

Integrating development and climate policies: national and international benefits

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What lessons for policy makers at national and international level can be drawn from the growing experiences of reconciling development and climate change? The key to achieving this is to approach the problem from the development perspective, since that is where in most countries the priority lies. Current knowledge on how to realize the benefits of such an integrated approach is assessed. The focus is on the main national development priorities, such as poverty reduction, disaster reduction, rural development, energy supply and transportation. Barriers and promising approaches are identified, based on the experience gained in several countries. The potential is explored for enhancing the global impact of such integrated approaches through replication of national experiences, supported by international organizations. Opportunities for large-scale initiatives are considered at national or regional level. The role of international agreements in fostering integrated development and climate policies is analysed, showing opportunities for achieving large co-benefits for addressing climate change by making use of existing policy frameworks for development and going beyond the UNFCCC framework.

Keywords: climate change vulnerability; development; disaster reduction; mainstreaming; policy formation; poverty reduction; sustainable development; synergy

Quelles sont les leçons que les décideurs peuvent tirer au niveau national et international pour multiplier les expériences de réconciliation entre développement et changement climatique? La solution est d'aborder le problème selon la perspective du développement, vu que c'est là où se situe la priorité pour la plupart des pays. Les connaissances actuelles sur la façon de réaliser les avantages d'une telle approche intégrée sont analysées. L'accent est mis sur les priorités nationales de développement principales, telles que la réduction de la pauvreté, la réduction des catastrophes, le développement rural, l'approvisionnement et le transport de l'énergie. Les obstacles et les approches prometteuses sont identifiés, sur la base d'une expérience obtenue dans plusieurs pays. Le potentiel pour améliorer l'impact global de telles approches intégrées est étudié par la reproduction d'expériences nationales, avec le soutien d'organisations internationales. Les opportunités pour les initiatives à grande échelle sont envisagées aux niveaux nationaux et internationaux. Le rôle des accords internationaux à l'intégration des politiques sur le développement et sur le climat est analysé, montrant comment, en employant les cadres de politiques existants pour le développement et en allant au-delà du cadre de la CCNUCC, de grandes synergies peuvent s'ouvrir en faveur de la lutte contre le changement climatique.

Mots clés: développement; développement durable; formation de politiques; intégration; lutte contre la pauvreté; lutte contre les catastrophes naturelles; synergie; vulnérabilité au changement climatique

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1. Introduction: the relation between development and climate change

Development efforts will be seriously hampered by the risks of climate change if these are not tackled. Reduced economic growth due to climate change damages, threatened or under-performing investments, and lower food production due to maladaptation to a changing climate, are examples of the influence of climate on development (Murphy, 2006; Schipper and Pelling, 2006; IPCC, 2007a; UNDP, 2007). Development that does not take climate change into account is unsustainable, as it will create societies that are vulnerable to climate change and can lead to high emissions of greenhouse gases from energy, transport and land use that will exacerbate climate change (Sathaye et al., 2007; Yohe et al., 2007). So there is a need to align and integrate policies on development and climate change.

The 'development first' approach, which starts from development priorities and integrates climate change vulnerability and greenhouse gas emissions considerations, provides a framework for reconciling development and climate concerns (Beg et al., 2002; Davidson et al., 2003; Heller and Shukla, 2003; Agrawala, 2005; Bradley and Baumert, 2005; CCAP, 2006; Srinivasan, 2006; Halsnæs et al., 2008; O'Brien et al., 2008; Ribeiro and Abreu, 2008). The resulting climate-inclusive policies aim at development with low vulnerability to climate change and development with low greenhouse gas emissions. They look for synergies and for a rational consideration of possible trade-offs between the different dimensions of sustainability.

The focus of this article is on exploring this integrated approach for developing countries. However, it is just as relevant for industrialized countries, where tensions between economic growth, job creation, and other socio-economic concerns with climate change have led to huge increases in the emissions of greenhouse gases and subsequent changes of the global climate (Robinson et al., 2006).

The objective of this article is to assess the current understanding on how to integrate development and climate policies so that mutual benefits are created at national and international levels. In other words, what lessons for policy at the national and international level can be drawn from the growing experiences in trying to reconcile development and climate change? The article therefore presents a comprehensive assessment of the relevant literature to draw a synthetic picture of key issues, major barriers and promising solutions.

