Sustainable Transport and the Clean Development Mechanism – Can there be a juncture?

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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 sets out to examine current transport projects under the CDM framework and identify potential barriers specific to the transport sector. It turns out that one of the main reasons for the low number of projects seems to be the high complexity of transport projects which renders methodology development difficult. Furthermore, 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 presented and discussed based on existing CDM criteria. This demonstrates 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. If policy makers were to allow sectoral projects under the CDM, comprehensive measures such as transport master plans could be implemented, enabling a variety of activities that would impact transport trends significantly. Moreover, transport research yields several modelling tools to address the methodological requirements of the CDM.

1 Introduction

The transport sector accounts for about 24 percent of global carbon dioxide (CO₂) 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 growing emissions from the transport sector there are no simple solutions. So far, improved efficiency has been always 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 also 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 emissions 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 two-fold:

- 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 greenhouse gas (GHG) emission targets in Annex B to the Kyoto Protocol (“industrialised 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 (to date almost 1300 projects have been registered or are at the validation stage, expecting a cumulative 1.37 billion CERs by 2012), there are currently only 2 transport projects in the pipeline (Fenhann 2006). Generally, 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 (Sterk / Wittneben 2006). This warrants a closer look at the project activities in the transport sector that have been indeed approved, rejected or are being reviewed. It also warrants a discussion on how the CDM could play a role in supporting sustainable development objectives in national transport policy.

This paper provides a starting point in integrating the CDM into a meaningful sustainable development policy by first shedding light on the different layers of depth in transport policy. It draws on the latest research in transport policy to come up with different categories of shapes that sustainable transport can take. Second, the paper goes over recent CDM activity in the transport sector and discusses why certain strategies seem to provide a better fit with the CDM as it stands today. In order to utilize the CDM as a mechanism to encourage integrated sustainable transport policy that brings with it structural change in the national transport sector, the paper examines in how far the evolving sectoral approach to the CDM could be made use of. In this vein, the current definitions and possibilities of a sectoral CDM are elaborated on, which is then connected to the need for a structurally integrated transport policy approach.

Our research question for this article 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 is what we set out to answer in this paper.
2 Approaches and Instruments in the Transport Sector

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. Transport policy, much like other infrastructure policies, is mainly discussed 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, Foley/Fergusson 2003, 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. trough taxes or emission trading) to transport and land use planning (ECMT 2000).

This paper 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. The two policy dialogues need to be informed of each other’s findings in order to meaningfully establish a climate regime that can tackle GHG emissions from the transport sector. Starting with a definition of sustainable mobility and principles of sustainable transport policy, the following will provide an overview through the sustainable transport policy lens on the opportunities for reducing CO$_2$ in order to structure the options for a further analysis of future ‘CDM compatibility’.

2.1 Strategies towards Sustainable Mobility

Today, sustainable transport is mentioned as a general guideline in many countries. For example, the actual 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 policy agenda (Aßmann / Sieber 2005). However, the understanding of sustainability and the focus on the different dimensions differ. In order to come to a common understanding of sustainable mobility as the main objective
for sustainable transport policy it was necessary to introduce more specific principles. The most accepted approach was developed at the OECD Vancouver Conference in 1996 by formulating nine principles of sustainable mobility including (1) access to other people, places, goods and services; (2) social, interregional and inter-generational equity, (3) Individual and Community Responsibility, (4) health and safety, (5) Education and Public Participation, (6) Integrated Planning, (7) Land and Resource Use (8) Pollution Prevention and (9) Economic Well-Being (OECD 1996: 61-63).

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 these principles (Aßmann/Sieber 2005). In addition, measures towards other principles such as integrated planning and access can lead to a reduced use of energy. But pursuing health, equity or education principles should not counteract environmental objectives. Nevertheless, transport policy varies enormously from country to country; both in the targets as well as the chosen instruments. According to the general principles, there is a broad variety of opportunities and instruments to influence transport. In order to come to a more specific picture of a sustainable transport policy, it is fruitful to look at political strategies that serve the implementation of the principles. Based on these strategies, categories of instruments can be described.

The political task is to provide mobility yet reduce the negative impacts of transport. Hence, three strategic approaches towards sustainable development in the transport sector have been identified in the literature (Klima-Enquete 1994, Petersen 2002, SRU 2005, Zegartowski 1997):

1.) **Transport Avoidance** – The most pressing task is to influence spatial planning in order to prevent transport (growth) without jeopardizing citizens’ mobility. Sustainable (urban) infrastructure thus sets out to serve mobility needs of the population without generating excessive transport.

2.) **Shift to more sustainable transport modes** – A second-level task is to identify possibilities to make people choose more sustainable transport modes such as walking, cycling or public transport instead of driving a car.

3.) **Transport efficiency** – The third-level task is to improve transport technologies and transport flows in order to orchestrate the needed transport in the most efficient way without wasting resources.

Spatial development and transport avoidance is at the core of sustainable transport policies. Dense structures of housing, working facilities, shopping facilities and places for holidays and leisure allow people to practice their activities and to fulfil their business duties without much transport in terms of kilometres (Petersen 2002). A second strategic aspect of sustainable mobility is the way in which the (remaining) transport needs are satisfied. The different transport modes (walking, bikes, trains, busses, cars and planes) have very different advantages and disadvantages for individual choice. From a policy perspective aiming at sustainable development social, economic and environmental benefits have to be weighted (Basler+Partner 1998). As the non-motorized modes walking and cycling have the lowest impact on the environment, it is reasonable to foster policies that counteract the disadvantages of their short reach in terms of distance. Furthermore, a more efficient organisation of transport (technology/transport flow) serves sustainable transport. The remaining transport needs should be energy, cost and time efficient in order to serve environmental, social and economic objectives.

