] The economic base scenarios have already been published: CPB, Omgevingsscenario's Lange Termijn Verkenning 1996-2020 (Scenarios for the Long-term Survey 1996-2020; in Dutch), Working document 89, 1996.

In the first phase of the LT-97, a comparison between the outcomes of the scenarios and the policy objectives provides insight into problem areas. In the second phase, policy alternatives will be defined in order to mitigate these problems. Partial and/or policy-based solutions will be considered first. The next step will be to develop an integrated package of policy measures for each individual scenario, thereby yielding policy scenarios.

No new scenario study of the world economy has been made for the LT-97. In principle, use is made of the scenarios from 'Scanning the Future' (1992). Nevertheless, a number of quantitative assumptions have been updated, for example for oil prices and demographics. In addition, the process of European integration now receives greater attention.

Scenarios
In the Divided Europe scenario (DE), neither the market mechanism nor the co-ordination mechanism in Europe functions optimally. The competitive position of Europe deteriorates. Low growth rates, slow technological development and little progress in solving environmental problems typify both the Netherlands and Europe. The economic growth rate is also slow in the Netherlands (1.5% per year); unemployment continues to be high. There are no major changes in the production structure.

Table 2.1 Scenarios of the Long-term study

	Scenario DE	EC	GC
GDP growth 1995-2020 (% per year)	1.5	2.7	3.3
EU energy tax	no	yes	no
NL energy taxes	REB [a], WBM [b]	WBM [c]	REB, WBM
New environmental technology	average	considerable	considerable
CO_2 emissions growth (% p.a.)	0.1	0.7	1.0
Main scope of new policy	domestic	EU	domestic[e]
Nature of new policy	'normal'	EU market compatible	market principles

[a] Regulatory Energy Tax, also called small consumer tax or ecotax.
[b] General fuel tax in Environmental Taxes Act.
[c] The present REB is replaced by a European tax in EC
[d] Provisional figures.
[e] However, the scope for domestic policy is limited by strong international competition.

In the European Co-ordination scenario (EC), great value is attached to policy co-ordination, solidarity and social cohesion. Europe continues the process of integration along the 'multi-tier' model. From Brussels emanate clearly European policies on environment, transport and energy. Worldwide, there is a degree of isolationism among the major global blocs. GDP growth in EC is distinctly higher than in Divided Europe. In the Netherlands, the annual economic growth rate is 2¾%.

The Global Competition scenario (GC), places the emphasis on very dynamic technological development, strong internationalization, and an important role for the competitive market. Liberalization, deregulation and fierce international competition result in strong economic dynamism, with world-wide specialization and a smooth process of knowledge diffusion. Consequently, the GDP growth in GC is higher than in EC. The government acts as the guardian of effective market competition. GC features the highest economic growth rate for the Netherlands (3¼% per year).

Table 2.1 summarizes the main features of the three scenarios.

Selection of a basic scenario
The LT-97 study aims to show the effects of policy variants in the light of a variety of different scenarios. It would, however, be overreaching to work out each of the policy variants in each of the scenarios. Each variant is therefore calculated within a single scenario. For reporting purposes, this calculation is used as an indication of the effect of the instrument concerned 'in general'. Where scenario-specific differences are relevant, this is stated in qualitative terms.

The same course has been followed with respect to the policy variants for the Green Tax Commission. The calculations are performed in the GC scenario, which combines extensive environmental bottlenecks with the implementation of any new policy at primarily the domestic level. In EC, the energy and environment effects of policy measures would be somewhat slighter in absolute terms than in GC: there is the same amount of environmental technology but the level of investment is not as high as in EC. In relative terms (percentage), the effects in EC are comparable to those in GC. In DE, these effects would be lower in both absolute and relative terms, because less environmental technology is assumed in DE.

3 Form of the taxes

Section 3.1 describes how the increased taxes have been given concrete shape, and what considerations were taken into account for that purpose. Section 3.2 then discusses the effect of the increased taxes on Dutch energy prices in relation to neighboring countries. Finally, section 3.3 looks at the appropriation of the tax revenues.

3.1 Tax variants

Prior CPB research has shown that the economic effects of national energy taxes can be unfavorable, particularly to large energy consumers (energy-intensive industries). For that reason, a distinction is made, in framing the increased taxes, between small consumers and large consumers.

Small consumers
From previous research by CPB for the Steering Group on Regulatory Energy Taxes (the Wolfson Commission),[9] it can be concluded that under certain conditions the competition effects of a 50% or 100% tax on the end-use prices charged to small consumers (the C variant) are fairly limited. The regulatory energy tax (REB), which entered into effect on 1-1-1996, has a lower rate (around 20%) and a narrower tax base (limited to the first bracket; exemption for 'unavoidable use')[10]. In principle, therefore, there could be room to increase and/or extend the scope of the regulatory energy tax. In this regard, two possible variants may be considered:

Variant 1	Doubling the REB. This is combined with higher taxes to large consumers (see below);
Variant 2	Tripling the REB for 'very small consumers'; consisting primarily of households.

[9] CPB, *Economische gevolgen op lange termijn van heffingen op energie* (Long-term economic effects of energy taxes; in Dutch), Working document No. 43, The Hague, 1992.
[10] This tax has also been studied by CPB: see CPB, *Effecten van een kleinverbruikersheffing op energie bij lage en hoge prijsniveaus*, (Effects of a small-consumer tax on energy at low and high price levels; in Dutch), Working document No. 64, The Hague, 1993.

Both variants retain the existing 'baseline' exemption (natural gas 800 m^3, electricity 800 kWh). The refund arrangement ('payment' discount) for renewable ('sustainable') energy continues to apply to the existing REB, but not to the increase; the reasoning for this choice is explained in section 3.3. Increasing the refund is discussed in Chapter 5, under 'incentives'.

Table 3.1 Tax levels (excl. VAT)

	1998 Situation Base		Increased taxes Variant 1		Variant 2
	REB	WBM	REB	WBM	REB
Natural gas[a]	*ct/m³*				
A band to 800 m^3	-	2.155	-	4.31	-
A band 800-5000[b] m^3	9.53	2.155	19.06	4.31	28.59
A band >5000 m^3	9.53	2.155	19.06	4.31	9.53
B, C1, C2 band	-	2.155	-	4.31	-
D and E band	-	1.41	-	1.41	-
Electricity	*ct/kWh*				
up to 800 Kwh	-	0.5[c]	-	1.0[c]	-
tot 800-10,000[b] kWh	2.95	0.5[c]	5.90	1.0[c]	8.85
10.000-50,000 kWh	2.95	0.5[c]	5.90	1.0[c]	2.95
above 50,000 kWh	-	0.5[c]	-	1.0[c]	-
Domestic heating oil	*ct/kg*				
up to 4000 kg[d]	12.60	3.27	25.20	6.54	37.80
above 4000 kg	12.60	3.27	25.20	6.54	12.60
Heavt fuel oil	*Dfl/ton*				
standard rate	-	32.33	-	64.66	-
Coal					
standard rate	-	23	-	46	-

[a] A band: 0 - 170,000 m^3; B: 170,000 - 1 million m^3; C_1: 1 million - 3 million m^3; C_2: 3 million - 10 million m^3; D: 10 million - 50 million m^3; E: over 50 million m^3. In addition, special rates apply for horticultural glasshouses, power stations and nitrogen producers.
[b] This upper limit is roughly equal to three times the average consumption per household; the factor of three was chosen in order to ensure that (virtually) all households remain below the limit and therefore encounter a incentive in variant 2.
[c] Not taxed directly, but indirectly through the fuel mix at power stations.
[d] The REB does not have a tax-exempt threshold, but instead a lower rate applies than for gas and electricity.

Large consumers

It seems logical to use the existing general fuel tax (WBM tax) for increasing taxes on large consumers, which tax provides different rates for consumption of up to 10 million m^3 gas (A, B and C bands) and for consumption in excess of that (the D band and higher). As a matter of fact, small consumers also pay the WBM tax, but the rates are far lower than the REB tax.

The Wolfson study shows that for large energy consumers, domestic taxes at 50% of the end-consumer prices (the 'B variant') have a strong relocation effect: large parts of energy-intensive manufacturing industry emigrate under the influence of such taxes. The tax to large consumers will therefore have to be substantially lower than 50%. It is difficult to define in advance those tax levels that will tend to limit this competitive effect. It is nevertheless, clear that, as a general rule, the higher the energy consumption, the more likely higher energy prices are to have such a competitive effect. Particularly for very large consumers, any price increase could have unfavorable effects. This explains the decision to double the WBM tax

(leading to an increase of about 10% in end-consumer prices) for consumption up to 10 million m^3, and to apply no additional WBM tax to consumption in excess of that level[11].

In addition, it is important to decide whether 'non-energy use' (i.e., the use of fuels as a raw material, e.g., in plastics manufacturing) will be subject to the tax. Because the strong relocation effects found by the Wolfson study are partly attributable to the taxation of non-energy use, it would seem logical not to tax non-energy use. This is consistent with the existing WBM tax.

As the WBM tax applies only to fuels, an increase of this tax would exert a positive impulse for sustainable energy sources.

Table 3.2 Effects of increasing energy taxes on real-terms[a] marginal energy prices

		Variant 1		Variant 2	
		2010	2020	2010	2020
		cumulated deviation in relation to reference path %			
Households	fuels	17.9	17.5	30.4	29.7
	electricity	12.7	12.4	23.4	24.5
Industry	fuels (incl. feedstock)	3.8	3.5	0.1	0.1
	electricity	4.6	4.0	0.0	0.0
Transport	fuels	2.1	2.9	0.0	0.0
Other	fuels	17.0	16.0	2.9	3.1
	electricity	14.0	13.6	0.0	0.0

[a] The tax is real-terms constant at 1995 prices.

Tax levels

Table 3.1 sets out in detail the tax variants in the form of tax rates, according to the 'band' of consumption for each fuel. Table 3.2 states the effects on energy prices in real-terms for various consumer categories. Table 3.2 shows that in variant 1, the tax affects primarily households and the category 'other' (including the service sector); the price impulse in relation to the reference path is around 15%. In variant 2, only households experience a substantial price impulse, of between 25% - 30%. In both variants the price effects for industry are relatively small. This is attributable to the form chosen for the taxes, with respect to which economic compatibility (avoiding effects on competitiveness) was a precondition.

