Climate Instruments for the Transport Sector:

Considerations for the Post-2012 Climate Regime

Consultants' Report
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Abbreviations

ADB	Asian Development Bank
ASI	Avoid-shift-improve
AWG-KP	Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol
AWG-LCA	Ad-Hoc Working Group on Long Term Cooperative Action
BAU	Business as usual
BRT	Bus rapid transit
CBD	Central business district
CDM	Clean development mechanism
CER	Certified Emission Reductions
CIF	Climate Investment Funds
CTF	Clean Technology Fund
CITS	Climate Instruments in the Transport Sector
CO_2	Carbon dioxide
COP	Conference of Parties
DALY	Disability-adjusted life-year
EB	CDM Executive Board
EF	Emission factor
ERP	Electronic road pricing
GEF	Global Environment Facility
GHG	Greenhouse gas
$GtCO_2$-eq	Giga ton CO_2 equivalent
IDB	Inter-American Development Bank
IEA	International Energy Agency
IPCC	Intergovernmental Panel on Climate Change
LRT	Light-rail transit
MAC	Marginal abatement cost
MDBs	Multilateral development banks
MRV	Monitoring, reporting and verification
NAMAs	Nationally appropriate mitigation actions
NMT	Non-motorized transport
OECD	Organization for Economic Cooperation and Development
PoA	Program of Activities
SBLs	Standardized baselines
SLoCaT	Partnership on Sustainable, Low Carbon Transport
STI	Sustainable Transport Initiative
TDM	Transport Demand Management
UNEP	United Nations Environment Program
UNFCCC	United Nations Framework Convention on Climate Change
VKT	Vehicle kilometers traveled

Acknowledgement

The *Climate Instruments for the Transport Sector* (CITS) report was written by Cornie Huizenga, convener of the Partnership for Sustainable Low Carbon Transport (SLoCaT), and Stefan Bakker, from the Energy Research Center of the Netherlands.

Implemented by the Asian Development Bank (ADB) in cooperation with the Inter-American Development Bank (IDB), the CITS project is a first step to help ensure that the transport sector can benefit from the revised/new climate change mitigation instruments under a post-2012 climate change agreement.

For the project, studies were carried out in two Asian and two Latin American cities to explore how NAMAs, a new financial mechanism being developed under the UNFCCC, may support emissions reductions from urban transport policies and programs. The Asian case studies—in Hefei, the People's Republic of China, and Jakarta, Indonesia—were financed by the ADB. The Latin American case studies—in Belo Horizonte, Brazil, and Mexico City, Mexico—were financed by the IDB. The combined report was financed by the ADB and its publication by the IDB as part of a combined effort stemming from both institutions' participation in the SLoCaT Partnership.

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Executive Summary

Discussions on existing and future climate instruments are ongoing in the international climate and development communities. The *Climate Instruments for the Transport Sector* (CITS) study, commissioned by the Asian Development Bank (ADB) and the Inter-American Development Bank (IDB), assesses the current state of affairs with regard to the impact on the transport sector in developing countries of the Clean Development Mechanism (CDM), Global Environment Facility (GEF) and Clean Technology Fund (CTF). Based on desk analysis and case studies in Asian and Latin American cities, this study also provides recommendations for the successful scaling up of climate finance and capacity building in the transport sector, particularly through the use of nationally appropriate mitigation actions (NAMAs), a new financial mechanism being developed under the United Nations Framework Convention on Climate Change (UNFCCC).

Transport is responsible for an important and growing part of global greenhouse gas (GHG) emissions, with most of the future increase expected to come from developing countries. The Conference of Parties (COP), at its fifteenth session, took note of the Copenhagen Accord. That document, agreed upon by a majority of Parties to the UNFCCC, underlines that climate change is one of the greatest challenges of our time and recognizes the scientific view that the increase in global temperature should be kept below 2 degrees Celsius to avoid dangerous consequences. The document calls for emissions targets to be adopted by Annex I Parties and agrees that non-Annex I Parties propose and implement nationally appropriate mitigation actions (NAMAs). The need for scaled-up, new and additional, predictable and adequate funding for developing countries is recognized in the document, which also contains a pledge of USD 30 billion by developed countries for the period 2010-2012 to finance adaptation and mitigation in developing countries.

To limit the increase in global temperature to 1.5-2.0^{o} Celsius, developed countries will need to reduce emissions by 25-40% below 1990 levels by 2020. During the same period, GHG emissions in developing countries will also need to be reduced by 15-30% below business as usual (BAU). For the transport sector, this would translate to 0.6-1.3 $GtCO_2$-eq/yr reduction by 2020.

To reach the global goal of reducing GHG emissions by more than 50% below 1990 levels by the year 2050, significant emission reductions compared to BAU will be required in developing countries from 2020-2050. The manner in which developing countries develop their transport systems in the period leading up to 2020 will greatly determine the extent to which such longer-term emission reductions can be achieved.

Many countries, including developing countries, have started to issue policies and take actions on climate change mitigation, including in the transport sector, although most countries have not formally detailed their emission reduction plans for 2020. Initial analysis of commitments made by developing countries following the Copenhagen Accord shows that developing country action still falls short of the suggested 15-30% reductions in GHG emissions below BAU by 2020. There are a growing number of scenario analyses for the transport sector that indicate that such emission reductions are feasible, especially because of the co-benefits that pertain in terms of improved air quality, increased mobility, decreased levels of congestion, and increased security of energy supply. However, to achieve these co-benefits, ambitious policies with strong incentives for infrastructure investments, behavior change and technological progress—as well as for capacity building—are required.

In recent years, a shift in thinking has been taking place in the transport sector on how best to mitigate climate change. The new thinking moves away from a singular focus on measures to improve technology and places increasing emphasis on measures aimed at avoiding the need to travel by motorized transport and shifting travel to more sustainable, lower-carbon modes of transport. With its broader understanding of mitigation, this new "avoid-shift-improve" (ASI) approach has resulted in a number of transport policies and programs that can enable developing countries and cities to limit the growth in GHG emissions from both passenger and freight transport while also generating substantial societal co-benefits. Many of the new measures that incorporate the ASI approach have already been successfully applied in developing countries and are now ready for replication and scaling up.

A better understanding of the emission reduction potential, feasibility and cost-effectiveness of alternative policy packages and transportation interventions, together with an overview of the carbon footprint of current investments, could facilitate the future selection of less carbon-intensive options. This understanding could be achieved in part through the development and implementation of tools and methods to assess the impact of transportation interventions on GHG emissions reductions.

External assistance for developing countries could help those countries more quickly replicate and scale up GHG emission reduction activities in the transport sector. Such external assistance is required in several key areas, including capacity building, policy development, support for additional demonstration projects and the leveraging of domestic funding for infrastructure. Important sources of funding for the transportation sector in developing countries include the development agencies and multilateral development banks (MDBs). Climate change is becoming a specific strategic priority for the MDBs, and they are increasingly embracing the ASI approach as the conceptual basis for their internal policies on climate action in the transport sector. The general increase in funding for MDBs and the alignment of investment priorities towards sustainable low-carbon transportation increases the likelihood that MDBs can play a substantial role in helping developing countries replicate and scale up sustainable, low-carbon transport policies, programs and projects.

