Green4sure
A Green Energy Plan

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1 Green4sure, A Green Energy Plan: summary

We present to you Green4sure, A Green Energy Plan, elaborated by CE Delft for six of the Netherlands' largest environmental and trades union organisations[1]. Its point of departure is a keen awareness that CO_2 emissions need be drastically and urgently reduced. The organisations asked CE Delft to examine whether, and above all how, the Netherlands can achieve a 50% reduction in its CO_2 emissions by 2030 compared with 1990, while improving guarantees there will be enough energy for continued economic growth. At the heart of Green4sure is a comprehensive and well-considered package of policies with which the government can induce trade and industry and individual citizens to make energy-efficient and green choices in their day-to-day activities.

The name Green4sure has a dual reference: to the 'greenness' of the central emissions target and to security of supply, an increasingly important issue as dependence on energy imports grows. It is a Dutch plan with a European perspective; a plan for government steering that leaves the market to do its work; a plan that encourages innovation; and a plan that retains maximum freedom of choice.

The first step in such an enterprise is to set an ambitious climate target, whether this be a 20, 30 or 50% reduction in CO_2 emissions. In recent months this step has been taken at both the national and international level. The next step is to make sure these ambitious targets are going to be achieved. Technology in itself is not the limiting factor here, as experience shows, but its application. And that is something that requires public support, firm political commitment and above all a robust plan with a well thought out set of policy measures.

Potentially, there is enough public support for the changes required. Today there is a virtual consensus that climate change is one of the most urgent issues facing global

[1] The Green4sure project is an initiative of the Dutch trades unions ABVAKABO FNV and FNV Vakcentrale, the Greenpeace Foundation, the Netherlands Society for Nature and Environment (*Stichting Natuur en Milieu*), Friends of the Earth-Netherlands (*Vereniging Milieudefensie*) and the Worldwide Fund for Nature (WWF).

society in the years ahead. The threat posed by global warming and its projected impacts on our climate, quality of life, economy and society as a whole is enormous. With so much at stake, governments, NGOs, a great many citizens and large sections of trade and industry are convinced of the need for major changes in the way we produce and consume energy.

With Green4sure we hope to provide a provisional yet solidly underpinned impetus to a change in the way our society uses fossil fuel-based energy. We are well aware that the ambitious targets proposed here will need to be accompanied by a range of far-reaching changes. As with any major change, there is bound to be resistance, However, we are convinced these changes will above all serve as a source of inspiration for new products and services to fulfil our basic needs and desire for comfort in an environmentally benign and energy-efficient way. Green4sure will, in other words, create opportunities for new economic activities.

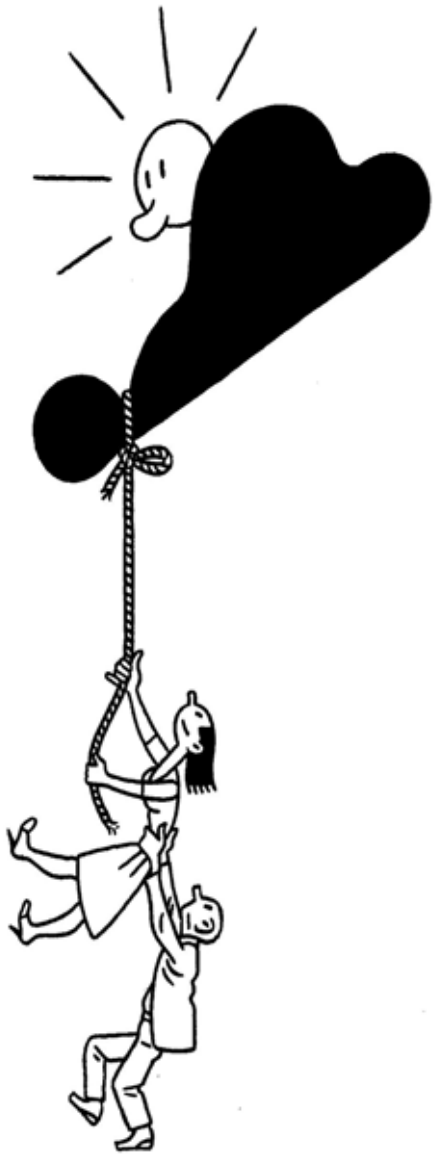
2 Green4sure in summary

In this short version of the full report we describe the basic choices behind the Green4sure plan. We explain how they are underpinned and describe their impact. We indicate where we are heading (targets) and how we aim to get there (policies). Given the choices made, Green4sure is a market-based energy plan in the spirit of our times that ties green targets to realistic policy instruments that have been well thought through in terms of economics.

Our point of departure is the ambitious target of 50% reduction in CO_2 emissions by the year 2030 compared with a 1990 baseline. Although this target goes beyond that set by the present Dutch government (30% reduction in 2020), because of the 2030 horizon we have taken there is in fact little discrepancy between the two. We have chosen to extend our vision to the year 2030 because this is long enough for a major turn-around while still ensuring that the proposed changes can be readily envisaged. The Green4sure targets represent the first step towards the further cuts in carbon emissions needed in the course of the present century.

We have opted for government policies designed to change the behaviour of trade and industry and individual citizens. These policies impinge on decision-making behaviour of all kinds and make due allowance for the resistance to change that will inevitably arise. Most of the policies are generic rather than specific. The core policy at the heart of the plan is allocation of carbon budgets to all energy users, similar to the EU Emissions Trading Scheme now in force for industry. This quota system will be supported by efficiency standards for domestic appliances, vehicles and buildings; targets and, later, standards for the use of renewable sources by energy suppliers; and facilitation of sustainable choices. By facilitation we mean a multitude of new financial and fiscal measures, including road pricing and suitable compensation for low-income groups and others, but also new investments in utilities and changes to today's legislation. So that change can start apace, we propose an interim set of policies to support measures taken to protect the climate, until such time as the new regime of

budgets and efficiency standards has reached maturity. These include so-called Green Funds and research grants to promote innovation, a variety of charges, environmental permits, an interim Electricity Act, tax incentives and differentiation of property transfer tax.



Another key choice concerns differentiation between sectors. We fully realise that any major changes to energy systems may have a far greater impact on energy-intensive and internationally operating industries than on energy-extensive businesses whose competitiveness is governed far less by energy costs. For this reason we propose three different carbon budgets: one for industry, electrical power generation and greenhouse horticulture, a second for the transport sector, and a third for the built environment (households, offices and small businesses). This differentiation ensures that each sector contributes to the cuts according to its capacity to do so and provides scope for specific flanking policies.

The choices made in the proposed policy package make it possible for this to be a domestically led strategy; measures that can be taken at the national level can be implemented immediately. For a number of sectors and instruments, though, a European approach will be essential. Such will be the case for the carbon budgets for industry, greenhouse horticulture and transport, for example, as well as for the proposed standards for appliances, lighting and vehicles and the requirements made of electricity suppliers.

The impact of Green4sure will be felt in a variety of ways. In the first place it will have a major impact on carbon emissions. The ambitious target of a 50% cut in emissions by 2030 proves entirely feasible. Another key impact will be the improved security of supply achieved by less fossil fuels having to be imported from politically sensitive regions. Of course we have assessed the costs and benefits of the plan and how these would pan out for individual sectors and citizens. The costs of Green4sure are certainly higher than in scenarios involving no additional climate policy, but these are offset by a variety of benefits. With time there will be modest growth in employment and there will also be added benefits in terms of new market opportunities and improved local quality of life (less air pollution by particulates and NO_x).

At the end of this report we paint a picture of ‘the good life’ as it might look in 2030 if the Green4sure plan is adopted. It provides examples of (technological) developments that will help achieve the Green4sure targets. As will be seen, the far-reaching changes envisaged will not undermine current lifestyles but challenge people to adjust, sometimes in major ways, sometimes only marginally.

