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Acronyms and abbreviations

COP	Conference of the Parties
EU	European Union
GATT	General Agreement on Tariffs and Trade
GHGs	Greenhouse gases
HS	Harmonized Commodity Description and Coding System
IPCC	Intergovernmental Panel on Climate Change
IPR	Intellectual property right
LDC	Least-developed country
Mtoe	Million ton oil equivalent
MW	Megawatt
NGO	Non-governmental organization
ppm	Parts per million
PPMs	Processes and production methods
TBT Agreement	Agreement on Technical Barriers to Trade
TRIPS Agreement	Agreement on Trade-Related Aspects of Intellectual Property Rights
Twh	Trillion-watt hour
UAE	United Arab Emirates
UK	United Kingdom
UNFCCC	United Nations Framework Convention on Climate Change
US	United States
WTO	World Trade Organization

Contents

Executive summary

With growing concerns over climate change, the debate over the linkage between climate change and trade is likely to intensify. Such a debate in trade discussion is not new as the linkage between trade and environment has been a long-standing issue. As with trade and environment, the impact of trade on climate change is a controversial issue. The multilateral trading regime under the World Trade Organization (WTO) has already accepted that restricting trade may not be the best approach to promoting the environmental cause and, hence, the discussion at the WTO is centred on how trade liberalization can be used to serve the environment. Yet, there are calls for using trade measures in the fight against climate change.

Scientific evidence that climate change is happening and much of it is human induced is now clear. It is a global responsibility that climate change-inducing emissions are reduced. How will that be done is a difficult question as countries have varying emissions profile as well as ability to mitigate and adapt to climate change. Emissions levels in developed countries are not only higher but even much of the historical emissions that are causing climate change have been contributed by them. Developing countries, on the other hand, seem to be relatively more vulnerable to climate change. Progress at the United Nations Framework Convention on Climate Change (UNFCC), especially in the context of agreeing on an arrangement for emissions reduction in post-2012 years, appears to be far from satisfactory.

The most controversial issue in the context of trade and climate change is the proposed border tax measures against products coming from countries that do not take measures to reduce emissions. It is not clear if such measure can be WTO-compatible. Even the UNFCCC discourages such measures. The United States (US) has already drafted a law to impose border tax measures. But the way it has been designed appears to be against the WTO principle as it proposes to discriminate between countries and such discrimination may not be allowed by the WTO. Even in the famous *Shrimp-Turtle* case, the WTO Appellate Body allowed the use of trade measures to protect the environment, but made a clear observation that such measures have to be non-discriminatory.

Thus, even though the US says that its action will be directed only against India in South Asia, other countries in the region, particularly Pakistan and Sri Lanka, may not be spared. The European Union is yet to contemplate any concrete plan in this regard, although there is a call for adopting border tax adjustments there also.

As the WTO is discussing the possibility of liberalization of some goods and services that might be helpful in promoting a better environment, there has also been a call to liberalize trade in climate-friendly goods. A problem with this approach is that it is difficult to define environment- or climate- friendly goods. In any case, most of such goods are used for multiple purposes. Moreover, technology

being dynamic, what may be the best for the climate today may not remain so in future and changing the list of so-called environment- or climate-friendly goods will not be easy given the complexity of the negotiations at the WTO. Interestingly, though it is widely recognized that diffusion of technology is an important issue in the context of climate change and that the WTO's intellectual property right (IPR) regime may be hindering such diffusion, there is hardly any discussion on this at the WTO. There has been a call for using compulsory licensing to promote greater diffusion of climate-friendly technologies. But it is not clear if this can be effectively used given the WTO's IPR rules as well as other techno-economic conditions.

Meanwhile, carbon emissions-related trade barriers are already proliferating through private measures. In some countries, products are labelled for air travel and consumers are discouraged to buy products that are airlifted from far-off places. This approach itself is misleading as it considers emissions caused in the process of transportation only, ignoring emissions during production even though differences in production-related emissions often offset the emissions in transportation. Eco-labels, which are quite popular in some developed countries, are also taking into account the emissions factor comprehensively. This is bound to cause difficulties for South Asian exporters although most products they export are low in emissions. Costs of certification for eco-labels or carbon labels would be very high. However, the current WTO rules may be unable to deal with this problem even if such labels cause undue restriction of trade.

South Asian countries are quite vulnerable to climate change due to geographical and socio-economic conditions. Climate change is likely to affect macroeconomic and trade performance, and livelihoods and living standards in these countries. They can deal with this problem better if they cooperate on adaptation to climate change. They might also adopt some climate mitigation measures which are closely linked with their energy security, which is also a growing concern in most parts of South Asia. Regional energy cooperation, particularly in hydropower and other renewable energy, can be of great help to the entire region. This might also help them to deal with the growing carbon-related trade protectionism in the developed world.

Chapter 1

Introduction

The linkage between trade and environment has long been a controversial issue. When some developed countries started restricting trade through environmental policies, developing countries got concerned. Despite most developing countries opposing the idea of linking trade and environment, the issue got a formal place in the multilateral trading framework in 1994 through the Marrakesh Agreement Establishing the World Trade Organization (WTO), placing sustainable development among the objectives of the WTO.

It is argued that trade openness in the presence of inter-country differences in the stringency of environmental regulations will lead to a race-to-the-bottom and polluting activities will shift to developing countries. This will mean that the competitiveness of developed countries will suffer while the environmental objectives will not be met. However, empirical evidence in support of such a hypothesis is still lacking (Nanda 2008a).

On the part of developing countries, it is argued that trade has a potential to promote development, which in turn could contribute to environmental conservation. This is based on the so-called Environmental Kuznets Curve argument: in the beginning of economic development, low weight is given to environmental concerns, raising pollution along with industrialization, but after a threshold, when basic physical needs are met, demand for a clean environment rises, reversing the trend (Harbaugh et al. 2002).

In the context of climate change, however, such an argument is difficult to sustain as developed countries did not show any decline in their emissions of carbon dioxide, which is the main contributor to greenhouse gases (GHGs). As people demand better environment as a result of increased income, they might be quite comfortable if their immediate environment is kept clean by exporting pollution to other countries or regions. Moreover, the full impacts of climate change can be felt only in the long run and the costs of climate change will be borne by future generations. Thus, demand for better environment may not translate into demand for reduced climate change.

It is important to ask how much environmental price one would be willing to pay to promote efficiency and choice through trade.

Trade itself can be damaging to the environment due to transportation of goods as shipping causes pollution. This can be quite significant as one European Union (EU) estimate says that ships are likely to emit more GHGs than all land sources combined by 2020, unless some measures are taken. Such concerns are valid even for domestic trade. It is, thus, important to ask how much environmental price one would be willing to pay to promote efficiency and choice through trade, especially when much of it is of intra-industry type and not guided by differences in resource endowment (Nanda 2008a).

International trade can lead to specialization across nations promoting efficiency. However, what one often sees in practice is not so much of specialization as intra-industry trade (Krugman 1979). Intra-industry trade can also play a positive role

in promoting competition and thereby efficiency as well as more choice for consumers. Nevertheless, such benefits may involve environmental costs if such trade occurs in bulky goods that require substantial shipping.

Such concerns may be valid even when trade is not of intra-industry type and international specialization does take place. The comparative advantage theory typically does not take into consideration transportation costs. In practice, however, when economic agents make their decisions, they do take account of transportation costs. But do they take into account the negative externalities imposed by their actions, i.e., environmental costs? There is no reason that this should happen on its own unless trade policy factors this into account. Such trade can take place also due to other policies at the national level. Taking the example of India, which exports rice and imports wheat at the same time, a number of questions crop up. Is such a situation good for the environment? Is it happening because of a distorted incentive structure (e.g., subsidies)? Can it be good for the country, both economically and environmentally, if it stops exporting rice, reduces the production of rice, and grows more wheat?

Trade can work as a means of introduction and diffusion of climate-friendly technologies.

In a large country like India, such a specialization, particularly in the production of agricultural goods, can occur even within the country. One state may specialize in one crop and supply its harvest to the entire nation. Such specialization may not be due to agro-climatic conditions or other economic reasons, but simply due to farmers' tradition and knowledge or government policies. But this also leads to transportation requirements that can be avoided. Should there, then, be efforts to break such traditions? Should states or regions, then, produce everything that they can if doing so does not impose additional costs?

Trade, however, can work as a means of introduction and diffusion of climate-friendly technologies. Technologies embodied in goods can reach countries that trade with countries that invent such technologies. Closer trade relations among nations can also promote awareness on the existence of climate-friendly technologies even when such technologies are not embodied in tradeable goods or services.

What is most controversial in the context of trade and climate change is the possibility of using trade measures to combat climate change. There have been talks of border adjustment taxes, to be imposed on goods coming from countries not adopting measures to cut carbon emissions. The emergence of carbon labelling as a non-tariff barrier is another concern for developing nations. In some countries, including the United Kingdom (UK), the concept of food miles has already taken off, discouraging consumers from buying food products air-freighted from distant countries. Such measures can proliferate further.

Such measures and possibilities have raised several concerns. First of all, they raise the issue of sovereignty. If such trade measures affect the way nations deal with their production, transport and consumption, then they may impinge on the sovereign powers of the nations. They also raises ethical issues, such as ecological space for developing nations. In many developing countries, the current emission level is far lower than that to which most developed countries contemplate to cut down theirs eventually. Associated with this, of course, are the right to development and the right to livelihoods of the poor people in developing countries.

Against this backdrop, this paper examines the emerging issues in the context of trade and climate change and their possible implications for South Asian countries. Chapter 2 provides a brief background on climate change, including a global political economy scenario surrounding the issue. Chapter 3 provides a general context of trade and climate change and possible unilateral

trade measures by developed countries and their possible implications for South Asian countries. Chapter 4 deals with the climate change agenda of the WTO in the context of liberalization of trade in environmental goods as well as intellectual property rights (IPRs). Chapter 5 looks at carbon standards and carbon labelling, which are already emerging as trade concerns. Chapter 6 examines the climate change vulnerability of South Asia in the context of its economic and trade performance, and a possible regional agenda to deal with the possible adverse consequences. Chapter 7 makes some concluding observations.

Chapter 2

Climate change: A perspective

Scientific studies make it clear that climate change is already happening, with GHG emissions induced by human activities as a significant driver of this change (IPCC 2007a). Prior to industrialization, the CO_2 concentration in the atmosphere was about 280 parts per million (ppm). But by 2007, it had increased to about 382 ppm mainly due to combustion of fossil fuels and significant deforestation in different parts of the world.

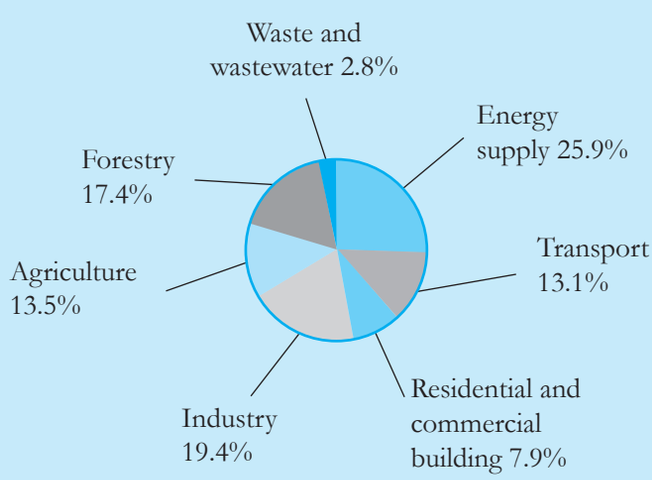
The major sources of emissions are energy supply; industrial activities like production of steel, cement and fertilizer; forestry (deforestation leads to decreased capacity of the earth to absorb CO_2 and increases emissions); agriculture; and transport (Figure 2.1). The limiting of global average temperature to 2 degrees Celsius above the pre-industrial level would require CO_2 concentration to be stabilized between 445–490 ppm. The temperature will continue to rise, however, for a few centuries even after emissions and CO_2 concentration are stabilized. Such stabilization would require drastic cuts in emissions.

2.1 Climate change and the global initiative

Recognizing the danger of climate change, the global community, at the United Nations Conference on Environment and Development (also known as the Earth Summit) at Rio de Janeiro on 3–14 June 1992, adopted a new international instrument, the United Nations Framework Convention on Climate Change (UNFCCC). Parties to the UNFCCC are classified as: Annex I countries (industrialized countries and economies in transition); Annex II countries (developed countries which pay for climate change-related costs of developing countries); and developing countries.

