11 Policies and measures

What is covered in this chapter?

Without policies that provide incentives to act, the enormous potential for reduction of greenhouse gas emissions will not be realized. This chapter is therefore devoted to discussing the various policies that can be used to influence behaviour of consumers and companies, the circumstances under which they are effective, and the administrative capacities required. With emission reduction objectives becoming more stringent, there is a shift from 'soft policy instruments' such as funding for research and development, information, voluntary agreements, and green government procurement to 'hard instruments' like regulations, taxes, and tradable permit systems. Particularly trading systems are becoming popular. Climate policies are just half the story. It is equally important to use non-climate policies, such a general tax, macro-economic, trade, and other environmental policies to change behaviour in a more climate friendly direction. In practice combinations of policies are always needed to achieve optimal results. Lessons have been learned from implementation of policies about what works best in what sector. Ultimately it is the total package of policies in a country that will determine greenhouse gas emissions and some examples of that will be discussed.

Realizing mitigation potential requires government policies

The point has been made over and over again in the previous chapters: without specific policy action by governments the potential to bring greenhouse gas emissions substantially down will not be realized. There are just too many incentives to continue business as usual practices and too many barriers to capture the reductions that would pay for themselves. So the question then becomes what are the most effective policies?

There is a substantial collection of studies available on this question, drawing on a range of environmental, energy, and transportation policy approaches. This material can be used to draw conclusions regarding climate change policies. There is now also a growing experience of implementation of climate policies in many countries that have started to address climate change. Both sources can be used to try and answer our primary question.

The focus will be on national and local policies, because those are the ones that have a direct influence on decisions that affect greenhouse gas emissions. International policies, as they emerge from international agreements between countries or from international institutions, will be discussed in Chapter 12.

Governments cannot implement effective policies on their own. Social scientists have introduced the term 'governance' (as opposed to 'government') to capture the changing complexity of modern societies. Business, non-governmental organizations, and civil society[1] all play an important role in shaping social change[2]. With increasing globalization of the economy and the acceptance of market mechanisms in many countries the idea of governments regulating desired social change has lost its appeal. Implementing new policies does require the support and involvement of these groups. And business, NGOs, and civil society often are the instigators of change that then is captured in new policies. Some companies for instance have found that performing in a socially responsible manner and pursuing a sustainable development strategy is in fact good business. NGOss are often able to mobilize public support for environmental causes that governments can build upon.

As argued in Chapter 4, controlling climate change cannot be realized with climate change policies alone. Creating incentives to move towards a low carbon economy have to be embedded in policies that directly address economic activities themselves. Tax policies can make a huge difference in investment preferences. Trade policies determine the market for low carbon technologies. Energy security policies can steer development of the energy system in a low carbon or a high carbon direction. A discussion on the most effective policy instruments therefore needs to be put in a broader context.

Types of policy instruments

There is a range of policy instruments relevant to controlling climate change available to governments. A list of the main instruments is given in Box 11.1. They can be applied at local, sub-national, national, or supra-national (as in the case of the European Union for instance) level. The IEA Policies and Measures database has a large number of records of existing applications of various policy instruments[3].

Box 11.1 Definitions of the main policy instruments relevant to controlling climate change

Regulations and standards: These specify the abatement technologies (technology standard) or minimum requirements for pollution output (performance standard) that are necessary for reducing emissions.

Taxes and charges: A levy imposed on each unit of undesirable activity by a source.

Tradable permits: These are also known as marketable permits or cap-and-trade systems. This instrument establishes a limit on aggregate emissions by specified sources, requires each source to hold permits equal to its actual emissions, and allows permits to be traded among sources.

Voluntary agreements (VAs): An agreement between a government authority and one or more private parties with the aim of achieving environmental objectives or improving environmental performance beyond compliance to regulated obligations. Not all VAs are truly voluntary; some include rewards and/or penalties associated with participating in the agreement or achieving the commitments.
Subsidies and incentives: Direct payments, tax reductions, price supports, or the equivalent thereof from a government to an entity for implementing a practice or performing a specified action.
Information instruments: Required public disclosure of environmentally related information, generally by industry to consumers. These include labelling programmes and rating and certification systems.
Research and development (R&D): Activities that involve direct government funding and investment aimed at generating innovative approaches to mitigation and/or the physical and social infrastructure to reduce emissions. Examples of these are prizes and incentives for technological advances.
Non-climate policies: Other policies not specifically directed at emissions reduction but which may have significant climate related effects.

Note: The instruments defined above directly control greenhouse gas emissions; instruments may also be used to manage activities that indirectly lead to greenhouse gas emissions, such as energy consumption.

(Source: IPCC Fourth Assessment Report, Working Group III, box 13.1)

Regulations

Regulations are widely used in environmental protection. They come either as generally applicable standards or site specific operating permits. Generally applicable standards can be divided into two separate classes: technology standards, prescribing the means to be used to control emissions; or performance standards, requiring a maximum energy use or emission per unit of product.

An example of a technology standard would be the requirement to install a specific CO_2 capture system at a coal fired power plant, the installation of an incinerator on an HCFC plant to destroy HFC-23 in the plant's exhaust gas, or the requirement to install solar water heaters in certain types of buildings. In many cases the specificity of the situation is such that tailored permitting conditions are being used to prescribe the required action. However, this requires well trained and adequately staffed regulatory agencies that do not exist everywhere.

Examples of performance standards are building codes that require a maximum amount of energy use per unit of floor space or automobile fuel efficiency standards, mandating a maximum fuel use or CO_2 emission per kilometre. Standards can be used to get rid of the most inefficient products or processes by following the best available products on the market. This is often the case for energy efficiency standards for household appliances. They can also be used to 'force' technological improvement by setting standards for a future date that are more stringent than the best available products on the market. A good

example of the latter is the EU decision to set a maximum CO_2 emission of 130 gCO_2/km for new passenger cars on average to be reached by 2015, while the current average is still around 160 gCO_2/km. The EU is also decided on even more stringent standards for 2020. Performance standards give more flexibility to companies, architects, and builders to reach the goal in the most efficient way.

In general, regulations and standards provide no incentives to companies to move to technologies that go below the current standards. There is often even the fear among companies that doing so would trigger more stringent regulations. One way of addressing that problem is to regularly revise standards according to technological development or to set 'technology forcing' standards for a future date. This poses big challenges for regulatory agencies however.

Regulatory approaches have proven to work well when dealing with mass products, such as automobiles or household appliances. For buildings they have also worked well. Many countries have building codes in place. See Box 11.2 on the application of building codes in China. Another area where regulations have performed well is the banning of ozone depleting and powerful greenhouse forcing fluorinated chemicals.

Box 11.2 Building codes in China

Approximately 2 billion m^2 of floor space is being built annually in China, or one-half of the world's total. Based on the growing pace of its needs, China will see another 20–30 billion m^2 of floor space built between the present and 2020. Buildings consume more than one-third of all final energy in China, including biomass fuels (IEA, 2006). China's recognition of the need for energy efficiency in the building sector started as early as the 1980s but was impeded due to the lack of feasible technology and funding. Boosted by a nationwide real estate boom, huge investment has flowed into the building construction sector in recent years.

On 1 January, 2006, China introduced a new building construction statute that includes clauses on a mandatory energy efficiency standard for buildings. The Designing Standard for Energy Conservation in Civil Building requires construction contractors to use energy efficient building materials and to adopt energy saving technology in heating, air conditioning, ventilation, and lighting systems in civil buildings. Energy efficiency in building construction has also been written into China's 11th Five-Year National Development Programme (2006–2010), which aims for a 50% reduction in energy use (compared with the current level) and a 65% decrease for municipalities such as Beijing, Shanghai, Tianjin, and Chongqing as well as other major cities in the northern parts of the country. Whether future buildings will be able to comply with the requirements in the new statute will be a significant factor in determining whether the country will be able to realise the ambitious energy conservation target of a 20% reduction in energy per gross domestic product (GDP) intensity during the 11th Five-Year Plan of 2005–2010.

