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The Kyoto Protocol and Sustainable Development

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The Kyoto Protocol and Sustainable Development

Shaheen Rafi Khan

Abstract

On the basis of their present and projected per capita emissions, developing countries are not likely to be key players in global warming with such emissions being well below the global average. This paper argues that developing countries have no intrinsic reason to buy into the 'mitigation groundswell' driven by Northern global warming concerns, of which the clean development mechanism (CDM) is the most recent manifestation. On the other hand, the local consequences of GHG emissions present more compelling evidence for Pakistan to make an effort to abate such emissions. Also, market incentives and the complex north-south dynamics associated with CDMs will either induce or compel the South to buy into the CDM process. At that stage, it should come armed with its own menu of options – one driven by sustainable development concerns.

1. The politics of the Kyoto Protocol (KP)

The United Nations Framework Convention on Climate Change (UNFCCC) adopted in 1992 and ratified in 1994, was an important first step towards framing a global response to climate change. The UNFCCC goal is to "protect the climate system for present and future generations by seeking to stabilize greenhouse gas concentrations in the atmosphere at a level preventing dangerous anthropogenic interference with the climate system." The UNFCCC charter articulates specific principles as a basis for future action on climate issues. These include equity, sustainable development, reducing vulnerability of developing countries and the need to take precautionary measures preceding scientific certainty.[1] In particular, Article 4 of the Convention forcefully espouses developed country action in mitigating climate change.

The third meeting of the Conference of Parties (COP-3) in Kyoto in 1997 formulated practical steps aimed at making the UNFCCC principles operationally meaningful. The meeting concluded with 160 countries signing the Kyoto Protocol (KP). The KP covenants included mandatory emission cuts and various mechanisms, guidelines and criteria for implementing them:

- Annex 1 countries (industrialized countries and countries in transition) were required to reduce their greenhouse gas emissions (GHG) by an average 5.2% below the base year, 1990, over the period 2008-2012. The variance around this average was quite large, with some countries actually enjoying emission entitlements.[2]
- No quantitative emission cuts would be imposed on developing countries in the first phase. But they could comply voluntarily and reap the financial benefits from emissions trading.
- To become binding, the Protocol would need to be signed by 55% of Annex 1 countries, responsible for 55% of total GHG emissions.
- The protocol sanctioned "emissions trading," a generic term for different trading modes (quota and project based). It refers to market-driven transactions where high-emitting countries (which face high costs of curbing emissions) can trade their obligations with low-emitting countries. International Emissions Trading (IET, Article 16, bis) is between KP Annex B (developed

1 For details, see Aslam (Aslam, M.A.: 2000: pp 3-4)
2 See Table 1, page 6 in Najam et al: 1998

country) parties only. Joint Implementation (JI, Article 6) also falls in this category. The Clean Development Mechanism (CDM, Article 12) is a separate category, which allows emissions trading between developed and developing countries, which have no binding emission reduction requirements. There are also more nuanced distinctions: JI and CDM are distinct mechanisms. The general category under which all three fit is the "flexibility mechanisms," though this term is not found anywhere in the treaty.

- Initially emissions reduction efforts would focus on projects in the Energy/Transport, Industry and Waste sectors deferring Land Use, Land Use Change and Forestry (LULUCF) projects to a later date. The reason was that while "sources" were easy to quantify, "sinks" were not. For instance, establishing credible baselines for forestry projects in developing countries could pose methodological problems. However, the "sinks" option was not ruled out.
- An adaptation fund was to be set up to help developing countries cope with the impacts of secular and extreme climatic change. Among many options, one was to tax CDM projects so that a proportion of the funds could be used for adaptation activities in developing countries.

1.1 Reactions to the KP

A key concern underpinning the deliberations of the KP is that the mandatory emission cuts fall far short of those required to slow down the atmospheric accumulation of GHGs. Experts argue that the proposed 5.2 percent reduction is both too little and too late and that emission cuts of greater than 50 percent below 1990 levels are required to arrest global warming effectively in the near future (Hadley Center, 1999). Revised predictions by the IPCC suggest that global warming could increase by as much as 5.8º C over the next 100 years, a far grimmer scenario than envisioned originally. According to Friends of the Earth International (FOEI), the levels of carbon dioxide in the atmosphere, projected to be up 8 percent over 1990 levels by 2010, will be only 0.4 percent lower if all the Kyoto targets are met – not nearly low enough to halt climate change and all its predicted adverse impacts on developing countries. Therefore, the importance of domestic cuts in the North cannot be stressed enough.