2. Benefits of integration

Several countries have already demonstrated the benefits of an integrated development and climate strategy. Such benefits include reduced poverty, increased employment opportunities, and improvements in health, energy and food security, and infrastructure, as well as climate benefits (Halsnæs et al., 2008; O'Brien et al., 2008; Ribeiro and Abreu, 2008).

The alcohol fuel programme in Brazil, for instance, has created a cost-effective way to substitute for fossil fuels. Labour-intensive sugarcane production systems provide opportunities for income and job generation for hundreds of thousands of poor smallholder families in the Brazilian northern and north-eastern regions. In doing so, the economy has become less vulnerable to changes in oil prices while generating income for the rural population. The programme has helped to reduce its import dependency from oil, has saved about US\$52 billion (January 2003 US\$) between 1975 and 2002 in foreign exchange, has created 900,000 relatively well-paid jobs, and has considerably reduced local air pollution in the cities as well as decreasing greenhouse gas emissions (Moreira et al., 2005; Lebre la Rovere et al., 2006).

In Senegal, the pressure on land is increasing with the growing population. Climate change poses an additional stress, which increases the vulnerability of forest and agricultural systems. To

stabilize agricultural production levels, the restoration of soil fertility is a key factor. Agroforestry assists agricultural development and addresses climate change by providing a local energy supply for the rural poor, rehabilitating degraded lands, and sequestering carbon from the atmosphere (Sokona et al., 2003; Sow and Saint Sernin, 2005).

In many cases there is not a pure win-win situation. Trade-offs often have to be made between certain aspects of development and addressing climate change. In fact, the intention of making development more sustainable by bringing in the climate dimension might be at odds with other dimensions of sustainability. Promoting large-scale bioenergy production is a prime example of a policy where trade-offs between food security, biodiversity and climate change have to be made (see further below). Higher costs of clean energy systems have to be weighed against social and economic benefits.

3. Implementing integrated policies at the national and sub-national level

Country experiences show that integration of development and climate policies, or mainstreaming, can be most effectively occur at the national or sub-national level. This article therefore starts with an assessment of national experiences. This is followed by investigating the possibilities for scaling-up national experiences and, finally, the international context for such national approaches is discussed.

3.1. Key barriers to implementation

Although some national governments and international organizations have begun to mainstream climate policy in other policy areas, integrated development and climate strategies are not widely implemented for a variety of reasons (Agrawala, 2005; Sow and Saint Sernin, 2005; Mitchell et al., 2006; Schipper and Pelling, 2006; Hellmuth et al., 2007; Kok and de Coninck, 2007; Agrawala and van Aalst, 2008).

Climate change has, for a long time, not been recognized as an important issue for development, despite the fact that it is already starting to negatively impact development efforts. In addition, the costs and benefits of an integrated approach are not always clear, and attribution to single actions or policies is difficult. There are also reasons that have to do with how governments work and the lack of human and institutional capacity and lack of coordination and cooperation. Lack of joint decision making between different national ministries is a major constraint. Developing countries feel the pressure, especially from the international donor community, to mainstream various interrelated aspects into their core development policies; not only climate change, but also gender, HIV/AIDS, biodiversity and other issues. The OECD (Agrawala, 2005) calls that mainstreaming 'fatigue' or 'overload'. And last, but not least, there is a poor understanding of how to deal with scientific uncertainties amongst stakeholders.

3.2. Poverty alleviation

Poverty alleviation is a core objective for national governments in developing countries. At the international level, realization of the Millennium Development Goals (MDGs) is the most prominent issue on the development agenda at the moment. Climate change is threatening the realization of these policy objectives, because the poor are among the most vulnerable to climate change. Improved access to clean energy will help local development and reduce health problems from indoor air pollution caused by traditional fuel use. So, poor people can benefit most from mainstreaming climate change into development policy (see also Jerneck and Olsson, 2008; O'Brien et al., 2008).

