

Ecological tax reform

Contributions and debate from the conference june 22,1995



Report from the Danish Board of
technology 1996/3

ISBN: 87-90221-08-7

ISSN 1395-7395

Foreword

On 22nd of June 1995 the Danish Board of Technology held a conference with 130 participants on ecological tax reform. The issue currently is a hot topic in public debate, since the parliament and various business organisations and major corporations are negotiating the extend and the time table for a change in the tax system towards a more ecological system.

The conference was arranged because Denmark seems to be one of the countries where it might be important to highlight the debate on which kind of changes are needed to promote more sustainable patterns of production and consumption.

This report contains the presentations on different aspects of this very complicated subject made by:

Harald Agerley (DK)
Per Sørup (CEC, IPTS, Seville)
Hans Bergmann (CEC, DGXI, Bruxelles)
Kaare Clemmensen (DK)
Hans Jochen Luhmann (Germany)
Stein Hansen (Norway)
Allen Aspengreen (USA)
John Elkington (U.K.)

We have edited the debate during the conference. For this part of the conference we had invited the following persons, all from Denmark, to present a short viewpoint:

Inge Røpke
Frede Vestergaard
Per Henriksen
Jørn Nørgård
Henrik Kærgård
Nils Enrum
Karen Hjulmand chaired the conference.

Journalist Peter Hesseldahl has made a short introduction to the different aspects and issues discussed in relation to "Ecological tax

reform".

Thanks to all - speakers and participants - who contributed to make the arrangement a good conference and to make this report possible to publish, so that also people, who were not present, now can use it.

The Danish Board of Technology

June 1996

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Introduction

Environmental Tax Reform

By Peter Hesseldahl, Journalist

An environmental tax reform is seen by many as a possible solution to some crucial problems of modern society - pollution, excessive resource consumption and unemployment.

Changes in the system of taxation are here seen as a long term process, one that must cheapen the costs of labour and make the costs of resource use more expensive - a process which can also create major changes in our society as to conceptions of quality, work, consumption etc.

Green taxes have become an important element in today's political debate, but the discussion is often limited to considering such taxes as a kind of extra indirect tax. In this way, competitive ability, the price level of commodities and what is to be done with the tax revenue are subject to intense debate among the parties involved. The perspective with, and the objective of such taxes get lost in this

debate.

The Conference will present proposals for an ecological tax and duty system that will contribute to:

- * Changing technology so that it becomes more resource and energy effective
- * Changing the economic mechanisms so that resource consumption and pollution become more expensive while human resources become cheaper
- * Changing personal life styles and values so that material consumption becomes less decisive for our choices and priorities

Hence the discussion of an environmental tax reform must be part of a far broader discussion about how to organize economic life so as to contribute to fundamental changes in our existing values.

There is a need for a constructive interaction between state and market in the form of a whole "toolbox" with many different tools to change behaviour, policies, organization, production, everyday life, consumption etc. And there is a need to discuss the appropriateness of the tools in relation to the overall goal - and in relation to each other.

The Danish Board of Technology hope that the conference will be an inspiring contribution to a clarification of the various aspects of an ecological tax reform. This introduction is meant as an appetizer to the conference, which we hope you will enjoy.

The Danish Board of Technology, May 1995

Key questions

Answers to the following questions are sought from the conference:

- * What will an environmental tax reform look like in order to contribute to such a development ?
- * What is the role of direct and indirect taxes in relation to other tools?
- * What are the limits to the capacity of green taxes to engender system and attitude change?
- * Are the economic policy tools sufficient or are other measures necessary in order to change existing concepts of welfare and quality criteria?
- * How should indirect taxes be arranged in order to contribute to job creation?
- * What kinds of environmental duties are to be found in the EU and Denmark? How do they work? What are they intended to do?
- * What problems are linked to the administration of green taxes?
- * How can the level of taxes and duties be so determined that they reflect a price setting which takes into account the environmental costs of production and consumption, the so called "true prices"?
- * To what degree is it possible for companies to switch and re-organize production to meet future demands for sustainable production and consumption?

How to read the introduction

The conference paper is divided into four sections:

- the first section describes the principles and the economic mechanisms underlying an environmental tax reform
- the second section describes the effects that are the goal of the tax reform
- the third section deals with the political and economic difficulties in implementing an environmental tax reform
- the fourth section raises a number of crucial issues that have to be clarified in order to assess whether an environmental tax reform is a positive change.

What is an Environmental Tax Reform?

There is no fixed, finite definition of what an environmental tax reform is. There are, however, a number of recurrent key points when the concept is discussed:

- the aim is to reduce the strain on the natural base by motivating industry to produce new resource- and energy effective technologies

and by encouraging consumers to a greater degree to purchase goods that are produced in a less resource-demanding way.

- an environmental tax reform entails that the taxation of natural and non-renewable resources is increased while, simultaneously, the rate of income tax on the labour force is reduced.
- The shift in taxation is carried out at a moderate but constant rate over many years.
- An environmental tax reform requires international agreement and co-operation. It is difficult to implement in a single country since it affects prices and competitiveness.

Externalities

There are a large number of production costs that do not figure in company accounts and hence are not part of its economic calculations. These are called externalities.

In a large number of cases, it can be proven that, if externalities were included this would involve a radical change as to which technologies and which forms of production can make it on the market. A frequently mentioned example is that of windmills which, at the moment, cannot compete as to price with coal-fired power stations. If, however, one were to include the environmental damage involved in the extraction and the burning of coal, and in addition the circumstance that once coal has been used it is no longer available for future consumers, then windmills would be cheaper.

At the moment, a number of resources are far cheaper to consume than what it costs to repair the environmental damage which follows from consumption. In many cases, some resources are today cost-free or even subject to more or less open state subsidies. For example, the price of oil does not reflect such costs as pollution, global warming or, in many cases, the military costs of ensuring stable supplies. Society's expenditure on traffic accidents, respiratory problems, acid rain and noise disturbance are, similarly, not considered when calculating transport prices.

When such "free" resources and environmental damage are not considered in the calculation of production costs there is no reason for companies to save and rationalize in this area. The result is a tendency for environmental damage and resource use to receive very little attention. Instead, the focus is on the development of technologies and systems that reduce the use of expensive labour.

The idea underlying an environmental tax reform is that companies and consumers should be more motivated to reduce the damage to the environment by calculating external costs.

Misleading Signals

Today it can be expensive to act in an environmentally friendly way and hence, even an idealistic businessman often cannot permit himself/herself to do so. The short-term saving can, however, be expensive in a long-term and more societal perspective.

One can say that the economic market signals are misleading. The prices one pays do not correspond to economic realities and hence the pattern of consumption and industry's planning are out of step with what, in the long run, the natural base can sustain.

The danger with incorrect economic signals can be illustrated by an extreme example: the former East bloc countries, where the state kept energy prices extremely low. The result was that the productive apparatus and the technology that was developed were extremely ineffective as to energy consumption. No one worried about leaking oil pipes, about heat insulation as long as such factors played no role in economic planning nor were part of the criteria for company success.

True Prices

The basic idea underlying an environmental tax reform is that, to a higher degree, prices would reflect all the costs involved in the consumption of resources. However, one quickly gets into difficulties in attempting, in detail, to arrive at "true" prices. This can be illustrated by a single example. Global warming may prove to have enormous costs on which it is impossible to put a price, let alone calculate exactly how much a given raw material shall increase in price in order to reflect costs.

When discussing the taxation of resources there will, necessarily, enter in more or less subjective assessments, but prices, and hence the signals sent to consumers and to industry, can only reflect environmental costs. Hence the problematic of "true" prices is an important aspect of the debate on environmental tax reform.

Market Forces - or Control Down to the Last Detail

An alternative to an environmental tax reform could be to set a large number of limit values and quotas on consumption. This would partly involve building a comprehensive control apparatus and, by so doing, one would hardly benefit from the dynamics of the market and its capacity to develop the best solutions under given circumstances. An important point with an environmental tax reform is to encourage consumers and companies to do something to reduce their costs, to switch to less resource-demanding consumption. The ingenuity that this would give birth to is precisely that which one seeks to mobilize. The idea of an environmental tax reform is to use market forces to promote change towards sustainability.

Not an Extra Source of Income

In the debate, it is often emphasized that an environmental tax reform must not be seen as simply a way of getting more money for the exchequer. The idea is to keep the total level of taxation unchanged by lowering the rate of income tax in pace with the increase in resource taxation. For those who use many resources this would naturally mean increased expenditures. But the total effect on the state's income is neutral.

Green Taxes in Denmark

Denmark started a tax reform in 1994 which, in the first instance, involved lowering the rate of personal income tax. Simultaneously, an environmental duty was imposed on the private consumption of, first and foremost, water. The green taxes on consumption were introduced in 1994 and will increase gradually over four years. They are expected to produce DKK 10-15 thousand million a year.

Currently, negotiations are taking place on the introduction of green taxes in the private sector. It is planned to introduce these duties over a three year period from 1996. The main feature is duties on CO₂ and SO₂. The whole revenue will return to the private sector in the form of a reduction in social security contributions - the size of which depends on the company's wage bill - and in the form of an investment fund for environmental improvements. The revenue from such taxes on the business sector is expected to be of the order of DKK 2 thousand million a year.

The Effects of an Environmental Tax Reform

Changes in Technology

One of the goals of a tax reform is to alter the pattern of technological change. The theory is that, since labour is today so expensive, much of research and development focuses on how to save on labour costs. If resources become more costly than labour then it would be more profitable to develop technologies that minimize the consumption of energy and other raw materials. The price advantage of products that, throughout their life cycle have low resource consumption will be more evident after an environmental tax reform.

Products with low resource consumption and which are cheap to scrap or recycle will be more competitive.

In Germany, industry is very aware of the problem in that the German government has long prepared, and in some cases introduced, measures that require manufacturers to provide for the costs of destruction and re-use of products and packaging. Hence it is part of the price of the product and a factor in price competition that the product is suitable for re-use.

Higher prices for energy are a means to press the consumption pattern in the direction of more modest products. But there are paradoxes here. The manufacture of a low-energy product can be very resource demanding. For example, a low-energy fridge could have a higher price the more evident it is that, in the long run, it is cheaper to run than a more energy-gobbling fridge.

Changes in Consumption Patterns

It is assumed that the pattern of consumption will change when certain goods and certain forms of consumption increase violently in price. If transport costs increase, it can pay to buy locally or regionally produced goods that are manufactured without major pollution. In addition, one can expect that consumers will be less willing to travel frantically on holiday and in leisure time.

On the other hand, the consumption of entertainment, education, service, care and communication that all require a lot of labour power but very few physical resources will become relatively cheaper.

Changes in the Pattern of Trade and Production

Today, transport costs are so cheap that products from the other side of the globe can compete with locally produced products. This is true not only of compact, high technology and specialized products but also for such ordinary products as meat, vegetables, wine and toys.

It is conceivable that increased transport costs might lead to a greater degree of local, physical manufacture while there continues to be major international exchange of electronically manufactured products in such fields as design, information, entertainment etc. In other contexts, there is talk of the transition to an "Information Society". This development does not have to be in conflict with a more sustainable structure of industry and trade.

Changes in the Labour Market

It is expected that the use of human labour power will increase because it will become relatively cheaper with an environmental tax restructuring. In areas where previously one would have introduced machines, it will be economical to use labour power. One example is repairs. Consumption goods are often far more expensive to repair than the cost of buying a new one because the manufacture is automated and rationalised and the raw materials involved are very cheap. If the raw materials become more expensive and the labour power cheaper, repairing will be more profitable. That products are manufactured in such a way that they are easy to repair can become a competitive parameter.

The question is how much the relationship between the price of labour and the price of physical resources must change before working through in the form of a changed pattern of consumption, new jobs and new types of products?

One can illustrate how hard labour is currently taxed by the following calculation: If you have to have a skilled craftsman e.g. a plumber, at a cost of DKK 5,000, then if the tax rate is 60% you have to go out and earn DKK 12,500. From the DKK 5,000, the plumber deducts VAT (at 25% in Denmark). So we are now down to DKK 4,000. Hereafter the plumber's income is taxed so he receives a wage of DKK 1,600. So, to get a job done for which the plumber's net wage is DKK 1,600, you have to earn DKK 12,500.

Of course, the bill has to be paid even after an environmental tax reform. Nor is the tax reform designed to raise or lower the total rate of taxation. Tax is simply to be raised at another place; through taxation of physical resources.

After an environmental tax reform, labour intensive tasks, including the task of restoring and preserving the environment, will fall in price. Today, the cost of social welfare is very expensive and, in some instances, such tasks are either neglected or performed by machines - and not always with a particularly good result. Similarly, it is conceivable that such a reform would increase employment in consultancy work, individual adaptation of products, handicraft and design.

Changes in Life Style and Outlook

An environmental tax reform would, generally, have deep repercussions and affect practically every sphere of society by giving a clear signal about reducing resource consumption. It is worth considering whether the demand for decreasing resource consumption, seen in the light of the global population increase, of the rapid increase in consumption in developing countries and the threat of global warming, whether these problems can be met by simply making technology more effective. Many claim that it would require a fundamentally different life style and understanding of the necessity of limiting personal consumption.

Difficulties and Problems

Reduced Competitiveness

It is obvious that a green tax reform is not everybody's cup of tea. Taxation will hit those industries that are major consumers of energy and raw materials hard. Many forms of production will simply no longer be profitable, or they will be ousted by alternatives that, due to their lower consumption of raw materials are not so heavily encumbered by taxation. In Denmark, the industries at risk are, among others, the manufacture of cement, insulation material, glass, animal feed, dried milk and paper. Market Gardens with heated greenhouses will be hit, so too will domestic airlines and ferries, especially those fast ferries that drink fuel. They have, until now received dispensation from taxes on fuel.

There is no avoiding the fact that it is an explicit goal of the tax reform to hit raw material-heavy industry: partly to incite them to find more modest forms of production and energy, partly to persuade consumers to consume less of this kind of product.

It will involve factory closures, retrenchment and dismissals in the industries affected. On the other hand, we can expect a comparable increase in those sectors that cannot supply alternatives or sectors with new cost structures can find it easier to find markets for their goods and services.

The voice of these latter sectors is hardly heard. The industries threatened are often well-organized and ensure that their views are heard. Those that will shoot up have fewer chances to make themselves heard in this debate. An environmental tax reform will involve a loss of certain kinds of jobs but, on the other hand, should, in principle, open the way for a number of new jobs.

Requires Global Agreement

There will be difficulties unless all countries introduce the same rate of tax on raw materials. If, for example, Denmark goes it alone then the resource-heavy sectors of Danish Industry lose competitiveness in relation to foreign companies. As both the Confederation of Danish Industries and the Danish Trade Unions have pointed out, this can involve a loss of many thousands of jobs. In this connection it is worthwhile considering whether, if these resource-heavy industry simply move to Eastern Europe or elsewhere - where environmental considerations are not taken so seriously - this would lead to an environmental improvement. The effect on the environment could even be negative if production is taken over by companies that pollute more than the Danish ones.

A shift of policy without distorting international competitiveness requires that many other countries do the same. A country which alone encumbers industry with environmental costs puts itself in a risky situation and the inclination to reject the idea will be strong. On the other hand, from an environmental perspective, one can be of the view that someone has taken the first, symbolic step. We run into precisely the same problematic when the debate moves from the national to the regional level. If the EU collectively decides to introduce environmental taxes, then parts of European industry will have decreased competitiveness in relation to other continents.

A Strategic Advantage

The question is whether one can derive a strategic advantage by being in the forefront of a step that one assesses has to be taken by everyone else sooner or later. If one believes that the current level of resource consumption can continue to increase it would naturally be foolish to reduce competitiveness by limiting this growth. If, on the contrary, one is of the view that in any circumstance it will be necessary to cut this down within relatively few years, one can hope to derive a competitive advantage in the longer run because, in that case, the alternatives that can compete under the new price relationships will already be there.

It is worth considering whether Denmark's exports are primarily of a kind that are resource-heavy or whether they are primarily labour intensive. In the latter case, an environmental tax reform will lead to an improved competitiveness. It would be imprecise to claim that environmental taxes would hit Danish industry in general since the effects will be very different from sector to sector.

Denmark is not the only country where green taxes or an environmental tax reform are under consideration. In the USA, the Clinton administration has attempted to introduce green taxes but the proposals have not been accepted by Congress. Several European countries have the same idea and under EU auspices Delor's White book proposes a shift of taxation from labour to energy and raw materials.

Delor's White Book

The EU Commission's white paper of 1993 "Growth, competitiveness and Employment - Challenges and Paths into the 21st Century" the idea of a tax reform is presented in chapter nine. The background to the reform is that the level of taxes in the Community has, on average, increased disproportionately in the years 1970 - 1991 when compared with the USA and Japan. It is assumed that the pressure of taxes has, in itself, come to constitute a barrier to growth, competitiveness and employment.

The report therefore proposes investigations as to the possibilities of reducing labour-related taxes by 1-2% of GNP. This reduction in taxes, duties etc. should however be compensated for by taxing other factors of production or consumption. Among such compensation possibilities, the report names, inter alia, environmental taxes (CO₂ and energy taxes) and duties on commodities that are damaging to health.

Chapter ten, "Thoughts on a New Development model for the Community", mentions changes in taxation principles as one of the measures that can contribute to solving the fundamental social and economic problems of the community and move towards a "sustainable developmental model". The current development model is characterized by both qualitative and quantitative "underuse" of labour resources combined with "overuse" of environmental resources. The main task is a systematic revision of macro-economic and sectoral policies on the basis of the fundamental principle that market prices must also reflect all external costs.

The Big Issues

There are a number of issues that have to be clarified in order to conduct the debate about a green tax reform in an objective way.

Price Elasticity

One absolutely basic question is: does it work? The term "price elasticity" is used to explain the fact that consumers do not change their purchases immediately so as to respond to changes in the price of commodities they can choose between. There is a certain inertia: perhaps many are willing to pay more for a product than they do at the moment, or else companies are able to absorb price increases at one point of production by cuts at other points in production.

The question is, therefore, how big the price elasticity is and, hence, how large the price changes have to be before a tax reform changes the behaviour of consumers. Similarly, one has to consider how great the price changes have to be, before companies change the products they manufacture and the technology they develop and use. How far does one have to go and at what speed? And how can consumers and the business sector be motivated to change?

Social Side Effects

Another important issue is whether an environmental tax reform will have social side effects and, if so, to what extent. To what extent can consumers parry increasing raw material prices by reducing consumption? A reduction of wages and an increase in the prices of material consumption can be an unpleasant combination if one already has problems with making ends meet.

Is this the end of Mallorca travel?

Will consumers have the same amount of money at their disposal as before - and what can they get for their money ? Precisely how will our consumption change? What precisely do we get more of and what do we get less of?

What is the Money to be Used for?

Should the tax revenue go into the general budget or should it be earmarked for environmental improvements or be returned to the hardest hit industries? Can one justify "green taxes" if the money is not spent on improving the environment?

Does it happen naturally?

Finally, it is worth considering whether there is any need for state intervention. It is likely that, simply as a result of the rapidly growing energy consumption in developing countries, that higher prices will come anyway, especially oil prices. For example, the Economist points out that the number of washing machines in China has increased from just about nothing in 1978 to 97 million in 1994. Similarly, the number of electric fans has increased twenty times over. In 1993 alone, China's oil consumption increased by 11%.

If a real depletion of resources occurs, sooner or later this will result in price increases that will regulate consumption and force the development of alternative technologies. But the problem with this is the risk of situations of real shortages, shortages that would be very unpleasant for sectors of the population. Furthermore, it is possible that the greatest environmental threat is not the depletion of resources but that the earth's atmosphere cannot absorb more waste, first and foremost CO₂.

Is there an Alternative?

And, finally, it is worth considering whether there are other alternatives. An environmental tax reform is neither without problems nor painless. An economy and an industrial sector based on increasing consumption of energy and raw materials will, in the long run, lead to drawbacks that far outweigh those that are connected with an economic re-orientation whose driving force is another conception of nature.

Environmental problems in a long-term global perspective

By Harald Agerley, Manager

Global consumption has increased tremendously in this century as can be seen from the growth in the volume of production.

	Total production	Annual Growth (%)
1900	100.0	2.6
1913	172.4	4.3
1928	250.8	2.5
1938	311.4	2.2
1953	567.7	4.1
1963	950.1	5.3
1973	1730.6	6.2
1980	3041.6	2.4

Production of World Manufacturing Industries, 1900 - 80

Production grew by a factor of 3 from the beginning of the century until world war II, until 1980 much faster, by a factor 10, and, for the whole period, by a factor of 30.

A minor part of this production has been for military purposes and, during recent decades, for large research projects such as space exploration. But most of this production has had the ultimate purpose of private material consumption. So this consumption can be

assumed to have also grown by a factor of about 30 in the period under consideration. Extrapolating to the end of the century, a factor of about 40 is obtained. This can be split up into a factor of 4, corresponding to the growth of global population during this century, and a factor of 10 representing the growth in consumption per capita.

Consumption has, in particular, grown rapidly in the industrialized countries. We in these countries are now responsible for about 3/4 of total global consumption while we represent only 1/4 of global population. This corresponds to an average consumption per capita in the industrialized countries 10 times that in the developing countries.

Material consumption is always connected with a resource cycle, from extraction of resources i.e. materials and energy, through transportation to manufacturing, and, frequently, via consumption to scrapping. During this cycle, an impact is made on the environment by emissions and waste. Many observers believe that the total impact of these resource cycles has reached the limit of sustainability or may already have passed it.

But global consumption will continue to grow for many decades to come. One reason for this is the ongoing population explosion, the other reason increased consumption per capita.

The annual growth of global population is now close to 100 millions; as a result of about 150 million births a year and 50 million deaths. This means that 1 billion will be added to the global population in about a decade. And this growth is expected to continue for the next 2 or 3 decades. But the growth *rate* as such has been declining for some years. It is hoped that this decline will continue, eventually bringing growth of global population to an end. But for the next 50 years growth will continue to be strong.