All three strategies are important and useful as normative guideline for individuals, corporate actors or policy-makers. However, a hierarchy can be introduced with respect to the sustainability of measures. Firstly, transport avoidance is a top priority. Increasing mobility without increasing transport demand and thus inducing motorized traffic is the most promising way on how social and economic goals can be related
to environmental objectives. Hereby conflicts between the dimensions can be avoided most easily. Secondly, the shift from motorized modes to non-motorized serves a similar aim. However, a shift from car traffic to public transport still incorporates environmental (e.g. pollution) and social (e.g. costs, access to public transport) problems. Thirdly, the efficiency strategy is important but less sustainable. Even if there is a huge potential for energy savings in individual motorized transport and pollution could be reduced significantly by technological innovation, other sustainability objectives like economic well-being, equity or access are hardly affected. In addition, the negative impacts of e.g. cars in terms of landscape damage and noise cannot be reduced through more energy efficient engines.

2.2 Sustainable Transport Instruments

The presented strategies are normatively backed by the principles of sustainable mobility. The strategies point out the direction of action but still do not describe concrete action. In order to come to more specific activities, it is useful to distinguish (a) individual decisions or behaviour (b) municipal or corporate measures and (c) political steering approaches. All three of these activities are relevant for CO$_2$ emissions of the transport sector. While the first is related to personal preferences and opportunities, the second describes decisions of companies or municipalities that have a stronger impact on CO$_2$ emissions than individual action. The third category aims at changing the conditions for individual behaviour and corporate measures through setting a framework of incentives and rules. This distinction is important because until now, the project CDM mainly aims at corporate measures or corporate policy while the sustainable transport policy discourse is related to a more general approach of steering within public policy$.^1$ Coming from such a public policy perspective, the implementation of the presented strategic approaches requires a discussion of the instrumentation of concrete policy-making. For that reason, a typology will be proposed. As section three of this article will show, the current CDM projects in the transport sector are different from that. In order to link the following discussion of instruments to the problem of climate change and the Clean Development Mechanism it will focus on the consequences of energy use and CO$_2$ emissions.

So far, integrated transport and land-use planning has been identified by the literature as a main steering approach to head into the future of sustainable transportation (Petersen 2002, Fischer 2002, Dalkmann 2004). The spatial structure and its transport system is the basis of the population’s and business’ transport behaviour. When only short distances are required to be overcome, efficient modes are chosen and efficient flows are possible, the impact of transport on the environment is limited. Hence, integrated transport and land-use planning is necessary to reduce greenhouse gas emissions. However, this promising approach is still lacking in most national transport policies. The planning focus is mainly on infrastructure construction instead of taking ‘access’ into account. Recent environmental approaches are still often focussing on regulation (e.g. emission limits) and aim at technology improvement (e.g.catalytic converters, efficient engines) in order to minimise the negative consequences of unsustainable spatial and transportation systems (Petersen/Schallaböck 1995). In addition, for the last decade, gasoline and purchase taxes were used to provide incentives for developing and buying energy efficient technologies. Nevertheless, contradictory incentives, such as inexpensive housing in the suburbs, may still counteract these policies.

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$^1$ In fact, the conceptualization of the Clean Development Mechanism aims at setting incentives for emission reductions in the transport sector. Therefore, the concept – not the project – is a transport related policy.
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. Hence, the OECD developed a typology of instruments for environmentally sustainable transport. This includes regulative, economic and informational instruments (OECD 2001). In order to describe the variety of approaches in the transport sector, an extended typology of instruments is suggested. This typology is based on the public policy approach of regulative, distributive and re-distributive policies (e.g. Tömmel 2003) and adds the OECD’s category of informative policies. This aims at the inclusion of ‘new’ or ‘soft’ instruments aiming at informing and convincing people to act differently (OECD 2002, Heritier 2002, Jordan et.al. 2005, Litman 2005). In order to remain in the terminology of transport policy four types of instruments are introduced: planning (i.e. distributive), regulation, economic, and soft instruments (see Table 1). Until now, sustainable transport literature focuses on public policies. However, corporate policies can be subsumed under these types as well. However, it must be considered that these are on a different level.²

² On 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).
Table 1: Classification of Sustainable Transport Instruments

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

Not all kinds of instruments are associated to only one type of instrument, 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. The following paragraphs describe the types and give illustrative examples.

Land-use and transport plans are associated with the entire set of strategies including transport avoidance, modal shifts and efficiency in terms of improvements of transport flows. In relation to sustainable mobility, transport planning is mainly discussed in terms of integrated land-use and transport planning (urban development and transport as well as different transport modes). The planning procedures can be closely linked to the principles of sustainable mobility including access, public participation, equity etc. The main intention of such plans is to allocate financial resources to define the future infrastructure development (e.g. land-use purposes, transport infrastructure) or design of transportation systems. But further instruments such as city tolls, parking fees or speed limits can be linked to the planning objectives. See box 1 for an example from Ethiopia.
Box 1: Road Sector Development Programme (RSDP) in Ethiopia

The Road Sector Development Programme (RSDP) in Ethiopia from 1997 to 2007 included a sectoral Environmental Assessment (EA) promoted by the World Bank. The aim of the EA in rural Ethiopia was to ensure that in-country capacity, regulatory frameworks and procedures for environmental management were established and could serve as a basis for future road construction EA. The draft EA guideline developed during the project by using the World Bank’s toolkit will act as scooping document to identify, at an early decision-making process, future projects and programmes which are likely to have significant adverse impact on the environment. The report’s detailed recommendations to avoid potential environmental impacts will influence planning and design processes of future road projects.