The challenge is to make better use of the core instruments of poverty reduction policies, such as the Poverty Reduction Strategies (IMF/World Bank, 2005) and sector-wide approaches that are vital to get access to multilateral and bilateral assistance. Practically, this can be achieved through 'climate proofing' poverty reduction policies, i.e. systematically evaluating development strategies, policies and projects on their climate dimension. This means checking whether climate vulnerability is reduced, GHG emissions are minimized, parallel climate change decision-making structures are avoided, affected communities are involved, and traditional knowledge and coping strategies are being used. Promising results are shown by the Danish Development Assistance Programme (Danida, 2005; Klein et al., 2007; Agrawala and van Aalst, 2008).

3.3. Rural development and land use

One opportunity for integrated development and climate policies in rural areas comes from the emerging bioenergy market. Bioenergy crops not only generate income for farmers, they can also improve the rural renewable energy supply and national energy security, and they have potential as an export commodity. However, there are possible trade-offs with food production. On the one hand, investments in bioenergy crops could be mutually reinforcing, since market and transport conditions and inputs for productive and efficient biofuel and food production systems are similar. Farmers' income could increase, and better agricultural policies to deal with drought and erosion will directly influence the food security of the poor. On the other hand, competition for land and labour could have a negative effect on local food production and food prices, and increase dependency on food imports, especially when large-scale bioenergy markets emerge. In that case, biodiversity also becomes a concern (UNDP, 2000; Sow and Saint Sernin, 2005; Hunt and Sawin, 2006; IPCC, 2007b). Current scenarios for biofuel production up until 2030, however, do not require more than 4% of the world's arable lands (IEA, 2006). Experience from several countries shows that national biofuel policies could benefit from careful analyses of the local circumstances regarding problems with food, labour and biodiversity, better regional market integration to allow bioenergy cash crops to reach the relevant markets, and improved coordination between agricultural and energy policies (Dubash and Bradley, 2005; Sow and Saint Sernin, 2005; Dufey, 2007; Shukla, 2007).

3.4. Disaster reduction

There is a great potential for linking existing disaster reduction and prevention, on the one hand, and climate change adaptation, on the other, to reduce vulnerability to weather-related disasters. Both approaches reduce risks. A primary condition for this is that disaster-reduction and climate-change communities within governments, private sector, civil society and science in countries need to cooperate. Involving the people and institutions at the local level is important. Better information on upcoming extreme weather events is crucial, requiring capacity for early warning and climate predictions. Combined actions could help to shift attention from relief to prevention and preparedness through better land-use planning, and improved quality of houses and other building structures. A problem with preventive actions is that they are not always possible, such as in high-population-density areas in poor countries where people are forced to live in flood-prone areas. They are also less visible, and therefore often less attractive to politicians and donors (Schipper and Pelling, 2006).

3.5. Energy

Energy security and improving access to energy are very important for local and national economic development. This can be realized in ways that also reduce health risks (through reduction of indoor and outdoor air pollution), and mitigating climate change through lower emissions of CO₂.

Shifts from coal to natural gas and domestic renewable energy supply (bioenergy, wind power, hydropower) lead to a more diverse and cleaner energy supply. Even in countries with large coal reserves, such as China, there are possibilities to do this, given the air pollution problems caused by coal, logistical problems to move coal in sufficient quantities to power stations, and the opportunities created by energy system reform (Heller and Shukla, 2003; Heller, 2006; Winkler, 2006; Sathaye et al., 2007; Victor and Heller, 2007). Applying clean coal technologies (including CO₂ capture and storage, and provisions to limit air pollution) would be a possibility to make coal use sustainable, but additional costs are still a major obstacle (IPCC, 2005).

Efficiency in energy supply and in the end-use sectors plays a key role in realizing development benefits, such as reducing energy costs, making production more competitive, improving availability of electricity supply, increased energy security, and employment opportunities (Ng and Schipper, 2005; Jiang et al., 2006; Shukla, 2006; Winkler, 2006). Achieving energy efficiency, however, is faced with many economic, institutional and market barriers. Financing renewable energy and energy efficiency is still problematic in many countries (Dave et al., 2005; KfW Development Bank, 2005). In countries with a large share of renewable electricity, maintaining that share in the future is a challenge. The private sector plays a key role in energy supply and use in many countries and therefore needs to be closely involved in mainstreaming climate change into energy policy (Heller, 2006; Victor and Heller, 2007).