Assistance for developing countries to adopt a more low-carbon growth trajectory for the transport sector can also come from existing special climate funds or mechanisms such as the CDM, GEF or CTF. So far, however, the impact of existing climate instruments on the transport sector has been limited. This is due to several reasons:

- The relatively small amounts of funding available compared to the problem at hand.
- Competition between sectors for the available funds, especially in light of the perceived higher levels of uncertainty involved in reducing emissions from transport compared to other sectors.
- The complexity of methods required to estimate and then monitor, report and verify (MRV) emissions reductions in the transport sector.

There is a shared awareness that comprehensive approaches covering large parts of the transport sector will be required to realize the mitigation potential in the sector. This is best characterized by the transformational approach currently promoted by the CTF. CDM, when it continues beyond 2012, will most likely be implemented in much the same manner as it currently is. A lowering of the transaction costs and a greater use of Program of Activities (PoAs) carry some promise for the transport sector. Overall, however, the role of CDM will remain limited due to its more stringent requirements for assessment of GHG emissions reductions when compared to GEF, CTF and future climate mechanisms.

The case study on standardized baselines included in this report revealed the difficulty in coming up with standardized baselines for non-technology options in transport, such as achieving a modal shift through bus rapid transit systems. For technology-related mitigation options, there is some scope for standardized values for vehicle characteristics, which may be useful for climate instruments other than CDM as well.

Although the post-2012 climate instruments are still being developed and negotiated, expectations are that NAMAs offer the best potential to strengthen climate change mitigation in the transport sector in developing countries. This notion is underscored by the expected availability of considerably larger financial support in the next decade, from a total of $30 billion for mitigation and adaptation from 2010-2012 to $100 billion per year for mitigation by 2020.

Although international mechanisms can catalyze investments, the bulk of investments for climate action in the transport sector will need to come from domestic sources. Therefore, it will become increasingly important for external funds—i.e., climate change funds and MDBs—to help remove barriers to the implementation of projects, as well as to catalyze and leverage domestic funding. Different funding streams will also need to become truly complementary instead of operating in parallel.

To leverage change in an optimal way, the blending of resources from MDBs, climate funds, and local and national sources is likely to become necessary. To enable such blended funding arrangements, institutional objectives and methodologies will need to be aligned with each other. What's more, because of the special characteristics of the transport sector—including the difficulties of attaining monitoring, reporting and verification (MRV) standards under the current CDM—a separate window for transport-related climate funding may need to be established within UNFCCC. Such a "ring-fence" arrangement would help ensure that the transport sector received mitigation-related funding in proportion to its contribution to climate change.

Under the CITS project, several case studies based on the ASI approach were carried out in Asian and Latin American cities to explore how urban transport policies and programs could be developed as supported NAMAs. Issues related to scope, institutional involvement, financing and monitoring of NAMAs were covered.

The proposed NAMA in Jakarta, Indonesia centered on that city's transport demand management (TDM) policies—namely, road pricing, parking policies and public transport. The proposed Mexico City NAMA focused on the optimization of the existing conventional bus system. The NAMA in Belo Horizonte, Brazil proposed an integrated mobility plan that includes investments in non-motorized and public transport infrastructure, as well as combined land-use. The case study in Hefei, People's Republic of China focused on one aspect of the NAMAs: the potential of standardized baselines (SBLs) to simplify the MRV, a critically important component for the successful implementation of transport sector NAMAs.

None of the case studies provides a complete assessment of a NAMA, although some provide a more complete assessment than others. Taken together, however, the studies demonstrate that NAMAs in the transport sector have the potential to yield significant local and global environmental benefits, as well as economic and social benefits. They also give the first on-the-ground evidence of the policies and guidelines that will need to be in place in any post-2012 climate agreement to enable transport NAMAs to achieve their full potential.

NAMAs and many of the other policy options that take the ASI approach are consistent with sustainable development and would generate substantial co-benefits related to traffic congestion, air pollution, road safety and fuel security. In fact, many of these policy options are expected to be implemented in large part because of these co-benefits rather than because of the climate impact. Co-benefits, therefore, can play a decisive role in determining the extent to which a transport measure will be implemented. As a result, it is important that supported NAMAs do a better job of acknowledging the importance of co-benefits than existing climate instruments do. A full acknowledgement of co-benefits would need to go beyond recognition and also include a certain reward for realizing co-benefits. This could be accomplished by making the amount of overall financial support contingent on the degree to which co-benefits are realized. To do this, however, would require practical methodologies to monitor these co-benefits as part of any future MRV system.

A continued emphasis on incremental costs as one of the main criteria for deciding whether to invest in supported NAMAs may continue to limit funding for climate change mitigation in the transport sector, which is known for its limited responsiveness both to economic incentives and to methodological challenges for assessing incremental cost. These challenges include: properly taking into account the typically high upfront investment costs and associated risks; implementation uncertainties; and implementation costs, such as the preparation of policies and awareness-raising campaigns. A strict application of the incremental cost criterion could discourage countries from undertaking programs with high GHG reductions but with (apparently) low or negative incremental costs. Within transport, that might lead to a focus on vehicle and fuel technology-oriented NAMAs, which generally have high(er) incremental costs than do NAMAs that focus on the "avoid" and "shift" parts of the ASI approach. A new appraisal methodology will need to be developed to assess financial backing under a supported NAMA—i.e., one that evaluates how the NAMA would leverage or catalyze domestic climate action in the transport sector and how it would reduce emissions below BAU. This would require a thorough understanding not only of economic factors (e.g., investment risks and implementation costs) but also of non-economic factors (e.g., political and consumer uncertainties).

Support for barrier removal and capacity building can help developing countries catalyze the formulation and implementation of sustainable, low-carbon transport policies, programs and projects. However, it is expected that this will not be enough to generate the emission reductions required from the transport sector as part of an intensified mitigation effort in support of a post-2012 climate agreement. A contribution to investment costs would also be required in order to mitigate risks associated with the high investments and the uncertainty of consumer behavior, as well as to create an additional incentive to governments to implement and maintain the measure.

MRV should facilitate NAMAs rather than act as a barrier. MRV of transport NAMAs could do this by providing policy feedback on the success and effectiveness of actions, as well as a basis for sharing experiences. It also could provide information to stakeholders on the progress of policies, which could help to maintain public support for policies. This is of particular relevance to the transport sector, where most policies depend, at least to some extent, on behavioral changes.

The CITS project case studies demonstrate the complexity of MRV in a context of limited availability of reliable data, which makes it difficult to come up with reliable estimates of GHG emission reductions. The case studies do not have a final answer on MRV, but it is clear that the approach to MRV for transport will need to be flexible and will also require different types of indicators. In most developing countries, the availability and quality of transport data will determine the complexity of the MRV approach that can be applied. The MRV approach should be based on generally available data, or on data that could be collected in a timely manner and at a reasonable cost within the scope of the NAMA. Better models and GHG inventories, possibly at the local level, would be needed to enable ex-ante and ex-post estimation of emissions. In some cases, dedicated surveys may also be of use in assessing the ex-post emission reductions. To ensure that transport mitigation efforts enabled by external assistance are of sufficient scale, it is suggested that a range of MRV approaches be allowed, including both direct GHG assessments and the use of proxy indicators.