(Source: IPCC Fourth Assessment Report, Working Group III, box 13.3)

Box 11.3 The Carbon Emissions Reduction Target obligation in the UK

The Carbon Emissions Reduction Target (CERT) – which came into effect on 1 April 2008 and will run until 2011 – is a regulatory obligation on energy suppliers to achieve targets for promoting reductions in carbon emissions in the household sector. It is the principal driver of energy efficiency improvements in existing homes in Great Britain. It marks a significant strengthening of efforts to reduce household carbon emissions – with a doubling of the level of activity of its predecessor Energy Efficiency Commitment (EEC).

CERT will deliver overall lifetime CO_2 savings of 154 $MtCO_2$, equivalent to annual net savings of 4.2 $MtCO_2$ by 2010, and equivalent to the emissions from 700 000 homes each year, and will stimulate about GBP 2.8 billion of investment by energy suppliers in carbon reduction measures.

In addition to the energy efficiency measures of the current EEC, suppliers will be able to promote microgeneration measures; biomass community heating and CHP; and other measures for reducing the consumption of supplied energy. CERT will maintain a focus on vulnerable consumers and will include new approaches to innovation and flexibility. Suppliers must direct at least 40% of carbon savings to a priority group of low income and elderly consumers. Extending the priority group to include the over 70s seeks to ensure that a large number of fuel poor households, who are not eligible under the current criteria, become eligible for support.

In addition, the newly launched ACT ON CO_2 advice line will help customers take advantage of suppliers' offers under CERT.

(Source: www.defra.gov.uk/environment/climatechange/uk/household/eec/index.htm)

The reasons that regulations work better for these types of situations than other instruments are varied: for consumer products and automobiles for instance the complexity of comparing products, the difficulty of considering purchase price and lifetime operating costs, and the multitude of other non-energy considerations in individual purchase decisions make financial incentives ineffective. For buildings there is an additional problem that the user of the building (the one that pays the energy bills) is often different from the one deciding on the construction or the refurbishment.

For existing buildings one of the most effective policy approaches has been 'demand side management (DSM)'. This means giving electricity companies the task or the opportunity to reduce the demand for electricity in existing buildings in exchange for a possibility to earn money by selling less. Incentives can for instance be created by allowing the companies to include the cost of the DSM programmes in the price they charge for electricity. Since energy efficiency improvement is usually cheaper than building a new generating plant, consumer prices for electricity are lower than without the DSM programmes. DSM programmes can be voluntary or required by the regulations that affect electricity generators. The approach has been particularly popular and successful in the USA[4]. Recently it has been introduced in the UK (see Box 11.3). Application in other parts of the world is a matter of making the necessary changes in the way electricity generators are regulated.

Financial incentives for users, like a tax on energy, are not very effective in such situations. The same holds for smaller companies that often do not have the expertise or the capacity to do rigorous cost minimization and therefore often do not make use of profitable low carbon technologies.

A very different argument in favour of regulatory approaches is the limited administrative capacity in many developing countries. This makes technology standards and performance standards, which can often be copied from other countries, the easier way to control greenhouse gas emissions. When administrative capacity becomes bigger and more sophisticated, taxes, subsidies, and tradable permit approaches may become more attractive.

Taxes and levies

The principle of a tax or levy is simple: increase the price of energy use or greenhouse gas emissions so that less energy is used and measures to reduce energy use or emissions become profitable. A uniform tax or levy has the advantage that all energy users or greenhouse gas emitters face the same carbon price and in theory all measures up to a certain cost level (depending on the level of the tax) are taken, provided they do take the measures that are profitable.

Taxes and levies are widely used on energy products (often as excise duties, but increasingly as CO_2 charges), on motor vehicles (mostly as purchase, registration or road tax, increasingly differentiated according to the CO_2 emissions of the vehicle), and on waste. In a few countries (Norway, Sweden, Denmark, UK) a tax or levy is charged directly on CO_2 emissions[5].

Taxes or levies on energy or emissions can have negative impacts on poor people, since they normally have few possibilities to reduce the tax burden by investing in energy efficiency improvement and emission reduction. Also their expenditures on energy often form a substantial part of their income. The main drawback of taxes and levies however is that they are generally very unpopular amongst businesses and voters. So politically it is very hard to raise taxes to a level where they are really effective in influencing decisions or to adjust the tax over time to get the desired effects. As a consequence many taxes have lots of exemptions, usually to accommodate concerns of influential lobby groups. Or there are ways to avoid the tax by taking alternative actions (see for instance the UK Climate Change Levy in Box 11.4).

Box 11.4 The UK Climate Change levy

The UK has a tradition of action on climate change that dates from the early acceptance of the problem by the Conservative Prime Minister Margaret Thatcher in 1988. The Labour government in 1997 reaffirmed the commitment to act and to use market-based instruments wherever possible; however, it voiced concerns on two aspects of this commitment: Firstly, that such measures might have a disproportionate effect on the poor which, in turn, might

affect the coal mining communities (an important constituency) and, secondly, that this commitment might perpetuate a perception that the Labour government was committed to high taxes. A key element of the UK's climate policy is a climate levy. The levy is paid by energy users (not extractors or generators), is levied on industry only, and aims to encourage renewable energy. An 80% discount can be secured if the industry in question participates in a negotiated 'climate change agreement' to reduce emissions relative to an established baseline. Any one company over-complying with its agreement can trade the resulting credits in the UK emissions trading scheme, along with renewable energy certificates under a separate renewable energy constraint on generators. However, a number of industrial emitters wanted a heavier discount and, through lobbying, they managed to have a voluntary emissions trading scheme established that enables companies with annual emissions above 10000 tCO_2-eq to bid for allocation of subsidies. The 'auction' offered payments of 360 million and yielded a de-facto payment of 27€ per tonne of CO_2. Thus, the trading part of the scheme has design elements that strongly reflect the interest groups involved. The levy itself has limited coverage and, consequently, households and energy extractors and generators have no incentive to switch to low carbon fuels. However, its design does take household vulnerability, competitiveness concerns, and the sensitivity of some sectoral interests into account. Thus, while the levy has contributed to emission reduction, it has not been as effective as a pure tax; a pure tax may not have been institutionally feasible.
(Source: IPCC Fourth Assessment Report, Working Group III, box 13.2)

As discussed above in the section on regulation, the price signal established through a tax or levy is not always leading to the desired response (i.e. lower use of the commodity or taking measures to reduce emissions). That is particularly the case for decisions by individuals where cost minimization is not the most important factor, for instance when buying household appliances or a car and when choosing a house or apartment. In larger companies where cost minimization is a priority, the effect of taxes is much better, but business is often exempted in order not to undermine their competitiveness internationally. In general the effectiveness of taxes and levies is modest. The UK Climate Change Levy for instance has resulted in about 2% reduction of CO_2 emissions so far. There is one success story of a CO_2 tax: the Norwegian CO_2 tax played a big role in the establishment of the Sleipner CO_2 capture and storage project at a natural gas production platform off the Norwegian coast. Paying for the CCS installation was more attractive than paying the tax.

Tradable permits

Another way to give emissions of CO_2 and other greenhouse gases a price (other than through taxation) is to issue allowances (or permits) for a limited amount of emissions and to allow trading of these permits. This is also called a 'cap and trade system'. Scarcity is created by limiting allowances to less than what is going to be emitted. Then buying and selling of these allowances will create a price. Individual companies that are likely to

emit more than their permits entitle them to can decide to invest in emission reductions or to buy permits from other companies. If investments bring emissions below the allowance, they can sell excess permits or keep them for later use (so-called 'banking'). The first large scale application of a tradable permit system happened in the US in the 1980s for SO_2 under the Clean Air Act. For CO_2 the EU Emission Trading System (see Box 11.5) is the largest tradable permit system in operation.

There are a number of important design issues for a tradable permit scheme: the coverage (which sources, which gases?), the way permits (allowances) are issued, and enforcement issues. Economic theory is clear about those issues: the broader the coverage, the more the permits are auctioned (i.e. sold to the highest bidder) and the stricter the penalties for non-compliance, the more effective and efficient the system will be. In practice however, this ideal is not met.