Source: http://www.worldbank.org

Regulative instruments represent a large variety of rules. Physical norms, market rules or traffic regulation cover a broad field of action. In addition, procedural rules such as public participation, gender mainstreaming or impact assessment procedures are regulations that make the picture even more complex. In general, such rules can easily be related to the principles of sustainable mobility (e.g. pollution avoidance, participation). In terms of the strategic approaches discussed above, the development of rules can promote different strategies. While speed limits and emission regulations are mainly linked to transport efficiency, market rules in the public transport sector can aim at shifting transport modes. Transport avoidance is mainly addressed by procedural rules that affect planning processes. Box 2 gives an example for CO₂ emission limits.

Box 2: Emission limits for CO₂

The United States, Japan and China have introduced emission limits for the CO₂ emissions of cars. In the European Union a voluntary agreement fulfils the same objective. Although the European approach is not pure regulation, it is a good example how to measure the effects of the policy instrument. The commitments of the European, Japanese and Korean automobile industry require reducing the average CO₂ emissions of new passenger cars from 186 to 140 g CO₂/km from 1995 to 2008. Assuming that a car travels 14,000 km a year, the average fleet age is 7 years and the number of cars is stable, the European Commission predicted potential savings. The calculation was based on a reference scenario (baseline) of 380 Mt CO₂ emissions from passenger cars in 1990 and 536 Mt in 2010 with an annual growth in passenger car mileage of 2%. Furthermore, a linear reduction in average new passenger car CO₂ emissions was assumed as well as an average vehicle lifetime of 12 years. This assessment accounted 85 Mt CO₂ emission savings to the ACEA agreement. Monitoring is organised by the European nation states (environmental protection agencies) that measure emissions of new car models and count the registration of different car models.

Source: Bongardt, Kebeck 2006

The key rationale of economic instruments is to internalise the external costs of transport in order to avoid incentives for individual car or air transport and thereby influence the preferences of people towards sustainable non-motorized means of transport (Dalkmann 2004). Whether these are fuel taxes, city tolls or
parking fees, people have to pay for environmental damage, health and security problems as well as the infrastructure needed. In addition, subsidies on energy efficient cars give incentives for consumers to consider different options. Economic instruments are related to all three strategic approaches: Pricing policies encourage transport avoidance, modal shift and introduction of efficient technologies. A good example for an economic instrument is London’s congestion charge (Box 3).

**Box 3: Congestion Charge in London**

In February 2003, the Mayor of London introduced the Greater London Congestion Charging Scheme. The congestion charge encourages the use of non-car modes of transport and intents to ensure quicker and reliable journey times. It requires drivers to pay £8 if they drive within the charging zone between 7am and 6.30pm Monday to Fridays. After the first six months of operation Transport for London (TfL) published a report surveying the scheme. Main findings were that the number of vehicles entering the zone dropped by 30 per cent. Around 50-60 per cent of this reduction was attributed to transfers to public transport. In a recent study (2005) TfL identified the charge succeeded in reducing congestion by 30 per cent and emissions of NOx and fine particles from traffic in the charge zone by 12 per cent until 2004. Moreover, fuel use and carbon dioxide emissions were reduced by about 20 per cent in the charging zone.


Cognitive instruments or ‘soft policies’ take effect in a different way. It is assumed that behaviour can be changed by informing or convincing people or companies. Most of these instruments take effect in direct communication with the people and not through changes in the framework. Hence, these instruments often take the form of corporate policy. Mobility management activities of business or individuals as well as eco-driving training (fuel efficient driving) are examples in the transport sector. However, there are schemes that take the form of a public policy instrument. Examples for such schemes are environmental audit schemes (for transport companies), the concept of transport plans for companies in the UK or information campaigns. These modes of steering are important but quite vague and in some cases effects are hardly measurable. The instruments focus on information of the public or the consumers in order to encourage learning. The approach easily fits to the sustainability principles, since information about local destinations or environmental friendly modes is a way to reduce transport without endangering access. In terms of the strategic approaches, again transport avoidance and shift of modes are at the core of these approaches. However, fuel efficiency can be encouraged through eco-driving trainings (see Box 4).
**Box 4: Eco-Driving Training in Companies**

More and more international companies provide eco-driving courses for their drivers. Examples are DHL and Deutsche Telekom AG. Since September 2004, 200 DHL Solutions Germany drivers have learned eco-driving techniques. The eco-driving programme helps DHL to reduce emissions from CO2 and other pollutants. The Diesel consumption of the eco-driven vehicles came down by almost 10 per cent while driving time barely increased. The company benefits from lower fuel costs and less wear and tear on its vehicles and the employees benefit from a more relaxed driving manner and less stress. The Deutsche Telekom AG estimates the savings from their ecologically trained drivers as over 300,000 € annually.


This section described the concept of sustainable mobility and ways of its practical implementation in the transport sector. General principles and strategic approaches such as transport avoidance, modal shift and transport efficiency help to systemise a broad variety of instruments. Especially transport planning is able to support sustainable development and, as a side effect, encourage the reduction of greenhouse gas emissions. Regulation, economic and soft instruments are supplementary to the integrated land-use and transport planning instruments and support behavioural change towards less energy consumption. While the following section focuses on recent attempts of setting up CDM in the transport sector, i.e. corporate policy, the public policy instruments described in this section will be discussed within the framework of sectoral approaches to the CDM in section 5.
3 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. Box 3.1 describes the elaborate project cycle, laid down in the Marrakesh Accords, that projects have to undergo in order to become registered and generate CERs.