3.2 International comparison of energy prices

Given the requirement that the increased taxes be economically compatible, it makes sense to compare how the increase would affect energy prices in relation to a number of other European countries. Table 3.3 contains an international comparison for a number of important rate groups for natural gas and electricity.

Table 3.3 warrants the conservative conclusion that the Dutch energy prices appear to be favorable in relation to the European average[12]. However, a number of comments are called

[11] As a matter of fact, very large consumers would then also pay the increased tax, on the first 10 million m^3 of consumption. They would not, however, experience any behavioral stimulus, because the marginal energy costs do not increase.

for in this respect. The United Kingdom has not been included for the purpose of determining the European average. The 1995 liberalization of energy markets in the UK led to substantial price decreases[13]. In the other European countries considered here (including the Netherlands) this liberalization process has yet to be completed. This illustrates the somewhat arbitrary nature of the term 'European average' as a criterion for fixing the additional energy tax in the Netherlands.

Another comment is that the table reflects 'marginal prices' (the price of the last-used unit). Average prices are more relevant to the competitive position of businesses. However, insufficient information is available on average prices in other countries. The marginal prices are regarded as an indication of average prices.

Table 3.3 Energy prices on 1 January 1996 (excl. VAT, incl. environment taxes)[a]

	Belgium	Germany	France	average[b]	NL incl. REB [c]	Same, incl. Variant 1	UK
natural gas(ct/m^3)							
small consumers	48.2	51.9	50.9	50.3	49.1	60.8	35.0
large consumers							
1.3 million m^3	23.2	32.6	23.0	26.2	24.9	27.1	17.0
13.2 million m^3	19.6	28.2	19.0	22.3	19.6	19.6	13.9
132.2 million m^3		19.2			16.4	16.4	8.7
electricity (ct/kWh)							
small consumers	26.4	27.8	23.5	25.9	21.3	24.8[d]	18.5
large consumers							
1.25 kWh	19.4	22.9	16.3	19.5	15.6	16.1[d]	12.6
10 million kWh	15.5	18.4	13.8	15.9	12.2	12.7[d]	10.6
24 million kWh	12.7	15.3	11.9	13.3	10.4	10.9[d]	9.8

[a] Marginal rates.
[b] Unweighted average for Belgium, Germany and France.
[c] The REB has been fully incorporated in these prices, including the tiers still to be implemented for natural gas in 1997 and 1998. These tiers are 3.2 cent/m^3 (plus VAT) each. No tiers apply in the case of electricity, and the full REB - approx. 3 cent/kWh exc. VAT - is incorporated in the rate as at 1 January 1996.
[d] Including the transmitted effect of the increased WBM rates on the electricity price (0.5 ct/kWh).
Source: Eurostat, *Statistics in focus, Energy and industry*, 1996, Nos. 12-15.

For large gas consumers, the rate increases caused by variant 1 take the Netherlands to roughly the European average as defined here (Belgium, Germany, France), while the Dutch rates for small gas consumers exceed the European average. For both large and small consumers, electricity prices remain below the European average. Variant 2 is not included in the table, because it relates exclusively to 'small, small consumers.' For this group (mainly households), the gas price in variant 2 rises to 70.5 ct/m^3, well above the European average. For this group, the electricity price in variant 2 would work out at 27.3 ct/kWh, slightly above the European average.

[12] The Third White Paper on Energy suggests that in 1995, large-consumer gas prices in Germany and the Netherlands were practically the same (p. 130). However, Germany has a high level of regional differentiation in its gas rates. The White Paper assumed the lowest German rates. The present document is based on the average rate in Germany.
[13] See also W. van Bergen and P. Boot, *Energieprijzen en liberalisering; een internationale vergelijking van de ontwikkeling van energieprijzen in liberaliserende energiemarkten* (Energy prices and liberalization; an international comparison of the development of energy prices in liberalizing energy markets; in Dutch), Ministry of Economic Affairs, 1996.

3.3 Allocation of tax revenues

Revenues

The tax revenues of the existing and contemplated WBM and REB taxes are virtually doubled in variant 1, in line with the doubling of most rates. This would lead to an additional tax revenue of Dfl. 3.4 billion (REB: + 2.3 billion, WBM: +1.1 billion). In variant 2, the tax revenues of the REB alone increase by Dfl. 3.4 billion.

Table 3.4 Tax revenues (excl. VAT)[a]

	1998 situation Reference path		Increased taxes Variant 1		Variant 2
	REB	WBM	REB	WBM	REB
	Dfl. billion				
Natural gas	1.2	0.8	2.4	1.4	3.0
Electricity	1.0	n.a.	2.0	n.a.	2.5
Oil products	0.1	0.3	0.2	0.6	0.2
Coal	n.a.	0.2	n.a.	0.4	n.a.
Total	2.3	1.3	4.6	2.4	5.7

[a] These are initial revenues, excluding behavioral effects. The revenues have been calculated on the basis of partly obsolete consumption figures; more recent figures are not available.

Recycling Revenue

The revenues are recycled to businesses by reducing the employers' premiums for employee insurance, with the state taking responsibility for an indexed share of the premium. Revenues are recycled to households via the wage and income tax route, in such a way that the effect of tax and recycling is neutral to the government financing deficit.[14] In calculating the passing on into wages, it is assumed that this recycling takes place in proportion to net income. This ensures that the model reflects a relatively balanced household purchasing-power pattern.

In the current version of the *Athena* industrial sector model used for the calculations, institutional changes affect the level of unemployment in an equilibrium situation. Societal acceptance of tax and recycling on the part of employees is assumed [15]: and further, that the introduction of increased energy taxes will not lead to additional wage demands[16] (i.e., the method for recycling revenue is accepted as adequate). Secondary effects, however, may occur. For example, a change in the labor market could have an effect on wage levels.

The Green Tax Commission has also asked for an analysis of the effect of 'positive incentives' (encouraging behavior through tax exemptions). The addition of incentives could, in itself, tend to favor acceptance of a tax. This is, however, also conditional on the use of tax revenues spent on incentives to cover the higher cost price of environmental conservation technologies. In that case, these tax revenues would no longer be available for reducing other costs (e.g., labor). This could adversely affect the competitive position,

[14] The approach chosen means that in the calculations the extra VAT paid (mainly by households) on the tax increases is largely shifted back to households.

[15] In terms of the model, this means that the (long-term) coefficient for cost increases experienced by employees through taxes is identical to that for the cost increases through higher prices.

[16] Previous CPB research has shown that if wages rise because of additional wage demands, the economic effects become less favorable. See CPB, op.cit., 1992.

particularly of large consumers.[17] The same applies to the purchasing power effect on households. In addition, the results are less transparent if the effect of taxes and incentives are only reported together.

In the light of these background factors, it was decided to calculate and present the effects of fully recycled taxes in this chapter. Chapter 5 considers separately the additional effects of replacing part of the recycling of taxes with incentives.

Should there be a higher refund for sustainable energy?
The current and contemplated REB tax system incorporates a refund arrangement ('payment discount') for electricity generated from sustainable sources. This has the effect of stimulating sustainable energy. At present, the refund relates to only a very limited share of the total REB tax revenue.

Because the WBM system is a tax on fuel, it increases the cost price of fossil-based electricity but not that of sustainably-generated electricity; this also exerts a limited incentive for sustainable sources.

In an initial preliminary version of the calculations, it was assumed that the REB refund arrangement would also apply to the doubled and tripled REB rates in the tax variants. However, it was found that, by 2020, this would lead to a substantial part of the tax revenues having to be refunded; the total would run into hundreds of millions of guilders. This is caused by a strong growth in generating sustainable energy; in the reference path this is already growing relatively quickly in relation to its present low level, and it would be further reinforced by the increased incentive in the tax variants.

Although this development enhances the environmental benefit of the tax, this does not correspond the Green Tax Commission's request to examine the effect of appropriating a maximum of Dfl. 500 million to *selective* incentives. Observing this maximum, application of the refund arrangement under an increased REB rate results in the greater part of the amount being appropriated to *generic* incentives for the supply of energy only. Moreover, for presentation purposes, it is more transparent to treat any effects of increasing the refund as an incentive rather than a tax effect.

For these reasons it was decided not to assume any increased exemption from the REB tax for sustainably-generated energy in the tax variants. Additional incentive is provided in the 'subvariant positive incentives' (see Chapter 5). On the other hand, the WBM does yield an additional stimulus for sustainable energy through increased rates on fuels, although this stimulus is smaller than in the case of the REB tax, because the cost price effect of the WBM rate increase for electricity is smaller than the REB increase.

[17] Over time, a positive effect can also occur should the Netherlands, helped by the incentives, build up a competitive advantage in the manufacture of energy-saving appliances and sustainable energy. However, this effect is uncertain.

4 Effects of increased taxes

4.1 Energy consumption and emissions

The effects of the tax variants on energy consumption - except for transport and processing[18] - were determined with CPB energy model NEMO.[19] Transport was computed with the RIVM model FACTS;[20] consumption for processing was determined by means of the ECN model SELPE. In a separate report, the ECN gives comprehensive details on the calculations relating to energy consumption for processing purposes.

Table 4.1 sets forth the percentage effects of increased taxes in domestic energy consumption. The effects of the tax on industrial energy consumption are small, because in manufacturing industry, the increase in the marginal energy price is small (see Table 3.2). For large consumers - notably in the chemicals and metals sectors - the tax does not even have any effect on the marginal energy price; in these cases, the mode of taxation (designed for economic compatibility) completely excludes the incentive for additional energy saving.

