Clean Development Mechanism in the transport sector – Experiences and future development

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Abstract

In development policies, transport is closely linked to economic progress. As the externalities of transport activities include numerous health hazards and environmental harms, decoupling of welfare and transport growth is necessary. While the project portfolio of the Clean Development Mechanism (CDM) is expanding rapidly, the transport sector has so far played a rather minor role. In order to better understand why there are so few transport projects under the CDM, this paper examines current transport projects under the CDM framework. In addition, this paper explores in how far and what kind of sectoral approaches to the CDM may provide a better framework for transport projects. To this end, different transport instruments are discussed based on existing CDM criteria. We conclude that it is possible to design sectoral transport activities within clear project boundaries that fit into a framework of a programmatic or policy-based CDM. Although we are able to ascertain that transport policy research yields several modelling tools to address the methodological requirements of the CDM, sectoral approaches will only compound transport projects' problems regarding high complexity and related uncertainties. The CDM may therefore need new rules to manage these risks. Nevertheless, sectoral approaches allow the scaling up of activities to a level that affects long-term structural change. Permitting sectoral projects under the CDM may allow for the implementation of comprehensive measures such as transport master plans that can enable a variety of activities impacting transport trends significantly.

Introduction

The transport sector accounts for about a quarter of global carbon dioxide (CO_2) emissions (IEA 2005). Global transport-related greenhouse gas (GHG) emissions are currently rising by 2.5 percent per year, in the countries of the global South even by 4.4 percent (IEA 2004). The transport sector is thus the fastest growing source of GHG emissions. It is expected that the urban population in countries of the South will double by 2030, which may lead to a corresponding further increase of urban transport emissions (Browne et al. 2005: 2).

In order to tackle the high and ever-growing emissions from the transport sector there are no simple solutions. So far, improved efficiency has always been jeopardized by the increase in the number and weight of cars as well as the kilometres travelled. In industrialized countries, the development of comprehensive transport policies has shown that although environmentally-friendly technology can mitigate GHG emissions in this field, a more deeply rooted, complex and integrated approach to managing transport policy can take hold of the issue with a stronger grip than technological innovation alone is able to. Fundamentally, spatial development that leads to avoidance of transport is the most effective tool in battling transport emissions (Petersen 2001). Sustainable solutions to transport policy need to first and foremost address the issue from this perspective.

Developing sustainable transport patterns in countries of the global South is one of the most urgent challenges in tackling climate change considering the growing trend in GHG emis-

sions from this source. The Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC) provides with its Clean Development Mechanism (CDM) a way to encourage industrialized countries to foster climate-friendly projects in developing countries. This instrument might contribute to steering transport in the countries of the South into a more sustainable direction. The objective of the project-based mechanism is twofold:

- to assist countries not included in Annex I to the UNFCCC ("developing countries") in achieving sustainable development, and
- to allow countries that are included in Annex I to the UNFCCC and have inscribed specified GHG emission targets in Annex B to the Kyoto Protocol ("industrialized countries") to acquire Certified Emission Reductions (CERs) from CDM project activities undertaken in Non-Annex I Parties and count them towards their Kyoto targets.

Although the CDM has proven to be a popular tool (as of the latest version of the UNEP Risoe Centre's CDM pipeline overview, to date more than 1,700 projects have been registered or are at the validation stage, expecting an annual 300 million CERs in 2012 and a cumulative 1.9 billion CERs by 2012), there are currently only 3 transport projects at least at the validation stage (Fenhann 2007). There have been critics voicing complaints that project activities most likely to enable host countries' sustainable development, such as renewable energy, energy efficiency and transport project activities, are not competitive and are marginalised in the CDM market. As a further concern, it has been noted that in its current form even good projects are isolated local efforts that contribute little to the sectoral transformations that will be necessary to effectively combat climate change (Sterk / Wittneben 2006).

This warrants a discussion on how the CDM could play a role in supporting sustainable development objectives in national transport policy. Scaling up the CDM from localised efforts to a more sectoral scope has been put forward as one potential means to enhance the sustainable development benefits the CDM can deliver (Sterk / Wittneben 2006). In particular, Browne et al. (2005) have suggested that sectoral approaches might provide a better fit for transport projects under the CDM than the current project-based approach. "Better" has two dimensions in this context. First, sectoral approaches might make it easier to address the methodological requirements of the CDM. Second, they might allow including activities that cannot be defined or implemented in a limited local context and generally enable the CDM to have a deeper impact on long-term structural trends. The challenge is to define what a sectoral approach could mean for the transport sector and to assess in how far it would be feasible. Our research question for this paper may thus be stated as: Can a sectoral approach to the CDM provide a better framework for projects in line with a sustainable transport policy that encourages structural change and integrated policy making?

This paper is based on a policy paper written in the JIKO-project at the Wuppertal Institute funded by the German Environmental Ministry. It is an attempt to bring together the knowledge gained from the experience in sustainable transport policy on the one hand, and the current debate on the evolving CDM structure on the other. Starting with sustainable mobility, the following will then describe recent CDM activity in the transport sector .In order to utilize the CDM as a mechanism to encourage integrated sustainable transport policy that elicits structural change in the national transport sector, the paper then examines in how far the evolving sectoral approach to the CDM could be made use of. The current definitions and possibilities of a sectoral CDM are elaborated on and connected to the need for a structurally integrated transport policy approach.

Transport and the CDM

SUSTAINABLE TRANSPORT POLICY

While it is widely recognised that transport is one of the main global sources of greenhouse gas emissions, in the transport decision-making arena these emissions are just one issue amongst other pressing concerns. In the environmental field these are negative impacts from transport in terms of air pollution, noise and landscape damage. Moreover, transport policy, much like other infrastructure policies, is mainly discussed not in environmental terms but in the context of economic development and social cohesion. Transport infrastructure is a location factor for trade and industry and an important economic indicator often used in discussion about job creation and equal life standard. However, in order to discuss sustainable transport, it is important to highlight that 'access' to different destinations and not to transport means is the key term for defining a sustainable transportation system (Litman 2003: 4). Being mobile does not mean to travel long distances but to have a variety of options for different human activities such as leisure, work or business (Petersen 2004, Becker 2006). In this context, there is an ongoing international debate on sustainable mobility and environmentally friendly transport policies (e.g. ECMT 2000, SRU 2005, Richardson 2005, Tuominen 2005) and the way to measure its implementation (Gudmundson et.al. 2005, EEA 2003).