3.6. Transport

In the area of transportation, development priorities are focused on increased mobility, creating new infrastructure, and on health, air pollution and security of oil supply. Both development and climate can benefit by changing fuels (biofuel or natural gas), introducing more efficient vehicles, promoting public transportation and bicycles, and adapting city models (Ng and Schipper, 2005). Well-maintained public transportation systems, such as busses, can make a large contribution to increasing social well-being through improved convenience, less congestion, cleaner air and social contacts. Excellent examples exist in Bogota and other Latin American mega-cities (Hidalgo, 2003; WRI/EMBARQ, 2006). Avoiding lock-in into a car infrastructure is a prerequisite for such a public transport policy. This means that better integration of city planning, urban transport and environmental policy is a key condition to achieve these benefits.

The Brazilian bioethanol and biodiesel experience (Moreira et al., 2005; Ribeiro and Abreu, 2008) shows the importance of consistent government policies, a sizeable scale of production, and the introduction of flexible fuel vehicles by the automobile industry, as key success factors for the introduction of biofuels. Major obstacles to moving towards a sustainable transport system are the complexities of securing sustainable biofuel production in many countries (i.e. avoiding the massive use of subsidies to support unsustainable solutions), lack of political will to give priority to the large part of the population without cars, and the up-front investments in good public transport systems.

3.7. General conclusions

Several general conclusions can be drawn on effective ways of integrating climate change into different policy areas at a national level and making implementation happen:

- Take the evolving political and economic conditions in the country as the point of departure, and concentrate on the main policies and programmes that form the core of development planning. This means involvement of all relevant players.

- Acknowledge the importance of the sub-national level for implementation of, in particular, measures to reduce vulnerability. Local level solutions are key. Without the involvement of decentralized institutions, local development planning, and use of participatory approaches, policy implementation is not likely to be successful.
- Develop shared strategies between relevant ministries and governmental bodies and allocate responsibilities in a coordinated manner. National development strategies, sector and environmental strategies, poverty reduction strategy papers, and the planning and budgeting process offer opportunities to mobilize coordinated efforts. It is not primarily a matter for the Ministry of Environment; action has to come from the Ministries of Economic Affairs, Finance, Planning, Agriculture, and Energy, where the core decisions on development are taken.
- Promote a risk-management approach in public and private decision making, so that stakeholders will take uncertainties on climate change and its impacts into account. An important contribution can be made by the scientific community in communicating these climate change risks to all stakeholders in the development process in terms that relate to everyday practice.
- Consider climate change as a cross-cutting issue in development assistance. This implies moving away from a situation in which the topic is dealt with by climate experts in a special division. Integrate climate change with other development policy areas such as agriculture, trade, forestry, infrastructure and technology.
- Focus on facilitating national governments in their process to mainstream development and climate. Capacity building and capacity utilization will be key factors.
- Show realism in dealing with synergies and trade-offs. Synergies are not always possible, especially when markets are imperfect. Low energy prices due to heavy subsidies can, for instance, be a major obstacle to improving energy efficiency.

4. Enhancing the global impact of national experiences

The second part of this article looks at the scaling-up of national approaches. In order to have a global impact there is a need to:

- Replicate promising approaches of integrated development and climate policies in other countries, with assistance from international organizations;
- Increase the scale of development activities within countries that have a positive influence on reducing vulnerability or keeping GHG emissions low.

The key question is how this scaling-up process could be realized through international initiatives.

International organizations, (such as the FAO, UNDP, UNEP, UN Regional Commissions, the World Bank, Regional Development Banks, OECD, the Red Cross) as well as new public-private partnerships (such as the Global Village Energy Partnership, the Renewable Energy Policy Network 21), do already play a facilitating role in implementing integrated development and climate strategies in many countries. They can provide a forum for further development of these approaches, share good practices, build adequate human and social capacities, initiate new partnerships and regional collaboration, set standards and guidelines, and provide reliable data. However, differences between countries and regions are very important, and replication is therefore not the same as copying. Approaches need to be tailored to specific needs and circumstances, along with available resources (Red Cross, 2003; Burton and van Aalst, 2004; UNDP, 2004).