Table 4.1 Effects on energy consumption of increasing energy taxes

		energy consumption	cumulated deviation in relation to reference path		elasticity
		1995	2010	2020	2020
Variant 1		PJ	%		
Households	fuels	397	-4.4	-4.0	-0.23
	electricity	71	-5.1	-5.5	-0.44
Industry	fuels (inc. feedstock)	933	-0.6	-0.6	-0.18
	electricity	107	-0.6	-0.6	-0.14
Transport	fuels	421	-0.6	-1.0	-0.34
Other	fuels	415	-2.7	-3.3	-0.20
	electricity	84	-3.0	-3.5	-0.26
Conversion of fuels		586	-0.7	-2.0	-
Total domestic consumption		3015	-2.2	-2.1	-
Variant 2					
Household	fuels		-7.1	-6.5	-0.22
	electricity		-9.2	-10.5	-0.43
Industry	fuels (incl feedstock).		0.0	0.0	-
	electricity		0.0	0.0	-
Transport	fuels		0.0	0.0	-
Other	fuels		-1.1	-1.4	-0.45
	electricity		0.0	0.0	-
Conversion of fuels			-1.0	-2.2	-
Total domestic consumption			-2.1	-2.0	-

The largest savings occur in households: in variant 1 around 4% on fuels (notably gas) and over 5% on electricity, in variant 2 around 7% and around 10%, respectively. Variant 1 also causes a distinct effect (around 3%) in the category ‘other’, which includes the service sector in particular. In terms of total domestic consumption in 2020, both variant 1 and variant 2

[18] Losses occurring in electricity generation, oil refining, and transportation of primary fuels.

[19] For more information, see C. Koopmans and D.W. te Velde, *NEMO: Netherlands Energy demand Model; A Top-down Energy Demand Model Based on Bottom-up Information*, CPB, Note IV/97/02, 1997.

[20] For more information on the transport calculations, see Geurts et al., *Verkeer en vervoer in de Vierde Nationale Milieuverkenningen* (Traffic and Transport in the Fourth National Environment Surveys; in Dutch), RIVM, Bilthoven, 1997 (forthcoming).

lead to a cumulated reduction in consumption of approximately 2% relative to the reference path.

The last column of table 4.1 includes the resultant price elasticity of energy consumption. These factors are the quotient of the change in consumption (Table 4.1) and the real-terms price change (Table 3.2). The price elasticities are somewhere between -0.14 and -0.45.[21]

With regard to emissions, the calculations are limited to rough assessments of the effects of the variants on total national CO_2 emissions. These effects are shown in Table 4.2. For both variants, the change in CO_2 by 2020 lies somewhere between 4 and 5 megatons, approx. 2% of the emission level in the basic path. The greater part of this effect will already have been reached by 2010. In variant 2, the effect - at the same level of tax revenue - appears to be slightly smaller than in variant 1. However, the calculations are an approximation, so that relatively small differences are not of major significance.

Table 4.2 CO_2 effects of increased taxes

	2010	2020
	cumulated deviation in relation to reference path, megatons	
Variant 1	-3.8	-5.1
Variant 2	-3.6	-4.6

4.2 Economic effects

In broad terms, the two variants reflect substantially the same economic effects. The fuel tax causes an increase in the price of private consumption. The rise in the wage base lags behind due to the fall in employers' premiums. Measured against the development of export prices relative to the competition, there is a slight deterioration in competitiveness. The somewhat higher price level and the reduction in natural gas revenues (as a result of the induced energy saving) - the latter leading to a higher level of taxation - cause slight decreases in private consumption, exports and GDP. This is reflected in a small decrease in the employment rate; the decrease is concentrated among the consumption-sensitive trade and quaternary sectors. The calculations do not assume that domestic savings on gas consumption lead to increased gas exports. In the variant, natural gas reserves in 2020 are therefore larger than in the basic path.

On the other hand, wage costs fall as a result of the shifting of employers' premiums, and this increases the employment rate. Over time, half of the compensation represented by reduced employers' charges will be lost, because of an increase in gross wages, mainly through the functioning of the labor market. This partly cancels out the employment effect. Benefits are linked to gross wage levels, and therefore these rise as well. The net employment effect in both variants works out to 0.0%.

The macro-economic effects are summarized in Table 4.3. In general, the effects are rather larger for variant 2 than for variant 1. This is primarily attributable to the difference between the two variants in allocating the tax sum between households and businesses (the total tax sum is virtually identical in each). In variant 2, 75% of the tax is borne by households, as

[21] The price elasticity of electricity consumption also includes, apart from an effect on energy efficiency, a limited effect of the tax on the presence of electrical appliances ('electrification').

opposed to 55% in variant 1. Recycling revenue via employers' premiums leads to smaller wage and price increases and also has a rather more favorable effect on the employment trend. In other respects, here again, minor differences between the variants have no major significance.

Table 4.3 Key economic figures of the tax variants

	Variant 1		Variant 2	
	2010	2020	2010	2020
	cumulated deviation in relation to reference path %			
Wage base of firms	0.0	0.1	0.4	0.4
Price of private consumption	0.8	0.8	1.2	1.2
Price of exported goods excl. energy	0.2	0.2	0.2	0.2
Total private consumption	-0.2	-0.2	-0.2	-0.3
Ditto excl. energy	0.1	0.1	0.1	0.1
Total investments excl. housing	0.1	0.1	0.1	0.1
Total exports of goods excl. energy	-0.2	-0.2	-0.2	-0.2
Vol. gr. domestic product (f.c)	-0.1	-0.1	-0.1	-0.1
Same, excl. energy	0.0	0.0	0.0	0.0
Total employment	0.0	0.0	0.0	0.0
	% of GDP			
Tax burden	0.1	0.1	0.1	0.1
of which: Tax burden on households	-0.3	-0.2	-0.3	-0.3
Indirect taxes	0.4	0.3	0.4	0.3

Table 4.4 shows that the effects for individual business sectors are also not large. Apart from the energy industry, the cumulated effects on gross production levels per sector in 2010 and 2020 are somewhere between -2 and +2%.

Purchasing power

No separate calculations have been made regarding the purchasing power effects of energy tax increases and recycling. However, the order of magnitude of these effects can be derived from previous research into a small-consumer tax[22]. This showed that the purchasing power effects depend on the type of household, the tax form (with or without tax-exempt consumption) and the method of recycling. In the case of the small-consumer tax with tax-exempt consumption and full recycling, the purchasing power effects of all three recycling variants considered vary between approximately -2 and +2%. In two if the three recycling variants, negative effects of respectively-0.6% and -0.3% occur in the case of the lowest income single-person households. In the third recycling variant, increasing the tax-exempt allowance, the effects for single-income households up to and including the statistically average income level are 0.0% and +0.5%; for higher incomes and two-income households, between -0.5 and 0.0%.

[22] CPB, 1993, op.cit., pages 19, 21 and 22.

Table 4.4 Effects on gross output per sector of industry

	Variant 1		Variant 2	
	2010	2020	2010	2020
	cumulated deviation in relation to reference path			
Agriculture	-0.1	0.0	-0.1	0.0
Food, drink & tobacco manufacturing	-0.1	-0.2	-0.2	-0.2
Chemical manufacturing	-0.3	-0.3	-0.4	-0.4
Metal manufacturing	-0.3	-0.3	-0.4	-0.3
Other manufacturing industries	-0.1	-0.1	0.0	0.0
Construction industry	0.3	0.2	0.6	0.5
Real estate management	0.1	0.1	0.1	0.3
Trade	0.0	0.0	0.0	-0.1
Shipping and aviation	-0.1	-0.1	-0.1	-0.2
Other transport services	-0.1	-0.2	-0.1	-0.2
Communication services	-0.1	-0.1	-0.1	-0.2
Banking and insurance	0.0	-0.1	-0.1	-0.1
Other tertiary services	-0.1	-0.1	-0.1	-0.1
Quaternary services	-0.2	-0.2	-0.2	-0.2
Government	0.0	0.0	0.0	0.0
Minerals	-1.2	-1.1	-1.5	-1.6
Oil industry	-0.3	-0.7	-0.1	-0.4
Public utilities	-2.5	-2.6	-2.7	-2.5
Total	-0.2	-0.2	-0.1	-0.1

The price movements for households in variant 1 (see Table 3.2) are of the same order of magnitude as in the previous calculations.[23] It is therefore to be expected that the purchasing power effects will not differ very greatly from the picture outlined above.

Two comments are called for at this point. First, purchasing power effects are calculated for 'average' households. Households with relatively low levels of energy consumption in proportion to their income may benefit greatly from the tax and shifting back, whereas households with relatively high energy consumption levels may experience adverse effects[24].

Second, these are initial purchasing power effects. From the moment energy taxes are introduced (or perhaps even before), volume and price adjustments will take place. In this way, extra energy is saved, causing a slight decline in tax revenues. It is also possible that businesses may pass on in their prices the combined effects of tax, shifting back and additional energy saving investments on their cost levels. This could lead to price increases or price decreases, depending on the energy intensity and labor intensity of the business's output and its scope for energy saving. Households, too, may attempt to pass on any adverse effects by means of higher wage demands. Indications of the ultimate effects are shown in Tables 4.3 and 4.4.

[23] CPB, 1993, op.cit., page 11.

[24] See also Steering Group on Regulatory Energy Taxes, *Eindrapportage* (Final report; in Dutch), Ministry of Economic Affairs, 1992, Chapter 9.

The overall economic effects
From the findings as presented, it may be concluded that, beyond the energy sphere, the economic effects of the tax variants are very small.

5 Positive incentives

5.1 Methods of influencing behavior

This chapter describes a sub-variant containing incentives for energy conservation and sustainable energy, in addition to higher energy prices.[25] The effects on energy consumption were calculated by ECN using the SAVE model.[26] A large number of separate conservation options are defined in SAVE. The penetration of each option is partly dependent on the cost-benefit ratio, which in turn is determined by the level of energy prices (and taxes), and the capital investment cost of a given option. These characteristics make SAVE particularly suitable for analyzing policy aimed at specific energy saving options. Other models have been used to predict the penetration of sustainable energy sources.

The effect of incentives is considered in a subvariant of tax variant 1. If a basic path without tax increases were chosen, more options would still be available (i.e., not yet implemented), and the effects of incentives might be a little higher than for a basic path that includes tax increases.

The basic assumption is that no more than Dfl. 500 million of the tax revenues will be allocated to incentives. The intention is to allocate this amount over sustainable energy or energy conservation techniques in the various sectors in such a way as to optimize the environmental benefit. This chapter illustrates the additional effects of incentives.

Generic and selective incentives
The subvariant was initially calculated with a generic incentive of 20%[27] of the additional investment vis-à-vis a reference technology (as of 2000) for all conservation options for manufacturing, utility buildings (notably services), and households. For consumers, this incentive takes the form of a temporary exemption from paying the tax. A comparable incentive is employed for sustainable sources. The amount paid to the government by the energy distributor - as collector of the tax- would decline in proportion to the volume of sustainably-produced energy.