The focus on sustainability can be explained by the fact that transport is a crosscutting issue, crucial for economic, social and environmental objectives of societies (Petersen 2002). Hence, a careful weighting of the different aspects is needed. In order to overcome the core conflict between transport related environmental and socio-economic objectives, the concept of sustainable transport policy focuses on minimizing the negative effects of transport and maximizing economic prosperity and social equity. In this discourse the problem of greenhouse gas emissions is acknowledged (Brown 2005, World Bank 2002, ECMT 2000, WBCSD 2004). Especially growing figures of road transport in developing countries as well as global air transport highlight the challenges. Nevertheless, there are a number of proposals on how to tackle this concern. The options reach from internalisation of external costs (e.g. through taxes or emission trading) to transport and land use planning (ECMT 2000).

Today, sustainable transport is mentioned as a general guideline in many countries. For example, the current policy documents of the European Union (European Commission 2006) and the World Bank (1996, 2002) underline this aim. But also in the countries of the South, sustainability is on the transport

Table 1: Classification of Sustainable Transport Instruments

	Planning (distributive)	Regulation (normative)	Economic Instruments (re-distributive)	Soft Instruments (informative)
Public Policy	• Regional & urban land use planning • Transport Infrastructure planning • Least Cost Planning	• Physical norms and standards, (e.g. emission limits, safety) • Regulation of traffic organisation (e.g. speed limits) • Operation licence requirements (e.g. public transport, taxi) • Regulation of decision-making (e.g. EIA, SEA, public participation, gender mainstreaming)	• Taxes on fuels • Road-pricing • Subsidies • Purchase taxes • Fees and levies • Emission trading • Auctions (e.g. vehicle licenses)	• Provision or support of mobility management and marketing schemes (e.g. car-clubs) • Cooperative-agreements • Provision of eco-driving training schemes • Co-ordination with regards to technical standards, procedures and R&D
Corporate Policy	• Company logistics • Choice of location • Choice of technology (e.g. bio-fuel)	• Travel rules (only public transport refunding, restrictions to air transport)	• Financial incentives for using sustainable modes	• Implementation of Mobility Management • Eco-driving training

policy agenda. Even if the reduction of CO_2 emissions is not explicitly named, reduction of energy use as well as energy efficiency is a key concept to serve principles of sustainability (Aßmann / Sieber 2005). Generally speaking, sustainable transport is the consequence of different measures and policies aiming at influencing transportation need and behaviour. An integrated approach, taking different instruments into account, is required to foster sustainability and effectively combat rising emissions in the transport sector. In order to remain in the terminology of transport policy four types of instruments are introduced: *planning* (i.e. distributive), *regulatory, economic, and soft instruments* (see Table 1). Until now, sustainable transport literature focuses on public policies. However, corporate policies and activities which have so far been the main focus of the CDM can be subsumed under these types as well. Nevertheless, it must be considered that these are implemented on a different level.[1]

Not all instruments are associated with only one type, i.e. the presented classification describes ideal types. For example, regulation concerning public participation in a planning procedure is a combination of planning, informing policy makers, and regulation. Economic instruments may be seen as the government imposing regulations on the market. Furthermore, voluntary agreements are often closely related to regulative approaches. In addition, the instruments are often interdependent and do not work without others. Nevertheless, the classification is useful to discuss policy options in more depth against a sectoral approach of the CDM.

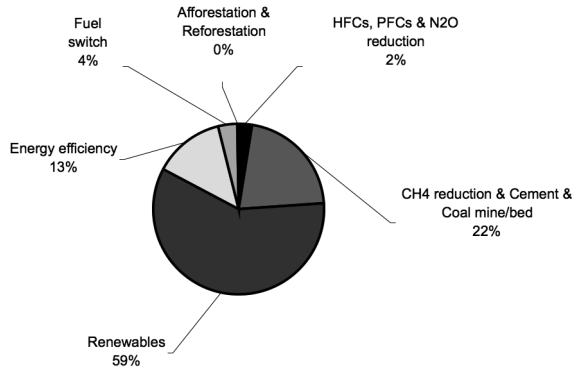
CURRENT STATUS OF TRANSPORT PROJECTS IN THE CDM

Considering the substantial impact of the transport sector on the global climate, it makes sense to tackle this growing source of GHG by setting up CDM projects. The following eight steps describe the elaborate project cycle, laid down in the Marrakesh Accords (UNFCCC 2006a), that projects have to undergo in order to become registered and generate CERs.

1. Preparation of the **Project Design Document (PDD)** by the project proponents. The PDD is the central document on the basis of which the Parties involved as well as the CDM Executive Board decide on the approval and registration of a project. For the purpose of calculating the emission abatement or carbon sequestration achieved by the project, the PDD has to establish a so-called **baseline**, i.e. a scenario that reasonably represents the emissions that would occur in the absence of the project. Moreover, the PDD needs to demonstrate that the emission reductions are "**additional**" to any that would occur in the absence of the project. The PDD also has to contain a plan for **monitoring** the project's emissions.
2. **Approval of new methodologies**: When the Baseline and Monitoring Plan are not designed according to approved methodologies, the project proponents need to develop their own methodology and submit it to the CDM Executive Board (EB) for approval.
3. **Approval by the Parties involved**, including confirmation by the host Party that the project supports it in achieving sustainable development.
4. **Validation** of the PDD, i.e. an examination whether the PDD meets all requirements, by an independent auditing company accredited with the CDM Executive Board, called **Designated Operational Entity (DOE)**.
5. **Registration** of the project activity by the CDM Executive Board.
6. **Implementation** of the project and **monitoring** of all relevant emissions / carbon sequestration by the project developer.
7. **Verification and certification** of the emission reductions / carbon sequestration by another DOE.
8. **Issuance** of the CERs by the CDM Executive Board.

The first CDM projects faced many difficulties and delays in progressing through the full project cycle, but by now the CDM has become fully functional and is expanding rapidly.