	Industrial countries	Developing countries	Global population
1900	0.6	1.0	1.6
1950	0.8	1.7	2.5
1995	1.2	4.6	5.8
2050	1.3	8.7	10.0
2100	1.3	9.9	11.2

Global Population in billions, 1900 - 2100

According to the latest forecast of the UN Population Fund (mean variant) world population will grow to 10 billion by the middle of the next century. While growth in the industrialized countries will be very moderate, most of the countries having passed the demographic transition, population in the present developing countries will approximately double.

Based on this population forecast and assumptions on the growth in consumption per capita, an estimate can be made of the growth in global consumption up to the year 2050.

The assumption made here for the developing countries is that consumption per capita will increase by a factor of 4. This may seem a high figure, but it corresponds to a growth of only 2.4% per year. For the last 40 years growth has been higher than this and, currently, it is also higher: due to the strong growth in a number of Asian countries which now have annual growth rates of between 5 and 10 %.

It should also be born in mind that a quadrupling of consumption per capita in the developing countries will only bring that consumption up to a level corresponding to 40% of our current level - and probably only about 20% of our future level. Furthermore, increased living standards in the developing countries are one of the preconditions for bringing the population explosion to an end.

For the industrial countries, it is assumed that consumption per capita will double. In historical terms, this would be a very low rate of growth. It can therefore be said that this forecast rests on an implicit underlying assumption which could be that, at a certain point, a saturation will occur with respect to the desire for increased material consumption, or that lifestyles will be deliberately changed in a less materialistic direction because of a more general awareness of the fact that environmental problems are mainly a result of excessive material consumption.

	Index Now	Population growth factor	Consumption growth factor	Index Year 2050
Industrial countries	75	1	2	150

Developing countries	25	2	4	200
Global total	100			350

Estimate of Growth in Global Consumption, 1994 - 2050

In the above table global consumption at the outset is given an index value of 100 and an index is calculated for the year 2050. Consumption in the industrial countries is assumed to double. Since there is only a slight increase in population (disregarded in the table) this means that consumption per capita doubles. Consumption in the developing countries will increase by a factor of 8, consisting of a factor of 2 for population growth and a factor of 4 for growth in consumption per capita. The assumptions made result in an index of 350, corresponding to a growth in global consumption within the period considered by a factor of 3.5.

Note that consumption in the developing countries will correspond to twice the present global consumption. Also that the industrial countries will be responsible for 43% of total global consumption as against 75% now. Reduced consumption in the industrial countries would help bring the total down, of course, but a considerable reduction would be required to make a major impact. Population growth and growth in consumption per capita in the developing countries will be the decisive factors.

The assumptions made here on the growth in consumption per capita are probably on the low side. That may also be the case for the growth in population. Therefore a growth in global consumption by 2050 by a factor of 4 is probably a minimum. Higher - and even much higher - growth rates have been estimated by others.

With present technology such a growth in consumption would have devastating effects on the environment. But fortunately technology can be changed. The necessity of such change is clearly seen from the Paul Ehrlich equation:

$$I = P * A * T$$

where I stands for the impact on the environment of material consumption, P for the number of people, A for affluence or consumption per capita and the decisive factor T for technology. If P*A increases by a factor of 4, as discussed above, and an increase in I is not acceptable, then the factor T has to be reduced to 1/4 of its present value. The impact on the environment per unit of consumption has to be decreased to 1/4 of the present value.

Since, to a large extent, this impact is proportional to the amount of resources used, it can also be said that the use of resources per unit of consumption should be reduced to 1/4 of its present value. Over the timespan considered, this corresponds to a reduction of 2% per annum. In other words, resource productivity should be improved by 2% per annum - as a global average. The magnitude of this improvement happens to be more or less the same as that of the improvement in labour productivity in the present century.

Could this be achieved? I belong to those who firmly believe it could. First of all, resource productivity has increased considerably this century, though not at the rate now required. Competition in the market has been driving this process, together with the increase in labour productivity. But I am mainly basing this conviction on the fact that we have seen tremendous developments in science and technology in this century. We have seen this process accelerate, as knowledge has accumulated. And we now have a very great number of highly educated scientists and engineers mastering this knowledge: as well as numerous advanced research facilities.

To a very great extent, it has been competition in the market economy which has driven these developments, and the market economy could do it again, bringing about increased resource productivity, if adjusted with a set of additional rules.

But today's market economy is not driving the development in a direction of sustainability; at any rate not with sufficient force. We have in a way a market failure, because the market does not respond to environmental problems. The main reason for this is that many prices today are no longer "true" and only with true prices can the market respond rationally. Prices are the main information element in the system. It is on the basis of these that it is decided what and how much should be produced. Prices also determine by whom, where and, finally, how consumption should be distributed. It is therefore important that prices are true, in the sense that they reflect costs correctly.

The reason for many prices not being true any longer - true in the sense that they also reflect environmental costs - is that, to a great extent, costs in production and consumption are loaded off on society and future generations. These are the so called 'external' costs, representing impacts on the environment in numerous ways. To disregard these costs may have been rational enough decades ago, when the total impact of consumption on the environment was much smaller than today, and nature therefore could recoup itself. But very often this is no longer the case today, due to the strong growth in consumption and the resulting increased impact on the environment.

In order to correct this market failure, these external costs must therefore become internalized. The obvious way to do this is to charge eco-taxes or green taxes reflecting the external costs. The effect hereof should be to force producers to develop new materials, new product concepts and new manufacturing processes, since manufacturers will compete on minimizing all costs, including the costs that

have now been internalized. At the same time, such taxes should shift consumer preference away from material consumption towards more service consumption, by taxing labour relatively less and material consumption more. As a side effect, this would also help the service sector to increased growth, and it is in this sector, we would mainly find future employment growth, also resulting in more welfare.

There are other market economic instruments than eco-taxes. One important instrument is tradable emission permits, a system often greatly misunderstood by its critics. Another, and perhaps more important, is take-back-obligations for the producers. This could have a major impact on material selection, product design and assembly techniques, and lead to the development of disassembly techniques and more advanced recycling techniques. But these instruments are not on the agenda here today.

To install green taxes will be an extremely complicated undertaking. What should be taxed? How do we measure, calculate and monitor? How high should the taxes be? We must have cost/benefit factors and price elasticities in mind when fixing tax rates. With what speed should they be introduced? It does not make sense to introduce taxes faster than science and technology can respond to their signals. And it can be costly to give them full impact in periods shorter than plant or product lifetimes.

But on top of all that we have the major difficulty, that these taxes should be international, introduced more or less simultaneously in all industrial countries. (The developing countries shall have to follow sooner or later of course. But this is a subject not considered here). Such simultaneous introduction is required to avoid distortions in international competition and plant relocations. But most important, the taxes will not trigger the massive worldwide research and development efforts required, unless all - or most - industrialized countries participate. I must confess that I do not at all view the international political scene as ready to take the measures required.

Some countries believe that they can do something for the environment by acting on their own. This may, of course, be correct for tackling purely local problems. But apart from such cases, I do not at all believe in such national stand-alone actions. They only result in more widespread use of the present best available technology, thereby achieving improvements of resource productivity by 10 or 20 percent, or perhaps even somewhat more. But always only a drop in the ocean, considering the insignificant magnitude of the results in a global perspective. What we need is to bring our T-factor down to 1/4 or less and to do so globally, and not by merely some 10 or 20 % in limited areas. We need revolutionary breakthroughs in science and technology, more of those we have seen in this century. National stand-alone actions may give kudos to governments or some ministers in the political game, but the risk is that they have a soothing effect and deflect attention from the real problems in the real world.

As a final note it should be mentioned that in spite of confidence in the market as the main instrument to counter the environmental problems, it has to be recognized that regulation will still have a role to play: as it had, for instance, with the phasing out of the CFC's. But again, such regulations should preferably be international in order to ensure sufficiently massive efforts in the market to develop replacements or new ways of doing things.

To summarize, I believe we could solve the environmental problem of the future with new science and technology, provided market forces would drive this process. In order to do that, the market must be given supplementary rules of the game - and that must be done internationally. But I fear there is a long way to go before our politicians will be able to act.

In the meantime, it is, of course, highly important to develop, analyze and discuss the instruments which could be used to correct our market economy in an eco-direction, in order that these instruments will be there on the day the international polity may be ready to take action.

Technology Development which takes care of the environment and employment at the same time

By Per Sørup [1], EU Commission, Institute for Prospective Technological Studies, Sevilla

If we could find ways in which technology could develop, innovate, so that care was taken not only of resources and pollution, but also of societal dimensions like employment, social equality, local and regional development and a healthy balance in the development of the relation between rich and poor at a global scale this would certainly merit the term "Sustainable development". Sustainability concerns environment and society: it is a notion of how to conceive a non-conflictual development embracing the "environment", but also the "haves and have-nots", as well as the "North and South". Recently attention has focused on the high unemployment rates in the EU, and has thus stressed the social dimensions of sustainability.

But is there a special role for technology to play? Can we devise a technology development which is sustainable per se? Many would deny this. Technology has always been polluting and will always be. Technology development has always been putting people off their

jobs and will always do. This article questions such quick relations and looks for long-term solutions.

First we will look at current theory of the role of technology innovation as the driver of (economic) development and generator of jobs. We will see that theory predicts that - although not straight forward - technology innovation - will be able to generate the jobs needed. Second we impose the environmental criterion of reducing materials flow as a requirement for less pollution. We will see that in theory at least materials can be substituted by labour, and that environmental concerns thus produce even more jobs. Lastly we discuss policy instruments to direct development in this direction, and find that an ecological tax reform although beneficial in no way sufficient.

Just one point of warning before we start. In this article we are not discussing whether and how tax revenue (whether coming from "green taxes" or not) should or could be used for generating new jobs (in the environment area or outside this area). And we are not discussing the golden dreams of how "environmental technologies" (filters and clean-up technologies) will be the creating thousands of jobs and revenues for European economies in the next few years to come (if pollution of course continues at present levels or are increased).

[1] The points presented in this article are not necessarily shared by the European Commission, the Joint Research Center and/or the Institute for Prospective Technological studies.

1. Technology Innovation as Generator of Jobs

Technology innovation is often considered the driver of economic growth. But what about jobs? Conventional wisdom seems to indicate that whenever technology innovates a few people are laid off. This, however, happens at the micro level, at the level of the factory, at the level of the machine. At the macro level, says theory, this is different. That technology innovation, which is conventionally seen as identical to rationalisation, and thus - at the micro-level - destroys jobs, is also a *creative destructor* is due to the fact that through process innovation, rationalisation, increased labour productivity is obtained the increase in purchasing power which drives a new round of demand-driven job-creation.

That this process is never smooth invites for a new challenging role for governance. We all know that the people that are laid off at the factory level are the "old" (and increasingly "not-so-old") and the less educated. Although theory predicts that new jobs will be available, this is not always that easy. The time-frame may be incongruent with normal individual or family time-frame. The space-frame as well. And more over: one cannot be sure at all that the laid off coal pit worker from the British midlands can (if he would) go into a London computer magazine and get the next job available.

So it is not easy. But good prospective governance may be able to do a lot. Good management, which knows the value of experienced workers with a local aptitude and which is willing to spend some months of salaries keeping their folks, should also not only be able to do a lot for employment, but probably also for their profits in a longer term perspective.

In principle it should work. But what about the environmental dimension?

2. The Environment

The necessary jobs for a sustainable social development is thus provided through increased economic growth. That this growth will be harmful to the environment seems to contradict *ad infinitum* any happy co-life between the social and the environmental dimension of sustainability. Yes, so it seems. Growth, technology development, economic growth seems intimately related to more and more pollution. But does it need to be so? No, not necessarily.

Economic growth is not only a function of labour productivity, but also a function of capital and resource productivity. Growth could therefore be sustained even lowering labour productivity if resource productivity could be increased. In the basic analyses of Solow in the 1960's of the background for economic growth, the intensity of the flow of resources through our society was never considered. However, it might well be that this flow of resources, which has dramatically increased over the last few decades, could explain from where comes the economic growth that could not otherwise be explained.

The dramatic increase in resource flow is for environmental concerns not more acceptable. In my view environmental concern is more a question of flow of materials than of eating-up the stocks and problems of substitution (and there I depart a bit from conventional economic analysis, which enjoys very much the idea that the main environmental problem can be referred to problems of exploitation of non-renewable natural stocks. Probably because stock problems fits economic theory, whereas biological equilibria do not). The flow of materials through our economic /ecological system in itself is now, however, large enough to influence important ecological equilibria with potential disastrous consequences.

In stead of optimising labour productivity, we could consider optimising the resource flow. This would provide ample background for growth and jobs at a lower and more sustainable resource flow. We would enter a dematerialisation strategy based on re-cycling, re-use and a general change from products to services. Old - almost forgotten virtues like product quality and long-life - would come to new life. Not necessarily everywhere, but in certain product areas.

Does this sound strange and a bit - you know? Not at all! The thinking was introduced years ago by large makers of office-machines like photo-copiers. They do not sell machines, they sell services, the service of having your thing photocopied, quick, reliable, and according to the best standards of the day. For that you don't care about the machine, you care about the service. That it works. And works efficiently. And for that the manufacturer needs a machine with very high quality, which can be repaired and which can be up-dated by your very skilled labour force. And of course it will work in other areas of services too. And why not also in the production/manufacturing areas as well?

And now that we have introduced some question marks, why not continue? For every thing is not that easy: Will there be markets for these products? Won't they be too costly? Do people globally share our concern? Good questions, because if such high quality products will not be sold, jobs will soon be lost. And the environment will be even better off for production will stop. 'We need to analyze this. We need to know much more. But there are, as we have seen, indication that it may work in certain areas, even in manufacturing. Biological - or ecological -farming is one area which is on its way to prove that high quality, environmentally beneficial production with higher labour intensivity (more jobs involved) are actually increasing its market shares (not least if prices are kept only marginally higher than for other similar products.

But there are more questions to be answered: what about local-regional-global economic and materials balances if such schemes of production and consumption are actually taken up by more and more? Will developing countries suffer from having their export of basic products restricted or will they - as many believe - find better ways of economic and social development if they need to find ways to produce themselves?

3. The Instruments

An increase in resource productivity requires at least that economic instruments are developed (eco-taxes) that we have the necessary technological knowledge, and that our knowledge about the resource flow (statistics) and its potential and relative dangers (weighting factors) are known. This may sound easy, but it is not the case today. And it is not easy. A lot of development work and even research is necessary. And it is essential not to let decision- makers believe that this is not the difficult area. It is.

We know a lot already of the difficulties in introducing eco-taxes. Both at the technical level and -not least - at the political level. So let me not go into details here. Let me only stress that a serious search for additional candidates for eco-tax bases (as it is known, i.e. candidates for what to tax, and how) is desperately needed. Maybe also to take the steam off the political debate on carbondioxide. And maybe to provide alternatives, if the carbondioxide after all is not that problematic: there are certainly other candidates that add to the materials flow of modern society. But from an environmental point of view we often need to know more. And from a technical taxation point of view we have sparsely started our analysis.

Now statistics. Can it really be true that we have not enough information on materials flow? Some statisticians become very upset when I enter this part of my presentation. They have been working now for years in their Statistical Bureau, have been through many a fight, have succeeded. Not always, but enough to have some statistical data to present. Yes, but only for very, very few substances (water, lead, and and?). And most often only within their national framework. The point is, that a uniform system is necessary. Water use may be the easy to quantitate and compare between EU member states. But the use of 1 cubic meter of water does not have the same weight, importance, environmental impact in Andalucia, Spain and Skaane, Sweden.

The weighting factors which will allow for comparison between regions and EU member states, not to speak about the necessary additions of water use with use of pesticides, and pollution by other products are only in their first (almost academic) being. They need international acceptance in order not to distort competition, and governments need to find their role vis-à-vis industry, not to interfere with the political innovations like "share of responsibility", which provides for the necessary decentralisation which will allow things to happen, speedily enough to work.

And let me add to this, that statistics which combine, integrate economic performance, environmental performance and social performance (jobs, local benefits, etc.) are almost non-existent. The long road towards internationally agreed "Green" National Accounting schemes, not in the form of some mystical, single "green" GDP, but in the form of satellite accounts and useful information, have only very, very recently been stipulated by the European Commission and other international bodies. Work - and for that - resources need to be allocated. And resources for statistics are not among the most popular agendas when decision-makers meet these days.

Environmental taxes in the EU member states

By Hans Bergmann, EU Commission, DG XI

My contribution to this Conference will focus on the following:

1. Current trends in the state of the environment and of employment in the EU.
2. An overview of some of the economic instruments deployed by selected EU members with regard to the environment.
3. To discuss some opportunities for tax reform.
4. To discuss some of the constraints to tax reform.
5. To raise some EU-related problems.

1. Current trends

Employment

It is clear that, generally, production in the EU is becoming increasingly automatized and this trend puts ever greater demands on the skills and training of employees. Furthermore, there is a disturbing trend of increasing unemployment. During every business cycle the trend exacerbates. We currently have some 17-18 million unemployed in the EU. There is a general recognition that steps will have to be taken to reverse this trend.

The environment

Since there are major efforts to tackle the problem of local pollution - with the major exception of traffic pollution - the European public can easily get the impression that things are improving. However, as to the more regional and global problems of pollution, there are few grounds for such optimism. We have four main kinds of problems here:

1. the problem of acidification
2. the problem of CO₂
3. the problem of ozone
4. the problem of the ozone layer

We have increasing problems connected to land use. We have problems of the loss of biodiversity; the loss of ecosystems in our coastal zones and our forests and the loss of virgin forests. In the winter of 1994-95 there was major flooding, particularly in Holland, and it was strongly suspected that changing patterns of land use were a primary cause of this. There are also environmental problems whose origin and extent are as yet unknown: such as the problem of chemical ex oestrogenic pollutants. All in all, there are few grounds for optimism.

2. An overview of eco-taxes and other economic instruments in the EU

I will limit this overview of economic instruments used in EU member states, or under consideration, to those that generate revenue and thus will not discuss tradeable permits, deposit refund systems etc.

Inputs

Taxes on water use are, as yet, not widespread (though I know they are planned in Denmark as part of the environmental tax reform). Minerals are another natural resource that are not much taxed today and there is certainly scope for measures in this field. Taxes on the use of energy, particularly on fossil fuels such as oil, coal, gasoline and diesel, are today widespread. Such taxes can be imposed on either the energy content or on the CO₂ content. Yet another natural resource input that could be taxed is the use of fertilizers which are, currently, taxed in Sweden and Finland (and are being proposed in Denmark). As to pesticides, Sweden is, currently, the only

country with such a tax though proposals are under review in a number of countries.

Emissions

When discussing taxes on emissions we are partly talking about air pollution. Here the main pollutants are sulphur, NO_x, H₂S, HC₁, soot, and heavy metals. France, Portugal and Sweden all have taxes on such pollutants.

Another kind of pollution by emissions is water pollution. Here the main pollutants are BOD, P, N and heavy metals. A considerable number of continental EU countries - Belgium, France, Germany, the Netherlands, Portugal and Spain - tax such pollutants, though to differing extents and on different substances. Germany has quite a sophisticated system of taxing such pollutants.

Aircraft noise is yet another form of pollution that is increasingly such to debate: due partly to population increase and partly to the increasing demand for a better quality of life. Germany and the Netherlands both impose aircraft noise taxation.

Final Products

Certain products damage the environment directly and some such products are directly taxed for this. One such product is electric batteries which are taxed, in different ways, in Portugal and Sweden. Another such product is polyethylene which, today, is taxed in Italy. (Previously, Italy had a tax on plastic bags but, today, the tax is only on the raw material). Yet another such product is lubricant oils, the disposal of which in nature is a major source of pollution: making critical the issue of waste lubricant recovery. Taxes on lubricants are imposed in Finland, France and Italy.

Packaging

The issue of imposing taxes on packaging is, currently, subject to much debate, especially in Germany. The "länder" in Germany have the constitutional right to impose taxes and many communities attempt to do so. This has stirred considerable controversy, and considerable work for the Commission. An important issue here is whether the recycling or re-use of packaging is environmentally neutral. But a major problem is that there is, currently, more recycling than communities can handle.

Waste

Several countries, including Sweden, are discussing some kind of waste charge. The basic idea is to have a user charge that would cover the cost of treating waste and/or an additional environmental charge, especially on hazardous waste.

Land and forest use

To protect the soil, the Netherlands and Belgium impose a tax on the number of livestock since too many livestock per hectare can lead to excess emissions of natural fertilizer.

Another growing problem is the transformation/destruction of natural lands for a variety of industrial purposes. Think, for example, of the effects of the construction of vast parking lots for peri-urban supermarkets: parking lots designed to cope with the maximum capacity of a few shopping hours on Saturday afternoon. The UK is debating whether to impose a land fill tax.

The idea of a tax on forest use is under discussion in Sweden. The idea is partly to stimulate better use of our forests.

Road pricing

Taxing the use of roads on environmental grounds will probably increase in the EU states. Some countries have already imposed charges on the use of motorways and a number of other ideas are under debate. Oslo and a number of other Norwegian cities have imposed a city toll and such measures will probably also increase since traffic pollution is such a major problem.

3. Taxation and the environment

The idea of a tax shift - increasing environmental taxes and reducing labour taxes - requires a somewhat wider definition. Such a wider definition should encompass the following:

- A. The removal of environmentally harmful subsidies.
- B. The removal of environmental distortions in current taxation systems.
- C. Increasing environmental taxes and reducing labour taxes (a tax shift).

These will be discussed in some greater detail below. But, generally, all proposals to change tax systems, and in particular all proposals to increase taxation, will meet stiff opposition since any change creates both winners and losers. But this is also why a tax shift that

creates obvious winners is strategically important.

A. Removal of environmentally harmful subsidies

According to Panayato of Harvard University, the cost of environmentally harmful subsidies on a world scale is of the order of USD 1 billion e.g. subsidies on fossil fuels, heavy industry, electricity and infrastructure. Generally speaking, to reduce such subsidies while decreasing the taxation rate on labour would be environmentally beneficial and, probably, beneficial to job creation. But to remove such subsidies is, however, not easy: there are substantial vested interests and political considerations e.g. many such subsidies sustain jobs in relatively backward regions.

The kinds of subsidies which exist in the EU states and which are potentially damaging for the environment are, inter alia:

- * state aid to airlines (which can make air fares cheaper)
- * state aid to car manufacturers (which can make cars cheaper)
- * state aid to the shipbuilding industry (do we want more trawlers and more over-fishing?)
- * state aid to coal mines (cheaper fossil fuel?)