4.1. Poverty reduction

A critical issue for scaling-up is financing the mainstreaming of climate change into poverty reduction strategies (O'Brien et al., 2008). There is a tendency in the development assistance communities to rely on additional climate funding to realize this mainstreaming. However, the inherent risks of climate change to poverty eradication strategies (as a significant proportion of development assistance is sensitive to climate change) warrant the use of core development funding for this purpose (Greene, 2004; Brouwer and Aerts, 2006; Murphy, 2006). This would require integration of climate change risks in the national poverty reduction and development plans of developing countries. Given the magnitude of the climate change risks, increasing overall funding through leveraging non-ODA funding remains critical.

A second important issue for scaling-up is creating the right conditions in developing countries – with assistance from bilateral and multilateral organizations – for mainstreaming climate change in poverty reduction policies. A good example is the Poverty and Climate Change Initiative (African Development Bank et al., 2003). A large number of bilateral and multilateral donors agreed on an approach on how to mainstream and integrate adaptation to climate change into poverty reduction efforts. Local livelihoods, human capacities, and technologies serve as the starting point. Creating access to resources and markets to build coping capacities is important. Data on vulnerabilities can be provided by international organizations. Partnerships between the public and private sector at community, national and international levels, such as the Poverty and Environment Partnership (UNDP, 2005a), are effective vehicles for disseminating best practices. Implementation of the MDG agenda will provide a strong incentive for such partnerships (Rockström et al., 2005).

4.2. Rural development and land use

For land-use systems, where large differences exist in local conditions, scaling-up integrated development and climate policies has to be adapted to local circumstances. Efforts are needed to provide reliable land-use data, practical standards and guidelines to both national policy makers and local communities. This requires a coordinated effort between national governments and international organizations. The FAO Food Security and Nutrition and Vulnerability-related Information and Mapping System (FIVIMS) is an example of such information systems for agricultural development (FAO, 2007).

Biofuel production is one of the prime candidates for scaling-up integrated agriculture and climate strategies. Coordination of UN activities in promoting sustainable bioenergy programmes and partnerships is assisted through the International Bioenergy Platform (FAO, 2006a) and the Global Bioenergy Partnership (FAO, 2006b). Since many countries are not able to generate the necessary investment and the required institutional support, the assistance of financial institutions is important. An interesting development in this field is the recent announcement of a biodiesel production programme in Senegal, financially supported by Brazil, India and the West-African Bank for Investment and Development (Africa Research Bulletin, 2007). Improving international trade opportunities in biofuels, as discussed by the WTO, can be significant for rural development (Dufey, 2007).

4.3. Disaster reduction

Scaling-up integrated disaster reduction and climate change adaptation policies seems very promising, especially by making use of the UN ISDR Hyogo Framework for Action 2005–2015 (UNISDR, 2006). Climate change risks have already been recognized, and integration in disaster preparedness and prevention is being discussed at international and national levels (Sperling and Szekely, 2005). Implementation of the agreed actions is on a voluntary basis, but is supported by

intergovernmental processes to develop guidelines, monitoring tools and data, with encouragement by national platforms. Improvement in mapping vulnerable areas, effective prevention approaches and early warning systems is a key concern. Resources for national implementation have to come from national budgets, which make disaster prevention vulnerable to the setting of priorities. Climate change may help to better integrate disaster reduction policies in development planning. What is needed is practical action at the national level on mainstreaming of climate risks in the disaster reduction and development agenda, with the support of the international processes (Thomalla et al., 2006).

4.4. Energy

Scaling-up in the energy sector can follow two different routes. One focuses on future large-scale energy projects. The other refers to the many small-scale initiatives that are needed in many countries for improving energy efficiency and the implementation of renewable energy.