1. On the local level, public authorities are able to act on both levels: Decisions on public service provision are more or less corporate policy (e.g. establishing a rapid bus transport system) while public policies aim at steering of the behaviour of individuals and businesses in the local community (parking fees).



Source: Fenhann 2007

Figure 1: Share (%) of CDM Projects in Each Sector

Currently, more than 1,700 projects have been registered or are at the validation stage, expecting a cumulative 1.9 billion CERs by 2012. However, the share of transport projects in terms of both number of projects and number of CERs is negligibly small: only three projects with 2 million expected cumulative CERs are currently at the validation stage or have been registered. Apart from these, nine other transport projects (including small scale projects) have submitted proposals for new methodologies to the EB. While the methodologies of five projects were rejected, the proposals of other four projects are still under consideration, although either in the second version already or with considerable obstacles regarding approval.

The main reason why there are so far only very few transport projects in the pipeline seems to be their high complexity. Due to the large number of small mobile emission sources usually affected, baseline development and the calculation and monitoring of emission reductions is challenging and requires lots of data. In consequence, methodologies are very complex and difficult to develop and to apply. Projects undertaking fuel switch (or technological changes at specific vehicles) seem to be most suitable under the current form of the CDM since the project can be clearly defined and it therefore seems possible to overcome methodological problems. However, even in these cases methodology development has been a long and complicated process and is yet to be successfully concluded. Almost all methodologies currently under consideration had been submitted to the EB for the first time in 2004 or 2005 already.

It has to be noted, though, that the CDM is still a relatively new instrument and problems of complexity are not unique to the transport sector. Further transport projects may yet find ways to overcome the methodological challenges. From this perspective, the current under representation of transport projects may be an expression of typical start-up difficulties rather than an indication of fundamental problems.

Sectoral Approaches to the CDM

Samaniago and Figueres (2002) first introduced the concept of a sectoral CDM. It entered the broader debate in 2005 when the CDM was being severely criticised from different sides for various perceived shortcomings. On the one hand, critics highlighted very high transaction costs and lengthy procedures stifling project development. On the other hand, the CDM was perceived as being limited to isolated local efforts and thus failing to achieve transformational effects at a scale that would be necessary to effectively contribute to sustainable development. Sectoral approaches were put forward as one potential remedy for these deficits (Sterk / Wittneben 2006).

The debate on sectoral approaches did not focus on one specific concept. Instead, several different models were proposed:

- Samaniago and Figueres (2002) suggested a government-driven mechanism that would enable developing countries to develop national or local policy initiatives that discernibly lower GHG emissions in a particular sector. In this approach, the CERs are supposed to flow directly to the host government that will thus be compensated for its efforts and may choose to pass some of the benefits on to industry and households affected by the measures. Measures that might be implemented under such an approach might be a feed-in law for electricity from renewable energy sources or a mandatory fuel efficiency standard for cars.
- By contrast, Cosbey et al. (2005: 55-57) labelled this approach "policy-based" and defined a "sectoral CDM" as mechanism driven by private actors to combine similar projects within a country or local region along the lines of a sector. This approach is essentially akin to project bundling which had already been allowed for small-scale CDM projects at that time. A hypothetical example could be the upgrading of all gas-fired power plants in a country to combined cycles.
- Bodansky et al. (2004: 8) discussed a "programmatic crediting mechanism" that might encompass both public and private actors. This term was taken up by Figueres et al. (2005: 7) who defined programmatic project activities as a multitude of actions that occur as the result of a deliberate programme, which can either be a voluntary or mandatory government measure or a private sector initiative and is coordinated by one enacting agent. In essence, this type is a project bundle but with one central actor who provides an incentive. Some such projects have in fact already been registered. One example is the Kuyasa housing project in South Africa. It consists of upgrading the energy efficiency of more than 2,000 households and is coordinated by the City of Cape Town and the organization SouthSouthNorth (UNFCCC 2007).
- Bosi and Ellis (2005) (developed further in Baron / Ellis (2006)) propose the introduction of sectoral crediting mechanisms. These would essentially consist of baselines decoupled from individual activities. Instead, the overall sectoral emission mitigation below the sectoral baseline would be credited. Such a mechanism could be implemented at the government level or might be devolved to the private entities in the respective sector. As they envisage it, such a

mechanism would probably run in parallel to rather than be incorporated into the CDM. They propose three options for setting sectoral baselines: absolute sectoral emissions targets, relative sectoral emissions targets (e.g. in terms of emissions per unit of output) or policy-based baselines. The latter is akin to the original proposal for a "sectoral CDM" by Samaniago and Figueres (2002). An example of a sectoral emission target would be to define a cap for emissions from the power sector, which could then be devolved to the individual power utilities.

The political discussion culminated at the first Conference of the Parties to the UNFCCC serving as Meeting of the Parties to the Kyoto Protocol (COP/MOP 1). The Parties decided that "project activities under a programme of activities" as well as bundles of large-scale project activities may be registered as single CDM project activities whereas policies or standards cannot (FCCC/KP/CMP/2005/L.7).

However, it can be expected that the issue of policies and standards has not been wiped off the agenda for good but will resurface in the negotiations on the Kyoto Protocol's second commitment period after 2012. Moreover, it was not immediately clear whether a programmatic project that implements a policy or standard could qualify for CDM registration. At its 28th meeting, the CDM Executive Board finally passed guidance on the implementation of programmatic projects. According to this guidance, programmatic projects may indeed implement any policy/measure or stated goal, including mandatory policies and regulations if it is demonstrated that these are not being enforced as envisaged (UNFCCC 2006b). One example that is currently going through the CDM approval process is a project that would implement an energy efficiency standard for air conditioners in Ghana (UNFCCC 2006c).

Nevertheless, sectoral project activities still pose a number of design and methodological challenges which need to be examined. The key concerns are:

- Defining the Project Boundary
- Baseline and Additionality
- Project Approval Process
- Distribution of Costs and Benefits
- Relation to the Current CDM

Since the transport instruments outlined above are mainly policies, the following will go no further into the details of large-scale bundles or sectoral targets but focus on the implications of including policies in the CDM, be it under an explicitly policy-based approach or through a programme of activities implementing a policy.