Despite its shortcomings, the KP did not enjoy easy passage at subsequent COP meetings (COP 4 through COP 7). The US almost scuttled the proceedings and, ultimately, a watered down version of the original protocol was approved at COP 7 in Marrakesh. The US refused to endorse it. While the north and the south differed on most issues, intra-north accord was absent as well with the US, Japan and Australia taking inflexible positions, while the European Union (EU) was more conciliatory. Similarly, intra-south, some countries such as Brazil, Chile, Argentina, Indonesia and Malaysia bought into CDM mechanisms and voluntary compliance.

With their heavy reliance on carbon-based fuels, most industrialized countries found the prospect of major CO_2 emissions cuts unacceptable. The US proposed to deflect the burden of emission reductions to its existing, new and expanded forests. This alone would provide them with carbon credits equivalent to about 60 percent of their reduction commitments. Along with Japan and Australia, it also lobbied strongly to include LULUCF projects in JI and the CDM. The EU and most developing countries opposed their inclusion. Their objections stemmed from environmental and equity concerns and from the perceived technical difficulties in calculating carbon absorption by soils and plants.

By and large developing countries were equally unhappy with the provisions of the KP. With regard to emissions trading, they preferred to see the North meet the bulk of its commitment through cuts in domestic emissions (up to 80%). Otherwise, the root cause of the problem would be ignored, namely,

unchecked fossil fuel burning. The US, Canada and others favored “unfettered trading”, while the EU proposed a complicated 50-50 system.

A concern was that the CDM could become a vehicle for dumping less than cutting-edge technologies in the South (because they are cheaper) and likely to become redundant some years down the line, leaving the South with the onus of upgrading them. A shift to renewables would allay this concern, and meet the dual objectives of climate protection and sustainable development.

The proposed Adaptation Fund came under scrutiny. While developing countries listed it as one of the main factors for signing the Protocol in 1997, in hindsight they reasoned it would raise the price of CDM projects. and make them less competitive than emissions trading and Joint Implementation in the global carbon credits market. In order to establish a level playing field – and not lose an option they would be compelled to buy into anyway -- developing countries proposed that the adaptation fund be levied on all three mechanisms.

Other, relatively less contentious, issues revolved around legally binding consequences for non-compliance. The suggested options included “borrowing” from future commitment periods, a Compliance Fund that non-complying countries would pay into and, a Compliance Action Plan.

1.2 What did the KP accomplish?

The KP has been signed finally. And, following the World Summit on Sustainable Development (WSSD) in September this year -- notwithstanding the Bush administration's refusal to ratify the Kyoto Protocol on climate change, it accepted language that says nations backing Kyoto "strongly urge" states that have not done so to ratify it in "a timely manner." Further in a move that could “assure the success of Kyoto,” Russia indicated that it expected Moscow to ratify the Protocol soon.

In essence, the achievement is illusory. Because the US is a major emitter, contributing 35% of global equivalent CO_2 emissions, its abstention at COP 8 meant that other countries were able to leverage more concessions both in terms of their quantitative commitments and the manner in which such commitments would be met. The revised protocol is a watered down version of its original self, so much so that many international NGOs, like Greenpeace, fear that the new commitments represent an average increase in emission entitlements by 0.2%.

Specifically, the diluted version of the original KP accepts: a) a reduction in original commitments from 5.2 percent to 2.4 percent; b) the reduction does not have to occur at source but through ‘sinks’ accreditation as well -- industrialized countries can attribute on-going afforestation and reforestation activities towards their reduction targets;[3] c) there are no caps, meaning no restrictions on how much of their emissions industrialized countries must reduce domestically, and how much through emissions trading; d) the caps for sinks projects within the CDM are generous (these are the cheapest type of projects and; e) no restrictions have been laid on coal and gas projects, and no priority given to renewable energy projects.

3 The only way any progress could be achieved was by granting major concessions to countries -- such as Japan and Australia -- that were critical to the process and who now enjoyed even more leverage, courtesy of the US abstaining. Russia also wrung *huge* concessions from the process based on the same dynamic.

2. Is the KP fair? A view from the south

A benchmark for assessing equity is the somewhat idealized southern stance taken by the Centre for Science and Environment (CSE), India. However, it is not an isolated view, and has found related resonances among civil society representatives in the North, such as the Stockholm Environment Institute (SEI). The CSE concludes that the covenants of the Kyoto Protocol (KP) are inequitable and built in them are perverse incentives to pollute. Its proposal, which combines fair entitlements with the principle of convergence, aims to produce equitable as well as effective outcomes.

