



» **australian commodities**

06.4 december quarter 2006

GPO Box 1563 Canberra 2601 ❧

telephone +61 2 6272 2000 ❧

[www.abareconomics.com](http://www.abareconomics.com) ❧

ABARE is a professionally independent  
government economic research agency

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ABARE project 1163 ❧

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ISSN 1321-7844

**abare**

> helal ahmmed > +61 2 6272 2146 > hahammad@abare.gov.au

# climate change policies

## integrating developing countries into the architecture of policies

guy jakeman and melanie ford

- > *An environmentally effective, economically efficient and equitable response to the climate change challenge requires a sustainable global effort that must involve active participation by all major emitters, many of which are developing countries.*
- > *In this article, two key issues associated with the participation of developing economies in global response to climate change are explored – transaction costs and preferential treatment to encourage the participation of developing countries.*
- > *In achieving the targeted level of global greenhouse gas abatement assumed in this study and with differential transaction costs, gross domestic product in developed and developing countries in 2050 is projected to fall by 1.1 per cent and 5.3 per cent respectively relative to the reference case. This compares with projected losses of 0.9 per cent and 4.2 per cent in developed and developing countries when transaction costs are assumed to be zero.*
- > *Preferential treatment for developing countries (through a carbon equivalent penalty that is 20 per cent below the level imposed in developed countries) would reduce the cost of climate change mitigation effort for developing countries relative to a globally harmonised carbon equivalent penalty. But this would increase the cost to developed economies.*
- > *To engage developing countries effectively in any substantive policy response mechanism and to minimise the associated transaction costs, the technical, administrative and institutional capacities of many developing economies need to be enhanced. Agreements such as the Asia Pacific Partnership on Clean Development and Climate could play an important role in assisting to build such capacity.*

### introduction

The objective in this article is to explore some key issues involved in integrating developing economies into a global climate change response policy framework.

An environmentally effective, economically efficient and equitable response to the climate change challenge requires a sustainable long term global effort. While there is increasing recognition that an effective response to climate change must involve active participation by all major emitters, many of these are developing economies.

The varying levels of economic, social, technological and institutional development in different regions in the world require careful consideration when developing a long term

global response to climate change. Other factors that need attention are the differences in domestic infrastructure, industry and trade orientation of individual economies that could influence the costs of mitigating emissions. These costs will affect different countries' ability to mitigate emissions and adapt to the highly uncertain impacts of climate change. As a result, reaching a global agreement on an effective climate change response policy framework is challenging.

### challenges to achieving a globally optimal environmental outcome

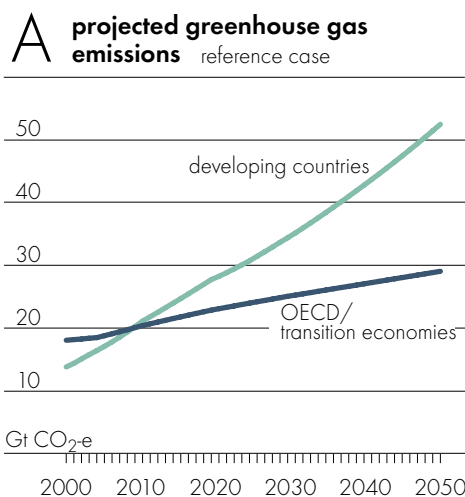
A globally efficient response to climate change requires finding an appropriate long term environmental goal that minimises the net costs of climate change damage after accounting for the net mitigation and adaptation costs. However, there are many uncertainties associated with establishing both the extent and scope of climate change damage and the costs and benefits of mitigation and adaptation. Hence, any long term mitigation targets should be determined using the principles of 'adaptive management'. This would allow the long term environmental goals or targets to be refined as more information becomes available; it would also give domestic industries in individual economies a degree of long term policy certainty.

An appropriate global response to the climate change challenge should aim to attain a given environmental outcome at least cost. To be environmentally effective and economically efficient, the development of a global policy framework must involve mitigation by **all** major emitters, including the key developing economies. Effective adaptation management should also be combined with the widespread deployment of cleaner, less emissions intensive technologies.