Next, a *selective* incentive variant of 20% was calculated, also in the form of a tax exemption. An attempt was made to improve the effectiveness of the incentive, expressed as primary energy saved per guilder of incentive. First, those options associated with large numbers of 'free riders' were eliminated[28]. In addition, the cost-effectiveness of the option

[25] This chapter gives a brief summary. For more information, see P.G.M. Boonekamp et al., *Positieve prikkels t.b.v. CO_2 -emissiereductie; Rapportage aan de Commissie Vergroening Belastingstelsel* (Incentives for CO_2 Reduction; Report to the Green Tax Commission; in Dutch), ECN, Petten, 1997.
[26] P.G.M. Boonekamp, *Het SAVE-model - De modellering van energyverbruiksontwikkelingen* (The SAVE model - Modelling Energy Consumption Trends; in Dutch), ECN, Petten, 1994
[27] The figure of 20% was originally chosen because it was estimated that the total incentive amount would work out in the order of magnitude of Dfl. 500 million as a result.
[28] 'Free riders' are persons or businesses that receive a subsidy for an energy-saving investment that they would have made anyway, even without the subsidy.

itself (savings per guilder of incentive) was used as a selection criterion. The effectiveness of the thus selected options was then determined.

The same approach was followed for sustainable sources; for example, unlike offshore wind energy, onshore wind energy receives no additional incentive. It is then relevant to know how much extra MWe this yields in relation to the volume already set out in the basic path.

This variant leads to less primary savings but, at the same time, to more effectiveness per guilder of incentive. If the total incentive requirement works out to more than Dfl. 500 million, an even more strict selection is applied or the percentage is reduced. If, however, the requirement should fall to below Dfl. 500 million, it is possible to increase the incentive percentage. This process has been repeated until, by a rough approximation, a total of Dfl. 500 million was found. This proved to be the case at 40% stimulus for the selected options.

5.2 Findings

In performing the calculations, it was found that a large proportion of the conservation options is already implemented in the basic path. In this situation, a generic incentive arrangement will attract a relatively large number of free riders. However, in the model calculations using SAVE, it appears possible that by careful selection of options to be stimulated, the incentive amount can be limited to a much greater degree than the savings effect, thereby strongly increasing the effectiveness per guilder.

The results of the calculation exercise are reported in Table 5.1. The savings in 2020 are approximately one and a half times as large as in 2010. Some degree of saturation therefore seems to occur. This may result in part because in the basic path (tax variant 1) the prices increase over time while the investment costs decline; for that reason more of the options to be stimulated have already penetrated into the basic path by 2020.

With generic incentives, the budget needed is higher than the available Dfl. 500 million If the most attractive options are selected for incentives, the total amount falls well below Dfl. 500 million. Doubling the degree of incentive for selected options causes the amount to increase strongly again, both because of the doubling and the larger number of options to be stimulated. The total amount then works out to roughly Dfl. 500 million.

Effectiveness

The effectiveness of selective incentives is between 130 (2010) and 180 MJ (2020) per guilder of stimulus. For natural gas as primary energy, this corresponds with Dfl. 140 and 100 respectively per ton of avoided CO_2. Incidentally, these values for stimuli are not directly comparable with the usual costs per avoided ton of CO_2: in that case, the figure given does not relate to funds applied by the government but the total costs of reduction.

Table 5.1 Model calculations relating to incentives

	2010		2020	
Incentive				
Incentive type	generic	selective	generic	selective
Expenditure	Dfl. million per year			
Households	240	200	290	180
Utility Buildings	150	120	30	50
Public utilities	300	70	420	140
Subtotal	690	390	730	370
Sustainable sources	-	30	-	120
Total	690	420	730	490
Savings	PJ primary			
Households	16	17	24	23
Utility Buildings	10	19	16	32
Public utilities	9	14	13	24
Subtotal	35	50	53	79
Sustainable sources[a]	-	4	-	11
Total	35	54	53	90
Effectiveness	MJ per Dfl.			
Households	70	90	80	130
Utility Buildings	70	150	560	710
Public utilities	30	210	30	170
Average (subtotal)	50	130	70	210
Sustainable sources[a]	-	120	-	90
Average (total)	50	130	70	180

The effectiveness tends to differ quite a bit between 2010 and 2020; two effects are involved here. On the one hand, there is still, in 2020, the beneficial effect of the incentives from the beginning of the period. This results in increasing effectiveness over time, especially in the case of utility buildings. On the other hand, after a certain period, as time passes, incentive money repeatedly goes into the replacement of obsolete energy-saving options (e.g., in the case of energy-efficient household appliances).

Effect on energy consumption and emissions

It can be concluded from the calculations that selective incentives for 'potentially successful' options might achieve better results than generic incentives. The best results - at least in theory - are achieved with an 'interactive policy strategy': the government updating the list of relevant options every year or two, on the basis of accurate monitoring.

At the same time, however, the effectiveness of selective policy is more sensitive to incomplete information among policy-makers than the effectiveness of generic policy. Generic incentives also stimulate options which are not, in the first place, expected to be implemented. Selective incentives relate solely to options that are likely to be successful. If this turns out not to be the case, the anticipated effect is lost. According to economic theory,

selective policy is difficult to apply. In principal-agent situations, the objectives of the principal (i.e., the government) are reflected in the choices of the agent (a business or household) to a limited degree only. This applies particularly where there is 'asymmetrical information.' If the government possesses far less information about individual options than the households and firms where these options ought to be implemented, it is impossible to focus the policy precisely on the most potentially successful options.[29]

Furthermore, accurate monitoring of the choices made by households and businesses can lead to considerable transaction costs.[30] In addition, constant updating of the list of qualified options would not be helpful in supporting the image of a reliable government. On the basis of these considerations, it may be that in practice the choice will not fall on an arrangement with maximum effectiveness. More generally, it is questionable whether the administrative and legal interpretation can indeed be so precise as to ensure that the effect is maximized.

In view of these reservations, the effect of incentives is shown in Table 5.2 with margins. The lower limit for the effect of selective incentives is taken as the effect of generic incentives, because it is possible to exceed that effect by means of selective incentives. The upper limit is taken as the effect, as determined above, of strongly (but not fully) optimized incentives. The values of the lower and upper limits are less probable outcomes; the highest probability lies with intermediate values. Incidentally, this calculation does not allow for potential structural effects that might be induced by the stimulation. Subsidizing energy-consuming appliances could lead to additional growth of related activities concerned, which are usually energy-intensive in nature.

Table 5.2 Energy and CO_2 effects of incentives[a]

	2010	2020
	cumulated deviation in relation to variant 1	
	PJ	
energy consumption	-20 to -55	-35 to -90
	Mton	
CO_2 emissions[b]	-1 to -3	-2 to -5

[a] The effect van generic incentives (lower limits in the table) has be 'rescaled' to the same subsidy amount as for selective incentives (upper limits in the table); Dfl. 420 million in 2010 and Dfl. 490 million in 2020.
[b] This energy saving is assumed to come from natural gas.

Economic effects

The economic effect of the incentives has not been calculated separately. It represents a 'shift' in spending and investment: Dfl. 500 million is no longer used to reduce income tax and employers' premiums but is applied for investments in energy saving and sustainable energy sources. In the tax variants, Dfl. 3 ½billion is 'shifted'. No conclusions can be drawn as to the direction of the expected effects; nevertheless, given the relatively small scale of the amount to be shifted for incentives, it may be assumed that, in terms of their absolute order of magnitude, these incentives will be smaller than the effects of increased energy taxes set forth in Chapter 4.

[29] On principal-agent situations, imperfect information and public failures, see, e.g., J.E. Sitglitz, *Economics*, Norton and Company, New York, 1993, pages 568-569, 599-600.
[30] Measuring the extent to which use is made of the incentive facility is fairly simple, but distinguishing 'free-

6 Conclusions

This study demonstrates the feasibility of reducing Dutch CO_2 emissions by 2020 by between 4 and 5 megatons (about 2%) by doubling existing energy taxes or by tripling the tax on 'very small-scale consumption' (notably by households). This creates no major economic effects, provided that: 1) very large energy consumers are exempted from the tax increases; 2) the tax revenues are fully or partly shifted back in the form of reductions to other taxes; and 3) there is public acceptance of the tax and tax recycling. If, moreover, part of the tax revenues are appropriated to selective incentives, the total CO_2 effect can increase to 7 - 10 megatons (3 - 4%) by 2020.

The main effects of the possibilities considered for greening the tax system by increasing energy taxes and by selective incentives are summarized in Table 6.1.

Table 6.1 Summary of principal effects

	2010	2020
	Cumulated deviation relative to reference path	
Energy consumption	%	
tax variant 1	-2.2	-2.1
same, incl. selective incentives[a]	-3 to -4	-3 to -4
tax variant 2	-2.1	-2.0
CO_2 emission	Megatons	
tax variant 1	-3.8	-5.1
same, incl. selective incentives[a]	-5 to -7	-7 to -10
tax variant 2	-3.6	-4.6
Employment	%	
tax variant 1	0.0	0.0
tax variant 2	0.0	0.0

[a] Dfl. million (2010) and Dfl. 490 million (2020).

Abstract *[original in English; not edited or amended - NOT adapted to translation of terms in main text]*

Increasing energy (and lowering other taxes) is an important option for a possible 'greening' of the Netherlands tax system. We designed tax increases aimed at avoiding serious effects on the competitive position of Dutch firms, or very negative effects on real incomes for private households. The research is part of CPB's new Long Term Study.

We designed two variants: one in which both the existing small-consumer energy tax and the existing all-consumer energy tax are doubled, and one in which the small-consumer energy tax is tripled for very small consumption (mainly households). This leads to energy price increases for households of about 15% in the first variant and 25 to 30% in the second variant; the first variant also increases energy prices for small firms, by some 3%. Both variants increase energy tax revenues by Dfl. 3 ½billion. The revenues are recycled through decreases in social security contributions (firms) and income tax (households). We assume that employees do not demand higher wages in response to the tax increases (they consider the revenue recycle as enough compensation).

Both variants have an effect of minus 2% on Netherlands energy consumption and CO_2 emissions in the long term (in 2010 and 2020). The largest effect takes place in households: about minus 4% in the first variant 1 and minus 7% in the second variant. The total CO_2 effect amounts to between 4 and 5 megatons.