Coverage is often partial because of difficulties administering large numbers of small sources (such as cars and households). Emission sources that are hard to measure accurately (non-CO_2 emissions from agriculture for instance) are another reason to keep certain emission sources out of the emissions trading system. The EU ETS for instance covers only CO_2 and only about 40% of the total EU greenhouse gas emissions.

Allocation of permits is a sensitive issue. Coming from a situation where greenhouse gas emissions to the atmosphere from companies were free, governments generally give emission allowances away for free to companies (called 'grandfathering'). The step to auctioning is generally too big for getting sufficient political support for introducing a tradable permit system. There is a tendency however to gradually shift to auctioning. Under the EU ETS for instance EU Member States can auction up to 10% of the allowances in the period 2008–2012 and by 2020 70% of allowances to industries not subject to international competition will be auctioned. This shift was made easier when it was discovered that freely allocated permits to electricity generators in the EU nevertheless led to increasing the price of electricity on the basis of the value of these permits. Electricity companies were accused of making 'windfall profits'.

Auctioning permits creates a new problem: what to do with the (substantial) revenue from auctioning? Ministries of Finance usually demand these to be part of general revenue. Others propose to use part of these revenues to stimulate development and deployment of low carbon technologies. Yet others suggest that part of these revenues could be used to help developing countries to make a rapid transition to a low carbon economy. The debate is still ongoing.

The amount of permits received is another very crucial thing for a company. It determines to a large extent how much a company should reduce its emissions or how many permits it should buy. No surprise therefore that there is normally heavy lobbying to get more permits. Under the EU ETS allocation to individual companies for the period 2008–2012 was left to EU Member States. This led to strong differences in allocation between comparable companies in different Member States, generating competitiveness concerns. As a result, in the third phase of the EU ETS (after 2012) there will be centralized allocation of permits by the European Commission, based on a commonly agreed system. One particularly important point in allocation is how to reward past emission reductions by companies. It would be not be fair to ignore past actions. Using performance standards

(emissions per unit of product) is a good way to solve that problem: above average performers would receive somewhat more and below average performers somewhat less permits.

A related issue is to whom are the permits issued. In principle there is a choice: for instance, issuing permits to the users of electricity (downstream) or to the producers of it (upstream). The general trend is to use upstream permitting in order to reduce the administrative burden of dealing with large numbers of small users/emitters. The disadvantage is that smaller consumers only notice a higher price for electricity that may not trigger the desired reductions in electricity use.

The position of newcomers, i.e. new companies that enter the market, and of companies that strongly expand production often leads to heated debates. In a system where permits are given for free, normally governments keep some permits in reserve for newcomers, but those that expand production will have to buy the additional permits on the market. In an auctioning system these problems disappear, because every company would have to buy the permits.

Compliance with the system is a very important issue. It should be very unattractive for companies to violate the system by emitting more than the permits it possesses dictate. One important element of a good compliance system is to have accurate monitoring of emissions. The other crucial element is to set a penalty that is substantially higher than the price of permits in the market. There is a complication though, because the CO_2 permit price cannot be predicted. Large fluctuations of the price do happen, although normally during the earlier phases of introducing an emissions trading system. These fluctuations create uncertainty for companies in estimating the costs of the permits and in deciding upon investments in emission reduction projects. As a reaction to this phenomenon proposals about setting up a tradable permit system in the USA do contain elements of 'price caps' (setting a price level above which free permits are issued by the government). These proposals are very controversial however[6].

Tradable permit systems are only used so far in industrialized countries. That certainly has to do with the administrative and enforcement capabilities that are needed to run such a system. But applying tradable permit systems for climate change control in developing countries would also be politically difficult because of the need of the economy to grow and improve the living conditions of people, which leads to a strong increase in greenhouse gas emissions. Technically and politically that raises problems.

Box 11.5 The EU Emissions Trading System

The EU Emissions Trading System (EU ETS) is the world's largest tradable permits programme. The programme was initiated on 1 January, 2005, and it applies to approximately 11500 installations across the EU's 25 Member States. The system covers about 45% of the EU's total CO_2 emissions and includes facilities from the electric power sector and other major industrial sectors. The first phase of the EU ETS runs from 2005 until 2007. The second phase will begin in 2008 and continue through to 2012, coinciding with the 5-year Kyoto compliance period.

Member States develop National Allocation Plans, which describe in detail how allowances will be distributed to different sectors and installations. During the first phase, Member States may auction off up to 5% of their allowances; during the second phase, up to 10% of allowances may be auctioned off.

Market development and prices: A number of factors affect allowance prices in the EU ETS, including the overall size of the allocation, relative fuel prices, weather, and the availability of certified emission reductions (CERs) from the Clean Development Mechanism (CDM). The EU ETS experienced significant price volatility during its start-up period, and for a brief period in April 2006 prices rose to nearly 30€ per tonne; however, prices subsequently dropped dramatically when the first plant-level emissions data from Member States were released. The sharp decline in prices focused attention on the size of the initial Phase I allocation. Analysts have concluded that this initial allocation was a small reduction from business as usual emissions.

Consistency in national allocation plans: Several studies have documented differences in the allocation plans and methodologies of Member States. Researchers have looked at the impact on innovation and investment incentives of different aspects of allocation rules and have found that these rules can affect technology choices and investment decisions. When Member States' policies require the confiscation of allowances following the closure of facilities, this creates a subsidy for continued operation of older facilities and a disincentive to build new facilities. They further find that different formulas for new entrants can impact on the market.

Implications of free allocation on electricity prices: A significant percentage of the value of allowances allocated to the power sector was passed on to consumers in the price of electricity and that this pass-through of costs could result in substantially increased profits by some companies. The authors suggest that auctioning a larger share of allowances could address these distributional issues. In a report for the UK government, a similar cost pass-through for the UK and other EU Member States was found.

(Source: IPCC, Fourth Assessment Report, Working Group III, box 13.4)

Voluntary agreements

Voluntary agreements (VAs) are agreements that are negotiated between a government and a group of private companies or other entities. They are therefore also called 'negotiated agreements'. VAs are different from 'voluntary actions': unilateral commitments of one or more companies without government involvement (discussed below). VAs have become quite popular: amongst private companies, because it gives them a lot of influence over what needs to be done and how it is done and helps them to establish a leadership image, but also amongst governments, because it avoids difficult battles about legal policy decisions. See Box 11.6 for some examples.

VAs come in many different forms, in terms of goals, stringency, role of government, and 'penalties' for non-compliance. They range from agreements on 'best efforts' to reduce energy efficiency and minimize emissions to agreements to meet very specific quantitative performance standards at a specific point in time (such as the European Automobile

Agreement referred to in Box 11.6). VA goals are generally not very stringent, which is caused by the voluntary nature. Not all companies normally join a VA and the VA often applies to domestic companies only. Competitiveness considerations make companies reluctant to commit to very stringent goals. The commitment of governments in VAs also varies. It ranges from communicating the results of the VAs to financial support with data collection or research and development. Many VAs do not have any form of 'penalty' for non-compliance, but some do, mostly in the form of legislation that governments will introduce if the goals of the agreement are not met.

Box 11.6 Examples of national voluntary agreements

- **The Netherlands Voluntary Agreement on Energy Efficiency:** A series of legally binding long term agreements based on annual improvement targets and benchmarking covenants between 30 industrial sectors and the government with the objective to improve energy efficiency.
- **Australia 'Greenhouse Challenge Plus' programme:** An agreement between the government and an enterprise/industry association to reduce GHG emissions, accelerate the uptake of energy efficiency, integrate GHG issues into business decision making, and provide consistent reporting. See http://www.greenhouse.gov.au/challenge.
- **European Automobile Agreement:** An agreement between the European Commission and European, Korean, and Japanese car manufacturing associations to reduce average emissions from new cars to 140 gCO_2/km by 2008–2009. See http://ec.europa.eu/environment/CO2/CO2_agreements.htm.
- **Canadian Automobile Agreement:** An agreement between the Canadian government and representatives of the domestic automobile industry to reduce emissions from cars and light-duty trucks by 5.3 $MtCO_2$-eq by 2010. The agreement also contains provisions relating to research and development and interim reduction goals.
- **Climate Leaders:** An agreement between US companies and the government to develop GHG inventories, set corporate emission reduction targets, and report emissions annually to the US EPA. See: http://www.epa.gov/climateleaders/.
- **Keidaren Voluntary Action Plan:** An agreement between the Japanese government and 34 industrial and energy converting sectors to reduce GHG emissions. A third party evaluation committee reviews the results annually and makes recommendations for adjustments. See http://www.keidanren.or.jp.