Large-scale shifts to natural gas in the power sector are realistic options for China and India. As indicated above, considerations of air pollution and logistics, combined with opportunities for importing LNG (liquefied natural gas), do make this attractive for China. In India, regional cooperation in importing natural gas from the Central Asian Republics and Iran would create similar opportunities although the current political instability will unfortunately make this difficult. From studies in China, it can be seen that an important success factor seems to be the alignment of the interests of provincial and local government, the business sector, and the national government. Understanding the political power structure and the local conditions is vital in such circumstances (Heller and Shukla, 2003; Heller, 2006; Victor and Heller, 2007). For clean coal technologies (including CO₂ capture and storage), international cooperation is needed in order to overcome the financial and technical barriers in developing countries (IPCC, 2005). A scale-up opportunity for Africa would be the building of a large hydropower-based electricity network in southern Africa (WEC, 2007).

Replication of national success stories is effective for energy efficiency and renewable energy. Partnerships such as the Renewable Energy Network 21 and the Global Village Energy Partnership have proved to be effective in mobilizing national initiatives and sharing experiences. Enhanced energy access, another top development priority, is not in conflict with integrated energy and climate policies, because it will only marginally influence total energy consumption (Wang et al., 2006; Sathaye et al., 2007).

The role of international organizations is important in knowledge transfer on energy efficiency, renewable energy and clean fossil energy (IEA, 2006), but also in leveraging the financial means for sustainable energy investments. The recently published World Bank strategy for clean energy and sustainable development, in response to a G8 initiative, is a good example of the latter (World Bank, 2006a; Miller, 2008). The Clean Development Mechanism may be a supplemental source of financing clean energy, but capital flows are small compared with the financing needs (Tirpak et al., 2007; Miller, 2008; Tirpak and Adams, 2008).

4.5. Transport

Since transportation greatly depends on local conditions, the replication of successful integrated transport and climate policies is difficult. The Brazilian successes with biofuels and flex vehicles (see Ribeiro and Abreu, 2008) might not be easily replicable elsewhere. The lack of international organizations, partnerships and programmes focusing on sustainable transport systems make it even more challenging. One of the few examples is the EMBARQ programme (WRI/EMBARQ, 2006),

which represents an attempt to learn lessons about sustainable urban transport from different cities around the world. What is needed is a combination of documentation of case studies, development of guidelines for monitoring and measuring the effects of sustainable transport programmes, facilitation of regional cooperation and, most important, integration of these experiences in infrastructure investment, both nationally and within international development financing.

5. Mainstreaming climate change in international frameworks and agreements

The third element of this article is the influence of international frameworks and agreements on the mainstreaming of climate change into development policy. Realizing climate benefits at the national level can be facilitated or hindered by international policy frameworks and agreements. Existing international frameworks and agreements are usually not designed to promote integration between different policy areas, and institutional structures often complicate such integration. So the question is, what opportunities are there to make better use of existing policy frameworks to realize development and climate benefits, and how to design future frameworks and agreements in such a way that they facilitate the implementation of integrated development and climate policies at national level. This obviously means there is a need to go beyond the Framework Convention on Climate Change and to broaden the climate agenda (Kok and de Coninck, 2007; Drexhage et al., 2007; Jerneck and Olsson, 2008). In that sense it is important that the Bali Action Plan for post-2012 climate agreements identifies the need to explore the catalytic role of the Convention.

5.1. Adaptation

There is general consensus that it is important to strengthen the adaptation component under the UNFCCC when designing post-2012 agreements (Aerts et al., 2005). But how can this be done to facilitate integrated development and climate approaches to deal with climate variability and change? One possibility is to create a close link at the level of a post-Kyoto agreement with the ISDR Hyogo Framework for Action 2005–2015 that is already integrating climate change risks into national and local disaster preparedness and risk reduction plans (UNISDR, 2006). The same could be done regarding existing and future bilateral and multilateral development assistance and poverty reduction programmes (African Development Bank et al., 2003; WRI, 2005; World Bank, 2006b), for instance by establishing formal reporting requirements. A very different possibility is to make use of the provisions of the Human Rights Convention for the protection of refugees to deal with possible forced migration as a consequence of climate change impacts (UN Security Council, 2007). Furthermore, linking insurance mechanisms to a new agreement, drawing on international platforms such as the UNEP Finance Initiative, would help the mainstreaming. Last, but not least, it would make sense to create links with the UN Convention on Combating Desertification, which deals with adaptation to drought. An additional advantage of integrating implementation of various international frameworks and agreements is the simplification of the administrative burden in developing countries.