Financing of supported NAMAs could be linked to the amount of GHG emissions reduced by the NAMAs, and a substantial part of the funding could be made available upfront, based on ex-ante emission reduction analysis. The MRV system for the NAMA could build in provisions that would reward or sanction the implementers of the NAMA in case GHG emission reductions deviated from the upfront estimations. For removal of barriers, the full incremental cost could be funded, and only monitoring of the implementation would be necessary, as ex-post assessment of GHG reductions resulting from such actions probably would not be possible.

Although the case studies in this report give an interesting first look at the practical implementation of NAMAs in the transport section, additional pilot projects of transport NAMAs need to be developed and analyzed in order to explore the potential and specificities of working with freight transport, rural transport and inter-city transport in addition to urban transport. The pilot projects would provide the experience and insights needed to inform the negotiations and, in that way, enable sufficient climate financial support to reach the transport sector and achieve the necessary emissions reductions. Setting up pilots can be done in the period 2010-2012 by making use of either fast-track funding under the Copenhagen Accord or of other climate funds administered by MDBs and other organizations. To be most effective, the scope of the piloting should include:

1) Suitability of NAMAs to promote measures incorporating the ASI approach for both passenger and freight transport.
2) Alternative MRV approaches (e.g., the use of proxy indicators vis-à-vis GHG assessments or the integration of co-benefits in MRV procedures).
3) The development and testing of alternative assessment methodologies of the costs of NAMAs and their eligibility to be part of NAMA funding.
4) The use of NAMAs to support specific investment programs (e.g., BRT or infrastructure for walking and cycling) versus NAMAs directed towards policy formulation, institutional strengthening and capacity building.
5) The use of supported NAMAs as stand-alone programs, versus linking NAMAs to larger investment programs funded by MDBs.
6) The relationship between supported NAMAs, unilateral NAMAs, credited NAMAs and low-emission development strategies.

7) Exploring the possible application of the Technology Mechanism[1] to the transport sector.

8) The role of capacity building.

Such piloting should be conducted in a coordinated manner, with the results documented and shared widely with the UNFCCC and other entities. Additional piloting of transport NAMAs could provide important input to assist with the development of detailed NAMA guidelines that could help to ensure that the transport sector is appropriately represented in mitigation efforts in support of a post-2012 climate agreement.

[1] A mechanism being negotiated under the UNFCCC with the purpose of development, deployment, adoption, diffusion and transfer of environmentally sound technologies among all parties.

1 Introduction

Although the specifics of the post-2012 climate regime (as of November 2010) are far from clear, the new architecture of climate instrument under the UNFCCC is expected to open a new window for more ambitious GHG emissions reduction actions. In order to achieve global long-term climate change mitigation objectives, it is essential that the transport sector in developing countries contribute to such mitigation efforts. Globally, governments and experts are discussing instruments that support mitigation efforts by developing countries. The proposals fall under two general categories:

- *Emission reductions that can be used by developed countries to achieve their mitigation targets*. This includes, inter alia, continuing the CDM beyond 2012, but with certain modifications to enhance the scale of emission reductions, lower barriers and reduce transaction costs while maintaining the environmental integrity.
- *Emission reductions that can be reported directly by developing countries to UNFCCC*. One instrument being discussed for this purpose is known as nationally appropriate mitigation actions (NAMAs).

To help ensure that the transport sector can benefit from future climate change mitigation instruments under a post-2012 climate change agreement, the Asian Development Bank and the Inter-American Development Bank—as a contribution to the Partnership on Sustainable, Low-Carbon Transport—commissioned the *Climate Instruments in the Transport Sector* (*CITS*) project. Implemented over the period September 2009–June 2010, the *CITS* project had the following outputs:

1) Synthesis of information on the GHG reduction and co-benefit potential of transport interventions and of existing and planned climate change mitigation instruments. This includes the CDM, GEF, CTF and NAMAs.
2) Four case studies from the Asian and Latin American regions, illustrating suitable NAMAs and projects in the transport sector as well as the application of standardized baselines in the transport sector.
3) Development of an informal network, spanning both developed and developing countries, of transport organizations to help guide the discussion on detailed guidelines for post-2012 climate instruments.

This final report is based on experiences with existing climate instruments, four case studies, recent literature on climate change mitigation and discussions with a number of experts. An excerpted version of this report, NAMAs in the Transport Sector, was published in October 2010. The full reports of the case studies are available at www.slocat.net

The format of the report is as follows:

- Chapter 2 explains the emissions reductions in the transport sector to be realized by developing countries and gives an overview of the abatement potential in the transport sector.
- Chapter 3 reviews the existing climate instruments and related climate change programs, as well as the assistance provided by MDBs, for their effectiveness and relevance to the transport sector in terms of GHG emissions reductions.
- Chapter 4 presents an overview of the discussions on post-2012 climate instruments and their significance for the transport sector.
- Chapter 5 gives a synopsis of the four case studies carried out under the *CITS* project.
- Chapter 6 proposes a framework for developing and supporting NAMAs in the transport sector based on all these discussions.

2 CO_2 emission reductions in the transport sector

2.1 What is needed and what is being done?

The Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) states that in 2004, the global transport sector accounted for 6 $GtCO_2$-eq, or 13% of total GHG emissions (Kahn Ribeiro et al., 2007). In a BAU scenario, these emissions are projected to increase by over 80% by 2050, with the bulk of the increase taking place in developing countries (IEA, 2009).[2] In order to avoid dangerous climate change, global GHG emissions would have to peak within the next decade and be reduced by more than 50% in 2050 compared to 1990 levels. For the year 2020, this translates into a 25-40% reduction compared to 1990 levels for developed countries, while the contribution by developing countries would need to be 15-30% compared to BAU (den Elzen and Höhne, 2008). Given a baseline projection of 4.3 $GtCO_2$-eq[3], this would translate into 0.6-1.3 $GtCO_2$-eq/yr reduction in 2020. For comparison, the European transport emissions in 2006 were approximately 1 $GtCO_2$-eq (IEA, 2008).

Transport emissions are caused by transport of passengers and by transport of freight.[4] Substantially changing the trend of increased GHG emissions from transport will require the adoption of a range of available and new technologies, as well as changing people's travel patterns. Strong policies are needed to achieve this. Countries around the globe have started to realize the scale of the challenge, and many countries have now adopted policies and,—in the case of Annex I countries—have pledged targets for GHG emissions reductions. A fewer number of countries have also developed targets or goals specifically for the transport sector. Table 1 gives a broad overview of general and transport-specific targets or goals. In the case of developed countries, targets are mostly in the form of absolute reductions in GHG emissions compared to 1990 or 2005. GHG emissions reduction targets for developing countries are usually framed in reductions against BAU scenarios or in terms of reducing GHG intensity per unit of GDP. In several cases, GHG emissions reductions for developing countries are expressed in the form of a range, whereby the availability of external support determines whether the lower or higher ambition level applies. Specific sectoral targets, including for the transport sector, are often expressed in terms of improvements in energy efficiency.

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[2] This is based on a maximum concentration of GHG of 450 ppm in the atmosphere. Some climate scientists, such as James Hansen, hold that to be really on the safe side, GHG concentrations need to be returned below 350 ppm, which would imply much steeper reductions.

[3] Authors' estimate based on IEA/OECD (2009), which in Figure 1.18 give estimates for non-OECD countries for 2005 (adding up to 3.1 Gt, or 41% of global transport emissions). Global transport emissions are projected in the baseline to grow by 10.7 Gt in 2030 compared to 7.5 Gt in 2005, which can be interpolated to 9.4 Gt in 2020, of which the non-OECD countries would contribute an estimated 46% (IEA/OECD, 2008).