**Box 5: The Phases of the CDM Project Cycle**

<table>
<thead>
<tr>
<th>Phase</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>1.</td>
<td>Preparation of the <strong>Project Design Document (PDD)</strong> 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 <strong>baseline</strong>, 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 <strong>“additional”</strong> to any that would occur in the absence of the project. The PDD also has to contain a plan for <strong>monitoring</strong> the project’s emissions.</td>
</tr>
<tr>
<td>2.</td>
<td>Approval of <strong>new methodologies</strong>: 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 for approval.</td>
</tr>
<tr>
<td>3.</td>
<td>Approval by the <strong>Parties involved</strong>, including confirmation by the host Party that the project supports it in achieving sustainable development.</td>
</tr>
<tr>
<td>4.</td>
<td><strong>Validation</strong> of the PDD, i.e. an examination whether the PDD meets all requirements, by an independent consultant accredited with the CDM Executive Board, called <strong>Designated Operational Entity (DOE)</strong>.</td>
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<tr>
<td>5.</td>
<td><strong>Registration</strong> of the project activity by the CDM Executive Board.</td>
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<tr>
<td>6.</td>
<td><strong>Implementation</strong> of the project and <strong>monitoring</strong> of all relevant emissions / carbon sequestration by the project developer.</td>
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<tr>
<td>7.</td>
<td><strong>Verification and certification</strong> of the emission reductions / carbon sequestration by another DOE.</td>
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<tr>
<td>8.</td>
<td><strong>Issuance</strong> of the CERs by the CDM Executive Board.</td>
</tr>
</tbody>
</table>

Source: Own presentation on the basis of UNFCCC 2006.

The first 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. Currently, almost 1300 projects have been registered or are at the validation stage, expecting a cumulative 1.37 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 two projects with 1.79 million expected cumulative CERs are currently at the validation stage. Apart from these, nine other transport projects (including small scale projects) have been submitted proposals for new
methodologies to the EB.3 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. Considering the total amount of 189 methodologies in the methodology pipeline, it is obvious that the share of transport projects is very small (Fenhann 2006).

Looking at the proposed methodologies, one can divide the projects into three different categories. One type of methodologies deals with switching from conventional to less emission-intensive fuels or biofuels, the second with efficiency improvements within one transport mode, and the third with modal shifts (sometimes including efficiency improvements). The projects are listed in Table 2. Annex 1 provides a more detailed overview of the different projects sorted by category. The following outlines overarching methodological difficulties within each category in order to assess in how far projects fit in the CDM in its current form.

Table 2: Proposed CDM Projects in the Transport Sector

<table>
<thead>
<tr>
<th>Fuel Switch</th>
<th>Efficiency Improvements</th>
<th>Modal Shift</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switching fossil fuels from petro-diesel to biodiesel in transport sector</td>
<td>Behaviour-oriented demand-side EE program (Small Scale) (SSC41)</td>
<td>Change from road to sea transport</td>
</tr>
<tr>
<td>(NM0069, NM0108)</td>
<td></td>
<td>NM0128</td>
</tr>
<tr>
<td>Transportation bio-fuel production with life-cycle-assessment (LCA)</td>
<td>Introduction of clean energy vehicles during renewal time*</td>
<td>Change from road to pipeline</td>
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<tr>
<td>(NM0109, NM0129)</td>
<td></td>
<td>transport (SSC58) (Small Scale)</td>
</tr>
<tr>
<td>Khon Kaen fuel ethanol project</td>
<td>BRT project. Mexico (NM0158), including modal shift</td>
<td>Introduction of P&amp;R bus system*</td>
</tr>
<tr>
<td>(NM0082, NM0185)</td>
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<tr>
<td>Palm methyl ester biodiesel fuel production for transport using LCA</td>
<td></td>
<td>Transmilenio – urban mass</td>
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<tr>
<td>(NM0142)</td>
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<td>transportation system (NM0052,</td>
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<td></td>
<td></td>
<td>NM0105), including efficiency</td>
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<tr>
<td></td>
<td></td>
<td>improvements</td>
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<tr>
<td>LPG retail outlets for cars (NM0083)</td>
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<tr>
<td>Emission reductions by low-greenhouse gas emitting vehicles</td>
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<tr>
<td>(AMS-III.C.) (Small Scale)</td>
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</table>

* Methodologies developed within the Japanese “Future CDM” project.

Fuel switch methodologies (NM0069, NM0082, NM0038, NM0108, NM0109, NM0129, NM0142, NM0185) in general face the problem that projects at all stages cause GHG emissions that are not directly linked to the project activity, i.e. leakages, such as N₂O emissions due to application of fertilizer in the production of biofuels or a potential change in fuel efficiency of vehicle engines due to the use of biofuels. Methodologies not only have to detect the various sources of direct and indirect emissions but must also quantify them. One great difficulty is the correct assessment of a possible change in “carbon pools”, i.e. CO₂ stored in the form of biomass (in a specific area). To avoid an overestimation of emission reductions, the net decrease in carbon pools due to the project activity, be it directly or indirectly, and also a potential increase in carbon pools in the absence of the project activity have to be taken into account. Other leakages that were not treated adequately by most of the methodologies are listed in Annex 1. Furthermore, some innovative methodologies use a Life Cycle Assessment (LCA) approach to determine net emission reductions. They

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1 Because some of the projects submitted more than one methodology to the EB as indicated in Annex 1, the total number of transport methodologies submitted amounts to 14.
provide LCA emission factors for both the conventional fuel that is to be substituted and for the biofuel to assess GHG emission of each fuel from cradle to grave. Although in general judged to be an appropriate approach by the Executive Board’s Methodology Panel, the methodologies that were submitted used emission factors that were not applicable to the respective project activity. Currently another considerable problem seems to be the avoidance of double counting. Methodologies claiming CERs from the production of biofuels have to ensure that a potential project activity at the demand side do not also claim CERs for the use of the same biofuels. To facilitate clarifications the EB agreed to open a call for public inputs on the issue starting 2 October and ending on 20 October 06.\(^4\)

Except for these overarching difficulties, the methodologies also contain many project-specific flaws. Most of the errors, wrong assumptions and conclusions can be corrected more or less easily, though. It can therefore be concluded that fuel switch methodologies in the transport sector are relatively straightforward and do fit well in the present CDM once the general uncertainties are resolved. In fact, one methodology is already close to being approved and others seem to be on track as well.