The effect on employment and GDP is zero for both variants. The effects on production per economic sector vary between -0.4 and +0.4%. The effects on real household income have not been explicitly computed; however, for the first variant they can be expected to be between -2 and +2% for different income levels and household types. These effects apply to the average household in each group; for individual households the effects can be larger.

We also looked at the possibility of creating exemptions for firms and households which invest in energy saving. Attempts to maximize the effect by creating exemptions for 'likely' investments only, however, will meet serious difficulties because the government does not have enough information to identify likely investments. If ½billion out of the Dfl. 3 ½billion in tax revenues is used for exemptions rather than recycled, the economic consequences are very limited, and the CO_2 effect goes up from between 4 and 5 megatons, to between 7 and 10 megatons.

It appears possible to increase existing energy taxes without causing serious economic effects, provided that the energy tax increase affects mainly small consumers; that revenues are (almost) fully recycled in other taxes; and that no extra wages are demanded.

Appendix 4

ECN report Incentives favoring reduction of CO_2 emissions

Incentives favoring reduction of CO_2 emissions

Report to the Green Tax Commission
18 June 1997

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1 Introduction

In the framework of the CPB/ECN/RIVM study carried out for the Green Tax Commission (also known as the Van der Vaart Commission), two tax variants on the recently-developed Global Competition (GC) scenario have been worked out[i]. The purpose is to stimulate both energy saving and the production of sustainable energy by means of the extra taxes. In the first variant, the present WBM (general fuel tax) and REB (regulatory energy tax) taxes are doubled for small and medium-scale consumption. In the second variant, a tripled REB alone is applied to small-scale consumption. For these variants, CPB has determined the resulting changes on the demand side; the ECN has determined the resulting changes on the supply side, including sustainable sources and cogeneration (combined generation of heat and power).

At the same time, the Commission requested the Policy Studies Department of ECN to work our an extra subvariant containing, in addition to the increased energy price, an incentive for specific energy-saving measures and sustainable options. In addition to the disincentive effect of the tax increase, this variant also provides a reward for additional savings or sustainable supply. For consumers, the incentive takes the form of a (temporary) exemption from paying the additional tax. For sustainable energy sources, a certain additional payment per kWh is applied. The precise mechanics of the arrangement must still be worked out.

ECN calculated the potential savings for end-users by means of the modules for Households, Production and Utility buildings (Services) of the SAVE model[ii]. In SAVE, a large number of separate energy saving options are defined; the specifications are taken mainly from the ICARUS database on energy-saving technologies[iii]. Decisions on the penetration of savings measures depend in part on cost/benefit ratios, which are in turn determined by the level of energy prices (including taxes) and the level of (additional) investment in an energy-saving option. The additional investment can be reduced with the aid of the incentives. The additional penetration for the various sustainable sources is calculated separately. The effect on Dutch energy consumption of the additional demand reduction and the increased supply of sustainable energy was calculated using the NEV computing model developed by the Policy Studies Department.

The effect of incentives has been found for a number of subvariants on tax variant 1 (with double REB and WBM taxes). These subvariants develop, step by step, a set of energy-saving and sustainable options designed to minimize CO_2 emissions within a given budget. In particular, they focus on selection of the most effective options, achieving maximized primary energy savings per guilder of incentive money (expressed in terms of MJ/guilder).

This report refers exclusively to the extra effects of incentives, on top of tax effects. For the effect of taxes, which has already been examined, reference is made to [i].

2 Approach and principles

The effect of the incentives was determined using the following variants and subvariants.

Tax variant 1
The incentives are linked to the first tax variant, i.e., the Global Competition (GC) reference scenario plus a doubled REB tax (the A band for gas and up to 50 MWh for electricity) and a

doubled WBM tax (A band to C band inclusive). The demand effect of these variants was calculated by CPB; the SAVE modules were used to perform a shadow calculation for finding a reference basis against which the extra effects of the incentives could be plotted. No calculation of the supply of sustainable sources was made for the first tax variant, in view of the absence of any effect, because the extra taxes have practically no effect on the production costs of conventional generating stations. Also, there is no shifting back of the tax revenues in support of sustainable sources (which does take place under the current REB, known as the payment discount).

Subvariant: generic incentives
Next, a subvariant was calculated with generic incentives for all energy-saving options in Production, Utilities and Households, amounting to 20% of the (additional) investment from 2000 onwards. This is referred to as the "Gen-20" variant below. For consumers, the incentive takes the form of a (temporary) exemption from paying the additional tax. For sustainable sources, a different approach is taken, without the intermediate step of a generic incentive (see the subvariant with optimized selective incentives). The extra incentive yields a certain additional savings, but it also requires an unduly large share of the tax revenues to be shifted back. This is because the Green Tax Commission proceeds from the assumption that no more than Dfl. 500 million of the extra tax revenue should be appropriated to incentives. It is intended that this sum be spread in an optimal manner over sustainable sources and/or energy-saving technologies in the various consumer sectors.

Subvariant: selective incentives
Following that, a selective incentive variant was worked out, with 20% stimulus (known as the "Sel-20" case). The effectiveness of the incentives - expressed in MJ of saved primary energy per guilder - was increased by selecting certain options. The basic selection criterion is the number of "free riders", persons or businesses benefiting (unjustifiably) from the 20% incentive under the arrangement to stimulate further penetration of the various options. This subvariant excludes those options whose extra penetration in the Gen-20 case is less than half of their prior penetration increase since the reference year. The absolute penetration level in a horizon year is not therefore relevant, but the move relative to the base year in the tax variant. As a result of the incentives, two to three times as many of the excluded options benefit from the incentives without actually penetrating. In particular those options which are on the verge of a breakthrough will feature few free rider effects. These are not yet present in the tax variant and they react comparatively strongly to a 20% incentive. The effectiveness of the incentives on the individual options selected was determined, in other words the ratio between the change in primary consumption and the extra share of incentive funds required. This was used where necessary to perform a further selection, applying a minimum effectiveness of about 40 MJ per guilder. Options which are not economically viable need not necessarily be excluded from the incentives, since, if they do not react to the stimuli they will also not require a share of the tax revenues. They have, however, been excluded for practical reasons. For sustainable energy sources, an alternative approach was adopted (see the subvariant on optimized selective incentive).

Subvariant: optimal selective incentive
The Sel-20 case leads to lower primary energy savings but also to a relatively larger decrease in incentive costs. The average effectiveness in MJ/guilder will therefore increase. The further the total incentive budget falls below Dfl. 500 million, the more the incentive percentage can be raised. In this way, the reduced primary savings made in the Sel-20 case

can be partly offset again. However, the effectiveness of the incentives will again diminish slightly. This process can be repeated until the approximate sum of Dfl. 500 million is reached. Ultimately, this is found to result in what is called an optimal incentive variant, in which 40% stimulus is given to additional investments in energy-saving options (this is called the "Sel-40" case).

For sustainable energy source, the effect of an optimal incentive is determined directly, without the two intermediate steps of Gen-20 and Sel-40. The reason for this is that there is no point in applying generic stimuli, because it is known in advance where the real options exist. There is also little point in first calculating a low level of stimuli, in view of the uncertainties as to cost and frequent difficulty of penetration. Optimizing the incentive is done by considering the degree in which a given incentive can make an option "economically viable", and also the free rider effects. For that reason, for example, onshore wind energy does not qualify for additional incentive, while offshore wind energy does. The stimuli are applied in the form of a contribution per kWh produced. The amount paid to the government by the energy distributor - as the collector of the tax- declines in proportion to the volume of sustainably-produced energy (payment discount).

Interaction with other incentive arrangements
The incentive will also increase the costs of existing incentive measures, thereby also taking a share of the funds that could otherwise possibly be used for reducing the tax on labor. For that reason, the additional expenditure incurred in other incentive arrangements as a result of the new arrangement considered here has also been charged to the budget of Dfl. 500 million. By means of the iterative process described, a set of options is ultimately found which, if encouraged to a certain degree, yields a relatively large energy savings on a total budget of around Dfl. 500 million. Whether or not a given option is placed on the list depends indirectly on other incentive arrangements; if an option already becomes economically viable under those other arrangements, it will more or less automatically cease qualifying for this incentive measure.

3 Results of the incentive variants

The results are described separately for four items:
- Production
- Utility buildings
- Households
- Sustainable sources.

Chapter 4 presents an overall picture, including the total additional reduction in CO_2 emissions.

3.1 Households

Proceeding on the basis of calculations using SAVE - Households, previously performed for the GC reference scenario, a calculation was first made using the increased REB taxes. This tax variant 1 was then worked out with a 20% generic incentive, i.e., a 20% deduction on the additional investment for all options. This subvariant, Gen-20, results in additional decreases of 16 PJ in 2010 and 24 PJ in 2020 in primary energy consumption by households. For incentive amounts of Dfl. 240 million and 290 million, respectively, around these target years, the effectiveness is 70 to 80 MJ per guilder of incentive money (see Table 3.1, Gen-20 column).

The energy-saving effect increases over time, but not proportionally with time as from 2000. One of the first causes is the rise in gas prices and the fall in costs of energy-saving options, as a result of which, without the incentive, the options already penetrate with time and there is less room for further penetration. The relative decline in potential of the energy-saving options over time should also lead to a decreasing share of incentive money. However, this is offset because for some options it is feasible to introduce an option (with incentives) only after 2010. In addition, the incentive budget tends to move increasingly towards investments in replacing worn-out energy-efficient options with new and equally energy-efficient options. This therefore costs incentive money, without yielding additional energy savings.

The strongest increase in penetration, in percentage terms, occurs in:
- triple-glazing
- floor insulation
- high-efficiency water heaters in existing buildings
- higher-efficiency central heating pumps
- reduced hot water system losses
- combined gas-fired central heating boiler and water heater (replacing electric)
- hot-fill washing machine
- higher-efficiency tumble dryer
- advanced dishwasher
- advanced vacuum cooling system
- high-efficiency electronic devices.