[4] This report focuses on land transport and does not address emissions from international shipping and aviation.

Table 1: Policies and targets as of June 2010 for GHG emission reduction, including for the transport sector

Country/ region	National Target	Transport 2020 target and main policies
EU	20-30% reduction by 2020 compared to 1990 levels	Sectors such as transport and agriculture that are outside of the Emission Trading System (ETS) will have binding emission reduction targets for each member state, in line with their ability to pay, in order to reach an overall cut of 10% by 2020.b
USA	17% compared to 2005 levels by 2020a	
Japan	25% reduction by 2020 compared to 1990a	Sectoral plan for transport under preparation
South Korea	30% emissions reduction target with respect to projected baseline emissions by 2020a	33-37% below BAU by 2020, equivalent to 20-24% reduction by 2020 compared to 2005 GHG emissions
Bhutan, Costa Rica, Maldives & Papua New Guinea	Carbon neutral by 2020a	No details provided on implementation in the transport sector
Brazil	Emission reductions of 36.1-38.9% with respect to baseline by 2020a	
China	40-45% reduction of CO2 emissions/GDP below 2005 levels by 2020a	Reduction in energy consumption of commercial trucks on a per unit basis of 16% compared to 2005 Reduction in energy consumption of commercial ships on a per unit basis of 20% compared to 2005 Reduction in energy consumption of commercial buses on a per unit basis of 5% compared to 2005e
Indonesia	26-41% below BAU in 2020a	
India	Reduce by 2020 the emissions intensity of its GDP by 20-25% with respect to 2005 levelsa	
Mexico	30% reduction with respect to BAU by 2020a	Emission reductions of 11.35 MtCO2e from 2008-2012. Emissions estimates of the sector for 2020, 2030 and 2050 are 186.5 MtCO2e, 185.0 MtCO2e and 128.0 MtCO2e, respectively
Singapore	16% below BAU by 2020a	

South Africa	A 34% reduction with respect to baseline by 2020 and a 42% reduction below BAU by 2025a	

Sources:

a. Duscha, V.; Graichen, J.; Healy, S.; Schleich, J.; Schumacher, K. (2010) Post-2012 climate regime. How industrial and developing nations can help to reduce emissions - assessing emission trends, reduction potentials, incentive systems and negotiation options

b. http://www.euractiv.com/en/climate-change/eu-wraps-climate-energy-policy/article-181068

c. Personal communication SLoCaT Focal Point Ministry of Land, infrastructure, Tourism and Transport

d. Jin Young Park (2010). Low Carbon Growth Path for the Transport Sector in Korea. Presentation at ADB Transport Forum 2010.

e. Dongchang Dai (2010). Moving Towards Sustainable Transport Development in China. Presentation at ADB Transport Forum 2010.

f. http://cambio_climatico.ine.gob.mx/descargas/dof_programa_especial_cambio_climatico.pdf

2.2 Emission reduction options and their potentials

Sustainable transport policy measures vary in nature, but they generally reflect at least one of three fundamental strategies that collectively are known as the avoid-shift-improve (ASI) approach (Dalkmann and Brannigan, 2007):

- Avoid the need to travel
- Shift travel to more sustainable, lower carbon modes of transport
- Improve the efficiency of modes of transport

As shown in Figure 1, transport policy instruments can further be divided into the following categories: planning, regulatory, economic, informational and technological.

Transport policy measures can be implemented at different levels. Local authorities often have a large degree of autonomy when it comes to issues such as parking and public transport, while national-level institutions usually establish regulatory standards guiding fuel efficiency. The link with sustainable development is most visible at the local level—e.g., through urban air quality and congestion problems. In the particular case of logistics and freight transport, policy decisions are made at the national level, but coordination often is needed at the local level. Moving towards sustainable transport can be done through projects, programs or policies.[5] A sustainable transport approach requires comprehensive packages of interventions at all levels—national, regional, local and, if applicable, at other levels as well.

[5] A project is a single activity clearly defined in space and time. A program is a larger set of (often smaller) activities spread over time and space (e.g., several BRTs in several cities), and is often used to implement a policy. A policy is the establishment of incentives to achieve policy goals (e.g., tax cuts).

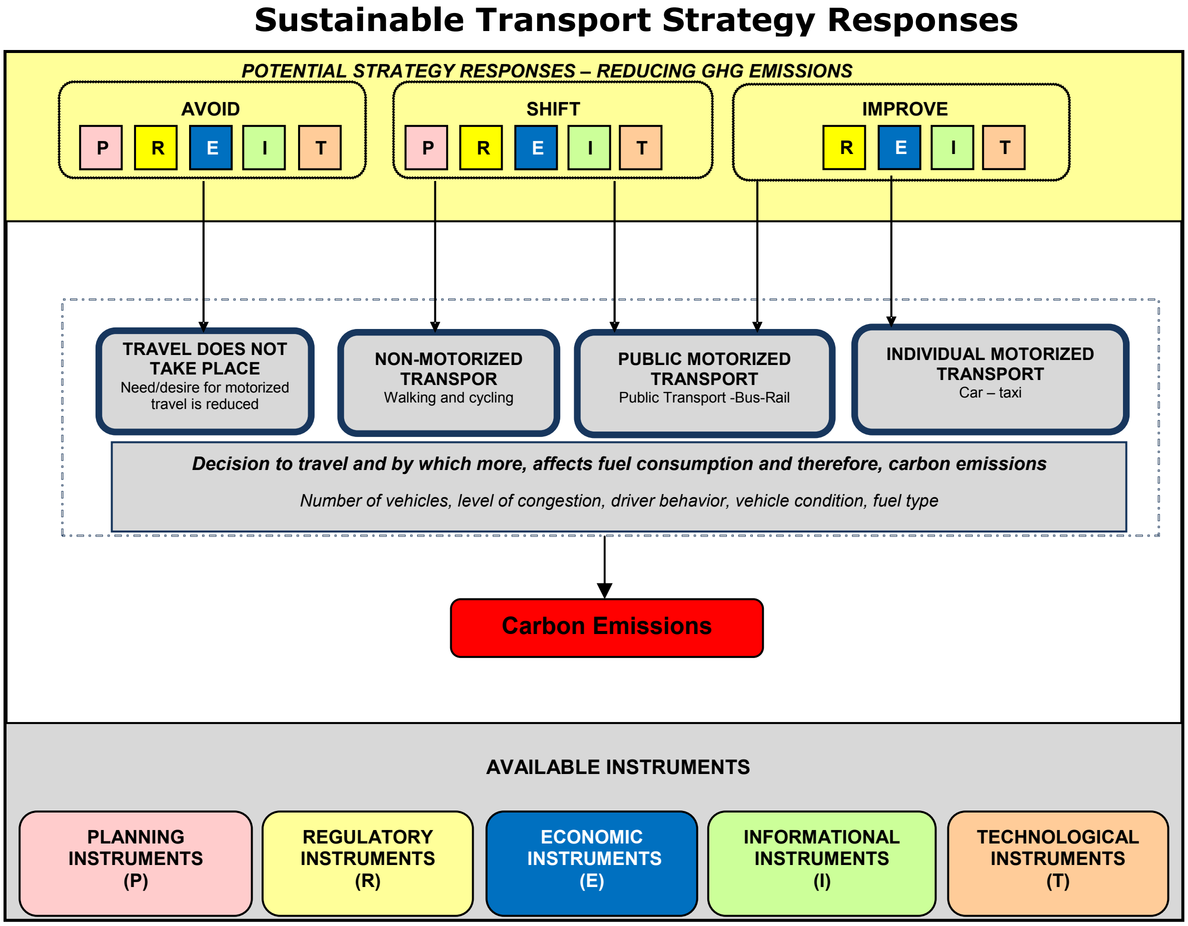

Figure 1: Strategies and instruments to reduce carbon from transport (Dalkmann and Brannigan, 2007).