Government steering plays a pivotal role in the Green4sure strategy, with suitable positive incentives and restrictions being introduced for industry and consumers by government to reward green and energy-efficient behaviour and guarantee that sustainable entrepreneurs are better off than their counterparts who continue to squander resources. Even today, industry itself is already asking for some kind of government steering. At the end of December 2006 eighty-eight top executives of international concerns gave their support to a letter by the Dutch chapter of IUCN in which the upcoming Dutch cabinet was urged to steer by the compass of sustainability. And on 24 January 2007, in a op-ed piece published in *NRC Handelsblad* and the *Financial Times*, Jeroen van der Veer, chief executive of Royal Dutch Shell, appealed to governments to come up with policies to tackle carbon emissions. “If the market is to do its job properly, we need more legislation”, the CEO said.

We are convinced that the policy package we have developed is indispensable for achieving a change in the Netherlands’ energy systems and that such a change is essential if we are to enjoy continued prosperity, both nationally and globally. In the words of the British economist Stern: “The costs of stabilising the climate are significant but manageable; delay would be dangerous and much more costly.”

3 Climate change and climate policy

The Earth’s climate is changing and human activity is partly responsible. This was the conclusion presented by the Intergovernmental Panel on Climate Change (IPCC) in early 2007 in its report to the United Nations. By emitting vast quantities of carbon dioxide and other greenhouse gases into the atmosphere mankind is accelerating global warming.

Accelerated warming threatens ecosystems and economies in a variety of ways, one being that farmland fertility may decline rapidly in densely populated regions and increase in regions presently uninhabited. To limit the anthropogenic contribution to global warming requires a 60% reduction in global greenhouse gas emissions by the mid-21st century. This would give a 50% chance of global warming being limited to a 2°C rise in temperature in the course of this century.

Carbon dioxide emissions are caused largely by one basic process: the combustion of fossil fuels. Wealthy nations consume greater quantities of these fuels than poorer nations and consequently emit more CO_2. To avoid the latter being hampered in their economic development, it has been agreed at the United Nations that industrialised countries should do more to reduce greenhouse gas emissions than developing countries.

4 Ambitions and scope

The six environmental and trade unions organisations cited earlier have set themselves the joint aim of developing a comprehensive energy plan that takes as its point of departure the models used by the IPCC. CE Delft was subsequently commissioned to elaborate such an energy plan, with one simple yet far-reaching objective: 'To halve the Netherlands' greenhouse gas emissions by the year 2030, relative to 1990'. The main focus of the study was to be the policy instruments used by the government to secure that objective. The policies in question must promote development and implementation of new technologies and greater use of climate-neutral energy sources and induce behavioural change, with the net result that private citizens and industry will in the future duly allow for the climate impact of their activities.

In implementing these policies the government will be requiring citizens and industry to make substantial efforts. Those efforts need not be the same for each sector and each individual, though. In allocating efforts to the respective sectors, we have striven for a minimisation of costs (direct costs as well as implementation costs), while at the same time remaining aware of the need for the support of consumers and industry as well as their capacity for action.

The NGOs' terms of reference for the Green4sure project also included a number of explicit constraints, briefly summarised as follows and explained below:

- a European perspective;
- a rapid change in Europe's energy systems;
- limited opportunity for carbon cuts outside Europe (CDM);
- no new nuclear power plants in the Netherlands;
- no new coal-fired power stations without CO_2 sequestration;
- no unavoidable income effects;
- no net oss of jobs;
- respect for the polluter pays principle.

These constraints are not arbitrary, but stem from the sustainability mantra *People, Planet, Profit*. The European perspective means the plan aims at the reform of energy systems across this economically and legislatively well-defined region. Even though climate change can only be kept within acceptable bounds if there is a drastic reduction of global carbon emissions, this does not mean the Netherlands and Europe cannot take action without other countries coming on board. Limiting the contribution of actions under the Clean Development Mechanism (CDM) ties in with the notion that the crux of the plan is to reform regional energy systems and carbon economies.

For environmental reasons, the NGOs reject both the nuclear option and coal-fired power stations without CO_2 storage. They are opposed to new nuclear plants because they remain unconvinced that the benefits of reduced carbon emissions outweigh the major drawbacks (nuclear waste, proliferation). They still see plenty of scope for cutting carbon emissions in other ways.

Halving Dutch greenhouse gas emissions by 2030 is more or less in line with the present government's objective of achieving a 30% reduction by 2020 and with the targets set by the European Union: a 20% reduction by 2020 even if other countries do not come on board and a 30% cut if they do. Numerous studies have shown that halving emissions by 2030 should pose no technical problem whatsoever; the challenge is to harness this technical potential in a timely fashion and on an adequate scale. And when it comes to inducing industry and citizens to invest in the development and use of such technologies, government has a pivotal role to play.

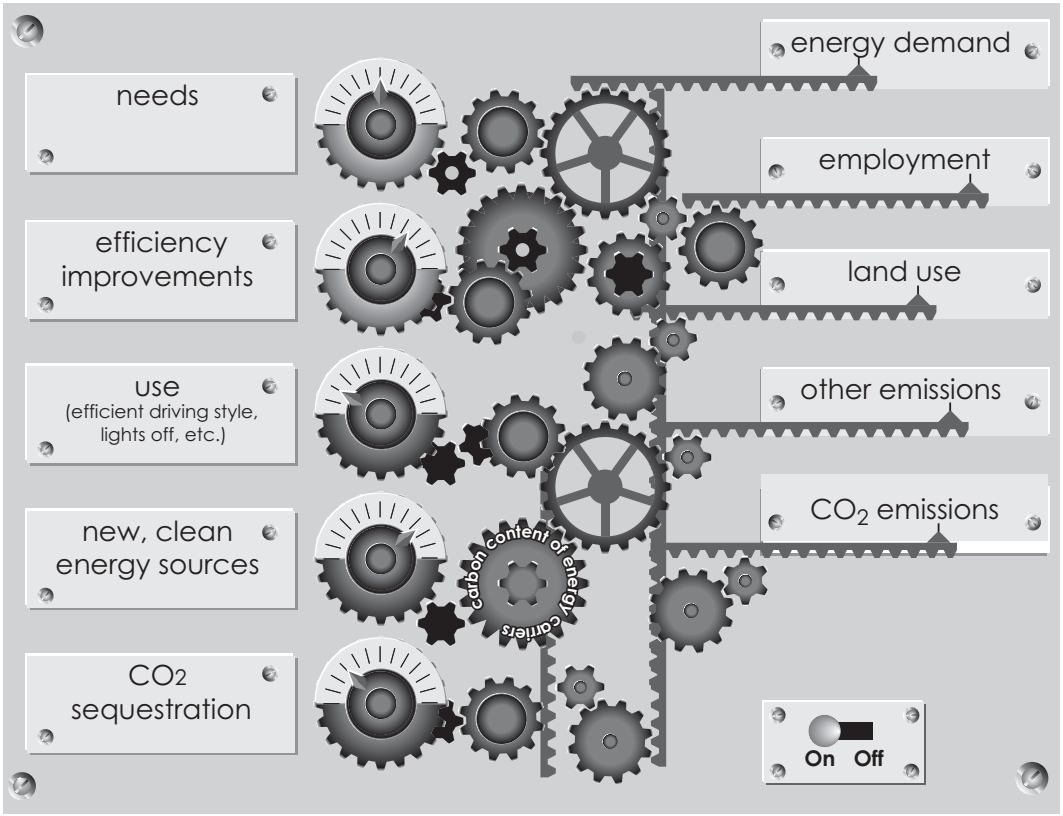
In elaborating the Green4sure plan we have duly allowed for experience with energy policies over the past few decades as well as for the barriers currently standing in the way of urgent, far-reaching action. These issues are discussed at length in the background report. Amongst other things, this has led to a differentiation of targets and to ancillary measures designed to limit unwanted side-effects (excessive burden for low-income groups, loss of business competitiveness, etc.).

