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Environmental Policy Instruments
in a New Era

by

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ENVIRONMENTAL POLICY INSTRUMENTS IN A NEW ERA

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synopsis

The aim of this paper is to give a long term sustainability perspective on instrumentation in environmental policy, within a broad, also strategic, evaluative framework.

To arrive at integrated insight, the basic function of policy instruments is discussed: why do you need them at all and how would they look like? It comes out that it is not at all clear how policy instruments can be classified and described. Nor is it clear how a consistent evaluation of policy instruments can be set up. Still, as some ordering is necessary for instrument development and instrument choice, an analytic framework is developed.

One basic problem in discussions on policy instruments is that both their functioning and their effects are context dependent. This implies that in decisions on policy instrumentation, binding society for a long time, also long term changes in context are to be taken into account, in terms of structural, cultural and economic developments in society. Some main lines of development are discussed, with implications for instrument choice.

Within these mouldable boundaries, some practical guidelines are given for policy development at a case level.

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ENVIRONMENTAL POLICY INSTRUMENTS IN A NEW ERA

Aim

This paper indicates the ways in which societies can use instruments for reaching environmental policy goals. There are four main aims in studying this chapter:

- *to grasp the essential role of policy instruments in environmental policy*
- *to understand the general working mechanism of the main groups of instruments, and the strengths and weaknesses of specific instrument configurations*
- *to understand the dynamics of policy instrumentation in a dynamic context*
- *develop a view on policy instrumentation as required for long term sustainable development of society.*

Survey

When analysing policy instruments, the question arises as to what exactly they are. Answering this question first leads us to a number of preliminary themes. For instance, why do we need instruments for environmental policy if integrated policies, without specific instruments, can cover all problems? Focussing on the causal chains involved leads to a series of other questions. For instance, how should one define instruments, eg, in terms of implementation mechanisms, sanction mechanisms, or working mechanisms? If one places instruments in their administrative setting, with the emphasis on horizontal governance, there again is the question: why do we need them? The answers given are: for simplification of policy, and for building into the fabric of society the safeguards for long term sustainability.

After taking these hurdles, the analysis builds up around the theme: what is the nature of environmental problems, and what are the general mechanisms for their occurrence? Concepts like 'external effects', 'collective goods' and 'free rider problems' are surveyed, as it is in this particular context that instruments should bring solutions. A final introductory theme is the evaluation of alternative instruments for environmental policy. A distinction is made here between first order criteria like effectiveness and costs; second order criteria covering aspects not easily modelled, like requirements on administrative capacity and effects on technology development; and strategic third order criteria. As instrument choices may bind society for decades, long-term strategic aspects, such as their fitting into overall regulatory developments, are a prime element in their evaluation.

Next, a survey follows of the main dimensions instruments can be specified in. Not only the traditional regulator-regulatee relations are covered but also instruments structuring the relations between different governmental organisations, and instruments structuring relations between private actors, both individuals and organisations.

In the last section, some major societal developments are surveyed, with a view on the implications for the functioning of different environmental policy instruments. The consequences of globalisation processes are indicated and some major strategic choices on overall policy instrumentation are worked out.

1 POLICY INSTRUMENTS:

WHAT ARE THEY AND WHAT ARE THEY GOOD FOR?

1.1 Policy instruments: what are they?

There are many instruments that possibly are relevant for environmental policy, like tools for analysis, checklists, and plans. More generally, instruments for environmental policy can be seen as the means for executing this policy. Here, a more restrictive definition is used:

Instruments for environmental policy are structured activities aimed at changing other activities in society towards environmental goals.

Of course, not all policy instruments are for environmental policy. Other instruments for public policy, like in energy and transport policy, may include environmental policy goals, as an extra on top of the prime non-environmental goal. This is the usual case now in most integrated policies. The borderline, therefore, is not strict. However, this is not a real problem, as policy instruments for non-environmental goals may be analysed in a similar way.

Not all policies are structured. Setting up the high-speed railway line to diminish air traffic between Paris and Lyon indeed reduced air traffic at first, and reduced its growth afterwards. Green politicians may exhort people in public speeches to leave their car at home for at least one day a week, with some success. Such incidental activities towards policy goals, however, are not seen as instruments. If, on the other hand, high-speed railroads are built consistently on trajectories with rising air traffic, one may see the provision of infrastructure as an option-creating type of policy instrument. If a politician's speeches are part of a series set up for public education, they too may be seen as part of a communicative instrument. The borderline is not strict, which, again, is not a problem.

As a last borderline in the definition, it may not be clear what exactly the environmental policy goals of some instruments are, and if these goals really are environmental ones. Raising prices for dumping waste in landfill sites may have non-environmental aims; e.g., to increase the availability of landfill sites or to give an incentive for increased use of under-utilised incineration plants. Or it may, supposedly, be a means for reducing primary materials production, reducing resource depletion and the environmental effects related to materials processing. What exactly constitutes the 'real' prime motive is often difficult to establish, but also not very relevant. Such borderline instruments still may be analysed as instruments for environmental policy, with environmental effectiveness as one aspect in their assessment. The actual environmental effectiveness of instruments in most cases is not a distinguishing criterion. In certain circumstances, subsidies on environmental improvements may work out negatively, by delaying structural change which otherwise would have taken place. These then are environmental policy instruments not adequate for that situation, but they still are environmental policy instruments.

1.2 Why have policy instruments?

Why bother about environmental policy instruments when actual policies based on integrated assessments can integrate environmental and other consequences in day-to-day actions? The main reason is that the complexity of all empirical relations, and the complexity of assessment are so large, and the information requirements so vast, that this option is not really available. Instruments work by simplifying reality. They can be studied and assessed at a general level, with conditions on their sensible application stated. The complexity of policy making is thus reduced. On the receiving side, in society, most policies have their effects not in terms of directly correcting current activities but, to a large part, by guiding the planning of and decision making on future activities. Having instruments of which the nature is known from literature and past experience will make policies more predictive and adaptation to policies easier. These adaptive mechanisms in society, if structured in stable patterns, can be seen as part of policy instrumentation as such.

1.3 A framework for analysing policy instruments

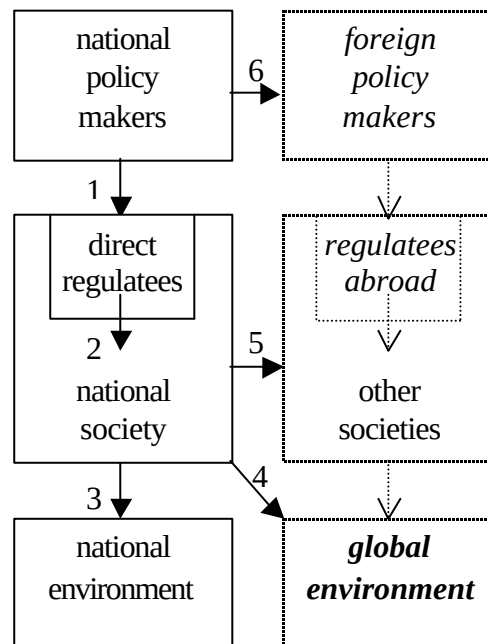
Different policy instruments may be characterised in a common framework, with an empirical part, how they work, and an evaluative part, with criteria on how good and adequate they may be. The evaluative part will be worked out in a later section. The framework for the empirical part of the analysis has four main units: regulators, regulatees, society, and environment. These four units, for one country or region, are mirrored in the same entities abroad, see *Figure 1*. The framework defines the basic structure for modelling the functioning of environmental policy instruments. In a most basic mechanical model, there is a single causal chain from regulator's actions to environmental effects. This limited framework already opens up a world in which a rich variety of instruments and a high complexity of mechanisms can be distinguished. That means that even in its simplest form, effects of regulations depend on the specific circumstances given in society.

The starting point in the model is some public regulation, a collective one, like setting an emission standard in the metals plating industry, or a private one, like setting an environmental performance goal for a firm. As a first step in the causal chain, there is the technical adjustment enforced on regulatees as the subjects of instrument application (1). A second step of causal chains is centred around economic mechanisms, usually, and related to the costs induced on regulatees (2). The degree to which such secondary effects are taken into account may vary. Effects on markets and on other technologies will usually be part of the analysis, and will depend on the specific circumstances in these markets. Stricter emission standards in a small open economy with a few large internationally operating firms may lead to emission reduction by shifting production to locations abroad, without necessarily changing technologies. Conversely, in a large country with many small firms producing for the national market, technology adjustments will be more pronounced, with only limited changes in the volumes produced. For given national technical effects and volume changes, the net resulting environmental interventions can be derived and linked to effects on the national environment (3) and on the environment abroad (4). As most markets are international now, national policies will induce economic changes abroad (5), also with certain environmental effects. Finally, policies in one country may directly influence policies abroad (6). Dutch excises on petrol, e.g., are limited by the German excises on petrol, as a too large differential will lead to the closing of gasoline stations in the border regions. Californian regulations on 'emission

free cars' have set in motion regulatory activities and technology development in Japan and Europe, and at a global scale.

The model with one-way causalities does, however, not correspond to full reality, where feedback mechanisms, always dynamic, abound. If regulatory capacity is limited, as in some way it always is, using regulatory power for solving one problem precludes its application for solving others. Using one type of instrument for one problem, like covenants on achieving best available practice for energy saving in industry, will make the later introduction of emissions taxes on CO₂ and NO_x rather unacceptable for industry. Negotiations on a covenant depend on what industry sees as an alternative to the covenant: maybe emissions taxes or maybe avoiding costly actions. Hence, such negotiations necessarily take place "in the shadow of the law", as phrased by Galanter (1981) and Scharpf (1991). Indirect effects in society, through induced economic and environmental developments, result through complex feedback mechanisms. A most common mechanism is that regulations induce costs and hence lead to market changes and technology adaptations. For instance, costly measures to reduce emissions in the metals plating industry have induced a shift to high quality coatings, with other types of emissions resulting. On the other hand, by inducing changes in an industry, cost saving innovations that are available already may then be introduced in a faster and broader way.

Table 1 Regulation: a simple model without feedback loops



The ultimate feedback, of course, is through environmental quality. The poor air quality in Mexico City raises costs of production, lowers legitimacy of government, and makes it difficult for firms to attract managers and specialists from abroad. Visible actions, in terms of standards and regulations, are most apt to remedy these negative effects in the short term, by assuring that 'something is done'. Less visible actions like changes in liability rules and

market structure might, however, be more effective in the end. Hence, a feedback loop may influence instrument choice.

Feedback mechanisms by nature are dynamic. Having set up a policy for some environmental problem in a certain way, e.g. by issuing emission rights, makes it very difficult socially and even juridically to change over to policy instruments more in line with the polluter-pays-principle, where emitters have to pay for their infringement on the right of others not to be polluted.

Why is the question of how instruments work so important for the characterisation of instruments? The answer is that instruments are not independently given; their definition and description, and the analysis of their functioning are closely related. Most instrument definitions focus on only one element in their functioning. The covenant, e.g., focuses on the procedure in the policy formation process; technical prescriptions focus on technologies as applied in industry; tradable emission permits focus on equalisation of marginal emission reduction costs between firms, industries, or countries; liability rules focus on specific enforcement procedures and actual compensation. Neither of these descriptions takes into account all steps in the framework, let alone the feedback loops as will usually exist.

Limited description may easily lead to simple assumptions on the other steps in the causal chains required for environmental effectiveness. For instance, many believe that emission permits may not be ideal in terms of costs, but that at least they are a sure means in reaching specified results. In most countries, however, this belief is not well founded (Bonus *et al.*, 1998; Vogel, 1986; Hawkins, 1984; and Bardach & Kagan, 1982). Rules are often on paper only and not necessarily linked to actual practice. Environmental standards and regulations in the former Soviet Union belonged to the most stringent in the world while environmental quality was worse than in most other countries. This means that by defining or at least viewing their functioning in the broader framework, the myopia of partial views can be avoided. Thus, the context of their functioning becomes more important.

1.4 Policy instruments in context

Most people would agree that policy instruments are to be placed in the broader framework of their functioning. However, this could lead to counterintuitive results. Filling in this framework may show that what is named the same instrument, actually is something different in different contexts. Implementation of one and the same instrument may also be very different, depending on prevailing circumstances. In litigious societies with limited general legitimacy, legislation may be implemented effectively only with years of delay, while in highly integrated less formalistic countries, legislation and implementation may be nearly synchronous (see Vogel, 1986). Similarly, with regulatees, technology-binding legislation may lead to adversary reactions, or it may lead to internalisation of the rules enacted.

The broader effects of policy instruments in society heavily depend on already established institutions. In several communist countries, emissions taxes have been enacted, but to no avail. (See Endres 1997 for the contextual requirements for market based instruments.) As volume increases in production were the prime aim for state-owned firms, with prices fixed and with the state bearing profits and losses, the emissions tax was just added on the balance sheet, with no behavioural consequences in the firm itself (see Cole and Clark, 1998). By contrast, similar taxes in capitalist countries with competitive markets may induce far-reaching behavioural changes. For instance, Dutch waste water taxes enacted in the 1970s

were followed by overall decreases in effluent volume by a factor 20, mainly through process integrated technology changes (Bressers, 1988; Huppes & Kagan, 1991).