Applying Sectoral CDM Approaches to the Transport Sector

The above has highlighted that there is a wide variety of measures that can be taken to steer transport patterns into a more sustainable direction. The following paragraphs will frame these instruments according to the requirements of the CDM project cycle. The key questions that need to be answered for a project and will be further discussed in the following are:

1. What would be the CDM project activity in each respective case? A CDM project activity has been defined as a measure, operation or an action that aims at reducing greenhouse gas emissions. It needs to have a real, direct and measurable impact on GHG emissions.
2. Who would be the project participants? In general, a project participant may be (a) a Party involved, or (b) a private and/or public entity authorized by a Party involved to participate in a CDM project activity.
3. What would be the project boundary? In the CDM, the project boundary shall encompass all anthropogenic emissions by sources of GHG under the control of the project participants that are significant and reasonably attributable to the CDM project activity. Would there be potential for leakage?
4. What would be the baseline and how would it be set in each respective case?
5. How would the demonstration of additionality be carried out?
6. How would the project's emissions be monitored?
7. What would be the emission reduction, in particular, should there be a discount or other limitations on what may be credited?
8. What would be the contribution to sustainable development?

The question is if and how the transport instruments presented above fit and what would be the consequences for (a) policy formulation and design of instruments, and (b) the design of a sectoral CDM. Thus, opportunities and limits for further development of the CDM in the transport sector will be identified.

In principle, each single transport instrument and measure could be assessed against the above checklist. This is certainly a task worth to be done but not possible in this paper. Further research would be necessary and more detailed information about measures and instruments would be needed. Nevertheless, a rough assessment of the presented typology is possible and helps to identify options and suggestions for the CDM.

PLANNING INSTRUMENTS

In most cases of planning instruments, a political body decides to initiate a planning process and commissions a particular unit of administration. The decision of the plan and its implementation is in most cases defined in a general timeframe at the beginning of the planning procedures and the whole process can be seen as one continuous activity. However, the measures to be included can vary and change during the planning process. For example, in transport plans it is to some extent left open at the beginning whether investments in construction of roads, reorganisation of bus routes, change of modes, pricing or new forms of customer information are included. The task of the planning process is to define such measures and decide on the best options for future development and the necessary investments. Some measures defined in the plan can be policies. Nevertheless, the planning process and its implementation can be understood as a project activity in the sense of a measure or

operation that aims at reducing GHG emissions and it easily fits the EB's definition of a "programme" as a "coordinated action by a private or public entity which coordinates and implements any policy/measure" that leads to GHG emission reductions via an unlimited number of activities under the programme. Potential policy elements of a transport plan could be incorporated in the form of activities that implement these policies. Importantly in this context, the EB guidance does not require that all activities under a programme be defined ex ante but permits individual activities to be added to the programme at any time during its duration (UNFCCC 2006b).

In addition to the administration, further participants can be incorporated. Depending on the issue this might be authorities of neighbouring regions, investors, NGOs, unions etc. For example, urban transport master plans require the involvement of the administration, public transport providers as well as passenger organisations and the union of drivers. The project boundary needs to cover all transport emissions addressed by the plan which may require a complex procedure depending on the scope of the plan. Land-use and transport master plans can be related to different levels of administrative units aiming at local, regional, national or international societal functions. Identifying sources and accounting for leakage may also be complex depending on the measures that are to be undertaken. For example, if one activity was to construct new transport infrastructure, the project would have to account for the GHG emissions caused by the construction.

Regarding the baseline-setting and monitoring requirements, there are several starting points. Methodological parallels can be found especially in Strategic Environmental Assessment (SEA). SEA provides not only procedural rules for incorporating environmental objectives in planning processes but also a suitable methodology for the assessment of the environmental impact (Therivel 2004; Sadler 2006). Through predicting net effects of induced or reduced traffic, overall energy consumption is calculated for different planning scenarios (alternatives) on the basis of complex transport models (Gühneman 2000). Transport models have a long history within transport research and they are essential for all planning processes. Nevertheless, transport models are based on a broad variety of assumptions and might not meet the level of accuracy required under the CDM. Their applicability to the CDM therefore warrants further study. Given that millions of cars may be affected by large-scale projects, it is a great challenge to define the present situation and how it would develop without the intervention. In addition, the development and adaptation of models require financial resources that are small compared to the costs of construction but still need to be taken into account.

In SEA application to a Local Transport Plan (LTP) an assessment of the status quo scenario as well as the business-as-usual scenario representing the development that would most plausibly take place in the absence of the LTP is required. The latter could serve as the CDM baseline. Also the effect of the proposed measures including the estimated emission reductions is calculated. CO_2 emissions are a key indicator for SEAs in the transport sector as cumulative emission effects of transport networks and induced traffic are major problems. The preparation of monitoring is also obligatory within SEA procedures. Hence indicators exist and data is collected anyway. However, it must be considered that like all forecasts the models and assessments are connected to a certain level of uncertainty and depend on a set of assumptions introduced by the participants. In order to come to better decisions about indicators and assumptions, SEA requires the participation of environmental authorities and independent actors in order to improve the assessment. Regarding sustainable development, planning instruments generally have a high potential for including economic, social and environmental issues (Petersen 2004). The task of transport or land-use plans is to weigh the different aspects.

The most difficult part will be the demonstration of additionality. In many countries or regions plans and programmes are common administrative instruments. Therefore, it is necessary to define and assess the additional impact of the plan. It might be possible to define a certain set of measures as 'additional' and calculate two different scenarios with and without this set. Another possible way is to define only a share of the emission reductions as additional. But in such countries of the South that do not have mandatory planning rules, introducing transport plans as a sectoral CDM 'project' is in any case a benefit, not only in terms emission reductions but also for promoting sustainable development more generally.

To conclude, planning processes can be defined in terms of programmatic CDM and there are highly developed methods of environmental assessment. However, whether these methods are accurate enough to meet the requirements of the CDM will require further study. But it can be assumed that assessing the effects of planning processes is aligned with more uncertainty than assessing localised project activities. Therefore ways would need to be found to address this uncertainty.