5 Far-reaching choices

Halving greenhouse gas emissions implies a fundamental change in our patterns of energy use and above all a drastic reduction of the amount of fossil fuels we burn. The only way this can be done is by effecting a change in the behaviour of energy consumers (trade and industry, private citizens) and suppliers of energy, appliances, vehicles, buildings and products.

We examined the factors governing the carbon emissions due to energy consumption and identified five: functional demand (needs), the efficiency with which this functional demand is met, the way we use energy, the nature of the energy sources we use to produce it (in particular, their carbon content) and the amount of CO_2 we sequester. These factors, which together create a certain demand for fossil fuels and level of carbon emissions, are all things we can influence.

Figure 1 Factors governing carbon emissions



If we are serious about halving CO_2 emissions, we shall have to work on all these factors. For individual citizens and industry alike this will mean making far-reaching choices across the entire behavioural spectrum. It will require changes in the functional demand for energy (choosing to live near one's workplace, for example), it will mean opting for energy-efficient appliances and homes and changing the way those appliances are used, and it will mean opting for clean forms of energy rather than polluting ones.

For all these factors there is already freedom of choice today. Already there are people who consciously opt to live close to their place of work, who eat little or no meat, who drive a fuel-efficient car and cycle or walk when they can, who have installed high-efficiency lighting throughout their home, who buy the most efficient fridge available, who make sure their power and gas supplies are as green as possible. Equally, there are companies that have opted to buy the most fuel-

efficient trucks on the market, that train their drivers to adopt an efficient driving style, that develop new processes to make the same products using less energy, that design and market entirely new, more efficient products. But while there is no lack of examples, overall our energy consumption and CO_2 emissions continue to rise and the majority of citizens and companies are still not opting for the most efficient products and forms of behaviour. To reduce society's overall demand for (fossil) energy, resistance to change needs to be reduced and a choice for less polluting products, appliances and services made more appealing.

Behavioural change
Although clean and efficient technologies have a major part to play in reducing carbon emissions, that aim cannot be achieved simply by promoting environmentally friendly purchasing behaviour, for it is always the combination of technology and behaviour that counts. What is the significance of buying a fuel-efficient car, for instance, if it is then used to drive 50,000 km a year? And what is to be gained by putting solar panels on your roof if you then spend 30 minutes every day showering? If high-efficiency lighting is left on unnecessarily all day throughout the home, energy consumption will still be unduly extravagant. And a washing machine with energy label A is only truly efficient if used for a full machine's wash.
But to induce behavioural change by means of legislation is difficult if not impossible. For this reason no legislation impinging directly on behaviour has been included in Green4sure, although due allowance has been made for the behavioural element by opting for generic instruments like emission budgets. These generic instruments provide major guarantees as to results, while giving all parties the freedom to identify the emissions cuts that work best for them – by way of energy-efficient appliances, more frugal behaviour or clean solar power, for example.

Once this ball gets rolling, it will become progressively easier to adopt behavioural patterns different from today's – as central heating suppliers come to offer mainly high-efficiency boilers, as more and more businesses emerge that specialise in insulating existing buildings, as clean cars become cheaper than dirty ones, and so on.

6 Resistance to change

Changing circumstances often lead to a change in behaviour, but this is by no means always the case. Anyone who has tried to promote energy-efficient behaviour will know how much resistance that can engender. People are naturally averse to change, either because they do not see it as an improvement, or because it means having to break a habit, or because they do not consider that the benefits outweigh the efforts required.

Behavioural change results from the weighing up of pros and cons, profit and loss, costs and benefits. In practice, that process of weighing up is sometimes emotional, sometimes rational, but it is by no means something that people always do consciously. Habits are of enormous value for decision-making in today's complex world. To keep this complexity manageable we employ a range of 'tricks', sometimes referred to more clinically as 'limited rationality'.

In many cases behavioural change will require an effort from each individual energy user, who then receives no tangible reward, with the benefits accruing to society as a whole. This so-called social dilemma drastically reduces people's

willingness to change. People are only prepared to change if everyone does so. This is precisely why the role of government is so important.

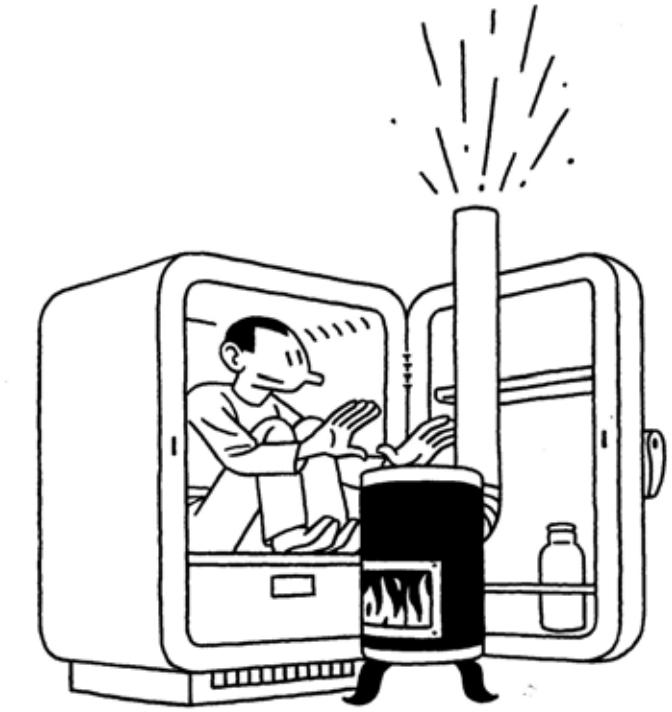
Resistance to change
Some kinds of resistance to change are emotional in nature:
- introducing a new form of behaviour or using a new type of appliance creates insecurity;
- front-runners fear they will be at a competitive disadvantage if their new energy patterns are not adopted by all other companies;
- the fact that most energy users are ill-informed creates insecurity;
- people may have other preferences, opting to spend their money on other things;
- it takes time and money to make non-traditional choices;
- people tend to overestimate the cost of energy measures and underestimate the benefits.

The resistance of corporate energy consumers to behavioural change (in terms of micro-economic decision-making, investments, equipment and vehicle usage, etc.) is far more rational:
- uncertainty about (long-term) trends in energy prices;
- with investment funds finite, preference for investments benefiting the core business rather than for energy saving;
- environmental benefits do not feature on the company's balance sheet, while the higher price paid for cleaner energy does.

Everyone is agreed that government has a crucial role to play both in initiating change and in overcoming resistance to change. Generally speaking, governments only adopt such a role once there is sufficient support for the changes in question. Because government intervention almost always evokes public resistance, this leads to deadlock:
- yes, but it's not really a problem and other problems are worse, moreover;
- yes, but there are others contributing more to the problem than me;
- yes, but what can I as an individual do about it;
- yes, but the solutions have unacceptable consequences.

To achieve the objectives of Green4sure we have sought incentives with which the government can reduce the various forms of resistance to change and render the benefits of change more directly tangible. This will mean that people who are considering changing their behaviour will indeed do so.

7 Incentives for behavioural change



In the quest for effective incentives, we distinguish two kinds of government policy: specific and generic.

Specific policies seek to solve specific problems and enforce specific measures. Examples include outright prohibition, regulations, subsidies and information campaigns on particular measures and forms of behaviour, and tax exemptions for certain energy-efficient technologies. In the present context we are concerned with things like subsidies on purchases of solar cells, high-efficiency boilers and hybrid cars, and regulations on building insulation and the use of certain building materials.