In some Western countries, like England and the Netherlands, policy development and implementation were linked in a less recognisable way. There was a broadly accepted practice that firms would function without the obligatory permits (see Vogel, 1986). In such a 'slightly illegal' situation, regulators may actually have more influence on developments than when a seemingly strict permit is issued which tends to petrify the past. Tendencies towards a more formalised and litigious type of society, as in the US, have made this style of regulation more difficult. In the old situation, there was bargaining in the shadow of the (possibly unreasonable) law, with a permit as an eventual short-term fixation of a situation. In the new, more formalised situation, it is not so clear how administrators can have a flexible influence. The covenant has taken over the bargaining step, while the shadow has not been clearly defined. Thus, the precise definition of an instrument depends on a more precise look at its functioning. In the Dutch and English contexts, for example, permits actually were not the 'real' instruments for environmental policy at all; they rather formed the background for negotiations, with mostly informal deals between regulators and regulatees achieving actual environmental improvements.

The recognition of the contextual specificity of policy instruments seems to give a blow to the basic aim for distinguishing policy instruments: to simplify reality and make behaviour of all concerned more predictable. If instruments as officially used hide what actually is happening, they just increase complexity and may better be left out. In the administrative sciences and in sociology of law, the consequence of this type of analysis has indeed been that a prime view on instruments has been more or less abandoned. In horizontal government, as an ideal, all stakeholders participate, in principle at equal footing, with deals resulting as are most apt to the situation (see von Benda-Beckmann and Hoekema 1987). Why, then, bother about instruments? The answer is not straightforward. Governments, with their own organisational, economic, and legal powers increasingly may use decentralised types of analytical tools to direct the outcomes of negotiating procedures in the right environmental direction. Such sensible developments should not be denied when discussing the role of instruments; they can instead be made part of the development of environmental policy instruments. Therefore, instruments can also cover situations where government may be invisible or even absent.

Why, then, do we need environmental policy instruments at all? There are several reasons. First, a negative one. There are limits to horizontal government, on human resources and knowledge required for adequate negotiations. This limitation is there on the side of government but also with other stakeholders. Most firms hate continuous negotiation because it soaks away their management capacity and so endangers their current and future functioning. Sustainability requires the continuous adjustment of behaviour of all firms and all consumers, as now mainly guided by market considerations. Influencing this behaviour clearly is beyond the scope of the negotiating government. Hence, corrections on the outcomes of in-firm decision making, including technology development and product design, and of market processes can be the subject of negotiating governance only in special occasions, within the capacity limits of regulatory bodies.

In addition, there is a more positively formulated reason for having environmental policy instruments. Institutional development in society somehow has to cope with sustainability in a structural way. Leaving a central value like sustainability to day-to-day negotiations would be unwise or even immoral. Somehow, quasi-automatic mechanisms, such as institutions, are to

be shaped to safeguard the sustainability of operational, tactical and strategic decisions. In these mechanisms, environmental policy instruments will play their indispensable part.

In between, there are the negotiations on which instruments to apply and how to apply them. In this field, horizontal governance and instrument analysis overlap practically. The instruments, the more or less ready options for government action, constitute the 'shadow of the law' in which governments can safeguard the sustainability of the outcome of the negotiations in the networks involved.

Still, there remains a domain where instruments at first sight may not seem to be relevant, as with some single big issues. For instance, should we just curb further growth of passenger air transport with its noise and emissions? One option here would be to limit the growth of airports, which would not require specific instruments for environmental policy, as long as airports are publicly owned. Another option, however, would be to use the price mechanism for environmental purposes. By taxing emissions of carbon dioxide, nitrogen oxides and noise high enough, these emissions will be reduced, not only through technology adjustment but also through a reduction in the number of passengers transported. The growth of airports then would be reduced as a consequence of environmental measures, not as an indirect means for the environmental aims. Using instruments for environmental policy in this way may prove to be more useful than seemingly simple measures like preventing airports from growing.

1.5 Environmental problems: causes and solutions

In order to understand the working of instruments in solving environmental problems some insight in the causative mechanisms resulting in environmental problems is required. In virtually all causal models for societal actions, some rational actor models play a central role. It is within such rational actor models that many of the causes for environmental problems can be discerned.

Common to all environmental problems is the causal mechanism that private advantages of some actions outweigh the negative effects for the persons (or organisations) deciding on that action, while at the same time this negative effect may be relevant to others. The negative effect then is external to these private considerations: it is an **external effect**. If the single owner of an island cuts down his forest for making his garden, he prefers the garden to the forest; there is no environmental problem involved yet. Only if others bother, about the disappearance of the forest or the consequences of its disappearance, there is an environmental problem. This is the **collective good** nature of environmental quality. It is a necessary mechanism for environmental problems to occur. In economic jargon, it is external effects of private actions that are detrimental to a collective good.

A second (additional) mechanism in problem development is that the detrimental effects usually result from the actions of many. Though not strictly necessary in a logical sense, this is the typical situation for nearly all environmental problems. It is the **tragedy of the commons**. Single actions may hardly contribute to the problem but their multitude leads to overall undesirable effects, ultimately the breakdown of the ecological system.

Together these two mechanisms have a power that is hard to break. If an individual producer or consumer corrects his behaviour, his action may have negative economic effects on himself, even if only in terms of the burden of bothering. At the same time, the positive effects on the environment might be negligible. In such cases, we end in the **prisoners dilemma**. Rational actors will only choose the behaviour with the preferred outcome if they

may expect most others to act in the same way. In the 'wrong' situation, actual behaviour by others proves that this expectation is not justified and rational actors will choose the sub-optimal behaviour. If corrective action is taken by all but a few, the environmental problem is mainly solved, also for these few, while they do not bear their share in the costs. This is the **free rider problem**. If free riders are visible, social norms on collective action may easily erode and with it the collective environmental good. If the free rider is invisible, the flesh is weak. It then takes highly internalised values for most people to remain on the right track.

Critique on this model has been that the rational actor model underlying it has a too simple view on real motives of real people. In reality, many actors indeed often behave altruistically, because they like doing so, and groups of actors often have an explicit or tacit mutual understanding on avoiding 'bad' behaviour (Sen, 1977). At least some people bother about separate collection of waste streams, even in instances where others cannot see what exactly they are doing. They have internalised environmental norms to some extent. However, even after relaxing restrictions on rationality to include such social aspects of human behaviour, the unpleasant situation remains that detrimental environmental effects occur. Even after taking into account the social nature of behaviour, the wrong choices still are made so often that environmental problems result.

On the basis of these theoretical deliberations, sometimes named the 'field model', we can now specify what environmental policy instruments should do. They should:

- avoid external effects on the environment and thus save collective goods, here environmental quality
- avoid the tragedy of the commons
- solve the prisoners dilemma
- prevent the free rider problem.

Following the model, we can also indicate the mechanisms policy instruments may be aimed at. Focussing on a single actor, the correction on his behaviour can be brought about in a number of ways (see Bressers and Klok 1988 for a fuller treatment).

1. *The set of available alternatives can be changed.* This can either be done by offering new alternatives, like separate collection facilities; by removing alternatives physically, as when fencing nature areas; or by improving knowledge on already existing but yet unknown alternatives, as with nature education programmes.
2. *The consequences of alternatives can be changed.* This may be done positively, as when giving subsidies for lead free petrol, or negatively, e.g., by menacing jail or penalty to somebody dumping toxic wastes.
3. *The evaluation of consequences of alternatives can be changed.* This can be done by changing the value system of actors, through educational processes, or by improving their active knowledge on the consequences of given alternatives, as for example with ecolabelling schemes.

By these three types of mechanisms of a policy instrument, the **external effects** on the collective good might be avoided, as would the **prisoners dilemma** and the **free rider** problem. However, in many situations, this is possible to a limited extent only and the situation still might be that of the prisoners dilemma, with the free riding option lurking. If heavy industries would be brought to reducing their CO₂ emissions substantially by a large number of specific measures, the prisoners dilemma would remain for all other actions, where free riding is the norm. In addition, the non-heavy industries would still be riding free. Thus,

there is another role of policy instrument in avoiding the *tragedy of the commons*, by solving the prisoners dilemma.

4. *Rightful trust in everybody's positive and due contribution to our common good can be created.* This would make free riding virtually impossible. Here, the individual may seem to be deciding alone. In fact, however, he is making his decisions as if he were the collectivity, deciding for all together simultaneously. This co-operative solution is a most direct option for solving environmental problems, with collective values being internalised in individual decision making. This option seems highly idealistic but it is a normal solution to many problems, at least in small communities. Tasks for the common good are executed, that is, behaviour is adjusted, because one expects everybody to do so. Still, this ideal is not always reached even if only a small number of people are involved, as can be seen in some families where children (or parents) try to avoid the daily dishwashing duties, always with good reasons at hand.

What are the requirements for this type of co-operative behaviour? One element would be that free riders are sanctioned for free riding, when they are caught. This would mean that the bad behaviour is forbidden at the level of the individual, and no co-operative approach is required. However, control and sanctions may be more informal, not involving police and administration but friends and family, or the neighbours next door. Another prerequisite is that the behavioural norm is clear and non-commitment is visible.

1.6 Evaluation criteria for policy instruments

The analysis of how instruments for environmental policy work is one part of policy instrumentation, indispensable for any evaluation. But what are the criteria for judging policy instruments? The framework for the evaluation of instruments (and related policies) mirrors the empirical analysis. The empirical analysis ultimately is to indicate effects in terms of these criteria. This adds a layer of analysis of a normative and political nature. As it is consequences of instruments which are taken as the basis of evaluation, the approach is that of consequentialism, not in the narrow sense of a utilitarian type of economism, but in the broad sense given to this term by Sen (2000). In this broad view, consequences may incorporate the preferences of individuals, as is exclusively the case with utilitarianism, but may also cover collective aspects like '*sustainability*'. Virtually all criteria for evaluation as specified below belong to this second group, see Table 2.

Sustainability may be an agreed upon general goal, as in many countries it already is. Its specification is normative and political. Environmental effectiveness of instruments will be another indisputable part of instrument evaluation. However, at what level of detail is this effectiveness to be established, taking into account which mechanisms and which time horizon? Is there a right to some minimal quality everywhere, with permits as possibly most apt instruments, or is some overall level of emission reduction enough, with taxes as an adequate instrument? Are cost-effectiveness and efficiency important parameters for judgement, as for most people costs will be important? Or are distributional effects more relevant for instrument choice? Are economic and environmental effects abroad to be taken into account, or only national ones? Do other aspects of justice, like the right to pollute versus the right not to be polluted, play a role in instrument choice? Is freedom of choice by producers and consumers an independent criterion for judgement?

Even if one would refrain from normative choices in these respects, one still meets the same questions as empirical ones in developing and implementing policies. Other people will mind about distributional effects, people abroad do mind about being polluted, and there is a general acceptance of a broadly defined polluter-pays-principle, implying that the one who pollutes should bear kept responsible for this consequence of his actions. If people judge policies as going against their values, the legitimacy of these instruments will be reduced, as will be their effectiveness. No doubt, the normative acceptability of instruments is one main empirical factor in both their political relevancy and in their environmental effectiveness. Thus, through the backdoor, the normative questions come in again.

When lead-free petrol came on the market - at a slightly higher price than leaded petrol, with an accompanying government action 'buy green petrol' - the reaction of many was that if they would buy green, they would be part of a minority taking the costs while the main problem would remain unsolved. In that way, buying green would have limited or even negative effectiveness combined with an unjust sharing of burdens. On the basis of their normative appraisal, many regulatees decided not to co-operate, forcing government to use other policy instruments. Straightforward product rules could then be the preferred option, for this normative reason.

The Dutch government solved this collective action dilemma differently, by making leaded petrol more expensive through a tax measure, which is equivalent to taxing lead. Thus, leaded petrol was pressed off the market effectively. Now everybody paid the higher price of lead-free petrol. In this solution, burdens for environmental improvements are shared equally, in the sense that everybody pays the same price per litre. This is in line with one of several justice criteria, which states that the effort for a certain amount of environmental improvement should be the same for everybody, at the margin. It is not an equal effort per head, as those who drive most pay most. This criterion happens to be nearly equivalent with the criterion of (static) economic efficiency (Baumol and Oates, 1988).

It would, of course, be strange if criteria for judging environmental policy would be different from those valid for other policies. So, the criteria are related to general views on what the tasks of government are. The combination of neo-liberal and socio-democratic views then covers the field, with different emphasis on different aspects with different political groups, but *grosso modo* with the same ingredients. Giddens compares the new consensus being formulated on tasks for public policy to more traditional views. They are very much related to structural developments in the economy, with global markets and international networks replacing command and control in firms. The emphasis in policy is also shifting from 'control' to 'generative policies', which allow "individuals and groups to make things happen, rather than have things happen to them, in the context of overall social concerns and goals" (Giddens, 1994:15). The value of equality shifts from distributional equality, in disposable income, to generative equality, in terms of security, self-respect and self-realisation (ibid: 1994:191). Developments in environmental policy instruments are part of these broader societal developments, unavoidably.

What are the criteria to use in judgement, for practical assessment of instruments? For environmental policy, the first criterion probably is effectiveness in environmental terms. In integrative policies, however, effectiveness cannot be established disregarding other values. How important is the toxic effect on child development as compared to cancer risks on a much longer time scale, and as compared to the loss of plant species that might have had a pharmaceutical importance? The time scale of effects requires choices on the relative importance of future effects. The specific location of effects may not only influence their type

and magnitude but involves different social groups as well. The spatial distribution also relates on how effects abroad should be taken into account at home. Should national policies also aim at effects abroad as part of overall effectiveness? Current WTO regulations go against such considerations. And how to deal with low-chance high-impacts effects, where evaluating effectiveness is based on the degree to which risk avoidance or precaution is deemed important?