(Source: IPCC, Fourth Assessment Report, Working Group III, box 13.4)

Environmental effectiveness of VAs has been the subject of many studies. The findings are mixed. The majority of agreements have not achieved significant emission reductions beyond what would have happened under a business as usual scenario. However, some more recent agreements, in a few countries, have led to faster implementation of best available technology and to measurable emission reductions. The most successful VAs have clear and quantitative targets, a defined baseline situation to compare with, independent third party monitoring and review, and a credible threat of legislative action

when goals are not met. VAs fit better in some cultures than in others. In Japan for instance there is a long tradition of close cooperation between industry and government and compliance of VAs is taken very seriously. These mixed findings are often ignored by fierce proponents of VAs that do not like to see a move towards more stringent policy instruments. In the run up to the introduction of the EU Emissions Trading System for instance there was strong resistance by German and Dutch industry associations who argued that their VAs were more effective than the envisioned emissions trading system. Now the system is in place, industry has adjusted very well to it.

Introducing other policy instruments does not mean that VAs no longer have a role to play. They can often be supplementary to other policies as a way of raising awareness and mobilizing the innovation capacity of industry. VAs can also be used to promote actions of non-commercial entities, such as Social Housing Corporations[7], local governments, and water management authorities. They then become a tool to coordinate policy at different levels of government.

Subsidies and other financial incentives

Subsidies are popular because they are politically attractive. And that not only holds for direct subsidies, but also for price support (guaranteed prices for renewable electricity for instance) and tax deductions or exemptions. They are in fact indirect subsidies. Subsidies are widespread, but not always helping a low carbon economy. Many countries for instance provide subsidies on fossil fuel products or fossil fuel based electricity. In OECD countries these fossil fuel subsidies are 20–80 billion US dollars per year and the amounts in developing countries and countries with economies in transition are even higher. These subsidies are often justified to assist poor people, but in practice most of the subsidies end up in the hands of people who do not really need them. The result is increased consumption, lack of incentives to use energy efficiently and unfair competition with renewable energy. Removal of such subsidies is politically very difficult, which explains the pervasiveness of existing fossil fuel subsidies.

Subsidies can be effective however to help the market development of low carbon technologies. They are widely used for that purpose and have been successful. For renewable electricity feed-in tariffs (a guaranteed price at which utilities have to buy the electricity from suppliers, see Chapter 5) and producer subsidies (a certain amount per kWh produced) are used in more than 50 (developed and developing) countries[8]. Important in using subsidies as a policy instrument is the need to reduce them over time to reflect the cost reduction of the technology due to the fact that the market is expanding and to reflect cost increases of fossil fuel alternatives. What is also important is to focus the subsidy as precisely as possible on those that need it and not where the low carbon technology would be used anyway.

Subsidies are relatively expensive policy instruments, because not all the money gets to the right place and because subsidies are often continued at too high a level for political reasons[9].

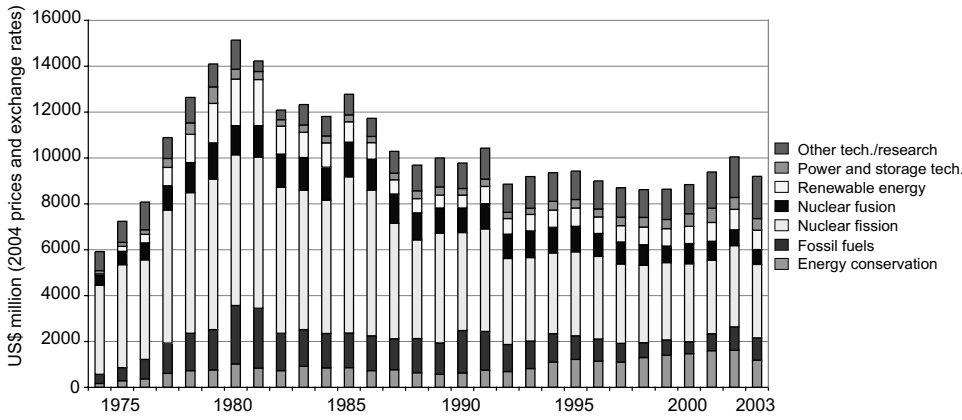

Figure 11.1 **Public funded energy R&D expenditures from IEA Member States.**
Source: IPCC, Fourth Assessment Report, Working Group III, figure 13.1.a.

Research and development

Funding and focussing research and development (R&D) is an important policy instrument. For controlling climate change in the longer term it is essential that new, improved and cheaper low carbon technologies become commercially available and R&D is crucial for that. R&D is however sometimes used as a substitute for direct policy action in cases where the political will is lacking or strong opposition against climate change policy is present.

Energy related R&D funding by governments has declined substantially after the oil crisis of the 1970s. It is now almost half the 1980 level and there is no systematic increase, not even after the Climate Change Convention came into force in 1994. Figure 11.1 shows the trend and the share of the various topics. Private R&D funding has also declined[10].

R&D alone has only a limited effect on changing greenhouse gas emissions. The reason is that cost reduction of new technologies is driven more by the learning effect of actually building and implementing them (see Chapter 10). But a successful long term transition to a low carbon economy cannot be achieved without a much strengthened R&D effort[11].

Information instruments

Awareness about the impacts of climate change and the opportunities to control it is vital to effective action. It is important for taking individual action in households and companies, but also to build public support for local and national policies to seriously reduce greenhouse gas emissions. Civil society (the broad array of non-governmental and business organizations in society) plays a big role in this area. Governments cannot do this on their own.

Product labelling, either mandated by law or on a voluntary basis, is widely used to inform consumers about energy use of household appliances, cars, and even houses[12]. There are many different systems in use, mostly focussing on energy use. Some attempts have been made to start labelling of food products regarding the indirect CO_2 emissions due to transport. This has led to heated debates if this is a proper reflection of the carbon content of food items, because only transport is covered and because it ignores important social issues. See the example about labelling of air freighted perishable goods in Box 11.7.

Box 11.7 How green are your beans?

In 2006 the UK supermarket giant Tesco announced its plan to introduce carbon labelling. They are therefore working on developing a universally accepted and commonly understood measure of the carbon footprint of every product they sell – looking at its complete lifecycle from production, through distribution to consumption. The issue that has been the focus of much attention is that of 'food miles': the carbon cost of transporting food from around the world and domestically between centralized distribution points and stores. Air freighted fruit and vegetables are often highlighted in this debate, and both Tesco and Marks & Spencer have recently introduced 'air freighted' labels to enable consumers to make informed choices.