REGULATIVE INSTRUMENTS

Regulations can also be understood in the sense of measures that aim at reducing GHG emissions but according to the COP/MOP 1 decision policies and standards are not eligible under the CDM. By themselves, regulations also do not meet the requirement of leading to direct reductions in GHG emissions. The establishment of a regulation as a CDM project would therefore only be possible if changes were made to the CDM rules, but these would probably take effect only in future commitment periods of the Kyoto Protocol. However, according to the EB guidance activities to implement a regulation can in principle be carried out under a programme of activities if the regulation is not mandatory or if there are barriers to enforcement.

In general, rule making is the province of governments. The authorities on different levels define rules adequate to their decision competence. The regulations set up by the different bodies are in general complementary. Hence, sectoral administrations and political representatives on different levels are the main participants. However, cross-regional cooperation or international regimes may lead to an extension of the stakeholders involved. The boundary would cover all emission sources covered by the regulation. Once the activity is defined properly, an assessment of the impacts is needed. Like in planning processes there are experiences with impact assessment procedures for policies as well. As until now few full ex-ante environmental assessments of policies have been carried out it could be worth to look at research projects on ex-post evaluation of policies.

Taking the example of the ACEA Agreement, by which the European automobile industry (Japanese and Korean aim at the same targets in similar agreements) has agreed with the European Commission to reducing the average test CO_2 emissions of new passenger cars from 186 to 140 g CO_2/km from 1995 to 2008 (Bongardt / Kebeck 2006), the project participants would be the European Commission and ACEA. The national governments might also be included as project participants, in particular since their environment protection agencies are responsible for monitoring the agreement. The project boundary would encompass all CO_2 emissions from the whole fleet of cars newly registered after the introduction of the agreement. The Commission's rough assessment of the possible effects of the voluntary agreement is an example of an ex-ante assessment providing both the baseline and the expected emission reduction. Since the agreement's target is substantial below business-as-usual forecasts, it could be taken to be additional in the CDM context. The agreement is also a good example for monitoring of regulatory instruments. Average test CO_2 emissions from new passenger cars in the European Union have been reduced from 185 g CO_2/km in 1995 to 163 g CO_2/km in 2004. Based on statistics of the number and fuel consumption of newly registered cars CO_2 emissions can be calculated by assuming average driven kilometres based on transport models. In a rough assessment, ACEA calculated that improvements in its cars have contributed almost 35 Mt CO_2 emission reductions between 1995 and 2002 (Bongardt / Kebeck 2006). A CDM methodology for this case would require predicting and monitoring the development of driven kilometres for newly registered cars to factor in potential rebound effects due to the lower operating costs of more efficient cars and other factors leading to changed driving behaviour such as potential rises in gasoline prices. So far, this is not included in the official monitoring procedure. It would be possible to fulfil these requirements on the basis of government statistics and transport surveys, but sufficient data is so far lacking even in most industrialized countries. Implementation in developing countries would therefore require significant investments, which would need to be carefully weighed against the potential CDM benefits. If the assessment did take into account the whole fleet of new cars and the actual movement of cars, leakages could probably only occur if the production of less CO_2-emitting cars was more CO_2-intensive than the production of more CO_2-emitting cars, which would need to be assessed.

Environmental standards for bus fleets might be even easier and more precise to assess than the monitoring of individual transport. Effects of speed limits or market rules are closely related to other measures such as planning or economic development and more difficult to assess. The contribution to sustainable development of a regulation could be determined through the tool of sustainability impact assessment.

Regulation is at the core of policy-making. Norms and limits are developed in the political system on all territorial levels. Regarding transport, emission or speed limits, traffic rules etc. are omnipresent. Again, additionality will be a major critical point. Furthermore, the project activity is not as easy to define as for planning instruments and includes more uncertainty.

ECONOMIC INSTRUMENTS

Unlike regulations, which set norms and limits to products and behaviour, economic instruments aim at changing the preferences of individual and business mobility. Including external costs into the price of transport activities (e.g. through eco-tax, parking fees, congestion charge etc.) is supposed to lead to behavioural change and thus emission reductions. But the design of economic instruments, i.e. the definition as a project activity, is similar to regulation. Hence, the forms of defining a time frame, the project boundary and participants and the baseline as well as the assessment and monitoring of effects are comparable and incorporate the same opportunities and problems. Like in regulation, the assessment of effects seems to be a major difficulty. However, there are methodologies for the evaluation of economic instruments. For example, the German Environmental Agency carried out an ex-ante evaluation of the 1999 eco-taxation law and assessed the effects between 2000 and 2010 based on a modelling approach: „The simulation shows a 2 % to 3 % medium-term reduction of CO_2 emissions compared with the scenario without the ecological tax reform. This amounts in absolute terms to no less than 20 to 25 million tonnes" (Bach et.al. 2002).

An even better example is London's congestion charge. As part of the Mayor´s Transport Strategy in 2002, the Congestion Charging Scheme of Central London was introduced in February 2003 with the aim of reducing congestion and improving traffic conditions in central London. The congestion charge encourages the use of non-car modes of transport and intends to ensure quicker and reliable journey times. It requires drivers to pay £ 8 a day if they drive within the charging zone between 7 am and 6.30 pm Monday to Fridays.

In this case, the project activity would be the definition of the concept and the implementation of the London Congestion Charging Scheme. Within the implementation of this policy tool participants included not only authorities like the Mayor of London, but also companies like Transport for London (TfL) as the responsible implementation agency. The present boundary of the congestion charging zone is sometimes referred to as the London Inner Ring Road, including the whole City of London, the City's financial district and the West End. This area covered by the instrument equals 1.3 % of Greater London. In September 2005, the western extension of the congestion charging zone was confirmed and will come into force in February 2007. In CDM terms, the project boundary would be defined as the GHG emissions from the vehicles moving within the charging zone. The project would have to account for leakages such as increased emissions outside the charging zone caused by drivers taking detours to avoid the charge. A further challenge would be to differentiate between emission reductions that have been caused by the charge and reductions due to other factors such as spikes in fuel prices or significant improvements in car efficiency such as those aimed at by the ACEA Agreement.

