2. The four main types of policy instruments

This section describes the four main groups of policy instruments starting with the traditional regulatory “command and control” instruments, and then continuing to the three main types of so-called new environmental policy instruments: market-based instruments, informational/educational instruments, and voluntary agreements. The key features of each group are briefly described and their respective strengths and weaknesses are presented. The section ends with a comparison, which sums up the main strengths and weaknesses of the main types of instruments, and a brief discussion of criteria for instrument selection.

2.1 Command and control instruments: compliance through regulation

Definition and Background

Command and control instruments (CCIs) have been used for a long time and they are the basis for national environmental policies all over the world. CCIs can mandate or prohibit specific behaviours or the use of a certain technology, define a level of environmental performance to be achieved etc. They are usually combined with some mechanism for monitoring of the regulated entities and a sanction for non-compliance. (e.g. Hotta 2004). Environmental CCIs can be divided into the following three general categories: 1) environmental quality standards, 2) technical/emission standards, and 3) restrictions and bans. *Quality standards* specify a minimum desired level of environmental quality, or the maximum level of pollution of a certain medium. An example is quality standards for urban air. In order to be effective such standards need to specify who is responsible for taking action in case the maximum pollution levels are exceeded. Some form of sanction against inaction would normally also be needed. *Technical/emissions standards* specify either mandatory technical equipment to be used in certain applications, or maximum levels of emissions or resource consumption for specific products or systems. For example, many countries require automobiles to be equipped with catalytic converters (a technical standard) and, in addition, they regulate maximum emission values for certain pollutants for vehicles (an emission standard). *Restrictions and bans* refer to the direct limitation of an undesirable behaviour or technology, or restrictions on the sale or use of certain products/substances with detrimental environmental and health impacts. An example is the prohibition of lead additives in gasoline or a ban of waste dumping.

Among these three types of CCIs, *Technical standards* are the ones with the most obvious applicability to resource efficiency and with potential to promote technological innovation

and change. Technology-based standards directly specify the methods or equipment to be used by the regulated entities, while performance-based standards specify the level of performance to be achieved. Technology-based standards can be for example building standards requiring certain types of insulation to be used for new constructions. Performance-based standards set targets to be achieved, for example on the maximum heating need per square metre living space of residential buildings, and a time frame for compliance, but do not specify in detail how to achieve those targets. Since performance standards provide greater flexibility they are typically better at generating innovation, but they need to be revised at suitable intervals.

CCIs can be implemented in isolation, but many policy problems require a set of policies. For example, a ban on waste dumping would normally be associated with a requirement on some specific actor to collect waste and ensure proper treatment. In addition, technical and performance standards may be needed in order to make sure that the waste treatment has limited negative impacts on humans and environment.

Strengths and limitations

There are several benefits of CCIs which explain their dominant position in environmental policy making. For governments, the setting of targets/standards is inexpensive and the goals for policy achievement are clear. These instruments have proven to be effective for addressing directly visible damages and point sources of pollution (Fiorino 1995).

On the other hand, industry tends to be reluctant to submit to command and control regulation. Their argument is often that uniform regulation ignores the unique situation of each company, including differences in abatement costs, and therefore leads to excessive overall costs. Such resistance has in many cases hindered the effective implementation of CCI based regulations. (Hotta 2004). Another concern over CCIs is that they are static in the sense that they only require compliance with certain targets and therefore provide no incentives for improvements beyond those targets (Stavins 2000). In addition, if CCIs are used to regulate only a few large entities, such as major industrial production plants, the compliance can easily be monitored, but if the number of regulated entities is very large, if for example individual households or SMEs are targeted, the monitoring costs can be excessive.

However, the shortcomings of CCIs and the difficulties of implementing them effectively do not imply that control regulation should be avoided or replaced with other instruments. What it means is that to effectively regulate impacts of products with globalized life-cycles and to increase their resource efficiency, it is important to have more comprehensive, dynamic and

flexible policy approaches. This can be achieved by introducing and using CCIs in a more flexible manner and/or by combining them with other types of instruments as discussed further on.