Whilst imported produce is easy to single out for its climate impact, any significant move away from these products would have negative impacts on producers in Kenya, Thailand, and other countries that have built up perishable exports industries. As Hilary Benn, UK Minister for International Development, notes: *'The food miles debate poses a real dilemma. People say I want to do my bit to stop climate change. So, should I only buy local and boycott produce from abroad, especially things flown in – or should I support poor farmers to improve their income, to take care of their families, to work and trade their way out of poverty?'*

Research by IIED has found that if consumers were to boycott fresh produce air freighted from Africa, the UK's total emissions would be reduced by less than 0.1%, but impacts on workers, communities, and economies in countries that have invested in developing a niche in perishable goods would be much more significant. This danger is certainly seen as important by industry players in exporting countries. As Jane Ngige, Chief Executive of the Kenya Flower Council said: *'We consider ourselves as partners with UK supermarkets . . . One minute we are talking about fair trade and market compliance, the next this is less of an issue and the issue is lessening the carbon footprint of the developed world possibly by cutting markets in Africa'.* Kenya's High Commissioner in London, Joseph Muchemi, has also criticized the labelling scheme which he says may lead to a boycott of such products. However, according to Tesco, '*our customers love Kenyan produce. There has been no reduction of sales but instead they seem to have gone up*'.
(Source: What assures consumers on Climate Change, Consumers International, 2007)

In addition, many governments run or commission information campaigns to inform consumers of opportunities to reduce energy use, reduce CO_2 emissions, and save money. Companies are also positioning themselves more and more as 'green' in the hope to appeal to consumer awareness. Lessons on what is needed to be trustworthy for consumers so that they do buy 'green products' have been formulated (see Table 11.1)

Table 11.1. Lessons on green marketing

What works in assuring consumers	Application to climate change
Consistency. Companies that consumers trust give out the same message in everything they do – through their products, labels and promotions, customer service staff, corporate communications, and through partnerships with trusted experts	**Yahoo,** for example, in developing a strategy for going carbon 'neutral' has sought to do this in a way that is not only rigorous and transparent but embedded in its corporate culture. Company founder David Filo announced the plan by posting a question on the company's 'Yahoo Answers' site asking customers how the company should go about achieving carbon 'neutral' status
Seeing is believing. A picture may be worth a thousand words but a demonstration beats everything	Given the invisible and global nature of greenhouse gas emissions this is difficult to do, and there is a danger of focusing on highly but tokenistic actions visible. **The Co-operative Group's** Solar Tower in Manchester UK and **Wal-Mart**'s move to put solar panels on the roof of some of its stores are key examples where companies have used highly visible demonstrations alongside less visible operational changes and policies
Serious intent. Consumers accept that companies are profit-motivated, but they object when there is a discrepancy between what they say and what they do, or where they appear to be 'greenwashing' in their approach	This is likely to be a major challenge. **Few companies** are yet able to claim that they have done everything possible to reduce their own impacts, and that consumption of their products is consistent with a 'one planet lifestyle' in which emissions levels could be cut by 90%
Trust in the messenger. Companies need to take a broad view of assurance and develop both formal and informal mechanisms to get their message across, not forgetting their own employees as ambassadors of the company. And while it is fact that consumers say they do not trust celebrities, reality proves some however respond to them, though there is increasingly a call for more accountability	**News Corporation** uses both the power of individual relationships and mass media to get the climate change message across to consumers. While in the UK BSkyB engineers have been dropping off low energy light bulbs when they install equipment in people's homes, the company has set up a MySpace channel dedicated to climate change and Chairman Rupert Murdoch has committed to engaging its millions of readers, viewers, and web users around the world on this issue
Layers of information. Companies that people trust provide an ethics built-in guarantee within their brand and back this up with the right information when and	**Marks & Spencer's** 'Plan A' and **Whole Foods Market** both tie the company's commitments to climate change into its overall brand offering and back it up with further information and endorsements including store ambassadors – in the case of Marks & Spencer – for those who want to find out more

Table 11.1. (*cont.*)

What works in assuring consumers	Application to climate change
where it is needed to help consumers make decisions without having to always 'read the small print'	
Linking responsibility, quality, service, and value for money	**Toyota** succeeded in marketing its hybrid, Toyota Prius, as a mass market vehicle. Buyers are attracted not only to the car's fuel efficiency but to its iconic status as an environmentally friendly vehicle popularized by many celebrities
Helping customers select choices. The majority of consumers do not want to have to take into account too many extra factors in their everyday decision making	**The Co-operative Group** is employing a choice reduction strategy to only stocking energy efficient compact fluorescent light bulbs and high energy efficiency rated kitchen appliances

Source: What assures consumers on Climate Change, Consumers International, 2007.

Information instruments alone are unable to realize significant emission reduction. Their importance lies in supporting other instruments to be more effective.

Voluntary actions

Although not a policy instrument per se, voluntary actions do play a role in shaping public policy and mobilizing society to tackle climate change. As indicated above, voluntary actions are different from voluntary agreement in the sense that governments do not play a role.

There are many examples of business, NGO, and joint initiatives aiming to make a difference[13]. Public disclosure of greenhouse gas emissions for instance can help raise awareness amongst private companies about their contribution to emissions that can trigger reduction measures. The Carbon Disclosure Project is one of the biggest private efforts in place today (see Box 11.8). It was initiated to assist institutional investors in assessing the risks of investing in companies. The Global Reporting Initiative[14] is another private initiative involving thousands of companies and institutions, focussing on promoting sustainability reporting by companies.

Box 11.8 Carbon Disclosure Project

The Carbon Disclosure Project (CDP) is an independent not-for-profit organization aiming to create a lasting relationship between shareholders and corporations regarding the implications for shareholder value and commercial operations presented by climate change. Its goal is to facilitate a dialogue, supported by quality information, from which a rational response to climate change will emerge.

CDP provides a coordinating secretariat for institutional investors with combined assets of over $57 trillion under management. On their behalf it seeks information on the business risks and opportunities presented by climate change and greenhouse gas emissions data from the world's largest companies: 3000 in 2008. Over 8 years CDP has become the gold standard for carbon disclosure methodology and process. The CDP website is the largest repository of corporate greenhouse gas emissions data in the world.

CDP leverages its data and process by making its information requests and responses from corporations publicly available, helping catalyze the activities of policymakers, consultants, accountants, and marketers.

(Source: http://www.cdproject.net/)

Other voluntary initiatives are the World Business Council on Sustainable Development 'Cement Sustainability Initiative'. A number of the biggest cement manufacturers from across the globe report information about energy use and CO_2 emissions and develop standards to promote lower emissions. The World Steel Association[15] has comparable voluntary programmes for its member companies. Joint NGO–private sector initiatives

are the WWF Climate Savers[16] and the Pew Business Environment Leadership Council[17] where companies are supported by positive publicity of NGO's if they pledge to undertake emission reductions actions as part of their green marketing strategies.

A special form of voluntary action is green government procurement. In this category fall (national, regional, or local) government purchases that are screened for low carbon products, government buildings that are made more energy efficient on a voluntary basis, and also governments purchasing renewable electricity for their government buildings or installing solar PV cells to generate their own. Of course these measures are normally subject to some form of budgetary approval by elected councils or parliament, and in that sense they are different from voluntary action by private entities. They nevertheless can create good examples, can be moved quickly without the need for legislation, and can help to build markets for low carbon products. Requiring local and national governments to implement green procurement is a next step that has now been initiated in the EU, which brings this approach into the regulatory category[18].

Non-climate policies

As was extensively discussed in Chapter 4, integrating climate change into other socio-economic and development policies is one of the most effective ways to change investment patterns, behaviour, energy use, and greenhouse gas emissions. It can influence the drivers of social and economic development and realize a transition to a prosperous low carbon economy. It also engages a whole new range of stakeholders, which in many countries are more influential than those that shape environmental or climate change policies. By combining the goal of reducing greenhouse gas emissions with promoting social and economic progress, resistance against climate change action can be effectively overcome. See Chapter 4 for a more in-depth discussion.

What are the strengths and weaknesses of the various policy instruments?

When discussing the main types of policy instruments above, it became clear that each instrument has its strengths and weaknesses, often even dependent on the national circumstances in which it is applied. To help assessment of what works best under what conditions, the different policy instruments can be checked against four criteria[19]:

- *Environmental effectiveness*: how effective is the instrument in realizing emission reductions? This is not only affected by the type of instrument of course (information versus regulation for instance), but also to a large extent by the stringency of the goals set and the enforcement of the policy.

- *Cost-effectiveness:* what are the social costs of achieving a specific environmental effect by the respective instrument? The most cost-effective policy is the one that achieves a desired goal at the lowest costs. In comparing policy instruments this becomes somewhat problematic, because different instruments cannot all achieve the same goal in terms of emission reduction.
- *Distributional considerations:* how does the instrument affect different groups in society? Is there a fair distribution of who pays the costs and who reaps the benefits? Policies that are perceived as being unfair to specific groups normally have a hard time getting through the political decision making process, although sometimes lobbying power is more important.
- *Institutional feasibility:* can the instrument get through political decision making and can it be implemented and enforced given the institutional infrastructure? Institutional capacity varies a lot between countries, so this is an issue that often leads to different scores for advanced industrialized countries versus poor developing countries.