The issue of time should also be noted. Polices and measures can lead to impacts in the short, medium and long terms, depending on a number of factors, such as how long they take to implement, how they affect emissions generation and whether the solutions are commercially available or are still being researched and developed. For example, the large-scale introduction of fuel cell vehicles and four-wheeled electric vehicles may be achieved in the long term once the technology is financially accessible and the supporting market has been developed. The shift from single occupancy vehicles towards mass transit may be achieved to some extent in the medium term, as this would require large-scale investments in infrastructure as well as in behavior change. Policies that encourage transit development management, such as the creation of dense and mixed neighborhoods around transit systems, only have an impact on GHG emissions over the long term.

In current policy efforts, as well as in published literature on the potential of emission reductions in transport, the "improve" category of ASI still dominates. Marginal abatement cost (MAC) curves for developing countries—which were developed in the late 1990s and early 2000s in the framework of CDM strategies, and which detailed the cost-benefit of different GHG mitigation options—often included only a handful of transport options, which were mainly related to vehicle efficiency, fuel switch and bus rapid transit (BRT) systems (Bole et al., 2009). Cost-effectiveness of transport mitigation efforts continues to be a topic of debate. McKinsey and Company (2009a) presents a MAC curve with high upfront costs for transport. It focuses only on technological improvements and does not consider demand reduction or modal shift options, which are believed to have a lower cost than technological improvements (Johnson et al., 2009). This has contributed to an overall low priority for the transport sector in economy-wide mitigation strategies (Anable, 2008). More recently, McKinsey (2009b) developed a cost curve for India that includes mileage standards, biofuels, integrated planning, modal shift in the freight sector, public transport, electric vehicles and hybrids.[6] To enable a full implementation of the ASI approach, it is important that the economic and financial analysis underpinning policymaking and investment planning reflects all three components of the ASI approach.

The IPCC, in the Fourth Assessment Report, concludes that "(t)he mitigation potential by 2030 for the transport sector is estimated to be about 1,600-2,550 $MtCO_2$ for abatement costs up to 100 US$/$tCO_2$. This is only a partial assessment, based on biofuel use throughout the transport sector and efficiency improvements in light-duty vehicles and aircraft and does not cover the potential for heavy-duty vehicles, rail transport, shipping, and modal split change and public transport promotion and is therefore an underestimation (…) (low agreement, limited evidence)" (Kahn Ribeiro et al., 2007). However, the report also acknowledges that integrated transport and land-use strategies—including transport demand management and modal shift measures—can be effective if rigorously implemented. It also notes that the demand for vehicles, vehicle travel and fuel are significantly inelastic and, therefore, that price increases need to be substantial to make a difference in GHG emissions. The most ambitious mitigation scenario in a 2009 International Energy Agency study (IEA, OECD 2009b)—the BLUE Map/shifts scenario—includes more energy-efficient vehicles, low-GHG fuels, advanced vehicles and modal shift. Global transport emissions are cut by 40% in 2050 compared to 2005, and by 70% (or 10 $GtCO_2$-eq) compared to the baseline in 2050.

Recent studies acknowledge the need for policies that focus on the "avoid" and "shift" elements of the ASI approach in order to achieve the desired and necessary emission cuts (Johansson, 2009; Hoen et al., 2009). However, these still play a relatively small role in the overall policy effort. Hoen et al. (2009) estimate that road pricing, spatial planning and mobility management (telecommuting, flexible working hours) could reduce passenger travel demand in the Netherlands by 15%, 2% and 10%, respectively.

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6 Andreas Merkl of the Climate Works Foundation announced at the ADB Transport Forum that took place May 27-29, 2010 that McKinsey, with support from Climate Works, is currently also working on a new global MAC curve for transport that will include modal shift and behavioral change (Merkl, 2010).

Compared to technological options[7], it is generally acknowledged that barriers to policy options involving behavior change are not as well understood and that the reduction potential for these options is surrounded by large uncertainties (Gross et al., 2009). In a meta-analysis of mitigation potential across 46 models in six countries, Clapp et al. (2009) note that the models may underestimate the abatement potential in the transport sector as they do not take into account behavior changes and modal shift. The abatement cost per ton of CO_2 for these types of measures, however, is often low or negative, even excluding consideration of co-benefits (OECD, 2005).

A recent study submitted by the United States Department of Transportation (2010) describes emissions reductions up to 2050 that can be achieved by the following range of measures: introducing low-carbon fuels; increasing vehicle fuel economy; improving transportation system efficiency; reducing carbon-intensive travel activity; aligning transportation planning and investments to achieve GHG reduction objectives; and pricing carbon. Another multi-stakeholder study, “The Moving Cooler” study (Cambridge Systematics, 2009), estimates the potential effectiveness of strategies to reduce GHG emissions, including by reducing the amount of vehicle travel that occurs; by inducing people to use less fuel-intensive means of transportation (e.g., walking, bicycling, riding in a bus or train, or carpooling); and by reducing the amount of fuel consumed during travel through transportation system improvements. It concludes that emission reductions of 4-24% below BAU can be achieved, depending on the type of measures taken to advance the proposed strategies.

Most of the studies related to mitigation in the transport sector continue to focus on developed countries. The bulk of the analysis is related to mass transit and urban transport. An additional effort is needed regarding freight logistics, which is believed to be a major source of GHG emissions (IEA, 2009b). Limited awareness of the importance of freight emissions, combined with a lack of basic and reliable data, has been a major hurdle in the development of abatement scenarios, especially in the developing countries.

Recently, there has been an increase in the number of studies that assess in more depth the mitigation potential of (especially) the passenger transport sector in developing countries. Most of these recent studies include activities that fit in with the “shift” and “improve” components of the ASI approach:

- The Indonesian Technology Needs Assessment includes several emission scenarios developed from bottom-up data of vehicle quantities and mitigation options such as hybrids, fuel switch and modal shift (Republic of Indonesia, 2009). The Indonesian Sectoral Roadmap (Triastuti, 2010) projects 0.9 Mt CO_2-eq reduction from BAU from “avoid” strategies, 5.5

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[7] Several of the studies referenced in this section define technology in a manner that focuses on vehicle engine and fuel technology. It is important to acknowledge that technology also includes ICT and other forms of technology that help the overall transport sector function more efficiently and effectively.

Mt from "shift" strategies, and 4.8 Mt from "improve'" strategies over the period 2009-2030, with system abatement costs ranging between 18 and 25 \$/tCO_2 [8].

