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Integrated Development and Climate policies: how to realise benefits at national and international level?
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Paper 1	National Policies
Authors	P.R. Shukla (IIM Ahmedabad) and Kirsten Halsnaes (UNEP Risø)
Session	1.2: National policies
Topic	Synthesis of national experiences with integrated development and climate policies

Synthesis of National Experiences with Integrated Development and Climate Policies

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Global responses to climate change are gradually considering the potential synergies between sustainable development and climate change policies. In the coming years developing countries face great challenges in development and its impact on climate. The path of development chosen by the region, upon which lies the future growth of energy and emission trajectories, would be greatly influenced by technological developments, economic cooperation between countries, and global cooperation in mitigation and adaptation of climate change.

In many developing countries policies that are sensible from a climate change perspective can emerge as side-benefits of sound development programmes. In the energy sector, for example, price reforms, sector restructuring, and the introduction of energy efficiency measures and renewable energy technologies - all undertaken without any direct reference to climate change - can mitigate climate and other environmental risks while achieving their main goal of enhancing economic and social development.

Moreover national development policies in these countries pay considerable attention to extending developmental benefits to the poor people. These include eradicating extreme poverty and hunger, ensuring primary education for all, women empowerment, enhancing life expectancy, energy access to all, and environmental sustainability. Most of these align with the UN Millennium Development Goals (MDG) and also enhance the adaptive capacities of the populations towards adverse impacts of climate change.

Therefore a less polarised way of meeting the challenges of sustainable development and climate change is to build environmental and climate policy around development priorities that are more important to developing countries, and this has been the starting point for a number of international study programmes that in partnership with developing countries have conducted studies about how climate policies can be integrated in development policies.

The international programmes span studies that on a national basis focus on SD and mitigation aspects and/or on vulnerability and adaptation aspects, as well as studies that primarily focus on international policy regimes. Several sectors have been covered including the energy sector, infrastructure, agriculture, and the water sector.

An overview of some of the larger activities is given in Table 1.

Table 1 Overview of International Development and Climate Programmes

	Focal Areas	**Major Partners**	**Outputs**
Development, and Climate – Energy Component	Mitigation options in the energy sector Adaptation options related to energy, infrastructure, and water/agriculture energy linkages	UNEP Risø BCAS Bangladesh Coppe Brazil ERI, China IIAM India Enda, Senegal ERC South Africa	Methodological Guidelines Country study reports with modeling results Special issues of World Development Journal
Development and Climate, Landuse Component	Mitigation and adaptation options in landuse sectors	MNP and PRI, The Netherlands BCAS Bangladesh Brazil China IIAM India Enda, Senegal ERC South Africa	Journal papers
OECD Development and Climate Project	Vulnerability and adaptation	OECD Environment and Development Directorate Egypt Fiji Bangladesh Nepal Tanzania Uruguay	Summary report Country study reports
Asian Perspectives on Climate Regime Beyond 2012	International climate policy regimes	IGES, Japan China India Indonesia Korea Vietnam	Summary report
Growing in the Greenhouse	SD Policies and measures for climate change mitigation	World Resources Institute Brazil China India South Africa	Summary report
Development and Climate Engaging developing countries	Climate Change mitigation, International and national policy regimes	The PEW Centre	Summary report

The countries that have been involved in the international programmes as included in Table 1 particularly are a number of Asian countries with high economic growth rates, and in particular China and India have been part of several studies. African and Latin American countries have only been covered to a very limited extend and the focus has here mostly been on large economies like Brazil and South Africa. The paper provides more detailed results of the individual studies and examines these in light of the different methodological approaches that have been used.

Some of the studies provide rather detailed national empirical results such as for example the Development Climate energy studies, and the case studies by WRI on mitigation and by OECD on adaptation. However, there is not yet a clearly established link between such national examples and various models for development based international policy regimes, which have more been the focus of the IGES study on Asian perspectives beyond 2012. In this way, there is a further need for linking national experiences and international policy recommendations.

Paper 2	Rural development and land use
Author	Siwa Msangi (IFPRI)
Session	2.1: International initiatives – introductions
Topic	International rural development/ agriculture/biofuel programmes and key issues in making these programmes effective

How to Make Successful Agricultural and Biofuel Programs for Rural Development?

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As global energy resources become increasingly scarce in the face of growing energy demand for transport fuel and other productive uses, many developing countries have begun to turn to the possibilities that biofuels from renewable resources could offer in supplementing their domestic energy portfolio. For those countries which spend a considerable portion of their domestic budget on fuel imports, the prospects of substituting these imports with domestic production of biofuel products is especially attractive. India has expanded its production of biofuels from sugarcane-based ethanol to that of bio-diesel from oil crops, in an effort to diversify its energy sources, and to take advantage of the comparative advantage that oil crops have within its water-scarce agricultural production regions. Due to the high demand for oil-based products for food consumption is high in India, the feedstock for bio-diesel production has been largely comprised of non-edible oils such as Jathropa and Pongamia (World Bank, 2005). Other see the advantage of feedstock plants like Jatropha, to be in their ability to grow on marginal lands, with low water inputs (Francis *et al.*, 2005)

Brazil which has a long history of sustained investment in the improvement of sugarcane yields and in the development of conversion technologies to process sugarcane to fuel ethanol, stands as the global leader in the production of ethanol from sugarcane feedstock, both in terms of volume of production, and relative efficiency of production. Brazil also has a relatively abundant water endowment in the major cane-growing areas, compared to the major cane growing areas of other countries, like India, and can sustain the environmental needs imposed by high volume of sugarcane cultivation. But even the well-developed cane-based ethanol industry in Brazil is not immune from the impact of world market prices on local supply of cane feedstock, as was witnessed in the early 1990s when domestic production of fuel ethanol from cane saw a sharp drop, due to the increase of world prices for sugar.

The level of efficiency that is required, in terms of industry-level distribution and processing infrastructure, to make large-scale biofuel production viable and economical exists in relatively few countries around the world, and presents a challenge to those developing countries that would seek to emulate the growth pattern of biofuel production from local feedstock crops. Due to the fact that ethanol production from cane feedstock requires fairly rapid processing after harvest (between 24-48 hours) to prevent the breakdown of the sugars, the number of developing countries that can provide the needed flexibility and efficiency within the collection, conveyance and processing chain is relatively small, and suggests a level of infrastructural development that many countries aspiring to large-scale biofuel production would not have. This suggests a portfolio of needed investments within these countries targeted at both productivity improvements as well as towards improvements in infrastructure, that can lead to a reduction in transportation and other transactions costs that might otherwise present a formidable barrier to the emergence of a crop-based, biofuel industry.

Many of these country-level investments coincide with those that we might consider necessary, in general, for the improvement of food production, distribution and delivery systems in developing agricultural economies. Many of the environmental stresses that could stand in the way of crop production for biofuel feedstocks, in terms of soil quality or other critical resource endowments, such as water, are the very same stresses that put pressure on the production of food for domestic consumption and export. Indeed, a great many of the "pre-conditions" that one could list for the establishment of an efficient and well-functioning domestic biofuel program, in terms of the agricultural production and delivery systems, are the very same ones that policy makers and researchers consider when trying to define the necessary conditions for food security and the reliable delivery of food-based services to developing country populations.

In light of this coincidence, it would appear that the "food-for-fuel" trade-off that some policy analysts have characterized for the future of large-scale expansion of biofuel production need not occur. Indeed, the very investments that might enhance food security, through the strengthening of food production and delivery systems could be the very ones that ensure the healthy operation of a nascent biofuel industry, and prevent the kind of sharp trade-off that some predict. Without doubt, there will be market-level price effects when there is large-scale expansion of production from a feedstock commodities that also has sizeable food and feed use value – and, to be sure, those who are most vulnerable to price increases could be adversely affected. Nonetheless, the potential long-term effects of this must be evaluated in the light of how short-term price increases will impact that supply response of other regions which growth these tradable food commodities, and how markets and production systems will adapt over the longer-run period. Many arguments that predict the worse impacts on food supply and prices tend to ignore these effects, both in terms of global supply response, and domestic level productivity and land-use shifts that would accompany these changes.