Table 11.2 gives a concise overview of how the various policy instruments score against these criteria. As discussed above for each of the policy instruments, they all have their strengths and weaknesses. Environmental effectiveness of regulation and tradable permits is higher than for the other instruments, with information, R&D, and voluntary agreements being on the soft end of the scale. From a cost-effectiveness point of view market approaches through taxes or tradable permits generally score better than others, but the specific design of the instrument can make a big difference. Distributional and equity considerations are important for all instruments and all of them require careful design or compensation to create a level playing field. Institutional feasibility can be a real problem for some instruments in countries with limited administrative capabilities. If there is not a well functioning tax system or no experience with regulated markets, the use of taxes and tradable permits can be problematic. As said above, policy instruments have to be tailored to the specific circumstances in a country and a sector and should be used in combination to be effective.

What are the lessons from practical experience?

Since the entry into force of the United Nations Framework Convention on Climate Change (UNFCCC) in 1994 and more specifically after the agreement on the Kyoto Protocol in 1997, countries have begun to implement policies to reduce emissions. So there is now a reasonable experience with climate policies from which conclusions can be drawn. Table 11.3 summarizes these conclusions for the criterion of environmental effectiveness, for each of the main economic sectors.

The differences between sectors are striking. In energy supply, financial instruments (taxes and subsidies) are the most effective, with only renewable energy obligations as an effective regulatory instrument. In the building sector, the picture is completely different. Regulatory approaches are clearly superior there. For transport, agriculture, and forestry it

Table 11.2. National climate policies and their performance against four evaluation criteria

	Criteria			
Instrument	Environmental effectiveness	Cost-effectiveness	Meets distributional considerations	Institutional feasibility
Regulations and standards	Emissions level set directly, though subject to exceptions. Depends on deferrals and compliance	Depends on design; uniform application often leads to higher overall compliance costs	Depends on level playing field. Small/new actors may be disadvantaged	Depends on technical capacity; popular with regulators in countries with weakly functioning markets
Taxes and charges	Depends on ability to set tax at a level that induces behavioural change	Better with broad application; higher administrative costs where institutions are weak	Regressive; can be ameliorated with revenue recycling	Often politically unpopular; may be difficult to enforce with underdeveloped institutions
Tradable permits	Depends on emissions cap, participation, and compliance	Decreases with limited participation and fewer sectors	Depends on initial permit allocation. May pose difficulties for small emitters	Requires well functioning markets and complementary institutions
Voluntary agreements	Depends on programme design, including clear targets, a baseline scenario, third party involvement in design and review and monitoring provisions	Depends on flexibility and extent of government incentives, rewards, and penalties	Benefits accrue only to participants	Often politically popular; requires significant number of administrative staff
Subsidies and other incentives	Depends on programme design; less certain than regulations/standards	Depends on level and programme design; can be market distorting	Benefits selected participants, possibly some that do not need it	Popular with recipients; potential resistance from vested interests. Can be difficult to phase out

Table 11.2. (*cont.*)

	Criteria			
Instrument	Environmental effectiveness	Cost-effectiveness	Meets distributional considerations	Institutional feasibility
Research and development	Depends on consistent fundings when technologies are developed and polices for diffusion. May have high benefits in the long term	Depends on programme design and the degree of risk	Benefits initially selected participants; potentially easy for funds to be misallocated	Requires many separate decisions. Depends on research capacity and long term funding
Information policies	Depends on how consumers use the information; most effective in combination with other policies	Potentially low cost, but depends on programme design	May be less effective for groups (e.g. low-income) that lack access to information	Depends on cooperation from special interest groups

Note: Evaluations are predicated on assumptions that instruments are representative of best practice rather than theoretically perfect. This assessment is based primarily on experiences and published reports from developed countries, as the number of peer reviewed articles on the effectiveness of instruments in other countries is limited. Applicability in specific countries, sectors, and circumstances – particularly developing countries and economies in transition – may differ greatly. Environmental and cost effectiveness may be enhanced when instruments are strategically combined and adapted to local circumstances.

Source: IPCC, Fourth Assessment Report, Working Group III, table 13.1.

Table 11.3. Selected sectoral policy instruments that have been shown to be environmentally effective in the respective sector in at least a number of national cases

Sector	Policies[a], measures and instruments shown to be environmentally effective	Key constraints or opportunities
Energy supply	Reduction of fossil fuel subsidies Taxes or carbon charges on fossil fuels	Resistance by vested interests may make them difficult to implement
	Feed-in tariffs for renewable energy technologies Renewable energy obligations Producer subsidies	May be appropriate to create markets for low emissions technologies
Transport	Mandatory fuel economy, biofuel blending, and CO_2 standards for road transport	Partial coverage of vehicle fleet may limit effectiveness
	Taxes on vehicle purchase, registration, use and motor fuels, road and parking pricing	Effectiveness may drop with higher incomes
	Influence mobility needs through land use regulations, and infrastructure planning Investment in attractive public transport facilities and non-motorized forms of transport	Particularly appropriate for countries that are building up their transportation systems
Buildings	Appliance standards and labelling	Periodic revision of standards needed
	Building codes and certification	Attractive for new buildings Enforcement can be difficult
	Demand-side management programmes Public sector leadership programmes, including procurement	Need for regulations so that utilities may profit Government purchasing can expand demand for energy-efficient products
	Incentives for energy service companies (ESCOs)	Success factor: Access to third party financing
Industry	Provision of benchmark information	May be appropriate to stimulate technology uptake
	Performance standards Subsidies, tax credits	Stability of national policy important in view of international competitiveness

Table 11.3. (*cont.*)

Sector	Policies[a], measures and instruments shown to be environmentally effective	Key constraints or opportunities
	Tradable permits	Predictable allocation mechanisms and stable price signals important for investments
	Voluntary agreements	Success factors include: clear targets, a baseline scenario, third party involvement in design and review and formal provisions of monitoring, close cooperation between government and industry
Agriculture	Financial incentives and regulations for improved land management, maintaining soil carbon content, efficient use of fertilizers, and irrigation	May encourage synergy with sustainable development and with reducing vulnerability to climate change, thereby overcoming barriers to implementation
Forestry/forests	Financial incentives (national and international) to increase forest area, to reduce deforestation, and to maintain and manage forests	Constraints include lack of investment capital and land tenure issues. Can help poverty alleviation
	Land use regulation and enforcement	
Waste management	Financial incentives for improved waste and wastewater management	May stimulate technology diffusion
	Renewable energy incentives or obligations	Local availability of low cost fuel
	Waste management regulations	Most effectively applied at national level with enforcement strategies

[a] Public R&D investment in low emissions technologies have proven to be effective in all sectors.
Source: IPCC, Fourth Assessment Report, Working Group III, table SPM.7.

is a mixture of financial and regulatory instruments that have shown to be the most environmentally effective. Industry is a special case: tradable permits, voluntary approaches, and information instruments have played a strong role there.

As part of the UNFCCC obligations industrialized countries report annually on the implementation of climate policy. Box 11.9 gives a summary of the most recent trends in the use of policy instruments.

Box 11.9 Summary of policies and measures used by Annex I countries

Annex I Parties, with few exceptions, are increasingly relying on harder (economic and regulatory) instruments over softer (voluntary) instruments to elicit emission reductions. In addition, new and innovative policy approaches have gained prominence and share in overall policy portfolios such as market-based mechanisms, including tradable certificate schemes.

Carbon taxes have played a key role in some countries for some time, but newer quotas and tradable certificates systems (i.e. regulations with an element of economic flexibility) are growing more quickly and are already more widely used. In countries where both carbon taxes and emissions trading are implemented, governments are seeking synergy between the two instruments to ensure comprehensive coverage of emission sources: in most cases, emissions trading targets a fixed number of mostly large sources and installations, while carbon tax remains in sectors that are not easily incorporated under emissions trading. Emissions trading is the largest and most visible form of tradable certificate systems, but green certificates (renewable energy sources), white certificates (energy efficiency), and landfill allowance trading schemes are growing as well. Moreover, regulatory approaches are widely used to mitigate emissions from industrial processes, for example emissions of PFC, HFC, and SF_6.

