9.5 Governmental policies for sustainability: tax, tradable emission rights and subsidies

9.5.1 The problem

With regard to the environment, the major task of the government is to facilitate (and enforce) the transition towards a sustainable society for their citizens. In the light of the three stakeholders model, the role of the governments is to create regulations and new systems for tax and subsidies, in order to to create a business environment which gives 'green' solutions a fair chance in competition with the current product and services.

There are 3 important aspects with regard to governmental regulations and systems for tax and/or subsidies:

1. the commercial playing fields have to be kept level during the transition period, ensuring that a company cannot gain position by avoiding investments and innovations
2. regulations have to cope with the fact that governments can only set rules within their own territory, whereas world trade has no longer any restrictions (according to regulations within the EU, and agreements of the WTO, protection of own industries has been forbidden)
3. regulations have to stimulate innovation within the life cycle.

With regard to point 3 it is important that the transition towards sustainability will trigger innovation, which will make the transition less costly than many believe it will be. Innovations are supported by regulations in which (Porter et al., 1995):

- results are regulated, not technologies (leaving maximum room for "how" the results are achieved)
- strict requirements are set to results (leaving no room for half solutions)
- rules are set at the end of the chain (leaving maximum room where and how to make changes in the chain)
- free market initiatives are encouraged (to create new combinations of activities, new 'profit pools')
- phase-in periods are defined and adhered to (innovation takes time and requires stable governmental policies).

The major problem of governmental regulations is how to combine point 1 and point 2 in an open economy. This major problem can be explained by describing the dilemmas of a few scenarios for governmental policies, analysing the effects of these scenarios by means of Figure 9.5.

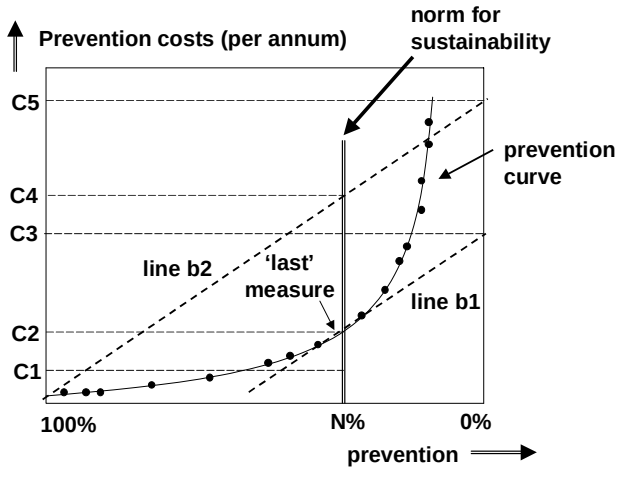

Fig. 9.5: Marginal prevention costs and total costs on the road towards sustainability

The basics of Figure 9.5 have already been explained in Annex 2a for the case of emissions:
For each type of emission, the costs and the effects (in terms of less emissions) are accumulated for several prevention measures to be taken (a 'what if' calculation), the 'prevention curve'. At a certain

point of the curve, the 'norm for sustainability' is reached. The marginal prevention costs are defined by the costs per kg reduction of the 'last' measure, depicted as the slope of line b1.

The basic problem is *not* that the total costs to reach the norm for sustainability are too high. For acidification + eutrophication + summer smog + winter smog + heavy metals,
the total Dutch prevention costs per annum, C2, of the curves as calculated in Section 2 are approximately 2.5 billion Euro, being only about 0.7% of the Dutch Gross National Product (GNP).
The annual costs of prevention measures for CO2, as proposed in Section 2, are estimated at 2.3 billion Euro (including savings of energy consumption), being approx. 0.6% of the Dutch GNP [1].
The problem is though to distribute the costs of those measures: who pays what? Since those measures are distributed over all sectors of our economy, and since the price of each measure is different in terms of Euro/kg, it is not feasible to 'dictate and specify' technical measures to all parties involved.
So what to do in terms of regulations to lead the market towards sustainability? Taxation? Tradable emission rights? Subsidies?

The problem will be analysed by separate scenarios for tax, tradable emission rights, and subsidies.

9.5.2 Taxation

The simplest way of pushing every party involved towards sustainability is taxation:
suppose that emissions are taxed at the level of the marginal prevention costs (Euro/kg) at the norm for sustainability (this costs level is depicted in Figure 9.5 as the slope of line b1).
The result will be that all parties will take prevention measures rather than pay tax, if these measures are at the left side of the norm for sustainability in Figure 9.5. Parties at the right side of the norm will prefer to pay the tax, since the measures are more expensive.
So taxation is effective and simple in terms of pushing all parties involved in the right direction.

The disadvantage of such a sudden, simple taxation system is that the total sum of tax for emissions is exorbitantly high at the start of the transition: see point C5 in Figure 9.5. This high tax level will be rather devastating for our economy, so citizens are not likely to make such a heavy sacrifice for sustainability.
After the prevention measures have been taken, the total costs of measures + tax will become lower: point C3 in Figure 9.5.

Increasing the tax in small increments over a long period of time will resolve the problem of the wild disruption of our economy (point C5), but the end result will be that the sum of measures + tax is still rather high (point C3). Especially in an open economy high costs levels for emissions are problematic in terms of the international trade: products become too expensive to stay competitive and there is a big likelihood that production will be moved outside the borders ('export' of environmental pollution).