As for the second category, efficiency improvements within a transport mode, so far only one methodology has been submitted (SSC41). The methodology comprises training programmes promoting behavioural changes to achieve a more efficient operation of vehicles. However, the EB decided that this type of methodology is in principle not eligible under the CDM because the measured emission reductions are not directly attributable to the project activity.\(^5\) The other methodologies containing efficiency improvements within one transport mode also aim at a modal shift, resulting in more complex methodologies (NM0052, NM0105, NM0158). The more fundamental difficulties of these methodologies to a large extent result from the modal shift that is to be induced and are therefore covered in the following.

Within the third category, there is a marked difference between projects (respectively methodologies) located in the public (NM0052, NM0105, NM0158) and those located in the private sector (NM0128, SSC058). Compared to the former, the latter are less complex and probably can be established more easily (see Annex 1). Therefore, the following focuses on the difficulties methodologies that aim at the public sector are facing.

As in the case of fuel switch, transportation methodologies in the public sector have various project-specific flaws, maybe even more of them. However, some general difficulties can also be identified. Due to high technology costs as well as transaction costs associated with such projects, CER revenues only contribute a small part of total costs and are usually not enough to make the project profitable. Moreover, such projects usually serve a variety of objectives and thus it is hard to prove their additionality. Another great challenge methodologies are facing is the development of an adequate baseline. Beside the availability of excellent and comprehensive data, clear “business-as-usual” transportation plans are necessary. Even if reliable data is available, which is probably doubtful for many Southern countries, forecasts for establishing the baseline of such projects are still uncertain due to the many factors they depend on (see also OECD 2001: 16ff and Browne et al 2005: 59, 74). Furthermore, due to their high complexity the methodologies entail various explicit and implicit assumptions, for instance it is assumed that the so called “rebound effect” does not occur.\(^6\) Although some assumptions are indispensable to limit complexity and guarantee applicability, the majority of the ones used in the methodologies submitted is questionable as indicated by the EB. The necessity to consider, evaluate and measure the diverse direct and indirect effects as well as leakages not only hampers baseline development and the calculation of emission reductions, but also considerably

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\(^5\) See EB decision at: http://cdm.unfccc.int/methodologies/SSCmethodologies/Clarifications [accessed 24 October 2006].

\(^6\) If a project activity reduces traffic on a specific route, the created space may be occupied by new trips undertaken due to the more comfortable road situation. The term “rebound effect” describes these phenomena.
complicates monitoring. On the one hand, this results in baseline and monitoring methodologies which are complex and project-specific, thus not really providing an instrument other projects can adopt. On the other hand, there is a serious danger that measured emission reductions are not (only) caused by the project activity, but by a variety of other factors influencing emissions. Finally, projects in the public sector involve numerous levels of jurisdiction and therefore require long time horizons (Browne et al 2005: 63).

Recognising the underrepresentation of transport projects in the CDM, Japan in 2005 established a multinational working group of experts within its “Future CDM” project to develop widely applicable CDM methodologies in hitherto underrepresented areas, including transport. Ultimately, two transport methodologies were developed and will soon be submitted to the EB. One aims at the introduction of clean-energy vehicles (CNG) in a specific truck fleet during vehicle renewal time, the other comprises the promotion of public transport utilization by introducing a Park & Ride (Bus) System.⁷

A first conclusion to be drawn from the analysis is that all projects fall within the second and third strategy outlined in section 2, i.e. modal shift and increasing efficiency. However, moving towards sustainable transport systems requires the implementation of elements from all three strategies. In particular the approach to avoid transport through spatial and transport planning is missing within the CDM. A second conclusion is that one main reason why there are so far only very few transport projects in the pipeline is their high complexity. 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. All methodologies currently under consideration had been submitted to the EB for the first time in 2004 or 2005 already. Key problems relate to potential leakages and double counting.

Projects located in the public sector face even more difficulties when developing an appropriate methodology, especially if they aim at a modal shift. Main problems are:

- First, it is very hard to prove additionality because CER revenues only contribute a small part of total costs and projects usually serve a variety of objectives.
- Second, forecasts of future emissions are uncertain due to the many factors they depend on, resulting in doubtful baselines.
- Third, vital assumptions cannot be verified or only with significant effort.
- Fourth, it seems to be challenging to monitor the diverse impacts on emissions.

In consequence, methodologies are complex and very project specific. The only project that has already been successful is the Transmilenio project in Bogotá (Colombia). All other methodologies of the second and third category are far from reaching approval.

### 4 Sectoral Approaches to the CDM

Browne et al. (2004) suggest that sectoral approaches might provide a better fit for transport projects under the CDM than the current project-based approach, in particular for projects addressing the demand side. The concept of a sectoral CDM was first introduced by Samaniago and Figueres (2002). It entered the broader

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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 Non-Annex I Parties 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.

- Finally, 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.

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8 As to the first line of criticism, it bears pointing out that the CDM project pipeline has since virtually exploded. The observed bottlenecks were therefore probably rather due to usual birth pains and shortages in funding rather than to structural weaknesses.

9 See 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].
In line with the bottom-up approach of the CDM, it would probably not be necessary to define ex ante what constitutes a “sector”. A whole range of definitions has been suggested in literature (e.g. Samaniego and Figueres 2002: 92f), as illustrated in Box 6.

**Box 6: Potential Definitions of a Sector**

Approaches to defining a “sector” might be:
- using a traditional sectoral definition such as the energy or the transport sector,
- looking above or below the traditional sectors, for example, by defining the upgrading of all gas-fired power plants in a country to combined cycles as a project,
- defining a city or a local area as a sector,
- comprising all the emissions of one particular non-CO$_2$ gas in a country in one project,
- targeting the application of one particular technology,
- taking a combination of approaches, e.g. transport in a particular city.