(Source: UNFCCC secretariat report FCCC/SBI/2007/INF.6 19 November 2007)

'Lean and mean'

An effective national policy is thus always a matter of putting together a portfolio of policy instruments. However, the leaner such a portfolio is, while covering all important sectors and activities, the better it is. Packages of policies can easily become overlapping, creating unnecessary burdens for and confusion amongst different actors and putting pressure on administrative and regulatory institutions. Design of an effective and efficient policy portfolio is crucial.

All policy instruments have their limitations and that is a strong incentive to go for combinations of policy instruments. Tradable permit systems could in theory cover the whole economy. In practice however they become very complex and labour intensive when dealing with large numbers of smaller emitters and emission source with a high degree of uncertainty (see the section on tradable permits above). That is the reason that such systems are usually restricted to large emitters, creating the need for other

instruments to cover the other emitters. Another weak point of tradable permit systems is that they do not easily provide incentives for development of future low carbon technologies. Additional policy instruments to promote R&D and demonstration plants then need to be introduced[20].

Similarly, carbon taxes could theoretically cover the whole economy as well, because actors, particularly individual consumers, often do not react to the financial incentives created by a tax. In those circumstances regulatory instruments can be much more effective. Political problems with taxes also put limits on what a tax policy can do.

National policy packages

What ultimately counts is how the overall national policy package fits together. Many countries have by now put together such packages, both countries that have emission caps under the Kyoto Protocol and developing countries that are addressing greenhouse gas emissions as part of their national sustainable development plans. China for instance has a sustainable development plan in place for the period till 2010 that will lead to significantly lower CO_2 emissions than otherwise would have occurred. See Chapter 4 for a detailed description. India has recently published its National Action Plan on Climate Change (see Box 11.10). Of course, these national policies are not meant to lead to absolute reduction of emissions. Given the huge development challenge, that is not yet possible. But these plans will be able to keep emissions below what they otherwise would have been. What is fundamental to developing country policies is that they are driven by non-climate change considerations, such as energy security, modernization of industry, improving air quality, or combating erosion. Climate change benefits almost always come as a co-benefit.

Box 11.10 Indian National Action Plan on Climate Change

Emphasizing the overriding priority of maintaining high economic growth rates to raise living standards, the plan 'identifies measures that promote our development objectives while also yielding co-benefits for addressing climate change effectively'. It says these national measures would be more successful with assistance from developed countries, and pledges that India's per capita greenhouse gas emissions 'will at no point exceed that of developed countries even as we pursue our development objectives.'

National Missions

National Solar Mission: The NAPCC aims to promote the development and use of solar energy for power generation and other uses with the ultimate objective of making solar competitive with fossil-based energy options. The plan includes:

- Specific goals for increasing use of solar thermal technologies in urban areas, industry, and commercial establishments
- A goal of increasing production of photovoltaics to 1000 MW/year

- A goal of deploying at least 1000 MW of solar thermal power generation. Other objectives include the establishment of a solar research centre, increased international collaboration on technology development, strengthening of domestic manufacturing capacity, and increased government funding and international support

National Mission for Enhanced Energy Efficiency: Current initiatives are expected to yield savings of 10 000 MW by 2012. Building on the Energy Conservation Act 2001, the plan recommends:

- Mandating specific energy consumption decreases in large energy-consuming industries, with a system for companies to trade energy savings certificates
- Energy incentives, including reduced taxes on energy efficient appliances
- Financing for public–private partnerships to reduce energy consumption through demand-side management programmes in the municipal, buildings, and agricultural sectors

National Mission on Sustainable Habitat: To promote energy efficiency as a core component of urban planning, the plan calls for:

- Extending the existing Energy Conservation Building Code
- A greater emphasis on urban waste management and recycling, including power production from waste
- Strengthening the enforcement of automotive fuel economy standards and using pricing measures to encourage the purchase of efficient vehicles
- Incentives for the use of public transportation

National Water Mission: With water scarcity projected to worsen as a result of climate change, the plan sets a goal of a 20% improvement in water use efficiency through pricing and other measures.

National Mission for Sustaining the Himalayan Ecosystem: The plan aims to conserve biodiversity, forest cover, and other ecological values in the Himalayan region, where glaciers that are a major source of India's water supply are projected to recede as a result of global warming.

National Mission for a 'Green India': Goals include the afforestation of 6 million hectares of degraded forest lands and expanding forest cover from 23% to 33% of India's territory.
National Mission for Sustainable Agriculture: The plan aims to support climate adaptation in agriculture through the development of climate-resilient crops, expansion of weather insurance mechanisms, and agricultural practices.

National Mission on Strategic Knowledge for Climate Change: To gain a better understanding of climate science, impacts, and challenges, the plan envisions a new Climate Science Research Fund, improved climate modelling, and increased international collaboration. It also encourages private sector initiatives to develop adaptation and mitigation technologies through venture capital funds.

Other Programmes
The NAPCC also describes other ongoing initiatives, including:

- Power Generation: The government is mandating the retirement of inefficient coal-fired power plants and supporting the research and development of IGCC and supercritical technologies
- Renewable Energy: Under the Electricity Act 2003 and the National Tariff Policy 2006, the central and the state electricity regulatory commissions must purchase a certain percentage of grid-based power from renewable sources
- Energy Efficiency: Under the Energy Conservation Act 2001, large energy-consuming industries are required to undertake energy audits and an energy labelling programme for appliances has been introduced

Implementation
Ministries with lead responsibility for each of the missions are directed to develop objectives, implementation strategies, timelines, and monitoring and evaluation criteria, to be submitted to the Prime Minister's Council on Climate Change. The Council will also be responsible for periodically reviewing and reporting on each mission's progress. To be able to quantify progress, appropriate indicators and methodologies will be developed to assess both avoided emissions and adaptation benefits.
(Source: Pew Center Summary, http://www.pewclimate.org/international/country-policies/india-climate-plan-summary/06–2008)

Policy programmes in industrialized countries are often more directly focussed on emission reductions and co-benefits do not play such an important role. They are often very broad with large numbers of policy instruments complementing each other. A good example is the climate policy of the European Union. The 27 Member States have put together a comprehensive set of policies to reach the target of reducing greenhouse gas emissions collectively to 8% below the 1990 level over the period 2008–2012. An important part is formulated at EU level, but that is supplemented with extensive policy packages at national level. The EU has put together such a package for reaching its unilateral objective of reducing greenhouse gas emissions further to 20% below the 1990 level by the year 2020[21]. A summary of that policy package is presented in Box 11.11. Box 11.12 shows the complementary national policy programme for Germany, covering the actions in addition to implementation of EU policy. As part of the internal effort sharing within the EU Germany is supposed to deliver a reduction of 21% compared to 1990.

Japan, which has a reduction obligation of 6% below the 1990 level under the Kyoto Protocol, is following a very different approach than the EU and other industrialized countries in terms of its policy package[22]. It has not introduced tradable permit systems (a limited voluntary version is being introduced), nor has it requirements or feed-in tariffs for renewable energy. On the other hand, it has a strong energy efficiency standards programme, with automatic strengthening[23]. It also has extensively used voluntary agreements between government and industry and has invested heavily in research and development[24]. It is also one of the few countries to use policies aiming at lifestyle

changes, such as guidelines for minimum temperatures in air conditioned buildings or 'lights out at night' in offices.

Going against the (federal) tide on climate change in the US, the State of California has been one of the forerunners in developing climate change policies. It built this on a long history of active environmental policy and electricity regulatory actions. The latter for instance led to implementing extensive so-called 'Demand Side Management' programmes that make it attractive for electricity generators to invest in end-use efficiency improvement, while being able to make a profit. This was realized by regulations tying the investments in end-use efficiency to the electricity prices that companies can charge. There are building codes and appliance standards in place, and there are many policies to stimulate the generation of renewable energy. As a result of all efficiency policies it is estimated that about 20 power plants of 500 MW have been avoided since the beginning of these programmes in the 1970s. Building of coal fired power plants has been effectively banned, although coal based electricity is imported into the State from elsewhere. As a result the average emissions of CO_2 per capita in California are about half that of the rest of the USA[25]. New car standards have been introduced for 2016 and 2020, bringing emissions down to levels comparable to what is now being discussed in the EU[26]. These are challenged in court however by the US federal government, which considers car emission standards to be the prerogative of the federal government. Strong overall emission targets have also been set for the State: reduction of greenhouse gas emissions to 1990 levels by 2020 and 80% below 1990 levels by 2050. The share of non-hydropower renewables in electricity has been set at 20% in 2020 and 33% in 2020 (it was 11% in 2006)[27].