On all these issues it is not my task, nor that of the Commission, to take a particular position: rather it is to note that such subsidies can, potentially, have environmentally harmful effects.

Yet another area in which subsidies can have environmentally harmful effects is the allegation that certain member states charge very low prices for water to agriculture e.g. for irrigation.

B. Removal of environmental distortions in current tax systems

It is clear that many taxes affect behaviour and hence can have an environmental impact. For example, subsidies or tax deductions on the use of company cars can mean that the user has, in effect, a zero marginal cost on his/her car use.

The firm Moret, Ernst & Young are undertaking a study of this issue for the Commission. The report is to cover all member states and should be ready by the end of 1995.

C. A tax shift

The proposal for the introduction of a common EU CO₂ tax would generate income of the order of 1% of EU GDP. Many have regarded this proposal as far too radical. However, if we take an historical perspective, we can see that the tax burden generally, the share of GDP accruing to the public sector, has increased from roughly 30% to 50% over the last thirty years or so. Thirty years ago, few could have imagined this and many would regard it as far too radical! A further example is to review the changes in the cost of energy over the last 30 years. After a major rise in real terms in the 70's, it is now calculated that the cost of petrol to the consumers has actually decreased over the last twenty years: at a time when real incomes have, on average, increased.

There are major market opportunities involved if our societies are transformed by, among other things, a tax shift in a more sustainable direction. Such a tax shift would provide incentives to the development of a whole range of new machinery, new products, new energy sources, new raw materials and new knowledge and ideas. Such a tax shift can, by creating new demands, create new jobs. It can also promote major changes in technological development. A tax shift can even push firms to take action which today is profitable but which is not undertaken due to conservatism.

Problems of a tax shift

In discussing the problems of a tax shift it is worth remembering that it is always easier to see problems than to see opportunities.

Resistance

But problems do exist. One of these is the problem of resistance. Every change always creates winners and losers and it seems to be a fact of life that the losers are more vocal and more powerfully organized: perhaps because winners don't always know they are winners or else because they take a low profile. There are, however, signs that the supporters of a tax shift are becoming more vocal and organized. Recently, the Economist stated that, within the general field of environmental legislation and eco-taxes, green industry lobbyists are increasing in strength. And there are signs that those firms that profit from tighter environmental legislation are beginning to organize themselves to support environmental regulation.

Competitiveness

The whole issue of the effects of a tax shift on competitiveness is a crucial one. It is quite clear that such a tax shift would affect the competitiveness of many firms. The issue is real but it is sometimes overstated. It must be remembered that environmental costs, including

eco-taxes, are only one of a number of cost factors and that these other factors are usually more important. They include exchange rates, income and company tax, rules and regulations in general, interest rates and, perhaps above all, labour costs. Perhaps there is a tendency to focus excessively on environmental costs and eco-taxes because they are relatively visible and relatively new.

The argument concerning the damage to the international competitiveness of the firm or branch also requires a closer look. Let us look at those countries and regions which are the EU's major competitors. One major competitor is the USA which has, generally, somewhat higher salaries and stricter environmental regulation than the EU. And the same is true, generally, of Japan. The Newly Industrialized Countries (NICs) tend to have lower wage costs than the EU and lower standards of environmental regulation. However, real wages are increasing rapidly and there is growing concern among the NICs about their massive environmental problems. For example, Taiwan is planning to invest around USD 1 billion over the next ten years in environmental protection measures. Furthermore, standards of environmental regulation are becoming stricter among the NICs.

Administration and control

One major problem, or perhaps fear, is that given that the imposition of environmental taxes requires strict control, this will lead to excessive bureaucratic controls. And it is certainly important that taxes on, for example, energy are controlled. This, however, need not be a major problem. After all, we already have a vast system of administrative control vis-à-vis personal income tax, involving millions of subjects. With environmental taxes there are fewer tax subjects.

From my own Swedish experience in working with the Swedish Ministry of the Environment and EPA, I know that the administrative costs of eco-taxes are very low. Furthermore, it is possible to create a system which gives firms an incentive to declare the correct figures. One such method is not to allow tax deductibility for the cost of a taxed input unless the environmental tax has been paid.

Fiscal and incentive effects

One problem that is often discussed is that both the incentive and the fiscal effect of environmental taxes can be so great that the tax base is eroded. There will certainly be a tendency for producers and consumers to substitute away from those goods and inputs which are subject to environmental taxes. But, looking on the bright side, were such tax bases to be so eroded that they disappeared then there would be no more environmental problems. This state of affairs will, unfortunately, probably not occur for a very long time. But the problem does emphasize the need for flexibility and change in eco-taxation.

4. Some EU-related problems

The internal market

Large differences in taxation between member states, including environmental taxes, can be perceived as a hindrance to the well-functioning of the internal market. However, the principle of subsidiarity gives the member states large scope for action in the sphere of environmental taxes. From the point of view of the Commission such taxes are OK providing:

- * they are non-discriminatory
- * they do not require border controls

Particularly the non-discriminatory requirement does cause some problems. If such charges benefit local producers, they will have little reason to complain. By contrast, those who are harmed by such charges are often, geographically and politically, some distance away. The Commission is aware of this problem and tries to monitor the issue of non-discrimination carefully.

Both for industry and for environmental protection there could be advantages in the harmonization of environmental taxes and charges. But such harmonization is, politically, very difficult to achieve (as our own experience with the Commission's CO₂ tax proposal has indicated).

State aid

The issue of state subsidies and concealed subsidies is one in which the Commission has considerable powers. On the levy side, such environmental taxes can be more difficult for a foreign firm to bear or to avoid in a legal way. A related problem is the issue of environmental tax exemptions which primarily benefit national firms. Such tax exemptions can create problems of fairness. Tax exemptions may well be regarded as a form of state subsidy.

There are also problems as to the redistribution of revenues. Certain kinds of redistribution can be regarded, under EU regulations, as illegal subsidies.

5. Conclusions

There are obviously both opportunities and problems in the implementation of an ecological tax reform. As can be seen, and as I have tried to illustrate, there is considerable creativity as to the charges/taxes used by member states. One important issue is to actively spread information around the EU as to what proposals and initiatives are taking place. We are now setting up a network of environmental economists, from all the ministries of the environment and of finance, for the whole EU.

Changes in this field are occurring rapidly and it is probable that environmental taxes will constitute an increasing part of tax revenues. To continue to go forward, it is important that we find the positive and beneficial links between the environment and the economy and ensure that they do not, so to speak, stand on opposite sides of the fence.

Environmental tax reform in Denmark: Scope, perspectives and employment effects

By Kåre Clemmesen, Economic Council of The Labour Movement

The following contribution represents my personal views, which are based partly on the preparation of the 'Dithmer' report in my work in the Danish Ministry of Finance.

Throughout the last few years, there has been a public debate in Denmark as to whether we should use more eco-taxes on polluting goods and production processes and use the revenue to lower taxation on labour income. This tax-rearrangement has been termed an ecological tax reform.

I will talk about the possibilities of moving in the direction of an ecological tax reform by the use of green taxes and about the possible effects on the level of unemployment.

1. Ecological tax burden - scope and perspectives

Denmark is usually seen as one of the pioneer countries in this matter. In Denmark there is wide public acceptance of the need to use taxes as one of a variety of instruments to reach the desired higher standards of environmental quality.

Today, and especially after the last tax reform in 1994, we have quite a few different taxes and duties that can be categorized as ecological. I will not give a detailed description here.

On a larger scale, how far has Denmark gone in the direction of ecological taxes - i.e. how large is the ecological tax burden ?

It depends on what we understand by an ecological tax. It is not as self evident as it sounds. Some of the taxes and duties which are now considered ecological, were in fact originally introduced for other reasons than the environmental aims which are now important. And some of the ecological taxes are, even today, primarily regarded as payments for use of public goods, payments which cannot be seen as environmental.

I think two different measures can be used when the purpose is to add up the various ecological tax and duties - a narrow measure and a broader one.

Narrow measure of eco-taxes

The narrow measure of ecological taxes includes the taxes which are levied directly on goods which contribute to overall pollution (e.g fossil energy, waste, sewage) or natural goods which are scarce because of the pollution level e.g. drinking water.

This includes taxes on: Gasoline, oil, natural gas and other fossil energy products, electricity, water, sewage, pesticides, waste and packaging.

If we use the narrow measure of ecological taxes we reach an overall ecological tax level of about 2.8% of GDP (in 1994). According to the income tax reform which started in 1994, the level of some of the environmental taxes (especially on water and electricity) will be raised gradually each year until 1998. In 1998 the narrow measure of ecological tax level reaches 3.7% of GDP.

Originally the taxes on energy, which are by far the most prominent of the taxes listed above, were introduced for other reasons than

environmental considerations. After the second oil crisis in 1979/80, the main reason for the introduction of energy taxes was to lower dependence on imported crude oil. Later, energy taxes became very important for overall fiscal revenue.

Broader measure of eco-taxes

The broader measure of ecological taxes includes in addition:

- The registration duty on motor vehicles and
- the weight duty on motor vehicles.

It can be argued that these taxes should be included in the ecological tax level measure. They contribute to the environmental standard by making individual transport by motor vehicles more expensive compared to e.g. public transport. Thereby they induce a reduction in transport, or a shift in transportation in a direction that reduces the overall pollution from vehicles.

On the other hand, such tax payment for the purchase and use of a car and other vehicles, can be seen as an indirect payment for the use of roads and bridges, which are constructed and maintained by the public. This has in fact nothing to do with the environment. However, these 2 taxes are of great importance for overall tax revenue. They contribute almost 1.7% of GDP.

The broader measure of the ecological tax level - including these taxes on car purchase and usage - thereby adds up to about 5% of GDP (in 1998).

The ecological tax level of 5% of GDP should be compared to the overall tax burden in Denmark, which is in fact about 50% of GDP. Given this, the Danish tax system can be said to have gone some - but only some - of the way towards an ecological tax system.

How much more eco-taxation is possible ?

Surely it is possible to go further in the direction of an ecological tax reform. But how large an ecological tax burden is really attainable ? I do not think that the overall ecological tax burden can be more than doubled, that is, raised by 5% to about 10% of GDP, thereby enabling a reduction in the personal income tax burden of the same size.

As I see it, there are only a few obvious areas which can be seen as new targets for ecological taxation. One of them is the use of fertilizers and pesticides in agriculture. Another could be taxing the use of more organic solvents in production processes. Likewise, a duty on the use of heavy metals would surely be a very good idea.

But to reach an ecological overall tax level of 10% of GDP, it will undoubtedly be necessary to double the tax rates of most of the existing, important environmental taxes, i.e. the energy- or traffic-related taxes. This would, in practice, mean doubling the registration duty on motor vehicles, resulting in about a 60% increase in market prices; and the prices of gasoline and other fuels should be raised proportionately.

But this may not even be enough to reach an overall ecological tax level of 10% !

Reduction of the eco-tax base

The idea behind the introduction of environmental taxes, is the well-established fact that consumers and producers respond to changes in relative prices and thereby use less of the polluting material e.g. gasoline, when a tax is levied on it.

The implication of this behaviour is that a reduction of the tax base occurs simultaneously e.g. the total consumption of gasoline falls when the energy duty is raised. The total revenue from the ecological tax does not increase in proportion with the tax rates.

The effect depends on the elasticity in the demand for the good i.e. how much the demand for the good changes when the price of the good rises by 1%

This tax-base-reduction-effect is of more than theoretical importance when the tax constitutes a major part of the market price. And this will be the case when we have to double the registration duty on motor vehicles - which accounts for about 2/3 of the market price of household vehicles. The same is the case with the tax on gasoline - which accounts for about 2/3 of the market price.

Let me make my point clear by using an example.

Assume that the price elasticity in the demand for the good is 1, which means that consumers will, all in all, spend the same share of their disposable income on the good, regardless of the price.

Assume the net price of the good is 100 Danish crowns. Assume in addition, the green tax constitutes 100% on top of the net price i.e. DKK 100. So the tax corresponds to 50% of the market price, which is DKK 200. This is shown in the following example:-

If 1000 items are sold, the total consumer purchase will be

$$1000 \cdot 200 = \text{DKK } 200,000$$

and the government tax revenue will be

$$1000 \cdot 100 = \text{DKK } 100,000$$

Assume thereafter, that the green tax rate is doubled to 200 DKK. This means that the market price of the item will be raised by 50% to DKK 300 whereby the tax is 2/3 of the market price.

If the elasticity of demand for the good is 1, the consumption will drop by 1/3 to 66% of the original level, that is 666 items. Thereby, the total purchase of the good still totals DKK 200,000.

The point is this: the eco-tax base drops by 1/3 along with the drop in purchases of the good. The result of this operation is an increase in the tax revenue of only:

$$(133,300 - 100,000) / 100 = 33\%$$

The problem becomes worse if we double the eco-tax rate once more, so that tax constitutes 4/5 of the market price instead of 2/3. This operation raises the revenue by a mere 20%, as shown in the example. And so forth.

EXAMPLE (when elasticity of demand is 1):

Before:

	Price: (DKK)	Demand: (items)	Revenue: (DKK)
Net price	100	1000	100,000
Green tax	100	1000	100,000
Market price	200	1000	200,000

After doubling tax rate:

	Price: (DKK)	Demand: (items)	Revenue: (DKK)
Net price	100	666	66,600
Green tax	200	666	133,300
Market price	300	666	200,000

Fall in tax base: $(666 - 1000) / 1000 = -33\%$ Increase in tax revenue: $(133,300 - 100,000) / 100,000 = 33\%$ Next doubling of tax rate:

	Price: (DKK)	Demand: (items)	Revenue: (DKK)
Net price	100	400	40,000
Green tax	400	400	160,000
Market price	500	400	200,000

Fall in tax base: $(400 - 666) / 666 = -40\%$ Increase in tax revenue: $(160,000 - 133,300) / 133,300 = 20\%$

Of course the size of the price elasticity of demand is of central importance to this calculation. It could very well be larger or smaller than 1 - and could, of course, be estimated before the introduction of the ecological tax.

In the main econometric model of the danish economy - ADAM - which is widely used by ministries and institutions in Denmark, the

price elasticity for most groups of consumer goods is around 1.

The elasticity of demand for the good may be less than 1. Then the tax revenue effect will be more positive than the above calculations indicate. This is the implication in situations where the tax does not have a very great effect on the demand for the good. The other side of this is, however, that the environmental effects of imposing the tax on this good will be relatively small.

If the elasticity is greater than 1 for certain items - which cannot be precluded in advance - the tax revenue will increase less than in the calculations shown above. With higher tax rates, the revenue gains of raising the tax rate further eventually becomes negative in this case.

Many goods may seem to have a much lower elasticity than 1. But this may only be the case in the short run. If very heavy green duties are imposed on certain goods, there surely will be major incentives to construct alternative substitutable ones. Gradually the tax base will erode.

My point is that, with a total tax burden around 50% - as is actually the case in Denmark - it is not realistic to imagine a tax system which is primarily based on ecological taxes. The tax base would erode gradually. On the other hand, as this is a sign of an effective reduction of the pollution level, the tax works as it should.

All in all, an ecological tax reform is good for the environment, but it is not an instrument that can lead to a major decrease in the income tax burden.

2. Employment effects of an eco-tax reform

With the reform of the income tax system in 1994, personal income taxes were lowered and, simultaneously, some green taxes were imposed on households (water, electricity, waste). In the years to come, (until 1998), the environmental tax levels on households will be raised gradually, while the marginal income tax will be lowered by some percentage points.

Actually, only about 30% of all the environmental taxes are paid by the corporate sector, and in the years to come this share will be reduced somewhat because of the upscaling of environmental taxes on households. So a major objective of the current government has been to obtain a fairer distribution of the overall environmental tax burden between the household sector and the corporate sector.

Today the CO₂-tax rate on the corporate sector is a mere DKK 50 pr. ton CO₂, which corresponds to about 10 USD pr. ton. And there are a lot of exemptions.

These considerations were part of the terms of reference in the preparation of the official report 'Green Taxes and the Corporate Sector', called the Dithmer Report after its chairman (the report was issued in april 1994). A much discussed part of the report were the estimates of the employment effects of introducing a higher CO₂-tax on the corporate sector.

Employment effects estimated in the Dithmer report

The estimations in the report took as a benchmark a CO₂-tax of DKK 200 pr. ton of CO₂, faced in gradually over 4 years. After full-inphasing in the year 2000, this would give a tax revenue of about DKK 6 billion, corresponding to about 0.6% of GDP (DKK 200 corresponds to 51 DM or 37 USD).

The analysis was carried out by using the macroeconomic model ADAM and some smaller satellite models, constructed especially for the purpose. The models revealed that the employment effects of this taxation would be rather small, but positive, if the tax revenue was returned completely to the corporate sector.

The preferred instrument used to return the tax revenue was tax reliefs in the social security contributions of the corporate sector. Alternative instruments analyzed were reductions in personal income tax and the value-added tax (VAT).

The overall effects of the CO₂-tax, if it is returned completely to the corporate sector by tax reliefs on social security contributions, can be divided into 4 parts:

(a) Direct tax effect

The direct effects of the tax on CO₂-emissions were estimated to be at their maximum 5 years after the phasing in of the tax began, resulting in a total loss of 29,000 jobs. This corresponds to about 1% of total employment in Denmark (in 2001). The main reasons for this job loss are a decrease in the competitiveness of the corporate sector and, especially, the general fiscal contraction effect of the levy of an extra tax.

(b) Return of tax revenue

The return of the tax revenue by reliefs in the compulsory social contributions almost regains corporate competitiveness and, at the same time, acts as a fiscal relief comparable in size with the direct contractive effect of the tax. The job gain resulting from the return of the tax revenue was estimated to be 24,000 jobs after 5 years. This corresponds to about 0.85% of total Danish employment (in 2001).

The analysis showed that the gain would be much less if other tax instruments were used for returning the revenue e.g. reductions in personal income tax or in value-added tax (VAT).

The direct effect of the CO₂-tax, when it is completely returned to the corporate sector, is not neutral. Most of the firms, in sectors which are in international competition, are not compensated fully by the returning of the tax revenue, when the return is linked to their use of labour. Such firms are relatively energy intensive and less labour intensive than other firms. So the overall result is a loss of employment, estimated at 5,000 jobs.

(c) Substitution effect

With the imposition of a CO₂-tax on energy use, firms will seek to reduce their use of energy and instead use more of the other production factors - real capital and labour - to reach the necessary production level. This is called the substitution effect. This is the whole idea of the operation. The substitution towards labour comprises taking on new staff to monitor energy use, to insulate pipes, to construct new low-energy-use machines and so forth.

It is assumed in the model, that this substitution takes place gradually over 6 years - the period it takes to change the capital equipment and the production technology of firms. This assumption is the same as that used in the latest version of the main econometric model of the Danish economy - ADAM.

After full substitution, the result is a gain of 9000 jobs, which corresponds to about 0.3% of total Danish employment. This is a modest, but realistic, assessment of the overall substitution effect.

All in all, the model estimations described above resulted in a gain in employment of about 4,000 jobs after 5 years, corresponding to 0.15% of total Danish employment.

(d) Friction costs

However, the model calculations did not include the costs of any closure of very energy-consuming firms and plants. Or more generally, the costs of being forced to shift from one technology of production to another earlier than the natural depreciation of the capital apparatus; such costs were not taken into account. In the Dithmer report, such costs were termed friction costs.

It is very difficult - almost impossible - to estimate the friction costs on model grounds. They were, however, assumed to be rather small, because only a small part of manufacturing industry would experience relatively large cost increases as a result of the higher energy prices. Most of the technology shift would therefore take place gradually together with the normal depreciation process of capital.

On the basis of such calculations and arguments and of usual sensitivity analysis, the overall assessment of the employment effects of the CO₂-tax was assumed to be neutral or at least very modest - less than 10,000 persons in overall gain or loss - which corresponds to 0.4% of total employment.

It must be emphasized that this assessment is based on the assumption that the phasing in of the CO₂-tax takes place at a rather modest pace. The report emphasized that higher tax rates - e.g. doubling the CO₂-tax target to DKK 400 pr. ton of CO₂ - or quicker phasing in of the tax would increase the friction costs relatively steeply. The employment effects were assessed to be neutral only in the case of a gradual phasing in at a modest pace.

Outcome of the Dithmer-report

The Dithmer-report resulted in a violent public debate, especially between the manufacturing industries' federation and the ministries. The industrial federation claimed that the ministries underassessed the costs for the competitiveness and friction costs of the manufacturing sector.

The outcome of this debate was the decision (taken by the government in the Spring of last year) to gradually introduce a rather modest CO₂-tax and SO₂-tax, with a total tax revenue of about DKK 2.1 billion, corresponding to 0.2% of GDP, when fully phased in the year 2000. The revenue is sent back to the corporate sector in a combination of tax reliefs on social security contributions and subsidies for investments in energy-conserving technologies.

This outcome cannot be said to contribute much to the overall shift of the tax burden towards more emphasis on ecological taxes. In 1998, the corporate sector will still contribute less than 1/3 of the overall ecological tax burden.

Employment effects of a general ecological tax reform

Back to the main issue: Could an ecological tax reform - if it is at all feasible - help combat unemployment in Europe?

Nowadays, most economists think that the unemployment level - except for some cyclical variations determined by the general cyclical situation of the economy - is a result of labour market conditions: or, more precisely, the degree of wage flexibility in the labour market, which eventually can be altered by changing the unemployment benefit system and so forth.

They think there is a long-term equilibrium level - the so-called natural or structural unemployment level, to which the unemployment level seeks in the long-run - if it were not for the constant shocks to economic activity. This is the idea of the so-called vertical long run Phillips curve i.e. in the long run, there is no trade-off between unemployment and inflation. The implication of this is that fiscal or tax policies cannot change the overall unemployment level in a permanent way.

There is a lot of empirical evidence that this is actually the case in the long run, given that structural employment is not really "natural" and permanent, but is a result of historical processes: a long period with high unemployment generates high structural unemployment etc.

Gives this, the introduction of an ecological tax reform could not do much to alter the unemployment level permanently.