The option with the strongest increase does not necessarily yield the most energy savings per guilder of incentive. As described in Chapter 2, a considerable increase induced by incentives, on top of an already high increase in penetration, leads to many free rider effects. On the other hand, a small increase in penetration without free rider effects can still be effective. Selection of the most effective options results in a list of just over 15 options. Giving 20% stimuli to these options alone yields a primary energy saving of 7 PJ (rather than 16) in 2010 and over 9 PJ (rather than 24) in 2020. The costs today amount to only Dfl. 60 million and 51 million per year, respectively; in particular, not stimulating the use of electric heat pumps has a major impact on the energy-saving effect and the incentives budget. The effectiveness rises respectively to 110 MJ and 170 MJ per guilder. The higher effectiveness in 2020 in comparison with 2010 is partly due to the fact that prior to 2010, stimuli continue to contribute towards energy savings in 2020 (see Table 3.1, Sel-20).

Here again, the energy-saving effect does not increase proportionally with time after 2000, because after that year an increasing share of the potential has already penetrated in tax variant 1. However, selection ensures that incentives do not continue incessantly as old high-efficiency options are replaced by new high-efficiency options. Consequently, the budget share required is able to decline with time.

Table 3.1 Results of the incentives variants - Households

	2010			2020		
	Generic Gen-20	Selective Sel-20	Optimal Sel-40	Generic Gen-20	Selective Sel-20	Optimal Sel-40
ENERGY SAVINGS						
PJ of primary energy	16	7	17	24	9	23
INCENTIVES						
Dfl. mill. per yr.	240	60	200	290	50	180
EFFECTIVENESS						
MJ per guilder	70	110	90	80	170	130

For an increase in the incentive rate to 40% (on the additional investment) for the same set of options, the total extra energy savings in relation to the tax variant works out just as high as for generic incentives. However, the amount is considerably lower, especially in 2020. Relative to the Sel-20 case, therefore, the energy savings increase considerably, but the effectiveness declines slightly (see Table 3.1, Sel-40).

In terms of effectiveness of incentives, the most attractive options are:
- vacuum-insulated cooling systems
- high-efficiency water heaters in existing buildings
- reduced hot water system losses
- vacuum-insulated deep-freezers
- triple-glazing in living-room/bedroom
- advanced high-efficiency gas-fired tumble dryer
- advanced washing machine
- floor insulation.

In addition, there are a large number of moderately effective options; of these, the electric heat pumps for hot water and space heating in particular have a large potential.

Additional comments
In households, a considerable proportion of the savings take place autonomously or as a direct result of the extra taxes. At the same time, a number of options are so uneconomical that they fail to penetrate even with extra incentives. In addition, the increasing application of district heating systems is tending to reduce the energy-saving opportunities for a number of options (e.g., high-efficiency central heating boilers). The incentive therefore only acts on that group of options which are on the verge of a breakthrough.

The obsolescence factor built into the SAVE model means that, as options come up for replacement, there are constantly new opportunities to save energy. This limits the savings rate, but it also tends to spread the demand for incentive money over time. Because the cost-benefit ratio of the options in the base scenario increases over time, the penetration also increases, and less room is left for further penetration induced by incentives. With the passing of the years, the incentives budget also moves increasingly towards replacement of worn-out efficient options by new and equally efficient options. In some cases, continuous stimuli are needed to maintain a given level of energy savings (up to the moment when that option is able to penetrate without any incentive, either through technological advance or higher energy prices). Furthermore, those options that are sensitive to incentives sometimes

have a (negative) interaction: e.g., further penetration of insulation tends to limit further penetration of high-efficiency central heating boilers. All in all, the law of diminishing returns leads here to a fairly low effectiveness for incentive money. It would be possible to raise the effectiveness, i.e., achieve more savings per guilder, by further focussing incentives on selective segments with households.

3.2 Utility buildings

Proceeding on the basis of calculations with SAVE - Utilities[iv], a calculation was first performed using increased REB taxes. This tax variant 1 was then worked out with a 20% generic incentive, i.e., a 20% deduction on the additional investment for all options. This subvariant, Gen-20, results in additional decreases of 10 PJ (relative to tax variant 1) in 2010 and 16 PJ in 2020 in primary energy consumption by households. For incentive amounts of Dfl. 150 million and 30 million per year, respectively, the effectiveness is 70 - 560 MJ per guilder of incentive money (see Table 3.2).

The additional decline in primary energy consumption does increase over time, but not in direct proportion. This effect has already been discussed in the chapter on households. The effectiveness of the incentive increases strongly with time, because later target years benefit from savings through measures in which investments were induced by incentives in earlier target years. In order to optimize the effectiveness of an incentive, a selection was made - based on the results of the generic subvariant - of the energy-saving measures with the highest savings per guilder of incentive money. The most attractive options in terms of incentive effectiveness in the various utility sectors are:

- roof insulation
- cavity wall insulation
- floor insulation
- double glazing
- heat recovery
- electric heat pump
- higher-efficiency warm tap-water systems
- higher-efficiency cooking (post-2000)
- lighting control systems
- reflection-fluorescent lamps
- speed-controlled pumps
- speed-controlled ventilation
- new refrigerant technology (post-2000).

Selective incentives yields an additional primary energy saving of 7 PJ in 2010 and 12 PJ in 2020. The costs of the incentive today amount to only Dfl. 50 million and Dfl. 20 million per year respectively. By that date, the cost effectiveness has therefore risen respectively to 160 MJ and 740 MJ per guilder (see Table 3.2, Sel-20).

Increasing the stimuli for the same set of energy-saving measures to 40% of the additional investment takes the extra primary energy savings (in relation to tax variant 1) to 19 PJ in 2010 and 32 PJ in 2020 (see Table 3.2, Sel-40). The effectiveness declines slightly relative to the Sel-20 case, because the free riders, who would have invested in some of the options anyway, even without incentives, are now encouraged by the rate of 40%, rather than 20%.

Table 3.2 Results of the incentive variants - Utility buildings

	2010			2020		
	Generic Gen-20	Selective Sel-20	Optimal Sel-40	Generic Gen-20	Selective Sel-20	Optimal Sel-40
ENERGY SAVINGS						
PJ of primary energy	10	7	19	16	12	32
INCENTIVES						
Dfl. mill. per yr.	150	50	120	30	20	50
EFFECTIVENESS						
MJ per guilder	70	160	150	560	740	710

In all variants with incentives, the incentive supplements the additional stimulus schemes such as VAMIL (accelerated depreciation of environmental investments) and EIA (energy investment tax credit). The difference in subsidy requirements between the incentive variant and the tax variant is taken as the cost of the incentive. This extra subsidy requirement also includes additional VAMIL and EIA expenditures, because the incentive induces more investments in energy saving measures. This amount for VAMIL and EIA totals about Dfl. 10 million per year in the Sel-40 case. These costs of existing incentive measures are included in Table 3.2.

In Utilities, there is a relatively large level of incentive for insulation. Because this yields very long-term energy savings after a substantial one-time incentive outlay, large time-lag effects occur. This partly explains the large differences in effectiveness between 2010 and 2020. For that reason, it is also worth considering the effectiveness of the incentives over a longer period, e.g., from 2000 to 2020. If the energy savings in 2020 are correlated to the average incentive amount for the period as a whole, then the effectiveness is 340 MJ/guilder (as opposed to 710 MJ/guilder in the final pre-2020 years) in the optimized Sel-40 case.

Additional comments

The same additional comments as for Households apply to Utilities. However, there is a more progressive increase in effectiveness over time, because following a non-recurrent stimulus, insulation options continue to contribute towards total energy saving for a long time. In Utilities, a substantial stimulus for a limited number of options yields a relatively large amount of energy saving. The question is how this fits within the integrated energy-saving strategy based, for example, on the EPN energy performance standard. The incentive also raises the costs of existing incentive measures, such as EIA and VAMIL. These extra expenditures under other incentive schemes that result from the new arrangement applied here are in the order of Dfl. 10 million per year.

3.3 Production

As for Households and Utilities, a calculation was first made for the tax variant. To do this, the REB tax on the A band (gas) and the high rate group for small-scale electricity consumers was doubled. Also, the WBM tax was doubled for the A, B and C bands for gas. SAVE - Production[v] is based on 34 segments, each incorporating assumptions about the marginal energy rates involved. For the remaining heterogeneous sectors in metals, food, building

materials and textiles, the A band for gas was taken as the marginal rate; this therefore results in a relatively large increase in energy prices in the tax variant.

The first subvariant with generic stimuli for all energy-saving options - the Gen-20 case - induces savings on primary energy consumption amounting to 9 PJ in 2010. The incentives average Dfl. 300 per year over the last five-year period; their effectiveness is therefore low, at 31 MJ/guilder (see Table 3.3). Before 2020 the savings slightly increase further (to 13 PJ), as does the incentives amount; the effectiveness remains the same (see Table 3.3). The energy-savings options which increase most strongly (horizon year 2020) are:

- heat pumps in glasshouse horticulture; improved boilers in other agricultural/horticultural applications
- process integration in the artificial fertilizer industry
- heat recovery from furnaces, high-efficiency ventilators and process optimization in the building materials industry
- heat recovery from hot-rolled steel processes
- various technological innovations in food manufacturing
- innovations in paper making; improved boilers in paper processing
- various small-scale process options in chemicals manufacturing
- hydraulic drive systems for construction machinery.

Table 3.3 Results of the incentive variants - Production

	2010			2020		
	Generic Gen-20	Selective Sel-20	Optimal Sel-40	Generic Gen-20	Selective Sel-20	Optimal Sel-40
ENERGY SAVINGS						
PJ of primary	9	7	14	13	13	24
INCENTIVES						
Dfl. mill. per yr.	300	20	70	420	60	140
EFFECTIVENESS						
MJ per guilder	30	310	210	30	220	170

On the basis of these results, a limited number of energy-saving options were selected in the light of their presumed sensitivity to financial instruments (i.e., without independent technological improvement) and incomplete penetration in the base variant (< 75% in 2020). The following selected options have been worked out for a 20% incentive:

- chemicals: heat recovery, process integration, heat pumps/mechanical vapor recompression, and various other process improvements;
- food, paper: improved drying techniques (mechanical, steam-drying, direct drying), process integration, heat recovery, heat pumps and various process improvements;
- agriculture: improved boilers, condensers, heat pumps, solar-powered water heaters, and thermal use of CO_2 fertilization;
- construction materials: heat recovery from furnace waste gases, process optimization and high-efficiency ventilation;
- base metals: heat recovery, hot connection, thin-casting and heat pumps;
- construction, agriculture: hydraulic drives systems for vehicles and machines;

- processing industry: structural options such as insulation, heat recovery ventilation, improved boilers and residual heat utilization.