Since its implementation, a number of reports about the instrument's efficiency have been published showing significant changes compared to the baseline scenario. Monitoring of the central London congestion charging scheme undertaken by TfL is based on counting the number of cars entering and leaving the zone and assuming an average emission factor. In order to

continuously assess the effects of the scheme there is an extensive monitoring programme in place, which consists of over 100 survey and research activities to complement the already existing monitoring carried out in London. It has shown a reduction in fuel use and CO_2 emissions of 20 and 19 % respectively within the charging zone (TfL 2005). Since its introduction, the number of cyclists entering the charging zone during charging hours has increased by about 19 % and there is additional evidence that walking has also increased. As stated in the Environmental Assessment report (TfL 2005), the number of people who have transferred from driving into the charging zone to either cycling, walking, riding a motorcycle, using a taxi or car sharing, is forecast to be between 5,000 to 10,000. As estimated in the Mayor's Transport Strategy, the expected emission reductions of the scheme are predicted to cut central London's traffic levels to "summer holiday level" all year.

Economic instruments can be found on the local as well as on the national level. As the example of London shows, it is in principle clearly feasible to evaluate the effects on the municipal level. However, the broader the scope of the instrument is, the more uncertainties occur. Reasons which encourage people to use private cars less often are usually multi-fold and economic instruments take effect indirectly. Even if surveys and statistical evaluation of the general fuel consumption give insight in the way instruments work, the assessment is subject to uncertainties. Moreover, it takes substantial resources to rigorously establish a baseline and monitoring. Even in the industrialized countries currently only a few cities dispose of the necessary data. So here as well the necessary investment would need to be weighed against the potential CDM benefit.

Furthermore, the question of additionality is not easy to answer. In contrast to plans or regulation economic instruments are less common on local or regional level. Hence, the additionality of a congestion charge might be easier to justify than value added taxes. Moreover, the high initial costs for implementing a congestion charging scheme may be a substantial barrier to implementation. But many economic instruments also yield financial benefits to the project participants even without generating CERs. A charge or tax leads to new financial sources for public authorities. This is also a threat for the sustainability of the activity as increasing prices, especially when they also affect public transport modes, may lead to problems for poor people to afford mobility. In order to serve future generations and the poor, a careful design of the instrument is required.

SOFT POLICY INSTRUMENTS

Soft policies are often corporate policies or measures. If limited to a company, initiatives such as eco-driving are not sectoral in scope but might in principle fit under the project CDM, even though the first attempt to develop a methodology for an eco-driving training project was not successful. The EB argued that emission reductions would not be directly attributable to the project activity, but driving behaviour does have a clear impact on GHG emissions.

Nevertheless, there are more general schemes of soft policies that are closer to a sectoral, programmatic or policy-based approach. More policy-based schemes include mainly administrative actors. In these cases, defining the project and the methodology has characteristics and challenges similar to those elaborated above for regulations and economic instruments.

Taking a sectoral approach would in the case of eco-driving mean implementing a larger programme covering a number of decentralised training activities. The project boundary would cover all vehicles whose drivers take part in the training programme. To evaluate developments, it is necessary to collect data on driven kilometres as well as on the fuel consumption of the individuals. For instance, effects of eco-driving training on bus drivers who drive the same routes every day are relatively stable. Fuel consumption of the municipal vehicle fleets including waste transport vehicles have been monitored in Heidelberg (Wilke et.al.).

Assessing the past development of driven kilometres and fuel consumption and developing a forecast by considering proposed vehicle fleet changes and market development without any change of driving determines the baseline. Demonstrating the additionality of the project could be difficult since reducing fuel consumption also reduces operating costs. The project participants would therefore need to demonstrate that there are barriers preventing the implementation of the programme, such as too high upfront costs. Even if no transport is avoided and no modal shift is realized, the project would be sustainable in the sense that it would have no negative socioeconomic or ecological impacts, no jobs would be in danger and drivers would learn more about fuel efficient driving and could use this knowledge for their private mobility.

Conclusion

The Kyoto Protocol with its CDM provides a way to encourage industrialized countries to foster climate-friendly projects in developing countries. However, while the CDM in general is currently expanding rapidly, transport is so far hardly represented in the CDM project portfolio. One of the main reasons for this discrepancy seems to be the high complexity of transport projects which renders methodology development difficult. Due to the large number of small mobile emission sources usually affected, baseline development and the calculation and monitoring of emission reductions is challenging and requires lots of data. In consequence, methodologies are very complex and difficult to develop and to apply. It has to be noted, though, that the CDM is still a relatively new instrument and problems of complexity are not unique to the transport sector. Further transport projects may yet find ways to overcome the methodological problems. From this perspective, the current under-representation of transport projects may be an expression of typical start-up difficulties rather than an indication of fundamental problems.

Browne et al. (2005) have suggested that sectoral approaches to the CDM might provide a better framework for transport projects. They might on the one hand be able to deal with the methodological challenges and on the other hand able to incorporate activities or strategies that cannot be defined or implemented in a restricted local context, such as spatial or transport planning.

The discussion has shown that it is in fact possible to design programmatic or policy-based sectoral transport activities within clear project boundaries. The main stakeholders surrounding such activities would be administrators and politicians, but in some cases also corporate stakeholders such as managers or representatives from industry associations. Trans-

port policies take place on different administrative levels; the municipal and regional level seem to be the most appropriate for CDM activities. Planning and some soft policy instruments are related to the programmatic CDM, while regulations, economic instruments and several soft policies pertain more to a policy-based CDM. Policies as such are currently not eligible to be registered as CDM projects. However, the recent guidance of the EB on programmatic projects allows for programmes that implement a policy. Implementing the instruments discussed in this paper as CDM projects may therefore not have to wait for changes to the CDM rules that would allow for the establishment of a policy to be eligible for the CDM.

Transport research yields several tools to address the methodological requirements of the CDM. Methodological parallels can be found especially in the application of SEA to a spatial or transport plan on various levels (local to national). In SEA an assessment of a status quo scenario as well as a business-as-usual scenario is required, which would be the CDM baseline, and the potential effect of the proposed measures, including potential GHG emission reductions, is calculated. In addition, the preparation of monitoring is obligatory within SEA procedures.