Specific policies have two main advantages:
- it is clear what measures are being implemented to reduce carbon emissions;
- they are tangible and easy to envisage.

Such policies also have a number of major drawbacks, however:
- their implementation requires high government outlays on both policy development and policy enforcement;
- in practice, not all the measures will lead to the carbon cuts calculated;
- in our society, not all the factors governing energy consumption are amenable to government policy (comfort requirements, for example).

At the moment, most climate and energy policy can be termed specific. Indeed, over the past few decades specific policies were the obvious course of action for picking the ‘low-hanging fruit’ embodied in easy solutions. While these policies have certainly been useful in reducing fuel and energy consumption, they are insufficient for achieving the substantial cuts in carbon emissions that are needed and proposed here.

Generic policies, for their part, have a number of advantages:
- they home in on all the factors instrumental in reducing carbon emissions (as described in section 5);
- they leave it to individual energy consumers to decide whether they wish to achieve their carbon cuts via efficient appliances and vehicles, renewable energy or changes in usage behaviour;
- they encourage creativity and innovation.

One drawback is that it is unclear to those deciding on this kind of policy where exactly it is all going to lead and what precise technologies are going to be used.

Suffice it here, however, to cite two examples from the past where generic policy has led to an outburst of creativity and innovation while at the same time contributing to the stated policy objectives. The Dutch Surface Water Pollution Act, enacted in the 1970s, was based on stringent standards but left a great deal of freedom as to how they were to be met. It gave a major impulse to the development of water treatment technology in the Netherlands, creating a flourishing industry that went on to market its processes worldwide. The second example is more recent. In 1995 an energy performance standard was introduced for new buildings, which though stringent leaves a great deal of scope as to how it is to be achieved. This had led to the development of many new types of equipment and materials that have been widely applied (the HR-107 central heating boiler, HR++ glass, balanced ventilation, geothermal energy systems, etc.).

8 The Green4sure policy framework

The pivotal element of the Green4sure policy framework, introduction of carbon budgets, would be supported by a variety of other policies, some of them temporary. All the elements of this package would be implemented in such a way that their policy impact is generic in nature.

The main policy instrument, then, is the allocation of carbon budgets. Each group of actors is assigned a budget, i.e. an entitlement to emit a certain amount of CO_2 (directly or indirectly), which in the course of time will be progressively reduced. Individual citizens and businesses are then free to choose how they remain within the bounds set by their budget. This system of carbon budgets in explained in more detail in the following section (8.1).

To back up this core system, Green4sure envisages an array of flanking policies. After all, it is entirely plausible there will be considerable pressure from society to increase these budgets. For this reason it is essential to introduce ancillary policies to ensure these budgets are indeed feasible. Another reason such policies are justified is that markets do not always

operate perfectly. These flanking policies are discussed in section 8.2.

Because haste is of the essence, a series of temporary policies is required to ensure that emissions are duly reduced until such time as the system of carbon budgets has become properly effective. Among the options proposed are various charges and subsidies and 'Energy Efficiency Utilities' for the built environment (discussed in section 8.3).

To ensure climate change is effectively addressed it is essential the government instigates this far-reaching policy package as soon as possible. One option would be to pass a Climate Protection Act, i.e. framework legislation to serve as an anchor for carbon emission targets in the coming decades and provide a comprehensive legal basis for the package.

Table 1 The Green4sure policy framework

	Core policy	Flanking policies			Temporary policies	
	Emission allowances and budgets	Efficiency standards	Energy sources	Facilitation	Innovation	Other
Industry	European Emissions Trading Scheme (EU ETS)		n.a.	Utilities: heat and CO_2 grids	Green Fund	A tax on waste heat emissions; environmental permits & fiscal incentives for medium-sized businesses
Power generation			Mandatory share of renewables in 2012		Doubling of public expenditure on energy research	Refunds for grid input of renewable energy until 2012; standards for new power stations (max. CO_2 emission per kWh)
Greenhouse horticulture		n.a.	n.a.		Innovation fund for low-energy greenhouses	
Transport	EU climate budget for transport	Vehicle efficiency standards	Improved air traffic control	Investment in public transport; revoking of tax schemes relating to transport mobility	Green Fund	Standards for fuel CO_2 content; tax incentives for purchase of fuel-efficient vehicles
Built environment	Dutch climate budget for buildings	Standards for appliances and lighting	100% renewable energy mandatory in 2030	Review of home tenancy	Green Fund	Differentiation of property tax; creation of Energy Efficiency Utilities
		Energy performance standards (various) for existing dwellings				

European policy
Dutch policy

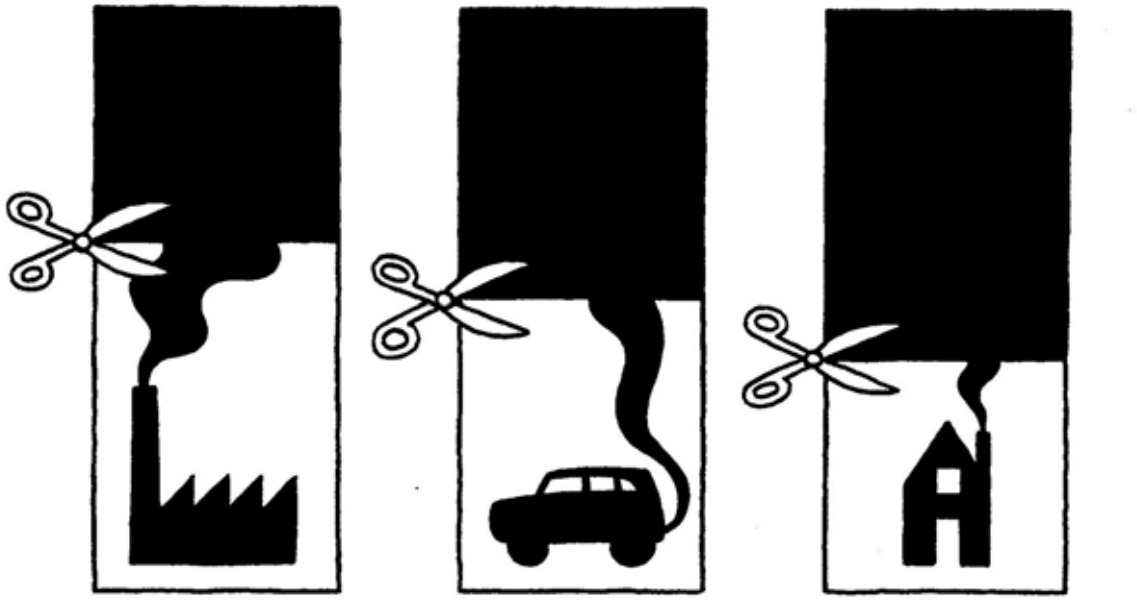
8.1 Emission budget for all energy users

In the generic approach adopted in Green4sure the government allocates to all (groups of) energy consumers a certain quota of emission allowances, with that quota gradually declining over time. This will take the form not of a single system for all energy consumers, but of three systems:

- a European system for energy-intensive industries (the EU Emissions Trading Scheme, EU ETS);
- a European system for the transport sector; and
- a national system for the built environment.

To secure the 50% reduction target in 2030 relative to 1990, the Green4sure carbon budgets have been set at -40% for industry, -60% for the built environment and -35% for the transport sector. These sector-specific CO_2 emission targets have 2005 as their reference point.

Under ideal circumstances, a single 'one size fits all' system would maximise the social welfare – or, rather, minimise the loss of welfare – associated with addressing climate change. In that case, the current EU ETS for industry could be taken as a basis, with all other energy consumers then simply joining the



scheme. In today's markets, though, this would put an unnecessarily high cost burden on industry. By opting for three parallel systems, Green4sure's prime focus at the moment is to raise support for the required changes rather than achieve such changes at least cost to society.