Next to environmental effectiveness, there are other values. A first and broadly accepted one is costs, or better: welfare effects in terms of production losses required for environmental improvements. Instruments which help stimulate environmental technology development, like economic market based instruments, will have lower costs in the long run (see for theoretical aspects Baumol and Oates 1988 and for empirical aspects Hemmelskamp 1997). So a clear distinction is to be made in the cost criterion between short term costs (st) and long term costs (lt). In multi-purpose instruments, the environmental cost-effectiveness (or 'eco-efficiency') can only be established by attributing one part of cost to environmental goals and other parts to each of the other objectives contributed to. Other values relate to ethical categories of justice and equality, covering traditional distributional justice within and between generations, justice as fairness, and the newer generative equality (see on these ethical issues Rawls 1972 and Giddens 1994/98). Intergenerational justice has been made operational in an environmental context as 'sustainability' in the Brundtland Report of 1987.

However broad one models effects of environmental policy instruments, there always will remain relevant aspects beyond modelling, not to be left out of account, but to be specified as second order or as strategic criteria (see Table 2). Government has to operate with some legitimacy, which means that on average, some minimal level of social and political acceptability and support is required in instrument application. Furthermore, instruments have to fit more or less to the capacities of the existing administration. Large changes in sectoral competitiveness may create social instability and should better be avoided, in general. Another element, lacking in most quantified models, is how instruments influence technology development. These aspects, partly overlapping, are hardly quantifiable. Still, they may be essential for a well-founded judgement on environmental policy instruments.

Table 2 *Criteria for evaluating policy instruments*

First order criteria	Second order criteria	Strategic criteria
effectiveness social costs (st; lt) eco-efficiency distributive justice -intragenerational -intergenerational justice as fairness 'generative equality'	social and political acceptability within administrative capacities limited changes in competitiveness incentive for sustainable technology development	fitting in the broader conceptual framework for public policy fitting in the broader institu- tional framework of society fitting in general cultural developments fitting in general economic developments

Instrument choice may bind society for years and decades. Hence, such choices are to be placed in a strategic context, not only reckoning with relations as they are now, but also with

developments as are taking place in this longer time perspective. Four main strategic areas may be distinguished, related to politics, social structure, economy, and culture:

1. Instruments are to fit in the broader conceptual framework for public policy, e.g., along the lines sketched by Giddens (1998).
2. They should be in line with the broader institutional framework of society, e.g., in terms of increased mobility, functional specialisation of organisations and internationalisation of organisations.
3. They should consider general cultural developments as in individualisation, mass culture and other-directedness, as sketched by many sociological studies.
4. Finally, instruments are to be adapted to general economic developments, as in globalisation of markets, shifts from hierarchical co-ordination to network co-ordination, and shifts from production of commodities to production of services, as sketched by Castells (1996).

Some people, especially economists, simplify the evaluation by reducing it to an economic analysis. In principle, such an assessment may cover all environmental effects, is based on a specific discount rate, uses a risk avoidance factor of zero, takes an equal weight for every Euro or dollar - thus disregarding income distribution -, and only reckons with current private preferences. They assume independence between effects and independence between individual preferences. Then, indeed, each emission or environmental intervention has an environmental price tag in terms of a (negative) net present value, as part of social costs. Environmental policy instruments then can be scored in one unit: money. This overall score is the sum of the environmental effects, after their transformation into a net present value as sketched above, and the direct economic (market related) effects. The one Euro or dollar figure resulting then indicates which instrument to use in which situation.

In reality this hypothetical situation, of course, does not exist. Where price tags can be put on emissions, these prices relate to partial effects and will mostly be based on not very realistic assumptions. Several aspects of justice, such as equality and justice as fairness, are left out or included only superficially. Moreover, second order and strategic criteria are not all apt for economic quantification. Therefore, this option is too narrow to be the sole base for a convincing instrument assessment, although costs of course play a role in such an assessment.

The main lines of argument in this section can be summarised as follows:

*The prime role of policy instruments is in **reducing social complexity** to manageable proportions.*

Instruments as institutional arrangements may not only be seen as tools of governments to influence private behaviour, but also as means for guiding behavioural relations between public bodies, and between individuals and private organisations.

*Environmental problems mainly result from **external effects** economic activities have on **collective goods**.*

*Environmental policy instruments help avoid the **tragedy of the commons** by solving the **prisoners' dilemma** and preventing the **free rider problem**.*

*The evaluation of instruments for environmental policy is not only based on **first order criteria** for evaluation of effects, like eco-efficiency and distributive justice. It also involves **second order** criteria, like effects on competitiveness and influence on technology development, and **third order strategic criteria**, like fitting in with general institutional, cultural and economic developments.*

2 DESIGN, ANALYSIS AND EVALUATION OF POLICY INSTRUMENTS

Having set out the role of environmental policy instruments and the criteria for their evaluation, the next question is how to specify and assess them. It should be clear by now that there is not one unique way for doing so. Therefore, there is no final choice made here on how instruments should be categorised. Many dimensions have their due place and not all of them can be included at the same level. Instead, a choice for four “main” dimensions is made. Together they specify the central aspects of instruments. Using these as a framework, a number of instrument types are being surveyed. The close link between policy instruments, the policy preparation and policy implementation process is worked out in a separate section. The ultimate ratio for policy instruments lies with what they produce. The evaluation is the final section of this second part of the chapter. The relations between the elements of this chapter are surveyed in Figure 3 below.

2.1 Categorisation of instruments

Instruments as societal ordering mechanisms bring order in the relations between actors and guide the behaviour of actors in relation to the environmental purpose or goal of the instrument. What is common to all environmental policy instruments is that they are thought

to bring about a change in behaviour as compared to the behaviour without application of the instrument. These behavioural adjustments are aimed at improved environmental quality; that is what makes them instruments of environmental policy.

In specifying instruments, we discern four main types of characteristics or dimensions. In question form they are:

1. Who influences whom?
2. What is the influencing mechanism?
3. What is being influenced?
4. What is the operational goal?

These four empirical dimensions are quite general; in principle, they are the same all over the world, regardless of cultural differences. In addition, in principle, these four types of characteristics can be analysed more or less independently. Some further instrument characteristics, however, seem more bound to specific cultures and institutions. An example is the juridical status, often used as a defining characteristic. Juridical categories are linked to the specificity of judicial systems. For instance, an EU regulation does not have a *pendent* in most other countries, while Anglo-Saxon statutory law is not present in most European and (ex) communist countries.

The general tasks of instruments - avoiding the ***tragedy of the commons***, solving the ***prisoners dilemma*** and preventing the ***free rider problem*** - could easily have been made into defining characteristics. They have not been included here because of their rather abstract and strategic nature. Hence, they play a role still in instrument design and instrument evaluation, be it in general or at a case level. The normative evaluation criteria as specified in the previous section have not been included here either, making a distinction between empirical-descriptive elements and the normative evaluation. Of course, there is to be a link between descriptive elements and evaluation, as ultimately it is the evaluation that counts. In the evaluation, it is not only the direct effects of the instruments that count; it is the overall effects that are the proof of the pudding. There is a tendency to include some standardised effect mechanisms into policy instruments, like global warming potential (GWP) in national and international climate policy. So some mechanism may play a role in the goal as specified in the instrument. Most mechanisms, however, will be independent from the instrument. Therefore, their analysis is required, as a separate step, in the evaluation of policy instruments.

It seems that the four dimensions discerned above cover the main aspects of policy instruments, being relevant for evaluation either directly, or indirectly, through some sort of empirical modelling. The ultimate integration of the evaluation in the instrument would safeguard the right instrumentation but would make the instrument as complex as effect analysis and evaluation is by now. Some steps in this direction have recently been taken, using standardised environmental effect mechanisms and standardised evaluation procedures, as in using life cycle assessment (LCA) for selecting cost effective emission reduction measures in the oil and gas producing industry in the Netherlands. For instruments influencing decentralised decisions, as seem to be increasingly required, a further development of instruments in this direction is essential, not only covering effect mechanisms but also their evaluation in terms of relative importance of different effects.

We will now fill in the four main dimensions chosen for further elaboration. It should be clear that also at this level, there is not one truth. For instance, one can describe ‘actors’ in many dimensions, not only as individuals but also as collective units, as organisations. What is guiding the choices? In the end, the question is to be answered how policy instruments can fulfil their function in simplifying the complexities of reality to allow for effective and concerted actions towards environmental goals. More specifically, the question relates to how instruments can be set up and how their functioning can be evaluated. As we already have four dimensions, a further systematic detailing should be sparse, as otherwise too many categories would result.

Who influences whom?

When asking who is influencing whom, a major distinction can be made between governments on the one hand and non-governmental actors, like individuals, firms, and organisations on the other. These two types of actors involved in instrument application lead to a first further categorisation of instruments. A distinction is thus made between three types of actor relations, see Table 3.

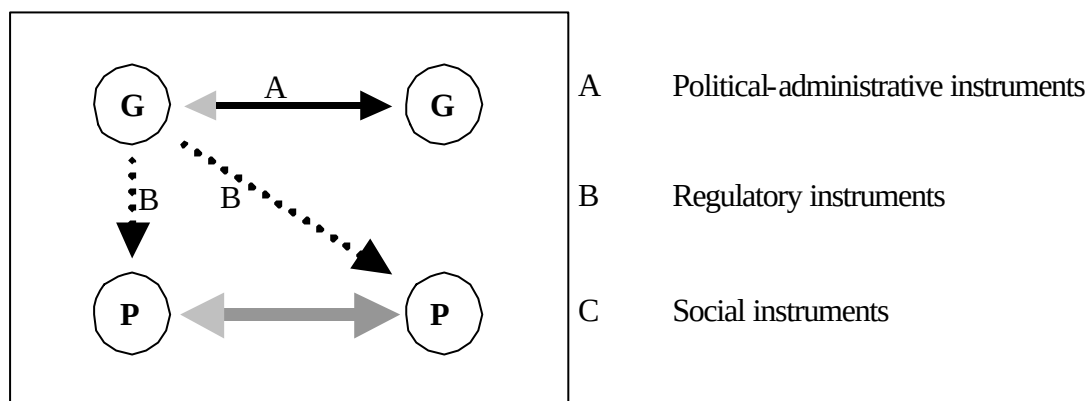
Table 3 *Actor relations*

Actor relations	Examples
Governments (G) influencing Private actors (P)	environmental permits SO ₂ emission charges
Governments (G) influencing Governments (G)	Montreal Protocol EU regulations
Private actors (P) influencing Private actors (P)	ISO 14 000 Series private certification systems

An environmental permit is a main instrument where governments influence private actors (including publicly owned firms), as are emission taxes, e.g., SO₂ taxes creating a market incentive for reducing SO₂ emissions. An international treaty like the Montreal Protocol on substances that deplete the ozone layer is a binding instrument between governments, and an EU environmental regulation binds national governments in the EU. An ISO 14 001 audit guarantees a degree of generality in describing environmental performance of firms, creating an incentive to take environmental aspects seriously. Private certification systems, such as for food in supermarkets, influence the behaviour of food producers and create options for choice for consumers.

We will use the three main types of actor relations in structuring the presentation of the instruments in this chapter, as political-administrative instruments (A), regulatory instruments (B), and social instruments (C), see Figure 1.

Figure 1 **Categorising environmental policy instruments based on actor relations**



What is the influencing mechanism?

The influencing mechanism specifies how one actor influences the other. It involves the limitation, prescription or the addition of options; mechanisms which influence the outcomes of options, as in market influence; mechanisms which lead to a different evaluation of outcomes, as through information; and mechanisms which work through institutional changes in the surroundings of regulatees, like liability rules. The focus is on the influencing mechanism (Table 4, next page). Ultimate effects, e.g., of changes in liability rules, will usually work through further effect chains, like market mechanisms and the creation of options with lower liability risks. Specific procedural instruments, in principle part of the institutions of society, are taken separately here, leaving only the more general institutional aspects in the structural instrument mechanism. The terminology used in practice varies somewhat. For instance, binding instruments, covering the limitation and prescription of options, are also named direct instrument or juridical instruments. This does not seem handy, however, as option creation can be seen as a direct instrument as well and financial instruments like emission taxes also have a distinct juridical status.

What is being influenced?

A further basic characteristic is the nature of the influenced object. Is it a material object, like a chemical compound, a material, a product or an installation; or is the object of regulation an activity or process, like the way an incinerator is operated, the speed of cars, the leakage prevention in refrigerator repairs, or the concentration of a substance as emitted?

Regulating 'things' is not done because of the inherent properties of the material object.

Table 4 **A typology of instrument mechanisms**

<i>Instrument mechanisms</i>	<i>Examples</i>
binding instruments, prohibiting	prohibiting: no cadmium stabiliser in PVC as building material is allowed
binding instruments, prescriptive	communities offer the option of separate waste collection
option creation	multiple waste containers for separate collection
market influence (volume or price)	volume: auctioned car ownership rights price: energy tax, SO ₂ tax
cultural/informational	normative: ecolabel information: explain contribution of organic solvents to summer smog
structural/institutional influences	liability rules public decision making safeguards
procedural influence	obligatory environmental officer in firm ISO 14 001 audit

Ultimately, it is only processes, as activities, which influence the environment through some sort of environmental intervention. Environmental policy instruments try to influence these activities directly, or indirectly, through material things. In general, regulating things is easier than regulating processes, as most things can be inspected and controlled any time, while control of behavioural aspects is much more complicated. Bypassing a flue gas purification installation, e.g., saves costs. Illegal bypassing can be stopped only if the inspector comes by at the right time. Cadmium in PVC stabilisers in building materials, however, can be measured any time.