However, similar to all forecasts the models and assessments are connected to a certain level of uncertainty and depend on a set of assumptions introduced by the participants. Given that millions of cars may be affected by large-scale projects, it is a great challenge to define the present situation and how it would develop without the intervention. Scaling the CDM up to a more sectoral level to include measures such as those discussed in this paper would therefore further increase the complexity of projects and the uncertainties surrounding baseline development, project monitoring and the emission reductions achieved. Sectoral approaches are therefore not "better" for transport than the current CDM in the sense of reducing the methodological difficulties that currently plague transport projects in the CDM. The advantage of sectoral approaches could instead be to scale activities up to a level that is equal to the scale of the challenge faced in redirecting transport into a more sustainable direction.

However, the resulting increased uncertainties are problematic since each CER generated through the CDM will be used to allow one more tonne of GHG emissions in the industrialized countries to be emitted. CERs that have resulted from faulty emission reduction documentation therefore lead to an increase in GHG emissions globally. Hence on a global scale, not conducting a CDM project activity is preferred over a falsely calculated CDM project.

Policy makers face a difficult decision in order to encourage emission reductions in the transport sector. They could decide that the CDM is not suited to implement projects that operate in a complex context and that a sectoral approach too much exacerbates the methodological difficulties that a transport CDM project faces and instead look at ways other than the CDM or a sectoral approach to the CDM to bring about structural change in the infrastructure of countries of the global South. Alternatively, policy makers may want to continue to strengthen the transport sector in the CDM project portfolio through sectoral approaches. In this case, the CDM as a tool to use by countries of the global South has to be further developed. One option could be to find ways to quantify the uncertainties that transport projects face and discount the CERs depending on the probabilities that have been calculated. Another way to deal with the uncertainties could be to use highly conservative measures when calculating the baseline and tend towards a less optimistic forecast of emissions. In addition, projects could be subjected to a rigorous ex-post assessment to clearly determine which part of the emission reduction measured is due to the project activity and which part is due to other factors. Finally, it could be a principle of sectoral approaches that there has to be a certain buy-in or co-financing from the host countries in the sense that not all emission reductions are going to be credited. In this way, what is currently at best a zero-sum game as regards the climate, since each emission reduction in the global South is going to lead to an equivalent emission increase in the North, could be transformed into an engine for actual net emission abatement.

Additional research is needed to further examine the potential role of the CDM in transport policy. Studies need to examine to what extent the CDM can be a stimulus for introducing ambitious sustainable transport measures at a local level. Moreover, since transport models are based on a broad variety of assumptions and might thus not meet the level of accuracy required under the CDM, their applicability to the CDM also warrants further study. Another issue that can be addressed by further policy research pertains to the question of how a sectoral CDM would fit into the overall climate regime. Taking into consideration that sectoral projects can be expected to yield significant amounts of CERs, this might encourage industrialized countries to adopt stricter emission targets in future commitment periods than it would otherwise be the case. This would be another way for a sectoral CDM to actually produce a net climate benefit. However, if industrialized countries do not adopt ambitious targets post-2012, a sectoral CDM delivering large amounts of CERs could easily extinguish any domestic emission reduction efforts by industrialized countries.

If a sectoral approach is considered by policy makers, the existing capacity to carry out such projects in countries of the global South will probably in many cases not be sufficient. Training local staff may not only help to increase the number of rigorous CDM projects proposed, both in the existing and in a sectoral CDM framework, but also support further building capacity to plan, implement and monitor transport policy and infrastructure developments that set global transport on a sustainable path.

References

Aßmann, Dirk and Niklas Sieber (2005): Transport in Developing Countries: Renewable energy versus Energy Reduction? In: Transport Reviews, Vol. 25, No. 6, 719-738, November 2005.

Bach, Stefan, Michael Kohlhaas and Barbara Praetorius (2002): The Effects of the Ecological Tax Reform. English Summary. (http://www.bmu.de/oekologische_finanzreform/links/doc/files/erneuerbare_energien/down loads/application/pdf/diw_energypolicy2002.pdf) accessed: 23rd Oct 2006.

Baron, Richard and Jane Ellis (2006): Sectoral Crediting Mechanisms for Greenhouse Gas Mitigation: Institutional

and Operational Issues. Paris: Organisation for Economic Co-operation and Development (OECD) / International Energy Agency IEA), COM/ENV/EPOC/IEA/SLT (2006) 4.

Becker, Udo (2006): Defining the issues: What is "Environment and Transport" all about, and how can the fundamental conflict between transport development and environment protection be resolved? In: 2nd conf. Environment & Transport, incl. 15th conf. Transport and Air Pollution, Reims, France, 12-14 June 2006.

Bodansky, D., E. Diringer, J. Pershing and X. Wang (2004): Strawman Elements: Possible Approaches to Advancing International Climate Change Efforts. Retrieved 1 March, 2006, fromWashington, DC: Pew Center on Global Climate Change. http://www.pewclimate.org/document.cfm?documentID=448 [accessed 2 January 2007].

Bongardt, Daniel and Kristina Kebeck (2006): Evaluation of the ACEA Agreement within the AID-EE Project. Case Study Report. To be published in 2007.

Bosi, Martina and Jane Ellis (2005): Exploring Options for „Sectoral Crediting Mechanisms". Paris: Organisation for Economic Co-operation and Development (OECD) / International Energy Agency IEA), COM/ENV/EPOC/IEA/SLT(2005)1.

Browne, Jodi, Eduardo Sanhueza, Erin Silsbe, Steve Winkelman and Chris Zegras (2005): Getting on track: Finding a path for transportation in the CDM. Final Report, March 2005. Winnipeg: International Institute for Sustainable Development.

Cosbey, Aaron, Jo-Ellen Parry, Jodi Browne, Yuvaraj Dinesh Babuy, Preety Bhandari, John Drexhage and Deborah Murphy (2005): Realizing the Development Dividend: Making the CDM Work for Developing Countries, Phase 1 Report – Pre-Publication Version. Winnipeg, Manitoba: International Institute for Sustainable Development. http://www.iisd.org/climate/global/dividend.asp [accessed 2 January 2007].