The drift of the argument is as follows. The KP has allocated entitlements to Annex 1 (developed countries) and transition economies to pollute the environment. These entitlements are implicit in their national commitments to lower emissions, (which amounts to a global 2.4% below the base year, 1990, by the year 2008-2012). In other words, their combined emissions – minus 2.4% -- would become frozen in perpetuity. In this manner, not only will northern countries legitimize their dismal historical record in polluting the planet but will claim credit for doing their bit for global warming as well. As matters stand now, the emissions of one American are equal to those of 25 Indians, 33 Pakistanis, 42 Maldivians, 85 Sri Lankans, 125 Bangladeshis, 250 Bhutanese and 500 Nepalese. Not surprisingly, developing countries feel they still have considerable emissions leeway in order to achieve their development objectives. Also, the relative emissions profile lends a flavor of filibuster to the US insistence that ratification should be predicated upon quantifiable emission targets for developing countries.

Najam et al (Najam and Page: SDPI: 1998) also question the choice of the base year, which, they argue, creates opportunities for "hot air accounting." The argue that huge emission margins have built up since 1990 in Eastern Bloc economies due to the recession and in countries such as Australia as a result of better forestry practices.[4] In contrast, countries like the US have increased their emissions substantially over the same period. Diverging emission trends since 1990 would allow high emitting countries, such as the US, to trade their commitments with countries, such as Eastern Europe and Australia, thanks to their emerging emission margins.[5] Thus, targeted reductions may actually prove to be ephemeral with substantive emission cuts becoming hostage to creative hot air accounting. Also, the pathways to emission cuts are critical. Most industrialized countries would prefer to end-load their emission reductions, which will mean greater additions to carbon concentrations as compared to what they would be if emissions were reduced gradually.

2.1 The Clean Development Mechanism (CDM): Is it equitable?

Three mechanisms provide alternatives for committed emissions cuts for Northern countries: emissions trading, Joint Implementation, International Emissions Trading and the Clean Development Mechanism. All three are based on the concept of paying for the privilege to keep on emitting domestically. This can be done either by buying emissions space from a low-emitting country, as in the case of emissions trading, or by investing in projects that will reduce emissions in another country, taking credit for the emissions reduced. Such mechanisms allow creditor countries to keep on burning fossil fuels in their countries with as much – if not more – latitude than before, while getting credit at the same time for meeting their reduction targets.

The most complete version is the CDM, in as much as it claims to be market-driven and promotes sustainable development. CSE takes issue with both claims. It maintains that CDMs are just a means to

4 In fact, aggregate emissions have actually fallen due to these developments.
5 Also, such margins are not likely to reduce in a hurry due to emission control technologies on the shelf.

ensure that the industrialized countries meet their emission reduction targets -- without actually lowering their own emissions -- at the lowest possible cost. Ostensibly market driven, the proposed arrangements actually are designed to prod developing countries into cutthroat competition for funds. Worse still, developing countries will have bartered away their low-cost options, leaving future generations with the burden of implementing the most expensive cost options by the time they become subject to mandatory emission reductions -- as they surely must, thanks to lack of effective compliance by the North. Thus, rather than the benign instruments they purport to be, CDMs are actually pernicious trading arrangements. The apparent lack of coercion makes them attractive for developing countries. Indeed there is evidence they are buying avidly into it. Countries like Malaysia, Indonesia, and Pakistan already have or are in the process of setting up CDM offices to attract mitigation projects and investments. The race has begun with low cost options being identified and submitted for funding. Projects priced as low as $14 per ton of carbon reduced are being offered, compared to the average $125 per ton it costs to reduce in the US. Seen this way, the proposed mechanisms are not equitable. A fair conjecture could be that many developing countries are buying into CDMs because of their immediate need for foreign exchange.

An opposing view is presented by Cosbey and Kellet (2002),

> One argument put forward by critics of the CDM is that it will allow Northern countries to harvest the low-hanging fruit form the South – the cheap and easy emission reduction options – and gain credits for doing so. If and when the developing countries eventually accept binding commitments to act, the argument goes, they will be left with only the most expensive options (Agarwal, 2000)
>
> From an environmental perspective this is a poor argument, akin to recommending that an athlete deliberately perform poorly so that he or she can more easily show show great improvement later. The problem is that if we wait for the time when developing countries make binding commitments and begin to harvest those cheap opportunities, the interim involves continued environmental degradation and its associated impacts on human health and well being.
>
> The argument is not straightforward from an economic perspective either. For one thing, it assumes a static basket of technologies and management practices available for improving environmental performance. If we assume a dynamic basket – a far more realistic assumption, particularly given the inevitable investment in innovation in the OECD countries – it is not obvious that the technological improvements available in the future will be more costly than those now viable under the CDM.
>
> As well, most of the investment that would occur under the CDM is efficiency enhancing or wealth creating. Deliberatley depriving and economy of such investment is not cost-free. The high costs of inefficiency are inevitably visited on domestic consumers, and on firms that lose market share in international competition. Those that advocate living with inefficient technologies to save the costs of transition later should consider the costs of waiting as well.