Some economists (including myself) think that the level of structural unemployment is changeable in a 4-5 year time horizon by such measures as job opportunities for the unemployed i.e the actual level of unemployment influences structural unemployment. But other problems emerge:

Why should an ecological tax reform create more jobs ?

The argument is normally this: the ecological tax re-arrangement leads to a lowering of taxes on labour income. It thereby reduces the wage level and lowers the costs of hiring workers, hence increasing the number of people getting hired.

But is this really the case?

The crucial point in this sequence of arguments is the statement that labour costs actually reduce as a result of the tax rearrangement. Let's analyze some practical situations:

(A) Following the idea of the tax reform of 1994, ecological taxes on various consumer goods (for example, water, waste, electricity, gasoline, plastic bags and wrappings) are raised year by year. Personal income tax is reduced by the same amount as the revenue from the rise in ecological taxes.

Why should this lead to lower wages ? The overall tax burden on the consumers is the same as before the tax re-arrangement. Therefore there is no cause to believe in special restraint in wage demands, leading to lower real wages. The overall wage costs will be indifferent (unaffected). The unemployment level will not be lowered at all.

This tax rearrangement is, anyway, a very good idea, because it leads to lower marginal income taxes, hence reducing some of the distortion which today's high marginal income taxes puts on the labour supply situation. Whether it will lead to more or less labour supply is difficult to say, but fundamentally it is a good thing to lessen tax distortions in the economy.

(B) It does not matter much whether the tax revenue is sent back through lower social security contributions rather than by lowering the income tax level. This tax re-arrangement appears to lead to a reduction in labour costs. But consumers pay fully for this re-arrangement via the increase in the tax burden on consumers of the extra environmental taxes on consumer goods. There is every reason to think that consumers will claim full compensation through increased wages - net of social contributions - of the same amount as the increase in the ecological tax burden. Therefore, in this situation, labour costs will not decrease.

(C) Another possibility is levying green taxes on the corporate sector and sending the revenue back to the corporate sector in the form of tax relief on social security contributions. Thereby, the cost of labour are reduced, keeping households neutral and corporations fully compensated. This corresponds to the fundamental ideas underlying the Dithmer report.

Unfortunately, it is difficult to design a system which fully compensates those parts of manufacturing industry which are most exposed to international competition. But, if the green taxes were introduced at the same time and with the same level in all of Europe, international competitiveness would not be much of a problem. So international coordination on this is very important.

To sum up, eco-taxes on the corporate sector which are sent back to the corporate sector as tax reliefs on wage costs eventually can help create new jobs. In contrast to this, green taxes levied on the household sector would have no effect on the unemployment level.

3. Some distributional aspects of an eco-tax reform

I will end my presentation by briefly pointing to another important problem arising in connection with the transition to a more ecological tax system: the distributional aspects.

Some of the green taxes may be seen as progressive, because they are imposed on goods which are primarily used by high-income groups e.g. the registration duty and the weight duty on car purchases and the tax on gasoline.

Others will be regressive in that they are put on goods which represent a larger share of the consumption of low-income groups e.g. heat and electricity.

In general, I think, it is reasonable to expect that, on average, green taxes will be neutral as regards income groups. But that, however, does not solve all the problems. With more emphasis on green taxes and less on taxes on labour income, the distributional demands to reach a certain degree of progression in the overall tax system become larger for the rest of the tax system, especially income tax.

Ecological Tax Reform - Presentation of some items of the political debate in Germany and policy proposals for the international community

By Dr. Hans-Jochen Luhmann, Wuppertal Institute

I have been asked to give a short presentation of the discussion and - perhaps - first steps of development with respect to the issue of an Ecological Tax Reform (ETR) in Germany. In fulfilling this request I will deal with the three following topics in my presentation.

- a plea for placing the ETR-issue in the context of existing legal arrangements/legal, preconditions;
- a review of recent decisions and events in Germany which may influence the further development of the ETR-issue and how it might be realised;
- a special and very sophisticated policy proposal which has been elaborated by a committee, set up by the conference of the Environmental Ministers at a state level. This proposal may possibly stimulate the development of similar tax proposals in other countries.

1. Legal arrangements/legal constraints

(A)

Legal arrangements which impose severe constraints on any conception of an ETR are in my view: The Framework Convention on Climate Change (FCCC) as well as that part of the German constitution which rules the issue of fiscal affairs.

With respect to the provisions of the FCCC my colleagues from the Wuppertal Institute and I would like to make a plea for introducing an overall energy tax in Germany as the main ecotax within an ETR. Such an overall energy tax may be based on the physical energy content of the energy carriers but not including renewable energy sources. The main argument favouring our approach from the scientific point of view is our recommendation to address all those activities which result in emissions of trace gases coming under the mandate of the FCCC and, under that mandate only. You may have in mind, that not only trace gases which contribute to the greenhouse gas effect directly are ruled by the FCCC. The provision also applies to all precursors of GHG. On the other hand our recommendation implies that substances which contribute to the greenhouse effect, but are already regulated under the Montreal Protocol may not be included in the base of the main ecotax within an ETR.

(B)

Following these principles outlined above we tried to determine by means of an - admittedly - very rough calculation the relative importance of substances emitted within the boundaries of Germany mainly according to the figures which are officially reported to the Secretariat of the FCCC. The main conclusion from this calculation is: As most of the emissions taken into account are "energy related", an overall energy tax seems to be the best approximation of a general greenhouse tax which is fully in line with the FCCC and the commitments which are being planned under this convention. "Energy related" in this context is a term officially defined and used in the national communications which Annex II-countries are obliged to deliver to the Conference of the Parties to the FCCC. It refers to all GHG-emissions which are due to the use of energy carriers in production, transfer (transport) and distribution as well as the eventual burning in the end-use sector. Those energy related gas emissions account for about 80 % of the total GHG-emissions in

Germany. Therefore I think it's quite right to point out that an overall energy tax seems to be the best 'proxy' for an overall GHG-tax perhaps one should add: under the FCCC.

(C)

The second legal provision/ legal constraint mentioned is the German constitutional law. In general it has great influence on policy strategies as German experience in the past has revealed. In the case of the subject "ETR" considered here I should refer to the exact wording of the central provision given in the German financial constitution. According to this the different types of taxes German governments are allowed to levy or to introduce are definitively enumerated. In this enumeration you can find the mandate to levy that kind of taxes which are in English called "excise (taxes)". That is the same term which has also been used during the last century in Germany ("Akzise"). But starting with the version of the German constitution which was adopted after the First World War this expression has been switched to a pure German one since then called "consumption tax" (not consumer tax!). According to this wording the majority of legal experts in my country agree in assuring that "input taxes" - which energy taxes are - can come under this provision. On the contrary with respect to "output taxes" levied on different GHG-gases emitted there are severe doubts in the community of legal experts that the constitutional provision legitimately can be extended so far that output taxes are also covered. The discharge of materials into the environment can indeed hardly be seen as being any kind of consumption, unless you want to assume that nature is 'consuming' the pollutants discharged. That is the reason why I am quite happy to see, that the tax base we recommend choosing for reasons of climate policy is at the same time the only one which is, given the German constitutional law, legally feasible.

2. Recent developments in Germany

(D)

The issue of energy taxes under the heading of "making a first step towards an ETR" is now gaining momentum. The reason is mainly: difficulties in financial resources. Up to now there have been only two tax proposals which have been elaborated on in detail, i.e. the EU carbon/energy tax proposal as well as a waste levy proposal at federal level. But in neither case has the lead in doing so been taken by the Ministry of Finance which is also responsible for tax matters in Germany - the responsibility for taxes and the budget it is not split as in Denmark. Up to now the general behaviour of the Ministry of Finance in my country is not to further any development of eco-taxes e.g. by establishing a professional capacity in its department. That is in my view a severe deficiency which may cause some delay in the further development in Germany. Furthermore, I am personally somewhat astonished to see that the German Minister in charge tries to deny a tax source that the people agree to be taxed on. As far as I am familiar with the history of taxation, that would be the first case in history where such behaviour of a Minister of Finance would be successful in the long run. I think it is due to the same consideration that the head of the ruling faction in Parliament, a Christian Democrat and former member of the Budget Commission in Parliament, has now taken the lead on the subject of ETR. He has installed a working group in his faction where 10 members of parliament, some of them ministers and deputy ministers, participate. This development means that results are to be expected shortly. All the important parties with representatives in the federal parliament are now in agreement on taking "first steps" towards an ecological tax reform.

But given the context I described what will be done as a first step cannot be very important - the lack of professional preparatory work on the subject cannot be without consequences. So what can be expected is:

- a kind of electricity tax which is only a substitute for the one we had up to the end of 1994 and which has been ruled out for pure formal legal reasons only;
- some extension of the tax base and the abolition of exceptions in the well-established mineral oil tax system which in Germany already includes not only mineral oil products but also the most important competing energy source, natural gas;
- the abolition of some minor subsidies which now seem to be environmentally unsound.

(E)

With respect to the compensation side of an evolving ETR in Germany the positions held are split. One faction is lobbying for spending the extra money for environmentally sound projects. The other one prefers a revenue neutral ETR and to channel the money back by transferring some jobs which have up to now been financed by the social security system to the general tax financed budget. That would reduce social security contributions and consequently marginal labour costs.

3. Provisions inside corporate revenue or profit taxation instead of or in addition to additional energy taxation

(F)

I guess that about half of the "energy related" emissions in the end-use sector in Germany originate from activities taking place in enterprises, i.e. in the business world. I.e. they are emitted from legal entities that are obliged to pay taxes on corporate income or profit. The other half of the emissions originate either from activities which are called "consumer activities" or from activities which are connected with non profit orientated activities of state authorities or charities and similar institutions.

These facts are the background of an innovative policy proposal which was elaborated in Germany last year. This proposal has only just begun to become fully acknowledged and has started to influence political debate.

(G)

One of the most severe problems faced with if introducing a uniform energy tax based on the physical contents of energy will be the completely unequal impact of such a uniform tax for the taxpayers in different sectors. As the disproportional effect of raising energy prices by means of energy taxation is generally recognized, two conclusions are generally drawn. First: In every proposal for additional energy or carbon taxes elaborated in the last few years I have become aware of provisions being introduced with the aim to protect that part of industry which is competing on the world market. The instrument generally used - not a very imaginative one - is exemption. The second conclusion generally drawn is: to restrict the rise of energy prices via energy taxation to only very modest price increases. As far as I see tax induced price increases in the range of 10 to 20% are generally considered as being very 'strong'. Having these constraints in mind there seems to be an urgent need for more imaginative solutions. The one I am talking about here seems to me being in accordance with the criterion "imaginativeness" for the promotion of ETR proposals which can be really implemented without giving place to too many exemptions.

(H)

One starting point of the proposal elaborated on behalf of the conference of Environmental Ministers in Germany is that they tried to be in accordance with the kind of tax reform which other groups in my country have for some time already been struggling or lobbying for.

First of all there are the Ministers of Finance. One of their main aims is to decrease the costs of administering tax inflow by making the tax system "easier" to administer. Under the main ideas in pursuing this aim is to substitute the need to declare expenditure in any particular case by some kind of lump sum provision. The second motive playing an important role is the fact that many people in Germany believe that the tax burden of industry which is subject to profit taxation must be decreased, so that industry will be able to get a more competitive position on the world market.

In the proposal both of these motives are successfully combined, i.e. first of all it is not a revenue neutral proposal of an ETR but one by which the tax burden of industry as a whole is intended to be net decreased.

It is a kind of lowering the tax burden of industry according to a new criterion. Up to now in the center of the discussion we have in Germany on this subject there are proposals for abolishing taxes which are levied only on a part of industry and which are - at least to a certain degree due irrespective of the fact if positive revenues were produced or not. According to the new criterion introduced here tax reduction should be granted in proportion to the 'energy efficiency', measured purely financially in terms of value added per value of direct energy use, i.e. expenses for energy carriers.

(I)

The other starting point of this proposal is a very fundamental consideration: If you want to promote climate-friendly behaviour in industry the increase of energy prices is not the only possibility of providing economic incentives to favour energy efficient investments.

If you consider investment behaviour and the calculus which it controls, the problem you are faced with is only to change the relative costs of energy use on one hand and of their alternatives, i.e. the use of renewable energies as well as energy conservation, on the other hand. Raising energy prices by taxes is only one special solution for this problem. The other solution is to make the alternatives for energy use more profitable. That is generally done by granting subsidies either on R & D or for investments. But for enterprises, subject to profit taxation, a more sophisticated possibility can make alternatives more profitable. This possibility is the main item of the proposal I am talking about. Its impact on the investment behaviour of firms is much higher than the influence which can be achieved by taxing energy prices in general. Assuming that the marginal tax rate of profits is generally 50% (it is in reality in Germany much higher) the effect on the relative competitiveness of energy use and the alternatives by introducing lump sum provisions into the corporate taxation system can be about 100% that has to be compared with the effect of typical energy tax proposals which have, in my view, generally a ceiling, a maximum increase of about 20%. So, that is one main conclusion, the incentive effect of solutions to the problem put to the corporate of profit taxation system can have a much stronger influence than the instruments which we normally consider, namely energy taxes.

(J)

The main content of the proposal is as follows. As a first step, it is proposed not to include expenditure for energy use (with the exception of renewable energies) in the amount of expenditure used to calculate the tax base, the profit, which is defined as excess of revenues versus expenditure. This measure alone would first constitute a severe additional tax burden for companies according to the amount of energy they consume. Secondly it would bring the announced drastic switch in the relative competitiveness of fossil energy use and energy conservation measures by about 100%. You can see this effect by noting that the after-tax-value of expenditure of enterprises making profits is only half of the price they pay on the market. If energy expenditure is no longer allowed to be tax-deductible the value of avoiding such expenditure has to be calculated - it is twice as high as previously. That is the way it will be calculated in internal feasibility studies for energy related investments. The rationale found that is to introduce after tax effects into the calculation scheme where it is usual to use pre-tax figures.

The second step of the proposal is designed to compensate the negative effect on corporate profits if the profits were restricted to the first step. The second step is the provision of allowing deduction of taxable expenditure for energy use but now not based on real expenditure but instead on a lump sum basis, e.g. 3% or 5% of the total expenditure of the individual firm. The average energy expenditure in German industry amounts to about 2.6% of the total expenditure. Allowing for a lump sum deduction of 3% or 5%, this means that industry as a whole will win from this provision. It is furthermore intended to allow every enterprise to opt for or against the lump sum rule. If - as is the case for enterprises in energy intensive industries - the expenditure for energy use exceeds the upper margin of the lump sum provision, the enterprise concerned may itself opt out with the effect that it is unaffected by that innovative measure, I chose to make it the subject of the last part of my lecture.

Thank you for your attention!

Sustainable Economy

By Stein Hansen, Sustainable Economy

1. Can we survive with green advice?

1.1 Background

The Norwegian society and economy has changed drastically over the last 40 years. Real GDP has increased fourfold, and many activities that constituted key pillars of the economy and society in the mid-1950's are now extinct (commercial whaling and the floating of logs being two such examples). At the same time, a number of new economic activities that were not even in our vocabulary at the time, have taken on a dominating role. These include fish farming, computer hardware and software, modern means of communication, petroleum sector activities, and a series of public and private services. It was also not foreseen at that time that women would enter the labour force to the extent they have done. In retrospect we can safely conclude that our projections in the mid-1950 for the turn of the century missed the target by a large margin.

It appears that the exogenous and external conditions faced by us as consumers and producers are changing at an accelerated pace. We must prepare ourselves for a life in the future world that is much more integrated and unpredictable than today's, with a more competitive business environment and increased interdependence between individuals and nations. New technologies keep appearing and we will undoubtedly have a much higher educated labour force in the future. At the same time the demographic profile of our population projects the share of senior citizens to grow rapidly. While it appears virtually impossible to predict what Norway and the world will look like 40 years from now, it will be necessary to plan today for how our social welfare shall be secured the first 2-3 decades into the next century.

Since it takes time before change in policies take full effect, it is now that our policies must be carefully adjusted to meet the new sustainability requirements, in order that transition shall be smooth and gradual rather than abrupt and destabilizing.

1.2 The Project Setting

In spite of the difficulties of seeing the contours of the distant future in the crystal ball, it would appear worth while to shed light on the potentials and limitations to economic and social development, as seen on the basis of the know how we possess at present with regard to technological progress, natural resources endowments and the workings of the economy. Such projections will naturally build on the world as we know it today, and only to a very limited extent absorb and reflect the genuinely new developments expected towards

2030. However, by looking ahead and carefully applying what we know today, we may become better prepared to trace important characteristics of the development ahead of us, and as a result be able to make decisions that will provide for a more sustainable development.

In Norway, we have a tradition for long term perspective planning in the above spirit. This helps explain why a rather unique ongoing study to be completed by mid-1995 was commissioned two years ago jointly by the Ministries of Finance and Environment and the National Research Council, based on initiatives taken by the Friends of the Earth and Project Alternative Futures of Norway at the time of UNCED in 1992. The project challenges the long term (1990-2030) scenarios of the official governmental 4-year long term plan [1] which portrays almost a doubling of most per capita economic indicators by 2030, and continued increase in CO₂-emissions.

Following the Second World War, strong interest groups were formed in Norway (as in other industrialized countries) to protect and promote particular sector interests (agriculture and resource intensive export industries). These lobby groups gradually succeeded in establishing favourable national framework conditions for their industries in the form of subsidies and strategic market positions.

Whereas this might have been useful during the structural adjustments of reconstruction of the economy following the war, it has gradually become clear that such internal transfers have economic as well as environmental costs to society. Environmental NGOs such as Friends of the Earth and independent research projects such as Project for an Alternative Future have come to see that one approach to the altering of the conserving policy influence of the above mentioned interest groups, is to adopt the economic efficiency arguments with regard to resources management. In other words, the macroeconomic arguments that used to be the strength of the post war interest groups representing industry and agriculture, are now being adopted by the environmental NGOs and used in their struggle for less pollution and an environmentally more benign production and consumption structure.

This project is a result of this evolution. It brings the environmental demands of the Friends of the Earth of Norway to the macroeconomic models that are routinely used by the central government for national planning and budgetary purposes. The idea is to simulate the long term environmental and economic impacts of imposing such environmental demands on Norway's small open economy. This analysis then provides a basis for an expanded dialogue on the feasibility of the various policy choices with long term impacts on future generations to be faced by the decision makers of today.

The project has established a close professional and political dialogue involving both the Ministry of Finance and the Ministry of Environment. This has been made possible because Norway has such a long tradition in integrated use of macroeconomic policy modelling [2]. It has been further facilitated because Statistics Norway pioneered the field of resource accounting in the 1970's, and gradually expanded the coverage of environmental satellite accounts for use in the routine planning and budget work along with national income accounting. Gradually, this framework was expanded for integration into applied macroeconomic modelling with particular focus on environmental impact assessment of alternative macroeconomic development paths. Such analyses are now part and parcel of the budgetary process of the central government, and both the Ministry of Finance and the sectoral ministries (including the Ministry of Environment) develop scenarios by means of e.g. multisectoral long term computable equilibrium models or medium term disequilibrium models. This provides a capacity to test and a capability to discuss the macroeconomic and environmental impacts of their respective policy proposals.

In order to facilitate adoption of the project findings and challenge the long term perspective plans of the government in the public policy debate, the project has adopted the same modelling apparatus and the majority of the assumptions that are being used by the government. The decision to apply the same modelling apparatus is not founded in a belief that these models are specially designed to shed light on the sustainability of a certain economic development path. The rationale is rather that by adopting and applying a common set of modelling and analysis tools, a policy dialogue between NGOs and government regarding key sustainability issues is facilitated, and can more easily reach the agenda of parliament, the various political parties, and influential interest groups.

The purpose of the simulations presented below is therefore not to provide detailed long term forecasts, but rather to supply a broader basis with a much more varied set of development options and impacts for discussion and priority setting as regards the management of our resource base for the long term future.

[1] Ministry of Finance(1993), "St. meld. nr.4 (1992-93): Langtidsprogrammet 1994-1997. "(Long Term Programme 1994-1997), Oslo.

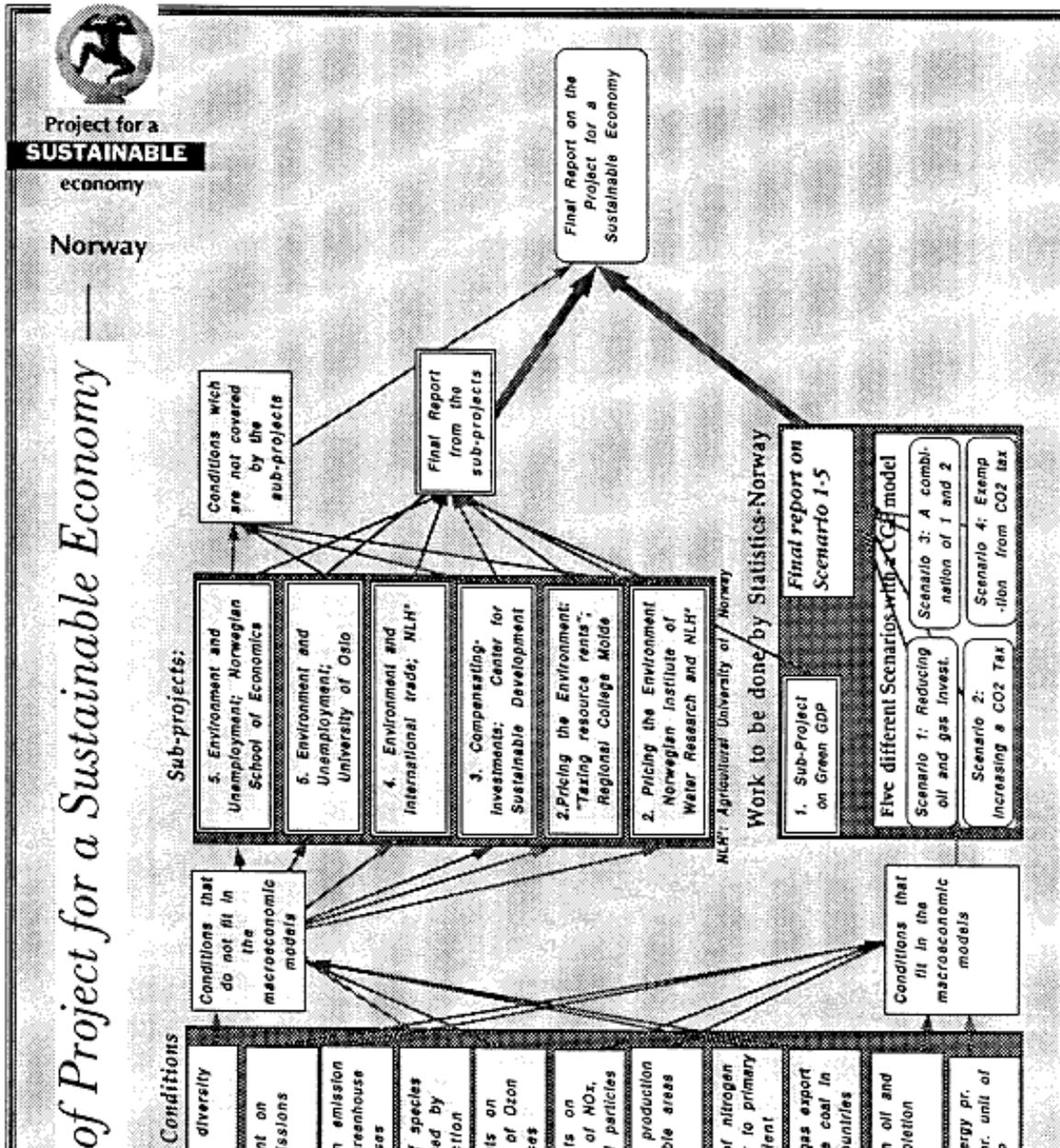
[2] See Lars Bergmann and Øystein Olsen (1992), "Economic Modelling in the Nordic Countries". Amsterdam: North Holland Publishing Company.