As a result of the strict selection, there is a slight decrease in the induced energy saving (7 PJ rather than 9 PJ in 2010), but the incentive amount declines substantially (Dfl. 60 million rather than 420 million in 2020). The effectiveness of the stimuli increases by a factor of 10 if a stricter selection is applied (see Table 3.3, Sel-20). Because there is now more financial scope for stimuli, a calculation was made for 40%, rather than 20%, financial incentives, the Sel-40 case. Now the energy saving works out highest of all the incentive cases, namely 14 PJ in 2010 and 24 PJ in 2020. The incentive amount is Dfl. 70 million and 140 million per year, respectively; the effectiveness goes down slightly in comparison with Sel-20 (see Table 3.3, Sel-40).

As described above, the stimulation of energy savings is associated with time-lag effects. It is therefore useful to consider the effectiveness over a longer period as well, for example from 2000 to 2020. If the energy savings in 2020 is correlated to the average incentive amount over the period as a whole, then the effectiveness is 300 MJ/guilder (as opposed to 170 MJ/guilder in the final pre-2020 years) in the optimal case.

Additional remarks
Most of the energy-saving options in SAVE - Production have also been implemented without stimuli, so that a general arrangement will attract a relatively large number of free riders. A selective incentive policy can lead to the implementation of only a limited number of additional energy-saving options. However, a real ceiling for these options has not yet been reached with the variants as calculated. It should be noted once again that the tax and incentive variants relate only to a relatively small share of industrial energy consumption.

3.4 Sustainable sources of energy

Lastly, the cost effects and energy effects of incentives for sustainable energy-generating capacity are discussed. Sustainable options include:

- onshore wind power
- offshore wind power
- hydropower
- photovoltaic cells (PV)
- solar-thermal power (water heaters)
- waste incineration
- new biomass (energy crops)
- ambient heat recovery (heat pumps).

The incentive variant is concerned with identifying new technologies that have not yet penetrated on a large scale and which may accordingly be ushered in with the help of an additional incentive. In this framework, therefore, onshore wind power appears to be a less eligible candidate. In the base scenario, this option is already represented to the tune of 3000 MWe, and additional stimuli would, above all, constitute a subsidizing of existing capacity. The same applies to waste incineration, where moreover the sustainable nature of this power generation mode remains questionable. Heat pumps and solar-powered water heaters are not considered here, as they have been included in the energy-saving options.

The effect of the remaining options is estimated below. The approach chosen is similar to the present shifting back of REB, i.e., the potential effect of an additional incentive of 2 ct/kWh is calculated. A higher amount leads to less effective stimulation, a lower amount produces negligible effects. Unlike savings on end-consumption, in this approach no generic stimuli cases are applied. Realistic options have been selected *a priori*. The results are given for 2020; for each option, the amount potentially available in 2010 is also indicated.

Offshore wind power
In the GC scenario, 500 MW of offshore wind power is available in 2020. At that date, this option will not yet be economically viable, but the scenario assumes that a number of projects will already have been completed in view of speculation concerning fuel price increases and acquisition of lower-cost offshore locations. Additional stimuli will bring offshore wind power closer to financial profitability, but in comparative terms it will remain uneconomic. An additional incentive of 2 ct/kWh will bring the most attractive projects forward, so that 750 MW may already be feasible in 2020, representing an additional growth of 250 MW, additional electricity production of 1.7 PJ, and extra fossil energy savings equivalent to 3.5 PJ (see Table 3.4).

As regards the costs, it should be remembered that the capacity built into the scenario will also benefit from the additional incentive. Electricity production by offshore wind power increases from 3.3 PJ to 5 PJ, or $1.4 * 10^9$ kWh. The incentive of 2 ct/kWh therefore costs $1.4 * 10^9 * 0.02$ = Dfl. 28 million. This represents an effectiveness of 125 MJ/guilder of incentive.

Incidentally, the additional demand on the existing exemption for sustainable energy (2.95 ct/kWh) has been disregarded here. The additional offshore wind power capacity receives a further Dfl. 14 million out of this budget. If that is taken into account, the effectiveness becomes about 80 MJ/guilder. In 2010, there is no additional potential for offshore wind power.

Table 3.4 Results of the incentives - Sustainable options

	Electricity production	Fossil fuel saved	Incentive costs*)		Effectiveness*)	
	PJe	PJ	Dfl. million		MJ/guilder	
Offshore wind power	1.70	3.5	28	(42)	125	(80)
Hydropower	0.20	0.4	6	(8)	70	(55)
Solar-PV	0.35	0.7	12	(19)	60	(40)
Biomass	3.00	6.1	22	(54)	280	(110)
Total	5.25	10.7	68	(123)	160	(90)

*) the figures in parentheses refer to burden on other incentive measures.

Hydropower
In the GC scenario, 52 MW of hydropower is available in 2020. The hydropower potential available in the Netherlands is limited, but assuming additional stimuli, an extra 15 MW appears feasible. This represents additional electricity production of 0.2 PJ. The total electricity production by hydropower capacity increases from 0.8 PJ to 1 PJ. The incentive of 2 ct/kWh therefore costs $0.3 * 10^9 * 0.02$ = Dfl. 6 million. This represents an effectiveness of

70 MJ/guilder of incentive. However, if the incentive form is chosen so as to support new capacity only, the effectiveness rises to around 375 MJ/guilder. The additional hydropower capacity receives a further Dfl. 2 million from the existing REB budget for sustainable energy. If that is taken into account, the effectiveness becomes about 55 MJ/guilder. The additional hydropower potential can already become available by 2010.

Solar-PV
In the GC scenario, 500 MW of solar-PV power is available in 2020, which as an average is not yet economic; however, the scenario assumes that a number of projects have already been completed in view of niche applications and expectation of fuel price increases. An additional incentive of 2 ct/kWh will bring projects forward somewhat, so that possibly 600 MW may already be feasible in 2020, representing an additional growth of 100 MW (additional electricity 0.35 PJ and extra fossil energy savings equivalent to 0.73 PJ). Electricity production by solar-PV power increases from 1.8 PJ to 2.15 PJ, or $0.6 * 10^9$ kWh. The incentive of 2 ct/kWh therefore costs Dfl. 12 million. This represents an effectiveness of 60 MJ/guilder of incentive. The additional solar-PV potential receives a further Dfl. 14 million from the existing REB budget. If that is taken into account, the effectiveness becomes about 110 MJ/guilder. In 2010 no additional potential for solar-PV can be realized with additional stimuli.

Biomass
Biomass energy is obtained from manure fermentation and from energy crops. The GC scenario does assume manure fermentation but no energy crops as yet. The latter option is not yet economic in average terms. An additional incentive of 2 ct/kWh can yield an extra electricity production of 3.0 PJ and 6.1 PJ extra fossil energy savings. The incentive amount is Dfl. 22 million. This represents an effectiveness of 280 MJ/guilder of incentive. A further Dfl. 32 million is received from REB revenues. If that is taken into account, the effectiveness becomes about 110 MJ/guilder. For this option it is estimated that two-thirds of the additional potential in 2020 can already be realized in 2010.

Total results
The options described here and the associated stimuli represent total energy savings in 2020 of almost 11 PJ costing an amount of Dfl. 68 and Dfl. 123 million per year respectively (exclusive/inclusive of the demand on the existing REB shifting back). This represents an effectiveness of 160 MJ and 90 MJ respectively per guilder of incentive (see Table 3.4). In 2010 almost 4 PJ of fossil fuel is saved for a total incentive amount of Dfl. 34 million (including additional demand on the existing REB budget), that is an effectiveness of 120 MJ/guilder.

Generally speaking the effectiveness is fairly low. This is due on the one hand to the free rider effects of stimulating capacity already present in the base case, and on the other hand the fact that the stimuli are unable to achieve truly economic application in the shorter term. The former applies notably to hydropower and solar-PV. The latter applies particularly to energy crops, solar-PV and offshore wind power; these options are only expected to play a role after 2010.

Additional comments
The first comment is that for certain technologies an incentive on investment rather than on resultant kWh might be more cost-effective. This applies most of all to technologies which

have already achieved a measure of penetration. One example is hydropower, where a substantial proportion has already been realized and further projects are expected soon. In that case it is more cost-effective to support the final (as yet uneconomic) proportion with a stimulus on the investment. This method avoids free rider effects for existing projects.

The second comment relates to integration of sustainable sources in the electricity supply. The result of the taxes and incentives is to reduce the end demand, including electricity, in relation to that in the GC scenario. If at the same time the supply of sustainable sources is allowed to increase, integration problems may arise. These may lead, for example, to the occasional non-integrability of wind power, causing a slight fall in annual production. The same goes for hydropower imports from Norway. The result may therefore be a (limited) degree of mutual crowding-out of sustainable options. At the same time, the extra sustainable-based electricity may obstruct the penetration of cogeneration and adversely affect the energy-saving potential. With its high economic growth rate, the GC scenario is typified by a strong growth in electricity consumption; the scenario predicts as yet no large-scale penetration for sustainable sources. For that reason, the systemic effects on the reduction in consumption and CO_2 emissions calculated here remain limited. Given a lower rate of growth or the realization of 10% contribution from sustainable sources in the basic scenario, the systemic effects will no longer be negligible.

4 Total effect of incentives

For the total effect, reference is made to Table 4.1.

4.1 Energy savings

In the Sel-40 case, the total savings of primary energy are 54 PJ in 2010 and 90 PJ in 2020. Allowing for the scale of the relevant energy consumption, the amount of additional saving in the Gen-20 case is roughly the same in the end-consumption sectors. In general, the energy saving in 2020 is about 12 times as large as in 2010. This seems to indicate a certain saturation effect. In part, this may be due to prices rising and investment costs falling over time in tax variant 1; this results in more of the options for incentives having penetrated in the base case by 2020. In the Sel-20 case, the savings effect decreases most for households and least for production firms. If the stimulation is then intensified (see Sel-40), Utilities stands out in energy-saving performance; Households returns to the level of generic stimulus.