However, Cosby and Kellett agree with the argument presented by the Stockholm Environment Institute (SEI) on flexibility mechanisms (including the CDM), which they feel undercuts the ability of developed countries to make real change towards achieving the FCCC objectives.

> The Kyoto Protocol's "flexibility mechanisms", as currently conceived, could undermine the value of the Kyoto targets. The facile arguments, underpinning the CDMs, neglect exactly those indirect and long-term impacts of GHG mitigation activities that are the most valuable outcome of near-term GHG reductions. The flexibility mechanism may well deliver some short-term cost-savings en route to the anticipated one-third of one percent reduction in atmospheric CO_2 concentrations. But the use of cheap, near-term GHG reduction abroad would obviate the need to invest domestically in developing the technologies, infrastructure and institutions upon which deep GHG reductions will depend in the longer-term (Lazarus et al: SEI: 5)

The article then goes on to say that in order for developing countries to travel along a low-carbon path they would need to be granted higher, negotiable, emission rights, using the revenues to build technological, institutional and human capacity and to establish a policy framework that will support sustainable development while achieving climate change objectives. Elements of this policy framework are: a) improved access to financing to help make markets more amenable to energy efficient technologies; b) energy prices, economic incentives and regulatory frameworks; c) technology innovation, diffusion and standards applicable to local conditions and; d) regional trade and cooperation.

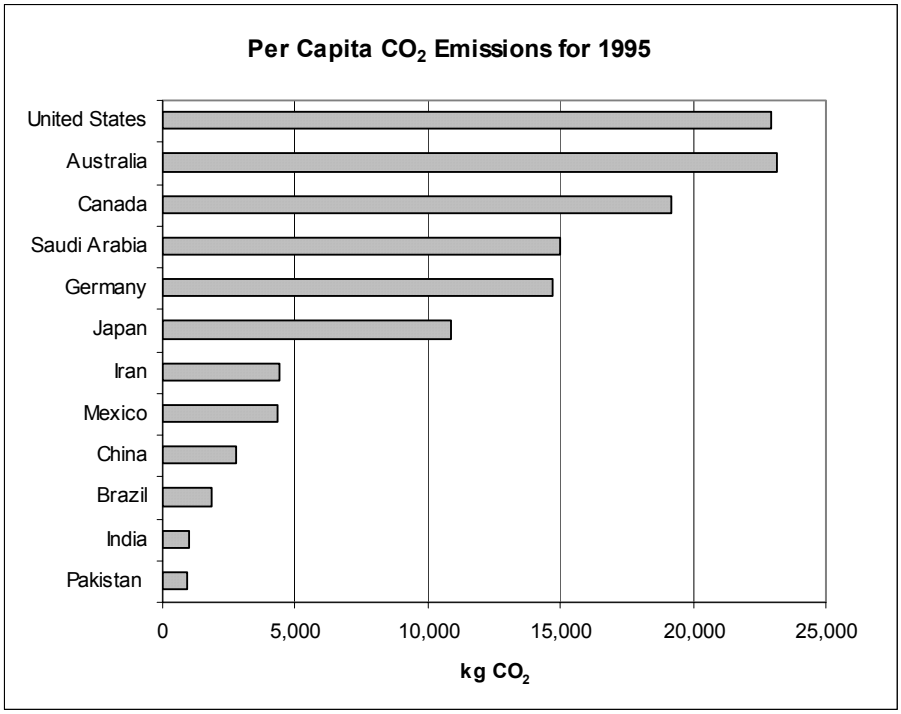
CSE develops the entitlements theme further. Interventions premised on market mechanisms without associated property rights or entitlements are clearly iniquitous, mortgage the future interests of the South and are ineffective in controlling emissions. The solution is simple -- institute such rights. How can this be done? By distributing budgeted emissions equally. Budgeted emissions are the difference between the optimum required for carbon dioxide stabilization and current emission levels. This difference should be divided equally on a per capita basis. All countries must commit themselves to reaching the determined per capita level (this is subject to scientific re-evaluation), also known as the principal of convergence. The merit in this is that secure tenure rights (to the atmosphere) would create a level playing field for emissions trading.

However, there is a reality check here. First, the North will not give away its emission privileges easily, especially when it has to come down to a budgeted per capita figure from its present high emission levels. Also, it goes without saying that this will have adverse implications for existing and planned GHG producing investments that have useful lifetimes and expected returns over many years. Recriminations, to the effect that the North has polluted the planet criminally, won't help. At best, the South can use this to get on the moral high ground and settle for phased emission reductions. The North can also argue, in reverse, that per capita entitlements are unfair because the South is demographically rampant. Even if deprived of practical value the per capita entitlements argument is a useful negotiating ploy as it strengthens the case for the South not to make any quantitiative emission reduction commitments, giving it space to exercise its right to growth.