There are some boundary cases where it may not be so clear whether the material object or the behaviour, as a process, is being regulated. For example, one may regulate the way the overflows of a sewer system are built, or how they are to function in terms of the allowable amount of overflow per occurrence and period. The first instrument type regulates the material installation, the second one the process. Such descriptions may easily be combined.

Another example at the boundary is where a certain installation may not emit more than a certain amount of some hazardous substance. In such a case, it is not so much a regulation of the thing but of the activity. An emission tax is regulating an activity, as it is the emission flow from some class of activities that is being regulated. The same is true for more complex emission regulations like a maximum amount of NO_x per kWh of electricity produced in a certain type of power installation. In permits for installations, one may both regulate the installation as a thing, and one may regulate its functioning.

A final boundary case is where process information is linked to a product. Timber wood, as a product, may be labelled as originating from a sustainably managed forest. The process aspect “in the chain” then is labelled on the product. Similarly, LCA information on products refers to all processes implied in having the product. In these real boundary cases, it seems easiest to

treat such instruments as product policy. A final example is on information for sustainable life styles. Though referring to the consumption processes, it focuses so much on purchasing of products, that also such an instrument may best be labelled as a product instrument.

A second main element in what constitutes the object of an instrument is how encompassing the object is defined. The instrument may apply to single items or to classes of items. Operating permits, e.g., apply to single installations. Rules on specific single products seem to be limited to immovables. General rules on technologies apply to classes of installations. Furthermore, the geographical applicability of an instrument may be limited. ISO norms have a global applicability, while most technology rules apply at the national level only. Behavioural rules may have a broad applicability, as with general speed limits for buses, or they may have a limited domain, as with denied access after sunset for a specific protected nature area. The main grouping of object types in instruments thus ranges from single mobile products (including installations and objects like nature areas); single immobile products; classes of products at a regional level; classes of products at a global level; classes of activities at a regional level; to classes of activities at a global level.

Table 5 A typology of influenced objects

<i>Object influenced</i>	<i>Examples</i>
single product (mobile)	cars/buses/trains/aircraft
single product, including instal- lations and objects (immobile)	test on fittingness of building in landscape permit requiring safety valve on specific pressure vessel
classes of products, regional	EU obligatory 3-way catalytic converters in cars rules on treatment of toxic wastes
classes of products, global	WTO rules on non-discrimination
classes of activities, regional	rules on NO _x concentrations from household boilers
classes of activities, global	ISO 14 001 requirements on environmental planning in firms

What is the operational goal?

The aims of instruments will always be in terms of some environmental quality or improvement, at reasonable sacrifices in social and economic terms, often taken together as 'sustainability' or sustainable development. Such aims usually are not embodied in instruments, as they cannot easily be specified and controlled. However, whatever ultimate aim was in mind when setting up the instrument, it is the operational goal only that works.

If, for instance, resource use and emissions reductions are the aims, and the operational goal in an instrument for reaching these aims is a minimum recycling percentage of packaging waste, the link between the aims and the operational goal is not so direct. Only the recycling goal is operational and can to some extent be reached. In how far this goal attainment also contributes to sustainability depends on many empirical relations. Concrete answers also depend on the way these empirical relations are analysed, with legitimate but differing

methods of analysis existing. There may be a large difference between direct effects at the locus of implementation; indirect effects as linked effects in the chain; and more complex secondary effects involving longer effect chains and feedback loops. Therefore, linking aims of instruments to their operational goals is not a straightforward affair.

As a rule, the closer one regulates to what ultimately is important, the less 'noise' and costs will be induced. If, for instance, car emissions are the problem, their regulation, if feasible, is a better option than regulating the weight of a car, although on average the latter is a reasonable indicator of emissions. If only this indicator is influenced by some instrument, cars will get lighter but not necessarily cleaner in the same proportion. So the goal regulated may range from products and installations to emissions.

Environmental interventions may be grouped according to their characteristics further along their causal chains in the environment. Several emissions may, for example, be taken together in terms of their global warming potential (GWP). One may even follow that line further and quantify several emissions in terms of an abstract entity like 'overall evaluation of effects', as in some eco-indicator score. One further step towards linking the object of analysis to ultimate evaluation criteria is to combine the environmental score with a socio-economic variable like cost or expenses. The goal of the instrument then is in terms of an entity like eco-efficiency or environmental cost-effectiveness.

So the question is: where in the effect chain is the operational goal in the instrument to be set?

When environmental policy started to expand in the 1970s, effect mechanisms usually were quite direct, as problems were largely local. If a flue gas purification installation was required in a permit, the direct effects were quite clear, and the indirect effects in society were limited. The reasons for requiring the cleaning up of the flue gas were also quite clear, and explicit modelling of environmental effects was hardly necessary. The improvements through end-of-pipe measures were obvious and often locally visible. These simple times, however, have mostly passed in the last decades of active environmental policy; things have become more complex now.

Process integrated improvements not only have specifiable local effects on the environment in terms of local resource use, local emissions and other local environmental interventions. They also have effects on all economic inputs and outputs. Hence, consequences of policy induced change can in many cases be established only by following the chains of indirectly linked products and processes, each with its own set of local environmental interventions elsewhere. And this is only a first step. There also are secondary mechanisms as related to market adjustments, influences on R&D, on long term competitiveness, on other regulatory measures, on cultural views, etc. In analysing not only direct effects, there is thus a continuum, starting at relatively simple primary effects in the chain and going to an ever increasing complexity of secondary effects; ultimately until the boundary of what can be analysed.

Primary mechanisms in the environment are relatively simple mostly, although recent climate models, e.g., are of quite complex nature already. Models with broader secondary mechanisms, though more adequate in principle, are still rare and usually have a limited validity. For a more complex problem such as climate change, the secondary environmental effects are intermingled with social reactions. For instance, coastal areas may be flooded by sea level rise, but sea defences can be improved to prevent this. So the effects of instruments for climate policy can be analysed practically up to climate forcing, possibly involving some ecological feed back loops. Beyond that, modelling becomes more subjective.

It is clear that in defining the goal of instruments, it is hardly possible to include all secondary effects. Some instruments do not even specify the primary chain effects in society, like most technology rules. Where governments specify rules on technologies like, for instance, on the catalytic converter for cars, one may assume that in the preparatory phase the analysis has been extended to include primary and secondary effects in the chain. Other instruments do take into account only direct effects, like the emissions from a regulated facility, as is the case with the permit for installations. Where decisions on technologies are made at a decentral level, as is increasingly the case, one needs a more comprehensive view of the ultimate effects of technology choices. So the most indirect instruments involve the largest complexity, first including mechanisms and effects in society, then those in the environment, and finally the overall evaluation of these consequences, to allow for rational decisions. There are strong mechanisms that prevent such an ideal state of affairs, related to the collective nature of environmental quality.

When specifying goals, it should be clear that instruments cannot control the full extent of all real effect mechanisms. The creation of direct effects unavoidably leads to indirect primary effects in the chain and to long or everlasting secondary effects in society and the environment. Policy actions may often change the situation forever. When evaluating instruments, the primary and secondary effects in the chain should surely be included, in principle. The question however is in how far such effect mechanisms can be included in instrument modelling in practice.

To some extent, it certainly can, as in LCA inventory modelling. Incorporated in an instrument like a covenant as is the case in Germany and the Netherlands in waste prevention, the modelling results should not be confused with state of the art modelling of real effects (as sometimes happens). The standardised modelling in the instruments is a proxy, which may improve on other ways of regulating technologies or single products that do not take into account effect mechanisms at all.

In real world situations, things sometimes are less complicated than theoretically perceived, and then environmental policy instruments may be simpler as well. For example, when banning a toxic and persistent agrochemical for which slightly more expensive alternatives are available, the real effect route in the economy does hardly have primary and secondary effects in the chain, and neither is there much complexity in the environmental pathways towards valued endpoints in terms of human and ecotoxic effects. There then is no reason to complicate the instrument and burden it with complex effect mechanisms and evaluations. A simple prohibition of the agrochemical will do, after a relatively simple analysis of effect chains in the policy formation process, including a view on alternatives. Such easy pieces have mostly been performed, however. After more than thirty years of active environmental policy, it seems that simple end-of-pipe (add-on) measures and simple product prohibitions have mostly been enacted. Such policies may now start to hamper environmental progress by fixing old technologies. The problem now remaining is more complicated and hence requires a more complicated instrumentation as well.

For integrated policy instruments there is a gap between what modelling can do more or less realistically, and what is needed for integration in overall evaluation. Somehow, the modelled multitude of environmental interventions and other effects are to be transformed into an overall judgement, even though secondary effect mechanisms are hardly modelled and valued endpoints hence cannot be modelled realistically in most instances. Several methods for this purpose are available which do the undoable. Economists derive overall evaluations in

monetary terms on the basis of past behaviour. Impact assessment in LCA first integrates in terms of policy themes and then through a weighting procedure into an overall assessment. For reasons of policy consistency, it would be necessary to use the same trick every time. There is a modest requirement on overall rationality of environmental policy. It is that the trade-off between different effects of each policy act is equal. This simple requirement can be transformed in a conditional statement (see von Neumann and Morgenstern 1953): if policies are rational, there is a single set of weights on effects which can “explain” all policy choices made. Given the theoretical and practical limitations on modelling, policy integration can only be reached through practical choices, based on not fully developed arguments.

One would like to go one step further and require that a practical method is a reasonable predictor of overall effects, as are yet unknown. This clearly poses a methodological problem. What one can do is to strive for a consistent and transparent solution, on the one hand taking into account real mechanisms as are known (partially only), and on the other hand to specify the normative background of the evaluation. This problem area, it seems, has not yet been under real scientific scrutiny. Some practical solutions are available, like using a panel (e.g., NOGEPA covenant), using policy aims for weighing emissions into one score (e.g., Swiss or Norwegian ecopoints), using a mix of partial economic valuation or some equivalency factors (e.g. ExterneE and EPS), and applying some preferences or value types (e.g., Eco-indicator 1999).

All these practical models have been developed in small scale hardly peer reviewed studies. Important questions are only touched upon and not answered. How can we differentiate between reversible effects, like ecosystem degradation, and irreversible effects, like species extinction? Particularly: how can we differentiate between small-chance-high-risk effects, as in possible runaway effects in climate change, as against more probable slow change scenarios? Assuming uncertainties can be specified in terms of risk, how can we evaluate these options with different probabilities? How can we make a comparative evaluation of climate change effects, which can hardly be specified in economic (welfare) terms as against effects of acidification in terms of reduced crop yields and increased corrosion, which can quite well be specified in terms of economic losses? Such fundamental problems have not yet been solved. There also is no coherent research programme so far dealing with these subjects so essential for decentralised decision making as is required in environmental policy instruments for the next decades.

For specifying operational goals, there are two main dimensions.

Complexity of the causal chains:				
direct effects	indirect effects:			
	primary effects	secondary effects		
Place in the effect/evaluation chain:				
technology	intervention	policy theme	ecoindicator	evaluated total effect

There is a gliding scale from direct effects through indirect effects to secondary effects, taking into account ever more complex causal relations. Full secondary effects include complex feed back mechanisms, like the reactions of producers on changed prices due to changes in demand. These two dimensions cannot be combined independently. It does not make sense, e.g., to specify goals at a technical level based on secondary effects, as in most cases knowledge on secondary effects is limited or fully lacking. It then is better to use more simple

but operationally modelled relations than none. Most analytical tools like substance flow analysis (SFA), life cycle assessment (LCA) and environmentally extended input/output analysis (envIOA) are based on very simple indirect relations only, thus allowing for an operational analysis, albeit each with limited validity. Taking this state of affairs for granted, the classification may be reduced to a simpler typology as in the table below. The option of using secondary effects as instrument goals, e.g., based on some economic model, seems not to have been applied yet. It also seems not so logical to combine a highly integrated goal in terms of an eco-indicator with only direct effects, although technically this is possible. Also this last option has been left out of account. Applying this reduction the simplified typology of table 6 results.

Table 6 Typology of operational goals in environmental policy

Operational goals	Examples
direct technical characteristics	binding rule: obligatory double skin in oil tankers (in most European and US harbours)
technical characteristics in the chain	requirements on recycling percentages of drink containers in take-back legislation (in several European countries)
direct environmental interventions	noise based landing fees in airports, as social instrument goal permit, with allowable emissions, as regulatory instrument (several OECD countries)
indirect environmental interventions	SFA based regulation of cadmium use in products (Netherlands)
direct theme scores	emission reduction targets for member countries (EU; Kyoto Protocol)
indirect theme scores	LCA based rules for waste prevention (Germany, Netherlands)
indirect eco-indicator scores	building regulations as being prepared for a limited set of eco-indicators (Netherlands, in prep)
indirect total effect scores	Eco-efficiency as selection criterion for emission reducing technical measures, is in NOGEPA covenant
secondary (total, etc) effect scores	(no example yet?)

2.2 Instrument design

Environmental policy instruments may best be set up by choosing the characteristics most relevant for the individual case. What exactly is the case is not so easy to say, however, as it is both defined by the context and by the choices made in instrument design. These reflective relations make instrument design a much less rational-mechanical activity than at first sight might seem possible. If, for instance, one first defines the ecological effects of over-

nutrification as a manure problem, and then the manure problem as a consequence of too many animals per hectare, the choice for regulating per farm seems logical. In addition, if one has the traditional permit in mind, the problem will be defined more easily this way. By contrast, if the problem is defined in terms of a lack of oligotrophic areas, or as a lack of spread of nutrient concentrations, a regional scope in regulation will be more logical.