4.2 The incentives budget

With a generic stimulus of 20% the budget requirement is higher than the Dfl. 500 million available. If the most attractive options for incentives are selected, the total amount falls to well below that level. Doubling the incentive rate for selected options causes the amount to increase again sharply, both as a result of the higher incentive and the larger number of eligible options. Ultimately, the incentives require Dfl. 420 million in 2010 and Dfl. 490 million in 2020.

Table 4.1 Summary of the results of the incentive variants

	2010			2020		
	Generic Gen-20	Selective Sel-20	Optimal Sel-40	Generic Gen-20	Selective Sel-20	Optimal Sel-40
ENERGY SAVINGS	PJ of primary					
Households	16	7	17	24	9	23
Utility buildings	10	7	19	16	12	32
Production	9	7	14	13	13	24
Subtotal	35	21	50	53	34	79
Sustainable sources	x	x	4	x	x	11
Total	>35	>21	54	>53	>34	90
INCENTIVES	Dfl. mill. per yr.					
Households	240	60	200	290	50	180
Utility buildings	150	50	120	30	20	50
Production	300	20	70	420	60	140
Subtotal	690	130	390	730	130	370
Sustainable sources	x	x	30	x	x	120
Total	>690	>130	420	>730	>130	490
EFFECTIVENESS	MJ per guilder					
Households	70	110	90	80	170	130
Utility buildings	70	160	150	560	740	710
Production	30	310	210	30	220	170
Subtotal (average)	50	160	130	70	260	210
Sustainable sources	x	x	120	x	x	90
Total (average)	<50	<160	130	<70	<260	180

4.3 Effectiveness

The effectiveness is expressed here in terms of MJ of primary energy saved per guilder of incentive per annum. For natural gas as primary energy, a value of 100 MJ/guilder corresponds approximately to Dfl. 180/ton of avoided to CO_2 reduction, 50 MJ/guilder with Dfl. 360/ton, and so on. According to the Ministry of Economic Affairs, the recent CO_2 reduction plan would represent a CO_2 avoidance of some 3 million tons with the appropriation of Dfl. 750 million in investment support, i.e. Dfl. 250/ton. This figure is comparable to a value of 80 MJ/guilder of incentive, well below the values found here. The CO_2 strategy, however, is not an annual but a once-only incentive; on the other hand, the cumulative effect (number of years with this reduction) is probably smaller than in the incentive variant. The values found for stimulation are not directly comparable with the customary costs per avoided ton of CO_2, which in the case of CO_2 removal and storage, for example, are in the range Dfl. 50 - 80 per avoided ton.

As is to be expected, the effectiveness is greatly increased by selection, and it declines again if the incentive rate is raised. The effectiveness in 2010 is highest for manufacturing industry; in 2020 it is highest for utilities and lowest for households. The latter effect may be associated with the larger cost-sensitivity among large-scale energy consumers. The effectiveness tends to vary between 2010 and 2020; two effects are involved in this. On the one hand, incentives are given up to 2010 from which the benefits continue through into

2020. As a result of this, the effectiveness will increase with time; this applies to utilities in particular. On the other hand, as time passes incentive money will repeatedly go into the replacement of obsolete energy-saving options (e.g. high-efficiency domestic appliances).

4.4 Reduction in CO_2 emissions

To determine the reduction in CO_2 emissions, the primary energy consumption savings must be restated in terms of CO_2 emissions. Here, savings on natural gas are taken; the alternatives used in the GC scenario, namely is coal (for power stations) and oil (for end-users) are not a realistic option. For the savings determined, this leads to a reduction in CO_2 emissions of 3.0 million tons in 2010 and 5.1 million tons in 2020.

The original assumption was incentives totalling Dfl. 500 million. Here, the calculations result in slightly deviating amounts in 2010 and 2020. Assuming that the energy savings may admit (slight) upscaling if the incentive budget is altered, the Dfl. 500 million incentive budget would yield CO_2 reductions of 4.4 million tons in 2010 and 5.1 million tons in 2020 (see Table 4.2). The generic incentives case achieves far lower reductions, namely 1.4 million tons in 2010 and 2.0 million tons in 2020. However, it should be noted that those figures include no (limited) contribution from sustainable sources.

Table 4.2 Reduction in CO_2 emissions - incentives

	2010			2020		
	Generic Gen-20	Selective Sel-20	Optimal Sel-40	Generic Gen-20	Selective Sel-20	Optimal Sel-40
CO_2 reduction	Megatons					
calculated cases	2.0	x	3.0	3.0	x	5.1
scaled to Dfl. 500 million	1.4	x	3.4	2.0	x	5.1

(primary fuel saved = gas)

5 Effectiveness of incentives as an instrument

Chapter 4 presents results relating to the calculated effect of incentives. The real effectiveness of the instrument is often the brunt of criticism; one may ask what margins should be applied in practice to the energy saving and CO_2 reduction figures presented here. These criticisms are inspired by the principal-agent theory, according to which non-generic management measures are only partially effective, because the government does not possess all information about the actual opportunities of all consumers to respond to certain incentive measures.

A number of aspects of the principal-agent theory are dealt with here consecutively. On the basis of these considerations, a general estimate is made of margins to be expected for incentives. The principal-agent theory appears to have its origins in the experiences gained up to the late 1980s, when meddlesome but ill-informed governments often tried to compel unwilling producers and consumers to undertake certain activities for the sake of the (supposed) public interest. Certainly in recent years, this picture has undergone considerable alteration, particularly in matters of energy saving and environmental measures. Recent years have seen a substantially altered stance on the part of both government and consumers, focusing on partnership, individual responsibility, and scope for individual decision.

Present-day policy measures also match practice more closely, because the government possesses far more knowledge of practical possibilities through the intermediary of, for example, the energy distributors and NOVEM, the Dutch agency for energy and the environment. Considerably more knowledge about energy-saving opportunities has also been acquired through consumer organizations (in the form of long-term agreements). Furthermore, with regard to matching government objectives with consumer choices, many changes have been introduced in comparison with past practices, for example, agreeing, rather than imposing, consumer targets, and applying a "no-regret" principle with respect to costs.

With regard to asymmetrical information in the case of selective policy, the following remarks may be made.

- Particularly in the case of small consumers, which is what this study is about, the consumer certainly does not possess the best information on (economic) energy-saving opportunities. In view of the very high transaction costs to small consumers inherent in acquiring knowledge about numerous options, each with a limited return, this may indeed not be expected of them. By seeking advice from intermediate organizations close to the consumer, a government can obtain better information than small consumers themselves. Consumer awareness of this aspect is shown by the demonstrated effect of consumers implementing an energy-saving option that qualifies for investment incentive not because of the incentive itself, but merely because the option itself includes an incentive. In other words, the investment incentive acts as a kind of guarantee to small consumers that the option is a good one.
- in principle, selective policy requires more information, especially to prevent available options from failing to receive a deserved stimulus. Encouraging options that prove unsuccessful in practice is less serious, because in that case no incentive money is claimed. The incentive variant considered here applies a list of options that is constantly updated by means of continuous monitoring of implementation. In that way, if information is found to be incomplete, it is possible to adjust the incentive scheme, albeit with some delay.
- If potentially successful options nevertheless fail, they do so, in principle, at the expense of the incentive effect as calculated here. However, updating the list enables failed options to be replaced by unexpected new alternatives. The setback is therefore temporary. Should an option fail, incentive money also becomes available for other purposes. One might consider anticipating a number of failures by initially providing stimuli for more options than actually correspond with the budget. This procedure prevents under-utilization of the budget and achieves a large energy savings.

With regard to the need for continuous updating of the scheme, the following may be noted:

- An effective incentive policy requires intensive monitoring of the results achieved, but the costs involved are not insurmountable. In the case of incentives, the total budget is Dfl. 500 per year Supposing that only 1% of this were spent on monitoring, and bearing in mind the current cost of approx. Dfl. 200,000 for BAK[vi] and BEK[vii] monitoring, a great deal of information would be gathered. Moreover, it is simple to implement the incentive scheme, for example via Senter, in such a way as to facilitate rapid and inexpensive monitoring. Monitoring costs to the government will occur particularly in the case of non-homogeneous consumers and energy-saving options, such as manufacturing. The present case, however, consists mainly of small consumers with generally standard energy-saving situations. The transaction costs can therefore be kept down, because of the definite decision to apply incentives to clearly defined options.

- Continuous adjustment of the incentive conditions need not necessarily undermine confidence in the government. The incentive conditions and amounts in the MAP[viii] (Environmental Action Plan of energy distribution companies) schemes have undergone constant adjustment. The incentive arrangements for wind energy and solar-powered water heaters are also of an intermittent character. In practice, this has not been found to erode the confidence of small consumers, provided that advance notice is given. On the contrary, there are practical examples demonstrating that consumers are made more alert by changes to incentive schemes.

Finally, when estimating the actual effect of incentives, the following considerations are relevant:

- A conservative estimate has been assumed for consumer reaction to the incentives. In the SAVE calculations, the extra penetration of options depends on the improvement in the cost-benefit ratio: a given improvement can be achieved both through a tax and through an incentive measure. In either case, an improved cost-benefit ratio is restated in identical terms into an extra penetration of options. Nevertheless, in practice, the incentive measure will probably be more effective, because the financial benefit becomes available immediately. In the case of a tax, the benefit only accrues after the passage of time, in the form of a lower energy bill. Because of the time preference, this deferred benefit is worth less in consumers' eyes than the direct benefit of the incentive. In addition, it may be noted that a contribution to the investment reduces the problem of capital availability.
- In the SAVE model, providing on average sufficient incentives for an option does not lead to complete penetration, because of the differences in individual circumstances. SAVE therefore already allows for differences in information availability in individual consumer situations.
- It is possible to achieve even greater energy savings on the same budget by directing incentives even more selectively, for example with percentages varying from year to year and from option to option. This has not yet been done, because of the large amount of extra calculation work involved. This procedure is estimated to yield a further 10% additional energy saving for the same budget.

All in all, incentives may be expected to generate an effect lying near the top of the margin between the value for the selective case and that for the generic case.

References

[i] Long-term study 1995-2020, CPB/RPD/ECN/RIVM/AVV, anticipated publication July 1997
[ii] SAVE model - Households, ECN
[iii] ICARUS, NW&S, RUU
[iv] SAVE model - Utility buildings, ECN
[v] SAVE model - Production, ECN
[vi] BAK, EnergieNed
[vii] BEK, EnergieNed
[viii] MAP, EnergieNed