3. Do developing countries need to mitigate?

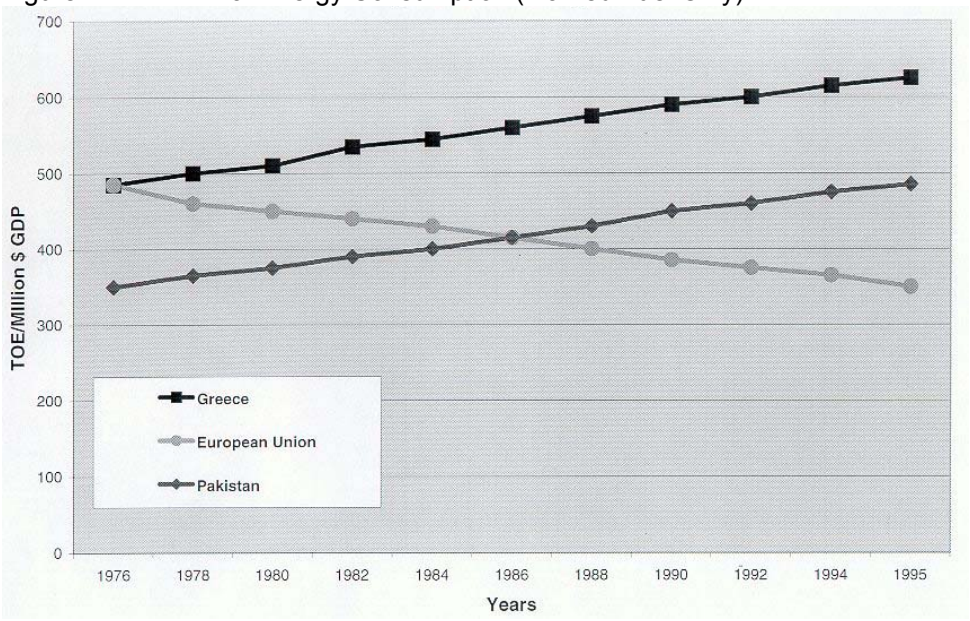
In as much as developing countries tend to be energy deficient, the answer is no. In so far as they are energy profligate, the answer is yes. The respective measurement indicators are per capita energy consumption and energy intensity. The per capita emissions profile presented below leaves little doubt that that the onus for mitigation rests with the north.

Figure 1: Emissions Profile



Conversely, high-energy intensity provides national grounds for mitigation – as such global warming becomes a secondary issue. While cross-country data for this particular measure is not available, we take the Pakistan case as being representative.

Figure 2: Final Energy Consumption (Marked Fuel Only)



Note: Toe = tones of oil equivalent

Energy intensity levels converged to the European average in 1985, with the comparison becoming distinctly unfavorable for Pakistan in 1995. The point to note is that not only is energy inefficiency in developing countries a source of concern per se but its impacts are highly localized, impacting predominantly on the poor. Table 1 illustrates the rapid growth of sector emissions.

Table 1: Estimated Air Pollutants by Sector (thousand tones)

Sector	1977/78		1987/88		1997/98	
	CO_2	SO_2	CO_2	SO_2	CO_2	SO_2
Industry	12,308	19	26,680	423	53,429	982
Transport	7,068	52	10,254	57	18,987	105
Power	3,640	4	11,216	95	53,062	996
Domestic	16,601	5	24,054	16	39,980	40
Agriculture	845	5	4,490	28	6,368	40
Commercial	1,726	11	2,587	13	4,261	25

Source: National Conservation Strategy (NCS), 1992

The truly dangerous pollutants to human health arise from **non-stationary** sources in urban areas. The average Pakistani vehicle emits 20 times as much hydrocarbons, 25 times as much carbon monoxide and 3.6 times as much nitrous oxide in grams per kilometer as the average vehicle in the US. Carbon monoxide levels in the range of 8-30 parts per million (ppm) and 6-40 ppm have been recorded for Lahore and Karachi, respectively. Ambient lead levels in Karachi have been measured at between 0.024 and 0.13 micrograms per cubic meter, which is high, by WHO/WB criteria (NCS, 1992: 84).

Traditionally air pollution was considered to be an urban phenomenon. More recently, with the expansion of industry in the rural areas, penetration of transport into rural areas, and the growth of brick kilns, air pollution is fast becoming a rural problem as well, particularly in the peri-urban areas and along the major national highways. For instance, it would be difficult to find an uninhabited stretch of more than five miles along the Grand Trunk road between Lahore and Islamabad.