In our presentation, we seek to lay out a framework which can allow both policy makers and researchers to better understand how programs which expand biofuel production can synergize with investment and development strategies aimed at strengthening the function of food systems. Looking at these investments from the perspective of improved production, storage, distribution and marketing mechanisms will allow us to better determine the ability of various countries to develop and/or expand their own domestic biofuel programs – noting which are in the best position to do so, and which are better advised to defer such developments. The evolution of key drivers behind energy demand growth and the diminution and increasing opportunity cost of non-renewable fuel resources play a large role in determining the 'optimal' timing of biofuel development in different countries, and argue for sooner adoption in some countries, compared to others. The existing and projected land use patterns must also be considered, as these will determine the extent to which cultivation of biofuel feedstock crops can be expanded, and how much of the total energy demand can realistically be met by domestic bio-fuel production. It is the convergence of these factors which determines the extent to which biofuel programs can contribute towards the satisfaction of local energy demands, lead to improvements in land use and quality, and also contribute towards the livelihoods and well-being of the rural poor.

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Paper 3	Disaster prevention and management
Author	Mark Pelling (KCL)
Session	2.1: International initiatives – introductions
Topic	How disaster management systems may support a ´climate proof´ development

How might disaster management systems support ´climate proof´ development?

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1. Introduction

Disaster management, and especially disaster risk reduction policy, places emphasis on human vulnerability. Vulnerability is seen as multi-dimensional and linked to ongoing processes of development and livelihood sustainability.

The unpredictability generated by climate change places more emphasis on the need for international frameworks to help national and local actors identify and support generic adaptive capacity along with hazard-specific response capacity. Concepts used to denote this type of preparedness include 'win–win' or 'no regrets' measures that address current vulnerabilities and development needs.

This paper seeks to identify opportunities and challenges for international actors seeking to support national and local vulnerability reduction initiatives through coupled disaster risk reduction and climate change adaptation frameworks.

First, we examine the relationships between disaster risk reduction, climate change and development.

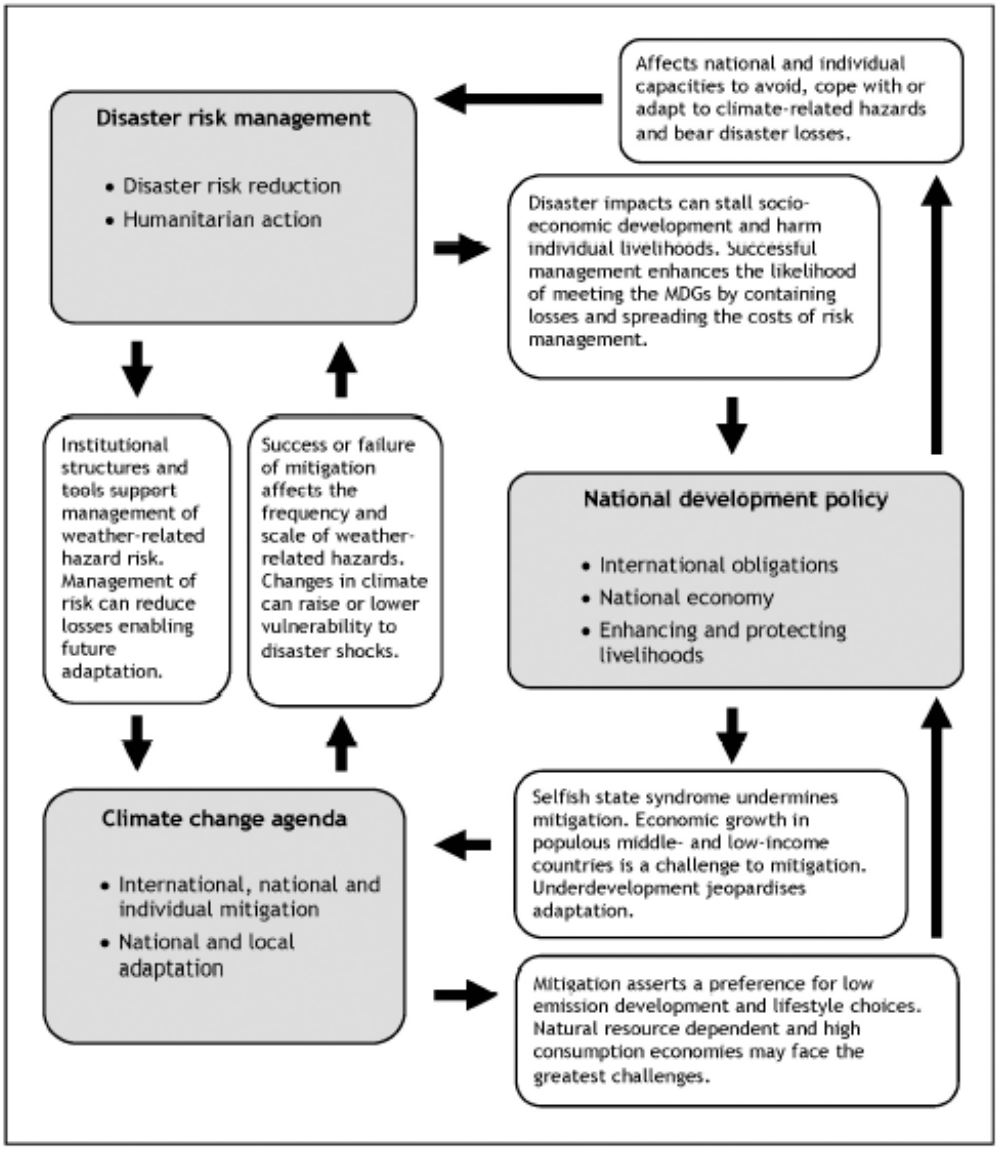
We then explore the potential of international organisations to contribute to developing key conditions under which large international initiatives to build development programmes with important climate benefits can be successful, through the lens of disaster risk reduction. This highlights four opportunity areas: building disaster risk reduction into development; linking relief, reconstruction and development; facilitating national disaster risk reduction legislation, and; supporting people centred early warning and local first response.

2. Disaster risk reduction and climate change

Reducing disaster risk requires the integration of disaster management and socio-economic development policy and action. Figure 1 presents a summary of the relationships between disaster risk management, global and national climate change agendas and national development policy.

The figure is useful in identifying flashpoints where virtuous relations have been interrupted or distorted.

Figure 1: Linkages between climate change, disaster risk and development



Source: Schipper and Pelling (2006)

3. International policy frameworks

Under the UNFCCC, Article 4.8, disasters are mentioned in relation to consideration of countries that are the most vulnerable to climate change. Article 4.8 says that these include nations with disaster-prone areas.

The Hyogo Framework for Action 205-15, (after tough negotiations) acknowledges climate change as a root cause of disaster risk. This provides a ready made institutional framework for national and local disaster response work. Though one without targets or a time-table for action. In this regard the UNFCCC negotiations offer more scope for a biding timetable for action.

4. What are the key conditions under which large international initiatives to build development programmes with important climate benefits can be successful?

Need to focus on conditions to generate positive action in the international community and responsive relationships with national and local partners. This points to the need for national and international policy environments that recognise the value of a pro-poor, people-centred approach to development, disasters and climate change.

5. What role can international organisations play in creating the right conditions?

This section explores four ways in which international actors can help in shaping national and international policy environments to enabling disaster risk reduction (DRR).

5.1 Building DRR into development

Donors remain reluctant to fund disaster risk reduction work, especially compared to the ease of obtaining funds post-disaster. There is a lack of co-ordination and co-operation between humanitarian and development sectors in the international community and inside individual agencies.

An international architecture does exist for some progress to be made. Bi- and multi-lateral donors can promote risk reduction through Poverty Reduction Strategy Papers and UN Development Assistance Programmes of Action. More climate change specific tools such as national Adaptation Programmes of Action also provide an opportunity for reinforcing risk reduction.

The Millennium Development Goals (MDGs) provide an overall framework for international development efforts. Table 1 presents a summary of the ways in which DRR can contribute to the meeting of each MDG.