An important process at the UNFCCC is the annual Conference of the Parties (COP). The 3rd COP, held in Kyoto, Japan, adopted the Kyoto Protocol in December 1997. Under the Protocol, most industrialized nations and some central European economies in transition (all defined as Annex B countries in the Protocol) agreed to legally binding reductions in emissions of an average

Figure 2.1 Sources of emissions



Source: IPCC (2007a).

of 6–8 percent below 1990 levels between 2008–2012.[1] The Protocol came into force in February 2005. The United States (US), which was to reduce emissions by 7 percent, did not ratify as the Bush administration rejected it in 2001. Like the COP at the UNFCCC, the Kyoto Protocol also provided for the Meeting of the Parties (MOP), which now is normally held back-to-back with the COP. COP11/MOP1 at Montreal in 2005 extended the life of the Kyoto Protocol beyond its 2012 expiration date and agreed to negotiate deeper cuts.

Annex B countries are expected to meet their emissions targets primarily through domestic measures. However, the Kyoto Protocol also provides for three market-based mechanisms, commonly referred to as flexible mechanisms, to provide flexibility for countries in meeting their emissions targets. These are:

The principle of common but differentiated responsibility under the UNFCCC is being interpreted differently by different countries.

- emissions trading—based on a cap-and-trade system, countries that have reduced emissions below their allocated allowance may trade the surplus allowances with others that have exceeded their cap.
- clean development mechanism—project-based mechanism that allows Annex B countries to invest in projects that reduce emissions in developing countries.
- joint implementation—project-based mechanism which enables Annex B countries to carry out joint implementation projects with other Annex B countries.

The members of the UNFCCC, meeting at Bali, Indonesia in 2007 (COP13/MOP3), agreed to have a shared vision for long-term cooperative action. They also agreed to adopt measures on mitigation, adaptation, finance, and technology transfer. Though no figure was quoted in the Bali Action Plan, there has been a suggestion from several quarters for containing the temperature within 2 degrees Celsius above the pre-industrial level, while others argue that this could bring unacceptable damage.

2.2 Issues that divide

Even with the above target, while the emissions path from 2050 to 2100 appears to be relatively clearly defined, there is much less clarity about the path up to 2050. Whether the emissions reduction is front loaded or back loaded will make a huge difference. What kind of emissions paths developed and developing countries will follow is also a contentious issue.

A principle that has been accepted at the UNFCCC is that of "common but differentiated responsibility". But different countries are interpreting it differently. While developing countries are not willing to accept any binding commitments on mitigation in the near future, developed countries insist that they do so.

Much of the focus in this regard has been on large nations like China, India and Indonesia. However, although they have high carbon emissions in absolute terms, they are far below many developing countries that do not attract much attention on a per capita basis, although the latter's per capita emission is as high as that in developed countries. Malaysia, South Africa and Brazil have per capita emissions comparable to many developed countries. South Korea has a higher per capita emission than Japan, but while the latter has emissions reduction targets, South Korea does not.

In West Asia, several countries, including the United Arab Emirates (UAE), Saudi Arabia, Qatar and Kuwait, have per capita emissions higher than that of the US. Energy-producing countries are, of course, a different category as other countries import a significant part of the energy produced. If the US takes the responsibility of all the emissions caused by the production all the energy it consumes, then its total emissions would be much higher. There are some countries like South Korea and Singapore that are categorized as developing countries, but are actually developed countries for all practical purposes.

Countries with larger populations tend to emit more GHG emissions. But it is not fair to simply measure total emissions when that is largely a function of population size. Thus, a useful comparison across countries is to measure emissions performance by carbon dioxide emissions per person. Moreover, for climate change implications, it is important to look at the stock of GHGs in the atmosphere. It is no doubt true that flow is linked to stock.

Nevertheless, if countries are allotted emissions entitlement as a stock concept and on the basis of population size, most developed countries have already exhausted their quota. Developed countries cannot undo their contribution to the existing stock of GHGs, but it is incumbent upon them to take the responsibility of mitigation and adaptation, even in developing countries. Unfortunately, the global discourse on climate change is focusing more on the flow of emissions than on the stock.

As noted earlier, the Kyoto Protocol under the UNFCCC specified targets and actions only up to 2012. The current process of determining an action plan for the post-2012 years was planned to culminate in the 15th COP to the UNFCCC in Copenhagen, Denmark in December 2009. It was expected that countries would agree to a long-term target for restraining temperature rise and also on some framework and measures covering the areas of mitigation, adaptation, technology transfer and finance. However, no agreement was reached.

A subset of countries—mostly from the developed world and some developing countries like China and India—agreed on the Copenhagen Accord. The Accord is a political agreement and not legally binding. It covers all the main elements of the Bali Action Plan, including a long-term goal, mitigation, adaptation, finance, technology, forests and measurement, and monitoring, reporting and verification. Among other things, the Accord calls for establishing a Copenhagen Green Climate Fund as one channel for delivering finance and setting up a High-Level Panel "to study the contribution of the potential sources of revenue" towards funding goals. The Accord has been quite an issue of discord as many developing countries were opposed to it.

If countries are allotted emissions entitlement as a stock concept and on the basis of population size, most developed countries have already exhausted their quota.

Issue for discussion

- How can the differing interpretations of the "common but differentiated responsibility" under the UNFCCC be reconciled?

Chapter 3

Climate change and trade: The general context

Whether trade measures can be used to combat climate change, or to be more specific, if trade can be restricted on the basis of climate friendliness of production processes is still a contested territory. It has often been argued that the success of the Montreal Protocol on Substances that Deplete the Ozone Layer, to a large extent, depended on the ban on trade with non-parties in ozone-depleting substances. There are, however, fundamental differences between the Kyoto Protocol and the Montreal Protocol with respect to the use of trade measures.

The Montreal Protocol was intended to phase out the use of certain specific chemical substances like chloro-fluoro-carbons and related chlorinated hydro-carbons responsible for the depletion of the ozone layer. The Kyoto Protocol deals with GHG emissions that occur in the production, transportation, consumption and disposal of a wide variety of products and services. Another fundamental question is whether countries that are party to the Kyoto Protocol but do not have any commitment for emissions cuts would be targeted for trade measures. This issue has created a lot of controversies as there have been talks about unilateral trade measures in some countries.

3.1 Border tax adjustment

There has been a demand that if developed countries have to take emissions cuts, they must have a border tax adjustment mechanism for imports coming from countries that do not take emissions reduction commitments. However, it is not clear whether such unilateral measures will be compatible with WTO rules. These measures may be targeted at the way products are produced rather than the inherent qualities of the products. Thus, the processes and production methods (PPMs) issue, and the definition of like products are relevant to the examination of climate change measures. The general approach under WTO rules has been to acknowledge that some degree of trade restriction may be necessary to achieve certain policy objectives as long as a number of carefully crafted conditions are respected.

The WTO's Appellate Body has opened the door to the possibility of trade measures based on processes and production methods.

The WTO's Appellate Body, in the *Shrimp-Turtle* case, has opened the door to the possibility of trade measures based on PPMs (Box 3.1). In this case, the Appellate Body upheld the import ban on shrimps, under Article XX of the General Agreement on Tariffs and Trade (GATT), if fishermen did not use a turtle excluder device and thereby killed turtles unnecessarily. However, the Appellate Body also observed that the ban was not imposed in a non-discriminatory manner. Though the issue is still not very clear, it may be noted that the recent academic literature in Europe has been more supportive of PPMs-based trade measures (Dröge et al. 2004; Green 2005).

Interestingly, neither the UNFCCC nor the Kyoto Protocol provides for specific trade measures. In fact, the UNFCCC stipulates that measures taken to combat

Box 3.1 The Shrimp-Turtle case

In the famous Shrimp-Turtle case, the US government, by virtue of its enabling legislation (Sec. 609 of US Endangered Species Act), imposed a ban on the import of shrimps that were harvested without using Turtle Excluder Devices because this way of trawling killed endangered species of sea turtles unnecessarily. The affected parties regarded the action as a unilateral measure restricting the entry of their products into the domestic market of the US, contrary to GATT rules. India, Pakistan, Malaysia and Thailand lodged complaints at the WTO in early 1997, claiming that Section 609 violated a number of WTO rules.

On 6 April 6 1998, a dispute settlement panel ruled against the shrimp embargo, arguing that it represented the kind of unilateral measure that "insofar as [it] could jeopardise the multilateral trading system, could not be covered by Article XX." GATT Article XX allows WTO-inconsistent measures to be taken for environmental and health reasons.

However, the Appellate Body reversed the stand of the panel. In its report, the Appellate Body made clear that under WTO rules, countries have the right to take trade actions to protect the environment (in particular, human, animal or plant life and health) and endangered species and exhaustible resources. It also said measures to protect sea turtles would be legitimate under GATT Article XX which deals with various exceptions to the WTO's trade rules, provided certain criteria such as non-discrimination were met.

The US lost the case, not because it sought to protect the environment but because it discriminated between WTO members. It provided countries in the western hemisphere—mainly in the Caribbean—technical and financial assistance and longer transition periods for their fishermen to start using turtle excluder devices. It did not give the same advantages, however, to the four Asian countries that filed the complaint with the WTO.

Source: http://www.wto.org/english/tratop_e/envir_e/edis08_e.htm

climate change, including unilateral ones, should not constitute a means of arbitrary or unjustifiable discrimination or a disguised restriction on international trade (UNFCCC Article 3.5). This has been interpreted differently by different experts. One view suggests that this means unilateral trade measures cannot be used (Dasgupta 2009). But there is the other view that argues that this indicates that trade measures can be used provided that they are not a disguised restriction on trade or do not lead to arbitrary or unjustifiable discrimination (Howse and Eliason 2009). In any case it is doubtful if such measures would amount to a subversion of the principle of "common but differentiated responsibility" as developing countries would be forced to share the burden of climate change mitigation in the name of avoiding carbon leakage and protecting competitiveness.[2]

In another view, Petsonk (1999) argued that the Kyoto Protocol's exclusion of developing countries in international emissions trading would amount to a violation of the WTO's non-discrimination principle if emissions credits could be defined as either "goods" or "products" under the GATT or "services" under the General Agreement on Trade in Services. This may not be tenable as developing countries can enjoy special and differential treatment under WTO rules.

Carbon taxes have already been implemented by several countries, such as Finland, Sweden and Denmark, but none have introduced border tax adjustments so far. However, in the US, the American Clean Energy and Security Act (Waxman-Markey Bill) passed by the US House of Representatives in June 2009, proposes to put a cap on GHG emissions, which would require high-emitting industries to reduce their emissions to specific targets between now and 2050. The Bill also envisages levying a charge on imports of carbon-intensive products from countries that do not adopt similar climate change mitigation measures. The US importers would have to buy carbon allowances for such products. It is being argued that such a measure is necessary to maintain a level playing field between domestic and foreign producers. There has been demand for a similar measure in Europe as well. In particular, French President Nicolas Sarkozy is in favour of implementing a direct carbon tax on some industries along with border tax adjustments.

However, such a measure would be difficult to implement in a fair manner.

PPMs would be different for different producers and would also be difficult to measure. Thus, a single adjustment rate for all producers is likely to be discriminatory. Moreover, such a single rate would be a serious disincentive for producers adopting energy efficiency measures on their own. The case for border tax adjustments may not be very strong as a study has shown that the overall impacts of domestic policies like carbon taxes and energy efficiency standards on competitiveness have not been very strong. While they have been negative in some sectors, in others, due to subsidies and exemptions, the impacts have actually been positive (World Bank 2007a). A Pew Center analysis projected that most energy-intensive sectors face only a modest competitiveness impact—losing on average 1 percent of production to imports—at a CO_2 price of US$15 a ton (Aldy and Pizer 2009).

The issue of border tax adjustment has been dealt with in the GATT/WTO framework. The *US-Superfund* case (Box 3.2) is an example where products were found to be eligible for border tax adjustment provided that the inputs were detectable and physically incorporated (Howse and Eliason 2009).[3] An engineering approach, of course, may not consider energy consumed as physically incorporated. Moreover, emissions are not even an input but a by-product to produce energy consumed in the process of production. It is, thus, not clear if the *US-Superfund* case will have any validity for border tax adjustments based on emissions.