3.1 Impacts on the Poor

3.1.1 Sources

The poor are most exposed to fumes [and polluted rivers] and least able to protect themselves. Of the estimated 2.7 million deaths each year from air pollution, 2.2 million are from indoor pollution, and 80% of the victims are rural poor in developing countries. Smoke from fuel wood is more dangerous to health than tobacco smoke, but every day women have to spend hours cooking over smoky fires. Leaded petrol, used more in developing and transition economies than in industrial countries, is crippling human health, permanently impairing the development of children's brains. In Bangkok, up to 70,000 children are reported to be at risk of losing four or more IQ points because of high lead emissions. In Latin America, around 15 million children under two years of age are at similar risk (UNDP: 5: 1998)

Pakistan tracks this global scenario very closely. Low-income neighborhoods in Pakistan's major towns and cities mushroom around industrial areas and power plants, where exposure to air pollution is high. The poor also work long hours in factories in unsafe conditions; in particular, women and children are the most vulnerable, exposed to dust and chemical inhalations in sweatshops and household industries producing textile items, carpets and leather goods. Traffic congestion and the resulting vehicular emissions are becoming an increasingly serious problem in the big cities. Poor communities are the most exposed to auto-emission and other toxic fumes, as they tend to live close to the main trunk roads. High auto-emissions are also linked to affordability; the poor cannot afford to travel in vehicles using cleaner but more expensive fuels.

The incidence of respiratory diseases and lead poisoning (predominantly among children) from mobile and stationary source emissions is escalating rapidly. Factors, which further increase the vulnerability of the poor, are poor nutritional intake, crowded living conditions (which increases the risk exposure) and lack of access to good medical facilities. Ultimately, those who are the most disadvantaged are made more so. The probability of escaping poverty, or enhancing their range of choices in their lifetime is reduced for them and the ability to pass on a better life to their children is also reduced.

Chronic respiratory infections, often related to smoky indoor atmospheres due to biomass use for cooking and heating are common in Pakistan's rural areas and in urban slums. Women suffer from much higher health risks as they do the cooking exclusively, as do the children and infants who tend to stay close to their mothers.

Brandon (1995) estimated the cost of health impacts alone (morbidity, mortality, IQ level loss) resulting from air pollution in Pakistan. It ranged between US$ 233-368 million per year. Such figures do not include the environmental and economic cost of air pollution. The cost of remediation for air pollution is estimated to be US$ 119.49 million per year (Rogers: 1997).

The evidence cited above points to a host of domestic reasons, both social and economic, that provide a compelling need for reducing inefficient energy use, yet have nothing to do with climate change. In fact, seen in this context, climate change benefits ensuing from such efforts are an unintended windfall.

3.1.2 Sinks

With sinks too, poverty lies at the heart of the problem and it is at this level that the problem should be addressed. A condition described as the poverty-environment trap, refers to the impact of deforestation on poor communities and, in turn, their propensity to raid forest resources in turn (Khan and Naqvi, 2001). The problem has its roots in management systems instituted by colonial governments (Azhar, 1993). Such regimes weakened community rights to the use of forest resources. Usufruct rights continued to remain but were proscribed heavily. Community management traditions, already fragile, eroded further with new opportunities for employment and out-migration. Also, demographic and development pressures have forced communities out of their ancestral lands into marginal areas where competition for resources is severe, resulting in further violations of indigenous property rights. The situation is marked increasingly by conflict, with communities forced to act as predators rather than as guardians of the commons. It is not surprising that forest and river ecosystems, already under threat during the colonial period, have begun to lose their self-sustaining capabilities.

The management system, designed for a specific purpose, has been unable to cope with these changes. The multiple, and often conflicting interests of commercial loggers, private developers, government and military agencies, hunters and impoverished communities has placed it under relentless strain. The forest department tends to choose the path of least resistance, coming down with a heavy hand on the disempowered communities and colluding for personal gain and profit with vested interests. Officials have become vulnerable increasingly to outside economic inducements, as opportunities for financial and professional betterment become hostage to fiscal insolvency. Rising prices of timber, fuel wood and forest products, an erosion in the standard of living of the forest custodians, fines and penalties that are applied selectively and fail to match the nature of the transgression, and royalties that are appropriated by the rich and powerful, combine to create a complex of perverse incentives antithetical to conservation (Knudsen, 1995) The irony is that commercial and development groups which management is not in a position to oppose – in fact, cooperates with -- are making the key inroads into forest resources and -- in fact. On the other hand, management targets communities, whose needs are of a subsistence nature essentially and

who – if their rights and traditions are protected – can collaborate with the authorities in the sustainable management of forest resources.