Some of the formidable challenges in reaching a global consensus on an environmentally effective, economically efficient and equitable global policy arise from the global and long term nature of the climate change issue. The varying circumstances of the individual regions around the world also mean that there are significant differences in these regions' abilities to mitigate emissions and adapt to climate change.

### global nature of climate change

Because greenhouse gases are long lived and well mixed in the atmosphere, emissions affect the environment in similar ways regardless of their location or source. Hence, any policy framework must include all major emitters (ideally, **all** emitters). As shown in figure A (based on Matsysek et al. 2006), developed countries (including economies in transition) currently contribute around 60 per cent of global greenhouse gas emissions (excluding land use change emissions). Importantly, however, this situation is projected to reverse over the next few decades. By 2050, the current developing countries are projected to emit over 60 per cent of global greenhouse gas emissions. Within the next two to three years, India is projected to overtake the Russian Federation as the world's third largest emitter of greenhouse gases, while China is projected to overtake the United States as the world's largest emitter (Matsysek et al. 2006).



Clearly any policy framework must include these regions to have any significant environmental impact in the long term.

### long term stock issue

Major greenhouse gases, such as carbon dioxide, are 'stock pollutants' that remain in the atmosphere for several to tens of decades before they disappear. Most projected impacts of anthropogenic emissions of greenhouse gases are the result of the accumulation of greenhouse gases (including those resulting from past industrialisation) in the atmosphere rather than annual emissions. Hence, while large short term abatement efforts are associated with fairly significant near term costs, the benefits associated with abatement action will only accrue in the very long run (Stern 2006; Victor 2004).

### incorporating developing countries in the global policy framework

Given the significant uncertainty over the geographic spread and duration of potential climate change impacts, as well as over potential local adaptation strategies, the current global policy discussion has been focused almost exclusively on emissions mitigation. Accordingly, the global climate change response policy discussed in the rest of the article deals only with emissions abatement.

### transaction costs

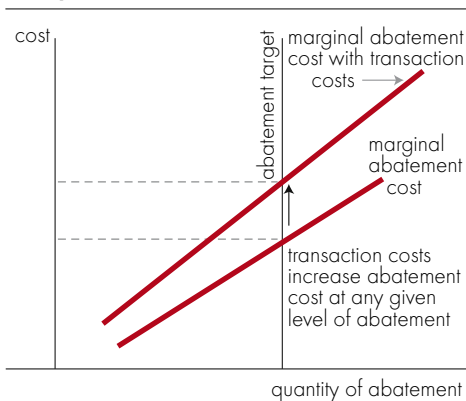
Efficient and effective implementation of a global abatement policy involving an emissions trading or a carbon equivalent penalty scheme will require appropriate institutional frameworks and infrastructure. In turn, this will require administrative apparatus for measuring, monitoring and ensuring compliance of the agreed scheme. Hence, implementation of a global emissions trading or a global carbon equivalent penalty scheme will involve

#### box 1 collecting accurate energy statistics

A common challenge in analysing energy production and consumption in some developing economies has been the uncertainty over official statistics. For example, in China, there were significant differences in official statistics for the period 1997-2002 between the quantity of coal produced and the quantity implied by consumption statistics. By 2000, the extent of the deviation was so great that total Chinese coal production implied by the consumption statistics was at least 230 million tonnes (around 25 per cent) greater than the official production statistics. Eventually it was found that the deviation in the production and consumption statistics was largely caused by underreporting of production from thousands of small coal mines. These coal mines had been ordered to be shut down by the central government in 1997 but because there were supply shortages these mines continued to produce (illegally). Allured by the tax revenue, local governments in coal mining regions simply underreported the coal production and consumption in their geographic boundaries. Acute staffing shortages meant that the National Bureau of Statistics struggled to compile the energy statistics, let alone conduct audits to validate the data. Weak enforcement of the Statistics Law and deficient statistical survey methods are other reasons cited in the literature (Jianjun 2006; Xueyi 2004).