Table 1: Disaster risk reduction helping to met the MDGs

MDG	Examples of what risk reduction can contribute
1. ***Eradicate extreme poverty and hunger***	• Disaster risk reduction and MDG1 are interdependent. Reducing livelihood vulnerability to natural hazards is key both to eradicating income poverty and improving equity, and to improving food security and reducing hunger. Reducing disaster impacts on the macroeconomy will promote growth, fiscal stability and state service provision, with particular benefits for the poor. • Disaster risk reduction and MDG1 share common strategies and tools: this overlap means that giving development more security from natural hazard can be very cost-effective.
2. ***Achieve universal primary education***	• In hazard-prone areas, the case for building schools and encouraging attendance becomes much stronger if buildings are safe and students and teachers are trained in emergency preparedness. Promoting safer structures may encourage better maintenance even in non-disaster times. • Reduced vulnerability will allow households to invest in priorities other than mere survival. Education is often a high priority. Girls (as 60% of non-attendees) may benefit disproportionately.
3. ***Promote gender equality and empower women***	• Better risk reduction will help protect women from disproportionate disaster impacts. • Collective action to reduce risk by households and communities provides entry points for women (and other marginalised social groups) to organise for other purposes too, providing a catalyst for economic and social empowerment.
4. ***Reduce child mortality***	• Disaster risk reduction will help protect children from direct deaths and injuries during hazard events (as exemplified in Box 5, p.24), and will lower mortality from diseases related to malnutrition and poor water and sanitation following disasters. • Health infrastructure and personnel in hazard-prone areas will be better protected. This may also promote better maintenance of infrastructure.
5. ***Improve maternal health***	• Disaster-related illness and injury will be reduced. • Improved household livelihood and food security will lower women's workloads and improve family nutrition. • Health infrastructure and personnel in hazard-prone areas will be better protected. This may also promote better maintenance of infrastructure.
6. ***Combat HIV/AIDS, malaria and other diseases***	• Public health risks, e.g. from flood waters, will be reduced, and nutrition and health status improved, boosting resistance to epidemic disease. • Fewer disasters will free up social sector budgets for human development. • Livelihood security will reduce the need to resort to work in the sex industry. • Community organisations and networks working in disaster risk reduction are a resource for family and community health promotion, and visa versa.
7. ***Ensure environmental sustainability.***	• Reduced disaster-related migration into urban slums and reduced damage to urban infrastructure will improve urban environments. • An emphasis on governance for risk reduction and more secure livelihoods will help curb rural and urban environmental degradation. • Risk reduction partnerships that include community level actors and concerns will offer more sustainable infrastructure planning, and enable expansion of private sector contributions to reducing disasters. • Housing is a key livelihood asset for the urban poor. Disaster risk reduction programmes that prioritise housing will also help preserve livelihoods.
8. ***Develop a global partnership for development.***	• Creating an international governance regime to reduce risk from climate change and other disasters will help overcome disparities in national negotiating weight. • Efforts to build equal global partnerships for risk reduction will have particular relevance for small island developing states and HIPCs. • Disaster risk reduction initiatives could promote better public-private partnerships.
All MDGs	• Reducing disaster impacts will free up resources, including ODA, to meet MDGs.

Source: White et al (2005)

5.2 Linking relief, reconstruction and development

Reducing vulnerability to climate related disaster risks requires the linking of relief, response and development. The international community can play an important role in providing incentives for this process.

There are three related areas where dilemmas for international humanitarian actors restrict local risk reduction.

Rights and Needs. Do interventions to reduce risk recognise rights and needs? Political neutrality traps humanitarians into responding to needs (food security) rather than rights (building governance). How might international frameworks provide more support for developmental action be delivered? Especially in places subjected to frequent disaster risk where the rights (development) and needs (relief) agendas overlap.

Power and Security. Where there is an imbalance of power – at and between local, national or international levels, reconstruction is too easily co-opted. In the majority of cases greater strengthening is needed for the local community and local and national government. What strategies can be developed at the international level to support greater balance of power? Where some equality is achieved during relief how might this be promoted during reconstruction and into development for human security?

Speed and Sustainability. Is the best reconstruction work necessarily the fastest? Evidence from recent disasters suggests that opportunities for enhancing governance, with knock on effects for local development and risk reduction, have been sacrificed for speed in the delivery of housing and other basic needs. Such strategies undermine longer-term development and human security. Can the international community work to provide incentives and tools to help decision-makers find the right balance between speed and sustainability in reconstruction?

Climate change discourse can reinforce a shift in disaster management: from response and recovery with a short-term view towards awareness, preparedness and risk reduction with a long-term, integrated outlook.

5.3 Supporting DRR Legislation

National legislation for disaster risk reduction is fundamental to the enhancement of human security. In 2005, the Hyogo Framework for Action (2005-2015) called for nation states and the international community to ensure that disaster risk reduction is a national and local priority with a strong institutional basis for implementation.

There are many examples of countries learning from each other during the scooping of risk reduction legislation. International organisations could facilitate this process, though informal learning or more formalized processes such as consultation on drafting of Poverty Reduction Strategy Papers.

South African experience of drafting DRR legislation found international actors helpful. In particular UN-ISDR and UNDP.

The hallmark of this international support was its enabling character that did not undermine local responsibility.

Moreover, since the early 2000s, the closer convergence in the messages from UNDP and ISDR has provided a more uniform global framework for directing national disaster risk reduction efforts.

5.4 A presumption for supporting rather than replacing local capacity

The higher profile afforded to disaster management from donor governments and the international community is to be welcomed. But it is important not to assume that international actors are always the best placed to manage disaster risk. Enthusiasm for contributing to risk reduction in two areas runs the risk of undermining overall capacity. These are early warning and disaster response.

Early warning. There is a bias in international support for greater investment in technical rather than people-centred aspects of early warning. This is a great missed opportunity.

Disaster response. At present investment in international response teams ignores the observation that local rescuers are not only first on the scene but also understand the geography and institutional structures best. International support and training for local first responders can build local capacity. This can not only enhance local development options, but can add value. Skills learnt for responding to natural disasters can also be of use in responding to civil or technological disasters, or to everyday emergencies.

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Paper 4	Poverty reduction
Author	Phil O'Keefe (ETC)
Session	2.1: International initiatives – introductions
Topic	Multilateral and bilateral Development Financing mechanisms that integrate climate change and key issues in making these programmes more effective

In order to address poverty, it is difficult to distinguish climate change adaptation from the range of livelihood adjustments that people undertake in response to a wide spectrum of simultaneous pressures, for example urbanization and HIV/AIDS. Because of these simultaneous pressures, it is often 'indirect' adaptations, occurring as a by product of some other livelihood strategy or coping measure, that raise standards of living that can effectively increase resilience to climate hazards. Examples of 'indirect' adaptation include diversified cropping strategies, higher food security via higher income or more secure access to productive land, improved sanitation, accessible and reliable water and fuel, education, access to employment and so on.

- Indirect adaptations are not a specific response to the impacts or risk of climate change. If you are worried about where your next meal will come from, you are unlikely to benefit fully from any other forms of intervention.
- Indirect adaptations increase the resilience of those experiencing chronic and absolute poverty to the additional pressures induced by climate hazard.
- Indirect adaptation is effective in the short term as it is dynamic by nature, reflecting the immediate needs of poor communities. This simultaneously increases resilience to longer-term climate hazards.
- Indirect adaptation is likely to enhance the effectiveness of some forms of planned adaptation strategies, such as community based disaster preparedness.
- There are forms of planned adaptation that can negate and/or destroy people's capacity for indirect and autonomous adaptation.

Indirect adaptations are the interface between development and climate interventions. It is through indirect adaptation to climate change – or a development first approach - that issues of poverty can be effectively addressed. This is the rationale behind taking a risk management approach to adaptation and mainstreaming adaptation to climate change within development programmes. Pro-poor climate adaptation discourses are increasingly placing emphasis upon short-term – immediate - climate hazard. The multi-donor report on poverty and climate change (2002) provided a strong international signal that development issues and sustainable livelihoods are a fundamental component of the climate change debate.

In developed countries, insurance is a key mechanism for offsetting climate risk, for example in the UK, but formal insurance markets are relatively weak in developing countries. With the exception of some microfinance schemes, formal insurance for poor people in developing countries is not financially viable for either the customers or the insurance providers. To a certain extent poor people in developing countries may have levels of access to informal networks at family, household, or community scale that can offset some climate risk, but the form and function of informal safety nets is variable and limited.

However, if we accept that the negative impacts of climate change are not the major - or even the only problem - facing vulnerable people, then it raises the question of whether or not adaptation should be funded from the development budget, since mitigation is generally financed through environmental agencies and departments. Furthermore, pursuit of UNFCCC adaptation funding through the Global Environment Facility means that developing country governments,

particularly the smallest and poorest countries, may have to devote a disproportionate amount of staff time to climate change which could distort the development process away from other priorities. However, despite the urgent need for adaptation to current climate risk, it is impractical to suggest that it should take precedence over 'competing' development priorities such as health, education and food security.

There is a level of interdependence between climate variability and climate change and developmental priorities such as health, food and water security. Therefore, it is politically acceptable to suggest that the 'additionality' of climate change should come from the development budget – but not that new 'climate adaptation projects' should divert resources away from other priorities. This additionality implies that climate adaptation screening is integrated or 'mainstreamed' into development interventions, and explains the increasing international consensus that development needs to be 'climate proofed' rather than treating climate change as a discrete phenomenon.