CCIs can be used at all three of the policy intervention points described in the introduction. At the stage of resource extraction, a quota system to control the volume of resource extraction, and requirements to restore mining sites into green areas are two examples. At the production and consumption stages, technical standards can be used for example to promote energy efficiency, to mandate the procurement of products made of recycled materials, or to ban the use of certain materials or designs that are difficult to treat at end-of-life. Examples at the waste management and recycling stage can be prohibition of waste dumping and inappropriate waste treatment, rules mandating waste separation by households, or emission standards for waste disposal sites and recycling facilities.

2.2 Economic instruments: creating market-based incentives

Definition and Background

Economic instruments (EI) work by encouraging certain behaviours and practices through economic incentives. Resource prices, as well as prices for products and services, set by the market do not properly reflect environmental and social impacts. Therefore, these prices send the wrong signals to the market players and encourage overexploitation, overuse and unnecessary pollution. One of the basic ideas behind EIs is that by adjusting prices through policy interventions, so that environmental and social costs are to some extent reflected in the prices of materials and products, the decisions made by producers and consumers can be brought more in line with overall societal objectives. Such internalisation of societal costs, which is based on the widely accepted polluter-pays-principle, can be achieved through taxes or use charges. In addition to internalising external costs, EIs can also be used for facilitating the adoption of cleaner and more resource efficient technologies and practices through subsidies, soft loans and tax reductions. A third type of EIs is tradable permit schemes, where market players are allowed to buy and sell permits to extract or use a specified amount of a resource or to emit a certain amount of a pollutant. Such permit schemes can be used in order to achieve a fixed environmental target, such as a maximum amount of air emissions, in a cost efficient way. The fourth and final type of EIs is deposit-refund schemes, which provide an economic incentive for the user of a product to return it to designated collection points at the end-of-life. Such schemes are commonly used for increasing collection rates of empty beverage containers for reuse or recycling.

EIs can be used to promote resource efficiency at all life-cycle stages, for example through tradable fishing quotas, tax reductions for fuel-efficient vehicles, and deposit-refund systems for reusable bottles. The number of applications of these instruments to the policy field of environment and resources has grown steadily since the 1970's. It is commonly argued that EIs are currently underutilised and that a more wide-spread adoption of these instruments would significantly contribute to enhanced efficiency and effectiveness of environmental policy making.

In contrast to the CCIs, which force all regulated entities to follow the same standards, the incentives and disincentives provided through EIs can generate different behaviours depending on each actor's specific circumstances (Stavins 2000). For example, the introduction of a water withdrawal charge is likely to affect different industries in different ways; those companies that can reduce their water use easily and at low cost are likely to do this, thereby saving money, while for those companies where it is technically complicated and expensive to reduce water use it may be rational to pay the full withdrawal charge instead of changing the production towards improved water efficiency. This flexibility can in some cases reduce the overall compliance costs quite significantly compared to a uniform regulation. From the regulator's point of view, who wants to protect the water resource from becoming over-used, it is the overall volume of water withdrawal that matters; from this perspective it doesn't matter which industry is making the largest reductions in consumption. For CCIs based policies to achieve the same level of cost-effective allocation of burden of compliance, the regulators would need to have access to detailed information on the internal cost structures of all the regulated companies (Stavins 2000), something that is normally not the case.

Strengths and limitations

The two most notable advantages of EIs over traditional regulation are their cost-effectiveness – as mentioned above – and their ability to provide incentives for innovation and improvement also beyond a certain level of performance (Stavins 2000). EIs can thus have a dynamic effect and provide continuous incentives, which the CCIs typically don't.

In order to generate the desired effects, however, economic instruments usually require sophisticated institutions to implement and enforce them. Charges and taxes need to be collected, and monitoring is needed to avoid free-riding. Tradable permits are especially challenging; to create a well-functioning market can require a fairly large administration, and

the regulated entities usually need training in how to utilise the permit market effectively. For pollution charges and taxes to have the desired effect, the government needs to be able to calculate the right levels; low levels mean that the environmental targets will not be reached while high levels put an excessive economic burden on the regulated entities. Such economic analyses are complex and require appropriate expertise. Besides, effects of EIs on environmental quality and resource consumption are not as predictable as under a traditional regulatory approach; assessments of their effects need to be undertaken and frequent revisions may also be required.