These challenges highlight not only the difficulty in collecting accurate statistics but also the difficulty that governments have in enforcing their laws. This is a particular challenge for developing policy frameworks that are reliant on accurate estimates and projections for emissions and on reliable monitoring and enforcement of abatement actions.

**B marginal abatement cost in the presence of transaction costs**



the level of abatement for any given abatement budget (figure B). Transaction costs will arise under any greenhouse gas abatement program or agreement. They include the costs of: searching for and negotiating with appropriate emissions trading parties or emissions abatement investors; approving abatement actions; monitoring and verifying abatement actions, including the determination of baseline emissions; insurance; and costs associated with enforcing the agreement.

Although transaction costs are not necessarily a major determinant of whether or not a country will participate in abatement action (but may affect the extent of their effective participation), they can be a significant determinant of the degree of effectiveness of particular climate change policy architecture. For example, the integrity of an international emissions trading system fundamentally relies on the basic property that all emission credits have the same probability of abatement actually occurring. Consequently, unless a sophisticated derivatives market is developed that can help stakeholders manage the risk associated with compliance problems, it will be necessary for all participating countries to have similar monitoring and enforcement effectiveness to have an effective outcome (Hinchy et al. 1998).

Furthermore, even if monitoring and enforcement effectiveness can be harmonised across all participants, it is likely to require a supranational authority that can administer penalties for noncompliance. This, in turn, is likely to require sovereign nations to relinquish some of their authority. These issues are not trivial and are likely to influence the effectiveness of any policy framework that relies on international emissions trading without accounting for the potential transaction costs.

**preferential treatment for developing countries**

Because of equity considerations and other development and social priorities, and also the issue of the accumulation of greenhouse gases resulting from past industrialisation, most developing countries are currently reluctant to participate in any substantive domestic or global abatement policy. To encourage their participation, various concessions and/or preferential policies may need to be considered, particularly during the early stage of the implementation of a global climate change response policy.

Possible concessions and/or preferential policies may involve lower carbon equivalent penalties and/or phasing in a given abatement task over an extended period for devel-

a range of associated transaction costs. These include both the costs of administering the scheme and the costs of complying with the rules of the scheme.

Transaction costs are generally recognised to be higher in developing countries since, generally, these countries do not have sufficient capacity and resources to establish appropriate institutions to gather accurate statistics or to enforce sufficient compliance. Such capacity is necessary for any abatement policy to be effective (see box 1 for an example).

Transaction costs increase the marginal cost of abatement over what it would otherwise be without such transaction costs for any given level of abatement. Conversely, transaction costs reduce

oping countries relative to the developed countries. Such forms of concession or preferential arrangement are not uncommon in internationally agreed policy arenas where both developing and developed countries collectively aim to achieve common economic and/or trade policy reform objectives. For example, during international agricultural trade negotiations, some of the negotiating proposals put forward involved developing countries reducing tariffs on farm products by two-thirds of those for developed countries, and for reforms to be phased in over ten years for developing countries and over five years for developed countries (Nair et al. 2006).

## implications of transaction costs and preferential treatment of developing economies

The economic implications of two particularly important issues in integrating developing economies into a global climate change mitigation policy framework are analysed here. The first issue relates to accounting for the transaction costs associated with any global climate change mitigation effort; the second covers consideration of the possible preferential treatment of developing countries. The two issues broadly reflect the imperfections that are likely to emerge in the design of any global climate change response policy framework.

### three scenarios analysed

To quantify the implications of the two possible ‘imperfections’ in a global climate change mitigation policy design, three illustrative policy scenarios are analysed using ABARE’s global trade and environment model (GTEM):

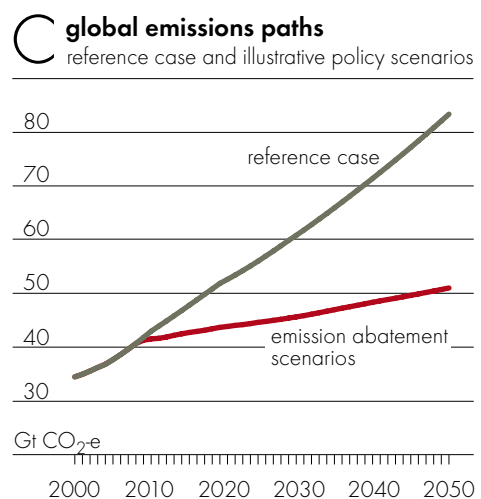
- > a globally harmonised carbon penalty with ‘zero’ transaction costs
- > a global carbon penalty with differential transaction costs between developed and developing countries
- > a global carbon penalty with preferential treatment for developing countries.