3.2 EU and US actions

With the objective of meeting its emissions reduction target under the Kyoto Protocol, the EU adopted its Emissions Trading Scheme in 2008. Under the scheme, more than 10,000 industrial units in several energy intensive industries were put under emissions caps. In this context, the EU is assessing the situation of some energy-intensive sectors where the possibility of carbon leakage is very high. These sectors may be supported by providing them with a higher amount of free allocation of emissions allowances. The EU is also considering a possible carbon equalization mechanism to create a level playing field for EU companies in energy-intensive sectors with significant risks of carbon leakage. The details of the possible mechanism are yet to be worked out, but this has raised concerns among many countries that trade with the EU.

The EU is considering a possible carbon equalization mechanism to create a level playing field for EU companies in energy-intensive sectors with significant risks of carbon leakage

Although the US is not a party to the Kyoto Protocol, the Waxman-Markey Bill proposed a cap-and-trade system with mandatory limits on emissions from 2012. The Bill proposed distribution of emissions allowances through auctions. The covered industrial units will have options to satisfy a certain proportion of their emissions cuts using offsets that can be bought from inside or outside the country. To address carbon leakage and competitiveness concerns, the Bill has a provision for an output-based rebate mechanism wherein rebates will be provided to eligible carbon-intensive manufacturers. Sectors are presumed eligible if they meet a 5 percent energy or GHG intensity threshold and a 15 percent trade intensity threshold. Each sector will be rebated at 85 percent of sectoral

Box 3.2 The US Superfund case

Under the GATT, Canada, the European Economic Community and Mexico jointly challenged the legality of US measures imposing discriminatory tax rates on imported and domestic petroleum as well as taxes imposed on certain imported substances that were allegedly not imposed on like domestic products. The US successfully defended the latter issue as a permissible case of border tax adjustments as envisaged under GATT Article II:2(a), which says that nothing in this Article shall prevent any contracting party from imposing at any time on the importation of any product, a charge equivalent to an internal tax imposed consistently with the provisions of paragraph 2 of Article III in respect of the like domestic product or in respect of an article from which the imported product has been manufactured or produced in whole or in part.

Source: Panel Report, United States—Taxes on Petroleum and Certain Imported Substances, adopted 17 June 1987, BISD 34S/136.

average direct and indirect emissions costs. Rebates are planned to be phased out beginning 2020, unless a Presidential Review determines that other countries have not yet taken substantial actions and leakage concerns persist. Emissions allowance rebates will compensate qualifying industrial units for higher costs at the same time providing incentives for them to become more efficient over time.

Rebates will be calculated based on the average output of the qualifying industrial units. For direct costs, industrial units will receive allowances based on their average output multiplied by the average direct GHG emissions per unit of output for all covered facilities of a particular industrial sector. For indirect costs, they will receive allowances based on their average output, the emissions intensity of their electricity supplier, and the sector's average electricity use per unit of output. Industrial units that are more efficient than the sectoral average will receive additional allowance rebate value beyond what is needed to cover their direct and indirect costs. Sector averages for both emissions and electricity use per unit of output will be recalculated periodically.

The output-based rebate mechanism envisaged in the US climate change bill may be in conflict with the provisions of the WTO Agreement on Subsidies and Countervailing Measures.

From 2020, imports of goods that are energy-intensive or have high exposure to trade may require the submission of emissions allowances. This represents a form of border tax, as it will raise the cost of imported goods to a level similar to that of their domestically produced counterparts. This requirement would take effect if there is no internationally binding agreement on emissions reduction by 2018 or if countries do not demonstrate comparable climate actions in a sector that is covered under the US emissions reduction programme.

This provision will take effect automatically in all eligible sectors, unless the US President, with the approval of the Congress, determines that the adjustment is not necessary for a given sector. It would also not take effect in a given sector if at least 85 percent of the sector's imports come from countries meeting one or more of the following criteria:

- the country is party to an international treaty and has agreed to emissions reduction at least as stringent as those in the US.
- the country is party to an international sectoral agreement to which the US is a party.
- the country has an energy or GHG intensity in that sector no higher than that in the US.

This requirement will also not apply to imports from least-developed countries (LDCs), and nations that account for less than 0.5 percent of global GHG emissions and less than 5 percent of US imports in a particular sector.

The output-based rebate mechanism envisaged in the Bill may be in conflict with the provisions of the WTO Agreement on Subsidies and Countervailing Measures, which prohibits subsidies that are specific to an enterprise or industry. Free allowances to industrial units in energy-intensive sectors can very well be considered as subsidies. There are also doubts if border tax adjustments will be allowed under WTO rules. Even if they are allowed, it is unlikely that they will be allowed in their present form. The eligibility of sectors for output-based rebates as well as border tax adjustments is based not only on the carbon intensity of the sector but also the trade intensity, which may be difficult to justify under Article XX of the GATT.

Another controversial issue in this regard is the countries against which border tax adjustments will be used. Ostensibly, the Bill wants to target large developing countries like China and India, and it has exempted imports from LDCs and nations that account for less than 0.5 percent of global GHG emissions and less than 5 percent of US imports in a particular sector. However, according to the WTO's most-favoured-nation principle, such discrimination may not be allowed. LDCs, of course, may be exempted due

to their special status. In South Asia, there are three countries who are not LDCs. Hence, along with India which appears to be an obvious target, Pakistan and Sri Lanka may also be targeted. It may be noted in this context that in the *US Shrimp-Turtle* case, though the WTO Appellate Body upheld the import ban under Article XX, the way it was imposed was not justified as the ban constituted "arbitrary and unjustifiable" discrimination.

Except India and Pakistan, South Asian countries do not have much energy-intensive products in their export basket. Even for these two countries, the share of such products (excluding petroleum products) in their export basket is not very high. The combined share of goods like steel, aluminum, cement, paper and chemicals remains less than 10 percent, both as total exports to the world and exports to developed countries. However, as per the proposed law in the US, border tax adjustments may be applied not only on goods with high energy intensity but also in sectors with high trade intensity. Hence, even textiles and clothing may be targeted. In this category, the vulnerability of Pakistan and Sri Lanka is quite high as these goods constitute more than 40 percent of their export basket. For India, the figure is less than 15 percent.

Issues for discussion

- How can WTO rules be clarified to effectively deal with possible unilateral imposition of border tax adjustments?
- Can an internationally binding emissions reduction agreement materialize without clarifying the legality of border tax adjustments?
- What could be the consequences for the global economy of the reactions of developing countries to developed-country unilateral trade measures taken on climate change grounds?

Chapter 4

Climate change and the WTO

The issue of climate change has already entered the WTO through its trade and environment agenda. WTO members have been discussing liberalization of tariff and non-tariff barriers to trade in environmental goods and services. Paragraph 31 (iii) of the Doha Ministerial Declaration of 2001 provides a mandate to, *inter alia*, negotiate on "the reduction or, as appropriate, elimination of tariff and non-tariff barriers to environmental goods and services."

It is understandable that such measures can facilitate transfer of climate-friendly technologies, but as of now there is little understanding on the extent to which they can reduce GHG emissions.

It has been estimated that, using currently available technologies, if 20 percent of energy is conserved in developing countries, the increase in CO_2 emissions from developing countries from 2000 to 2020 would decline to almost half (METI 2004). While some argue that great reductions can be made in GHG emissions using current technologies (particularly by increasing efficiency), this is still debated.

This argument assumes, among other things, that companies will replace their current capital stock with the most efficient available today—something that is not likely to happen in the near future even in developed countries due to its considerable cost (Saunders and Turekian 2007). To what extent trade can facilitate this process is debatable.

4.1 Environmental goods

A key challenge facing WTO members in the area of environmental goods and services is that there is no universally agreed definition of environmental goods and services. No definition was given in the Doha Ministerial Declaration. The Committee on Trade and Environment of the WTO has studied definitional issues at great length, but has been unable to reach any conclusion so far. However, some WTO members have put forward lists of what they regard as environmental goods, i.e., goods which they recommend for accelerated liberalization.

A key challenge to liberalization of trade in environmental goods and services at the WTO is that there is no universally agreed definition of environmental goods and services.

India opposed such list-based approach for accelerated liberalization and suggested an alternative project-based approach. India's argument is that many of such products would have multiple uses and they may not be used for environmental purposes once imported into a country. But a project-based approach will ensure that they are used for environmental purposes only. However, there have been too few takers of this approach. India may be open to other approaches but that would be possible if the suggested approach also takes into account its concerns and help meet the professed objectives.

It may be possible to identify certain products that are used solely for environmental purposes. However, it would still be necessary to define environmental goods. The list of the Asia-Pacific Economic Cooperation on which some

countries have based their proposed list was prepared in the context of voluntary liberalization and hence cannot be used for mandatory liberalization. It is more of a wish list and includes a wide range of goods like electric pumps which can be used in a sewage treatment plant but can have an industrial use as well. Even if it may not be possible to agree on a definition, there must be some criteria or parameters for identifying environmental goods. A list of environmental goods cannot be prepared in an arbitrary and ad hoc manner.

There has been a call for a special focus on climate-friendly goods. World Bank (2007a) has identified a list of 43 goods that can be good for the climate (Annex 1). This has already come up for discussion at the WTO. The list is widely referred to as the World Bank list, though it has not really been officially endorsed by the World Bank and the responsibility lies with the authors of the study. Nevertheless, even this list seems to be ad hoc as it has not been prepared with any defined criteria. Many find this approach unhelpful. All the goods listed may not have the same environmental or emissions performance. The World Bank study has tried to look at the possible impacts of tariff elimination in four categories of products, namely, clean coal technology, wind power, solar power and compact fluorescent lamp (CFL), and found that such elimination will increase imports of such products in major developing countries by 7.2 percent only.

What may be construed as an environmental good today may not be treated the same in the future as new products with better environmental performance may come.

Some goods can be identified which are used predominantly for environmental or climate change mitigation purposes. However, many of them do not constitute a six-digit category under the Harmonized Commodity Description and Coding System (HS) on their own. For example, the World Bank list includes solar boiler (water heater) and puts it against the HS code 841919. However, products under this code include not only solar boilers, but also all other storage water heaters. Thus, liberalization of imports of solar boilers would not be easy in the context of the existing customs administration system. Such problems will arise for many other goods as well. Mirrors for solar system, photovoltaic system controller, towers and lattice mats for wind turbines, generators for renewable energy, distilling or rectifying plants, gears, clutches and other speed changers for wind turbines are some of the items that are included in several lists, including the World Bank list, which have the problem mentioned above.

Moreover, technology being dynamic in character, a static list may not be of much value and revising the list on a regular basis would not be so easy. Environmental goods, including climate-friendly goods, are an evolving category. Not only are environmental goods difficult to identify and classify, they are continually developing in new and often unexpected directions. What may be construed as an environmental good today may not be treated the same in the future as new products with better environmental performance may come. If the WTO members decide on a list and stick to it forever, it will produce adverse outcomes for the environment. Better products might be discriminated against and worse products might be preferred.

In fact, such a problem has already arisen. For example, CFL is now being promoted as an environment- or climate-friendly good and many countries have argued for the liberalization of its trade. But we already know that LED is a much more energy efficient than CFL and environmental performance is much better even otherwise, as CFL uses mercury which is environmentally hazardous.

Thus, it is important to have a "living list" if a list-based approach is followed. A suggested option is to have two lists, one core and the other complementary, and the latter can be updated over time. Another suggested option is updating the list between rounds. But progress of rounds may not be as fast as technological progress. Nor would it be easy to agree on an updated list. Hence, a more

practical option could possibly be to allow countries to include a new product in lieu of a product included in the existing list if it can be shown with scientific evidence that the new product has substantially better environmental performance than the old one. This process may be subjected to dispute settlement to avoid arbitrary change of list.

Moreover, energy-efficient durable goods may not be able to achieve the desired emissions reduction objectives. Increased energy efficiency can increase the use of these products—the the Jevon's paradox may be at work.[4] If cars and air conditioners become more energy efficient, people may simply use them more. It is also doubtful that technology is the only solution to climate change. Developed countries have good access to technologies and financial resources, yet have emissions levels 5 to 10 times higher than acceptable limits.

It is also noteworthy that North America and Western Europe have similar levels of standard of living as well as similar access to technologies. However, the emissions level in North America is almost double that in Western Europe. Economic and environment policies as well as people's attitude play an important role in this regard. Town planning and public transport arrangement as well as the way different activities are organized can also play an important role.