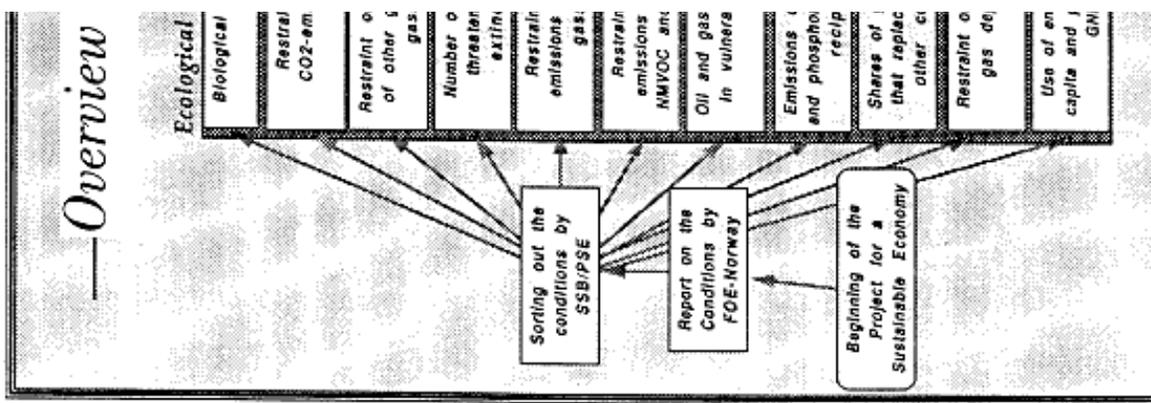
2. Operationalizing environmental-ngo-demands in macroeconomic models

The study contracted The Research Department of Statistics Norway to help operationalize this by assisting in the incorporation of the various environmental demands of the Friends of the Earth, and then simulate Norway's environmental and economic development outlook for the next forty years as a basis for comparison with the official government perspectives.

This has been no small order. The Friends of the Earth posed some 54 environmental demands of very different kinds to be taken into account by the macromodellers. A forum was established to determine how these demands could be met in the project. This forum has met regularly for almost a year, and gradually established that out of the 54 environmental demands, 26 could be incorporated in the macromodels. Some of them are incorporated directly as exogenous constraints/variables, whereas others among these demands take the form of goals to be met endogenously as a result of explicit macro- or sectoral policy choices, some of which are very drastic compared to what is envisaged in the governments official long term perspective scenarios. The remaining 28 demands could not be met in any meaningful way within the existing macroeconomic models, either because they were of a very local nature, or because they reflected issues and concerns presently not covered by our national income accounts or satellite resources accounts. The project has therefore initiated a series of parallel partial studies (both theoretical and empirical) to try to shed some light on the role of these environmental concerns as well. Figure 1 illustrates the structure of the project.

Figure 1.





65

One should take note of the fact that the models have been calibrated on the basis of historical data. This puts certain constraints on how far away from historical developments one can deviate and retain some faith in the usefulness of the simulations. The initial CO₂-requirement of the Friends of the Earth serves to illustrate this problem: Referring to the scientific reports from the U.N. Intergovernmental Panel for Climate Change (IPCC), they required 60% annual reduction in CO₂-emissions from Norway as Norway's fair contribution to stabilize global CO₂-concentrations.

The economic and regulatory policy measures needed to achieve that, were considered too far removed from anything the models could cope with, and yet retain some validity. It was therefore decided to strike a compromise and impose some very strong policy measures that would result in significant reductions in CO₂ emissions both compared to the official government scenarios for 2030, as well as compared to actual 1989 emissions, but admittedly not meeting Norway's share of the IPCC goal of stabilizing CO₂ concentrations as well as some of the other activity level- or output goals stated by Friends of the Earth. The simulations as presented are therefore meant to illustrate possible long term environmental and economic impacts if Norway makes some drastic policy commitments today and stick to them for an extended period by a process of gradually introducing stiffer economic and regulatory measures related to energy production and use, while at the same time preserving the current accounts balance and closely monitoring the development of the public budgets balance. The latter two dimensions are important to control because, only by securing their balance, will it be acceptable in this modelling context to simplify by leaving out explicit monetary policy interventions, currency devaluation and active interest rate policies.

The main regulatory measure adopted in the simulations was to reduce extraction of oil and gas, and the associated investment activities, compared to that assumed in the official long term perspective plan. This would be operationalized by stopping or postponing most of the listed further developments of oil and gas fields. The main economic instrument adopted in the simulations is an isolated Norwegian CO₂-tax which is gradually increased year by year for all sectors of the economy until 2015, and from that time stabilized in current prices, with some key energy intensive industries exempted in one of the simulations (no.4). The first simulation applied regulations only, the second applied the CO₂-tax only, whereas the third simulation combined the two and thus adopted a more moderate growth in the CO₂-tax. Additional variations around the third scenario were also carried out; the fourth simulation exempts key energy intensive industries from the CO₂-tax, whereas the fifth simulation shows the impacts on economic and environmental indicators if labour input is reduced 10% compared to the other simulations. This last simulation is included to show the possible impacts of a significantly increased preference for leisure.

The detailed documentation of this project is so far available in Norwegian only from Project Sustainable Economy (Prosjekt Bærekraftig Økonomi) located at the premises of Project Alternative Futures in Oslo. However, a comprehensive presentation in English is scheduled for later this year, and several working papers are being issued.

3. Findings from the macroeconomic simulations

The findings are interesting. The simulations suggest that there is substantial resilience in the economy when one has forty years to gradually adjust to new conditions for production and consumption. The simulations suggest considerable - albeit significantly less - growth in per capita GDP and private consumption, but the consumption pattern changes drastically away from fossil fuel intensive activities such as gasoline consumption which is reduced by around 65% in the various CO₂-tax simulations. It is important to keep in mind that the simulations adopt the same technological improvement assumptions for each and every sector (for example as regards specific gasoline consumption of the future car) as are used in the official perspective plan document.

It is also important to understand that it is implicitly assumed full employment in all the simulations with the long term multisectoral growth (MSG) model. In the medium term model (MODAG) on the other hand, unemployment and adjustment costs are explicitly modelled. The adjustments are significant. The sectoral composition of production and employment changes significantly away from energy and fossil fuel dependant sectors. On the other hand, overall employment impacts are less dramatic, and although there is increased unemployment for the first few years as a result of the policy changes, this effect tapers off gradually.

It should be noted that the modelling requirement to "close" the model can be done in different ways, and that each way yield different results. In the present simulation, as a result of reducing oil and gas investments, overall investments are reduced, which means reduced savings (private and overall). Since private income is initially fixed, this opens for increased private consumption (but over time reduced output will also reduce the level of consumption). Alternatively, one could have decided to close the model via the level of total private investments. In that case, as a result of reduced oil and gas investments, on-shore investments would have increased because private savings are fixed so long as private income is fixed. In other words, the model can be closed in a way that leads to increased on-shore investments, or in another way that leads to increased private consumption.

The long term simulations also assume a fixed current accounts balance. Where a deficit in the commodity and services trade arise, the balance as regards payments of interest, dividends and foreign aid must be improved. To the extent that interest and dividends payments are fixed, it will be foreign aid grants that must be reduced (quite substantially in some simulations) to meet the current account balance requirement. Subjecting the simulations to such current accounts constraints, implicitly stabilizes the foreign exchange- and interest rates. At the same time the budget balance is quite well maintained, except for the leisure preference simulation (no.5) where a large deficit arises.

Some key indicators from the five long term simulations are compared in table 1.

Table 1. Five different MSG-simulation results: Percentage deviation from the 2030 results of the Government base case scenario.

	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5
BNP	-5	-4	-8	-7	-18
Priv. konsum	-9	-2	-10	-10	-22
Eksport	-1	-9	-7	-4	-17
Import	-3	-5	-6	-5	-13
CO2	-15	-30	-35	-26	-40
NMVOG	-30	-15	-40	-40	-47
NOx	-10	-15	-20	-17	-26
SO2	+2	-40	-32	-12	-35

Source: MSG-simulations for Project Sustainable Economy, Norway carried out by Statistics Norway, March 1995

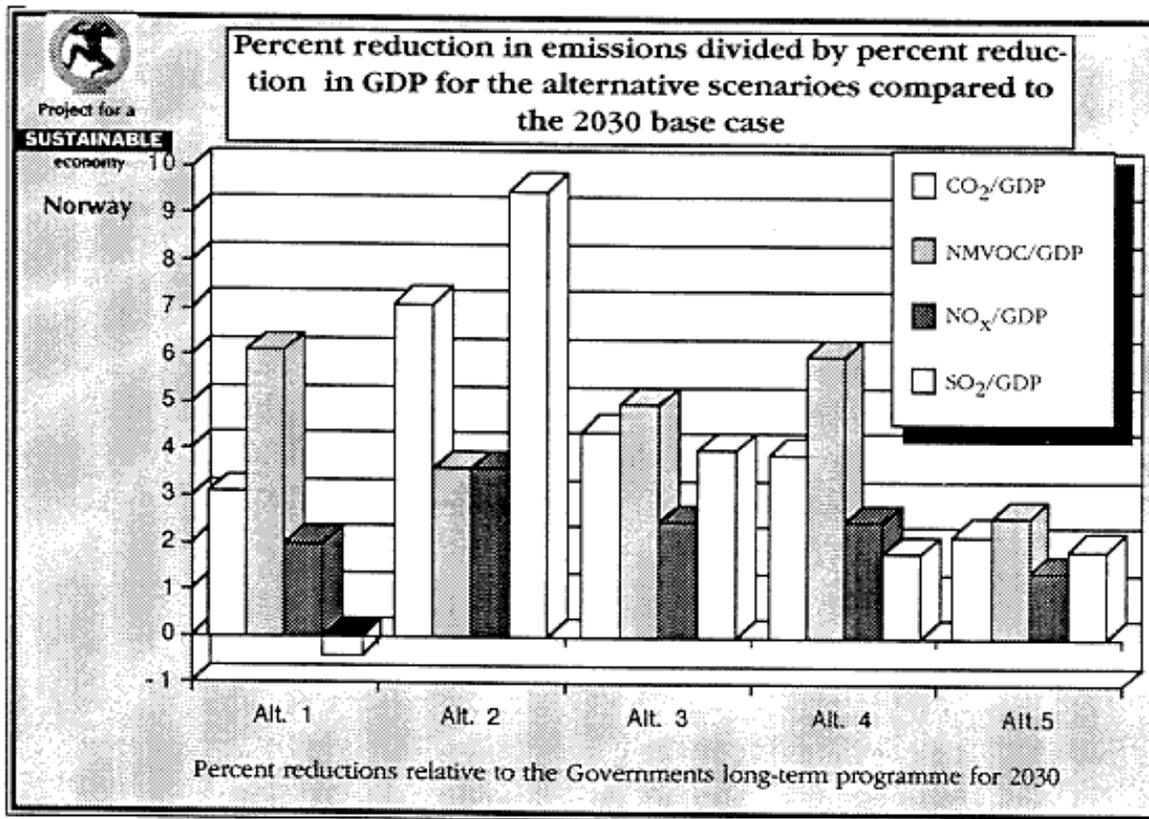
In the second simulation a rapidly increasing CO₂-tax on top of the CO₂-tax already in place is the sole policy instrument in use (other than measures to stabilize the current accounts and to keep an eye on the balance of the government budget so that the exchange rate and interest rates remain stable). This appears to provide for the most cost effective way of achieving the emission reductions, see figure 2 for a cost-effectiveness comparison of the 5 alternatives.

As far as emission reductions are concerned, figures 3 and 4 show that major improvements are within reach relative to the levels in 1989 and to the base case scenario in the governments long term perspective plan. CO₂-emissions are reduced by 26-40% relative to the 2030 base case scenario in the four simulations where a CO₂-tax is applied. As regards emission of non-methane volatile organic compounds (NMVOG), emissions originate to a large extent from oil and gas field operations, and reductions are therefore greatest in the simulations with direct regulation of these sectors. SO₂-emissions on the other hand, increase slightly relative to the government base case if no CO₂-tax is introduced, but decrease significantly in the other scenarios, except for the case (Simulation no. 4) where energy intensive industries are exempted from the CO₂-tax.

In simulation no. 4, the effects of exempting heavy polluting industrial sectors (chemicals and metals) from the CO₂-tax is studied. This scenario is included because it is expected that strong interest groups will mobilize to protect these traditional export industries against the worsening competitive environment (and likely close down) that such a CO₂-tax would result in. Compared to the scenarios where all sectors pay the CO₂-tax, this one yields less loss of GDP-growth, but CO₂- and SO₂-emissions increase substantially relative to those of the other alternatives for 2030. Like in the case of scenario 1 and 3, foreign aid transfers must be substantially reduced (by around 4 billion, equal to 10% in current prices, in order to the over all current account balance.

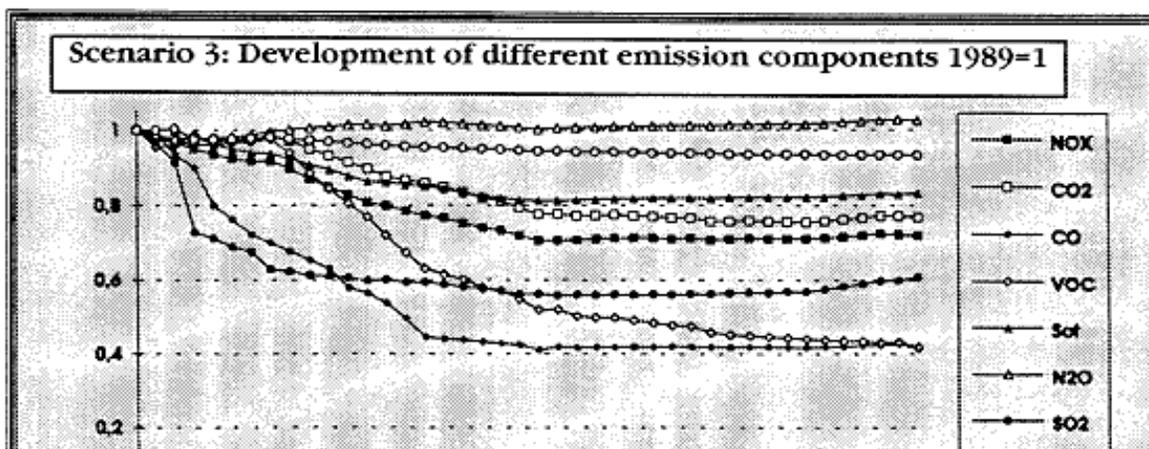
The project does not settle for only the macroeconomic costs (i.e. GDP and consumption losses) of reducing the various emissions. It also uses dose response information and best available environmental and health value estimates to determine the benefits from reduced emissions and reduced traffic. It is found that when such benefits are included in the overall macroeconomic impact assessment, the percentage point loss of GDP is reduced by 0.5 -1 percentage points. Since the direct GDP-losses range from 4% (alternative 2) to 18% (alternative 5), such benefits only improve the overall picture marginally, but they should nevertheless be included for completeness.

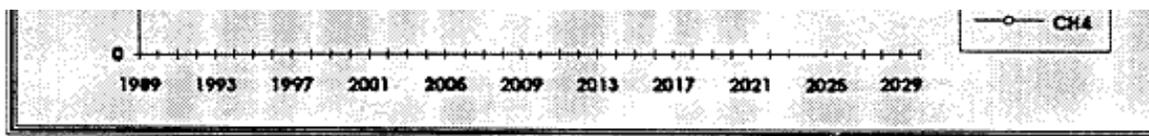
Figure 2



Source: MSG-simulations for Project Sustainable Economy, Norway, op.cit.

Figure 3.

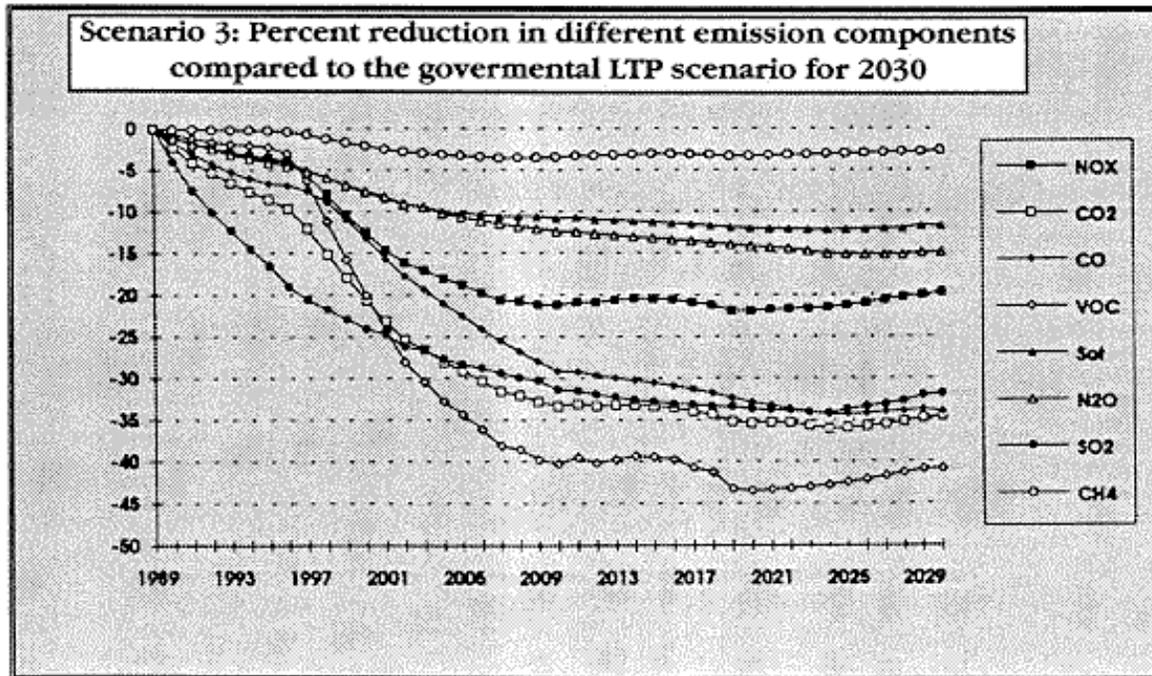




Source: MSG-simulations for Project Sustainable Economy, Norway, op.cit.

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Figure 4



Source: MSG-simulations for Project Sustainable Economy, Norway, op.cit.

Table 2. Percentage deviation in private consumption from the base case scenario for year 2030 (simulation no.3)

Consumption Category	Percentage change from base case
Electricity	+2
Stationary use of oil	-36
Gasoline	-63
Car purchases	-10
Public transport	-9
Food	-5
Beverages	-10
Other goods	-9
Clothing and footwear	-9
Furniture	-11
Housing	-13
Other services	-7
Tourism abroad	-14
Total Private Consumption	-10,4

Source: MSG-simulations for Project Sustainable Economy, carried out by Statistics

In table 2, changes in the 2030 consumption pattern compared to that of the government base case simulation is presented for the regulation/CO₂-tax combination.

Sustainable development implies providing consumption choice opportunities that are no less for the future than those of the present. Such choices depend to large extent on the value of the national wealth in the future, i.e. on the management of human capital, natural capital, man-made capital, institutional capital, and financial assets and debts to other countries. The simulations calculate the resilience to policy change for the part of this wealth which is the easiest one to measure; the sum of manmade capital, petroleum wealth, and net assets on other countries. It is seen from table 3 that national wealth is almost doubled even when the environmental austerity measures are introduced. Manmade capital dominates overwhelmingly (almost 90% of total), but is reduced when less petroleum revenue becomes available for on-shore investments. Petroleum wealth, however, increases when it is stored for future use. Foreign assets are scenario insensitive.

Table 3. National Wealth for 1989, and for 2030 in 1989-prices for each scenario and the base case (1'000 NOK per capita).

Wealth component	1989	Base case	Sim.1	Sim.2	Sim.3	Sim.4	Sim.5
1. Manmade	545	1021	961	971	924	940	845
2. Net foreign assets	31	113	115	113	115	114	112
3. Petroleum	200	33	58	33	58	58	58
4. Leisure	-	-	-	-	-	-	14
Total Wealth	776	1167	1134	1117	1097	1112	1029

Source: MSG-simulations, op.cit.

Source: MSG-simulations, op.cit.