Emission allowances for energy-intensive sectors
The energy-intensive sectors thus have their own specific regime: the EU ETS. There are two reasons for opting for different systems for energy-intensive (industry, power generation and greenhouse horticulture) and energy-extensive sectors (transport, small businesses and households):

- Ambitious cuts in carbon emissions translate to higher prices. Energy-intensive industries can only go so far in passing on these costs, putting them at a competitive disadvantage compared with non-European firms.
- In energy-intensive industries the going price for an emission allowance can have a far greater knock-on effect than in energy-extensive sectors, where energy costs are a far smaller fraction of overall operating or living expenses.

Separate climate budget for transport
The transport sector operates at the European level, with a great deal of cross-border activity. In this sector the Netherlands can only achieve substantial reductions if it harmonises its policies with those of its neighbours, to avoid unwanted cross-border fuelling activity or undue costs or benefits for certain modes of transport for which carbon cuts are difficult or impossible to achieve at the national level. In Green4sure we have therefore opted for an international, i.e. European, system for both freight carriers and private motorists.

Built environment via fuel and energy suppliers
The Green4sure plan envisages the carbon budgets for the energy-extensive sectors and the built environment being distributed and administered by energy supply companies. This choice derives from the basic nature of energy-extensive energy users: many millions of them, all consuming small amounts of energy (compared with industry). A personal budget for each household, each car driver and each small business would lead to excessive implementation costs for consumers themselves as well as for government. The same effect can be achieved, however, via existing gas, electricity and heat suppliers and filling stations, with fuel and energy bills incorporating a section in which ‘credit’ and ‘debit’ are calculated and reported. Each fuel and energy supplier would have to dispose over sufficient emission allowances for their aggregate customer base, to be purchased at a government-organised auction.

8.2 Flanking policy

It is anticipated there will be major pressure to increase these carbon budgets, from private citizens and pressure groups as well as industry. This is why the core policy of carbon budgets is flanked by ancillary policies designed to make the envisaged budgets feasible and enable robust action to be initiated as soon as possible.

If wisely designed, ‘command’-type policies can be of a generic nature and thus still not limit freedom of choice. One of the measures proposed in Green4sure, for example, is introduction of European legislation that makes it mandatory for car manufacturers and importers to ensure that the incoming vehicle fleet as a whole satisfies new fuel efficiency standards on average. To this end some manufacturers will reduce their vehicles’ fuel consumption, while others operating

in markets for inefficient vehicles (sports cars or SUVs) will be able to compensate the high fuel burn of their particular part of the fleet by trading emission credits with manufacturers operating in more fuel-efficient market segments. This will still leave consumers able to purchase large, heavy or fast cars if they so choose, but the price differential with more efficient vehicles will be greater than today.

Among the flanking policies are several specific measures designed to address particular issues. Thus, low-income groups and others who cannot themselves make any real energy savings, lacking the financial means to do so or living in poor-quality rented premises, will have to be compensated for higher energy prices. Wherever possible, though, this kind of specific policy has been avoided.

Efficiency standards

In Green4sure we have opted for introduction of efficiency standards for buildings (nationally), vehicles and appliances (at the European level). This is because end users in these sectors are ill-informed, and sometimes even lack the capacity to absorb and evaluate the information in question. This means people will not automatically opt for a change. In the case of certain household appliances, for example, it is difficult for normal users to assess how much energy is being consumed or how this can be reduced. A so-called beer-tender, for instance, increases average annual energy use by 10%, even though its rated capacity is only 75W, while a TV on constant stand-by consumes 70 kWh a year too much. Another reason for introducing efficiency standards is that price incentives do not always knock-on back to suppliers to a sufficient extent. In the absence of efficiency standards, producers and suppliers of vehicles, appliances and homes have no immediate motive for cutting fuel or energy consumption or reducing heating requirements.

Renewable energy standards

In Green4sure we have opted for a mandatory share of renewable energy in power supplies and vehicle fuels. In 2030 all the electricity for the built environment and small businesses will have to be generated from renewable sources.

Removal of barriers and facilitation

Current rules and regulations still create a variety of barriers to innovation and change and Green4sure intends to tackle these with particular urgency. In certain cases the market will need support, to facilitate trading in heat and CO_2, for example. New utility-type companies will need to be set up for heat transport and CO_2 sequestration. Projects for supply and intake of heat and CO_2 are large-scale undertakings beyond the in-house expertise and core business of most companies. The Rotterdam Heat Company is already investing in heat and CO_2 transport systems.

8.3 Temporary instruments

There is a need for swift action. The goal of halving emissions by 2030 can only be achieved if the government gets off to a quick start in introducing robust new measures. In some sectors, rapid policy changes can have a negative impact and lead to macro-economic distortions, though, evoking added resistance to the changes in question. This may be a reason for treating some sectors differently in the short term from what they can expect as time progresses.

In this context the Green4sure plan proposes the following temporary policies:

- environmentally-indexed road pricing, as an interim measure prior to introduction of carbon budgets for road vehicles;
- Energy Efficiency Companies for the built environment;
- a charge on waste heat discharges by industry;
- subsidisation of home improvements for selling purposes, through differentiation of property transfer tax;
- incentives for innovation.

Innovation

Green4sure also proposes setting up ‘Green Funds’ to support the development of promising new technologies. If we are to make haste with carbon cuts, proven technologies need to be implemented as soon as possible. New technologies must also be developed, though, and one major incentive for innovation will be the demand for new, clean, efficient technologies created by the new emission budgets and standards. In some cases, temporary Green Fund grants may help a new technology over the market threshold. The basic idea behind the Green Funds is that for every Euro of government support, private investors would contribute fifty.

A final key element of Green4sure is to create an adequate information flow to energy users, businesses, employees and so on, setting out the need for drastic reductions in

carbon emissions and explaining precisely how the new policies will work. One of the issues that should be specifically dealt with here are the socio-economic impacts of the various policies.

9 Overall impact of Green4sure

If implemented, Green4sure will give rise to plenty of changes in society. One of the first obvious signs of change will be the emergence of all kinds of new products and services that help reduce (fossil) energy consumption. A second change will be that energy consumers, large and small, will see the costs of pollution passed on in energy bills. This will give private citizens and trade and industry a solid incentive to really change their behaviour, leading to a sharp and rapid decline in emissions.

It is eminently feasible to halve the Netherlands' carbon emissions at acceptable cost. In doing so, employment will also ultimately rise (40,000 extra jobs by 2030) and there will be a major decrease in the amount of fossil fuels imported (-20%). The share of renewables in our energy supply will grow to 16%, while energy efficiency will improve by 2.1% a year on average.