4.2 Technology and IPR

Surprisingly, the issue of transfer of technology has not received much attention in the WTO discussion on trade and environment though it is an important component of the UNFCCC agenda. Nevertheless, the role of IPRs in access to environment-friendly technologies has been raised by some countries in the WTO Committee on Trade and Environment. Most notably, Cuba has demanded the shortening of patent protection period to facilitate transfer of clean technologies (WTO 2008). However, as the issue of IPR is not explicitly mentioned in the Doha Agenda on trade and environment, it would be difficult to make any substantial progress on this at the WTO. Similarly, there is also a Working Group on Trade and Technology Transfer at the WTO wherein not much has happened that can have a bearing on this issue.

Much of the discussion on technology transfer has been concerned with the issue of climate change mitigation. However, for developing countries, technology would probably be more important for adaptation. They will need technology in agriculture so that crops can withstand the impacts of climate change. They will need technology to deal with water stress, greater occurrence of existing diseases, and the arrival of new diseases.

The Intergovernmental Panel on Climate Change (IPCC) has listed the various hurdles to technology transfer, including high capital costs, limited access to capital, poor access to information, institutional and administrative difficulties in developing technology transfer contracts, lack of infrastructure to absorb riskier technologies, absence of economic incentives, and IPRs (Metz et al. 2000). Sale or licensing of intellectual property is an important component of transfer of technology in the international context.

Much of the discussion on technology transfer has been concerned with the issue of climate change mitigation.

Technologies protected by IPRs need to be licensed. The nature of the IPR regime is an issue in so far as it determines the terms of licensing. Therefore, there is a great likelihood of production and usage costs increasing because of payments made to obtain licences. In some case, the owner may just refuse to grant a licence altogether as such technologies are used as barriers to entry (Aoki and Small 2004). DuPont, for example, refused to grant licence for the production of chlorofluorocarbon substitutes to Korean and Indian firms that sought to meet the phase-out requirements for ozone-depleting substances (South Centre 2001). Such refusal can further

dampen the diffusion of technology. Often, production of relevant goods that embody such technology is cheaper in developing countries even after payments of royalties. Given this context, it has been suggested that the issuance of compulsory licences can be a tool for faster diffusion of climate-friendly technologies (Barton 2007; Khor 2008).

4.3 Compulsory licensing

Compulsory licence, a statutorily created licence that allows others to pay a royalty and use an invention without the patentee's permission, is an important feature of IPR law. It also includes the government authorizing itself to use an otherwise protected intellectual property without having to obtain the permission or authorization of a patent holder in cases of national emergency or use towards a public good. The issue of compulsory licensing becomes a case for consideration when a patent holder is not willing to share the technology with others voluntarily. Compulsory licensing introduces competition in the markets and hence makes the relevant goods and services cheaper.

The US has a long history of compulsory licensing, which has been mostly used as an antitrust remedy in cases of patent abuses.

In the US, 28 USC 1498 is the seminal legal provision relating to the government use of patents and copyrights. The process provided under this provision empowers the US government to use and authorize the use of a patent without any requirement to seek a licence or negotiate the use. It also entitles the patent right owner to compensation by filing a suit in the US Court of Federal Claims for recovery of his "reasonable and entire compensation".

The US has a long history of compulsory licensing, which has been mostly used as an antitrust remedy in cases of patent abuses. In *Besser Manufacturing*, the court quoted compulsory licensing as "a well-recognized remedy where patent abuses are proved in antitrust actions and it is required for effective relief."[5] Similarly in the *Glaxo Group* case, the court stated that "mandatory selling on specified terms and compulsory patent licensing at reasonable charges are recognized antitrust remedies."[6] The *General Electric* case is an interesting case in which the court required General Electric to issue "free" licences for light bulb patents to its competitors. [7] In the *Microsoft Corporation* case the district court endorsed compulsory licensing as "a remedy closely connected with the theory of liability in this case …. To ensure that no practices likely to result in monopolization….provisions plainly fall within public interest." [8]

There also exists a host of specific environmental and health legislation in the US that provide for the targeted licensing of specific technological applications to meet public health needs and specific environmental objectives like air pollution control. 42 USC Sec 7608 provides for mandatory licensing of air pollution prevention inventions under Title 42 (Public Health and Welfare) under the Clean Air Act. Mandatory patent licences have also been granted under Section 308 of the Clean Air Act.[9] The defence sector has been one of the major consumers of the compulsory licenses issues by the US government.

In Europe, although compulsory licensing has not been as frequent as in the US, the *IMS Health* case is considered to be a landmark case in this regard. In this case, the European Court of Justice laid down certain conditions under which a compulsory licence can be granted.[10] In the Regulation (EC) No 816/2006 of the European Parliament and of the Council of 17 May 2006 on compulsory licensing of patents relating to the manufacture of pharmaceutical products for export to countries with public health problems, prior negotiations in circumstances of national emergency and public non-commercial usage have been waived. In such cases, payment for a patent licence has been fixed at 4 percent of the remuneration given by the importing country.

Some South Asian countries too have legal provisions for compulsory licensing.

Sections 84 and 92 of the Indian Patent Act 1970 (along with revisions) relate to the issuance of compulsory licences. The Act states that after three years from the date of sealing of a patent, an interested party may apply to the Controller for the grant of a compulsory license alleging that the reasonable requirements of the public with respect to the invention have not been satisfied or that the invention is not available at a reasonable price (CUTS 2006). Pakistan also has similar provisions. Under Sri Lanka's Intellectual Property Act No 36 of 2003, compulsory licences can be issued only in extreme cases. This could be because Sri Lanka signed a bilateral agreement with the US in 1991 limiting the grounds for the use by Sri Lanka of compulsory licensing of patents.

The term compulsory licence does not figure as such in the WTO's Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS). However, it can be read into the provision of the Agreement on other use (of the patented subject matter) without authorization of the right holder. Exceptions to the rights of patent holders[11] and principles on measures for preventing the abuse of IPRs by right holders or the resort to practices which unreasonably restrain trade or adversely affect the international transfer of technology also provide reasonable flexibility for resorting to the provision of compulsory licensing.[12]

Article 31 (c) of the TRIPS Agreement also provides that a country can use such a measure "to remedy a practice determined after judicial or administrative process to be anti-competitive". Hence, countries can invoke their competition law where "abuse of dominance" is included as one of the anti-competitive practices and the source of dominance is an IPR. However, the provision also requires that the possibilities of obtaining a voluntary licence must be exhausted before a compulsory licence is sought. Similarly, Article 40 of the TRIPS Agreement dealing with control of anti-competitive practices in contractual licences provides that: "Nothing in this Agreement shall prevent Members from specifying in their legislation licensing practices or conditions that may in particular cases constitute an abuse of intellectual property rights having an adverse effect on competition in the relevant market." Hence, refusal to give a licence along with under-servicing of the market can also be interpreted as an anti-competitive practice. The right of WTO members to make use of compulsory licences in the interest of public health has been explicitly recognized in the Doha Declaration on Public health and the August 2003 Decision by WTO members. Pursuant to these, the General Council of the WTO amended the TRIPS Agreement on 6 December 2005.[13]

A compulsory licence can be granted in cases such as meeting government requirements, abuse of patent rights, national emergency, public non-commercial use and technical advance of considerable economic significance over the existing patent. Accordingly, Thailand issued a compulsory licence in late 2006 for five years on Efavirenz, an AIDS drug patented by Merck. Brazil followed suit in 2007.

To make use of the provisions for compulsory licensing for diffusion of climate-friendly technologies, climate change mitigation has to be treated as a public good.

The TRIPS Agreement recognizes countries' freedom to determine what constitutes national emergency in their context. While the flexibility rests with countries to determine when and in which cases compulsory licences can be used, in the absence of any specifications or directives, there is bound to be some confusion or conflict. To make use of the provisions for compulsory licensing for diffusion of climate-friendly technologies, first and foremost, climate change mitigation has to be treated as a public good. It is also important to lay down detailed guidelines and specifications to help a country identify a technology that can be eligible for the issuing of a compulsory licence. Similarly, eligibility criteria for the countries may be specified.

Under the World Intellectual Property Organization's Development Agenda,

some developing countries have talked about the use of compulsory licensing to promote greater access to technologies. However, developed countries, particularly, the US and the EU, have argued that compulsory licensing and its effects thereof would also send a strong signal to potential and current investors that their investment is not safe and welcome (WIPO 2005). Interestingly, it is not developing countries who invented the concept of compulsory licensing. As discussed above, it has been used on several occasions in the US and the EU. In particular, the US has been quite an enthusiastic user of it. However, the US and the EU feel that developing countries may not be "responsible" enough in its use.

The IPR issue is included in many regional and bilateral trade agreements—mostly of the North-North and North-South variety—as well. However, by and large, such agreements adopt higher standards of IPR protection, meaning that they will make compulsory licensing more difficult. The IPR-related provisions in the North American Free Trade Agreement (NAFTA) are similar to those of the TRIPS Agreement, which allows the use of compulsory licences without specifying the grounds for issuing them.

Developing countries will find it difficult to make compulsory licences work in climate-friendly products and technologies, as most of them do not have much production capabilities.

However, NAFTA also provides for detailed provisions on the rights of patent owners in the case of compulsory licensing, and since its coming into force, there has been a significant reduction of compulsory licences both in the US and Canada (Kommerskollegium 2008). Some bilateral trade agreements signed by the US have even more restrictive provisions. For example, four such bilateral agreements (US-Vietnam, US-Jordan, US-Singapore and US-Australia) limit the use of compulsory licensing to emergency situations, anti-trust remedies, and cases of public non-commercial use (Fink and Reichenmiller 2005).

The real effectiveness of compulsory licensing to promote transfer of technology, however, will depend on the market conditions of the relevant products and technologies. It is important that there are capable and willing firms to receive a compulsory licence. This will require a sufficient number of firms producing the same or similar products. Markets for climate-friendly products and technologies are unlikely to meet such conditions as they are highly concentrated. The concentration is even higher in particular segments of the industry (Sawhney 2006). If a firm remains a virtual monopoly for a sufficiently long period of time, then it becomes extremely difficult for any other firm to enter that industry. If there is no firm with adequate capability to receive a compulsory licence of some technology and use it, a mere legal provision for compulsory licensing is of little use.

The US is the world's largest producer of environmental technologies and occupies about 33 percent share of the international market. The other major suppliers are the EU (particularly Germany) and Japan. The Office of Environmental Industries of the US proudly claims that developing nations simply do not have the technologies (Nanda 2008a). It is very likely that the situation would be quite similar in the case of technologies that relate to climate change mitigation.

In a recent study based on patenting between 1978 and 2003, it was found that innovation in climate change technologies is highly concentrated in three countries, namely Japan, Germany and the US, which accounts for two thirds of total climate innovations in 13 technologies (Dechezleprêtre et al. 2008). If developing countries need to make use of compulsory licensing in order to make these technologies better accessible, they will need domestic companies with manufacturing capabilities. However, they are unlikely to have such capabilities in most of these technologies.

Developing countries will find it difficult to make compulsory licences work in climate-friendly products and technologies, as most of them do not have much

production capabilities. Indeed, production capacities are limited in developing countries also because they do not have access to the technologies. These products are very different from pharmaceutical products. For example, Bangladesh, an LDC, has capabilities to produce pharmaceutical products, but a relatively advanced developing country like India does not have much capability in climate change mitigation technologies.

In such a situation, it would be difficult for developing countries to operationalize compulsory licensing arrangements to promote access to technology. A requirement in the TRIPS Agreement (Article 31(f)) is that production under a compulsory licence has to supply predominantly for the domestic market. This came up as a major concern around the time of the 2001 Doha Ministerial Conference of the WTO. To deal with this, an amendment was made to the TRIPS Agreement, so that countries without pharmaceutical manufacturing capability could issue compulsory licences to foreign firms as well. However, this exemption from Article 31(f) of the TRIPS was allowed only for public health needs and the same cannot be used for climate-friendly goods and technologies.

If the TRIPS Agreement could severely restrict access to medicines, endangering public health in developing countries, as it is widely accepted now, there is no reason to believe that it would not restrict access to environment- or climate-friendly technologies. It would be useful to explore the idea of according the protection of environment the same status as that of protecting public health in the context of the TRIPS Agreement.

In the case of a national emergency or other urgencies, compulsory licences can be issued even without trying to obtain a voluntary licence. But there remains a question as to whether climate change can be treated on a par with a national emergency when the issue is actually global in nature or can be considered a civilizational emergency.

Compulsory licensing, though it may be helpful in some cases, cannot do much. Developing countries find it difficult to use the compulsory licensing provision due to political pressure from the developed world, particularly the US, even if it is allowed by the TRIPS Agreement (Wise 2006).