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, sectoral project activities pose a number of methodological challenges, which need to be examined. The Methodology Panel of the CDM Executive Board is currently elaborating a definition of what constitutes a “policy” and a “programme” (see Error! Reference source not found.). One key question is whether a project activity that implements a policy or standard could qualify for CDM registration.

The differences between the various sectoral approaches that have been suggested relate to the key methodological concepts and criteria of the CDM project cycle. Hence, the following checklist helps to identify the fit of measures and policies to the concept of CDM:

- **What would the CDM project activity** in each respective case entail? 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. The Kyoto Protocol and the CDM modalities and procedures use the term “project activity” as opposed to “project”. A project activity could, therefore, be identical with or a component or an aspect of a project undertaken or planned.
- **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.
- **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*. For sectoral projects, a whole range of definitions of what may constitute the project boundary has been suggested and is conceivable (e.g. Samaniego and Figueres 2002: 92f)
- **What would be the baseline** and how would it be set in each respective case?
- **How would the demonstration of additionality** be carried out?
• How would the project’s emissions be monitored?
• What would be the emission reduction, in particular, should there be a discount or other limitations on what may be credited?
• What would be the contribution to sustainable development? Under the CDM, the determination of whether a project contributes to sustainable development is the sole prerogative of the host country.

The checklist provides a framework for assessing in how far the transport public policy instruments outlined in section 2 might be compatible with the CDM. However, in the following section bundling and sectoral targets are not highlighted due to the following reasons:

• Bundling: A project developer can couple several project activities like bus systems, bio-fuel activities, eco-driving training etc. Nevertheless, the methodological problems of transport CDM projects remain the same. Baseline, additionality, monitoring, and the calculation of emission reduction have to be carried out for each project within the bundle. To overcome the problems of transport CDM projects the approach does only point at the problem of reducing the transaction costs of project developers.

• Sectoral Targets: This approach subsumes all kinds of measures within a sector. Hence, all policy instruments as well as municipal and corporate measures are included. After deciding about the boundary, be it a city, a region or a nation, the task is to create a scheme for measuring all emissions from the sector and predict a baseline and install monitoring to calculate the effects. If data about energy consumption of the transport sector exists and problems like fueling in neighbouring regions or countries can be calculated it might be a promising way to give incentives for emission reductions in the transport sector. But this approach is not longer connected to concrete measures or instruments.

The policy-based approach and the programme approach are focussing on policy instruments. In order to reduce complexity, the options to include public policies of the transport sector into the CDM through a sectoral approach are discussed with a focus on the policy-based approach and the programme approach.

### 5 Applying Sectoral CDM Approaches to the Transport Sector

Although only few projects that affect the transport sector have been successful in the CDM process, there is certainly room for further project activity. Projects can be differentiated along the lines of corporate policy, which is closely related to the existing CDM framework, and political instruments that might fit into the framework of a sectoral CDM. On a corporate or municipal level, it is possible to design project activities that reduce the emissions of transport. But the specific methodological problems of transport CDM projects (see section 3) lead to the question if a sectoral approach fits better to this sector. In order to evaluate transport policies, different methodologies have been discussed. Hence, the discourse on sustainable mobility yet includes several elements and methodological requirements of the CDM. The following paragraphs link

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For a more detailed discussion, how these issues would be defined and dealt with under each of the sectoral approaches see Sterk / Wittneben 2006.
both discourses and look at possible transport policies and their relationship to the basic criteria of CDM. The question is if and how the presented instruments of section 2 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.

The above-presented checklist defines essential criteria for formulating a CDM activity, whether within the existing CDM or a sectoral approach. The two main tasks are to define the framework of the activity (impact, participants and boundary) and develop a methodology to assess the additional emission reduction (baseline, additionality, monitoring and expected results). Regarding possible CDM projects each single transport instrument and measure can be assessed against this checklist. In order to screen the potential for the development of a CDM activity, each single transport measure or instrument could be analysed. 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**

Planning Instruments can be easily described in terms of a project activity. In most cases, a political body decides to initiate a planning process and commissions a particular unit of administration. Hence, the planning process and its implementation can be understood as a project activity. 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 is a project 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 open at the beginning whether investments in new 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. Hence, the overall planning process can be understood as a policy or as a public programme under which several activities are subsumed.

In addition to the administration, further participants can be incorporated. Depending on the issue this might be authorities of neighbour 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 boundary is usually the jurisdiction, i.e. the territorial area covered by 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. These planning levels are interdependent, but in general urban plans follow a similar rational to national infrastructure programmes.

Regarding the methodological 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. In SEA an assessment of a status quo scenario or a ‘do-nothing’ option is required, which would be the CDM baseline, and the effect of the proposed measures including the estimated emission reductions is calculated. CO\textsubscript{2} emissions are a key-indicator for SEAs in the transport sector because cumulative emission effects of transport networks and induced traffic are major problems. In addition, the preparation of monitoring is 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 weight the different aspects. For all instruments, it is the task of the host country to determine whether the project is sustainable. Nevertheless, sustainability appraisal provides a possible methodology.

Generally speaking, planning processes fit into the framework of a programmatic CDM. However, some measures defined in the plan can be policies. But planning processes can be understood as project activity and there are highly developed methods of environmental assessment. The most difficult part will be the definition of additionality. In most 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. Independent from the solution to this problem it is clear that assessing planning processes is possible but aligned with more uncertainty than localised project activities.

Regulative Instruments

In general, rule making is closely related to governments. The authorities on different levels define rules adequate to their decision competence. In principle, this process can also be seen as a project activity. 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 is usually defined through the jurisdiction of these actors. As decisions on political norms and rules are not always linked to a time frame, the definition of a project activity for political regulation is more difficult than for plans and programmes. A policy cycle includes 5 phases (agenda setting, policy formulation, decision-making, implementation and evaluation). In this process it is necessary to define after what period the instrument is implemented and the effects can be measured. This decision is flexible and must be justified by the participants. For example, the introduction of CO₂ emission limits leads to the question when the limits have to be implemented and after what time the effects should be analysed. The average age of the passenger car fleet in Europe is between 7-8 years (BAST 2005). As it is reasonable to define the point of evaluation based on the life cycle of the regulated product, 8 years could be the time frame for the project activity.