Thus, with regard to sinks too, the KP mandate acquires secondary importance. Sinks are intimately connected with the core issues of poverty alleviation and sustainable livelihoods. Among other things, policy efforts need to focus on tenure rights of communities and collaborative management of forest resources. These are more sustainable approaches, which offer beeter scope for arresting or reversing forest degradation, or ensuring that new plantations are protected.

3.2 CDMs and sustainable development

Clearly, the local consequences of GHG emissions and loss of sinks present more compelling evidence for developing countries to make an effort to abate such emissions and address deforestation. However, north-south dynamics (a euphemism for arm-twisting for some) will compel the South to buy into the CDM process. At that stage it should come armed with its own menu of options – one driven by sustainable development concerns.

The Pakistan component of the Asian Least Cost Greenhouse Gas Abatement Strategy (ALGAS, 1998) took a first cut at prioritizing mitigation options, ranking them on the basis of incremental cost criteria and CO_2 equivalent emissions abated (see table 2**)**. UNDP/UNEP/GEF and CDM-AIJ criteria, though different, converge for different reasons. While GEF is disposed to finance those options which have high incremental costs -- the idea being that developing countries would implement the low-cost options themselves – in effect, institutional and market constraints limit their choice to the easier options. Note further that they emphasize additionality for the South while some countries in the North, the US for instance, wants to attribute emission reductions to existing sinks. The CDM-AIJ mechanisms are geared towards low-cost, high emission reduction options in the first place, as they reduce donor-country liabilities to reduce emissions in their countries of origin by an equivalent amount -- and which they would have to do at a relatively higher cost.

These priorities are reviewed in the light of sustainable development criteria. In other words, the cost-benefit calculus has been expanded to include issues of health, equity, inter-generational concerns, environmental conservation and an enabling institutional environment, (a proxy for awareness, demand, market-readiness, functioning legal and regulatory framework etc.). Table 3 presents the same options ordered differently on the basis of this assessment. Admittedly, the ranking is crude and needs to be refined further through, for instance, a more formal analytical hierarchical ranking (AHP) procedure. By the same token, such processes can become hostage to a few leaders and are by no means superior to discerning analysis by the few.

Table 2: GHG Abatement Options Ranked According to Incremental Cost Criteria

Conventional Energy	Average Increm. Cost ($/tonne CO2 equivalent)	Potential CO2 Equivalent Abated(million tonnes)
Cogeneration	-27.6	105.8
Energy Efficient Lighting Systems	-21.9	36.8
Energy Efficient Fans	-20.7	42.0
Energy Efficiency Improvements in Tube wells	-15.2	77.5
Reduction in Electricity T&D Losses	-13.2	128.4

Continued…

Conventional Energy	Average Increm. Cost ($/tonne CO2 equivalent)	Potential CO2 Equivalent Abated(million tonnes)
Energy Efficient Motors	-12.5	5.3
Energy Efficient Refrigerators	-11.2	7.6
Energy Efficient Boilers	-10.5	25.7
Waste-to-Energy Generation	-10.3	2.2
Energy Efficiency Improvements in Water Heaters	-9.2	2.5
Energy Efficiency Improvements in Tractors	-7.8	72.8
Improved Engine Maintenance Practices	-5.3	51.6
Waste Heat Recovery Systems	-4.2	53.7
Reduction in Gas T&D Losses	-1.4	130.88
Improvements in Vehicle Maintenance	0.7	23.4
Improvements in Building Design	1.9	9.8
Substitution of Oil & Coal with Natural Gas	2.4	238.3
Improvements in Engine Design	11.6	106.6
Renewable		
Solar Water Heaters	-5.0	4.4
Mini/Micro Hydel Plants	-2.1	1.0
Wind Power Generation Systems	1.3	1.5
Solar Photovoltaic Systems	28.3	0.6
Forestry		
Commercial Plantations	-23.9	10.0
Riverain Forest Plantations	- 10.4	17.0
Reforestation in coniferous Forests	-7.6	21.8
Enhanced Natural Regeneration in Coniferous Forests	-3.1	26.0
Plantation on Agricultural Lands	-0.6	27.4
Agro forestry/Social Forestry	-0.4	73
Forest Protection in Coniferous Forests	-0.2	73
Watershed Plantation	0.3	63.4
Rangeland Improvement	0.6	80.2
AGRICULTURE		
Improved Feed for Livestock	-45.9	26.1
Methane Reduction From Paddy Fields	0.02	92.8