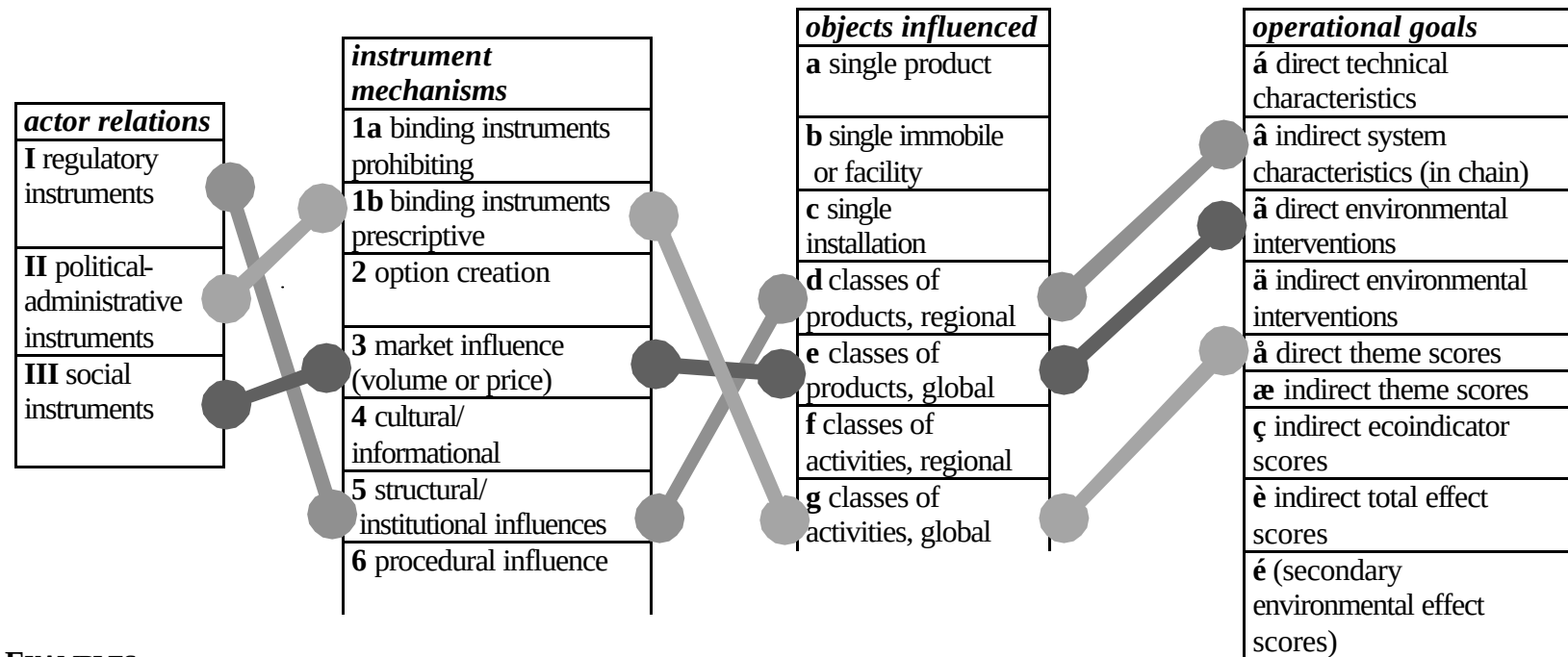
If one would have an instrument option in mind like a substance deposit (see Huppel 1988), the scale of the problem could well be defined at a regional level. Then the choice for individual permits does not seem as logical. This is to say, that it is not only the empirical context that indicates choices; further normative considerations may well play a role. The polluter-pays-principle reflects the normative principle that the one who pollutes is to pay for the consequences of his action - and for the costs of preventing them, as is the case in liability law in all Western countries. Tradable permits lead to the prevention costs being borne by the polluter, but not the damages. In this respect, the emission tax is more in line with general social and juridical considerations than the tradable permit. If filled in as a regional substance deposit, the focus on individual emitters vanishes more or less fully. With these caveats in mind, we now turn to design choices in instrumentation.

A policy instrument may be defined by combining elements from the four basic instrument dimensions discussed above. These characteristics are rather independent, so they may be used as a framework for instrument development: as an *instrument generator*. Any combination defines the main lines of an instrument. In Figure 2, the instrument generator, some examples are given.

Take, for instance, 'social instrument' from the column *actor relations*; use 'market influence' in terms of pricing from the set of *instrument mechanisms*; take 'classes of products' from the set of *objects influenced*; and take 'direct interventions' from the set of *operational goals*. (This is instrument: "III; 3; e; ã").

This instrument then can be further specified as to the product classes: e.g., 'aircraft', with different noise levels as the operational goal in pricing. 'Noise related airport landing fees' are a quite common social instrument. The motivation behind a social instrument may be another policy instrument, especially a regulatory one. It may be 'a binding instruments of a prohibiting nature; for a single immobile facility; with direct intervention as an operational goal'. In the example here, the motivation-creating regulatory instrument is: "the operating permit of the airport stating maximum noise levels in surrounding residential areas". The motivation behind the regulatory instrument may be based on a political-administrative instrument, e.g., an EU directive on permissible noise levels in residential areas.

Figure 2 The instrument generator



EXAMPLES :

-  extended liability for final toxic waste (Superfund US)
-  noise component in airport landing fees (many airports, including Amsterdam Airport)
-  international treaty on ozone layer depletion (Montreal Protocol)

2.3 A thousand instruments

With three types of actor relations, seven instrument mechanisms, seven types of objects influenced and eight levels of operational goals (as specified in the instrument generator), more than two thousand instrument types could be distinguished. Of course, not all combinations will be relevant but even if only a hundred would be relevant, a lot would have to be evaluated. Reducing complexity, that is the task here.

In addition, further dimensions are relevant, like the encompassing nature of instruments, their juridical and administrative set-up, and their communicative qualities. Such aspects may however be seen more as a matter of detailing, after setting out the main lines along the four dimensions. The evaluation criteria as developed in the previous section will help in specifying actual instrument design in a relevant way. So, with the kit as developed, the 'social engineer' may start the job, formulating policy instruments and communicating the ones selected to relevant audiences, as one major step in policy design.

We now come to the specification of a number of instruments, a partial specification of a selection of possible instruments. The first of the main characteristics distinguished above defines three main types of instruments: the regulatory instruments, the political-administrative instruments, and the social instruments. When specifying these three main types of instruments, the question is which further characteristics to take into view. The choice probably is between the mechanism of implementation, the objects of regulation, and the goals incorporated in the instrument. Therefore, we can go either for the objects or for the mechanisms as there is no *a priori* reason to choose one or the other. Focussing on objects, we would have main types like products instruments; installation instruments; and activity instruments (with some further differentiation). Focussing on implementation mechanisms, we would have prohibiting/prescriptive instruments; market instruments; cultural instruments; structural instruments and procedural instruments.

It seems that the implementation mechanisms are most commonly used, and also have a better inherent logic than the different object types. Therefore, we stick to these for the next level of specification of environmental policy instruments. This next level then is implementation. It is not the addressee but the entity about which the addressee is to do, not to do, or to change something. So, indirectly, the addressee is implied. The addressee is the person, functionary or organisation responsible for the object in some way. The addressee is not always clear and may be filled in in different ways; in that sense there also is a further addressee dimension. Pesticides, e.g., may be prohibited in their production, in their trade, in their sales or in their application, all to the same aim, to prevent their use and the emissions related to that. For an immobile installation, the range of options is limited to the person or entity responsible for its operation, usually but not always the owner, or a representing person or organisation.

I Regulatory instruments (guiding regulator-regulatee relations)

Regulatory instruments guide regulator – regulatee relations; they are the traditional environmental policy instruments.

1 *binding instruments*

Binding instruments can be either prohibiting or prescriptive. Prohibiting instruments usually are conditional. Something is forbidden unless some requirements are fulfilled. In symmetrical situations, as with speed limits, the difference is small.

The objects concerned are technological items, that is, the constitution and location of products and installations, or the functioning of products and installations:

- General rules on products
- General rules on installations
- Permits for operating specific installations
- General requirements on activities
- Land use regulations and zoning laws

2 *option creating instruments*

Option creation can be direct, as in providing separate waste collection facilities to households, that voluntarily may separate their wastes. More indirect types of policies can be in the form of subsidized technology development, as for mass produced solar cells. If competitive, such option creation can be sufficient to create an environmental technology shift, in this case towards renewable energy. There is no prescription or prohibition involved here. There is some overlap with informational instruments, as when making public the results of research on solar cells.

3 *market instruments*

Financial instruments

- Taxes or charges, on 'things': On natural resources, materials, products, waste flows, emissions, theme scores, eco-indicators. Examples: electricity taxes, SO₂ emission taxes (or charges).
- Subsidies, any form, including tax credits, on (not using) 'things': On natural resources, etc.
- Deposit-refund systems, on 'things': On resources, substances, etc (policy-induced)
- Taxes or charges on 'activities': e.g., road pricing

Market volume instruments ('things' only)

- Tradable emission permits
- Tradable production rights
- Tradable product ownership permits, like car permits in Singapore

4 *cultural/informational instruments*

Non-compulsory structured information

- Public ecolabelling schemes
- Public certification of firms

5 *structural/institutional instruments*

- Extended liability
- Good house keeping ownership rules
- Educational system, Copernicus charter, etc.

6 *procedural instruments*

- Covenants, voluntary agreements 'in the shadow of the law'
- Environmental Impact Assessment rules
- Obligatory information disclosure, as in the US Toxic Releases Inventory

The special nature of procedural instruments may be indicated by an example from the Netherlands (see Huppes et al. 1997). In a covenant between the Dutch central government and NOGEPA (Netherlands Oil and Gas Exploration and Production Association), a given budget for environmental improvement was to be spent for a specified level of overall improvement in air emissions. In the agreement, it was stipulated that specific measures were to be selected based on their eco-efficiency, with particular rules to establish the efficiency. For the economic analysis, usual costing methods were applied. The environmental analysis started with effects in society, based on LCA inventory modelling. The effects in the environment were specified in terms of policy themes. For establishing eco-efficiency, these theme scores were aggregated into one eco-indicator score, using covenant specific weights as established by all those concerned in the covenant.

II *Political-administrative instruments (guiding relations between public bodies)*

Governments are restricted here to the regulatory part of government, engaged in planning, developing, implementing policies, and using policy instruments in such, here: environmental policies. Other operative public tasks, like building and maintaining roads, canals and dykes, maintaining an army, and distributing electricity, are productive or consumptive activities, to be regulated as any other economic activity.

The relations between governments, as regulators, and private persons and organisations as regulatees, in most cases are hierarchical. The relations between governments may be hierarchical as well, as when the EU binds the policies of countries with Directives, and national governments prescribe policies to regional and local governments. However, in the international context, most relations regarding environmental policies are horizontal, as in bilateral treaties and multinational treaties. Some hierarchy is implied when international public bodies are involved. In addition, when, seemingly, bilateral relations are involved, there may actually be a hierarchy involved. For instance, 'joint implementation' is dealt with at the interstate level; but the rules for joint implementation are dealt with in the Kyoto Protocol and the (future) extensions to that protocol as set up under UN leadership.

In principle, the six main implementation mechanisms discussed above can apply. We will go through the options in terms of a number of examples.

1 *binding instruments*

International treaties and conventions with binding elements in them like the Montreal Protocol, Kyoto Protocol, the Biosafety Protocol

- EU Directives for member states

2 *option creating instruments*

- Clean development mechanism under the Kyoto Protocol.
- Multilateral Ozone Fund under the Montreal Protocol.

These options seem to stretch the concept a bit. However, their basic set-up is to allow states to develop regulatory activities which would not be possible or at least rather unlikely without the explicit development of the option.

3 *market instruments*

- Internationally tradable emission reduction obligations

4 *cultural instruments*

- International guidelines, as by OECD, and in the EU IPPC/BAT (Integrated Pollution Prevention and Control/ Best Available Technology) rules
- Rio Declaration, AGENDA 21
- National guidelines for local zoning laws
- ILO conventions regarding labour standards

5 *structural instruments*

- WTO rules

6 *procedural instruments*

- International Criminal Court (ICC)

III Social instruments (guiding relations between private actors)

These instruments are similar to political administrative instruments in that they may reflect horizontal relations between equals, or have a hierarchical element in them. Again, there are the six main implementation mechanisms.

1 *binding instruments*

- Contractually specified rules for waste management, as when firms oblige themselves to deliver a certain amount of waste for a longer period of time

2 *option creating instruments*

- Battery take-in in supermarkets

3 *market instruments*

- Noise related landing fees on airports
- Deposit-refund system on cadmium containing rechargeable batteries for household appliances, on a voluntary basis.
- In-firm tradable emission permits (see box)

4 *cultural instruments*

- Green marketing
- Green accounting
- Product sheets
- Ecolabelling rules

5 *structural instruments*

- Standard contracts specifying adherence to environmental standards as for instance set up by a branche organisation

6 *procedural instruments*

- ISO 9000 Series
- ISO 14000 Series (partly)

The international standard on environmental auditing, ISO 14001, for instance, is a procedural instrument, requiring firms to take due notice of environmental aspects in their operations, like having an environmental policy plan, having officials responsible for checking on its progress, etc. If rules were incorporated on how to further specify environmental performance, the instrument would become a cultural instrument.