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. An example for an ex-ante approach is the European Unions rough assessment of the possible effects of the voluntary agreement of the car industry to reduce average CO₂ emission from passenger cars (European Commission 1998). Thereby a baseline and the expected emission reductions have been calculated based on different assumptions. It was calculated that the ACEA agreement would avoid 85 Mt CO₂ emissions (see Box 2). The voluntary agreement is also a good example for monitoring of regulative instruments. Based on statistics of number and fuel consumption of newly

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11 There are experiences in The Netherlands with the E-Test and other assessments e.g. in Canada, New Zealand, the Czech Republic and Denmark.
registered cars CO₂ emissions can be calculated by assuming average driven kilometres based on transport models. Average CO₂ emissions from passenger cars in the European Union have been reduced from 185 g CO₂/km in 1995 to 163 g CO₂/km in 2003. On this basis, ACEA calculated that improvements in its cars have contributed almost 35 Mt CO₂ emission reductions between 1995 and 2002 (Bongardt, Kebeck 2006). Environmental standards of 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 can be determined as well. Again, sustainability impact assessment for policies based on sustainability indicators is a tool to conceptualize a regulation in the same way the environmental assessment does for the calculation of CERs.

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 include more uncertainty. Nevertheless, there are methodological approaches how to assess and monitor the activity. In general, transport and traffic regulation would fit into a policy-based sectoral CDM, but it is necessary that this sectoral CDM could cope with the methodological uncertainties.

Economic Instruments

An inclusion of economic instruments in a policy-based sectoral approach appears to be possible as well. Unlike regulations, which set norms and limits to products and behaviour, economic instruments aim at changing the preferences of individual and business mobility. The concept of including external costs into the price of transport activities (e.g. eco-tax, parking fees, congestion charge etc.) leads 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 as well as baseline definition, the assessment and monitoring of effects above described 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 CO₂ 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)\(^{12}\).

An even better example is London’s congestion charge. It shows how the effects of an economic instrument can be assessed and evaluated. It is possible to define the concept and the implementation of the London Congestion Charging Scheme (see Box 3) as a project activity. As part of the Mayor’s Transport Strategy in 2002, the Charging Scheme of Central London was introduced with the aim of reducing congestion and improving traffic conditions in central London. It is the first large-scale congestion charging scheme introduced in the UK. In February 2003, fee congestion was introduced and is expected to pay for itself within the next three years. All money raised from this charge has, by law, to be re-invested into London’s transport infrastructure. Within the implementation of this policy tool participants incorporated 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

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\(^{12}\) The emission reductions reported are based on all sectors. This study does not show the specific effects in the transport sector.
the London Inner Ring Road, including the whole City of London, the city’s financial district and the West End. The 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.

Since its implementation, a number of reports about the instruments efficiency have been published showing significant changes to the baseline scenario. Monitoring of the central London congestion charging scheme undertaken by TfL has shown a reduction in fuel use and carbon dioxide emissions (CO₂) 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 estimated to be between 5,000 to 10,000. In order to continuously assess the effects of the central London congestion charging 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. 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 local as well as on national level. On all levels the effects of such incentives are possible to assess. As the example of London shows, it is clearly feasible to evaluate the effects on municipal level. But the broader the scope of the instrument is, the more uncertainties occur. Reasons that encourage people to drive less are often multifold and economic instruments take effect indirectly. Even if surveys and statistical evaluation of the general fuel consumption gives insight in the way instruments work, the assessment is incorporating uncertainties. 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. But many economic instruments give 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 because increasing prices 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. Nevertheless, the host country has to determine whether the project is sustainable.

Soft Policy Instruments

As outlined in section 2, soft policies are often corporate policies. Nevertheless, there are more general schemes of soft policies that would fit into a sectoral, programmatic or policy-based approach. The task to define a project activity depends on the kind of instrument. More policy-based schemes include mainly administrative actors. The definition of a project and the methodology is closely related to regulation or economic instruments. In general, the same conclusions have to be drawn for soft policies. Activities that are more similar to a programmatic approach are different from that. An eco-driving or mobility management programme for companies or individuals includes an administration or a company department as main participant. The boundary can be defined as a territorial jurisdiction or a company. The leading actor coordinates and initiates different activities. To evaluate developments, it is necessary to collect data on driven kilometres as well as on fuel consumption of individuals. In business or organisations, this might be easier than for private households. For instance, effects of eco-driving training on bus drivers that drive the same routes every day are relatively stable. For example, fuel consumption of vehicle fleets of parcel
services companies have been monitored in Heidelberg (Dalkmann/Herbertz 2003). Hence, in a business context fuel consumption is a good indicator for effects of instruments focusing on information or training.

A good example is the case of DHL’s eco-driving training (see Box 4). Firstly, driving behaviour results in a direct impact on GHG emission. The project participants are the management and employees of DHL and the project boundary can be defined as being DHL’s activities in Germany (or another country). Assessing the past development of driven kilometres and fuel consumption of DHL and developing a forecast by considering proposed vehicle fleet changes and market development without any change of driving determines the baseline. The additionality of the project has to be justified by showing that the measure would not be carried out without the benefit of the CERs. Monitoring can be organized by measuring kilometres driven and fuel consumption. Hence, estimation about emission reductions was calculated.