- A World Bank study conducted in support of the national climate plan in Mexico (Programa Especial de Cambio Climático 2008-2012, PECC) includes a transport cost curve for Mexico that covers, among other policies, nine transport interventions (urban densification, bus rapid transit (BRT) system, non-motorized transport (NMT), bus system optimization, vehicle fuel efficiency standards, inspection and maintenance, border vehicle inspection, road freight logistics, and railway freight) (Johnson et al. 2009).
- In a study of East Asian countries, the World Bank (2010) estimates a potential emissions reduction of over 35% compared to the baseline for urban transport. This can be achieved by a combination of urban planning (7%), improved public transport (8%), transport demand management (7%) and fuel standards in line with the EU targets (14%).
- Analysis of emission reduction potential in the transport sector conducted by the World Bank in support of the CTF Investment Plan for the Philippines indicates that an annual emission reduction of 46 Mt can be achieved in 2030 compared to 2008, with 69% coming through fuel switching, 16% through improved vehicle efficiency and 14% through demand management (BRT–LRT). Nationwide, road transport GHG emissions in India can be reduced 19 percent against the dynamic BAU baseline by 2032 by improving public transport and light-duty-vehicle technology (World Bank, 2009b).

The relative lack of detailed studies in developing countries so far may be explained by a lack of resources, generally low data availability on the transport sector and generally low priority by the governments of developing countries towards GHG reduction as a goal in itself (Leather, 2009). More comprehensive policy analysis would have to include routine ex-ante and ex-post evaluations of the impact of policy interventions. This would require more detailed activity data and time series than are currently available in most developing countries, and the analysis would also need to include information on consumer behavior at the local level. Creating such data sets would require extensive investment of resources and significant capacity building, as well as an overhaul of transport data collection procedures and mechanisms.

In formulating mitigation options and policy measures, developing countries (as compared to developed countries) need to take into account several general characteristics of the transport sector, inter alia (Leather, 2009; Huizenga, 2009a):

- Rapid population growth and urbanization

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[8] A discount rate of 12% is used; however, the method of abatement calculation is unclear.

- A lower, but rapidly increasing, level of vehicle ownership
- Older vehicles and lower vehicle emission standards
- Higher population density
- Poor-quality fuels
- A higher, but often declining, share of non-motorized and public transport in overall distance travelled
- Growing dependency on road transport for freight logistics
- A higher share of motorized two- and three-wheelers in the vehicle fleet
- Higher urban air pollution levels, congestion and road accidents
- Poor transport data
- Lower spatial planning capacity

Leather (2009) notes the potential for developing countries to leap-frog to integrated cleaner transport systems, rather than follow the same unsustainable path that developed countries have taken. The more intense the transport problems that developing countries face, the more likely it is that the current situation may provide an opportunity to move more quickly to a sustainable transport future.

2.3 Incremental cost of mitigation options

Incremental cost is a central concept in several studies on climate mitigation.[9] In order to understand the concept of incremental cost better, this section gives some methodological background related to baselines and assessment of cost-effectiveness of mitigation options.

A key question in determining the incremental cost of mitigation is how, exactly, to define the term "mitigation." Reduction of emissions in the future implies one or more reference or baseline scenarios against which the GHG abatement is achieved. In most transport sector studies to date, future emission trajectories have been based on historical trends and a correlation between estimated economic growth and transport demand or projected vehicle stock. Future modal shares, fuel choices, technology distribution and emission rates are frequently calculated based on historical trends in modal shares, projected vehicle sales and assumptions such as fuel prices, fuel efficiency improvements and elasticities (see, e.g., IEA/OECD, 2009). For detailed studies on a national level, all planned transport policies are taken into account as well. On a (sub)sectoral level[10], all emission reductions below the baseline projection would

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[9] Incremental cost is a key concept in CDM, GEF as well as in proposals for NAMAs.

[10] On the level of single investments (not included in existing policies), it will not be possible to assess with certainty whether this goes beyond BAU.

be called mitigation. This is generally how national mitigation policies in the transport sector are being designed and studied.

This baseline approach for the transport sector is different from that of, for example, the electricity sector, for which economic optimization models are used to determine what electricity mix will fulfill the demand in the most cost-effective manner. This is because the electricity sector is very responsive to economic incentives, while non-economic considerations such as comfort or status are hardly an issue. For transport, such an approach would be very difficult to carry out, as it would require that all considerations by consumers be translated into economic parameters. Therefore, for the transport sector, the baseline approach based on historical trends is considered to be a pragmatic solution.

Incremental cost (or abatement costs) represents the additional costs of reducing GHG emissions against the baseline scenario (UNEP, 1999). Cost-effectiveness refers to the incremental cost relative to a policy objective—e.g., GHG emission reduction, which can be expressed in $ per ton of CO_2-eq reduced and is often used to identify the least expensive way to achieve a policy objective. Anable (2008) notes, however, that cost-effectiveness is of limited value as an indicator to compare transport policies, as carbon reduction usually is not the main policy objective—i.e., transport interventions can be justified based on other considerations, such as reducing congestion or improving air quality.

Costs of abatement options can be calculated from different perspectives, as shown in Table 2. In most incremental (or abatement) cost analysis, the economic perspective is used.

In theory, each of these approaches should also take into account costs related to the loss of welfare due to enforced choices[11]. The current reality shows that mobility based on private vehicles is preferred by many, even though public or non-motorized transport is cheaper, which could be explained by non-economic factors such as comfort or status. If road space is allocated in favor of a BRT, this may imply a loss of welfare for car drivers, which could be taken into account under a ''welfare-economic'' analysis. However, these welfare effects are highly context-dependent and difficult to quantify (Davidson et al., 2007), and this is rarely done in mitigation studies, be it for transport or for other sectors. Instead, mention is made of other (i.e., non-economic) barriers.

Most transport abatement cost studies so far have used the economic or private approach (McKinsey, 2009; Kahn Ribeiro et al., 2007, IEA/OECD, 2009b) or a combination of the two. In some cases, only the investment costs are considered (Wright and Fulton, 2005). In the transport sector, the end-user and investor are key actors in the success of a measure, and therefore it can make sense to include taxes and subsidies. It is important to state explicitly the

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[11] This applies in cases where, without the measure, people would have done something else, e.g. driven more; not being able to do something that you would have preferred to do constitutes a loss of welfare (Davidson et al., 2007)

assumptions and perspective, as the taxes and subsidies greatly influence the abatement costs. This is not always clear in mitigation studies.

Table 2: Abatement cost perspectives

Perspective	Approach	Example for BRT
Economic (National)	Looks at costs from a national perspective. Policy implementation costs are considered but taxes and subsidies are not. Discount rate is set at a social level.	Costs for capital investment, implementation and operation are countered by a reduction in costs both for vehicles (fuel) as well as for users who make the shift from private vehicles (both excluding taxes). Abatement costs are usually low or negative, the latter implying that the measure yields net benefits to society. A relatively low discount rate would be used.
Financial (Private investor/ end user)	The discount rate is set at a level applicable to investment decisions common to the private sector. Taxes and subsidies for the specific investment or operations are included.	For the private investor in infrastructure and operations of transportation systems, the outcome will depend on the extent to which the investment can be recovered from passenger fares, revenues from marketing or commercial facilities in stations and public subsidies. In practice, the investment will be made only if the abatement costs for the investor are negligible or negative (generate benefits).
Social (National)	Frequently considers economic costs (as described above) and social externalities.	The abatement costs would be lower than in the economic perspective due to consideration of co-benefits.