Hence, a political statement at the global level will certainly strengthen their position. A public health-type exemption to issue compulsory licences to foreign firms would certainly be a welcome move. However, the same may be allowed not only for LDCs but for all developing countries (Nanda 2009).

4.4 The WTO is for trade only

In reality, climate change is hardly a concern in the WTO trade and environment agenda. It is more of a market access agenda and the environmental objective is wished to be achieved through liberalization of trade in environmental goods and services. The WTO is oblivious of the fact that some of the existing WTO provisions like rules on subsidies and tariffs can thwart climate change mitigation effects at national levels, and also the possibility that the spread of climate-friendly technologies may be obstructed by the IPR regime under the TRIPS Agreement more than by trade barriers.

It would be useful to explore the idea of according the protection of environment the same status as that of protecting public health in the TRIPS Agreement.

Since an important item on the WTO trade and environment agenda is the clarification of the relationship between WTO agreements and multilateral environmental agreements, issues like border tax adjustments can be addressed at the WTO. Nevertheless, it is quite obvious that much cannot be expected from the WTO in terms of promoting rules that can contribute to climate change mitigation. It is also quite well-known that the Kyoto Protocol itself could not achieve its desired objectives particularly with respect to commitments made by nations in terms of reducing emissions up to the year 2012. The post-2012 arrangements under the Kyoto Protocol, thus, assume critical significance.

Issues for discussion

- What strategies should South Asian countries adopt to benefit from multilateral liberalization of trade in environmental goods and services?
- How can the domestic production capacity of South Asian countries be increased for effective use of compulsory licensing for climate- or environment-friendly technologies?

Chapter 5

Carbon standards and labelling

In the case of border tax adjustments, the main issues are government policies and measures that can restrict trade. However, individual purchasers are free to make their buying decisions that may include sustainability criteria. In fact, there is, albeit extremely limited, evidence that such measures are being adopted by individual buyers in the developed world. There is at present no legally biding global law to stop imports on the basis of labour standards, yet exporters from developing countries often find it essential to get their products certified that they did not use child labour in their production process.

In recent years, in the US, product standards introduced by companies and non-governmental organizations (NGOs) are gaining importance, as there is a price premium for the labelled products (Wiemann 2007). Sometimes, while placing the orders, it is found that importing firms ask exporters to purchase specific machines (from their country) to produce the final product in order to avoid hassles at later stages. Exporters are often asked to use specific components and raw materials as well.

Teisl et al. (2002) note that knowledge about the environmental attributes of products has become increasingly important to consumers. Governments and NGOs are supporting various eco-labelling programmes, which cover thousands of products in more than 20 countries. There have also been efforts to standardize environmental labelling schemes at the international level. Teisl et al. (2002) also note there is significant empirical evidence that even labels such as nutrition labels can change market behaviour.

Stern (2007) argues that product labelling can have a significant effect on consumer behaviour and preferences. This has been demonstrated by certification of organic products and social labels like Fairtrade. The latter indicates that specified social and environmental standards are met and that producers receive the minimum price and premium. According to Fairtrade Labelling Organizations International (2008), global sales of Fairtrade mark products increased by 47 percent in 2007 to cross €2.3 billion.

According to a survey undertaken by the UK Carbon Trust in 2006, about three fourths of UK consumers were concerned about climate change and two thirds of them indicated that they would prefer products with a low carbon footprint. Garnaut (2008) notes that there are studies that indicate that labelling schemes for appliances have been successful in encouraging the uptake of more energy-efficient products in several countries.

Exports from developing countries are considerably affected by eco-labelling in the EU and the US. Eco-labelling tries to ensure that the exports from a country are harmless for the consumers and environment of the importing country, looking at the entire life cycle of the product and analysing the production- and process-related criteria. Thus, emissions

Exports from developing countries are considerably affected by eco-labelling in the EU and the US.

norms will enter the eco-labelling criteria in future with greater measure (OECD 1997; ESCAP 1997; CUTS 2005).

5.1 Proliferation of carbon standards and labelling

Several global forums like IPCC (2007b), as well as experts like Stern (2007) and Garnaut (2008), have advocated measures such as product labelling and mandatory disclosure. Adjustment towards a low emissions economy may be easier when both price and non-price signals are used to reduce demand for relatively carbon-intensive products. Gupta et al. (2007) observe that information instruments may improve environmental quality by promoting more informed choices, although there is only limited evidence that the provision of information can achieve emissions reductions.

In the UK, it is already a part of government policy to encourage consumers to buy products with lower carbon emissions.

Stern (2007) identifies a number of information policies, including performance labels; certificates; more informative energy bills; wider adoption of energy use displays and meters; dissemination of best practices; and wider carbon disclosure. These can help consumers and firms make better decisions and promote competitive markets for energy-efficient goods and services. Garnaut (2008) argues that consumers should have adequate access to information about the benefits of energy efficiency and the costs and benefits of different low emissions practices.

Carbon labelling is believed to play an important role in this regard by providing information on the carbon footprint of a product. Since it is not possible for consumers to check the carbon footprint of product, carbon labelling can enable them to make purchase decisions by factoring in the carbon footprint of the product. Eventually, carbon labelling is believed to facilitate consumer participation in the fight against climate change. Carbon labeling schemes have been introduced in several countries (Box 5.1). However, it must be recognized that the benefits of carbon labelling are uncertain as they would depend on consumer perceptions of the reliability of the information, access to that information and their willingness to buy products with lower carbon footprint as they might be relatively expensive.

In the UK, it is already a part of government policy to encourage consumers to buy products with lower carbon emissions (DEFRA 2006). Former UK Environment Secretary Hilary Benn had been quite emphatic in calling for "better labeling—to help understand where food comes from, how it was made, which welfare standards were applied, and what its carbon content is" (Benn 2008). In June 2007, the Carbon Trust and the UK Department for Environment, Food and Rural Affairs commissioned the British Standards Institute to develop a comprehensive carbon footprint methodology that would calculate the full life cycle of carbon emissions from goods and services.[14] This methodology, referred to as Publicly Available Specification (PAS 2050), was launched in October 2008.[15]

The carbon footprint of a product is the carbon emissions across the supply chain for a unit of a particular product. According to the Carbon Trust, the total carbon footprint of a product takes into account total carbon emissions including the manufacturing processes with all the steps in the supply chain to produce, use and dispose of or recycle the product. The Carbon Trust introduced a carbon reduction label which is based on PAS 2050 in partnership with several companies. Adoption of the carbon reduction label on products involves agreeing to undertake a comprehensive carbon audit of their supply chains (including production and transport). The four core elements of the label are: footprint; carbon footprint measurement; endorsement by the Carbon Trust; and a commitment by the producer to reduce emissions or lose accreditation. There are some optional elements like how the footprint is created; product comparison information between different items produced by the same company and within the same cat-

egory; and consumer action tips on appropriate products.

As of now, there is no internationally agreed methodology for calculating the carbon footprint of a product. However, the Carbon Trust is reported to be working with the International Organization for Standardization and the World Resources Institute to develop a universally accepted standard for measuring embodied carbon emissions. In response to concerns about the high cost of implementing PAS 2050, the World Business Council for Sustainable Development is developing a simplified low-cost standard to achieve widespread adoption by businesses in both developed and emerging economies. The Carbon Trust is also reported to be working towards carbon reduction labels with Coca Cola, PepsiCo and other companies in the US, and with the China Energy Conservation Investment Corporation.

5.2 Food miles: "A dangerous obsession"?

In the developed world, there are already some private initiatives to discourage consumption of goods that have been transported from distant places. The so-called idea of "food miles" is promoted in some countries. Consumers are informed about the distance a particular item has covered to reach the store. Consumers are typically discouraged, through campaigns, to buy products that have come from far-off places. At first glance, it may appear to be justified to restrict trade to reduce avoidable transportation. However, the issue is not that simple. It is possible for a product to remain less carbon intensive even after it has been airlifted from Africa to a store in Europe compared to similar products grown in the neighbourhood if the carbon intensities of the production processes are very different.

The food miles concept originated in the UK in the early 1990s and has been supported by a range of environmental, community and farmer groups, including the World Wildlife Fund and Soil Association. The term food miles was originally coined by Tim Lang, who was the director of the London Food Commission between 1984 and 1990. He helped found Sustain, an alliance for better food and farming with a membership of around 100 national public interest organizations. Sustain provided a set of recommendations for consumers to support a sustainable food system. One of them was reducing food miles, which essentially meant buying local, seasonally available ingredients, to minimize energy used in food production, transportation and storage.

Box 5.1 Carbon labels in different countries

Carbon labelling schemes have been introduced in several countries. In the UK, the Carbon Trust has introduced a carbon reduction label in partnership with several companies. In France, voluntary carbon labels have been introduced in the supermarket chains of Casino. The aim is to label around 3,000 products. These schemes have been supported by the French Environment and Energy Agency, though they do not require audits by it. In Switzerland, the top supermarket chain Migros introduced the Climatop carbon label on several of its products. This label guarantees that the product is 20 percent more carbon efficient than its counterparts within the same product category.

In the US, the Carbon Fund, an independent non-profit carbon offset provider, developed the Certified Carbon Free label, which indicates whether the carbon footprint of the product has been calculated, and whether the carbon is being offset. It also monitors if the norms are followed. So far, only a small number of products carry the label. Climate Conservancy, an offshoot of Stanford University, developed the Climate Conscious label that provides carbon ratings (gold, silver and bronze) based on the carbon intensity of a product. In Canada, CarbonCounted, a non-profit organization, developed an online application, CarbonConnect, which enables companies to calculate the carbon footprints of products.

Carbon labelling schemes or carbon footprint methodologies are also being developed in Germany (Product Carbon Footprint pilot labelling scheme), Sweden (Climate Marking), and the European Union (which commissioned a carbon footprint measurement toolkit). In Japan, 30 companies have participated in a pilot scheme supported and coordinated by the Ministry of Economy, Trade and Industry.

Source: Stancich (2008).

The popularity of the concept was not limited to the UK. In the US, a San Francisco-based group that emerged in 2005, known as the "locavores", also gained significant popularity. Locavores encourage people to eat food grown or harvested within a 100-mile radius of their home. Even in Australia, which is a major exporter of food items, the food miles concept has been popularized by some organizations like the Australian Conservation Foundation and the Sydney Food Fairness Alliance.

Proponents of food miles in the UK particularly focus on the carbon intensity of air transport and the rapid growth in air-freighted food imports. Some farmer organizations supporting the food miles concept recommend consumers to look at the country-of-origin labels on food products and choose purchases that reduce food miles. Joining the bandwagon, two major UK retailers, Tesco, and Marks and Spencer, now place plane stickers on fresh produce that has been air-freighted from abroad.

Empirical evidence indicates that "food miles" is an unreliable and often misleading indicator of carbon emissions in the food supply chain.

The Soil Association of the UK, which provides certification for organic foods, also toyed with the idea of refusing organic certification to airlifted products. However, the possible negative impact of food miles on consumer demand for organic food imports has attracted significant media attention and, as a result, the Association seems to be modifying its approach towards air-freighted organic imports. It reportedly moved to change its standards so that organic produce can be air-freighted, provided it met the Ethical Trade or Fairtrade Foundations' standards.

The growing popularity of the concept of food miles, however, raises important concerns not only on its impact on food exporters and trade, but also its reliability in climate change mitigation. Food miles indicate only a part of the carbon emitted in the life cycle of a product. The concept indicates the carbon emitted in the process of transportation only, ignoring the carbon emitted in other phases in the life cycle of a product. Empirical evidence indicates that "food miles" is an unreliable and often misleading indicator of carbon emissions in the food supply chain. For example, a study conducted by Cranfield University found that cut roses grown in Kenya for the British market, based on a life cycle analysis considering more than 500 inputs, are 5.8 times more carbon efficient compared to Dutch greenhouse flowers even after accounting for emissions caused by air-freight. The same study also noted that emissions from the production of roses in Dutch greenhouses are likely to be 6.4 times higher than from roses grown in Kenya even over the next 20 years (Appleton 2009). Similarly, carbon emissions from green beans produced in Kenya that have been air transported to the UK may be lower than carbon emissions from green beans produced in the UK. Similar findings came out even in the case of strawberries grown in Kenya.