### key assumptions

In all the illustrative policy scenarios chosen, the same abatement target was assumed. In each policy scenario, economies of the world are assumed to impose a carbon equivalent penalty from 2010 on all sectors and greenhouse gases. The aim of the penalty is to reduce global emissions to a level consistent with stabilising the atmospheric concentration of carbon dioxide at 575 parts per million (ppm) by 2100 (figure C). This level was chosen as it is indicative of the future potential stabilisation ranges reported in the literature (IPCC 2001); it should not be interpreted as a policy prescription.

The reference case in figure C represents an emissions path for the world in which technological development and government policies progress along their likely paths in the absence of any significant emissions reduction policies – see Matysek et al. (2006) for a detailed description of the reference case.

To attain the carbon dioxide concentration target assumed in this analysis, the carbon equivalent



penalty is assumed to induce the adoption of a wide range of emission abatement technologies. For energy generation and use, for example, technology options may include adopting technologies that provide enhanced efficiency in intermediate and end uses of energy, shifting from fossil fuel based electricity generation toward renewables and nuclear power, as well as implementing carbon capture and storage technologies for electricity generation.

Reflecting the uncertainty over the geographic spread and duration of the benefits of avoided climate change, only the mitigation costs were considered in the following illustrative policy scenarios.

**a globally harmonised carbon penalty with zero transaction costs**

In this scenario, each region in the world is assumed to impose a uniform carbon equivalent penalty from 2010 on all sectors and greenhouse gases in order to meet a required abatement task. The scenario represents the least cost global mitigation policy to meet a given global emissions abatement target under the assumption of no transactions costs.

**a global carbon penalty with differential transaction costs**

In this scenario, the carbon equivalent penalty required to meet the specified abatement task is assumed to increase such that by 2050 the carbon equivalent penalty in developed and developing countries is 10 per cent and 25 per cent higher, respectively, than in the globally harmonised level under the previous scenario. The higher carbon equivalent penalty in developing economies relative to developed economies is to explicitly recognise the likely differential costs associated with the (sometimes substantial) differences in the institutional arrangements and costs to monitor, enforce and oversee emissions abatement and the likely differential costs of compliance with the rules of any abatement scheme.

**a global carbon penalty with preferential treatment for developing countries**

In this scenario, the economic implications of offering preferential treatment to developing economies in meeting a specified global abatement task are assessed. In particular, it is assumed that the carbon equivalent penalty implemented in developing economies is 20 per cent below the level imposed in developed economies. As a result, developed economies are required to abate more emissions, relative to the level estimated under the globally harmonised carbon equivalent penalty scenario above.

It is important to note that this ‘preferential’ treatment scenario is not intended to be policy prescriptive, rather it is meant only to provide insights into the likely economic implications of any such imperfection in the global climate change response policy framework.

**carbon equivalent penalty under three scenarios**

in 2005 US dollars

	globally harmonised carbon penalty	global carbon penalty with transaction costs		preferential treatment of developing countries	
		developed countries	developing countries	developed countries	developing countries
	US\$/CO <sub>2</sub> -e	US\$/CO <sub>2</sub> -e	US\$/CO <sub>2</sub> -e	US\$/CO <sub>2</sub> -e	US\$/CO <sub>2</sub> -e
2030	38	41	43	44	35
2050	70	77	88	85	68

**carbon equivalent penalty**

The estimated global and regional carbon equivalent penalties under the three illustrative abatement policy scenarios are presented in table 1. In each scenario, the carbon equivalent penalty rises through time as the level of required abatement increases and the lower cost abatement options are exhausted.