Multinational company tradable emission permits

Some major oil companies, including Shell, have introduced emission trading between the firms comprising these multinational companies. The emission trading focuses on climate changing emissions, like carbon dioxide and methane. Each independent business unit within Shell has an amount of emissions rights which may be sold to other Shell units. There is an accounting system which establishes the actual emissions of each unit. Emissions without a permit are not allowed, resulting in a company-internal cost penalty. If a unit has more permits than it needs it will try to sell them to other units. If it wants to expand, it may acquire permits on the internal but global company market. The total amount of emission permits is being reduced slowly, according to the environmental plans of the company, by reducing the allowable emission volume per permit each year. The business expansion and the reduction of the overall emission volume permitted puts an upward pressure on permit prices. Environmentally oriented technological development leads to a downward pressure. What will the effects of this instrument be?

The effects in terms of company emissions are quite clear: the goals of the Shell environmental policy plan are realised, while leaving technological freedom to the business units. The emission reduction is realised in the most efficient way, as each business unit reduces its emissions to the level where cost reductions are (roughly) equal to the costs of having the permit. A main problem in implementing such a system is the system boundaries chosen. How many firms partly owned by Shell and partly by other companies participate in the scheme? What happens to the total amount of Shell permits if Shell sells some of its activities, or acquires others?

What the net environmental effects in global society will be, in terms of reduced climate changing emissions, is less clear, due to, in this case, quite complex indirect effects. In activities where a company has competitors with less stringent policies, its costs will go up, relatively speaking. Hence, in the course of time, there will be a shift to firms not participating in that (or a similar) emission permit trading scheme. Also, questions arise as to how company environmental policy relates to public environmental policies in the different countries where the company operates. If more stringent policies are introduced in some countries, the permit system does not have effects there anymore, as induced costs of emission reduction are higher than the permit costs. With emissions taxes, in some countries, the firms involved will have a higher incentive to reduce emissions than other firms in the company. The overall efficiency within the company then is reduced. In this sense companies using such a scheme will create an argument against more stringent national policies. With public policies less stringent than the company scheme, public policy becomes superfluous. Here multinationals like Shell create an incentive for national governments to implement more stringent policies. The overall effect will be that public policies will tend to be harmonised at a global level towards the level of emission reduction as indicated by the large multinationals. Especially if most multinationals would come up with similar and equally stringent schemes, there would be a clear drive towards uniform policies, at the level of stringency as chosen by those firms, and not by governments. It should be relatively easy to expand the tradable permit system to trade between firms. Also, the choice of their policy instrument will influence policy implementation by governments as well, making it very difficult for instance to implement emission taxing schemes on top of the company tradable emission permit scheme. Shell chairman Moody-Stuart calls upon governments to implement similar market based mechanisms for achieving their Kyoto targets.

See for further information on the Shell tradable emission permit system (STEPS): www.shell.com/climate

2.4 Social embedding of instruments

Policy development and implementation, in terms of selecting and applying instruments, is not a mechanical procedure with results coming out independent from the broader social context and independent from the qualities of the actors involved. There have been simple views on the policy process which assume that the legislator enacts what is best and that the regulations will then be implemented by law abiding officers with the intended effects as results, of course only so if the technical preparations for legislation had been done properly. Political scientists since long (see e.g. Easton 1965) have shown how at a systems level, policy making is related to political support, limiting options for politicians and making the expected outcome of regulations only one aspect in the process. Sociologists of law have shown that similar laws work out differently depending on the administrative and social context in which they are functioning. A main difference, e.g., is that between the litigative American style of regulation, where laws are often fiercely debated and enacted after lengthy litigative procedures, while in England and also in the Netherlands the policy process is more horizontal, with officials influencing private decisions through discussion and information, and only ultimately through threats with strong regulatory reactions to non-co-operative regulatees (cf. Vogel, 1986; Jänicke *et al.*, 1998). Implementation then may take place 'in the shadow of the law', without any new laws or permits being enacted, or, in a private context, with contracts being signed.

In current administrative science, this has lead to more emphasis on the process of policy formulation and implementation, with less emphasis on the more formal characteristics of policies in terms of instrumentation. Policy making then easily is seen as a discursive process between all those involved, with outcomes in terms of their environmental actions based on power, interests, resources and shrewdness of the actors involved. We tend to (what we see as) a balanced view in this respect, indicating the role of policy instruments both in terms of structuring discussions and as indispensable means to wield power and shape both society and environment. Of course, this does not deny the fact that politics plays an essential part in policy development, nor that social processes are fundamental both in terms of policymaking, including instrumentation, and in policy implementation, using instruments.

Taking apart the process and the policy instruments being used in the policy process sometimes is quite straightforward. The US, for instance, has enacted laws on tradable emission permits for SO₂ emissions, after lengthy research on how this instrument may function (see, e.g., Cass *et al.*, 1982) and lengthy political discussions on its advantages and disadvantages in terms of efficiency and ease of implementation. Implementation is a mainly administrative process, upheld by checks and balances in which self-regulation plays a central role. Nobody wants his competitors to have a free ride, and therefore all trading parties support officials checking the outcomes of emission trade. The instrument is clearly differentiated from its broader social and political context.

With other instruments, however, the distinction is not so clear. Covenants between governments and groups of firms may be looked upon from different angles. In some instances, they create the discussion platform for coming to concrete actions, as in the Dutch packaging covenant. In that sense, it is not an instrument but a procedure that may lead to instrumental use, if needed. Or covenants may already specify concrete actions for specific parties, as also is the case in the Dutch packaging covenant. The 'shadow of the law' is very explicitly present in this covenant, where it is stated that the covenant replaces direct

regulation and, if not successful, will be followed by more direct regulation. The threat, of course, works only if regulatees - here: the private partners to the covenant contract - expect government to be able to come up with this legislation, if deemed necessary.

Voluntary approaches (including voluntary agreements) cover procedural variants of regulatory instruments (I; 6) and also most social instruments, usually functioning in the shadow of the law. They are to be distinguished from the social procedures followed in the preparation of other types of regulatory instruments, which themselves are not voluntary, like permits or emission taxes. The difference is not always sharp though, as in the example of “permit preparation”, formerly the main instrument in Great Britain and the Netherlands. In the research on voluntary approaches, a most striking conclusion is that little is known about the functioning of such voluntary approaches (cf. Harrison, 1999). Their effectiveness has not been studied thoroughly, and where it is assumed, it seems a matter of belief mainly. This belief seems similar to the old belief that binding instruments would automatically lead to the effects as specified. In the US, this may have been the case to some extent, but in most European countries, there is a well-known gap between legislation and execution. In addition, the legislation may enact what would have happened anyway. Effectiveness as being in line with legislation thus is safeguarded, while effectiveness of policy in terms of a behavioural adjustment for environmental improvement may be more or less lacking.

2.5 Instrument analysis and evaluation

In assessing policy instruments, a combination of normative and empirical analysis is required. The normative analysis guides the empirical analysis, as only results that are relevant normatively are relevant in the assessment. As always, however, things are not as simple in practice as they are in principle.

Empirically, two types of mechanisms are involved in the effect route towards environmental policy aims, or, broader defined, sustainability aims, and the broader set of norms and values of which they are a part. The first group is those in society, with many human control options, the second one in the environment, with hardly any control options. For both types of analysis, one may distinguish between primary effect mechanisms, essentially reducing causalities to one single chain, and secondary mechanisms, involving feedback loops modelled in a simple or more advanced way. Normatively, there is no well-structured set of values that can be linked to environmental problems. There is some ordering, however, in main value fields, as related to human health, economic prosperity, and the quality of nature. Amenity aspects, distributional aspects, the kind of our relation to the dead and living environment, and other normative aspects may be added.

As empirical analysis often is very scanty in environmental affairs, one either has to use assumptions, or one has to adapt the norms and values to the risks and uncertainties involved. We do not know with any precision what will happen if we continue to emit large amounts of greenhouse gases. The effect chains in the environment are rather uncertain and effects on society are very much conditional. Therefore, the assessment of predicted effects on “end point” might not be the relevant method to evaluate policy instruments to reduce climate change. One step back is to accept the uncertainties, and involve values on uncertainty to create new values, as are underlying the ‘precautionary principle’.

Another method to come to an operational assessment of policies and instruments is to look at their efficiency, taking their main goal as a reference. Although efficiency is highly important, even in the field of political feasibility it cannot be the sole judge on the quality of policy instruments. The main reason is that all partial policies will lead to some kind of problem shifting. Reducing acid emissions requires virgin resources and leads to additional other emissions, including greenhouse gas emissions. So the judgement on policies and instruments ultimately is based on their integrated evaluation or assessment, involving various social and environmental mechanisms and effects which are but very partially known.

This state of the art is discomfoting but should not lead to complacency. In real life, as opposed to science, a best guess is better than none, and defective but encompassing evaluation schemes are to be preferred to doing nothing, or fixing policy on some partial effects because other things have not been fully proven. For striking the balance, one at least needs to know what is not fully proven, and to see where problems in evaluation reside. A possibly faulty evaluation hence is better than none, and policy instruments should be set up in a way which best reflects available knowledge and accepted social norms and values.

The main lines of this section can be summarised as follows.

Policy instruments are not given entities to be investigated; they are social constructions with many degrees of freedom.

Four main dimensions are central to the definition of specific instruments but probably not enough for a full specification of operational instruments. They are: the nature of actor relations; the instrument mechanism in implementation; the objects influenced; and the operational environmental goals embodied in the instruments.

The four dimensions as filled in span up an instrument space. Criteria, ultimately evaluation criteria, guide the route through this instrument design space for relevant instrument choices.

Instruments are building blocks in the process of policy formulation and policy implementation; they are not the policy itself.

In actual policies, public and private, consensual acts are at the core of behavioural adjustments. This should not obscure the fact that power and interests play a central role in such processes and that power is very much based on the availability of operational policy instruments.

Transaction costs of environmental policy limit the ultimate effectiveness. Focussing on social procedures may enhance the effectiveness of specific policies, but implicitly excludes other policies being developed and implemented.

Structural instruments like liability rules and taxes may exert their influence with low transaction costs and potentially high environmental effectiveness, but for the time being only on a limited domain of environmental effects.

In design, analysis and evaluation, one part of the analysis is empirical and one part normative.

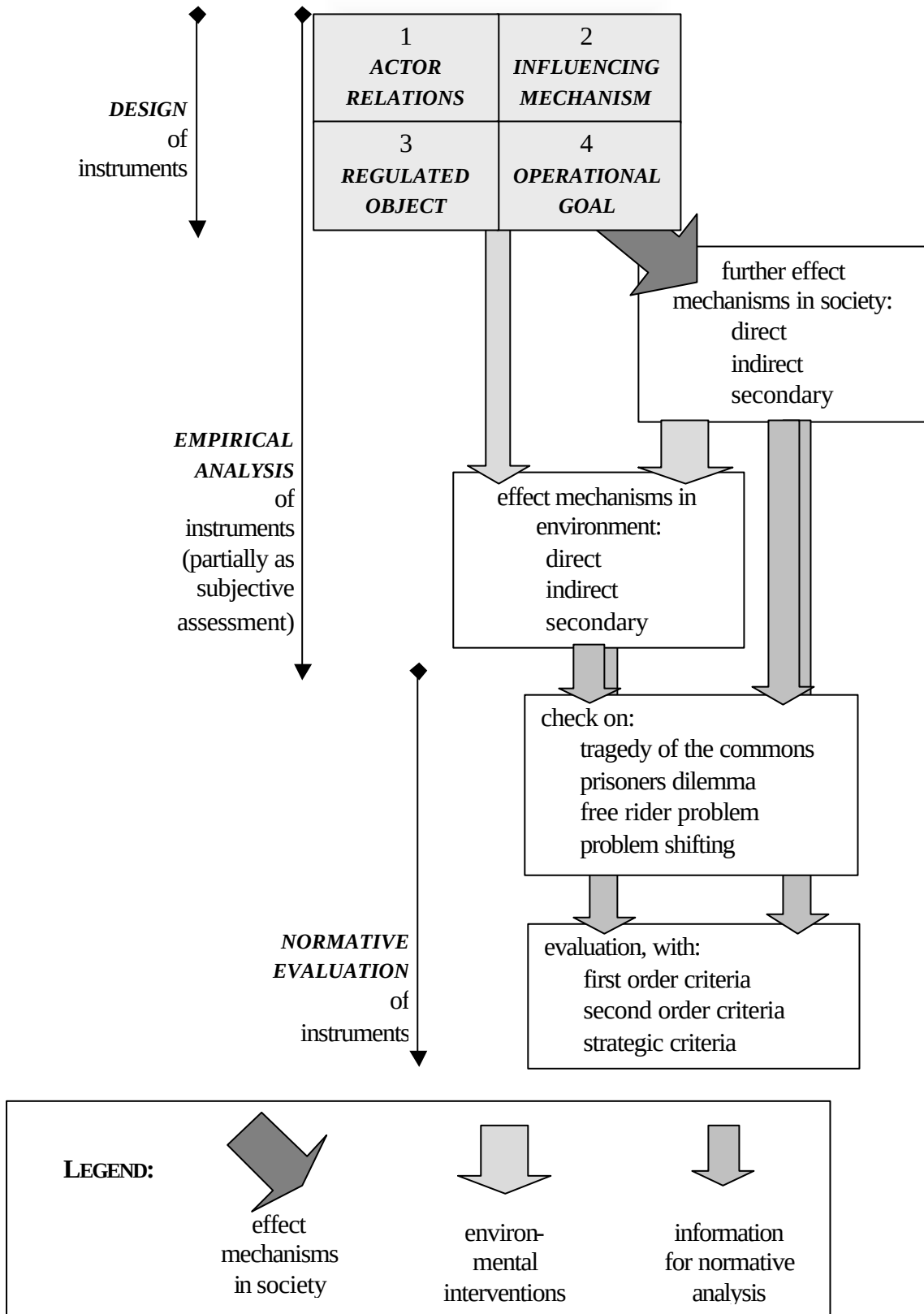
The empirical analysis is partially subjective and concerns direct, indirect and as far as possible also secondary effects.