The Netherlands in 2030

If Green4sure is implemented, by the year 2030 the following picture could be reality:

Behavioural changes

- *Consumers buy more efficient products and use more renewable energy.*
- *Citizens and businesses do not install lights everywhere, do not leave equipment switched on unnecessarily and do not cool their buildings with energy-guzzling airco systems.*
- *People live closer to their workplace and rush-hour traffic has declined, on the same road network as in 2005.*

Products

- *Energy companies are suppliers of electricity, heat and comfort, and less of gas.*
- *Cars and countless other products are more expensive, but also more efficient.*
- *New homes no longer require fossil energy for heating and cooling.*

Economic changes

- *Compared with the turn of the century, energy-extensive industries have grown.*
- *Energy-intensive companies have cut their energy consumption substantially.*
- *New energy-intensive industries no longer set up shop in the Netherlands, preferring to operate in countries with a surplus of cheap clean energy.*

Employment

- *On balance, there are some 40,000 new jobs.*
- *Employment in the construction and home improvement sector has grown, while that in energy-intensive industries has fallen.*

Energy supply

- *Fossil fuel consumption has declined dramatically.*
- *The relative price of renewable energy has fallen.*
- *Renewable energy output has risen substantially.*
- *Europe and the Netherlands are now far less dependent on foreign energy resources.*
- *Measured against projected income, there has been little overall increase in energy bills since 2005.*

Environmental impacts

- *Carbon emissions have declined dramatically.*
- *Emissions of NO_x and particulates have also sharply declined.*
- *The whole of the Netherlands is now free of air quality problems.*
- *The number of people suffering from respiratory disorders has declined.*

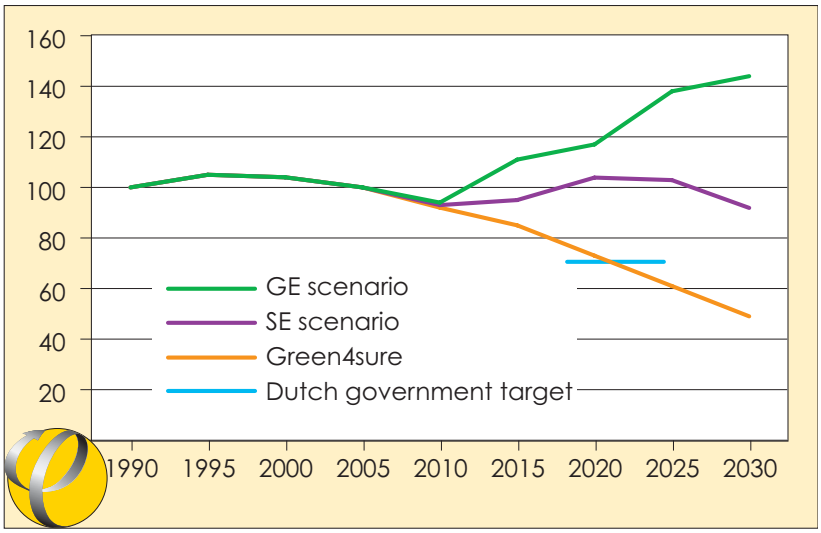
9.1 Impact on CO_2 emissions

As part of this study we compared the projections of Green4sure with those of the Strong Europe (SE) scenario, one of four elaborate scenarios developed jointly by several Dutch agencies and currently being debated in a variety of forums. The SE scenario is based on an assumption of European cooperation and limited economic growth.[2]

Our analyses and calculations show that in 2030 the Netherlands' domestic CO_2 emissions will be about 68 Mt less than in 1990, a 40% reduction. On top of this, the country will have secured about 20 Mt of emission allowances abroad under the terms of the Clean Development Mechanism. Aviation emissions do not increase to 21 Mt in 2030, as they do in the SE scenario, but fall to 4 Mt. Overall, this means the Netherlands will have reduced its CO_2 emissions by the targeted 50%.

Under the Green4sure plan, a cumulative total of 750 Mt less CO_2 will be emitted during the period to 2030 than under the SE scenario taken as a reference.

Figure 2 Greenhouse gas emission trends: Green4sure compared with the SE and GE scenarios (1990 = 100%)

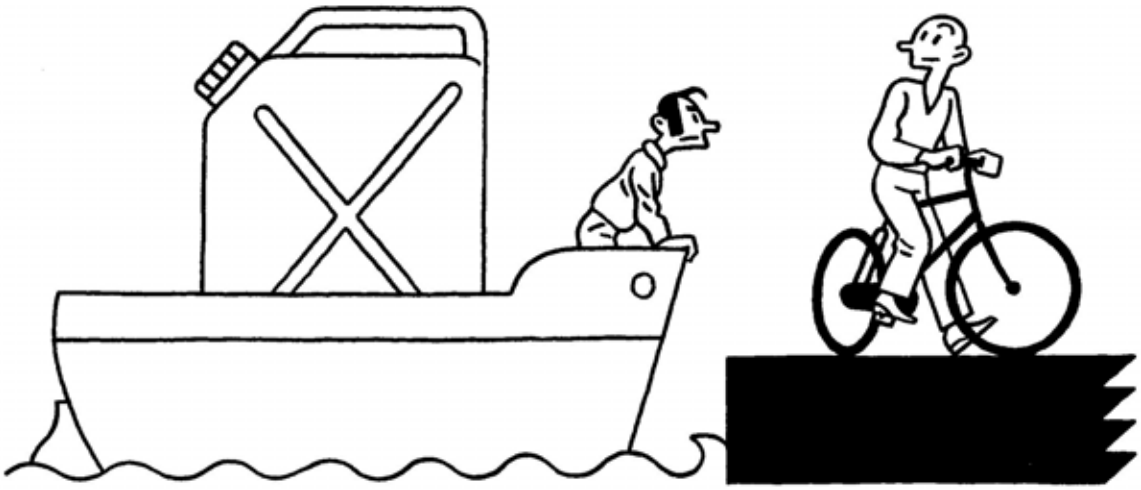


Altogether, Green4sure will halve the Netherlands' CO_2 emissions and lead to even greater cuts in other emissions (NO_x, SO_2, particulates). The resultant improvements in air quality will definitely be to the good of public health.

[2] The second of the scenarios pertinent to the European setting, Global Economy (GE), is at odds with Green4sure in many ways.

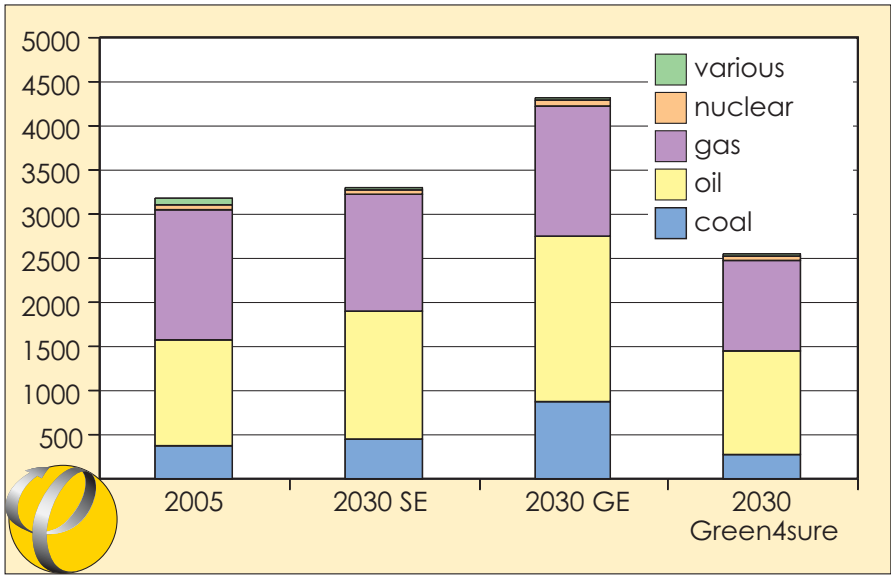
9.2 Impact on security of supply

In the SE scenario Europe and the Netherlands will be consuming 10% more fossil fuels in 2030 than they do today and 20% more than if the Green4sure plan is implemented. In Green4sure it is above all consumption of the most polluting fossil fuels (coal in particular) that is reduced most (-40%).



In 2030 a major share of fossil fuels will be being sourced from non-EU countries, making supplies and prices vulnerable to political conflict. With Green4sure this crucial aspect of security of supply will be greatly improved.