Saunders et al. (2006) compared energy use and associated CO_2 emissions in the UK and New Zealand food supply chains for four food products: lamb, dairy, apples and onions. It found that New Zealand is substantially more energy efficient and less carbon intensive in producing and delivering lamb, dairy and apples to the UK market compared with UK producers. However, New Zealand is slightly more carbon intensive in supplying onions to the UK market compared with UK producers. This is quite important as New Zealand is a major source of food items for the UK and the distance between the two countries being very long, the related magnitude of food miles is also relatively very high. The UK is an important traditional market for New Zealand's exports as the two countries have similar climates, indicating that their land is suitable for similar farming activities.

Thus, while food miles may have some immediate appeal among consumers, the concept results in less informed consumption choices and does not reflect

the carbon emissions embodied in many products. It also ignores the role of international trade in facilitating economic development, in particular in global poverty eradication. For example, the imports of fresh produce in Europe are supporting millions of farmers and their families in exporting countries.

Saunders and Hayes (2007) concluded that when a product's life cycle of emissions is considered, the emissions associated with air transport tend to be low. In fact, a UK Cabinet Office (2008) study noted that for consumers, driving six and a half miles to a shop to buy food emits more carbon than flying a pack of green beans from Kenya to the UK. It is also unrealistic to assume that the importing country could fulfil the demand in the domestic market and reduce or replace imports.

In sum, the encouragement of the food miles concept raises two major concerns: misleading information and the rise of disguised protection. As seen in many studies, emissions due to air transport account for only a small part of the emissions in the life cycle of a product. Total reliance on this concept can be misleading and may not only distort production, consumption and trade, but also lead to increased global emissions. There is also good reason to believe that the food miles campaign is being used as a form of trade protection. The greatest interest in the food miles label has been in the EU and the US where the clamour for agricultural protection is relatively high, and agriculture remains highly subsidized.

The issue of emissions from shipping has also drawn the attention of the global community and there are talks of imposing a tax on shipping.[16] However, such an approach may not be appropriate. There is a need to distinguish between avoidable and unavoidable trade. For example, if a country cannot produce certain goods, then it has to import them. On the other hand, some countries may have resource endowments such that they can produce only a few goods and export much of them. It may not be appropriate to put restrictions on such exports and imports. Moreover, a tax on shipping only will not take care of the emissions caused by transportation over land.

5.3 Carbon labelling: A lesser trade barrier?

Some experts (e.g., Muller 2007) suggest that carbon labelling is a better alternative than promoting the concept of food miles to address the issue of carbon emissions in international trade. Major exporters of agricultural goods like Australia and New Zealand also subscribe to this view (Hogan and Thorpe 2009). According to them, in the absence of carbon labelling, there is a risk that consumers will continue to be encouraged by some environmental, community and farmer groups to use food miles or air miles as indicators of the carbon footprint of food products. Worse, even governments might encourage this. For example, the EU is reportedly moving towards country-of-origin labelling of all food products. The issue of food miles and country-of-origin labelling is gaining ground in the US as well (Saunders and Hayes 2007). Thus, it appears that for consumers who wish to contribute directly to reducing carbon emissions, the promotion of carbon labelling could be a better option. But two concerns remain. First, carbon labelling will involve significant transactions costs along with the issue of quality assurance. Second, there is no guarantee that the promotion of carbon labelling will automatically stop the promotion of food miles.

For consumers who wish to contribute directly to reducing carbon emissions, the promotion of carbon labelling could be a better option than "food miles".

A matter of concern in carbon labelling is the administrative costs involved with the process. The costs of labelling are likely to vary according to the methodology or standards adopted. A complex methodology to measure the carbon footprint of a product would increase the cost of data collection and calculation of the carbon footprint, and the cost of the verification process. A simpler methodology means that it would be

less reliable as the estimate of the carbon footprint will tend to be tentative. Such a methodology may contain loopholes and relatively more emission-intensive products can pass as low carbon products.

For developing countries, the adoption of carbon labelling even on a voluntary basis is a matter of concern. Even though the UNFCC, the IPCC and experts like Nicholas Stern favour the adoption of carbon labelling, they might not have considered the impacts that such a scheme could have on developing countries, particularly small producers and poor people. Complying with carbon standards will require an estimation of the carbon footprint of all suppliers. Many small producers may not have fixed suppliers. They might source their supplies from the market without any knowledge of the original suppliers. This would mean that complying with standards or measuring carbon footprint will be extremely difficult. The adoption of carbon standards and labelling will amplify the existing inequalities.

Much of the demand for carbon standards and labelling is fuelled by the fear that producers in developed countries will lose competitiveness.

Though standards, labelling and air miles are more prevalent in food items, they are likely to make ways into non-food items as well in the near future. Much of the demand for carbon standards and labelling is fuelled by the fear that producers in developed countries will lose competitiveness and outsource their production to developing countries. Soil Association and Bio Suisse are backed by the local farmers' lobby.

It is very likely that most of the products coming from developing countries will have lower emissions. Yet they will face difficulties as the costs of compliance would be very high, particularly for small producers.

Thus, developing countries will be forced to share the burden of emissions reductions in developed countries through the trade route, even if they do not have any emissions reduction target as such and even if developed countries do not adopt border tax adjustments.

5.4 Carbon labelling and the WTO

Standard-setting and labelling activities come under the Agreement on Technical Barriers to Trade (TBT) of the WTO irrespective of whether they are mandatory and voluntary, though the applicable provisions are different. The TBT Agreement also covers standards promulgated by central government bodies, local government bodies, and non-governmental bodies. There is, however, no consensus on whether standards or technical regulations on non-product-related PPMs and private labelling schemes will fall within the purview of the Agreement. If the PPM is detectable and embodied in the product itself, then it may come under the Agreement. In the US *Shrimp-Turtle* case, the import ban was examined under Articles XI and XX of the GATT and the case, therefore, does not shed any light on the applicability of the TBT Agreement.

Should activities of Soil Association, Bio Suisse, Tesco, and Marks and Spencer be considered to be standardizing or simply marketing or strategic issues? Should private organizations dealing with labelling schemes be considered as non-governmental bodies? There are ambiguities. It would be interesting to examine the case of the Forest Stewardship Council. It is accepted by many WTO members that its standards and labels are globally recognized. It receives funding from the UK and Germany and its standards are referenced by many governments and it is listed by the World Standards Services Network as an international standardizing body. However, its standards are based on non-product-related PPMs and hence it has not been allowed to accede to the TBT Code (Appleton 2009). Private standards and labelling schemes are possibly taking advantage of some loopholes in the TBT Agreement and essentially defeating the very purpose of it. WTO members have been discussing the issue of private standards and recognized the need to deal with them so that do not unnecessarily restrict trade.

Issues for discussion

- How can carbon labelling be made pro-poor as well as truly effective in reducing emissions?
- How should the TBT Agreement be clarified and strengthened so that carbon standards and labelling do not serve as trade barriers?

Chapter 6

Climate change vulnerability and regional cooperation in South Asia

At the 16th summit of the South Asian Association for Regional Cooperation (SAARC) in 2010, a Statement on Climate Change was adopted with a view to making South Asia a world leader in low-carbon technologies and renewable energy. The statement also emphasized that the promotion of climate resilience will promote both development and poverty alleviation in a sustainable manner. The planned initiatives include the SAARC Inter-governmental Monsoon Initiative to assess member states' vulnerability due to climate change. This is important as South Asia appears to be among the most vulnerable regions in terms of the impacts of climate change.

In South Asian countries, as in most developing countries, per capita emission is very low, even lower than two tons, which some suggest to be the target for 2050. Since they already operate at a very low level of energy use, their mitigation efforts are not likely to contribute much to the possible global emissions reduction. It is also true that some degree of climate change is inevitable no matter what we do now. Developing countries, thus, need to make elaborate preparations for adaptation to climate change. Vulnerability to climate change is considered to be higher in developing countries due to social, economic and environmental conditions. Climate change will further reduce access to drinking water, negatively affect the health of poor people, and pose a real threat to food security (African Development Bank et al. 2003).

Climate change is also likely to increase the frequency and magnitude of extreme weather events such as droughts, floods and storms. It is well known that poor countries and people suffer more due to such natural calamities. Over 96 percent of disaster-related deaths in recent years have taken place in developing countries (African Development Bank et al. 2003). The impacts of climate change are likely to be superimposed on existing vulnerabilities. But they have very limited institutional and financial capacities to anticipate and respond to the effects of climate change.

In South Asia, a huge majority of the population depends on climate-sensitive sectors like agriculture and fisheries for livelihood. In seasonally dry and tropical regions, crop productivity is projected to decrease for even small local temperature increases (1–2 degrees Celsius). For some South Asian countries, these sectors are also the major sources of their exports. Climate change is thus likely to adversely affect macroeconomic health and trade performance as well as livelihood and food security. It is also expected to exacerbate current stresses on water resources. Though some developed regions will also suffer a decrease in water resources due to climate change, developing regions will suffer more. Decreased availability of water will also affect hydropower potential as well as agricultural production, particularly where irrigation plays an important role.

A huge majority of the population of South Asia depends on climate-sensitive sectors like agriculture and fisheries for livelihood.

Another important concern is the impact on health. While the health status in South Asia is already quite bad, climate

change is going to make it worse. In tropical regions, any increase in temperature is likely to increase the incidence of tropical diseases. Arrival of new diseases due to climate change cannot be ruled out as the behaviour pattern of microbes might change. This will impact not only human health but animal and plant health as well. Hence, this will have an adverse impact on agriculture and allied activities. Given this scenario, for low-income developing countries like those of South Asia with severe resource constraints, it makes sense to concentrate entirely on adaptation rather than on mitigation efforts.

6.1 Climate change impacts and trade performance

Greater trade cooperation within South Asia can reduce long-distance trade, which can be helpful in reducing greenhouse gas emissions due to shipping.

The impact on agriculture through different channels will affect the trade performance of South Asian countries. In central India, wheat yields may drop by 2 percent in a pessimistic climate change scenario. Even after accounting for farm-level adaptation, a 2 degrees Celsius rise in mean temperature and a 7 percent increase in mean precipitation will reduce net revenues by 8.4 percent. In Pakistan, cereal crops are already in the margin of stress and wheat yields are predicted to decline by 6–9 percent in sub-humid, semiarid and arid areas with a 1 degree Celsius increase in temperature, while even a 0.3 degree Celsius decadal rise in temperature could have a severe impact on important cash crops like cotton, mango, and sugarcane. In Sri Lanka, a 0.5 degree Celsius temperature rise is predicted to reduce rice output by 6 percent, and increased dryness will adversely affect the yields of key products like tea, rubber and coconut (Kelkar and Bhadwal 2007).

Climate change is likely to increase the frequency of droughts and extreme rainfall events leading to floods and cyclones. Bangladesh is already badly affected by such events, with crops being destroyed on a regular basis. Many other parts of South Asia are also affected from time to time. Several studies have shown that fluctuations in monsoon and temperature are important determinants of the productivity of several crops grown in the region. In Bhutan and Nepal, it is expected that increased severity and frequency of storms and floods could aggravate the occurrence of landslides, which, in addition to the danger posed to life and property, would deposit sediments in agricultural lands, irrigation canals and streams, contributing to the deterioration in the quality of agricultural lands and affecting crop production (Kelkar and Bhadwal 2007).

Agriculture and allied activities, on average, constitute about 25 percent of Sri Lanka's exports and 20 percent of Pakistan's exports. The share of agricultural goods in the Indian export basket is much lower and has been less than 15 percent in recent years.[17] However, for both India and Pakistan, agriculture generates indirect exports as both export textiles and textiles products, which are based primarily on domestically produced cotton. The share of agricultural goods in Bangladesh's export basket is not very high and it is a net food-importing country. Food items constitute about 12 percent of Bangladesh's import basket. In Nepal, the shares of agricultural products in exports and imports are about 25 and 20 percent, respectively. However, Nepal is a net food-importing country.

South Asian countries may do their bit in mitigating climate change at the national level as well as collectively at the regional level. In fact, regional efforts can be more effective than isolated national efforts. Such efforts can take the form of greater cooperation on trade, transit and energy. Greater trade cooperation within South Asia can reduce long-distance trade, which can be helpful in reducing GHG emissions due to shipping. It is also noteworthy that some of the trade between India and Pakistan takes place not directly but through the UAE. Similarly, a part of the trade between India and Bangladesh is transited through Singapore. In the absence of transit facility through Bangladesh, India's north-

eastern states currently use a longer and circuitous route that involves greater use of fossil fuels and emissions. Better transit facilities within the region can also go a long way towards reducing emissions.