Climate proofing can be understood as the protection of development interventions from the negative impacts of climate hazard, as well as ensuring that development strategies that mitigate against climate damage are pursued. Several donors are already committed to 'climate proofing' although they may not explicitly use this terminology. In order to be effective, climate proofing should encompass both the 'hardware' and 'software' of development interventions. An example of climate proofing the 'hardware' of development interventions would include risk assessments to ensure that new infrastructure such as roads, bridges, and buildings are not sited in areas subject to increasing climate hazard, for example areas vulnerable to sea level rise or increased flooding events. An example of how climate proofing could encompass the 'software' of development interventions could include policy/economic analysis of various scenarios in order to prevent inappropriate water resources development (for example those resulting from subsidies).

We also need to consider the way in which development interventions can be climate proofed to increase the effectiveness and sustainability of their impact upon individual and community resilience. For example, in agricultural/food security interventions, building upon indigenous knowledge of resilient cultivars/practices should be actively encouraged, but with sensitivity for the fact that many rural households have alternative income streams/labour obligations. The food for assets framework may be an example of how The linkages between climate change and poverty also include politically sensitive issues, such as the increased energy demands that will necessarily arise from poverty alleviation and job creation. The measures by which the inevitable rise in energy demand can be climate proofed are at the heart of intense negotiations under the United Nations Framework Convention on Climate Change.

Other than environmental assessment strategies, there are a number of other practical entry points for integrating climate change in development interventions. Despite the fact that there is often not a legal basis for strategic environmental assessment in many developing countries, this should not prevent strategic environmental considerations being integrated into the planning of projects and programmes. Climate proofing exit strategies, as well as improving the status of exit strategies within overall project and programme cycles could be an extremely effective measure for integrating climate risk into development interventions, including 'post-programme' monitoring.

There are currently several impediments to climate proofing development interventions. These impediments include weak regulatory frameworks at both local and national scale in many developing countries. Donor funding cycles may not coincide with needs, for example they are

likely to be based upon the fiscal year rather than harvest cycles which in some cases makes sense only from an accounting perspective. International development targets are not aligned with international environmental conventions (for example the MDG target is 2015, whereas Kyoto ends in 2012). A large proportion of development funding, particularly in fragile or collapsing states comes from private sources, e.g. diaspora remittances. It may be difficult to coordinate 'climate proofing' initiatives with private financing without extensive awareness raising campaigns. The question of policy coherence between development assistance and other policies (such as trade policy for example) is relevant when considering the scope of climate proofing development interventions, because a lack of coherence may exacerbate poverty and vulnerability to climate hazards. For example, results based management frameworks may conflict with donor coordination though the aim of donor coordination is to increase the efficiency of aid.

Therefore, although there is the potential for synergies between poverty reduction and reducing climate risk, there remain a number of challenges to realising these synergies. Climate adaptation as it has evolved under the convention will be examined alongside a number of case studies that will demonstrate the scope of climate proofing in the context of poverty alleviation interventions.

Paper 5	Energy security and access
Author	Tom Heller (Stanford University)
Session	2.2: International initiatives – introductions
Topic	International programmes for providing clean energy for development that integrate climate change and key issues in making these programmes more effective

China, Coal and Climate: Dealing with Emerging Economies After Kyoto

Current negotiations to extend and deepen the Kyoto Protocol are unlikely to succeed in establishing a firm basis for mitigating climate change at a meaningful scale. The two problems that have plagued Kyoto thus far-- the failure to engage key developing countries like China and India and the inability to create serious incentives to advance the speed at which innovative technologies can be commercialized-- remain well beyond the ambitions or reach of negotiators. In particular, in most developing economies officials and agencies charged with improving energy, transport, and land use resources continue to see environmental controls as obstacles to their core missions. Using the case of energy growth in China, with secondary reference to the same problem in India, my talk will describe how the pursuit of locally held energy goals might be structured so as to produce a system that is relatively more friendly toward carbon emissions mitigation without contributing to the sense of development constraints. Practical international collaboration among a small group of nations to stabilize and expand commodify trade in natural gas to the east of Suez can exemplify one alternative approach to climate change management that works around the near intractable problems of formulating a Kyoto-style global international environmental regime around a widely agreed set of principles and mechanisms.

Paper 6	Transport
Author	Suzanna Kahn-Ribeiro (University of Rio de Janeiro)
Session	2.2: International initiatives – introductions
Topic	International programmes for providing transport for development integrating climate change and key issues in making these programmes more effective

INICIATIVES IN TRANSPORT SECTOR WITH GHG EMISSION REDUCTION AS CO-BENEFIT: ANALYSES OF ETHANOL USE IN FLEX-FUEL VEHICLES AND THE BIODIESEL PROGRAM IN BRAZIL

As countries develop and the population grows, energy demand for transport also gets greater. This growth gives rise to oil use increase, which is the most used energy resource worldwide and its burnt is the main cause of CO2 emission increase. In 2003, oil by-products accounted for 43% of the world energy final use, equivalent to 3,098.4 Mtoe with a share of 41% of CO2 emission worldwide, corresponding to 10,193GtCO2 (IEA, 2005).

Transport is the human activity which most uses oil as energy resource. In 2003, 58% of the oil used worldwide was related to transport sector (1.797 Mtep) (IEA, 2005). This large oil use in transport is also reported in Brazil. In 2004, 40% of the total energy use in Brazil derived from oil by-products,that are 71,14 Mtep, of these, 61% accounts for the transport sector (MME,2006). In the same year, the main energy sources for this sector were diesel and gasoline, representing 52% (26,81 Mtoe) and 26% (13,596 Mtoe) respectively. The road mode accounts for this huge consumption, since it uses 96,7% of the diesel and 99,7% of the gasoline (MME, 2006). However, it is worth noting gasoline in Brazil is not used in its pure form but a mixture of anhydrous ethanol, ranging from 20-25% in volume basis, called gasohol.

The transport sector has also the greatest impact on the environment and on life quality, either due to the increasing congestion associated to lack of high-capacity transport infrastructure or to bad urban air quality, especially in developing countries. In fact, the highest population growth together with the motorization rate increase, are expected in these countries. An average annual growth rate of energy use in transport of some 0.9% and 1.2% for European countries and North America, respectively, is estimated, compared to 2,9% for Latin America, 3,6% for India and 4,2% for China (WBCSD, 2004).

The main target in transport sector policies is toward policies which seek for oil dependency reduction, air quality improvement and congestion reduction in urban areas, either in Brazil or in the rest of the world, especially in developing countries. Most of the time, those policies present a CO2 emission reduction as a co benefit, since those emissions are associated with fuel consumption.
Those policies are considered sustainable transport policies in as much as they reconcile the economic, social and environment objectives. Therefore, the search for greater transport energy efficiency has as main goal different purposes other than CO2 emission reduction, in that way, this reduction is usually not quantified and neither taken into consideration.

There are different paths in order to promote energy efficiency and the due emission reduction in transport. According to ASIF methodology ((Shipper, 2001), those paths can be clustered in four variables which are presented in Equation 1:
$G = Ai * Si * Ii * Fji$ (1)
where:
• G stands for emissions;

• Ai represents the volume of transport activity. This is conditioned by the number of vehicles operated and is a function of consumer demand;
• Si represents the modal mix of this activity. This is dependent on consumer choice, vehicle or mode pricing, and prevailing legislative or fiscal measures which influence mode selection;
• Ii represents energy used (energy intensity) by different modes of transport per unit of transport activity. This depends on the energy consumption characteristics of the stock of vehicles making up each mode and the conditions under which they operate;
• Fji represents the GHG emissions characteristics of this energy (fuel). This is directly related both to the carbon content of the fuel used and the energy required to extract, process, and distribute the fuel.

The paths which are easiest to work with, in order to obtain emission reduction are related to the variable I (intensity) and F (fuel carbon content). The energy intensity can be reduced through the increase of vehicles energy efficiency (fuel use/km) or through the increase of load factor. The carbon content could be reduced through the use of renewable fuels as bio-fuels
In Brazil, renewable fuels replacing fossil fuels, have been used during the last 20 years. Among them bio-fuels can be highlighted such as ethanol and bio-diesel.

The present paper objective is elaborating an analysis of the avoided CO2 emission as a co-benefit of two Brazilian initiatives in transport sector, that are the flex fuel development technology, aiming at increasing the hydrous ethanol use in transport sector in the country in light duty vehicles and the National Program of Bio-diesel aiming at partially replacing diesel in duty vehicles. Both initiatives had as main objective the oil dependency reduction, job generation and air quality.