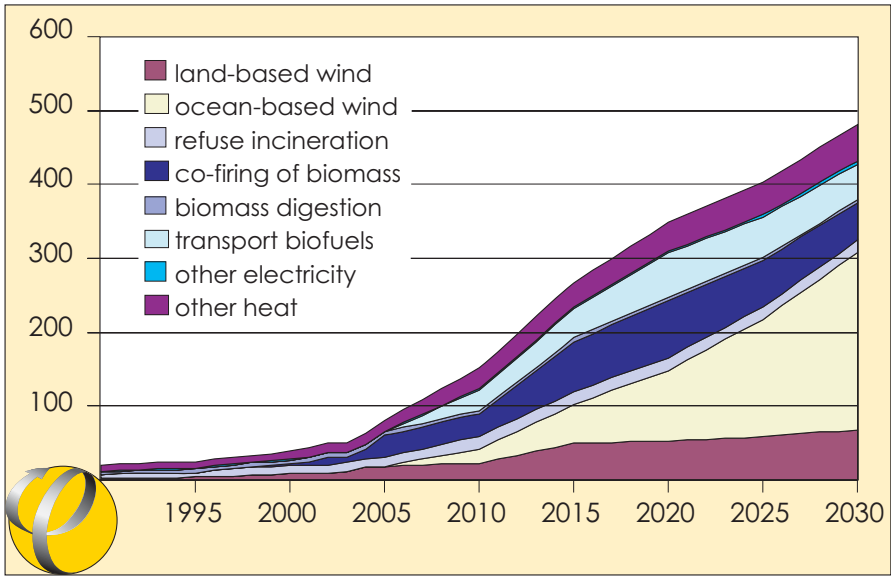
Figure 3 Fuel consumption in Green4sure compared with the SE and GE scenarios (PJ/year)



Besides reducing fossil fuel consumption, Green4sure means a major increase in the contribution of renewable energy sources. By 2030 that contribution, currently about 80 PJ/y, will have risen to 477 PJ/y. The bulk of this will derive from wind

turbines at sea and co-firing of biomass in power stations. The share of the various renewables is shown in Figure 4.

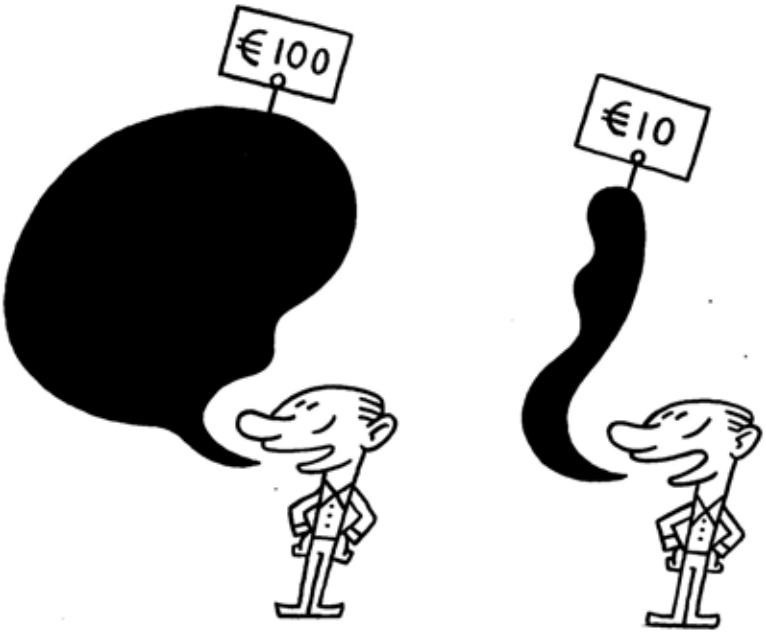
Figure 4 Contributions of renewable energy sources in Green4sure



10 Costs and benefits of Green4sure

Compared with the SE scenario, implementation of the Green4sure plan will lead to higher costs for trade and industry as well as consumers. At the same time, though. there will be greater economic prosperity: over the 25-year period considered, our national income will have grown by about 50%.

The higher costs are due to more expensive (but more efficient) appliances, vehicles, homes and energy (renewable vs. fossil). Offsetting this will be lower fuel bills, the result of two factors. Less fuel will be needed and, given Europe's ambitious climate policy targets, demand will fall and, with it, fuel prices. On balance, the direct costs borne by energy users as a whole will rise by over € 4 billion a year. Energy-conscious consumers will be better off, though, because for them the savings will more than make up for the additional costs.



On the other side of the balance sheet are the (indirect) benefits. Under Green4sure, emissions of CO_2 and other pollutants will have been dramatically reduced – the prime aim of the plan – leading to a reduction of over 50% in the so-called external, social costs associated with the current situation.

Table 2 Breakdown of additional costs of Green4sure compared with the Strong Europe (SE) scenario

Green4sure relative to SE Annual costs in 2030	Costs	Benefits
More efficient appliances More renewable energy Less fossil energy	€ 4.4 billion	
Emissions - CO_2 - SO_2 and NO_x - particulates		 € 3 billion € 0.3 billion € 0.1 billion
Implementation costs	€ 0	
Other - no nuclear - less / more economic growth - employment - security of supply	 not valued not valued zero zero	
Balance	costs: approx.€ 1 billion	

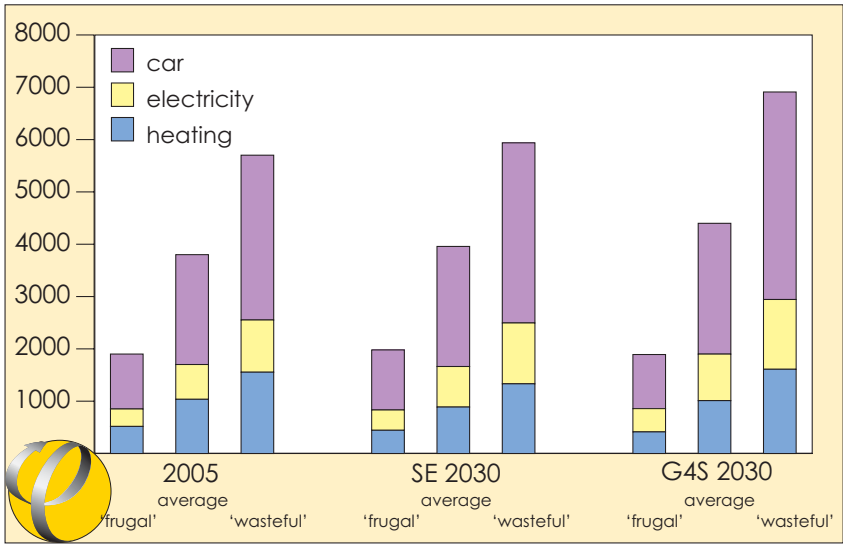
To avoid misunderstandings: this table shows the additional costs relative to the Strong Europe scenario, not compared with the present situation. The benefits of reduced SO_2, NO_x and particulate emissions are for the Netherlands, those of reduced CO_2 emissions for the world as whole.

In these cost calculations we used the year 1990 as our point of reference, taking the following values for key private consumption parameters: for gas used for space heating 1,850 m^3/y, for electricity consumption 3,500 kWh/y and for annual car mileage 18,000 km at 1:12 fuel efficiency. In the SE scenario space heating requirements decline by 10%, while electricity demand increases by 35% and annual car mileage by 50%, with allowance being made for slightly more efficient vehicles (1:15).

In Green4sure space heating requirements fall by 50%, electricity demand rises only slightly, by 10%, and car mileage remains unchanged. The majority of homes are assumed to have ‘B-grade’ energy performance, all electricity derives from renewable sources and cars drive 1:30. This leads to the additional costs shown in the table above. Each scenario was also run for a ‘frugal’ (-50%) and a ‘wasteful’ (+50%) energy user.