The criteria for instrument and policy evaluation refer to direct expected effects, but also include second order criteria and strategic criteria, placed in a long term view of development of environmental policy instrumentation.

See also Figure 3 on the next page.

Figure 3

A framework for design, analysis and evaluation of environmental policy instruments



3 POLICY INSTRUMENTS IN A LONG TERM PERSPECTIVE

3.1 The future context of instruments

Policy instruments do not function in a void. Structural changes in society and the environment lead to shifting conditions, with different functioning of existing instruments and new options for new instruments. Simple mechanisms may be at the core of an instrument, rightly taken for granted when first using the instrument but not so in the long run. For instance, the workhorse of environmental policy in Great Britain and the Netherlands is the permit for individual installations. It was assumed that decisions on how to operate these could be discussed with those responsible, before starting design and building of installations and long before a permit was due. Planning of the firm and planning of the permitting procedure were aligned, with quite some procedural flexibility. In many sectors, the planning and implementation of technologies are now reduced to months instead of years and involve integrated decisions on technologies implemented worldwide. Discussions with the local environmental authority will only be on some details but not on the technology itself. Nor may discussions be on factors involving real costs shifts, as expected costs have been incorporated already in the decision making in the network of firms involved in the technology. Therefore, the role of local authorities in the strategic and tactical aspects of technology development has been reduced to virtually zero in most cases of permitting. Only additional instruments like large bags of money may bring back some influence in exceptional cases. For instance, highly efficient and environmentally benign coal gasification plants for power generation are built only with huge subsidies now, globally numbering not more than a dozen installations so far. Therefore, in developing the instruments for environmental policy, as an operational set, one has to take into account such long-term developments in society, not only in the local firms but also in the broader settings in society.

A number of such developments have to be addressed, including indications of their potential meaning for the instrumentation of environmental policy. Relevant and significant developments are in the overall structure of society; in general cultural developments; in developments in the economy and specifically in industrial relations; in the changing role of government; and last but not least, in the changing nature of environmental problems. With some more detail, we also will look into the consequences of globalisation. Next, the prospects for different policy instruments in a changing world are worked out. These prospects do not automatically lead to a clear direction as to which instrument, to use when and how. In this respect, also policy instrumentation as a societal development itself is non-determined and based on strategic decisions. Some major strategic choices in policy instrumentation will be identified in the last section of the chapter, nearing the arena of political discussion.

3.2 General tendencies in society

In the social structure of Western countries, there is a decreasing role to be observed of intermediate organisations like churches, unions, parties, and clubs. The institutional integration is weakened and the indirect control on individuals is reduced. Mirrored in this structural development is a double cultural development. Already long ago, Riesman (1950) described the first as a change from *inner directed* to *other directed* control of the behaviour of an person. This means that it is not internalised norms and values that guide specific choices, but the notions of others on that subject as determining his choices. The second tendency, stated still longer ago by Tönnies (1887) relates to who these others are. The reference group for one's norms and values is shifting from closely knit small group partners for life, one's '*Gemeinschaft*', to larger groups of more shifting acquaintances, the '*Gesellschaft*'. These basic developments lead to new forms of integration. The differences between national cultures are diminishing, as global culture is developing through shared TV programmes, advertisements, books and movies; the nearly universal marketing of products; and through internationalisation of contacts via tourism and the internet. Though some discussion is possible on new ways of small group integration, the tendencies as specified all lead in the same direction: normative control on individuals in their roles as consumers and producers is decreasing. The legitimacy of measures thus has diminished and will not play its invisible (quasi-automatic) role the way it used to. Therefore, the assumption that rules will be followed automatically may increasingly be questioned.

In the economy, a deep structural change is taking place, based on new technologies and new forms of communication. The amount of specialised knowledge embodied in a given product is expanding and the technological complexity in or behind most products is increasing. The innovative capacity of firms is increasingly based on functionally differentiated, more or less independent innovation generating organisations. At the same time, the organisation of successful firms is more open to external options for innovation. A large firm like Shell has placed its main research capacity in an independent organisation, called Global Solutions, with Shell as a main client, but operating in the world market. The market for innovations has increasingly become a global one in industrial production, including and relying on the information and service industries. It is here that future technologies with their specific environmental consequences are born and start diffusing all over the world. Technological innovation, viewed by Schumpeter as the capacity of owners of firms to innovate their own activities, now has become a more or less independent capacity at the service of all other firms. It is an open question whether 'Schumpeterian dynamics' and the Rio Imperative of sustainability can be made compatible, based on the development of *zero emission* or *Factor Ten* technology which will not come by itself. When firms want to invest in new installations there will often be a *fait accompli*: here and now, or not here at all. Delays by environmental permitting procedures are becoming increasingly unacceptable for the firm, after having acquired the new and superior technology from the specialised technology developers abroad, with only weeks or months advantage on its competitors. So, in this new situation, traditional regulatory controls on technologies clearly have to be redefined, as they no longer can be based on insight from the regulator in the firm he is regulating.

Another structural change in the economy is the shift *from product to service*. This development takes place with traditional hardware, as with cars not bought but increasingly being leased. In addition, it is embodied in the emerging information and communication technologies. The hardware is owned by providers while clients pay for services only. This development is taken one step further when firms do not provide services but act as service-

providing organisations, leaving the actual physical activities related to service provision to smaller units, operating on a competitive market. Franchising is one older example, but in industrial production, the designer and marketer now externalise production to a high degree. A fast growing firm like Nokia is an example, with suppliers of all main parts being chosen flexibly every few months. If not externalised outside the firm, larger organisations set up business units which in many respects function as independent firms, selling and delivering their goods and services to other business units in the organisation but also on the outside markets, while other business units are not obliged to buy their inputs from business units within the same firm. No doubt, this downsizing of organisations combined with increased international competition for more or less standardised activities makes environmental control on such standardised mass production activities very hard for individual countries. The non-standardised, creative and strategic parts of the innovation process may hardly have discernable environmental effects and they are not influenced by binding instruments or market instruments, leaving the scene to softer informational instruments and to structural instruments with a limited environmental scope.

Pointing in the same direction is the changing nature of coordination in the economy. There is a marked shift from hierarchical control to coordination by contracts and markets. Contracts and markets are not fully anonymous but involve flexible relations, increasingly based on global communication networks. Anything can be bought anywhere in the world on short notice. Mainly fixed points are the locations of consumers and employees and some bulk resources, while most of the other aspects of the physical economic activities are variable as to location, also due to decreasing transport costs. Formerly the domain of the large multinationals, now also small and medium sized enterprises turn into small multinationals, integrated in international networks. In consequence of these developments, national regulators must feel their powers vanishing.

Will there be an end to increasing global production and consumption, thus easing the pressure on the environment? Here, recent developments point the other way. Economic growth is increasing again in the last decade, real growth being in the order of 3% per year, doubling consumption every 23 years; international trade is increasing by 7% per year. The growth in labour productivity, as the central factor in economic growth, is not matched by a proportional decrease in total labour time.

Tendencies in government reflect these broader developments. The ideal of planning the future is dead. It still is reflected in names like, in the Netherlands, the Central Planning Bureau, but planning, even indicative planning as existed in France, has gone, both in government and in business (Mintzberg, the 'guru' on strategic planning in the firm, has named his last book 'The end of strategic planning'). Where targets are set, as the reduction targets for greenhouse gas emissions in the Kyoto protocol, the link between the quantitative goal and implementation activities is quite weak, as global implementation mechanisms in the form of policy instruments are lacking. So, some of the vocabulary is still there, but planning and control are fading away. Especially the strong control as used to be present in the informal ways of regulation in Great Britain and the Netherlands has lost its glamour. Ultimately, the informal flexibility was backed up by the power of officials to implement what they liked, even if unreasonable. Negotiating 'in the shadow of the law' is increasingly difficult and the instruments involved have changed in nature. It seems these countries are all shifting towards American, more formalised and litigative procedures. This does not help much in the new situation of global competition on technologies and products.

New developments are also in avoiding the complexities and costs of formalised regulation by consensus building. Consensual processes are main vehicles for change, with horizontal government as a principle. In local affairs, those involved knew each other already, and horizontal government is not so much of a change. For higher level problems, as environmental problems increasingly are, this is a change as compared to previous practice. This tendency builds on corporate ideas of incorporating all main parties involved in a negotiating procedure, in which win-win situations are created, leading to the advantage of all. In corporate government it was the tops of the socio-economic institutions making deals; now it is 'those involved' in general, the stakeholders, who together decide on some problem or action. On the one hand, this tendency reflects the decreasing power of national governments. On the other hand, horizontal government also is an impetus for less active and less binding types of regulation. The consequence for environmental policy could be that for most problems, the hard way of setting standards more stringent than those involved think reasonable is not an open route any more; only information, stimulation and financial incentives may remain available if this tendency continues.

3.3 Globalisation tendencies

In the previous survey of tendencies, one recurring element was globalisation. Environmental problems increasingly are transboundary or global ones; economic production processes integrate at the global level for a global consumer market; and a global culture is emerging, at least in consumption. International political integration in blocks is loosing momentum in favour of, still limited, integration at the global level. Examples of the latter are the strength of the World Trade Organisation (WTO) and the vehemence of the political discussion on its further expansion vis-à-vis social and environmental interests. Together these developments pose severe problems for national environmental policy formation and instrumentation.

The consequences for instruments are that binding instruments based on command and control at a technological level are harder to apply. Any instrument with real effectiveness induces costs. The idea that economic-environmental win-win situations will emerge spontaneously is attractive but highly improbable as the structural causes for environmental problems remain and environmental pressures increase because of population growth and economic growth. It seems that win-win situations are related to weak sustainability, where innovations are attractive environmentally and economically, per unit of product. As at the same time economic growth is implied, the overall effects, at a macro level, will usually be detrimental to environmental quality. We therefore assume that for a longer time to come environmental policy is not superfluous at all, quite to the contrary. Its nature, however, will have to change.

Therefore, for national policies to be effective in the global context, international co-ordination of policies is required. This co-ordination is not only at the level of setting aims, as now increasingly is taking place; also the set-up of instrumentation has to be agreed upon internationally to some extent for arriving at nationally effective policies. Some first steps have been taken in climate policy and biodiversity policy, where international instruments between countries have been worked out for joint implementation, as a political-administrative instrument for emission trading and a clean development mechanism. For instance, on a bilateral basis, countries may now trade their emission reduction obligations to improve overall efficiency in emission reduction. European countries invest in new technologies in former communist countries to reduce emissions there as compared to the

supposed autonomous growth of emissions in those countries. However, any simple trading system based on (fictitious) future emissions may easily erode collective efforts and cannot easily be brought in line with systematic development of regulatory instruments. Imagine that a country may claim a credit for helping close an old power plant or helping plant a forest in another country. This is possible now under joint implementation. The net influence of these supporting activities may become negligible if these developments would have taken place anyway. There then is no actual result; only a clear result on paper. Political deals, with some side payments, then may become more important than real efforts for emission reduction.

Tradable emission permits might be implemented as a regulatory instrument as well. The question then is who would receive the emission rights being traded and how the initial distribution between countries would be. Whatever the initial distribution, after some time real emitters would have to have the emission rights corresponding to their emission volumes. Such a system would be more transparent, but it would have severe implications in the normative set-up of instrumentation. For global efficiency in climate policy, trade in private emission rights would have to be preferred on the same efficiency grounds now used in favour of joint implementation. Broader ethical considerations as embodied in the normative-legal structure of most countries would favour instruments in line with the polluter-pays-principle. In this case, emission taxes are to be preferred. Especially in the case of carbon dioxide emissions, such taxes could be set up relatively easy in principle. In working out such taxes, the main choices are on who receives the proceeds from the taxes. It could be the national governments implementing them; this would create an incentive for effective implementation. However, the carbon resource owning countries would effectively pay a large part of the bill through reduced prices for gas, oil and coal. In current thought on legal frameworks as discussed in the WTO, they might have a right on compensation. Also, the emerging global political community, as, for instance, a World Environment and Development Organisation (see Simonis 1998), needs financing and the carbon tax proceeds would seem an ideologically acceptable source.

3.4 Prospects for instruments

As explained above, the role of technology binding instruments is expected to further decrease. Only in nationally guarded industries, like building and infrastructure, and in the context of some internationally binding agreements, as with the Montreal Protocol, binding instruments may remain dominant. International coordination, as through technology guidelines or BAT rules, may also help in leaving some space for binding instruments. In other fields, different instrument types will take over or at least will become more important. Cultural and informational instruments are emerging now for guiding private choices in production and consumption, like the life cycle assessment LCA and Environmental Audits, as both standardised by ISO . Especially if the information in such tools for analysis is complemented with the normative information as to the relative importance of different types of effects, such instruments may have a broad influence. However, they create a limited incentive only, due to the collective nature of most of the environmental effects involved. Where real choices are to be made, with substantial costs involved in environmental improvements, information and normative statements will not suffice. If binding instruments lose their importance in limiting options, only financial instruments and liability instruments can substantially correct the pay-offs for those making choices, be they governments, business and environmental associations, or private producers and consumers. Softer cultural instruments are important to support prime movers and to generate political support.