4. The scope for revenue neutral environmental tax reforms

The above macroeconomic long term MSG-simulations in four out of five alternative environmental policy scenarios imply a substantial increase in national CO₂-taxes over and above what is assumed from such revenue in the Governments base case. However, in addition to the many environmental goals and constraints imposed in these simulations, the long term sustainability perspective also requires balance in the foreign trade and transfer accounts and close monitoring of public budgets in order to avoid a persistent budget deficit. As a collective result of all these budgetary and environmental goals and conditions, there is very little CO₂-revenue left to allow for a further reduction in other distorting taxes such as personal income tax or employer payroll contributions.

This outcome obviously limits the scope of this study for replacing distorting taxes on labour with less distorting taxes on resources and the use of the environment. The project has reviewed a number of such resource rent and environmental internalisation options for their revenue raising potential.

The main finding is that the rent Norway's natural resource wealth is already largely allocated on the basis of political redistribution criteria rather than on the basis of resource allocation efficiency grounds. These allocations of the rent from our hydropower wealth, agricultural land wealth and fisheries wealth are highly distortive at the outset due to substantial subsidies that stimulate resources wastage and limits the scope for lasting job creation. This criticism appears to be less relevant as regards the present use (other than for consumption) of the petroleum wealth.

If allocative efficiency were the ruling guidelines (and a number of inefficiency enhancing subsidies were removed or reduced), the additional natural resource rent revenue that could be harvested by the authorities in addition to present tax and rent revenue, is as

follows:

- Hydropower rent revenue NOK 3-4 billion/year - Fisheries rent revenue NOK 2 billion/year

The additional rent revenue in mining and forestry is viewed as marginal, and therefore not included in the above estimate.

There is, however, another largely untapped revenue source of a rent nature. Many industrialised countries have for years made property taxation based on land values a key revenue generator. It amounts to 10-11% of total tax revenue in the USA and Australia, but only 3% in Norway. Economic theory is very supportive of land use taxation on efficiency as well as equity grounds, in sharp contrast to what theory suggests as regards distortive taxation of labour. Norway has nevertheless refrained from attempt at substituting land taxes for labour taxes.

Land taxes may well be included in the list of resource based taxes. For one, land is a natural resource, although for identical pieces of land as far as fertility and productivity is concerned, the differential value between two properties would very often reflect differences in accessibility to frequently visited destinations, and other locational attractors (view, clean air, quiet, safety from crime, etc.).

Established land values and changes in such values is very often to a significant degree affected by public sector decisions to enhance and maintain public infrastructure (both social and physical). In such circumstances, rent increases are seen as a justly taxable object because the value added is due to nature itself or to public sector spending (other taxpayers moneys), and not to initiatives and efforts of the property owner.

This view applies equally in urban and rural areas, although it has been less focused on in the latter context. In a sparsely populated country like Norway, where communications are costly to establish, the value of inaccessible areas can be substantially enhanced when a new road, bridge or tunnel is built to provide for continuous connection. There are numerous examples of such projects in rural Norway where the infrastructure investment per capita is extremely high, and clearly far above any willingness to pay for such service improvement on behalf of those affected. If such projects were required to be justified on willingness to pay criteria, an increased annual property tax amounting to tens of thousand of kroner would result. One may safely conclude that if the same authority were responsible for both revenue generation and costs associated with such projects, annual expenditures on such projects would free up perhaps NOK 0.5-1 billion per year for alternative purposes, such as reduced taxes on labour.

Add to this the fact that a number of such infrastructure investments are dimensioned on the basis of peak period traffic, which is often the tourist traffic in a couple of summer months. These tourist come from far away, many of them from abroad, and their demand would hardly be affected by a doubling or tripling of user charges compared to what regular local commuters would be paying. However, attempts at discriminatory pricing of the use of such infrastructure have failed due to political resistance, unlike the situation in many other countries that have seen this as an opportunity to reap the scenic rent for the common good. Recent estimates suggests that prevailing policies results in a transfer of approximately NOK 0.5 billion to the far-away users; revenue that could otherwise be used to reduce for example taxes on labour.

In urban areas, infrastructure investments have similar effects, but because the initial land values tend to be larger, the revenue potential from taxes on increased land values resulting from infrastructure improvements is larger than in rural areas. Urban areas are typically characterised by congestion, and congestion taxes can be applied to simultaneously internalise negative congestion externalities and generate public sector revenues that can a.o. be used to offset other more distorting taxes. Such taxes can either be levied in the form of property taxes or as road user charges, water charges, etc., or perhaps preferably, a combination of both.

Both tax forms can be argued from an environmental perspective. Congestion taxes reduce emissions and energy use, and at the same time reduce peak period design demand, thus reducing or postponing capital intensive investments in areas with the highest land values. Property taxes encourage people to chose other savings alternatives than housing, thus reducing housing size and thus resource and energy bills. Ideally, taxes should be levied in such a way that consumers at the margin are indifferent between savings forms. Present taxation of savings advantages from living in your own house generates NOK 2 billion annually. However, if equality on the margin between savings alternatives were instituted, this revenue could be raised by an additional NOK 4 billion.

Congestion pricing in urban areas could perhaps generate NOK 1-2 billion of additional tax revenue. Add to this the NOK 1,5-2 billion potential identified above for rural areas, and the traffic could be tapped for an additional NOK 2,5-4 billion yearly.

The project has also estimated the scope for reduced transfers to agricultural production as a result of the liberalisation incorporated in the GATT agreement, and some further liberalisation effort. This could eventually free up NOK 3-6 billion for alternative uses.

In total, these maximum potential sources of additional tax revenue amount to NOK 14 - 19.5 billion (present prices) annually sometime into the next century. This amounts to 27-39% of present employer paid payroll taxes, and could be applied against a comparable reduction in these or other taxes on labour. In a situation with significant unemployment, it is not unreasonable to assume that this would increase demand for labour. However, our econometric knowledge of labour market responses to such tax changes is weak. The extent to which the reduced tax results in increased employment or increased salaries depends on demand and supply conditions in the various labour market segments. Labour is far from homogenous, and the effect could vary substantially between

occupations.

A recent study of the scope for double dividends in the six largest EU-economies found that by internalising all adverse environmental externalities, the increased environmental tax revenue would amount to 1.7% of the collective GDP of these six countries^[3]. It was estimated that this could provide for reductions in labour taxes by the same order of magnitude, and that by the year 2010, 2.2. million more jobs would be generated compared to a reference case (equal to 1 percentage point less unemployment). These results cannot readily be transferred to a Norwegian setting. For one, labour market rigidities may not be the same, and unemployment is initially much less in Norway. Secondly, initial pollution and congestion is much more severe in the EU-countries, so that the externalities to be removed by economic charges would be relatively much less revenue generating in Norway. The EU-double dividend effect can therefore be viewed perhaps as an upper extreme limit of what one could expect in Norway. In real terms, this percentage revenue increase would amount to perhaps NOK 12 billion per year, an amount not all that far removed from the NOK 14 - 19.5 billion interval estimated above from a completely different and independent setting.

In sum, the overall conclusion, however, is that there should be some - albeit limited - scope for double dividends, i.e. simultaneously improved economic efficiency/increased employment and improved resources management, if the tax base is reformed in order to reflect environmental and efficiency considerations as discussed above.

[3] Dri (1994), "The potential Benefits of Integration of Environmental and Economic Policies - An Incentive-Base Approach to Policy Integration", Report to the Commission on European Communities, Directorate-General for Environment, Nuclear Safety and Civil Protection.

Experiences with sustainable production in 3M

By Allen H. Aspengren, 3M Europe s.a.

Too often we seem to tax the wrong things. We have high income taxes that tend to discourage working and promote innovative accounting. We tax interest on savings and discourage savings.

Before rushing to a tax proposal, governments need to evaluate what is the purpose of the tax, are they taxing a good or bad thing, and what will the revenue be used for. Industry recognizes that pollution is bad and that Eco-taxes are one method to curb pollution. What industry wants is alternatives and flexibility to deal with the pollution problem. I'll discuss alternatives later in the paper.

When we look at Eco-taxes, they need to be fair and the revenues need to be used for a good purpose. Too often taxes that are collected go into a "general fund" that fails to help the environment or create jobs. Funds collected should be "revenue neutral" or used to fund some aspect of the environment such as research and development projects. Other alternatives could include funding the environmental agency or creating environmental jobs.

Let's look at some innovative alternatives to Eco-taxes that allow industry to operate and reduce pollution while saving money.

One of the alternatives that 3M has used in the U.S. is called the "Bubble Policy". Under this policy, the government establishes the limit a site can emit in terms of VOC's, NOx's or perhaps SOx. This limit acts as a "cap" on the sites which the facility can't exceed.

This "Bubble Policy" allows industry the option of determining which sources to control and how they should be controlled. Let's look at an example. Let's say that the cap of a particular site is 250 tons V.O.C. from 5 sources each emitting 100 tons. The site may elect to control 3 sources by 90% and allow the other sources to remain uncontrolled.

Another option is called "Controlled Emission Trading". The idea behind this is simple. Rules, even the best possible rules, cannot do what managers on the spot can, i.e. find the most effective way to eliminate or reduce pollution.

Instead of simply writing rules and then enforcing them "command and control" regulation, controlled trading encourages business to propose smarter alternatives before government moves on to enforcement.

Managers can either counterpropose changes within one plant or site or they can negotiate trades with other plants in the same area, e.g. by paying another company to reduce pollution more than it is required to do as a means of avoiding a more expensive equal reduction at their own facility. They can also "bank" any such excess reduction for future use or sale. Government or a trustee for the public interest, make sure that such counterproposals are both environmentally equivalent to and as enforceable as the rules they replace.

The concepts presented are real and have been used by 3M in the U.S. in meeting the regulations, reducing pollution and saving jobs.

What industry also needs is time. We need time to change a process from solvent to water based processes. Short time frames (1-2

years) do not allow for these changes. Extended time frames (3-5 years) would help to facilitate this conversion to a more sustainable process. Also, industry would like to see some kind of incentive or encouragement from governmental agencies to industries who have been pro-active and taken or plan to take the initiative to convert to more sustainable processes.

Industry has taken a strong lead regarding environmental initiatives in the 1990's. For example, the Business Council for Sustainable Development (B.C.S.D.) which is now the World B.C.S.D., was formed in the 90's to give a business input to the United Nations Earth Summit.

The B.C.S.D. which consists of C.E.O's from major firms throughout the world, not only made input at Rio, but also wrote a book called "Changing Course" which outlined changes business needed to do to obtain sustainable development. This book could be used by governments as a guideline for what industry wants.

Eco-efficiency was a term defined by the B.C.S.D. at their Antwerp Eco-Efficiency Conference in November 1993. Basically, it says "Eco-efficiency is reached by the delivery of competitively priced goods and services that satisfy needs and bring quality of life, while progressively reducing ecological impacts and resource intensity throughout the life cycle, to a level in line with the earth's estimated capacity". This concept builds upon the successful U.N. Cleaner Production initiatives.

Other industry-wide initiatives include the following :

- 1) The council for Solid Waste Solutions was created by the Plastics Industry to promote Recycling and Proper Disposal of Plastics.
- 2) The National Office Paper Recycling project is a coalition of U.S. Companies that address the economics of Paper Recycling.
- 3) The Aluminum, Car and Steel Industries formed coalitions to promote Recycling of their products.

As we look at individual company initiatives, let's start by looking at 3M. Their 3P (Pollution Prevention Pays) initiative is not new but began 20 years in 1975. The goal of the program is to eliminate pollution at the source through 4 main ways :

- 1) Process Reformulation.
- 2) Process Modification.
- 3) Equipment Re-Design.
- 4) Resource Recovery (Recycling).

The Program has been very successful and has generated over \$ 710 million in first year savings. More importantly, the following pollution has been prevented :

POLLUTION PREVENTED 1975 - 1994

Air Pollutants 178,000 tons
Water Pollutants 31,000 tons
Wastewater 2.7 billion gallons
Sludge/Solid Waste 475,000 tons

This initiative continues to generate savings and prevent pollution in the 90's.

Other company's environmental initiatives include Dow Chemical Company Waste Reduction Always Pays (W.R.A.P.) Program which includes source reduction, recycling, treatment and destruction and using secure landfills for their waste. They have also established a goal to reduce their air emissions by 50% by 1995 and have already met the goal of reducing organic discharges to water by 95%.

A.T.T., a leading multi-national telecommunications firm, has set the following goals :

- 1) Eliminate Chlorofluorocarbon Emissions 100% by year-end 1994 (Down 98% by year-end 1993).
- 2) Reduce Reportable Toxic Air Emissions 95% by year-end 1995 (Down 92% by year-end 1993).
- 3) Decrease Manufacturing Waste Disposal by 25% by year-end 1994 (Down 57% by year-end 1993).
- 4) Recycling 60% of paper by year-end 1994 (Reached 63% in 1993).

Kodak's goals include the following :

- 1) By 1993, achieve a 50% reduction in CFC's, discontinue their use by 1995.
- 2) Continue to be among the world's best companies in Protecting the Health and Safety of our People, Communities and Customers,

and the Quality of our Environment.

Bristol-Myers Squibb has their environment 2000 goals aimed at reducing emissions. In addition, they have a goal to reduce releases of 17 Industrial Toxic Projects (as defined by U.S. E.P.A.) 33% by the end of 1992 and 50% by 1995. They are on target for their reductions.

These are just a few examples of the many industrial companies that have voluntarily taken initiatives to protect the environment.

In Europe, voluntary disclosure of emissions actually started in 1988 by Norsk Hydro. Since then, many prominent firms throughout Europe have taken the initiative to disclose their emissions on a yearly or one time basis.

Chemical firms throughout the world have begun subscribing to the Responsible Care Initiative from the Chemical Industry.

In conclusion, I think that many industries as well as governments want sustainable development. In order to achieve it, however, we all (U.N.E.P., N.G.O.'s, Governmental Agencies, General Public and Industry, etc...) have to work together in establishing sound regulations that lead to sustainability. These regulations must be flexible and allow industry the time needed to convert to sustainable processes. Industry has also taken initiatives as stated above to control their emissions. These should be recognized and encouraged by governmental agencies. Only by working together we will achieve our common sustainability goals.

Some business implications of eco-taxes and sustainable consumption

By John Elkington, director of SustainAbility Ltd., London

The purpose of this short paper is to raise a number of questions which business will need to address in relation to ecological tax reform and the shift to sustainable production and consumption patterns.

Why sustainable consumption?

In the face of the evidence of continuing environmental problems around the world, the focus of the environmental debate is shifting: established 'supply side' issues and priorities (e.g. pollution control, energy efficiency and clean production) are being joined by a growing range of 'demand side' priorities (e.g. green/ethical consumerism, life cycle assessment and eco-taxes).

As a consequence, lifestyles and consumption patterns are joining population and technology issues on the political, regulatory and business agendas. In its latest report, *Who Needs It? Market Implications of Sustainable Lifestyles (1995)*, SustainAbility notes that:

'Changing consumption patterns' and 'sustainable lifestyles' feature prominently (though they are not clearly defined) in Agenda 21, prepared for the 1992 Rio Summit, and in the European Commission's Fifth Environmental Action Programme.

Over half of Americans and Canadians surveyed recognise that 'changes in lifestyle' and 'consuming less' are an inevitable part of solving environmental problems.

Friends of the Earth Netherlands (Milieudefensie) have developed a model - which has influenced the Dutch government's policy thinking - largely accepted by the Dutch government - which identifies specific reductions in consumption required for a 'Sustainable Netherlands', and this work has now been extended to cover the European Union as a whole.

All reviews of the subject point to the need for massive reductions in material and energy consumption if sustainability is to be achieved.

How is ecological tax reform linked to sustainable consumption?

The report also identifies and reviews ten 'Sustainability Vectors', defined as shifts in demographics, social values, politics, economics, consumption patterns, production processes, technology or science which moves us towards a sustainable world by simultaneously meeting human needs while promoting dematerialisation of the economy. The ten vectors fall into five clusters:

Ethical vectors cover issues of 'Equity' and 'Unmet Needs'

Socio-cultural vectors focus on 'Diversity' and 'Quality of Life'

Technological vectors embrace 'Dematerialisation' and 'Sustainable Technology'

Macro-economic vectors include 'Eco-infrastructure' and 'Critical Mass'

Political vectors relate to 'Visions' and 'Values'

Of these, both the technological and macro-economic vectors will depend on ecological tax reform to a considerable extent for their impact. In addition, eco-taxes and other fiscal instruments will also strongly influence the chances of success of the broader socio-cultural and ethical dimensions of our response to the challenge. The political vectors will help to determine the extent to which these other shifts are achieved.

Will ecological tax reform fade away?

Like everything else in human and political affairs, interest in ecological tax reform will have its peaks and troughs. But the underlying trend will be towards greater steering of markets through eco-taxes and other similar instruments. Indeed, when SustainAbility recently polled policy-makers and opinion-formers across the European Union, the consensus on the prospects of a renewal of interest in the carbon/energy tax was that it would be back on the agenda soon - and most people suggested it would be back before the year 2000 (Table 1).

Are companies alert to the coming challenge?

If we look back to the Business Council for Sustainable Development (BCSD)'s 1992 book *Changing Course*, the stance of the world's leading business people on economic instruments could be summed up as follows:

There is no clear view of what economic instruments are.

But all are likely to involve government intervention in markets.

The likely mechanisms include: pollution taxes and charges; tradable pollution permits and resource quotas; deposit-refund systems; performance bonds; resource saving credits; differential prices; special depreciation provisions; and the removal of subsidies and barriers. The BCSD was prepared to support ecological tax reform on the basis that:

"The introduction of economic instruments should be guided by the doctrine of 'fiscal neutrality'."

Table 1: ESE Barometer Survey 1995

Will the carbon energy tax be resurrected - and, if so, when?

Uta Bellion (Greenpeace, Netherlands/UK)	Yes (2000)
Rodney Chase (BP, WBCSD, UK)	Yes
Marius Enthoven (EC DGXI, Belgium)	Yes (1997)
Christina Garcia-Orcoyen (WWF Spain)	Yes
Domingo Jiménez-Beltrán (EEA, Denmark)	Yes
Brice Lalonde (Génération Ecologie, France)	Yes
Sara Parkin (Forum for the Future, UK)	Yes (1999)
Ulrich Steger (IMD, Switzerland)	No (maybe after 2000)
Carola Teir-Lehtinen (Neste, Finland)	Yes (1998)
Joke Waller Hunter (CSD, USA)	No

Source: SustainAbility/ESE, 1995

One indicator of business interest in ecological tax reform would be the coverage of such issues in corporate environmental reports. Two recent reports produced by SustainAbility, with a range of partners, have covered this area: *Coming Clean* (1993) and *Company Environmental Reporting* (1994). Overall, it is our analysis - albeit with no more than anecdotal evidence to support our case - that the growing business interest in environmental management systems, accounting reporting and benchmarking will help to prepare the ground for a more supportive business stance on ecological tax reform.

To date, however, very few corporate environmental performance reports to date have mentioned the subject. A rare exception was Dow Europe's 1993 report, published in 1994. Among the points it made were the following:

Many Dow processes are energy-intensive

Dow emitted 2 million tonnes of CO₂ in 1993

About 50% of the company's energy needs were met by co-generation

Opportunities for energy efficiency are becoming harder to find

Dow supports liberalisation of electricity and gas markets in Europe

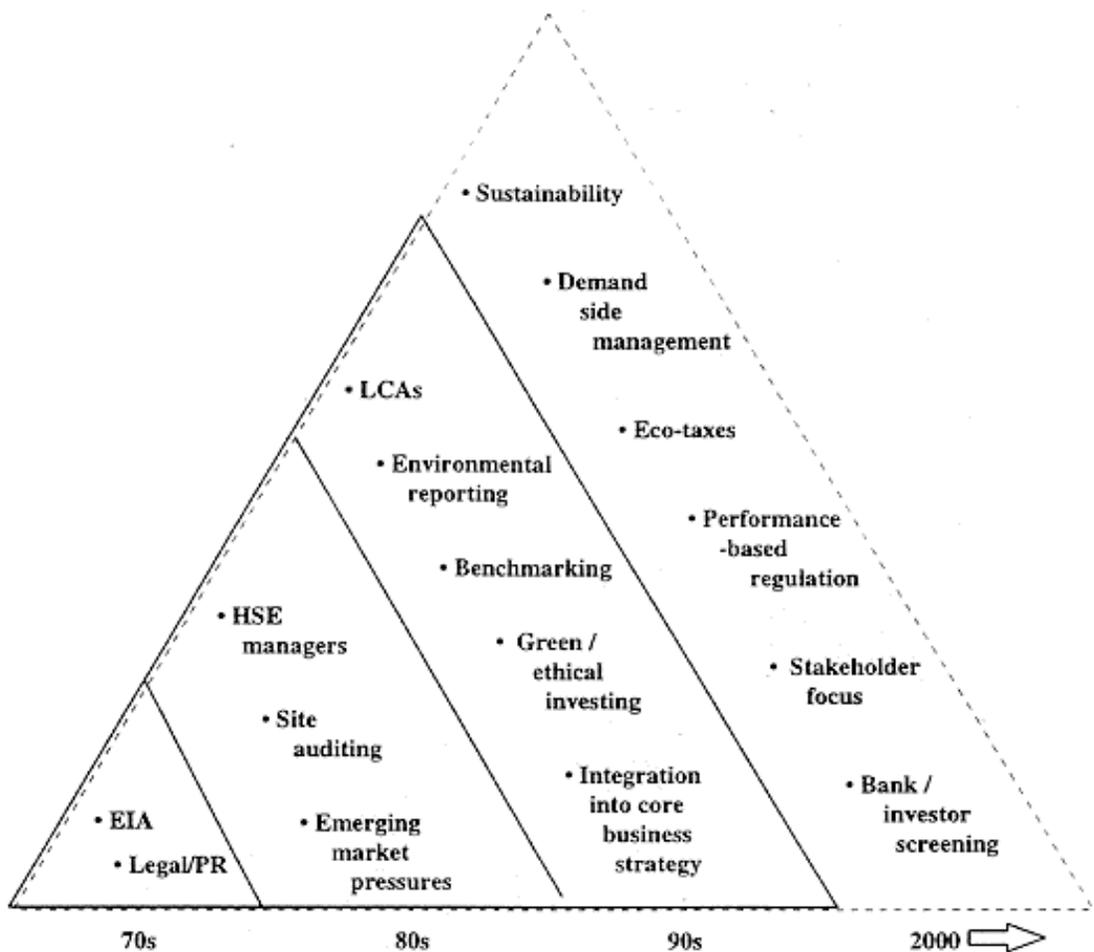
Dow accepts carbon-energy tax as steering mechanism

But the company also notes that the tax burden must be offset to protect industry's competitive position in export markets

What should business do next?