Under the globally harmonised carbon equivalent penalty scenario with zero transaction costs, the penalty is projected to rise to US\$70 a tonne of carbon dioxide equivalent (CO<sub>2</sub>-e) in 2050. As expected, the carbon equivalent penalty in developed countries is projected to be higher under the two remaining scenarios than under the globally harmonised policy scenario.

The assumed higher transaction costs in developing countries in the second scenario are expected to raise the carbon equivalent penalty in 2050 to US\$88 per tonne of CO<sub>2</sub>-e (relative to US\$77 per tonne of CO<sub>2</sub>-e in developed countries). On the other hand, the 'preferential' carbon equivalent penalty treatment for developing countries in the third scenario is estimated to lower their carbon equivalent penalty in 2050 to US\$68 per tonne of CO<sub>2</sub>-e (relative to US\$85 per tonne of CO<sub>2</sub>-e in developed countries).

### economic implications

The overall economic impact of the assumed 'imperfections' (scenarios) is measured as percentage deviations in gross domestic product (GDP) from the levels that would otherwise have occurred in the absence of any climate change mitigation policy (that is, the reference case).

As can be seen from table 2, the overall economic impacts would increase over time in response to the rising carbon equivalent penalty. Furthermore, the exclusion of transaction costs would underestimate the overall costs of abatement action.

The loss in GDP by 2050 for developed and developing countries is projected to be higher when the transaction costs are accounted for than when they are not (columns 1 and 2 in table 2). Relative to the reference case in 2050, GDP in developed and developing countries are projected to fall by 1.1 per cent and 5.3 per cent respectively when a global carbon equivalent penalty with differential transaction costs is introduced (compared with the projected loss of GDP of 0.9 per cent and 4.2 per cent in developed and developing countries, respectively, when transaction costs are assumed to be zero).

Preferential treatment of developing economies reduces the cost of climate change mitigation effort for those countries relative to the costs under the globally harmonised carbon penalty scenario but increases the cost of action by developed countries. In other words, under the third scenario, by 2050, GDP in developing countries is estimated to decline by 4.1 per cent, relative to the reference case, compared with a projected loss of 4.2 per cent under the first scenario. On the other hand, the GDP loss in developed countries, relative to the reference case in 2050, under the third scenario is projected to be 1.2 per cent (relative to 0.9 per cent under the first scenario). However, under the particular preferential scheme modeled here, the additional global cost is relatively small under the third scenario compared with the first scenario.

**2** percentage change in real GDP under three scenarios relative to the reference case

	globally harmonised carbon penalty %	global carbon penalty with transaction costs %	preferential treatment of developing countries %
<b>2030</b>			
world	-1.5	-1.8	-1.5
developed countries	-0.7	-0.8	-0.9
developing countries	-2.8	-3.5	-2.6
<b>2050</b>			
world	-2.4	-3.0	-2.5
developed countries	-0.9	-1.1	-1.2
developing countries	-4.2	-5.3	-4.1

## concluding remarks

Any global climate change response policy framework must account for the sometimes substantial differences in infrastructure, governance capacity, legal frameworks and monitoring and enforcement abilities that exist between developing and developed countries, while also working to reduce these differences. For example, attempting to introduce a complex international emission abatement policy mechanism in economies that do not have sufficient capacity and resources to gather accurate statistics or to enforce sufficient compliance will not achieve an environmentally effective or economically efficient outcome. It may also weaken the effectiveness of any such mechanism, leading to participation and compliance problems.

To engage developing countries effectively in any substantive climate change policy response mechanism and to minimise the associated transaction costs, enhanced technical, administrative and institutional capacity in many of these developing economies is required. Hence, improving the capacity of developing countries to participate in a climate change policy response effort needs to be an integral component of any global greenhouse abatement strategy. Broader areas for capacity building may include scientific and technical skills, technology development and transfer, and the establishment of appropriate institutions and governance for both adaptation and mitigation responses.

Building capacity in developing countries requires a concerted collective effort by both developed and developing countries. Bilateral and plurilateral agreements such as the Asia Pacific Partnership on Clean Development and Climate could also play an important role in this.

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