ECMT – European Conference of Ministers of Transport (2000): Sustainable Development – Sustainable Transport Policies. Report. http://www.cemt.org/online/council/2000/CM0001Fe.pdf [accessed 24th Oct. 2006].

EEA – Euroepan Environmental Agency (2003): Europe's environment: the third assessment. State of Environment report No 1/2003. http://reports.eea.europa.eu/environmental_assessment_report_ 2003_10/en/ [accessed: 23rd Oct 2006].

European Commission (2006): Keep Europe moving. Sustainable mobility for our continent. Mid-term review of the European Commission's 2001 transport White Paper. Luxembourg. http://ec.europa.eu/transport/transport_policy_review/doc/2006_3167_brochure_en.pdf [accessed 2 January 2007].

Fenhann, Joergen (2007): CDM pipeline overview. Updated 14 March 2007. UNEP Risoe Centre. Available on the Internet at: http://www.cd4cdm.org/Publications/CDMpipeline.pdf [accessed 19 March 2007].

Figueres, Christiana (2005): Sectoral CDM: 'Opening the CDM to the yet Unrealized Goal of Sustainable Development'. In: International Journal of Sustainable Development Law & Policy, Vol. 2, pp. 5-27.

Gudmundsson, Henrik, Andrew Wyatt, Lucy Gordon (2005): Benchmarking and Sustainable Transport Policy: Learning from the BEST Network. Transport Reviews, Vol. 25, No. 6, p. 669.

Gühnemann, Astrid (2000): Methods for Strategic Environmental Assessment of Transport Infrastructure Plans. Karlsruher Beiträge zur wirtschaftspolitischen Forschung, 9, Nomos Verlag, Karlsruhe.

IEA – International Energy Agency (2004): World Energy Outlook, OECD/IEA

IEA – International Energy Agency (2005): CO2 Emissions from Fuel Combustion 1971 - 2003, OECD/IEA

Litman, Todd (2003): Sustainable Urban Transport: A Sourcebook for Policy-makers in Developing Countries. Module 2b: Mobility Management. http:// www.vtpi.org/gtz_module.pdf [accessed: 24th Oct. 2006].

Petersen, Rudolf (2001): Integrated Transport Planning (ITP). Paper prepared for the CCICED Transport Working Group Seminar on Integrated Transport Planning, Beijing, P.R. China, April 21-22.2001.

Petersen, Rudolf, Thomas Langrock and Karl Otto Schallaböck (2002): Bedeutung der klimarelevanten Emissionen des PKW-Verkehrs und Bewertung von Minderungsstrategien. In: Wuppertal Papers Nr. 21, 2002. Wuppertal.

Petersen, Rudolf (2004): Land use planning and urban transport. In: Sustainable transport. A sourcebook for policy-makers in developing cities, Module 2a. http://www2.gtz.de/dokumente/bib/05-0513.pdf [accessed: 23rd Oct 2006].

Sadler, Barry and Barry Dalal-Clayton (2006): Strategic Environmental Assessment: A Sourcebook & Reference Guide to International Experience. Newbury, U.K.

Samaniego, Joséluis and Christiana Figueres (2002): 'Evolving to a Sector-Based Clean Development Mechanism', in: K. Baumert (ed.): Building on the Kyoto Protocol: Options for Protecting the Climate. Washington, DC: World Resources Institute, pp. 89-108.

Sterk, Wolfgang and Bettina Wittneben (2006): 'Enhancing the Clean Development Mechanism through Sectoral Approaches: Definitions, Applications and Ways Forward'. In: International Environmental Agreements: Politics, Law and Economics, Vol. 6, No. 3, pp. 271-287.

TfL – Transport for London (2005): Environmental Assessment of London's Congestion Charge. http://www.tfl.gov.uk/tfl/downloads/pdf/cclondon/E-Environmental-Assessment.pdf. [accessed: 24th Oct. 2006].

Therivel, Riki (2004): Strategic Environmental Assessment in Action. United Kingdom: Earthscan.

UNFCCC (2006a): Decision 3/CMP.1, Modalities and procedures for a clean development mechanism as defined in Article 12 of the Kyoto Protocol. In: UNFCCC (2006a): Report of the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol on its first session, held at Montreal from 28 November to 10 December 2005, Addendum, Part Two: Action taken by the Conference of the Parties serving as the meeting of the

Parties to the Kyoto Protocol at its first session, FCCC/KP/CMP/2005/8/Add.1, 30 March 2006, pp. 6-29.

UNFCCC (United Nations Framework Convention on Climate Change) (2006b): Executive Board of the Clean Development Mechanism. Twenty-Eigth Meeting. Report. Annex 15: Guidance on the registration of project activities under a programme of activities as a single CDM project activity (Version 01), http://cdm.unfccc.int/EB/028/eb28_repan15.pdf [accessed 2 January 2007].

UNFCCC (United Nations Framework Convention on Climate Change) (2006c): Project Design Document, Implementation of an Efficiency Testing, Consumer Labelling and Quality-Assurance Program for Air Conditioners in Ghana, Version 2, October 18, 2006, http://cdm.unfccc.int/methodologies/PAmethodologies/publicview.html?OpenNM=NM0159&single=1 [accessed 2 January 2007].

UNFCCC (United Nations Framework Convention on Climate Change) (2007): Project 0079 : Kuyasa low-cost urban housing energy upgrade project, Khayelitsha (Cape Town; South Africa). http://cdm.unfccc.int/Projects/DB/DNV-CUK1121165382.34/view.html [accessed 24 October 2006].

WBCSD – World Business Council for Sustainable Development (2004): Mobility 2030: Meeting the Challenges to Sustainability. http://www.wbcsd.org/plugins/DocSearch/details.asp?type=DocDet&ObjectId=NjA5NA [accessed 2 January 2007].

Wilke, Georg; Dalkmann, Holger; Bongardt, Daniel (2000): CO2-Einsparungen durch verändertes Fahrverhalten. In: Das Magazin 4/2000, p. 34. Düsseldorf.

World Bank (1996): Sustainable Transport. Priorities for Policy Reform. Washington.

World Bank (2002): Cities on the Move. A World Bank Urban Transport Strategy Review. Washington.