Figure 1 (p. 86) suggests that eco-taxes are very much part of the emerging environmental agenda for business. But is industry taking this challenge seriously? The answer, so far, has to be no. Despite regular pleas for greater use of market instruments in the place of further regulation, the international business community still has a long way to go before it is seen to be a central, committed player in this new phase of the environmental evolution of our economies. Perhaps this conference will help the process of awakening the slumbering giants?

Figure 1: Evolving Strategic Responses to the Environmental Challenge for Business



Source: SustainAbility 1995

Figur 1

Whether we focus on industry federations or individual companies, they should be asking themselves such questions as:

Do we know enough about:

- the different proposals likely to be advanced?
- the objectives of those likely to introduce ecological tax reform?

- the sectors, processes and products likely to be affected?
- the time-scales involved?

How can ecological tax reform help us - our company, our industry, our customers, our stakeholders - to achieve both our economic and environmental objectives?

At what levels should eco-taxes be introduced?

- energy and resource taxes?
- products taxes? - packaging taxes?
- disposal taxes?

Should our strategy in relation to ecological tax reform be reactive/defensive? neutral? proactive?

Whichever strategy we adopt, who should our partners be?

Is this an issue we should be discussing with our various stakeholders? And, if so, how?

Debate

The general agenda

Henrik Kærgård:

I kind of like the word "ecological". Somebody combined it with the word "tax". I have a basic problem after today. I think that Mr Agerley showed us this morning that we are facing a very great challenge. He mentioned, in his model for 2050, a factor of 5 between the level of consumption in the industrialized countries and the developing world. So there is still a factor of 2 or 3 to come after 2050. So maybe we talk about a factor of 10 when we reach the year 2100. Compared to that, all the economic scenarios of things we have heard about today are talking about a 10% improvement here, a 20% or maybe 40% improvement there and when we hear 40%, none of us believe it. But we are talking about 400%, 1000%, inside a time span of 50-60, maybe 100 years. I think there's a vast difference. And I think the economists here are talking about tools and instruments. But we have to find out what we do about the basic problems and that discussion has I think been completely lacking today. I would like to ask some of you people from the EU commission and some of the economists that have presented excellent reports here today. What are you going to do about the leap between 20% and 500% ? I don't think you can solve that by taxes. I think we need something else. Have you got an opinion on that?

Stein Hansen:

I will take up the challenge though not necessarily being able to provide an adequate answer. Several of my compatriots here have emphasized the importance of revenue neutrality if we are to achieve tax reforms. I think, in response to the very pertinent question that Henrik Kærgård has raised, revenue neutrality might have to give be given up. Because, certainly, one thing is that urban air quality may be changing and, in fact, in our part of the world the urban air quality has improved substantially in the last couple of decades. This has been used by many as a kind of tranquillizer, as a sort of proof that we can also solve the more pressing global problems which are more appropriately characterized by increasing entropy. But the urban air quality is not at all a question of entropy and entropy is a lot more serious because of accumulation.

I think the question you are posing is more related to the question of increasing entropy and how to deal with that. It demands much more Draconian measures, measures we have not had on the agenda today at all, measures that are very unpleasant. I don't see any politician who would risk his neck raising that. So who's going to do it? In which fora? Nationally? No. Internationally? Even worse. The first thing that will have to go, if the entropy issue is seen as a serious threat, is revenue neutrality. We would have to simply withdraw purchasing power from ourselves in one way or another. Not only that, but we can't just recycle that purchasing power and give it away to the people in the poor countries. Because their income elasticity for energy intensive goods is quite high.

So, if you want to cope with the overall issue, we have to give away a lot but not give it away to anyone just simply bury it somewhere.

Chairman:

Maybe you could include the free market.

Stein Hansen:

I think the market's failure, the failure to allow the market to operate properly is the number one problem. But that failure also includes this entropy problem which is an externality of an accumulative nature over and above the flowpipe externality which is normally modelled in the classical models. But other than that we have seen very few alternatives that can cope better with the externalities than

getting the prices right.

Hans Bergmann:

It is just regarding this constant consumption increase and these predictions that we will double our consumption or production. I think maybe one should clarify that this is a matter of value but not necessarily a matter of goods. I'm not sure that all in the Western world always want to buy more and more things. I think that maybe by ecotaxes and so on, we can maybe steer the increased wealth into consumption patterns that are less demanding on the ecosystems.

Kim Eilersen Nord, Friends of the Earth, Denmark:

A comment on the goals for the ecological tax reform. Elkington said that the consumer should not to be confused by companies on the issue of where to go. What is the target? What are the goals? In his lecture, Stein Hansen mentioned the concept of environmental space. My question is; What is your opinion about the environmental space concept as a goal for an ecological tax reform? This is just one measure among others. But we must have some goals for the ecological tax reform. How far should we go? The environmental space concept gives some preliminary estimate of level we should go for

Stein Hansen:

The word environmental space. I find it useless, at best just confusing and very hard to operationalize. It is a very static concept. If we had constant population, and a lot of other things were constant, one might perhaps use it after you have decided how much more energy an eskimo is allowed to use than the person who lives on Bali and so forth. But we don't have a static population. We have a fairly static population in a small part of the world. Other parts of the world are doubling their population in twenty five years. I don't see the concept as being very operationalizable. It is awareness raising and I sympathize and support that. But I think we have to focus on the kind of concepts politicians can relate to in their decision-making. The kind of variables that they can use in legislation, directives, command-and-control measures or economic measures, economic instruments of various kinds. All in order to try and change behaviour and change consumption patterns, production patterns away from what we find to be non -sustainable. Personally I have great difficulty defining sustainability. It is much easier to pinpoint what is not sustainable.

Kim Eilersen Nord:

I just want to get back to the overall goal of all this ecological tax reform. From my point of view it is to reduce the use of natural resources and I just cannot understand why we then calculate with growth all the time. Do we need the double growth which I think the first speaker was talking about. Or can we start to calculate with a negative growth or at least just non-growth?

Stein Hansen:

To our friend from the Friends of the Earth. In the study we have done for the Friends of the Earth in Norway, we don't predetermine whether growth is positive or negative. Growth is endogenous. It is a result of the whole model exercise we have been doing and we just calculate it. We don't have any particular personal feelings about the outcome. We just run the model and if it is positive it is positive, if it is negative, it is negative.

The insurance tax part that I have raised as part of ecological tax reform is to view the reduced growth rate of GDP that would result with a CO₂ tax for example. Most calculations suggest that if you introduce a CO₂ tax, that would reduce your CO₂ emissions by say 15-20% compared to a base case that would cost in the order of magnitude of 1% of GDP. Now, if we seriously believe what the climate experts claim about the consequences of accumulated climate gasses and we think that a 20% reduction in CO₂ emissions would reduce the risk of an irreversible global environmental damage, we could view that CO₂ tax as an insurance premium to reduce the likelihood of these kinds of global damages. And since it is only 1% of our income, in addition to what we pay in private insurance premiums anyway, we may think of that as a small sum to pay in order to secure a safer world for the future.

Change of attitude

Niels Enrum:

I will pose a question to Mr Elkington. One of Elkington's conclusions was that we have to change our values: that there is a need for exchanging "me" with "we", and "greed" with "need" etc. I wonder if you would elaborate on that a bit because it could be interpreted as wishful thinking: that is, if we were only all better people then all problems would disappear. What is going to be the dynamo in this movement from greed to need?

John Elkington:

I think that disasters and major industrial accidents used to be one of the major dynamos for new environmental policies and regulations. And I think that the Shell controversy was another important dynamo. But I think that the public, particularly in the OECD region, is becoming much more aware of forestry issues, fishery issues, the sorts of things that environmentalists have been trying to put on the agenda for quite some time. Even more importantly, more and more people who live in cities are finding the quality of urban air, for example, more or less unbreathable and it is getting to the stage where you hear it in normal conversations. Now does that trigger a value shift? I don't think it does. I think it creates the conditions within which value shifts can happen and I think the real dynamic is a change in generations. The older I get the longer I expect these sorts of value shifts to take. If one looks at business, which is the world I'm most familiar with, what has really changed things over the last twenty years is the younger generation of managers and directors coming up through companies. And I think you will see that in more and more different parts of society and parts of the economy. In presenting that set of value shifts to business audiences around Europe, one of the things that people have said to me is what you have there is the code of a new religion. In a sense, if you look at existing world religions, you quite often find values like that. But it is in that context that I think it is quite interesting that many of the companies are also saying, as I indicated, that they see evidence in their own customers and consumers of exactly those sort of shifts going on. Now, they won't go far enough, they won't go fast enough to really deal with some of the problems I think we are all concerned about. But if you take a generational perspective, I think we'll see some very fundamental changes indeed.

Speaker from the floor:

Just a comment on the need to change values. I think this conference has a sharp urban bias. It has been focusing on services and it has been focusing on industry and not very much on agriculture, forestry, fishery and all the primary production areas where really a major part of the discussion about sustainability really stems from. I think that when we look for solutions we have to really get into each sector and find out in each sector what are the remedies we can use. I have been working in forestry. If you want Danish forestry to become sustainable, you really have to change the tax system, or you have to change the whole economic environment. This is one very important issue that I would like John Elkington to comment on. The other is the issue of values and, I think, the whole environment of the values that we have today. We cannot conceive how our values will change because of the crises we are going to experience during the next ten years. I think that the long term projections of what policies are possible in the long run will not be very discerning because, when we get that far, our views and opinions will have changed greatly. Therefore I think, as was said by Stein Hansen earlier, we might all have to pay a bigger price.

Per Sørup:

Just a brief comment. I totally agree with the questioner on agriculture. It should have been mentioned, not least because it is one of my favourite themes when I discuss sustainable technologies. In fact I think it is the only sector where I can point to a sustainable technology at the moment in terms of a technology that is environmentally benign and labour intensive; that is, ecological agriculture. It is the most perfect example you can see of something having good environmental relations, a lot of labour intensive production and, at the same time, surprisingly, having an increasing market.

Jørgen Nørgård:

A lot of questions have been raised and many answered. I will try to pick a few from a more radical point of view. I generally feel that there is a lack of imagination when you hear the presentations. People say, I can't imagine more than a 100% tax and yet we had a 600% increase imposed by the Arabs on the price of oil in the 70's and 80's and we survived that. And now we are going to deal with similar severe problems. This is discouraging to me. We are here to discuss openly what we can do. You also hear statements that everybody wants more consumption, which is not actually true. But the people who say so probably want more and maybe their friends also want more. But it is not true when you look at the pattern. There are many indications of that. One of the things that caught my attention was the need for a value change. Maybe because I wrote a paper 22 years ago advocating an almost identical change to that proposed by Elkington. The need for that change was obvious, considering the environmental problems and to see that many others are concurring is actually quite encouraging. It is a slow process, a matter of generations. It is interesting to hear all the discussion here about green tax reform and employment. But you don't mention whether you are talking about 60 hours per week, 20 hours per week or the 37 hours we have at the moment. Of course, employment is something of a political decision. You can easily share out the work if you want to. This is a very important part of the issue of reaching a sustainable society: that is, to use flexibility in working hours. And it was one of the values that was originally introduced in European societies in the 1500's because of the environmental problems we were then facing when the forests were being depleted. At that time it was necessary to work hard to survive and this was put into the Protestant ethics etc. Now it is posing a threat to the environment because we insist on working. As I mentioned, the argument for increasing production in our societies is not that we need the products but that we need to keep each other busy. This is quite interesting and also very discouraging for people in other parts of the world to hear. We are consuming resources just to keep each other busy. So I think we have to give that part of our value system a very important reconsideration. I would like to hear comments on that.

Kaare Clemmesen:

I would like to answer on one aspect of this. Leisure is heavily subsidized in Denmark. Just think of the high marginal tax rate when you work one hour more. And if you add the extra benefit is in their various forms you have a very high marginal tax rate on an extra hour's work. Anyway, most of us work a lot, more than we have to do. We like it. I do not think you can alter that. I don't think you should alter that.

Jørgen Nørgård:

I agree that the high marginal tax rate is a good thing but this is also something we are trying to do reduce in order to get the economy growing again. And this, in my opinion, is completely wrong. So, as to a green tax reform, I agree that we should tax resources and the environment more and consequently tax labour less. But we should ensure we have a strong progressive tax system. Otherwise we'll get into trouble. The other thing I want to say, provocatively, is why is it so important to have a free market? We all seem to accept it. As far as I know, the free market's virtue is that it can cheapen the cost of products. And yet here we are talking about how to make products more expensive. So why is it so essential that we keep a free market economy? We seem to accept it without even questioning it. We all know there are environmental problems with the free market, yet we don't question the virtue of it. The free market also leads to higher levels of consumption.

John Elkington:

On the issue of the imagination. It is unfortunate in a way that Amery Lovins couldn't be here today. I would very much encourage you to read his paper. I did actually sit next to him at a press launch yesterday in London of the "Who Needs it?" report and some of the things he's coming up with really do address this imagination issue. He raised one point which I had never heard and which really captured my imagination as I hope it captures some of yours. I was talking about environmental reports that companies are doing on performance. Most of these things are incredibly boring to read. I had to read hundreds of them so it is something I'm acutely aware of. But then we mentioned something that's beginning to be talked about in the US and it is a concept which he calls "As if" reports. Now in Norway, Friends of the Earth have assumed that they were elected as the government and had a forty year term of office. What's beginning to be talked about in the US is that some companies are beginning to say "Lets imagine a future where the things we want to see happen, have happened and then think about how it is that we got there and how this company and this industrial sector evolved to make that possible". I totally accept what you are saying about imagination but actually think there are ways in which we can trigger that process of imagination even in some of the most conservative companies. I personally find that quite interesting.

Stein Hansen:

On the imagination: I did not have enough time in my original presentation to discuss the issue, other than, of course, raising the CO₂ tax twentyfive fold: which is quite imaginative! But I think more important is what you can see in our book when it comes out in August which is the first chapter of the book. That chapter brings us back to 1950. The reason being that our base year is 1990 and were looking into 2030 including the Friends of the Earth in power for forty years. So to try to imagine what things might look like in 2030. We thought, since we are starting in 1990, let's go back to 1950 and let's interview those people who were the chief forecasters at that time and find out what they thought about 1990 in 1950. It is amazing how different 1990 turned out compared to what people thought it would be when they did long term planning just after the war. They were so far off the target you can't imagine.

Jørgen Nørgård:

I agree a lot can be achieved. This is my main work area but I also know the limit is to what can be achieved. And first of all I know the limit is to what can be achieved when you at the same time demand economic cost because many of these measures will hamper economic growth and economic growth is of course a ridiculous measure. I don't care if gross domestic product goes up or down but it is used as a goal and therefore a lot of good options are blocked by that goal. For instance, the longer time of goods was mentioned. You can extend most goods' life time easily by a factor 2 and we could save a lot of resources. But industry and government don't want that because, for some reason, they want national product to go up. So I agree we can do it and we can have a better life. But we will have a lower gross domestic product and that is fine by me. And we'll probably have less employment also. That is also fine by me.

Hans Bergmann:

It is just regarding this constant consumption increase and these predictions that we will double our consumption or production. I think maybe one should clarify that this is a matter of value but not necessarily a matter of goods. I think that maybe by ecotaxes and so on, we can steer the increased wealth into consumption patterns that are less demanding on the ecosystems.

Jørgen Nørgård:

Just a comment on the demand for service in the future. Some services are quite energy intensive and resource intensive but some are not.

But it is strange to me to hear that you are talking about the economy can go on growing if we get people to consume something else than they do today. So why do they have to consume more? If we don't even know what they want to consume why are we pushing

them to consume more? Because that's better for the environment. But suppose they don't want to consume more as many things indicate. To reduce purchasing power by choosing more leisure time. We are not allowing that to happen and this would be much better. Then we could provide personal service to our children and our grandchildren without getting paid for it. And I think that has a higher value; to me at least. I agree you can achieve something by more service but I think it is a blind alley to think that this would solve future eternal growth problems. It will not.

Inge Røpke:

I will take the example of the small village of Hjortshøj in Århus. I think that they not only have the idea of changing the technology they use in their houses etc., but they also have the idea that they should live on a wage corresponding to, perhaps, 25 hours a week. They try to reduce their consumption so that this is possible. This is just to mention that some people in fact try to use less than they could use. I think that, if you look at organic farming and ecological farming that you mentioned before, you have seen the same pressure coming up from below. It is not the relative price that have brought people to have a third of demand for ecological products. Why not try to repeat that? I know it is not tomorrow but it would take some days to realize. That is the idea.

Per Sørup:

It is possible to do something different and we can do that. In fact I think the Technology Board should try to analyze this. I know that we are trying to do that. What are the conditions in which such things happened: ecological farming and what in fact comes out of that? What technological innovation is happening there? Is there a market outside these frames that can be applied further?

John Elkington:

Since we are looking at this in the "As If" framework, I think there are just a couple of quick points I'll make about the consumer. Most consumers do not approach their lifestyle decisions in an "As if" frame of mind. And one of the lessons that we learnt from the Green Consumer Guide experience in quite a number of different countries was that green consumerism - or ethical consumerism or responsible consumerism - whether it is driven by campaigning organizations or governments can be a very good way of helping ordinary citizens think about some of these issues. Because they are having to make a choice. In terms of information and education it is very powerful. And in terms of building a social critical mass for some of the changes that are required, I think it is very helpful. But, as I noted in my presentation, there are all sorts of barriers to ordinary consumers doing the right thing. One barrier is simply confusion. One product manufacturer tells them one thing, another tells them another and quite often the campaigning organizations change their ground over time. That is a killer for people who want to make fairly simple choices. So, in a sense, we need to give more credible information to consumers. The second point: in the diagram of sustainability vectors, I made the point that we need visions. I really do not believe that either politicians or, in many cases, the campaigning groups or business are providing sufficiently attractive visions of where it is we want to go. Unless you have something like that, many people will find it very difficult to operate in an "As If" frame of mind. The final point is that, from a UK perspective, I personally found the consensus conferences that the Board of Technology has developed a very interesting, if somewhat limited, approach to this problem. I'm very pleased that in the UK we have started to use the same process. So there are tools that we can use. But the consumer, I'm afraid, is not going to deliver the sustainability revolution in any short order.

Allen Aspengren:

I think, as I indicated in my talk, that we have to work together; the NGO's, the government and industry. But I do think industry needs to take more of a leadership role. We are creating the pollution. We have a lot of the solutions to the pollution and we need to work together with the other groups. I think we are a major player when it comes to the environment and to ignore us or to say that we are not really.....it is hard to believe!

Different aspects of ecological taxing

Inge Røpke:

The issue I want to take up is putting the ecotax reform into an historical perspective. I think there are two sides to the ecotax reform. One side is the production side and the other side is the consumption side. And by this I mean that if you change the factor prices and it is one of the ideas of the ecotax reform to change the relative prices of materials and labour, then you will influence the choice of technology in a more labour intensive direction. This is one part of the ecotax idea. If this is really carried through in an effective way then it will also have effects on the consumption side. Because the relative prices of final products will change as well. If you look at this in an historical perspective you can see that this is in fact what we have experienced already. If you look back, you can see we have been through a period in which materials have been very cheap and labour has been increasingly expensive. This has changed technology in a capital intensive direction and it has changed the relative prices of final products in the direction where you have to pay more to buy an hour of work.

Now for the first time, I think we have a debate, a conscious debate about where do we want relative prices to change in the future. And I think it would be a good political decision to demand a change in relative prices whereby we make care and repair and so on much cheaper, measured in material products. So I think that would be a good choice; also from a social point of view. Unfortunately, it takes quite a long time to realize this change. I think that is what we have heard from the panel today that it will take a long time to change prices through an ecological tax reform. And this makes me think that maybe would should start trying to realize these changes before economics has changed. I will ask one question of Stein Hansen and that relates to your model. Did you try to find out what would happen to the economy if you withdraw purchasing power. Will the economy collapse?

Stein Hansen:

It does not collapse. The fifth scenario I briefly mentioned - where we reduce the labour input by 10%, to put it another way we increase leisure by 10% - is equivalent to reducing purchasing power. This scenario reduces GDP and private consumption in the year 2030 by roughly 20% compared to the base case. But we are still richer than we were in 1989. So there is substantial resilience over that long a timespace because virtually all technologies, all capital that was invested in 1990 and 1995 would have be written off by the year 2030 anyway.

Frede Vestergaard:

This question is to Stein Hansen. The issue of reducing purchasing power. I take you as meaning you reduce the total demand in the economy and I wonder how in a normal Western economy you can reduce total domestic demand without this having some influence on the total level of employment. It seems to me that the economy will enter into a sort of recession if you start reducing total domestic demand.

Stein Hansen:

Well, we eliminated the problem by the definition of the model. This sounds ridiculous perhaps given that, in fact, we do have population growth. But all the demographic elements of the model were exogenous and so what we seem to do, in an exogenous way, is we reduce the amount of labour supply - the amount of time people would spend working - by 10% and then we see what happens to the activity level of the economy as a whole. We do nothing other than that. It is basically saying that labour decides it would like to work less.

John Elkington:

In my comments, I tended to focus on companies. I agree with you that the real focus needs to be at the sectoral level and that recipes for sustainability will be different from sector to sector. We were talking earlier on today about winners and losers and it is very clear that certain sectors will be major losers in a shift to a sustainable economy. The chlorine sector, although it may be very clever in keeping it is products and processes, would be one very serious loser. I think the interesting thing about the sectoral level of the discussion is that it is now much easier - as environmentalists or as environmental experts - to get alongside some of the leading companies in each sector.