5.2. Technology development and diffusion

The development and deployment of technologies that are climate-friendly call for a combined ‘push and pull’ approach. All climate-friendly technologies will be needed to manage climate change risks (IPCC, 2007b). Both a ‘push’ via government-funded research and development and a ‘pull’ via regulations, taxes, subsidies and tradable quotas will be needed to make those

technologies available. It must be kept in mind that the development of technologies for the longer term is not sufficiently triggered by short-term cap-and-trade systems alone. Research and development support and price signals (at least until 2020) will be important (Barker et al., 2007). In that respect the recent decisions by the European Union to reduce GHG emissions unilaterally to 20% below 1990 levels is a promising first step (European Commission, 2007). Diffusion of technology to developing countries is crucial in achieving the MDGs and supporting sustainable development. Investment by the private sector, facilitated by the UNFCCC Clean Development Mechanism, carbon funds of private and development banks, and adequate enabling conditions in developing countries, is the main driver for this technology diffusion (IPCC, 2000). Investment incentives and institutional enabling conditions for technology transfer need to be applied across the economy. Therefore it is important not to single out climate-relevant technologies, but to focus on general innovation and modernization policies (Tirpak et al., 2007).

One important way to create incentives through international frameworks and agreements is a strengthening of international cooperation in research and development of low-carbon technologies. There are existing arrangements within the IEA; in addition, several partnerships on hydrogen, fuel cells and CO₂ capture and storage are operational. De Coninck et al. (2007), in their analysis of Technology Oriented Agreements, point to the modest role of both information-sharing and cost-sharing agreements in bringing about significant emission reductions. It is not yet clear how best to reinforce these arrangements (Tirpak et al., 2007).

In terms of promoting the diffusion of clean technologies, facilitating conditions in recipient countries is essential. The current UNFCCC provisions are inadequate to make sufficient progress, because they are not based on the mainstreaming of climate-friendly technology diffusion into the regular innovation and investment frameworks of developing countries. Exchanging best practices, capacity-building, and public-private partnerships can all contribute (IPCC, 2000). A potentially effective approach to enhance technology diffusion could be agreements on technology mandates (standards, implementation), as discussed by de Coninck et al. (2007). Within a post-Kyoto agreement, this might be placed under the umbrella of Policies and Measures in the form of sector agreements or sustainable development policies and measures (see below). Longer-term emission goals could also create useful incentives (Tirpak et al., 2007). Given the central role of investment patterns for diffusion of technology, a lot will depend on new financing instruments (see below). The involvement of the real decision makers is essential, and the problem of the current UNFCCC technology transfer and financing framework is that these stakeholders are often not represented there.

5.3. Finance

Financing climate-safe and climate-friendly development requires large additional funds, which are not available through the UNFCCC financial mechanisms. Although CDM is now generating capital flows in the order of several billions of dollars per year, and GEF has spent several billions of dollars over the past 10 years (Tirpak et al., 2007; Tirpak and Adams, 2008), this is still a small amount compared with the additional US\$100–200 billion that is estimated to be needed per year to invest in clean energy, improved energy access, and making development less vulnerable to climate change (World Bank, 2006a; UNFCCC, 2007a). The UNFCCC adaptation fund, to be filled by a 2% surcharge on CDM project financing, is not likely to generate capital flows of this magnitude either. The main contribution needs to come from development financing and private investments, both domestic and international (Sussman and Helme, 2004; Miller, 2008). The World Bank's clean energy and the sustainable development framework is a first attempt to generate such a leveraging mechanism (World Bank, 2006a).

Apart from the problem of additional funding, there is also the issue of access to basic investment capital. This may not be an issue for large energy projects, since these are mostly located in countries with good access to investment capital and attractive conditions for FDI (foreign direct investment). But for small-scale energy-efficiency initiatives, access to financing is more frequently a barrier, even when it has excellent economic, social and environmental benefits. Solving this problem requires national solutions that involve the banking system as well as government involvement. Institutions such as the International Finance Corporation (IFC) and the European Bank for Reconstruction and Development (EBRD) have developed such lending programmes. Positive experiences can be replicated, but the lack of international frameworks or partnerships is a major barrier (KfW Development Bank, 2005; World Bank, 2006c; Miller, 2008).