One can conclude that tax may be effective from the point of view of reduction of pollution within a country, but is not advisable from an economic point of view. It has a much bigger influence on the economy than seems to be required: the method seems to be to coarse (the tax which is paid at the right side of the norm in Figure 9.4 does not serve any purpose).

9.5.3 Tradable Emission Rights

Systems for Tradable Emission Rights (TER) are much more subtle that tax systems. Those systems support the flow of money to investments on the most cost effective prevention measures in the industry (Sorrell et al., 1999) TER systems can only be applied in combination with rules which restrict 'free' emissions of production plants.

---

[1] The required extra investments in prevention measures for acidification + eutrophication + summer smog + winter smog + heavy metals are estimated at 25 - 30 billion Euro. The required investments in prevention measures for CO2 are estimated at approx. 20 billion Euro (Beeldman et al., 1998).

The first scenario is the most pure form of TER:
- free emission rights of production plants are restricted to the current emission levels (so the current level of emissions are the maximum free emission rights for the future)
- companies are allowed to buy emission rights from other companies.

The result of such a system is twofold:
- companies which expand, have to buy emission rights from other companies to extend their allowable emission levels
- companies which have the opportunity to reduce their emissions by prevention measures, will do so when they can sell their emission rights at a higher price than their own investments required for prevention.

In such a system the market will take care of an optimal distribution of prevention measures in terms of cost effectiveness.

When total emission levels have to be reduced, the situation becomes slightly more complex. Emission reductions of 10%, 20% or 30% will work basically in the same way along the lines of the aforementioned scenario. The reductions have to be implemented gradually (in small steps and slowly) to avoid heavy disruptions to the TER prices[2].
Reduction of a factor 3 or 4, as depicted in Figure 9.5, can better be implemented when the government takes part in the trading system. The first scenario has then to be replaced by another scenario, which is summarized hereafter.

This second scenario is then as follows:
- the government sets free emission levels to 1 / 3 or 1 / 4 of the current level (these TERs are given at no costs)
- the government sells the additional TERs at a *levy per annum* at the price level of x% of the marginal prevention costs per annum; x is slowly increased, step by step, until 100% is reached [3]
- companies can give the TERs back to the government (to avoid the annual the levy), which they are inclined to do when their own prevention measures (in terms of costs per annum) are less expensive
- companies can sell TERs to other companies as well (at a price level of the annual levy, or, at a slightly higher price per annum).

The advantage of such a scenario is:
- the burden of the levies is gradually increasing, investments to avoid the levy can be carefully scheduled
- companies are free to expand their activities, at the cost, however, of the price of the TERs they can buy from other companies
- the total burden at the moment of introduction can stay rather low, for instance at the level of C1 (lower than the total prevention costs, C2, to minimize the economic disruption at the start)
- the total burden will rise to a maximum level of C2 at the end of the transition.

Note that governments might compensate the levies at the beginning of the transformation with a tax relief (shift the burden of tax), as long as international agreements against protection of national industries are not violated.
Note also that the basic problem of introducing TER systems is the assessment of the level of applied technologies in current industries: companies which already did a lot in the field of emission prevention should not be ‘punished’ at the introduction by getting the emission rights at the same price

[2] The dynamic behaviour of such a “volume controlled” system results unstable prices because of the lead time of the prevention measures (control loops with a lead time are inherently unstable).
[3] Note that, when the TERs are introduced at the level of the marginal prevention costs at the norm, this would lead to a costs burden C4 at the moment of introduction.

as companies which did nothing in the past. At the moment of introduction, the emission level per output quantity and the ‘distance’ to BAT has to be brought into the equation.

An important advantage of TER systems is that these systems relate the environmental measures to the direct product costs in a way which is clear to all stakeholders (eco-costs become real costs in a direct and understandable way). When the TER costs in a product are directly communicated to consumers, consumers with a high level of environmental awareness are able to avoid products with a high level of TER costs (resulting in a shift towards a lower EVR).

9.5.4 Subsidies

Subsidies are not suitable for industry: they disturb the inherent competitiveness of companies and they are normally violating regulations of international trade systems (it protects the national industry). On the other hand, subsidies are suitable on the level of households. Here they can be applied as well in the form of tax relief.

The aim of subsidies is to influence the expenditures, especially on investments.
Subsidies have to be applied with great care:

- subsidies have to be specific for market niches (see the example of the TV of Section 3)
- the rebound effect has to be taken into account (generally speaking, subsidies can only be applied for products with a high EVR, see Section 5).

Subsidies are the ideal tool to support market introductions of innovation: the new sustainable solution can be made less expensive for the consumer than the classic product (for the period of the learning curve and the economies of scale curve).
A good example of tax relief on products was the introduction of the catalyst gas exhaust pipe of cars.
It is likely that innovative motor designs like the fuel cell motor need to be supported by subsidies as well to bridge the first production period with a low ‘economies of scale’.
Innovation of fuels for cars (like ethanol from biomass) might also be supported by tax relief systems (as has been done in the past for lead free gasoline).