In social cost calculations, full accounting for externalities is a complex issue. Mitigation options may have positive impacts on public health, energy supply security, biodiversity and traffic congestion, but uncertainties in these cases are often important (e.g., monetization of the value of life). The United Nations Environmental Program (UNEP, 1999) provides a reference for social cost calculations in which they present a basic framework for assessing impacts of mitigation measures that are not easy to express in monetary terms. In this case, the following aspects should be considered:

- *Employment*. If a project creates a job, a benefit to society accrues that is equal to the social cost of unemployment.
- *Income distribution and poverty*. Different income groups are affected (positively or negatively) by the mitigation action.
- *Environmental impacts*. These include air quality, biodiversity and sustainability.

In most mitigation studies, however, these types of impacts generally are not considered when determining the mitigation alternatives' abatement cost. As previously discussed, this is due to the high uncertainty of the input as well as to the general interest in producing results that are comparable to other studies.

Implementation costs are those in addition to capital and operating costs and could include costs related to awareness-raising campaigns or policies to overcome information gaps (UNEP, 1999). Implementation costs can be divided into administrative costs (such as costs for planning, training and monitoring) and barrier-removal costs (such as capacity building, enhancing market transactions and enforcing regulatory policies). Figure 2 in Section 2.4 provides an example of a social cost calculation where health benefits are included.

The methodological choices mentioned above are important for transport options, but to a different extent:

- Measures that support the "avoid" and "shift" aspects of ASI often have low or negative costs from an economic perspective due to the large energy savings and the use of a "social"[12] discount rate. These measures generate even lower costs for the end user due to the tax savings (of lower fuel use) and for society due to the co-benefits. It should be noted, however, that these negative cost options in MAC are a result of the two different approaches used to calculate the baseline and the mitigation options. Because the baseline scenario is not based on economic cost calculations but on historical trends related to private vehicle use, consumer preferences (including non-economic aspects) implicitly are taken into account. The mitigation costs, on the other hand, are fully based on an economic (rather than social) analysis where these welfare effects are disregarded; this can result in negative cost options, indicating that there might be other barriers preventing these options from being implemented.
- Measures that improve the GHG performance per person or per ton-km often have positive (and high) economic costs due to the high investments into new engine technology or the high costs of alternative fuels and the exclusion of tax benefits. They also generally have lower costs (often negative for energy efficiency options) from the end-user perspective compared to the economic perspective (though somewhat increased by the higher discount rate), and lower costs from the social perspective compared to the economic perspective.

2.4 Understanding the co-benefits of mitigation actions in transport

Transport policies and programs usually target several policy objectives, including improving mobility, reducing congestion, improving air quality, securing fuel supply and mitigating climate change. Benefits of sustainable

[12] Lower than the financial discount rate

transport policies and projects can be divided into the following categories (Leather, 2009):

- *Benefits.* The primary intentional goal of policies and projects, usually a reduction in transport operating costs or reduced traffic congestion.
- *Primary co-benefits.* Other benefits that directly result from transport policies or projects (e.g., GHG and air pollution reduction).
- *Secondary co-benefits.* Benefits that indirectly result from transport policies or projects (e.g., reduced health impact and costs from lower air pollution).

"The ASI approach will bring about different co-benefits, and these co-benefits may be different between developing and developed countries. Developing cities are dominated by large numbers of old, high-polluting vehicles and the policies focusing on 'improve' will have relatively high co-benefits. With many cities in developing countries yet to develop a strong planning capacity, planning instruments such as efficient mix of land use-transport-environment can bring about higher co-benefits compared to cities in developed countries. Similarly, in developing countries, regulatory and planning instruments targeting the freight sector can bring relatively large and immediate co-benefits compared to developed countries." (Leather, 2009)

Some specific studies show the large size of the co-benefits of sustainable transport projects and policies. For instance, at the program level, Woodcock et al. (2009) estimate the health effects of alternative urban land transport scenarios for London, United Kingdom and Delhi, India. The authors of that study noted that "reduction in carbon dioxide emissions through an increase in active travel and less use of motor vehicles had larger health benefits per million population (7,332 disability-adjusted life-years [DALYs] in London, and 12,516 in Delhi in one year) than from the increased use of lower-emission motor vehicles (160 DALYs in London and 1,696 in Delhi). However, the combination of active travel and lower-emission motor vehicles would give the largest benefits (7,439 DALYs in London, 12,995 in Delhi), notably from a reduction in the number of years of life lost from ischemic heart disease (10-19% in London, 11-25% in Delhi)." The authors conclude that "policies to increase the acceptability, appeal, and safety of active urban travel, and discourage travel in private motor vehicles, would provide larger health benefits than would policies that focus solely on lower-emission motor vehicles."

At the policy level, CTS Mexico (2009) shows that in the context of Mexico, sustainable transport national strategies bring large GHG pollution reduction potential and result in negative net social costs (i.e., net benefits) for society as a whole (Figure 2). The only intervention with a positive social cost is bus hybridization.

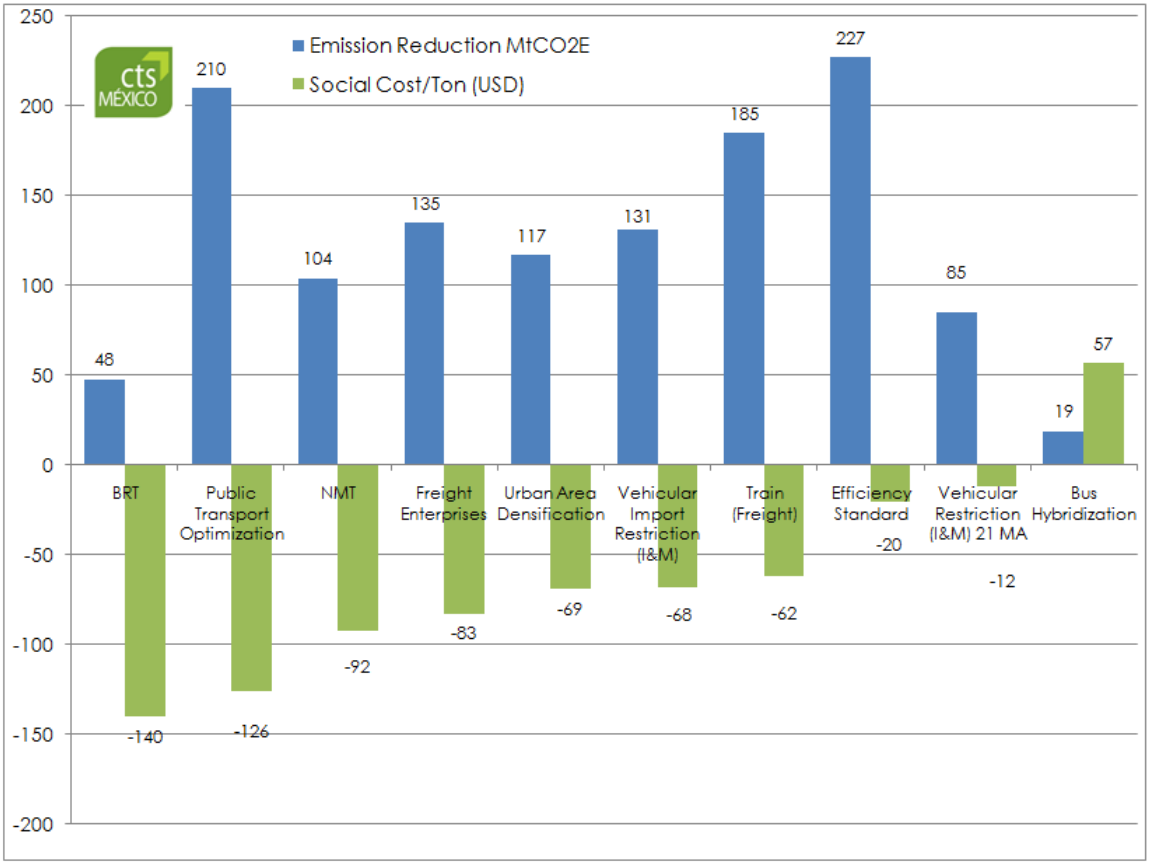

Fig. 2: Emission reduction potential and associated social costs (Johnson et al., 2009)