Source: Hagler Bailly Pakistan, October 1998

Table 3: Alternative Ranking of Mitigation Options

	IncremCost	Potent. CO_2 Equiv.Abated	Cons./Biodiv. Conser.	Health	Equity	Instit. Viability	Ranking
Substitution of Oil & Coal with Natural Gas	2.4	238.3	2	1	2	1	B I
Reduction in Gas T&D Losses	-1.4	130.9	2	2	2	1	C II
Reduction in Electricity T&D Losses	-13.2	128.4	2	2	2	1	C II
Improvements in Engine Design	11.6	106.6	2	1	1	2	B I
Cogeneration	-27.6	105.8	2	1	2	1	B I

Continued…

	IncremCost	Potent. CO_2 Equiv.Abated	Cons./Biodiv. Conser.	Health	Equity	Instit. Viability	Ranking
Methane Reduction From Paddy Fields	0.02	92.8	1	2	2	1	B I
Rangeland Improvement	0.6	80.2	1	2	1	1	A I
Energy Efficiency Improvement in Tube wells	-15.2	77.5	2	2	2	2	D II
Energy Efficiency Improvement in Tractors	-7.8	73.0	2	2	2	2	D II
Social/Social Forestry	-0.4	73.0	1	2	1	1	A I
Forest Protection in Coniferous Forests	-0.2	73	1	2	2	1	B I
Watershed Plantation	0.3	63.4	1	2	1	1	B I
Waste Heat Recovery Systems	-4.2	53.7	2	2	2	2	D II
Improved Engine Maintenance Practices	-5.3	51.6	2	1	2	2	C II
Energy Efficient Fans	-20.7	42.0	2	2	2	2	D II
Energy Efficient Lighting systems	-21.9	36.8	2	2	2	2	D II
Plantation on Agricultural Lands	-0.6	27.4	1	2	2	1	B I
Methane Reduction From Paddy Fields	-45.9	26.1	1	2	2	2	C II
Enhanced Natural Regeneration in Coniferous Forests	-3.1	26.0	1	2	2	1	B II
Energy Efficient Boilers	-10.5	25.7	2	1	2	2	C II

In Table 3, the options have been re-ranked according to their CO_2 abatement potential and on the basis of 4 sustainable development criteria: conservation potential, health, equity and institutional viability. The classification is simple – 1 represents success and 2 failure. Then these are further summed and graded on a scale from A to D. The grades are then combined with the incremental costs, with I representing high and II low incremental costs. Note how the ranking gets reversed once more broad-based criteria are invoked (of course with some exceptions, namely the fifth and the last two). Further, the more highly ranked options are also roughly coincident with their high abatement potential.

Sustainable development criteria are more appropriate for assessing mitigation options than simple economic criteria, which may place some options high in the rank ordering but make them institutionally, socially or environmentally less desirable. The next challenge is to focus attention on the extent to which existing development processes address sustainability concerns. CDMs then become a means of reinforcing such policies.

4. Conclusion

Pakistan signed the UNFCCC in 1992, and ratified it in 1994. By doing so it committed to taking steps towards climate change mitigation and the assessment and reduction of national vulnerability.

However, on the basis of present and projected per capita emissions, Pakistan is not likely to be a key player in global warming, with its emissions well below the global average. As such, it has no reason to buy into the 'mitigation groundswell' driven by Northern global warming concerns. The CDM is the most recent manifestation of this. On the other hand, the local consequences of GHG emissions present more compelling evidence for Pakistan to make an effort to abate such emissions. Examples of localized impacts are urban-centered health problems stemming from air pollution, especially among the poorer communities. Emissions of particulate matter and VOCs from the combustion of firewood and biomass pose a threat to human health in rural areas. Deforestation menaces countries in the form of degradation and soil erosion, with its downstream consequences

However, north-south dynamics (a euphemism for arm-twisting for some) will compel the South to buy into the CDM process. At that stage it should come armed with its own menu of options – one driven by sustainable development concerns.

The Pakistan component of the ALGAS project has taken a first cut at prioritizing mitigation options, ranking them on the basis of incremental cost criteria and CO_2 equivalent emissions abated. These priorities are reviewed in the light of sustainable development criteria. In other words, the cost-benefit calculus has been expanded to include issues of health, equity, inter-generational concerns, environmental conservation and an enabling institutional environment. The original ranking gets almost reversed once more broad-based criteria are invoked. the last two). Further, the more highly ranked options are also roughly coincident with their high abatement potential.

The South would do well to go into climate change negotiations with caution. Both expert opinion and the evidence point towards heightened climatic activity, both of a secular and sporadic kind. The North will eventually have to buy into mitigation commitments and will do its best to hive off this responsibility to the South. At least the South should swing a good deal for itself.

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