So the main problem for future environmental policy relates to how to compensate for the diminishing role of technology-specific binding regulations. The role of financial instruments so far is limited, with only few exceptions. Broader use is based on a number of conditions. A clear choice between issuing emission permits, against the polluter-pays-principle or creating emission taxes is required. The operational applicability at the level of emissions and resource use (eg CO₂ taxes), as opposed to application at products and technologies, has to be improved. And international coordination in terms of set-up and levels of taxes is needed to avoid unjust shifts in competitiveness between firms in different countries. For cultural instruments a better integration of different environmental aspects is required, as real actions always involve virtually all environmental problems as exist. This not only is a matter of information but of clearer normative guidance as to the relative importance of different environmental interventions, based on their potential consequences. Conceptual unclarity is a main problem here. Can we specify the ultimate consequences of CO₂ emissions, at an 'endpoint' level, in a realistic way? Or should we evaluate at the 'midpoint' level of global warming potentials? Or are potential instability and uncertainty the prime motives for reducing greenhouse gas emissions? Such questions need to be answered in a very practical manner if a trade-off between for instance energy use, land use, and a diverse set of emissions is at stake, as is the case in most practical decisions in production and consumption. Such a normative guidance not only is a prerequisite for practical decisions on specific technologies, but also for more aggregate developments, as in the directions for technology development and the creation of more sustainable life styles.

Ultimately, not only a view is needed on the relations between different environmental effects involved, and the trade-offs between different environmental interventions implied in our actions. Also the trade-off between economy and the sum total of environmental effects is to be stated as a clear principle, guiding the quantification of all types of instruments in a uniform way. Without such a guidance, equal treatment of similar cases cannot be realised, leading both to injustice and to substantial static and especially dynamic inefficiencies.

Finally, structural instruments, as changes in institutions, are a not yet fully exploited option for new policy instrumentation. For example, the cases now brought against the tobacco industry in the US indicate how large the payments may be in a specific judicial setting. In all cases, the creation of the right incentives should be accompanied by removing the wrong incentives. In many countries there are substantial subsidies on energy use, as by tax exemptions for kerosene; the costs of infrastructure is not reflected in prices, as with unpriced roads; and new technologies are difficult to implement due to complexities of regulation; and a global perspective in environmental policy development is prevented, as implied in emerging WTO regulations.

If such a broad shift in policy implementation would emerge, the result would be a more balanced internalisation of environmental consequences, both in public and private actions.

For newly emerging environmental problems, instrumentation usually is missing. The *appropriation of nature* (Fischer-Kowalski 1997), that is a decreasing share of nature in total biomass production, which is accompanied by an even faster reduction in natural biomass breakdown, as the source of food for all fungi and animals. This is one such a new environmental problem, here defined at 'midpoint' level, related to biodiversity, the life support function of ecology and the quality of nature. There hardly seem instruments available which may work at a global level. For some aspects, such as the protection of available genetic information, the road towards structural-institutional instruments has been taken, with governments or private organisations owning the species on their territories and their genes, either naturally found in organisms, or constructed. This may help in protecting

and regulating the existence of gene pools. It does, however, not necessarily help in creating healthy ecological conditions. Preponderance of single protected genes, as in agricultural production, may even lead to monocultures of such economically dominant genes, with probably negative overall ecological effects.

For saving and creating ecological values, there now are two lines in instrumentation. One is the creation of nature reserves, as an option-creating instrument. Increased spatial needs for food production, for growing and more affluent populations, and increased mono-cultural production of biomass for energy purposes literally leave less room for this instrument, given the mainly fixed amount of land on earth (which even will decrease due to sea level rise). The other, "integration" line is to create more ecological quality in areas primarily used for agriculture, recreation, infrastructure, production and housing. Again, the options have hardly been investigated and instrumentation is mainly lacking. Apart from emission reducing instruments, there is a clear lack of instruments safeguarding ecological richness in diversity and volume, not only in nature reserves, but also in human-dominated ecosystems. Furthermore, ecology-oriented instruments still lack theoretical foundations and operational development.

3.5 Strategic instrument choices ahead

Our first assumption here is that it is not possible to avoid the choice on environmental policy instruments, by doing nothing. Economic growth, population growth, and globalisation tendencies make internationally coordinated policy development unavoidable. However, it is not possible to make choices on policy instrumentation independently in each case. A well-argued strategy is to guide serious development of policy instruments. If the polluter-pays-principle holds, all instruments have to take it into account. Basic choices preferably should be made consistently, according to well-recognised principles. Some main lines in development are discussed here, related to basic liability rules; to environmental ethics; to the importance of efficiency and equity; to means-directed or goal-directed types of instruments; and finally, to principles of policy integration.

Liability rules

Liability rules have traditionally been set up as to prevent active infringements on the goods or rights owned by others, either individually or collectively. In the 1960s a debate started in economic circles on the other option, to give everybody a right on infringement of the goods or rights of others, especially in the environmental domain. The discussion was opened by Coase (1960), who showed that for the outcome in real terms there was no difference between these options, if transaction costs for arriving at these outcomes could be neglected in both cases. In the following discussions, the latter restriction has been broadened somewhat in that the conclusion of Coase also holds if transaction costs are similar. This point of view has had a deep influence on environmental policy, where, in the same period, the polluter-pays-principle had been broadly accepted. Different versions of this principle exist. A basic element is that polluters have to pay for the environmental damages they cause, thus internalising environmental aspects in their decision making. As Coase showed that the principle is not required for cost-effective policies, policy makers may argue policy instruments on the basis of net costs in terms of real outcomes including transaction costs, and do 'what is best', at a case level. This opened the road to tradable emission permits, which give the owners a direct right to pollute. The conflict between the polluter-pays-principle and the pragmatic do-per-case-what-is-best-principle somehow needs to be clarified and resolved

for basic innovation in national, and particularly in international policy instrumentation. In-between options are possible, but not necessarily more attractive (see Tisdell 1998). One option is to market emission permits with a very limited duration of validity. Effectively, for operations the right to emit then is to be bought every time again. If the amount of permits brought on the market by governments is set to realise a predetermined price level, the difference with an emission tax of a similar level is really very small.

Ethical norms

In the international setting of a globalising world, basic discussions are on which ethical principles give guidance in handling distributional effects. Should all citizens of the world have an equal share in the environmental use space? Is this share tradable? Does every citizen have the same right on a certain minimum environmental quality? Are the costs for environmental improvements to be distributed equally per head? Or is an equal percentage of income to be spent on environmental protection?

The answers on such questions have a direct bearing on instrument choice. Internationally, emission rights, with initial rights distributed to countries according to their share in world population, as a political-administrative instrument, would be in line with an equal environmental use space. Emission permits with levels based on attracting employment and income give more emission space to the poor. Equal emission taxes worldwide would roughly lead to equal shares of income being paid for environmental protection. If such principles were more than a guise for tactical interest protection, i.e. if they have a real meaning, the implications for policy instrumentation would be quite direct. Still, there is not one principle that can force the choice.

Efficiency and equity

A further strategic choice concerns the relation between *global efficiency* and *global equity*. For efficiency purpose, in the world as a whole, marginal costs of environmental protection or improvement should be equal, which means that in all choices environmental improvements should be realised till a certain level of cost per unit of improvement. If this rule is not satisfied, with some doing less and others doing more, the world can benefit from a shift in effort, with those still having cheap options for improvement doing more and those with high costs of improvement doing less. A real Pareto improvement is possible then, with everybody being better off if those reducing efforts compensate those increasing their efforts at environmental improvements.

The current emphasis on efficiency as a guiding principle for trade relations would indicate that this principle would also have prime importance in environmental policy instrumentation. Internationally tradable (private) emission permits and globally equal emission taxes would be prime instruments. Who is receiving the 'grandfathering' rewards of initial permit distribution, and who is receiving the proceeds from the emission taxes is not relevant for efficiency considerations. This indicates that there is some room for combining efficiency with equity, by redistribution of proceeds. Full emphasis on equity will indicate other instruments, however. The justice principle (as embodied in the polluter-pays-principle) would shift the choice from emission permits to taxes on negative environmental impacts.

Goal oriented and means oriented instruments

A further main choice is on the aim as made operational in the environmental policy instruments. For instance, emphasis on easy implementation corresponds with regulators having a clear grip on technology development and making policy integration an aspect of policy development. Dynamic efficiency, the most important cost aspect in the long run, remains a problem in this approach. This means-oriented approach is contrasted with the goal-oriented approach in which policy instruments are to internalise sustainability goals as fully and directly as possible, allowing for decentralised technology choice with incentives for environmental improvements.

It is clear that efficiency considerations also indicate a choice for the goals oriented option. In the liberal ideal, the choice is clearly for goal directed instrumentation. In socio-democratic and socialist circles, the choice might be more means directed. However, current ideas in European socio-democratic parties indicate that the broad integration of environmental considerations in private decision making is to be preferred as against the option of having governments decide on technology choices per case. So there is a broad aim towards goal oriented instruments, though means oriented instruments still are the main vehicle for environmental policy now.

Principles for policy integration

In means oriented policy instrumentation, the integration between different environmental aspects involved is implicit. One may assume, optimistically, that a single policy maker is consistent in the way the implicit trade-offs between different environmental aspects are made, and also the trade-offs against social and economic aspects. If different policy makers are involved, both in different public and private organisations, one cannot expect consistency to come about automatically. In goal oriented policies, there is an explicit statement on the relative importance of different environmental aspects related to activities, at the operational level of emission, extractions and disturbances, that is trade-offs are more explicitly to be stated, allowing for equal trade-offs in different situations. An example is the equivalency of 14 tonnes of SO₂ and 1 tonne of CO₂ as is being used informally in Dutch environmental policy.

For reasoned choices in this respect explicit statements are needed on why these trade-offs have been chosen, and how these environmental aspects are linked to concrete economic actions. Such relations depend both on evolving normative ideas about what is important, on the state and development of environment and society, and on the way these relations may be modelled. Consistency, also in time, can only come about on the basis of an explicit and encompassing discussion. This ideological superstructure to operational policy is poorly developed. In Dutch environmental policy, the themes approach has been developed as a conceptual framework over a decade ago, with themes like eutrophication, acidification, and ozone depletion. This approach has been followed by others, in different ways. The European Union, for instance, defined a large number of Preferential European Environmental Problems. They did so not as a systematic treatment of the subject but as a consensus bag, including quite incommensurate items ranging from waste prevention to biodiversity preservation. Waste prevention, however, is not an environmental aim but a means for reaching environmental aims. Through the backdoor, the means oriented approach thus comes in again. The explicit and general normative integration of environmental policy aims, as opposed to the implicit choices sufficing for technology binding instruments, is a clear task ahead.

SURVEY BOX: POLICY INSTRUMENTS IN A LONG TERM PERSPECTIVE	
social structure less intermediate organisations liability expanding more private and national ownership of biotic resources	economy increasing technological complexity functional differentiation of innovation from product to service from service provider to service organiser co-ordination: from hierarchies to markets and contracts more flexible co-ordination in networks time for communication drastically shortened globalisation of markets regional economic blocks succumbing in globalisation high rates of annual economic growth and industrial trade
culture smaller role of internalised norms and values smaller role of local groups increasing role of international mass media some cultural elements globalising	
government formalised and litigative tendencies in binding instruments decreasing role of binding instruments increasing role of horizontal mechanisms	
population continuing growth for the next decades high growth in most poor countries no further growth in industrialised countries higher average age in industrialised countries	environment ecological resources decreasing local problems dealt with reasonably emphasis shifting to continental and global problems abiotic depletion shifted to the very far future appropriation of nature increasing, biotic depletion increasing climate change continuing biodiversity loss continuing nature areas fast decreasing
prospects for instruments effectiveness of instruments: halving environmental effects per unit of income every 25 years internationally co-ordinated instrument choices essential instruments for safeguarding ecological resources to be developed overall effectiveness of instruments decreasing financial instruments essential for high trade-off between economy and environment	strategic instrument choices ahead tradable right to environmental damages <i>versus</i> collective right on undisturbed environmental quality equal right to environmental use space <i>versus</i> equal efforts for damage reduction global equity <i>versus</i> global efficiency means-directed technology specific instruments <i>versus</i> goal-directed environmental incentives normative integration of policies with broad internalisation in society <i>versus</i> political-administrative discussion per single choice item

Vocabulary

role	Set of norms determining a task for an individual in a specific context Example: Chief Environmental Executive in a corporation;
norm	Rules regarding appropriate behaviour in a certain situation. Example: thou shalt separate thy household wastes
institution	Coherent set of roles and norms example: 'marriage'; 'private property'; 'primary school'
organisation	Functionally independent institution Examples: Environmental Inspectorate; research institute; firm
culture	Knowledge, beliefs and values as are dominantly present in a society
regulations	Set of norms with a specified status in terms of administrative or statutory law
internalisation	1 Recognition of a norm as appropriate for one's actions 2 Adjusting somebody's behaviour in a desired way by establishing an appropriate mix of motives and expected effects
collective good	Main criterion: Non-rivalness; consumption by one does not reduce the availability to others. Additional criterion: non-excludability; nobody can be excluded from consumption.
prisoners dilemma	situation in which individual contribution to (not reducing) a collective good has net negative consequences for this individual as long as most others do not behave similarly
altruistic behaviour	behaviour not only driven by private benefits of actor but also by the benefits of others because actor himself values these

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