5.4. Sustainable development and emission reduction

The notion of linking GHG emission reduction in developing countries to the development agenda is now widely accepted as necessary for the broadening of the international efforts to deal with climate change. The question of how international frameworks and agreements could be designed to facilitate integrated development and climate policies leading to lower GHG emissions is being addressed in the context of the UNFCCC discussions on post-2012 agreements (Tirpak et al., 2007; UNFCCC, 2007b).

A promising idea is to look at local sustainable development policies and measures (SD-PAMs) in developing countries, as part of a system with different stages of commitments for countries, depending on their development stage. For developing countries that are not yet ready to participate in absolute emission reduction efforts, a system of voluntary or mandatory obligations to implement policies and measures to make development more sustainable could be created. That would lead to co-benefits in terms of limiting GHG emissions and reducing vulnerability to climate change (Baumert and Winkler, 2005; Winkler et al., 2007, 2008). This thinking may indeed appeal to large developing countries (CCAP, 2006; Gao, 2006). Proposals on expanding the UNFCCC Clean Development Mechanism to allow for sectoral CDM programmes (Figueres, 2005; Sterk and Wittneben, 2006) show some similarities, but the main difference is that sustainable development policies and measures would be built on domestic development policies and would therefore not be fully dependent on additional climate financing, as is the case with CDM. Discussions are, however, still at an early stage. Many questions remain unanswered, such as on quantification of the emission effects, whether it should be strictly voluntary or have a more mandatory character to make country efforts comparable, if it can be connected to the carbon market and the manageability of a system of SD-PAMs. A possible barrier is the baseline issue: the current CDM system only applies to measures that achieve a deviation from the baseline. If SD-PAMs change that baseline, it may interfere with CDM (UNDP, 2005b; Miller, 2008). Further elaboration of these questions is necessary to help negotiators make use of these ideas.

6. Conclusions and the need for further study

Over the last few years, progress towards integrating development and climate policies in several countries has been observed. Mutual understanding is increasing between different actors in this field and benefits have been demonstrated in several countries. Experiences show that integrated development and climate policies can be most effectively integrated at the national or sub-national level. This requires commitment of all relevant ministries and government bodies. Using a risk-management approach in decision making facilitates the mainstreaming of climate change issues,

provided that the scientific information is presented in a practical manner. The development assistance community can make a major contribution by making ‘climate proofing’ of programmes a centrepiece. However, significant barriers exist that hamper implementation. In various sectors, promising approaches have been identified to overcome these barriers.

Successfully multiplying and replicating promising experiences, facilitated by international organizations, programmes and networks, is crucial to enhance the global impact of the integrated approach. Replicating successful approaches in other countries, as well as aiming at activities at country level with large impacts, are both needed. Starting from evolving political and economic priorities in development planning is core to the approach. Promising approaches are viable in sectors such as poverty alleviation, rural development, disaster reduction, energy and transport. International organizations have an important role to play that needs to be targeted to the specific circumstances of individual countries. Especially in the energy and transport sectors, strong private-sector involvement is needed.

Multilateral frameworks and agreements can be used to create the right conditions for mainstreaming climate change at the national level. Good opportunities in that respect exist in the context of the ongoing discussions about new agreements and mechanisms to follow the Kyoto Protocol. Using existing agreements, frameworks and partnerships outside the climate domain, such as those for disaster reduction, combating desertification, human rights, trade, technology development and finance, has a large potential.

Obviously there is a need for further work, in particular on:

- More intense exchanges between development and climate communities, with the strong involvement of the private sector
- More in-depth analyses of barriers to integrated development, and climate approaches and possible solutions at both national and international level
- Further exploring of ‘large emitter deals’ (clean coal, coal to gas, avoiding deforestation, peatland conservation) and ‘replication mechanisms’ (adaptation, efficiency) and their relation to processes and organizations at different levels
- Further exploration on how development and climate approaches fit into new international frameworks and regime architectures
- Implementation of a series of ‘action-oriented’ demonstration projects.

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