Even if no transport is avoided and no modal shift is realized, the project is sustainable in the sense that no jobs are in danger and drivers learn more about fuel efficient driving and can use the knowledge for their private mobility. Hence, the eco-driving instrument fits into the framework of a programmatic CDM. The example shows that for corporate and municipal measures the most important problem is to develop methodologies that can easily be adapted to different local settings and collect the data required. In the case of Small Scale Methodology SSC41 an attempt to set up a methodology for eco-driving failed (see Section 3).

Soft policies are relevant for the CDM. However, it is important to look at the particular kind of instrument in order to decide if it follows a policy-based or a programmatic approach and the scale of the activity. In general, it is easier to define small-scale programmes than large-scale policies. The methodologies to assess effects of audit-schemes or reporting-based transport plans will vary significantly. Nevertheless, transport research offers models and assessment methodologies that can predict and monitor the effects. Again, the main problem for the inclusion in CDM will be the level of uncertainty. Hence, a revision of the strict requirements to methodologies in the CDM and establishing a procedure to cope with uncertainties in sectoral approaches would be a good way to include more transport projects and instruments.

The main findings for the different types of instruments are summarized in Table 3.

Table 3: Instruments as measured against the CDM Criteria

<table>
<thead>
<tr>
<th>Planning Instruments</th>
<th>Regulative Instruments</th>
<th>Economic Instruments</th>
<th>Soft Policy Instruments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Project activity</strong></td>
<td>Planning process and its implementation including a multitude of project activities like investments or policies</td>
<td>Rule by local, regional or national government that adopts (implements and enforces) means that reduce GHG emissions</td>
<td>Mean by local, regional or national government that adopts (implements and enforces) means that reduce GHG emissions</td>
</tr>
<tr>
<td><strong>Project participants</strong></td>
<td>Administration and other stakeholders</td>
<td>Mainly government and transport administration, establishes and enforces rules</td>
<td>Mainly government and transport administration, establishes and enforces rules</td>
</tr>
</tbody>
</table>
### Project boundary

<table>
<thead>
<tr>
<th>Project boundary</th>
<th>Territorial area covered by the plan</th>
<th>Jurisdiction of the project participants</th>
<th>Jurisdiction of the project participants</th>
<th>Jurisdiction of the public project participants or boundary set by company</th>
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</thead>
</table>

### Baseline

<table>
<thead>
<tr>
<th>Baseline</th>
<th>Status quo scenario established by the SEA assessment</th>
<th>Scenario without implementation of the rule</th>
<th>Scenario without implementation of the mean</th>
<th>Scenario without implementation of the scheme, baselines for each individual activity may be required</th>
</tr>
</thead>
</table>

### Additionality

<table>
<thead>
<tr>
<th>Additionality</th>
<th>Define certain set of measures within the plan or a share of the emission reductions as additional</th>
<th>Demonstrate that rule is mainly implemented due to climate reasons (shortlist of additional policies)</th>
<th>Demonstrate that mean is mainly implemented due to climate reasons (shortlist of additional policies)</th>
<th>May require demonstration of additionality for each individual activity AND for the overall scheme</th>
</tr>
</thead>
</table>

### Monitoring

<table>
<thead>
<tr>
<th>Monitoring</th>
<th>To be done for the whole plan using transport surveys and further SEA indicators and data</th>
<th>To be done for the whole transport sector, probably based on statistical data and indicators</th>
<th>To be done for the whole transport sector, probably based on statistical data and indicators</th>
<th>In principle to be done for each individual activity, sampling may be used</th>
</tr>
</thead>
</table>

### Emission reduction

<table>
<thead>
<tr>
<th>Emission reduction</th>
<th>Difference between baseline from the plan and actual emissions (SEA calculation)</th>
<th>Credit everything below the baseline or discount number of credits (uncertainty)</th>
<th>Credit everything below the baseline or discount number of credits (uncertainty)</th>
<th>Difference between baseline and actual emissions from the scheme</th>
</tr>
</thead>
</table>

### Contribution to SD

<table>
<thead>
<tr>
<th>Contribution to SD</th>
<th>To be determined by host country; sustainability impact appraisal</th>
<th>To be determined by host country</th>
<th>To be determined by host country</th>
<th>To be determined by host country</th>
</tr>
</thead>
</table>

Source: own analysis; inputs from Sterk / Wittneben 2006, Bosi / Ellis 2005, Figueres 2006

## 6 Conclusions and Outlook

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 render methodology development difficult. Especially projects in the public sector have to take into account numerous different factors. Proving additionality is complicated, because transport projects usually serve a variety of objectives. Forecasts of future emissions are uncertain due to the various factors they depend on, resulting in doubtful baselines. Vital assumptions cannot be fully verified and it seems to be challenging to monitor the diverse impacts on emissions. Investments are high and the assumed realization of CERs could be too small to invest into the development of methodologies and the creation of reliable data.
Browne et al. (2005) have suggested that sectoral approaches to the CDM might provide a more fitting framework for transport projects. The discussion has shown that it is possible to design 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. Transport policies take place on different administrative levels; the municipal and regional level seem to be the most appropriate for CDM activities. Thus, projects would best fit into the framework of a programmatic or policy-based CDM. Planning and some soft policy instruments are related to the programmatic CDM, while regulations, economic instruments and several soft policies pertain to a policy-based CDM.

Transport research yields several tools to address the methodological requirements of the CDM. Methodological parallels can be found especially in the application of Strategic Environmental Assessment (SEA) on a spatial or transport plan on various levels (local to national). In SEA an assessment of a status quo scenario or a ‘do-nothing’ option 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. 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 thus do not appear as a way to reduce the methodological difficulties that currently plague transport projects in the CDM. Such 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.

Additional research is needed to further examine the 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. Another issue that can be address 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. In this way a sectoral CDM could 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 being considered by policy makers, the existing capacity to carry out such projects in countries of the global South needs to be examined. Training local staff may not only help to increase the number of rigorous CDM projects proposed, both 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


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.