6.2 Case for energy cooperation

While it is true that forcing developing countries to adopt mitigation measures may impose undue burden on them, they may not ignore this issue altogether. Many developing countries, including those in South Asia, are quite vulnerable in terms of their energy security. Importantly, energy prices are likely to be on an upward path in the long run. At the current rate of production, oil will last for about 40 years only. But while consumption of oil is growing fast, major oil companies have been downgrading their own reserve estimates. They have also failed to add any major new finds over the last decade or so. In effect, global oil consumption is growing faster than finds.

About 100-odd countries have oil reserves. Of these, about 60 countries, including the US, Russia, the UK and Norway, are well past their peak production. By 2030, all countries will be past their peak production while global production will reach its peak around 2020. Hence, the fall in global oil prices due to the global economic crisis since 2008 is likely to be temporary. The reserve-production ratio for natural gas is about 60 years. Again, it is unlikely that new gas finds will be large enough to offset the rate of increase in production and consumption (Nanda 2008b). It is believed that the reserves of coal are much larger and may last for 180 years, but extracting coal would be much more difficult due to socio-economic as well as environmental reasons.

Energy prices may start shooting up even by 2020. Prices could rise so much that a large section of poor countries and poor people will be priced out of the market (Nanda 2008b). Considering such a scenario, developing countries must have an active and vigorous programme to promote energy efficiency and alternative energy. Moreover, while fossil fuels are going to see higher prices on a long-term basis, the prices of renewable energy are going to decline. This is where there is great scope for the South Asian countries to cooperate in mitigating climate change and its adverse impacts.

The South Asian region is poorly endowed with conventional energy resources. It accounts for more than one fifth of the world population, but its share of global oil reserves is about 0.6 percent and its share of global natural gas reserves is about 1.4 percent only. Its share of global coal reserves is relatively better, at about 10 percent, but still much lower compared to its population. In 2004, the region accounted for about 6 percent of global energy consumption. In the same year, the region's total primary energy supply was about 688.51 million ton oil equivalent (Mtoe), of which only about 557.5 Mtoe (80.97 percent) was produced in the region.

Greater regional cooperation in renewable energy will not only improve energy security and economic development in South Asia, but also reduce the carbon intensity of production and consumption.

About 38 percent of this energy, however, came from non-commercial sources like wood, animal waste and other biomass, which came almost entirely from within the region. Thus, external dependence of the region for commercial energy was much higher, at about 31.7 percent. The issue of energy cooperation in South Asia, therefore, has to be seen in the context of efficiency in management and use of renewable energy resources.

Greater regional cooperation in South Asia in the energy sector, particularly in renewable energy, will not only improve energy security and economic development in the region, but also reduce the carbon intensity of production and consumption. This will also reduce the likelihood of attracting trade measures on exports that some developed countries are contemplating. Even in a scenario of proliferating carbon standards and labelling due to private initiatives, the likely impacts on exports from South Asian countries could be less.

Table 6.1 Sources of electricity generation, 2007 (TWh)

	Coal	Oil	Gas	Hydro	Other	Total
Afghanistan				1		1
Bangladesh	2		21	1		24
Bhutan				3		3
India	549	33	67	124	30	803
Nepal				3		3
Pakistan		31	33	29		96
Sri Lanka		6		4		10
South Asia	551	70	121	165	30	937

Source: International Energy Agency Database.

6.2.1 Trade in electricity and gas

The region generated about 937 trillion-watt hours (TWh) of electricity in 2007 (Tables 6.1 and 6.2). About 86 percent of this was generated in India. However, almost all countries except Bhutan have shortage of electric supply. Pakistan also has nominal surplus but considering that a large section of the population does not have access to electricity, such surplus is of little significance. Since trade in electricity in the region is quite limited, the production pattern also reflects the consumption pattern across countries. Consumption patterns, however, are by no means reflective of demand patterns as there could be excess demand in most countries.

Fossil fuel powers about 79 percent of electricity generation in the region, with coal contributing about 59 percent. India depends predominantly on coal while Bangladesh and Pakistan are dependent largely on gas. Nepal and Bhutan depend almost entirely on hydropower for electricity generation. Pakistan and Sri Lanka get a significant share of electricity from hydropower. Sri Lanka is, however, the only country in the region which has high dependency on oil as it does not have coal or gas reserves, and does not have facilities to import gas.

Since the region is not well endowed with fossil fuel reserves, harnessing its hydroelectric potential is of crucial significance. Globally, the potential of hydroelectricity generation is about 13,000 TWh per year, of which about 1,083 TWh (about 8 percent) is in South Asia. In 2007, the region utilized just about 15 percent of this potential. South Asia has been able to create an installed hydroelectric capacity of 44,847 megawatts (MW), which is just about 10.3 percent of the potential capacity (Table 6.3).

Sri Lanka has almost exhausted its hydroelectric capacity. The capacity of Bangladesh is quite low and almost exhausted. Hence, much of the additional capacity would come from other countries, with the largest share coming from India. But tapping the unutilized potential would be relatively easier in Afghanistan, Bhutan and Nepal as their current utilization levels are very low. They have greater capacity of picking up the low-hanging fruits. Incidentally, these are also the countries in the region that can generate surplus electricity only through hydropower. For example, the current installed capacity in Bhutan is about 1,000 MW as against the potential of about 30,000 MW. Still Bhutan is the only country in the region to have a substantial surplus in capacity and generation.

The potential capacities in Afghanistan, Bhutan and Nepal cannot be utilized without outside support. Bhutan today has substantial surplus capacity that has been developed largely with outside support, particularly from India. Hydropower contributes more than 13 percent of its gross domestic product and about 80 percent of its export earnings. It also brings almost half of the government

Table 6.2 Installed electricity generation capacity (MW)

	Thermal	Hydro	Other	Total
Afghanistan	377[a]	392		769
Bangladesh	5045[b]	230		5,275
Bhutan		978		978
India	88,216[c]	34,391	14,295	136,902
Nepal	53[d]	590		643
Pakistan	12,423[e]	6,494	425	19,342
Sri Lanka	658[d]	1,772	5	2,435
Total	106,772	44,847	14,725	166,344

a Oil/gas-based; b mainly gas-based; c coal-based = 72,432; gas-based = 14,582 and oil-based = 1202; d mainly oil-based; e coal-based = 150 and gas/oil-based = 12,273.
Figures are for 2006.

Source: Compiled/estimated from various sources.[18]

revenue and is a critical source of funds for improvements in health and education. No wonder, King Wangchuck of Bhutan once said: "Water is to us what oil is to the Arabs." The Bhutanese success story can easily be replicated in Nepal. This would also be the best way to fight poverty (Weiss 2005).

Seasonality in power supply and demand over a year as well as variations in demand within a day can also be the source of complementarity and cooperation (Lama 2004). In Bhutan and Nepal, the peak demand is usually during December-January and is minimum during the months of August and September. During the months of peak demand, generation from hydropower plants is relatively low. The supply capacity in turn is at the maximum during the wet months of August and September when India is still in its peak demand period. This seasonality mismatch in energy supply and demand is where the complementarity in cross-border power trade emerges.

An integrated regional electricity grid with trading arrangements among the countries can improve efficiency in the entire region. Even if most countries in the region have excess demand for electricity, it nevertheless can be traded. Trade could occur even in such a situation because it reduces the distance between the points of production and consumption, thereby bringing down transmission losses. This is the reason why several countries, including the US, Canada, France, Germany and Switzerland, are all among the top exporters as well as importers of electricity. South Asia, where transmission and distribution losses of electricity are among the highest in the world, will do well if it fosters regional cooperation on energy.

There have been negotiations between India and Pakistan on the possibility of a gas pipeline originating in Iran and Central Asian countries and passing through Pakistan. There has also been some progress on cross-border infrastructure projects, such as a memorandum of understanding signed for transmission lines between India and Nepal, and an agreement for an interconnecting submarine electricity cable between Sri Lanka and India. A recent study has also found that for Bangladesh, it is viable to import electricity from India (World Bank 2007b). All of these point to the great potential for regional collaboration on energy. Such collaboration can bring about a win-win situation for all. For exporting countries, it will mean substantial revenue that could be used for development purposes. As of now, Nepal maintains substantial trade deficit both globally and with India. As with Bhutan, harnessing hydroelectric potential can turn it from a trade-deficit country to a trade-surplus country.

The seasonality mismatch in energy supply and demand gives rise to complementarity in cross-border power trade.

The region is poorly endowed with reserves of natural gas. Hence, trade in natural gas would be limited within the region. Nevertheless, the real benefit in this sector will accrue from a region-wide integrated gas pipeline network. A region-wide gas pipeline network will connect South Asia with Iran, Myanmar and even Central Asia as Afghanistan is also a member of SAARC. Import of liquefied natural gas (LNG) is not only expensive, it also needs substantial investments in LNG import facilities. As of now, Bhutan and Nepal are not using natural gas but they might find it difficult to ignore this option in the future. Though both have substantial hydroelectric capabilities, they might like to have gas as a cleaner fuel to run vehicles and

Table 6.3 Potential and actual hydropower generation

	Potential capacity '000MW	Installed capacity (2006) '000MW	Annual generation potential TWh/Yr	Actual generation (2007) TWh/Yr
Afghanistan	18.4	0.39	55	1
Bangladesh	0.78	0.23	2	1
Bhutan	30	0.98	70	3
India	301	34.39	660	124
Nepal	44	0.59	158	3
Pakistan	40	6.49	130	29
Sri Lanka	2	1.77	8	4
South Asia	436.175	44.85	1083	165

Source: Compiled from various sources.[19]

for other uses. Connecting Sri Lanka with India through gas pipelines will not be difficult. Enabling Sri Lanka to use gas for electricity generation as well as fuelling vehicles will be helpful to it both in terms of costs and reduction of carbon emissions as it is using oil for electricity generation as well. India's difficulties as well as apprehensions about getting gas pipelines through Pakistan and Bangladesh may get mitigated to some extent if it looks for a regional network, including even Nepal and Bhutan, rather than bilateral arrangements.

6.2.2 Biomass and renewable energy

Biomass-based energy can play an important role in promoting energy security and in poverty reduction, and can also have positive environmental effects.

Biomass-based energy contributes about 9 percent of global energy consumption but is the primary source of energy for about 2.5 billion people. In South Asia, its share is about 38 percent and is the primary source of energy to the majority of the rural population (Nanda and Goswami 2008). Biomass can deliver energy in all forms—solid, gas and liquid—and can be converted to electricity, heat and mechanical power. This source of energy can, thus, play an important role in promoting energy security and in poverty reduction, and can have positive environmental effects in terms of restoration of degraded land, water retention, etc. However, the way such energy is used in most South Asian rural households is not only inefficient as much of the energy generated is wasted, but is also hazardous to health. The problem can be taken care of to a large extent through the use of gasification technology. It fulfils the same purpose as fossil fuels but at a much lower cost.

Though this source is getting stretched due to increasing energy demand in rural areas, it will still be easily available in significant quantities and may remain the most economic alternative in rural and remote areas. Once the major source of energy everywhere, developed countries abandoned it in favour of fossil fuels during their industrialization. However, India has worked to make this source more efficient and cleaner. Today, India is the pioneer in biogas, gassifier and cook stoves. However, there is significant scope for further improvements in technology in this area. India can share this technology with its neighbours, which will be useful for them both in terms of raising efficiency as well as reducing carbon emissions. Regional cooperation can also be useful in promoting research for further development of this technology.

South Asia has a reasonably good potential in renewable energy like solar and wind power. The potential for wind power in South Asia is estimated to be in the range of 150,000-200,000 MW mainly in India, Pakistan and Sri Lanka.[20] Only a fraction of this is being utilized now, mostly in India. The installed wind power capacity in India is about 7,000 MW, the highest in Asia. India has also developed a good manufacturing capability in wind power generators, and exports these to several countries. However, Bhutan and Nepal have relatively low potential in solar and wind power.

Similarly, South Asia has a huge potential in solar energy generation, which is estimated to be more than 300,000 MW.[21] Afghanistan, Nepal and Pakistan have good potential, apart from India. But the current utilization level is extremely low. Here also, India is much ahead of its neighbours in solar power generation, and the development of solar power technology and products. It has a strong manufacturing base for modules/systems and, increasingly, SPV cells. India is, in fact, one of the pioneers in solar thermal products. Indian box-type solar cookers are considered to be the best in the world and solar water heaters, absorbers and coolers are also of global quality. It has also developed solar harvest processing and water pumping systems, appropriate for Indian use but suitable for other countries in the region as well.