In Brazil, studies for the application of Flex Fuel technology started in the beginning of 90s, when a possibility of replacing ethanol fuel vehicles was envisaged. At that time ethanol cars presented a huge drop in their sales. In March 2003, Flex Fuel car was officially launched in Brazil. The Flex Fuel vehicles presented good performance and fuel economy when fueled with either hydrous ethanol or gasohol. Since then, Flex Fuel technology is gaining market share in the Brazilian light vehicle fleet. In 2003 Flex Fuel vehicle in the Brazilian market corresponded to 3.7% of total sales of light duty vehicles and in 2004 and 2005 sales reached 21.6% and 50.2% respectively. In June 2006, Flex Fuel vehicle sales represented 72% of the total sales of that year (ANFAVEA, 2006).

Hydrous ethanol, used in Flex Fuel vehicle is made from sugar cane with high energy content, since each ton of sugar cane is equivalent to 1.2 oil barrel (Ribeiro, 2002). The sugar cane business in Brazil is an economic activity that represents 2.2% of the national GDP which corresponds to more than 8 billion dollars and creates approximately one million jobs, of which 4 thousands are in Sao Paulo, the main producer State in the Country (NAE, 2004).
In Brazil, ethanol could be considered a conventional fuel, once it is used since late 70s. The peak of ethanol industry was in 1986, however, due to some political and economical issues the share of ethanol in the Brazilian automotive market dropped to 0.8% in 2000.
The contribution of ethanol from sugar cane to reduce CO2 concentration in the atmosphere is due to its energy balance. When producing ethanol from sugar cane, bagasse is generated as a by product and it is used to generate electricity to the whole plant. Therefore no external energy source is needed to produce ethanol. This means that each energy unit invested in the sugar cane Agro-industry produces 8.3 units of renewable energy. Likewise, in the USA, the ethanol produced has a ration of only 1.3 (Macedo, 2004).

Regarding the co-benefit obtained from the Flex-Fuel technology, the present study estimates a range of 24.199 Gg to 27.922 Gg tones of avoided CO2 during the period of 2003 to 2006.
Bio-diesel as an alternative fuel for mineral diesel obtained from a chemical process called transesterification of fat or vegetable oil as castor oil, sunflower, soybean and other possible regional crops and used frying oil is the other initiative analyzed in this paper.
In 2004, the Brazilian Government created the Brazilian Program of Bio-diesel. This program established a mixture of 2% of bio-diesel with mineral diesel (B2). This percentage will be gradually increased. In 2008, the mixture will be mandatory all over the country, since presently the B2 mixture is only authorized in order to organize the market and the bio-diesel production chain. In 2013 a higher mixture of 5% bio-diesel (B5) will be mandatory.
According to ANP (2006), the capacity of the Brazilian bio-diesel plants is of some 85.3 million liters per year. This is a great challenge considering that to meet the Program's targets a production of 800 million liter per year in 2008 (2% of 40 billion liters of diesel consumed in 2005) will be necessary. This means that the present production supplies only 11% of the demand of B2.
The soybean bio-diesel energy balance shows a relation production/consumption of 1.43, which means, for each energy unit invested in the production of bio-diesel from soybean 1,43 units of energy is produced, disregarding the byproducts (Oliveira in NAE, 2005). Other studies carried out showed different results regarding different raw materials, e.g., the relation production/consumption of 5.6 for palm oil ((Martins e Teixeira in NAE, 2005).
Regarding the social aspects of the bio-diesel program, it is noted that it promotes job generation, both in the agriculture and in the industrial and logistical phase. According to the Ministry of Mining and Energy (2004), 152 thousand new jobs will be created in 2006 and another 153 thousand jobs in 2007, due to the bio-diesel (B2) implementation program
Concerning the quantification of the co-benefit obtained from the Brazilian Bio-diesel Program in terms of CO2 emission avoided, the present study considers the following assumptions: the Brazilian fleet fueled by mineral diesel consumes the mixture B2 of bio-diesel from soybean and uses methanol in the chemical process, in the years 2005 and 2006. According to these considerations, the Program could have avoided in such 2 years an amount of 1,293,660 tones of CO2.

In summary, it should be noted that these two Brazilian initiatives of using bio-fuels in the transport sector, shown in this paper, meet, without jeopardizing the growing transport activity, their main objectives, which are oil dependency reduction, air quality improvement as well and job generation. Thus, as a co-benefit the CO2 emission reduction is also obtained.
A key message to make transport policies (such as the ones mentioned in this paper) more efficient in terms of CO2 emission reduction is to promote the quantification of such emissions together with the diffusion of this results. Since the main objective of those policies is not the CO2 emission reduction, the calculation of the amount reduced is usually not done.

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Paper 7	Adaptation and disaster prevention
Author	Lennart Olsson (Lund University)
Session	3.1: Adaptation and disaster prevention
Topic	How can adaptation be included in international agreements so that it facilitates integrated development and climate actions?

How can adaptation be included in international agreements so that it facilitates integrated development and climate actions? (preliminary title)

Lennart Olsson (LUCSUS, Lund University Sweden)
Anne Jerneck (Dept. of Economic History, Lund University, Sweden)

Introducing the argument

It is a common perception that the climate change regime, with the UNFCC and the Kyoto Protocol as its main components, is concerned with mitigation of climate change i.e. reductions of GHG emissions. In this paper we will argue, however, that adaptation is as central to the Convention as mitigation and that the regime already allows for this. Hence, our argument is that there is no need to change the UNFCC, but it must be further elaborated in order to address adaptation more specifically and strongly.

The important Article 2 of the UNFCC states that the goal of the convention is to stabilise GHG levels in the atmosphere at a level that prevents dangerous anthropogenic interference with the climate system. But this is relative and depends strongly on the capacity to cope with climate change. What is dangerous is to a large extent determined by society's ability to adapt to climate change. If the adaptive capacity is low, even a minor climate change might become dangerous. But with increasing adaptive capacity society could cope with more severe climate change impacts. Consequently, we can argue that adaptation is central to the climate change regime.

There is a growing realisation in the scientific community that it is highly unlikely that anthropogenic climate change with palpable impacts can be avoided. Even with a successful implementation of drastic mitigation measures, the likelihood of stabilising global temperature below two degrees above pre-industrial levels is slim.

It is well known that developing countries are much more vulnerable to climate change impacts than industrialised countries, both due to low adaptive capacity and due to potentially severe climate change impacts. There are a number of factors that contribute to high vulnerability to climate change in developing countries. These include the often large size of rural and agricultural populations and their location in lowlying coastal and riverine areas. Moreover, much agriculture is very vulnerable to extreme climate events, such as drought, storms and floods. And due to the variability of hydrological regimes even irrigated agriculture is highly susceptible to climate variability.

The importance of adaptation for development

Development visions are often framed, at least by the international development community, in simplified quantitative terms such as reducing the number of people living under the poverty level (see the Millennium Development Goals) or in simplified symbolic terms like how to put poor people on the first step of the development ladder (Sachs 2005). At the global regime oriented

level, development is not often framed in terms like achieving sustainable livelihoods although this is much discussed at community levels and in research (Ellis 2000).

While development visions seldom consider the risk of increasing climate change impacts, concrete construction projects often do. In the construction of long-lasting infrastructure, such as bridges, dams and roads, it is obvious that investors must consider climate variability and potential climate change relevant for the expected life span of the investment. We argue that other development ambitions and efforts, such as national and regional development strategies, could learn from this thinking.

Relationships between risk management and development

Development implies an investment of some kind. For a poor household the investment can be in the form of labour, alternative use of land, money, or time. If the investment is perceived as very risky, the poor household is less likely to take the risk. Therefore we often talk about poor people following a strategy of risk minimisation rather than profit maximisation. Climate change is expected to increase both the frequency and the magnitude of extreme climate events, and hence increase the risk in particular in agriculture. Obviously there is a need for combining development visions and risk management in short and long term.

For good reasons, international development assistance (IDA) and disaster relief belong to separate discourses. We argue that this separation of development assistance from disaster relief is counterproductive.

Ownership of adaptation and development

Planning horizons of poor agricultural communities are typically short, next season or a few years ahead. This is both rational and necessary. From a climate change adaptation point of view, the planning horizon needs to be longer, typically one or several decades. An important challenge for development plans is to combine such planning horizons and still ensure local ownership of the development process. In the paper we will discuss possible avenues for such efforts.

How can adaptation and international development assistance become integrated?