Per Henriksen:

There is a problem related to the ecological tax reform which has not been mentioned today but which I see as a big market error in the way it performs nowadays. The first step is that governments decide that they want some green taxes or the beginning of an ecological tax reform. But the next step seems to be that they make major exemptions, especially for major energy consumers in industry. In this first stage, the Danish government, according to the Dithmer report, as I remember it, exempted about 40% of the industry's energy consumption from the tax, or reduced their tax rate. And I would like to ask the panel if any of you have a solution to this problem. I would like to mention a solution that would also give a lot of new problems but I think it is a kind of a solution. The solution could be that you also put the green tax on steel, concrete and so on. But that, when the finished products are exported out of the region, the tax would be deducted. If goods are coming into a region where there is an environmental tax on steel and concrete and other heavily energy consuming products, then the tax would be added. I know it is a bit of a bureaucratic way of doing things. But I think that it would create a situation where the companies operating in a region where there is the beginning of an ecological tax reform will have an advantage because on their home market they would try to minimize their use of energy and that would also create an advantage on the export market. On the other hand, the companies operating outside this region won't have the same incentive to minimize their use of energy. So they would be heavily hit when exporting to this region. So you create a situation where you do not have the long and ongoing discussion as to whether specific firms will move abroad: you create a situation in which companies might see an advantage in shifting their operations into this region. What do you think of this proposal or what other answers do you have to this problem of market error and the way we proceed with green taxes right now?

Kaare Clemmesen:

We have thought about the solution you propose here when we worked out the Dithmer report. It is a very good idea. It is the same idea which is in practice in the VAT tax system. It is a good idea but I'm sure it won't be accepted by the EU - it is seen as a selective

subsidy to industry. I think that this problem with the heavy energy-using part of industry will be solved in a few years when the rest of Europe introduces a CO₂ energy tax. I'm very optimistic at that point. When we have coordination in Europe, we won't have to talk about these problems of competitiveness. So that won't be a problem. But we still have a problem: Is the tax high enough? Because we have to have a switch in our national production. I don't think that a 200 crown CO₂ tax is enough for that purpose. Maybe it should be 800 crowns or something like that and, maybe, the gasoline price should be quintupled in the long run. But this has to be coordinated. It is impossible to do this alone.

Hans Bergmann:

I can't say whether it will be allowed or not but there are problems, of course. One other way to solve this problem of exemptions could be, to have a different rate of tax as they have in Sweden. It is not maybe the best solution but at least there is some marginal cost, even though it is smaller. Because in Sweden, industry pays only one quarter of what everyone else pays in CO₂ tax. But the debate about border tax adjustment has been quite disgusting, in OECD, for example. It is, as you said, quite difficult to administer border tax adjustment. Maybe, on a particular amount of steel you could possibly calculate the border tax. But in a Volvo car, for example, how much CO₂ tax is to be paid on a complicated product like this, is very difficult. Another tactical problem is that we, on the environmentalist side, try to sort of promote the idea that the environmental cost is a very small part of the total cost and thus does not affect competitiveness so much. So if you start to accept this discussion on tax adjustment when you do not have adjustment of labour taxes etc. then it is easy to accept the notion that environmental cost is a most horrible thing and that it affects competitiveness. When, in fact it is only one small factor. So there is, I think, a sort of tactical problem also. There is a debate about this but I'm not sure it will end satisfactorily.

Stein Hansen:

We have tried to simulate the impacts on particular polluting industrial sectors in the models we have used in Norway. It is quite clear that, for these particular sectors, a high CO₂ tax would certainly, over time, price them out of the market. That would definitely help Norway which fulfilled the stated CO₂ goals of our Parliament - that is, stabilization or reduction of CO₂ emissions. However, some of those Norwegian companies that would be priced out of the market as a result of this would then have to give up and production would move to Russia or wherever. So what would be good for the Norwegian CO₂ goal would probably be adverse for the global CO₂ goal. So that's one problem.

As far as the possibility of implementing this very fascinating tax refund pipescheme I would think that to refund the tax when you export out of the region could probably satisfy the GATT regulations, since you have imposed it on a national basis to start with. It would be a lot more difficult, in fact it would be directly in conflict with GATT regulations on the import side. Because then you could only justify the import tax on these commodities if you can prove that the commodity itself is damaging to health or environment in the country where it is to be consumed. But production processes do not permit import taxes under the GATT regime.

Henrik Kærgård:

I would like to support Per Henriksen's suggestion and I think it must be hard to be a bureaucrat because you always have so many problems. I think it can be easily done. It is a product differentiated VAT and you apply it when you sell the product on the market: just as you apply VAT. You have no problems on the border, you apply it when you sell. As for the technical problems. I can tell you that a couple of years ago we did a job for the Danish EPA in COWI consult where we computed accumulated life cycle energy consumption for a thousand product categories in the Danish Statistics' data base. This is not really difficult to do and you can easily differentiate this in the products. You can have it in a data base and you can do it. There is no competition problem in it. I think it is a very elegant solution and I think you should try to remove some of the difficulties.

Frede Vestergaard:

If a product is produced in a factory using natural gas as energy and the same product is also produced in a factory using coal as energy, how are you going to tax these different products when they are imported and you can't, for sure, say whether they come from the one factory or the other factory?

Henrik Kærgård:

That's right. Of course there is a limit to how much you can differentiate. You cannot say that when cement is bought in Poland it has to be taxed four times more than the cement bought in Denmark. But you could have a bulk tax on cement which is an average tax and I think that would at least help.

John Elkington:

I personally believe that business is fundamental. I think that companies have to be engaged in this process. I think the difficulty that many companies are currently having with ecological tax reform is that it is hard enough if you are dealing with marketing your new

product development or project development areas. You have a limited number of people who can deal with those issues. But companies are beginning to put these sorts of people into the discussion. If we were talking about life cycle assessments here or environmental reporting some of those people would be here. We had perhaps have a better turn out. The problem that we face with ecological tax reform is that the people who are best able to deal with it in the business sector are often the financial people. I'm afraid that we still have, despite what I said earlier, quite some way to go to convince these people that this is a serious threat or a serious need which they have got to become actively involved in. I think it will happen and I think that one of the key ways in which we can engage them is by beginning to talk to them in some of the language they already understand in relation to problems they already have. I'm not sure that that's yet been done sufficiently.

Frede Vestergaard:

It appears to me to be quite obvious that we must have more environmental taxes. But I was rather surprised to hear this morning Kaare Clemmesen say that he did not see the potential for more than a doubling of the present size, from 5 to about 10% of the gross domestic product. I wonder why this discussion of environmental tax reform does not include the so-called direct consumption taxes which have been discussed among economists time and again. I think it was the English economist, Nicholas Kaldor, who did a study of this about 30 years ago. In Denmark, Christian Sørensen from Odense University and from the Labour Council has also been arguing in the 80's in favour of direct consumption tax. It seem to me that there should be some possibility for raising taxes through direct consumption tax also. This, in the same way as other green taxes, would relieve the income tax of its present distortions, especially on consumption of services. But what I would like to ask Kaare Clemmesen here is about this other side of tax reform. We have talked a lot about green taxes. But we have not talked much about the other side of it. This double dividend, the second dividend of it, the effect on the labour market, has almost not been touched upon. We have talked about acting as if environmental taxes were already in place. But how do we get from point A to point B, especially in the labour market? What is the transmission mechanism which ensures that, if income taxes are lowered, labour costs to the employer are also reduced? How shall we ensure that this will happen? Since this is basically the mechanism whereby employment is increased. So this other idea of the green tax reform - achieving less unemployment and higher employment - how do we get to that? This is a question to Kaare Clemmesen.

Kaare Clemmesen:

As I see it, you pose me three questions. First, you wondered why I said we could only double the tax from 5% to 10%. What I talked about was the tax revenue. I can easily imagine, and I have said so before, that, for example, the price of gasoline increases five fold in the next 20 or 30 years. The same with other kinds of green taxes. My point is just that, when we double these taxes, the consumers will substitute away from these items. So the overall revenue from these taxes will not increase proportionally. It is just my guess, but I don't think it could be more than doubled if you look at the tax revenue. And the tax revenue is important if you are talking about effects of the tax reform: that is, how much can you lower the rest of the income tax pressure.

The second question, direct consumption taxes. I know this has been debated; especially some years ago. It sounds very ingenious to use a direct consumption tax. But, as I see it, we already have one today. The VAT tax is in fact a direct consumption tax. If we introduced a direct consumption tax today instead of personal income tax it won't alter our behaviour much. It would mean a little bit about how much we would save up for our pensions but that's all, I think. So that won't be a solution for the environment. The environment will only be saved, be better, if we directly put taxes on the items, the goods which give some form of pollution or which use nature more than we want to. So that's it. About the double dividend, I didn't name the double dividend and that's why I did not want to go into a discussion about tax distortion: that is rather a complicated issue which is very difficult to set figures to. What I talked about was that, if we make an ecological tax reform, we can raise the rate of green taxes and lower income taxes. Maybe that would let wage costs decrease a little bit. I don't think that would matter much for job creation because I, like most other economists, think that unemployment is a matter of the labour market, how it functions. It is matter of skills, it is a matter of unemployment benefit, it is matter of regional dispersion but it is all about how the labour market functions. If we have to deal with the unemployment issue, which is very important, we have to think of upgrading the skills of the workforce. That's the way to do it. I think they are two quite different questions: to do something about the environment and to do something for employment.

Speaker from the floor:

It is just on this issue of what is now recognized to be a tenfold reduction that we have to achieve, not the fourfold that was mentioned this morning. Most of the data coming through is saying we have got to achieve a tenfold reduction and you need lots of imagination for that. But we don't need to look too far. It is because we have been so profligate with resources. The flip side of that is it is relatively easy to make big improvements in eco-efficiency and you don't need imagination. Three particular examples in isolation achieved 90% reductions in themselves. That's a tenfold improvement. One was the SO₂ tax in Japan which, within the space of four or five years, reduced the SO₂ output by that order of magnitude such that they had to raise the tax 6-700 fold in order to maintain the revenue which was being used to compensate people who were ill from SO₂. When the toxic release inventory regime first hit America in 1987, the head of Monsanto said "Are we really putting out all this rubbish onto the communities of America?" And the answer was yes we are. And he said "This is just not acceptable just from a PR point of view, let alone a toxicity point of view. I want that figure reduced" -

and he was talking about hazardous air emission of all Monsanto plants throughout, I think, the world. He said that figure has got to come down 90% in five years. His engineers went potty for the first month or so. "This is impossible to do!" But it was because they were not even measuring half the stuff before and they had given this question no attention, that they achieved a 90% reduction in hazardous emissions across all those plants in five years. A third 90% reduction is what the 3M man was talking about which goes under the heading of waste minimization or clean production. Factories throughout the UK and other parts of Europe have, by concentrating on what they are doing and asking simple questions, often of the work people, "Why do you do the way you do things in this plant?" They have reduced, for example, hazardous solvents or use of water or lots of examples of substances by 90% often with no investment and with payback periods of a year or two years. All these separate things were three different ways of doing things. Once you put things together in a package, you'll have a law about company reporting toxic release and you'll have a taxation like the SO₂ one. You underpin it with regulations, information to consumers. In other words, with a package of tools you can easily get a tenfold reduction in throughputs in the next thirty years. It is there for the taking if you decide to go for it.

Henrik Kærgård:

I like success stories and I know a lot of them myself. But there is a trend you know. They tend to report on the issues on which they have gained 90% and the issues on which they have not gained or where they may even have spent more or made more environmental damage to reach the 90% on the other issues. They do not report on those. I know many examples, as you say, on hazardous substances and things like that. There are many environmental problems that you can easily completely erase. But show me companies that have a 90% reduction in energy consumption or a 90% increase in energy efficiency. I would like to see that. I have never seen one. Show me a 90% reduction in transport which consumes one third of the energy consumption in the world. Show me that.

Speaker from the floor:

If we are talking four decades, it is possible. Because you'll have seen real effort in the form of a comprehensive package of regulations, taxes etc. Companies have achieved 30 to 40% improvements in energy efficiency in a decade. If your talking four decades, you need a new approach. So it is achievable.

Per Henriksen:

I would like to ask the panel if the ecological tax reform approach is only an approach for the Western European countries. What about East Europe? Right now a lot of these countries don't have a really good tax system. They are building up tax systems. They have enormous use of energy and raw materials and very cheap labour costs. Have any of you in the panel considered whether a part of the new tax systems - which of course you have in East Europe - should be a kind of ecological tax system?

Stein Hansen:

If I can take China instead of East Europe. There are similarities. Two of the similarities are that, as far as costs and prices are concerned, there is complete disorder because there's been a detailed demand-and-control type of economy in both places. The other similarity is that in China, too, there have basically been no taxes before because people have received their rice portions, their coal rations and the apartment follows the job and so forth. So, first of all, when we talk about green tax reforms or ecotax reforms we tend, in the same sentence, to talk about revenue neutrality because we are talking about already highly distortive income taxes, labour taxes. We see the potential for efficiency gains by reducing highly distortive tax systems, replacing them with taxes that internalize externalities. That, of course, is not the case in these economies because you are not taxing labour to start with and you desperately need revenue to undertake some of the basic services that government has to do anyway. So the setting for taxation is very different from what we normally talk about when we talk about tax reform. You can go to another country, south of China, namely Singapore, which is a country that has gone by far the furthest in the world when it comes to environmental taxation. But for a totally different purpose: for the purpose of making Singapore the cleanest place in the world. But they use mostly user charges. You have to pay for everything. Anything that pollutes and uses up resources you have to pay the full cost. So they do it for reasons of efficiency and it works well. And I think the Singapore lesson is one that tries to be exported to other countries in Asia, including China. I think it is gradually sinking in there. It will take longer, I think, in Eastern Europe but certainly in Asia, the Singapore experience is being observed by other countries.

Hans Bergmann:

Just to clarify that. Some Eastern European countries are actually advanced, so to speak, on ecological taxes. Poland especially has quite a lot of tax on emissions which they use for environmental investments. And the Baltic states, for example, also do this and tax other areas too. For example, I was in Lithuania where they have a very beautiful natural park. The entrance fee was about 50 crowns per person which is a huge amount of money in that country. To charge, say 500 crowns admission, to a national park in Denmark or Sweden would lead to massive protests. But they do it. And they have police and military guarding it so that nobody gets in without paying. We are not always best, far from it. They are quite good sometimes.

Frede Vestergaard:

I would like to add that the World Bank has given figures lately that seem to show that the first issue is not to raise taxes but to get rid of subsidies to energy consumption in developing countries and former socialist countries. I remember a figure given at the Climate Conference in Berlin, that the total amount of subsidies given to energy consumption in developing countries and the former soviet Union is of the order of 150 billion dollars. So that's a first stage: to get rid of these subsidies before starting taxing.

Annex 1

CONFERENCE ECOLOGICAL TAX REFORM

PROGRAMME

Chairman: Journalist Karen Hjulmand, DR (Danish Broadcast)

9.00

Welcome Lars Klüver, The Danish Board of Technology

9.10-9.40

Environmental problems in a long-term global perspective. Background and future possibilities of an ecological tax reform comprising increasing tax on material consumption and decreasing tax on labour. **Harald Agerley, Manager.**

9.40-10.10

Sustainable technology - what are the elements and the decisive qualities of a technology development devoted to environment and employment? In which ways can an ecological tax reform support such a development? **Per Sørup, the EU Commission, Institute for Prospective Technological Studies, Seville.**

10.10-10.40

Coffee break

10.40-11.10

Environmental taxes in the EU Member States - overview of economic instruments and problems and opportunities with respect to changes of the current development of environment and employment. **Hans Bergmann, EU Commission, DG XI.**

11.10-11.40

Employment effects of an ecological tax reform. Environmental taxes in Denmark - based on the official report, the Dithmer Report. **Kaare Clemmesen, the Economic Council of the Labour Movement.**

11.40-12.10

Ecological tax reform - presentation of the debate in Germany and policy proposals for the international society. **Hans Jochen Luhmann, Institute of Climate, Energy and the Environment, Wuppertal.**

12.10-13.10

Lunch

13.10-13.40

"Sustainable Economy" - presentation of a Norwegian project focusing on environmental taxes and the interaction between economical politics and environment in the coming decades. **Stein Hansen, leader of project "Sustainable Economy", Norway**

13.40-14.10

Presentation of experiences with sustainable production in 3M - Minnesota, Mining and Manufacturing. In which way will an ecological tax reform influence expectations and objectives of the company? **Allen Aspengren, European Manager of Environment, Health and Safety, 3M.**

14.10-14.40

Sustainable consumption - what is it and how should the business sector prepare for the new demands related to an ecological tax reform? **John Elkington, director of SustainAbility Ltd., London. Member of the EU Consultative Forum on the Environment.**

14.40-15.10

Coffee break

15.10-16.55

Panel debate Questioning panel:

Frede Vestergaard, journalist, Weekend Avisen

Inge Røpke, economist, Technical University of Denmark

Jørgen Nørgård, chairman of the Ecological Council

Per Henriksen, secretary of environmental affairs, Socialist Peoples Party

Henrik Kærgård, Cowi Consult

Nils Enrum, economist, the Danish School of Public Administration

16.55

Conclusion

Annex 2

Participants at the conference Ecological Tax reform, June 22, 1995, Gammel Dok, Copenhagen

Allan Høxbroe: DR, Radioavisen

Allen Aspengren: 3M Europe s.a.

Anders Brinkbæk

Anette Blegvad: Vejen fra Rio, Danske Arkitekters Landsforening

Anita Sørensen: Handelshøjskolens Bibliotek

Anne Mette de Vissa

Anne Prag: Told og Skattestyrelsen

Anni Svanholt: Folketinget

Bent Hesslund Andersen: NOAH

Birte Nyholm: CIBU

Bjarne Rasmussen: Storstrøms Amt, Amtsrådhuset

Chris Dejean: Idespectrum

Claus Hvasshøj Jørgensen: COWI Consult

Claus Midjord: Ritzaus Bureau

David Gee: WBMG, Environmental Communications, London

Ejvind Vesselbo: Danmarks Statistik

Erik Toft: Trafikministeriet, Planlægningsafdelingen

Erik Veedfeld: DJØF

Eva Elbæk Jørgensen: Energistyrelsen, 13. kontor

Flemming Ludvigsen: Oliebrancens Fællesrepræsentation
Frantz Landberg: Frede Vestergaard : Weekendavisen

Gert Børsen: NOAH

Hans Bergmann: EU Commission, DG XI

Hans Jochen Luhmann: Wuppertal Institute

Hans Pedersen: DR, Radioavisen

Harald Agerley:

Henning Gjellerod: Folketinget

Henning Urup: Folketinget

Henrik Føhns:

Henrik Kærgaard: COWI Consult

Henrik Neergaard:

Henrik Sjørring Johansen: Center for innovation

Henrik Skotte: Energistyrelsen, 12. kontor

Henrik Theil, journalist : Finansforbundet

Henrik W. Rasmussen: 3M Europe s.a.

Ia Brix Jensen : CIBU
Ida Elisabeth Andersen : Danish Board of Technology
Inge Røpke : Technical University of Denmark

Jacob Bagge Hansen : Landbrugsrådet
Jan Kæraa Rasmussen : LO
Jane Stiesdal : Energi og Planlægning
Jens Frank : FTF
Jens Hald Madsen : Folketinget
Jens Peter Vernerisen : Folketinget
Jens Stærdahl :

Jeppe Øster : NOAH
Jesper Gundermann : Energistyrelsen
Jesper Lund Larsen : Branchesikkerhedsråd
Jesper Petersen : CIBU
Jette Gabrieli : FOGU, Grønt Universitet
Johan Nielsen : Miljøstyrelsen
John Bagh : SBI
John Elkington : SUSTAINABILITY LTD.
John Merkelsen : TIC
Johs. Grundahl : Danish Board of Technology
Jørgen Fastrup
Jørgen Nørgård : Ecological Council
Jørgen Schou : Miljøstyrelsen
Jörgen Edström : Elkraft

Kaare Clemmesen : Economic Council of The Labour Movement
Karen Hjulmand : Danish Broadcast
Karl Voigt Nielsen : Enhedslisten
Katja Iversen :
Kim Bak : Told- og Skattestyrelsen
Kim Ejlersen : NOAH
Kim Hjerild : Det Radikale Venstre
Klaus Sall : Regnskovsgruppen Nepenthes
Klaus Thostrup : Miljø og Energiministeriet
Kurt Hoffritz : Skatteministeriet
Kurt Kongsted : Skatteministeriet
Kurt P. Jensen : Energistyrelsen, 12. kontor

Lars Georg Jensen : 92 Gruppen, WWF
Lars Klüver : Danish Board of Technology
Lars Meldal
Lars Schmidt : Akademikernes Centralorganisation
Leif Albert Jørgensen : Danmarks Statistik
Leif Hald : Transportrådet
Lene Okholm
Lise Drewes Nielsen : Handelshøjskolen;TTR

Majbrit Johansen : LO
Marian Schrøder : Teknologinævnets sekretariat
Marianne Hansen
Marianne Vest Jensen
Marie Jørgensen : Bygge og boligstyrelsen
Mats Uluf Hansson
Mette Langager : FTF
Mette Nedergaard : Energistyrelsen, 12. kontor
Michael Linddal : Institut for økonomi, skov og landskab, KVL
Michael Nørgaard Andersen : Roskilde Kommune Teknisk Forvaltning
Michael Siemsen :

Nicolai Peitersen :
Nicolai Zagenis : Forbrugerrådet, studerende
Niels Hoeck : Landmand
Niels Lyksted : Teknik og Miljø i Amt og Kommuner, Nyhedsinfo.
Nils Enrum : Danish School of Public Administration

Ola Jørgensen : Ugebladet Mandag Morgen
Ole Busck : SID
Ole Christensen : HO RE CON
Ole Damsgård : Dansk Byplanlaboratorium

Ecological tax reform

Ole Engberg
Ole Vagn Christensen : Folketinget
Oluf Husted : Bøgely Gamle Skole
Per Henriksen : Socialist Peoples Party
Per Sørup : Institute for Prospektive Technological Studies
Pernille Rasmussen
Pernille Sørensen
Peter Bach : Energistyrelsen
Peter Hansen Nord : Folketinget
Peter Hesseldahl : Journalist
Peter Jezek : University of Economics, Praha
Peter Marstrand
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Pia Krogh Christoffersen

Roger Leys
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Steen Bengtson : LO
Steen Mejlby : SID
Steen Voigt : Berlingske Tidende
Stefan Brendstrup
Stein Hansen : Sustainable Economy
Sussi Handberg
Suzanne Veltze : DAKOFA

Tarjei Haaland : Greenpeace
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