2.3 Informational instruments: enabling informed choices

Definition and Background

Informational policy instruments (IIs) have become more popular in recent years, partly because of the IT revolution which has decreased the costs of information dissemination. (Tietenberg 1998, in Sterner 2003). IIs are a very diverse group of instruments, but two basic kinds can be distinguished. The first group is where *the government provides information* to some actor group. This information can range from very general kinds, such as overall objectives signalling the direction and ambition of the government in a certain policy field, to highly specific and targeted forms, such as technical training for SMEs in energy efficiency. The second group of IIs is where *the government requires some actor to provide certain information* (information disclosure), such as data on emissions of toxic substances from production facilities or on energy consumption of certain products during the use phase. On a general level, IIs are intended to provide information about the environmental performance of certain products, services or systems in a standardized manner so that stakeholders, such as consumers and investors, can make better informed choices – avoiding less sustainable options to the favour of more sustainable ones (Jordon et al. 2003).

Strengths and limitations

One of the advantages of IIs the low implementation costs compared to the complex administration often needed in order for command-and-control regulations to work properly. However, the effectiveness of an II depends upon the actual behaviour of the intended information users (Karl and Orwat 1999). Therefore, these instruments are likely to be effective mainly in markets where consumers, investors, government officials and other key actors have high awareness on environmental issues. Without the existence of adequate background knowledge and basic sustainability values among the key actors, information on environmental performance is not likely to generate significant changes in behaviour. Another

factor often seriously limiting the effectiveness of information as a policy instrument is economic factors pulling in the opposite direction. When economic incentives are lacking, such as when more sustainable products and services are considerably more costly than comparable substitutes with higher environmental impact, information disclosure requirements by themselves cannot be relied upon to bring about changes towards sustainability.

In general, informational instruments cannot be expected to function as substitutes for other policy instruments, but should rather be regarded as supplements, which can enable stakeholders to improve resource efficiency and pollution abatement (Karl and Orwat 1999). However, there are cases where informational instruments by themselves have been effective; especially requirements for industry to disclose information on environmental performance to the public have led to significant improvements. Another area where IIs have been used with some success is for labelling of energy efficiency. In this case, consumers have an economic incentive to buy more efficient products so there may not be any trade-off between sustainability concerns and economic considerations.

2.4 Voluntary agreements: negotiated target-setting

Definition and Background

Voluntary Agreements (VAs) aim to promote environmental improvements through voluntary action. OECD (1999) defines VAs as "schemes whereby firms make commitments to improve their environmental performance beyond legal requirement". Two well known examples are the Responsible Care Program for chemical management developed by major chemical companies and the Zero Landfill programme of major manufacturers in Japan.

OECD (1999, 2003) distinguishes four types of VAs: 1) *Unilateral commitments* made by polluters or resource users; 2) *Private agreements* between polluters or resource users and those who are negatively affected; 3) *Negotiated agreements* between industry and a public authority. This negotiated kind of VA has a stronger legislative character than purely voluntary approaches. It is an agreement which can include legally binding obligations to follow an action plan established through negotiation between the government and an industrial sector or group of companies. The agreement can even involve sanctions for non-compliance in which case these agreements will resemble CCI based policies. However, the negotiation element makes these policies different from typical regulatory approaches (OECD 2003). An example of a negotiated binding agreement is the Japanese Top-runner

policy scheme, which aimed at improving energy efficiency of appliances and vehicles. Under this scheme, the government set efficiency standards and target years in close dialogue with industry. Non-compliers could be punished; 4) *Voluntary programmes*, in which "participating firms agree to standards (related to their performance, their technology or their management) which have been developed by public bodies."(OECD 2003).

Also management standards, such as the ISO 14000 series, can be understood as voluntary agreements of the first type. While such standards are not policy tools in a strict sense, they can be used by policy makers, for example by requiring that all major suppliers to governmental agencies be certified.