We argue that international development assistance (IDA) has the potential of promoting integrated development and climate actions, but that this potential has not yet been recognised and used. In the paper we will explore a number of options for promoting such actions, including:

- Mainstreaming climate change into development policies
- Linking adaptation with other regimes
- Synergies of adaptation and mitigation
- Synergies between sectors
- Synergies between disaster management and development

Experiences from NAPAs

Least developed countries (LDC) have specifically been encouraged to develop plans for adaptation to climate change (Article 4.9 of the UNFCC). Of the 50 countries currently listed as LDCs, only six have completed their National Adaptation Plans of Action (NAPA). In the paper we will analyse some of these NAPAs in order to assess the potential of integrating adaptation and development.

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Paper 8	Technology
Author	Mike Wriglesworth (CEPS and ex-BP)
Session	3.2: Technology
Topic	How can technology development and diffusion be included in international agreements so that it facilitates integrated development and climate actions?

International Policy Framework for Development & Climate Action-Technology

This paper and presentation is focused on the question:

> 'How can technology development and diffusion be included in international agreements so that it facilitates integrated development and climate actions?'

The paper will review the existing place of technology development and diffusion in the UNFCCC convention and Kyoto Protocol, with reference back to how technology is treated in the Montreal Protocol on ozone-depleting gases. Another reference point is the role of national and regional technical standards in trade flows, and the potential for a technical equivalence concept identified by the Transatlantic Business Dialogue.

Generation and use of power are by far the most important sectors for climate action, particularly in developing countries, with huge investment needed in the next decades to meet development aspirations. The IEA study in support of the G8 Plan of Action has shown both that existing technology will form the basis of the bulk of investment in both developed and developing countries, and also the importance of incremental processes in progressively improving the efficiency of generating and of using power.

In the run up to agreeing the Kyoto Protocol, there was a fundamental philosophical debate between the US, advocating a flexible targets and trading approach to meeting commitments, and the EU emphasis on policies & measures, but cautious on trading. In future, interaction between policies, measures and trading with technology choices will become a major test of climate strategies, and of commitment to climate action.

An inclusive approach to agreeing climate action post-2012 will need to be broadly based, recognising the need to encourage research into finding new technologies, but especially to use the market to promote the diffusion of existing cleaner technologies. How market signals can become strong enough to achieve the diffusion needed should become a major part of the policy debate, including how trading might be harnessed.

Any international agreement on climate action is likely to have to cover very diverse policy approaches, e.g. between the EU and US, China and India. Agreeing common but differentiated responsibilities will become increasingly difficult in the context of global competitiveness concerns. The use of similar technological options might help bridge this gap by becoming a reference point for similar efforts, as could recognition of technically equivalent standards, whilst also reducing barriers to global trade flows.

Paper 9	Finance
Author	Alan Miller (IFC)
Session	3.3: Finance
Topic	How can financial mechanisms be included in international agreements so that it facilitates integrated development and climate actions for both adaptation and mitigation?

Incorporating Financial Mechanisms in International Agreements to Support Integration of Climate Change Mitigation and Adaptation with Development

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The views expressed are solely those of the author and do not necessarily reflect those of the IFC.

This paper has several parts. The first section reviews the diverse financing issues associated with climate change mitigation and adaptation, which range considerably from removing barriers to enable commercial lending for cost-effective energy efficiency improvements to providing significant subsidies for early stage application of promising new technologies. Barrier removal requires concessional funding for technical assistance including market assessment, investment evaluation, and training of banking officers, and is most effective in countries/regions with vibrant financial institutions and commercial lending. Access to capital is most often not a primary concern. In contrast, commercializing emerging technologies requires risk capital rarely available in developing countries. In the case of adaptation, understanding of financial requirements is still at an early stage but most likely will take the form of an incremental development cost for specific measures or insurance required to "climate proof" investments.

The second part provides an overview of existing sources of international assistance to support needed financial mechanisms. The Global Environment Facility (GEF), a financial mechanism of the UNFCCC but governed by an independent Council of 32 donor and recipient countries, has been the most important source of dedicated financing for climate change mitigation projects. Since its founding as a pilot program in 1991 and restructuring as an independent entity in 1994, the GEF has provided more than $1.5 billion for more than 200 projects in more than 80 countries, with a total investment value of 4 to six times as great. Projects have included financing for removal of barriers to cost-effective energy efficiency and renewable energy investments, substantial subsidies for several different climate friendly technologies (e.g., solar thermal power plants, mobile and stationary fuel cell applications, grid-connected PV, advanced biomass combustion), and measures to promote low carbon transportation alternatives (e.g., bikeways and bus rapid transit).

Initially GEF climate change programming was largely restricted to mitigation based on Convention guidance, but more recently GEF support for adaptation has expanded and now includes a pilot program within the core Trust Fund as well as administration of two voluntary Convention funds, the Least Developed Countries Fund (LDCF) and Special Climate Change Fund (SCCF). (Trust Fund projects are circumscribed by a requirement that funding be for the "incremental costs" of global environmental benefits; the two voluntary funds use a more flexible development baseline.) Together these three sources have about $200 million available for adaptation projects. In addition, the GEF is a leading candidate to manage the Kyoto Protocol Adaptation Fund, to derive its resources from two percent of the proceeds from CDM projects. The selection of a host to manage this fund is being debated by the Parties to the Protocol. In response to this debate the GEF Council recently agreed that it would be willing to depart from

the governance applicable to the Trust Fund such that only Protocol Parties would be allowed to vote on contested matters.

One issue with respect to GEF programming has been the local benefits of projects undertaken to provide global environmental benefits. The GEF itself supported a review of this issue in a report released in 2005. A relatively small number of GEF projects had been completed and had sufficient information available for analysis, but it was already evident that the local economic benefits of energy efficiency projects were more readily demonstrated than were the development impacts of longer term, technology commercialization projects. [More detail to be provided]

The other significant source of financing for climate change mitigation projects in addition to the GEF is carbon trading. With the onset of the first commitment period rapidly approaching in 2008, the volume and to some extent the prices paid for carbon offsets have been steadily rising. In 2005, the aggregated value of global carbon markets exceeded $10 billion, with much greater expected values in 2006. About half of traded volumes, or about $5 billion, was in developing countries (*State and Trends of the Carbon Market – 2006)* In contrast with the GEF, which is publicly administered and adopts its program priorities based primarily on expected long-term market on GHG emissions, carbon trading is primarily intended to engage the power of the market to find the lowest possible costs of carbon abatement (although numerous specialized funds and "premium" buyers provide some demand for blended products that achieve a wider range of developmental characteristics).

In the short run, the greatest carbon offset value has been for investments in destruction of HFCs, gases with a greenhouse gas impact much greater than CO2 (more than half traded volumes in 2005); reductions can be had for a cost equivalent to $1/ton CO2 or less, and accomplished relatively quickly. Energy efficiency projects are typically relatively small and consequently have correspondingly high transaction costs, while renewable energy projects have much higher abatement costs; together projects of these types amounted to only about 10 percent of volumes in 2005. However, there is little if any wider development benefit associated with HFC destruction. In one major project managed by the World Bank in China, the government has agreed to put a substantial share of the proceeds into a trust fund for projects with defined sustainable development benefits.

The HFC projects illustrate the tension inherent in balancing the desire for low cost carbon abatement in the interest of achieving the overriding objectives of the UNFCCC, with requirements for a wider range of local development benefits. Both objectives are of obvious importance, although if the imposition of developmental benefits is imposed in an overly restrictive way, the decline in trading could mean few benefits of any kind. This challenge has attracted growing interest from think tanks and individual experts including the World Resources Institute and IISD, resulting in some interesting proposals [More to be added]

A related issue in reviewing existing sources of financing for climate change mitigation and adaptation is the role of international institutions, particularly the World Bank and other international financial institutions (IFIs). Thomas Walde highlights the key role of such institutions in an era of globalization, as they combine a trans-boundary perspective, the technical and financial capacity, and modicum of political independence necessary to develop and implement projects and programs in partnership with developing countries. (Walde, 2003) Until recently, such institutions have generally not been given a mandate to engage specifically with climate change outside their role as implementing agencies for the GEF as their primary objective is poverty alleviation and developing countries lack quantified emission reduction obligations

under the Convention. As discussed below, the G8 provided IFIs with such a mandate at the Gleneagles Summit.