Other South Asian countries can benefit by collaborating with India on such technologies. Moreover, development of these technologies and their use in India

has been greatly facilitated by appropriate policy measures such appropriate energy and fiscal policies. This is another area where countries in the region can benefit by sharing experiences with one another.

Issues for discussion

- What strategies and actions should SAARC take for efficient use of biomass for energy generation?
- What concrete measures should SAARC take to promote regional trade in clean energy?

Chapter 7

Conclusion

With climate change gaining world attention, most developing countries are currently dealing with the challenges of engaging at the global level where much of the focus is on mitigation. The real challenge for them, however, is to understand the potential impacts of climate change and to take appropriate adaptation measures. They need to develop technical, institutional and human capabilities to face up to these adaptation challenges. They cannot ignore the issue of mitigation, however. Even though mitigation need not be a priority, particularly in countries with low emissions, it is linked to their energy security. Moreover, since developing countries are relatively more vulnerable, they have significant interest in mitigation efforts made by the global community as a whole. South Asian countries are no exception to this.

Developing countries are also likely to be forced to take some mitigation measures to maintain their trade performance as there has been a proliferation of private initiatives in export destinations that label products as environment friendly. It is not clear if there would be appropriate measures at the WTO or other forums to discipline such measures because some of them are arbitrary, particularly in the case of food miles. Even if rules are adopted in this regard, the question of efficacy still lingers.

Trade measures such as border tax adjustments are likely to be discriminatory and unlikely to serve any useful purpose. It is another matter that such measures would be extremely difficult to implement and might even be disallowed by the multilateral trading regime. In South Asian countries, the export sector is not the major source of GHG emissions. Hence, trade measures are unlikely to be effective in forcing countries to adopt climate change mitigation measures. The US Waxman-Markey Bill proposes that trade intensity will be a factor along with energy intensity in determining the sectors that may be eligible for trade measures. However, such measures are bound to create controversy.

Competitiveness concerns are best addressed through international agreements rather than unilateral measures. Policies such as the output-based rebating as proposed in the US may not face strong opposition as do border tax adjustments. However, there are difficult design issues and, importantly, such measures may not be compatible with WTO subsidy rules. Border tax adjustments do not fully counterbalance competitiveness issues since the manufacturers in the imposing country would still be at a disadvantage in global markets. Moreover, the affected countries might adopt retaliatory measures which could vitiate the global atmosphere and endanger the spirit of cooperation that might be required to tackle the problem of climate change. Since most developing countries are operating well below their bound tariff rates in most product lines, retaliatory actions may not be difficult to initiate.

Competitiveness concerns are best addressed through international agreements rather than unilateral measures.

There have been some concerns that if sufficient progress is not made at the UNFCCC and the WTO in resolving

the relevant issues, then the potential unilateral trade measures initiated by developed countries might be legitimized. However, this is unlikely to make developing countries rush towards a multilateral settlement of such issues if they are not convinced that it will be in their national interests. After all, trade measures, if at all adopted, are likely to impact only a segment of their economy, but commitments at the multilateral level will impact the whole economy.

Integrated electricity grid and trade among countries will improve efficiency, which might reduce emissions to some extent.

The issue of climate change has already entered the WTO arena through its discussion on trade and environment. In such discussion, the major focus is on liberalization of trade in environment- or climate-friendly goods. However, there are difficulties with this approach. It is difficult to define environment- or climate-friendly goods. Moreover, it is not clear to what extent such an approach will contribute to achieving environmental or climate objectives.

Surprisingly, climate change has not been an issue of enough discussion in the context of the TRIPS Agreement, which has major implications for access to technologies that will be important for climate change mitigation and adaptation. Some developing countries have proposed a more liberal IPR regime, including relaxation of the compulsory licensing framework. As expected, developed countries, the US and the EU in particular, have opposed it. It should be noted that compulsory licensing alone may not do much and, hence, other measures will also be required.

South Asian countries, of course, can do their bit for climate change adaptation and mitigation through greater regional cooperation. Greater trade cooperation, even if it creates some trade diversion, may contribute to climate change mitigation. An important step at the regional level will be intensive cooperation in the energy sector. Integrated electricity grid and trade among countries will improve efficiency, which might reduce emissions to some extent. Cooperation will also increase the share of hydropower and other renewable energy in the energy basket of the region as a whole. This will also help South Asian countries face the challenges of possible emissions-related trade barriers in developed-country markets. It goes without saying that there are many commonalities in the kinds of vulnerabilities that they are likely to face in the context of climate change. This makes an excellent case for intense cooperation for climate change adaptation.

Endnotes

[1] The Annex B countries are largely similar to the Annex I countries in the UNFCCC, except that some members of the UNFCCC, like the United States, were not party to the Kyoto Protocol.

[2] Carbon leakage is defined as the increase in CO_2 emissions outside the countries taking domestic mitigation actions. It is argued that an increase in local fossil fuel prices resulting, for example, from mitigation policies may lead to the re-allocation of production to regions with less stringent mitigation rules (or with no rules at all), leading to higher emissions in those regions and, therefore, to carbon leakage. This also means that countries that adopt mitigation measures lose competitiveness as their costs of production increase compared to countries that do not adopt such measures.

[3] US-Superfund, United States – Taxes on Petroleum and Certain Imported Substances, Panel Report, 17 June 1987, L-6175.

[4] The Jevons paradox, also known as the Jevons effect, is the proposition that technological progress that increases the efficiency with which a resource is used tends to increase the rate of consumption of that resource. In 1865, the English economist William Stanley Jevons observed that technological improvements that increased the efficiency of coal use led to increased consumption of coal in a wide range of industries.

[5] United States v. Besser Mfg. Co (1952); 343 U.S. at 477.

[6] United States v. Glaxo Group Ltd; 410 U.S. 52, 64 (1973).

[7] United States v. General Electric Co (1953); 115 F. Supp. 835, 843-46 (D.N.J. 1953).

[8] United States v. Microsoft, 87 F. Supp. 2d 30 (D.D.C. 2000).

[9] www.epa.gov/fedrgstr/EPA-AIR/1994/December/Day-30/pr-251.html (accessed 22. 07.08).

[10] NDC Health v. IMS Health: Interim Measures, Case COMP D/338.044 (3 July 2001).

[11] Article 30 allows members to provide limited reasonable exceptions to the exclusive rights conferred by a patent, if it does not unreasonably prejudice the legitimate interests of the patent owner and takes into account the legitimate interest of third parties.

[12] Article 8, TRIPS Agreement.

[13] www.wto.org/english/tratop_e/trips_e/pharmpatent_e.htm

[14] The Carbon Trust is an independent organization established by the UK Government in 2001 to work with business and the public sector to reduce carbon emissions and capture the commercial potential of low-carbon technologies.

[15] PAS 2050 is a specification for the assessment of the life cycle GHG emissions of goods and services.

It provides an agreed method of assessing product GHG emissions with links to existing standards (ISO14040-44, 14064 & 14025).

[16] This is being discussed within the framework of the Marine Pollution Convention, MARPOL 73/78, of the International Maritime Organization (www.imo.org).

[17] Based on the data available from government sources in these countries.

[18] Hydrocarbon Development Institute of Pakistan. 2005. Pakistan Energy Yearbook 2005; Ministry of Energy & Water, Islamic Republic of Afghanistan. Power Sector Strategy for the Afghanistan National Development Strategy 2007; Ministry of Power & Energy, Government of Sri Lanka (www.mope.gov.lk); Ministry of Power, Government of India (www.powermin.nic.in); Nepal Electricity Authority Fiscal Year 2006/07 – A Year in Review; Power Cell, Power Division, Ministry of Power, Energy & Mineral Resources, Government of Bangladesh (www.powercell.gov.bd/)

[19] Hydrocarbon Development Institute of Pakistan. 2005. Pakistan Energy Yearbook 2005; SARI/Energy Program. Regional Energy Security for South Asia: Regional Report. Cited in Thapa, Bishal, Amit Sharma and Rashika Gupta. 2007. Prospects for Energy Integration. *Himal South Asian*, April.

[20] Alternative Energy Development Board, Government of Pakistan (www.aedb.org/currentstat_solarthermal.php); Asia Cleantech (http://asiacleantech.wordpress.com); Ministry of New and Renewable Energy of India (http://mnes.nic.in); Schillings et al. (2004); United Nations Environment Programme (www.unep.org/Documents.Multilingual/Default.asp?DocumentID=430&ArticleID=4771&l=en).

[21] *ibid.*

Annex 1

Suggested list of climate-friendly goods

HS code	Product description
392010	PVC or polyethylene plastic membrane systems to provide an impermeable base for landfill sites and protect soil under gas stations, oil refineries, etc. from infiltration by pollutants and for reinforcement of soil
560314	Non-wovens, whether or not impregnated, coated, covered or laminated: of man-made filaments; weighing more than 150 g/m2 for filtering wastewater
701931	Thin sheets (voiles), webs, mats, mattresses, boards, and similar nonwoven products
730820	Towers and lattice masts for wind turbine
730900	Containers of any material, of any form, for liquid or solid waste, including for municipal or dangerous waste
732111	Solar driven stoves, ranges, grates, cookers (including those with subsidiary boilers for central heating), barbecues, braziers, gas-rings, plate warmers and similar non-electric domestic appliances, and parts thereof, of iron or steel
732190	Stoves, ranges, grates, cookers (including those with subsidiary boilers for central heating), barbecues, braziers, gas-rings, plate warmers and similar non-electric domestic appliances, and parts thereof, of iron or steel—parts
732490	Water saving shower
761100	Aluminum reservoirs, tanks, vats and similar containers for any material (specifically tanks or vats for anaerobic digesters for biomass gasification)
761290	Containers of any material, of any form, for liquid or solid waste, including for municipal or dangerous waste
840219	Vapor generating boilers, not elsewhere specified or included hybrid
840290	Super-heated water boilers and parts of steam generating boilers
840410	Auxiliary plant for steam, water, and central boiler
840490	Parts for auxiliary plant for boilers, condensers for steam, vapor power unit
840510	Producer gas or water gas generators, with or without purifiers
840681	Turbines, steam and other vapor, over 40 MW, not elsewhere specified or included
841011	Hydraulic turbines and water wheels of a power not exceeding 1,000 kW
841090	Hydraulic turbines and water wheels; parts, including regulators
841181	Gas turbines of a power not exceeding 5,000 kW
841182	Gas turbines of a power exceeding 5,000 kW
841581	Compression type refrigerating, freezing equipment incorporating a valve for reversal of cooling/heating cycles (reverse heat pumps)

841861	Compression type refrigerating, freezing equipment incorporating a valve for reversal of cooling/heating cycles (reverse heat pumps)
841869	Compression type refrigerating, freezing equipment incorporating a valve for reversal of cooling/heating cycles (reverse heat pumps)
841919	Solar boiler (water heater)
841940	Distilling or rectifying plant
841950	Solar collector and solar system controller, heat exchanger
841989	Machinery, plant or laboratory equipment whether or not electrically heated (excluding furnaces, ovens etc.) for treatment of materials by a process involving a change of temperature such a heating, cooking, roasting, distilling, rectifying, sterilizing
841990	Medical, surgical or laboratory stabilizers
848340	Gears and gearing and other speed changers (specifically for wind turbines)
848360	Clutches and universal joints (specifically for wind turbines)
850161	AC generators not exceeding 75 kVA (specifically for all electricity generating renewable energy plants)
850162	AC generators exceeding 75 kVA but not 375 kVA (specifically for all electricity generating renewable energy plants)
850163	AC generators not exceeding 375 kVA but not 750 kVA (specifically for all electricity generating renewable energy plants)
850164	AC generators exceeding 750 kVA (specifically for all electricity generating renewable energy plants)
850231	Electric generating sets and rotary converters; wind-powered
850680	Fuel cells use hydrogen or hydrogen-containing fuels such as methane to produce an electric current, through a electrochemical process rather than combustion
850720	Other lead acid accumulators
853710	Photovoltaic system controller
854140	Photosensitive semiconductor devices, including photovoltaic cells whether or not assembled in modules or made up into panels; light emitting diodes
900190	Mirrors of other than glass (specifically for solar concentrator systems)
900290	Mirrors of glass (specifically for solar concentrator systems)
903210	Thermostats
903220	Manostats

Source: World Bank (2007a).

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