Strengths and limitations

Voluntary agreements are obviously more flexible than command and control regulation and compliance can be less burdensome than for certain market based instruments. They are therefore commonly favoured by the business sector. However, the literature on environmental policy instruments does not provide much evidence of VAs being particularly effective (e.g. OECD 1999 and 2003; Blackman 2009). In addition, there are concerns that VAs can give undue benefits to large market-leading companies by promoting their business models and technologies (e.g. Porter 1990). VAs are likely to be more effective in situations where there is a high possibility of command and control regulation or economic instruments being used. It is typically easier to make an industry make strong "voluntary" commitments if there is a widespread perception in that industry that mandatory policy tools are likely to be introduced unless significant improvements are made.

OECD (2003) argues that it is generally more effective to use command and control instruments with some flexibility, and based on discussions with the regulated industry or actor group, or to use market-based instruments, than to encourage VAs. Negotiated agreements with binding targets and a phase-in period can be a compromise and a way to increase acceptance compared to CCIs developed without involvement of the key stakeholders. As discussed more below, voluntary measures can play an important role for motivating additional efforts of companies that already have a high environmental performance, while legally binding measures may be the most effective for ensuring improvements of the majority of companies in a specific sector.

2.5 Selecting instruments

The previous four sections discussed briefly some of the advantages and limitations of each of the main types of policy instruments. This section introduces three generic criteria for instrument selection and summarises the pros and cons of different instrument groups against that background. It should be stated at the outset that there is no ultimate instrument, which scores best on all criteria; all instruments have their particular strengths and weaknesses. The purpose here is to highlight such differences among the major instrument groups, thereby making it easier for policy makers to select appropriate instruments to address a certain policy problem.

Criteria for instrument selection

Criteria for selecting environmental policy instruments can be divided into three broad categories (US Congress 1995).

- *Environmental results*. This group of criteria centres on the likelihood that the objective(s) of the policy will actually be achieved.
- *Costs and burdens*. These criteria concentrate on the costs associated with the policy for society as a whole (including costs for governments and public authorities, for regulated entities, and for others affected by the policy in question), as well as how these costs are distributed. These criteria also include the administrative burden on governmental institutions to ensure policy compliance.
- *Change*. This final group focuses on the adaptability of the policy and to what extent it provides incentives for technological innovation and diffusion.

Command-and-control instruments have their major strength on environmental results. However, uniform standards can lead to high compliance costs. Enforcement can also be burdensome, especially with a large number of regulated entities. Finally, regulations are often static and therefore provide weak incentives for change beyond the regulated level. Performance based instruments are likely to be better than technology based ones in the sense that they allow for different technical solutions and therefore stimulate innovation. However, performance based policies can be more costly to monitor.

Economic instruments have an advantage both in the lower expected compliance costs and in the incentives they provide for continuous improvement. However, the environmental result is generally less certain than in the case of command-and-control instruments. An exception to this could be a permit trading system with a fixed (or decreasing) number of permits. Policy design and enforcement may be burdensome, however environmental and resource taxes generate revenue to the government thereby lowering the costs of policy making.

Both information based instruments and voluntary agreements are generally less demanding for the government than command-and-control instruments and economic policy tools. Compliance costs are also low to moderate and these types of instruments can generate drivers for continuous change. However, the crucial drawback is that the environmental effectiveness is uncertain and highly dependent on case specific conditions.

There is no golden rule on how to select a suitable tool to a given problem. In each situation certain selection criteria are likely to be more important than others, depending on environmental, social, technological as well as political factors. However, when understanding the major strengths and weaknesses of different kinds of instruments, policy makers will be better equipped to make informed decisions and to combine instruments in ways that compensate for shortcomings of individual instruments.

Instruments in developing countries

Governments in developing countries typically have very limited resources and may therefore have difficulties in developing and implementing command-and-control based policies. As mentioned above, also economic instruments usually require a relatively high institutional capacity for effective implementation. It has therefore been proposed that developing countries should make wider use of information disclosure and voluntary agreements. However, recent research indicates that these instruments have been largely ineffective and that an undue emphasis on such approaches may be a diversion from the need to build appropriate regulatory capacity (e.g. Blackman 2009). Especially for voluntary agreements there is a lack of evidence that they would be effective in the context of developing countries. Information disclosure has generated some improvements, but success seems to be limited to a few cases where the conditions have been favourable.