The IFIs have had a modest if growing commitment to support access to clean energy services as an essential element of poverty alleviation – the attainment of the Millenium Development Goals for health, education, clean water, etc. depend on the availability of modern energy services. More specifically, the IFIs have also been increasing their commitment to support of energy efficiency and renewable energy in recent years, although starting from very low baseline levels. For example, at the Bonn Renewable Energy Conference in 2004 the World Bank Group announced a commitment to increase its lending for defined clean energy projects by an average of 20 percent per year for five years. As part of this effort the Bank issues an annual progress report, and based on the first two years results is likely to substantially exceed its targets.

The World Bank (particularly the IFC) have had particular success with the application of targeted technical assistance and partial risk guarantees to engage local banks in lending for clean energy investments (primarily efficiency upgrades). UNDP, UNEP, the ECE, and other international institutions are implementing variations of the same approach based on their role and capacity, also often with promising results. (UNEP, 2006) These projects require some concessional resources but have very high leverage; once banks become comfortable with the different lending criteria needed to evaluate investments justified by energy saving the projects become self sustaining and even self-replicating as other banks duplicate product offerings. In the case of the IFC, such projects are now in effect in eight countries with on-lending equivalent to over $250 million. Such projects can only be implemented where financial markets are adequately developed and receptive, conditions which fortunately are being met in a growing number of countries.

A proposed approach to accelerating the transformation of clean energy financial practices is an International Energy Efficiency Project Financing Protocol to provide standard methodologies and good practice guidelines for commercial lenders. If such protocols can be designed with applicability to the diverse needs and circumstances of banks in the developing world, the impact could be highly beneficial.

Another role for EBRD and IFC, the two most private sector oriented of the IFIs, is to demonstrate more aggressive means of identifying opportunities for clean energy upgrades associated with their mainstream investments. Both institutions describe ongoing efforts to "push the envelope" through review of their portfolios, financing audits (EBRD), requiring clients to evaluate GHG emissions (IFC), and establishing benchmarks for different types of investments (EBRD). These measures benefit from donor support but may be replicable by interested private banks through cooperative information sharing efforts (e.g., the Equator Principles).

An important need arguably inadequately addressed by existing international arrangements is to share lessons and experience across countries and institutions. The IEA remains linked to the OECD but is gradually expanding its efforts with respect to clean energy technologies, and is also seeking to engage more effectively with large developing countries. The Bonn renewable energy conference in 2004 resulted in REN21, an ongoing secretariat for information exchange on trends in the global renewable energy market. Howard Geller is one of a number of energy experts to propose creation of an international clean energy agency to assume responsibility for information exchange and technology promotion in this field (Geller, 2003).

Most likely there is very little appetite for the creation of new international institutions. However, as already hinted above, there is some indication of a willingness among the IFIs to

take on expanded mandates in the funding of low carbon energy programs in partnership with their largest clients. An exploration of this approach became possible with the agreement of the G8 on a climate action plan at Gleneagles in July 2005. In response, the World Bank Group, in cooperation with other leading IFIs (particularly EBRD and ADB), have spent the past year preparing approaches for significantly expanding the scale of their support for clean energy finance in large developing countries – particularly the "Plus 5" countries, China, India, Brazil, Mexico, and South Africa. The World Bank has released two reports on a Clean Energy Investment Framework this year, the first in April for the Spring Meetings and the second in September for the Fall Meetings.

The G8 initiative and IFI response directly confronts arguably the most notable deficiency in existing international programs, their grossly inadequate scale. Indeed, a primary objective of the September report was to quantify the financing gap, describe the extent to which it might be filled by more effective use of existing instruments, and to the new extent new instruments may be needed offer some possible responses. More specifically, some key points in the report are:

- The existing financing gap in the energy sector in developing countries is about $80 billion per year;
- To address the need for modern energy services, the report proposes to double concessional support for energy access to $4 billion per year;
- To significantly decarbonize power production would require incremental investments of up to $30 billion per year
- There are three primary sources of funding for mitigating GHG emissions: GEF and other donor funding; carbon trading; and voluntary support
- Two alternative new financial instruments are outlined as mechanisms for providing the necessary increased support;
- As an alternative to new instruments, the GEF could be expanded but this would require up to a ten-fold increase for financing new technologies such as IGCC with carbon sequestration, which would in turn require "significant changes in the GEF's governance, operations, staffing and institutional arrangements"
- 20 to 40 percent of ODA and public concessional finance ($20 to $40 billion/year is subject to climate risk; the increased costs to address this risk range from 5 to 20 percent, "at least US$1 billion per year in funding that is clearly additional to existing ODA and concessional financing will be required."
- These issues and proposals will be the subject of further international deliberation at the Second Ministerial Meeting of the Gleneagles Dialogue, Mexico City, Oct. 3-4, 2006

Paper 10	Sustainable development and emission reduction
Authors	Harald Winkler (ERC) with Michel den Elzen (MNP)
Session	3.4: Linking sustainable development and emission reduction
Topic	How can emission limitation and reduction agreements be framed and formulated in international agreements so that it facilitates integrated development and climate actions?

Sustainable development policies and measures (SD-PAMs):
Concept and methods for a strategic approach for enhancing the climate regime post-2012

Harald Winkler, Niklas Höhne and Michel den Elzen

The concept of SD-PAMs

Sustainable development policies and measures (SD-PAMs) are an approach to stimulating action on climate change mitigation in developing countries. Instead of starting from explicit climate targets, the approach deliberately sets out to start from development objectives. This strategic approach taps into the primary motivation for developing countries, namely development. Defining more sustainable pathways to meet given development objectives has significant climate co-benefits. These co-benefits are by now broadly accepted (IPCC 2001b; Robinson et al. 2006; Winkler et al. 2006; Szklo et al. 2005; Munasinghe & Swart 2005; Baumert & Winkler 2005; Bradley et al. 2005; IISD 2005), the question is how to capture these benefits in the multi-lateral climate regime. A new strategic approach is needed, and SD-PAMs offers one possible approach.

The basis of the strategic approach

The principle of sustainable development is well established under the Convention and its instruments. The ultimate objective of the Convention explicitly frames the objective of stabilizing greenhouse gas concentrations in the context of sustainable development, in its often-forgotten second sentence: "Such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner". One of the underlying principles of the Convention is that Parties have a right to, and should, promote sustainable development (Article 3.4). The Delhi Ministerial Declaration on Climate Change and Sustainable Development (decision 1/CP.8) outlined the importance of linking climate change and sustainable development in both directions – integrating climate policies and measures in national development programmes, and taking climate change considerations into account in national sustainable development strategies in key areas such as water, energy, health, agriculture and biodiversity.

Economic and social development and poverty eradication are the first and overriding priorities of developing country Parties. Sustainable development is critical in delivering improved basic services such as energy, housing, transport, health, food security, ecoservices and others. Making development more sustainable can significantly reduce greenhouse gas emissions, compared to what they would otherwise have been.

The co-benefits of making development more sustainable are well-recognised at least since the IPCC's Third Assessment Report (IPCC 2001a) and its Special Report on Emission Scenarios (SRES). **Error! Reference source not found.** shows four of the families of scenarios from the SRES. Each of the striped scenario families represents a different storyline of how global emissions might evolve in future. The SRES scenarios deliberately do not consider policies

explicitly aimed at combating climate change. The striped reference scenarios shown in **Error! Reference source not found.** do not include climate policy and are shown together with mitigation scenarios resulting in atmospheric concentrations of CO_2 ranging from 450 to 750 ppmv (various shades).

Choosing a sustainable development path means that the baseline - or reference – GHG emissions are lower than in other possible futures. Put differently, a more sustainable development path has lower emissions, *even without* any explicit climate policy. The IPCC's Third Assessment Report found that this choice of future 'world' more important than the drivers determining GHG emissions (Morita & Robinson 2001: 142).

The corollary is also true – development objectives can be met in more or less emission-intensive ways. Beginning with one or more future development ambitions it would be possible to describe paths towards those goals (Metz et al. 2002; Winkler et al. 2002a). The selected scenarios show clearly that to reach the same atmospheric concentrations, significantly less effort is required if reference emissions are low (in the B family) than if the future world had higher emissions (in the A scenarios). The difference in emissions between the reference case in A1FI and 550 ppmv is much larger than the corresponding difference between B1 reference emissions and a path stabilising at the same level.

SD-PAMs as an approach builds on existing commitments by developing countries. Under Article 4.1 of the Convention, all countries made the commitment to "take climate change considerations into account, to the extent feasible, in their relevant social, economic and environmental policies and actions …" (Art 4.1(f). Developing countries' commitments under the Kyotot Protocol specify that mitigation programmes "would, *inter alia*, concern the energy, transport and industry sectors as well as agriculture, forestry and waste management" (Article 10.(b).i).