Box 11.11 EU integrated climate, energy, and transport policies for the period till 2020

The package of policies and measures that is currently proposed for implementation in the period till 2020 by the 27 EU Member States is as follows:

- EU Emissions Trading System (EU ETS):
  - emission cap to be tightened to −21% below 2005 by 2020 for covered sectors including air transport sector and parts of chemical industry in ETS
  - harmonized allocation of allowances to avoid competitiveness problems
  - increased auctioning of allowances: 70% auctioning of allowances to industries not subject to international auctioning by 2020 and 100% by 2027
  - linking of EU ETS to other emission trading systems and (in a limited way) to CDM
- CCS:
  - acceptance of CCS in ETS
  - regulations regarding liability and safety
- Non-ETS sectors (60% of total GHG emissions):
  - emissions cap −10% below 2006 by 2020
  - differentiated (according to GDP per capita) individual caps for Member States from −0% to +20% compared to 2005 by 2020

- Renewable energy:
  - 20% mandatory minimum share of renewable energy in final energy use by 2020 for EU as a whole
  - differentiated individual minimum shares of renewable energy for each Member State, varying from 10% to 49%
  - freedom for Member States to chose policies to realize this mandatory minimum
- Transport:
  - minimum use of 10% biofuel in transport, with minimum standards for carbon reduction and sustainability
  - average maximum vehicle emissions standard for new cars of 130 gCO_2/km, to be achieved in 2015
  - additional measures to reach 10 g/km further reduction on average
- Buildings:
  - more stringent minimum standards for building codes
- Energy efficiency:
  - energy efficiency standards for consumer goods
  - enhanced energy labelling for goods without standards

(Source: http://ec.europa.eu/environment/climat/home_En.htm; http://ec.europa.eu/energy/index_En.html)

Box 11.12 National climate policy Germany

The most important elements of the 2008 integrated energy and climate programme of Germany are:

- *General*: promotion and rapid implementation of EU legislation
- *Combined heat and power*: modification of subsidies to increase CHP share of electricity to 25% by 2020
- *Renewable energy*:
  - modification of feed-in tariffs, improvement of the electricity grid to handle fluctuating supply and zoning regulations for off-shore wind power; should lead to renewable electricity share of 5–30% by 2020
  - introducing feed-in tariffs for biogas, leading to a 6% share by 2020
- *CCS*: financing of 2–3 large scale CCS demonstration plants
- *Smart metering*: liberalizing the market for electricity meters and regulatory changes to allow variable price regimes
- *Energy efficiency:*
  - changing tax deductions for industry after 2012 to reward energy efficiency
  - subsidies for energy efficiency advice to business and households
  - market introduction subsidies for new energy efficient technologies
  - information campaigns
  - promotion of export of energy efficient technologies
  - enhanced energy labelling of consumer goods

- *Buildings*:
  - tightening building codes, including requirement for minimum use of renewable energy for heating
  - regulations to require actual energy consumption is charged to apartments
  - extension and modification of subsidies for energy renovation of existing buildings
  - energy renovation of government buildings
- *Transport*:
  - vehicle tax reform to make it CO_2 emission dependent
  - improved vehicle energy labelling
  - differentiation of road toll for trucks according to CO_2 emissions
- *Fluorinated gases:*
  - tightening of regulation on leakage from refrigeration
  - subsidies for introducing zero emission alternative technologies in refrigeration and air conditioning
- *Public procurement*: guidelines for energy efficient procurement for federal government agencies and encouragement of state and local governments to do the same
- *Research and development*: increased R&D funding
- *International assistance*: additional funding of low carbon energy and adaptation projects in developing countries, funded from the proceeds of auctioning allowances under the EU ETS

(Source: Federal Ministry for Environment, Nature Conservancy and Nuclear Safety: Key Elements of an Integrated Energy and Climate Programme, Decisions of the German Cabinet of Ministers, 2007)

Implementation and enforcement

Climate policies mean nothing without active implementation and enforcement. On paper policies may look good; however, if there is no clear, transparent, and competent implementation through qualified agencies and no enforcement through effective monitoring, inspection, verification, and issuance of penalties they are ineffective. Some of these aspects were discussed above when looking at the effectiveness of certain types of policy instruments in different circumstances. Policies that require strong administrative capabilities, such as fiscal and market instruments, could be ineffective in many developing countries. Regulations require inspection and enforcement to be effective. Unfortunately those aspects are often neglected.

There are no good overviews of compliance records of countries with their own legislation. International and EU networks of compliance and enforcement practitioners try to improve the quality of implementation[28].

Notes

1. Civil society is defined as 'the arena of uncoerced collective action around shared interests, purposes and values', see Rayner S., Malone E., Security, governance and the environment. In Lowi M., Shaw B. (eds). Environment and Security: discourses and practices, Macmillan, 2000

2. IPCC Fourth Assessment Report, Working Group III, ch. 12.2.3.
3. http://www.iea.org/textbase/pm/grindex.aspx.
4. IPCC Fourth Assessment Report, Working Group III, ch. 6.8.3.1.
5. See IEA Policies and Measures Database, http://www.iea.org/textbase/pm/index_clim.html.
6. The most important counterargument against price caps is that they will undermine the environmental effectiveness of tradable permits, its strongest property. Proposals for price caps have triggered other proposals for price floors (i.e. a minimum price at which permits are auctioned), in order to strengthen the instrument. See IPCC Fourth Assessment Report, Working Group III, ch. 13.2.1.3.
7. See http://www.ec.europa.eu/energy/demand/legislation/doc/neeap/netherlands_en.pdf.
8. REN21, Renewable Energy Status Report, 2007.
9. IPCC Fourth Assessment Report, Working Group III, ch. 13.2.1.5.
10. For US numbers see http://rael.berkeley.edu/files/2005/Kammen-Nemet-ShrinkingRD-2005.pdf.
11. IPCC Fourth Assessment Report, Working Group III, ch. 13.2.1.6.
12. See Energy labelling of housing in the Netherlands in http://www.ec.europa.eu/energy/demand/legislation/doc/neeap/netherlands_En.pdf.
13. IPCC Fourth Assessment Report, Working Group III, ch. 13.4.2.
14. http://www.globalreporting.org.
15. http://www.worldsteel.org.
16. http://www.panda.org/about_wwf/what_we_do/climate_change/our_solutions/business_industry/climate_savers/ index.cfm.
17. http://www.pewclimate.org/companies_leading_the_way_belc/.
18. http://ec.europa.eu/environment/gpp/index_en.htm.
19. IPCC Fourth Assessment Report, Working Group III, ch. 13.2.2.2.
20. IPCC Fourth Assessment Report, Working Group III, ch 13.2.2.1.
21. http://ec.europa.eu/environment/climat/home_en.htm.
22. Annual Report on the Environment and the Sound Material-Cycle Society in Japan 2008, Ministry of the Environment, Japan, 2008.
23. This is the so-called 'top-runner programme', see http://www.eccj.or.jp/top_runner/index.html.
24. WWF, G8 climate change scorecard, http://a*ssets*.panda.org/downloads/g8scorecardsjun29light.pdf*imaterds.*
25. No reason to wait: the benefits of greenhouse gas reductions in Sao Paolo and California, The Hewlett Foundation, Palo Alto, CA, 2005.
26. http://www.arb.ca.gov/cc/ccms/ccms.htm.
27. http://www.climatechange.ca.gov/ab32/index.html.
28. http://www.inece.org/index.html; http://ec.europa.eu/environment/impel/index.htm.