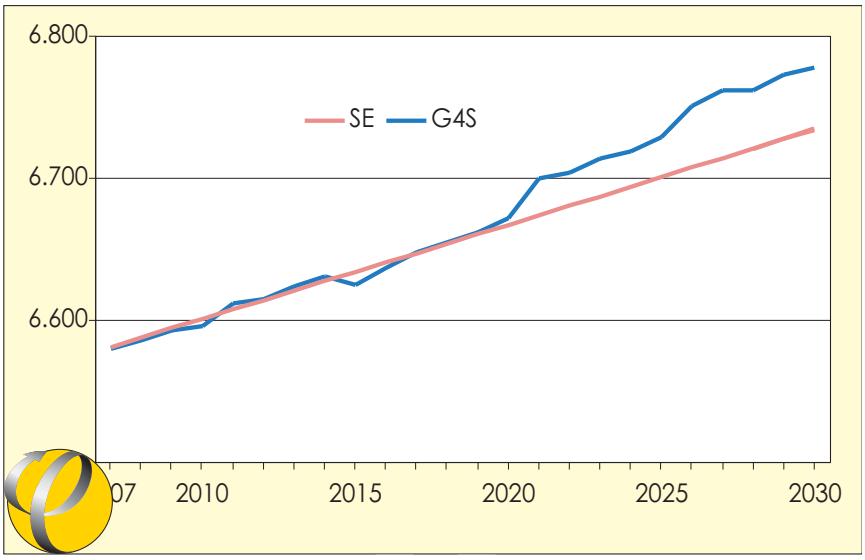
On average, consumers will be faced with higher fuel and energy bills compared with both 1990 and the SE scenario. For ‘wasteful’ consumers the increase will be greater, of course, but for the ‘frugal’ there will be scarcely any difference from 1990, while they will be better off than in the SE scenario. In the context of a projected 50% increase in income over the same period, this rise in energy costs can be termed modest.

Figure 5 Consumer fuel and energy costs



In the early years, Green4sure will provide somewhat less employment than the SE scenario. Around 2015 there is a tipping point, however. From then on, there are more jobs than in the SE scenario. In cumulative terms, Green4sure provides 400,000 man-years more employment than in the Strong Europe scenario.

Figuur 6 Employment impact of Green4sure (x 1,000 FTE)



The positive trend in employment is due largely to the action taken in the built environment, although the ancillary measures elaborated for industry and greenhouse horticulture agriculture also contribute. In the transport sector, the measures envisaged in Green4sure will mean a loss of jobs in the period up to 2030. The same holds for the energy sector, where job loss is anticipated some time after 2025. Although new energy systems will create extra jobs, this gain will be more than offset by job loss in the conventional energy sector.

Another point to note is that the additional employment will be mainly in the unskilled section of the labour market.

11 Realisation of Green4sure

Green4sure is a comprehensive policy package designed to elicit behavioural change and technical innovation among energy consumers on the one hand and developers of new products on the other. It is highly unlikely that society will adopt the proposed measures without a fight. There are still plenty of issues that need to be debated, including the nuclear option (yes/no), CO_2 sequestration (yes/no), the allocation of carbon budgets across the three systems and the elaboration of an array of standards. Some of these are national choices that may constitute a substantial shift from today's policies, the benefits of which will accrue above all to innovative businesses – and the environment, of course. Some of the policies will have to be anchored in legislation: the system of emission allowances for the built environment, energy standards for buildings, and road pricing, for example. In addition, Green4sure will mean a number of decisions having to be taken at the European level: tighter standards for vehicles and appliances, adaptation of the current EU Emissions Trading Scheme and development of a similar system for the transport sector, to name but a few.

Vested interests

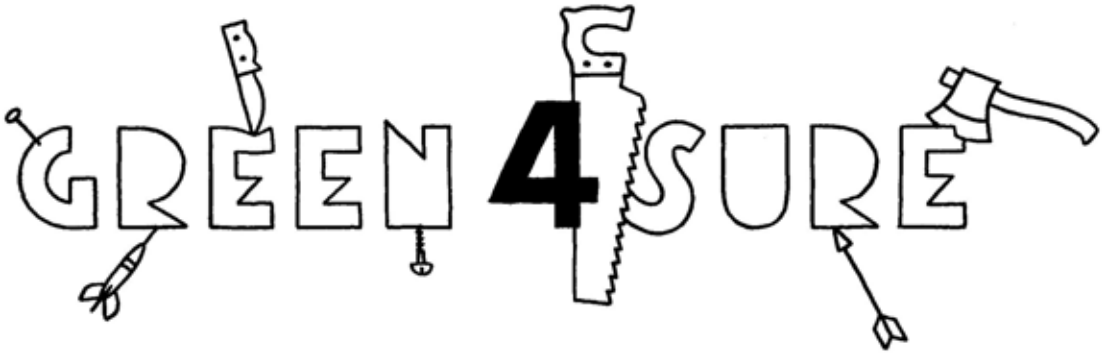
Green4sure has been developed as a coherent green energy plan to halve CO_2 emissions at acceptable cost and at the same time keep shocks to the economy as a whole and to individual consumers to a minimum. Certain parties will have less of an interest in ambitious climate policies, however. The effects of such a package will not be the same for everyone, and there will be winners and loser – and potential winners may even put up a fight. For business, policy changes create uncertainty as to whether market competitiveness can be maintained under the new regime, in which pollution has been given a price. Although much of the resistance will home in on details and the many concrete decisions that Green4sure entails, it may well ultimately be rooted in simple non-acceptance of robust climate targets. With Green4sure in their hand, NGOs and government will need to gain the explicit support of parties that do recognise the need for an ambitious policy to address climate change. In the process, there may well prove to be scope for improving the plan.

A Dutch Climate Act

One of the key elements of Green4sure is a new Climate Act, to serve as framework legislation for the three systems of emission budgets and give the emission targets legal footing. This Act, a draft of which we have drawn up, would also lay down the need for the various policies: the climate budget system for the built environment, standards for the current housing stock, creation of facilities for CO_2 and heat transport and trading, and a range of tax schemes. With a Climate Act in place, Parliament will have an instrument with which to assess policy progress, moreover.

European policy

Various other key elements of Green4sure hinge on European cooperation, and some of the issues that will determine its ultimate effectiveness can only be agreed at the European level. However, this does not mean the Netherlands should just sit back and wait to see what initiatives emerge from Brussels or what scope the Netherlands is granted at the European level.



A European climate policy initiative group could get the European element of Green4sure kick-started. This initiative group could take certain concrete initiatives that could count on the agreement of every member state. A second, practical option for supporting the European leg of the plan would be to increase the number of EU staff currently drawing up efficiency standards in the framework of the Ecodesign directive. This directive provides a host of leverage points for climate policy, but at the moment there is simply too little manpower for the work entailed.

12 Epilogue: coherence and commitment

Over a period of 25 years Green4sure can halve the Netherlands' environmental impact and at the same time substantially reduce its imports of fossil fuels. Dutch companies will at the same time be able to maintain their competitiveness, provided Green4sure is adopted across the EU. European cooperation is also indispensable for improving the efficiency of appliances and vehicles, in turn a *sine qua non* for implementing Green4sure at reasonable cost.

We are convinced that a comprehensive and coherent package of policies such as those elaborated in Green4sure is essential if the challenge of climate change is to be successfully tackled. To emphasise the urgency of the situation and its own political commitment, the Dutch government will need to pass a Climate Act laying down the ambitious targets and the overall conceptual and legislative framework of the Green4sure policy package. This will give innovative businesses a guarantee that their initiatives are in line with a government policy package that is steadfastly directed towards the future, while at the same time showing more hesitant parties that these wheels set in motion are to be taken seriously, and are inevitable. The same kind of commitment, preferably shared by

like-minded countries, is essential if European policy is to be steered in the direction set out in Green4sure.

A more extensive description of the many facets of Green4sure is provided in the main report, of which this is a popular summary, while a range of more specific details are elaborated in the background report. Both can be ordered from CE Delft or be downloaded from the websites www.ce.nl or www.green4sure.nl, although presently in Dutch only.