Clearly, the co-benefits of pursuing sustainable development can make a meaningful contribution to mitigating climate change. The challenge considered in this non-paper is to turn the conceptual link between sustainable development and climate change into a workable approach.

What are SD-PAMs ?

The SD-PAMs commitment would be to *implement* sustainable development policies. The voluntary pledge would be to implement and accelerate national sustainable development plans. The commitment is based on choosing a development path that results in lowered emissions, rather than an explicit climate target. SD-PAMs aim to encompass large-scale policies and measures, not only projects as in the CDM.

Whichever option is chosen, it will be important to establish methodologies to quantify the benefits of SD-PAMs, both for local sustainable development and climate co-benefits. The 'commitment' would not be measured not only in GHG emissions units, but primarily in SD units – building a 100 000 energy efficient homes, rather than a specified reduction in tons of CO_2 emissions. Section 0 below examines a range of different methodologies.

Methodologies for quantifying SD-PAMs

Methodologies are needed to quantify firstly the local sustainable development benefits, and secondly the GHG co-benefits of SD-PAMs. In the literature on SD-PAMs to date, the methodological approaches have tended to be bottom-up (Winkler 2006b; Szklo et al. 2005;

Dubash & Bradley 2005; Wei-Shiuen & Schipper 2005; Moreira et al. 2005). The approach itself starts from national development goals, and correspondingly analysis has looked at detailed case studies and national energy models to illustrate the impacts of SD-PAMs.

Top-down methodologies could be explored, in particular to answer questions about the environmental effectiveness – relating to climate change mitigation – of SD-PAMs. Quantification of GHG emissions avoided is not the primary driver of the strategic approach, but methodological tools to address this concerns could include analysis of efficiencies improvements and analysis in global emission allocation models.

Four methodological approaches are briefly considered in the paper – case studies, national energy models, analysis of energy efficiency improvements and global emissions allocation models.

Method 1: Case study - rural electrification in India

Rural electrification in **India** seeks to empower the 56% of households that remain without electricity supply. The development challenge is that 500 to 600 million people remain without access to electricity. Three paths were examined in a study (Dubash & Bradley 2005).

- A 'grid first' approach has little chance of meeting electrification targets.
- A strategic approach of 'diesel first' raises concerns about the cost of oil imports, security of supply and local air pollution.
- 'Renewables first' provides benefits, contributing to rural electrification, but at significant incremental capital costs (Dubash & Bradley 2005).

Given concerns raised about the grid and diesel technologies, there are important reasons for India to prefer renewable energy on domestic policy grounds. Favouring renewable energy sources brings significant CO_2 emission savings: between 14 and 100 million tons of CO_2 compared to using the grid.

Other case studies include energy-efficient low-cost housing in South Africa is one example of a SD-PAM, with the potential to remove the housing backlog while reducing emissions compared to a coal-fired grid (Spalding-Fecher et al. 2003; Winkler et al. 2002b). Avoided emissions might range between 50 – 600 kt CO2-eq if implemented at policy (Winkler et al. 2005) rather than project scale (SSN 2004).

Method 2: National energy modeling

The second methodology considered is to use national energy models to investigate the local sustainable development development and climate implications of energy policies. In South Africa, emissions from energy supply and use account for almost 80% of total GHG emissions (RSA 2004; Van der Merwe & Scholes 1998).

Studies on energy policies for sustainable development in South Africa have used this tool (Winkler 2006a). The study considered a range of energy policies, using the Markal model framework, a least-cost optimising tool. On the demand side, the policy options modelled covered industry, commerce, residential and transport sectors; on the supply side, they covered electricity and liquid fuels. The types of policy instruments investigated include both economic and regulatory instruments. Assessments against indicators of sustainable development were conducted to provides a sound means for policymakers to identify synergies and trade-offs between options, and to evaluate their economic, social and environmental dimensions.

In brief, the study showed that the combined effect of these energy policies could reduce total total energy system costs over the period by R 15.9 billion, relative to base case. At the same time, local air pollutants such as NMVOC, NO_x , SO_2 and carbon monoxide were reduced. The climate co-benefits of the combined policies were avoided CO_2 emissions of 142 Mt CO_2 for 2025, or 24% lower than in the base case.

Method 3: Analysis of policies by sectoral data

This method draws extensively on existing quantitative data to analyse the implications of SD-PAMs (Höhne & Moltmann forthcoming). Detailed data collected from the available literature includes activity data (in tons of product / output by economic sector), value added (in monetary terms) and energy use by fuel type. This data allows the calculation of both energy and GHG intensities. On the latter, the focus on mainly on CO_2 from the energy sector.

A similar set of policies as outlined for method 2 are analysed in this context.

This method enables the avoided emissions to be put in the context of global emission scenarios. Results form (Höhne & Moltmann forthcoming) will be included in the final paper.

Method 4: Global emission allocation models

The fourth method is analysis of SD-PAMs in global emission allocation models. Models such as the FAIR model (Den Elzen & Lucas 2003) and EVOC (Ecofys) are designed to allocate a given carbon budget across countries under different multi-lateral agreements. They could be used as a top-down approach to analysing climate implications of SD-PAMs, even though the latter are in principle bottom-up approaches. The key motivation for doing so would be to illustrate the environmental effectiveness in terms of climate change mitigation of SD-PAMs.

The use of this method will depend of detailed specification of a sufficient number of policies for several developing countries. Not all data on polices and measures in key developing countries is yet publicly available. Further work is needed to articulate national energy models with international allocation models. Collaborative efforts between research centres are needed to enable this, with particular attention to developing capacity within developing countries.

How can SD-PAMs be formalised in the multi-lateral system?

Formalising the pledged commitment could take two possible forms:

- The initial register could simply be a list of countries that wish to record their existing contribution through sustainable development and pledge further implementation. This could be recorded, for example, in a new Annex to the Convention. It has the advantage of simplicity.
- Another option would be a register of pledged policies and programmes. This approach has the advantage of specifying in more detailed the actions to which countries are committing. However, reporting in common SD units may pose some political and methodological challenges.

The two approaches are not mutually exclusive – there could be an initial list of countries, with a register of SD-PAMs maintained, for example, by the Secretariat.

An important part of building confidence in the ability of SD-PAMs to deliver on its potential would be regular reporting. Again, the Convention offers means of doing so in specifying that developing countries "…may on a voluntary basis, propose projects for financing, including specific technologies, materials, equipment, techniques or practices that would be needed to

implement such projects, along with, if possible, an estimate of all incremental costs, of the reductions of emissions and increments of removals of greenhouse gases, as well as an estimate of the consequent benefits" (Article 12.4).

Regular reporting on such projects and policies could either (a) be part of national communications, or (b) a separate reporting mechanism could be established. Primary reporting should include reporting in 'SD units', e.g. the number of efficient low-cost houses built. This does not imply the need for harmonised indicators of sustainable development, only that there is some quantitative assessment of the local sustainable development benefits. In addition, the GHG co-benefits should be quantified, as illustrated in methodological approaches above. Drawing on existing national capacity, means of monitoring the implementation of SD-PAMs could be established.

The multi-lateral system could provide further support to SD-PAMs in practical ways. The methodological approaches sketched in this paper could be investigated and elaborated more fully, perhaps by the Consultative Group of Experts or a sub-committee of the CGE. The Secretariat could be asked to prepare compilation and synthesis reports on the implementation of SD-PAMs.

To realise the potential of SD-PAM, the appropriate incentives are needed. A major advantage of SD-PAMs is that they could access both climate and non-climate funding. Climate funding might be made available through expedited access to existing mechanisms; whereas non-climate funding could include International Financial Institutions, Export Credit Agencies and mobilising domestic investment. SD-PAMs are capable of being linked to carbon markets in future, but it would seem advisable to explore the concept separately to this linkage initially. When linked to carbon markets, SD-PAMs is very similar in approach to extensions of the CDM to sectoral, programmatic or particularly policy dimensions.

SD-PAMs provide a strategic approach for capturing the climate co-benefits of developing countries' pursuit of sustainable development. By itself, the approach may not guarantee a particular environmental outcome – although this would depend on the number and ambition level of the policies implemented. The approach, however, is aimed at mobilising action, by turning climate change from a 'threat' to development into genuine opportunity to make development sustainable for developing countries. The approach does not require an entire new Protocol or mechanism, but 'only' a decision by the COP.

SD-PAMs could be important as one approach among others to build trust between countries in enhancing the climate regime. Sustainable development policies and measures, implemented through technology, enabled by finance, in balance with adaptation, could be an important package of options to take us beyond 2012.

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