At the project level, Instituto Nacional de Ecología (INE, 2008) quantified the most important environmental and economic benefits of a BRT corridor in Mexico City (Metrobus), whose initial 20 km started operations in July 2005. Over a 10-year period, the authors estimate a reduction of 280,000 tons of CO_2 emissions and net benefits from health impacts, travel time savings and project costs of USD 12.3 million.

A special type of co-benefit could be linked to those emissions that contribute to climate change but are not included in the Kyoto gases, most notably black carbon and tropospheric ozone[13]. Unger et al. (2010) show that if black carbon and ozone are taken into account, transport would be the economic sector with the highest contribution to climate change until the year 2020. The impact can be direct (e.g., particulate matter and black carbon) or indirect (e.g., ozone formation from tailpipe emissions).

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[13] One important reason to address black carbon and ozone is that these have a much shorter lifespan than CO2 as warming agents. The long(er) term impact of aerosols is still uncertain.

Quantification of co-benefits remains challenging, and often subjective, with no widely accepted approach as yet. Even on the level of individual co-benefits (e.g., health benefits of improved air quality), different methodologies are being used, let alone for other areas such as improvement in energy security or reduced congestion. In addition to the methodological difficulties, lack of data is a barrier to co-benefit quantification. Leather (2009) has proposed an approach towards explicitly including transport-related co-benefits in policy evaluation based on sustainable development priorities of a country and ex-ante and ex-post assessment of benefits. The Japanese Ministry of Environment (2009) also developed an assessment framework and methodology including qualitative and quantitative indicators for co-benefits of GHG reduction measures that, if further developed and tested, may provide a useful framework. For transport measures, co-benefit indicators can include (amongst others) air pollution reduction, fossil fuel consumption reduction and economic indicators such as time saving.

2.5 Summary

GHG emissions from transport in developing countries are growing quickly and will need to be part of an effective climate change mitigation strategy. Developing countries are increasingly adopting economy-wide mitigation objectives. However, these objectives are still short of the goal of a 15-30% reduction in GHG emissions below BAU for non-Annex I countries by 2020 (Duscha et al., 2010). Very few developing countries have detailed, quantified GHG emission reduction strategies in place for the transport sector. The trend towards more comprehensive emission reduction strategies that better reflect the ASI approach make it more likely that the transport sector will be able to generate a 15-30% reduction in GHG emissions compared to BAU by 2020. The chances for this will increase further if the co-benefits of GHG emission reduction strategies are acknowledged more explicitly. There is substantial uncertainty with regard to abatement costs in the transport sector due to differences in methodological choices and uncertainty about future energy prices and consumer behavior.

3 Applicability of existing climate instruments to the transport sector and relevance of MDB financing

In discussing future climate instruments in the post-2012 period, it is important to assess how existing climate instruments and other external financial assistance have impacted GHG emissions in the transport sector. To do so, this report looks at CDM, which allows UNFCCC Annex I countries to offset their emissions through purchasing Certified Emission Reductions (CERs) from activities implemented in non-Annex I countries. It also looks at the impact the Global Environment Facility (GEF) has had on transport, and it discusses the Climate Investment Funds (CIF) that were established by the World Bank in cooperation with other MDBs to fill an immediate financing gap while further details of the future climate regime were being worked out. Finally, it assesses transport lending of MDBs for its relevance in terms of climate change mitigation.

3.1 Climate instruments

3.1.1 Clean Development Mechanism - CDM

To date, the transport sector has played a very limited role in the CDM. As of July 2010, 30 out of 5,312 projects in the pipeline were related to transport (including biofuels) (UNEP/Risø, 2010). Of these 30 projects, only 3 were registered. The pipeline[14] includes all projects and PoAs that either are under validation by an operational entity, have been validated, are registered by the CDM Executive Board (EB), or are requesting registration. Together, the 30 transport projects are expected to reduce 3.15 MtCO_2-eq/yr up to 2012, or 0.4% of the total reductions of the current pipeline. Table 3 shows the transport projects broken down by approved methodology.

Table 3: Transport projects in the CDM pipeline, July 2010.

Transport sub-type		Methodology	No of projects	Emission reduction (ktCO2/yr)
Biodiesel from waste oil		AM47 / ACM17	1	226
Biodiesel for transport		AMS-III.T. / ACM17	5	495
Bus rapid transit		AM31 / ACM16	11	1,467
Cable cars		AMS-III.U.	1	17
Metro: efficient operation		AMS-III.C.	1	16

[14] The pipeline includes projects for which a review has been requested or is underway, and those for which corrections were requested.

Mode shift: road to rail	Freight and passenger	AMS-III.C. / ACM16	3	688
Rail: regenerative braking		AMS-III.C.	3	112
Motorbikes	Electric bikes	AMS-III.C.	4	130
Scrapping old vehicles		AMS-III.C.	1	3
Total			**30**	**3,153**

Source: UNEP/Risø (2010); A(C)M: approved (consolidated) methodology; AMS: approved small-scale methodology

Compared to its share in global GHG emissions, the transport sector is highly underrepresented in the CDM. A first explanation lies in the fact that across the globe, transport sector emissions are considered difficult to abate, and most countries first look at "low-hanging fruit" in other sectors in order to meet climate objectives (Barrias et al., 2005). The low share of transport projects in CDM can also be explained by the following barriers (adapted from Leather 2009; Millard-Ball and Ortolano, 2010):

- The difficulty in determining additionality, due to fact that mitigation actions in the transport sector can be implemented for a multitude of reasons, and the small share of CER revenues in the total project cost.
- Difficulty in establishing the baseline scenario, due to the fact that a multitude of scenarios are plausible.
- Complexity in designing methodologies and modeling tools appropriate for the CDM, including rebound effects.[15]
- Lack of data required to apply the methodologies.
- High project preparation and monitoring costs.
- Emissions from individual sources are relatively small and dispersed, making monitoring difficult and costly.
- Lack of uniformity in Methodology Panel[16] recommendations.
- Difficulty in determining life-cycle emissions (specifically for biofuels).

These barriers can help explain the fact that few methodologies have been approved in the transport sector since 2003, when the first CDM methodology was approved, although a slightly larger number have been proposed in recent years (Millard-Ball and Ortolano, 2010). In addition, experience has shown that

[15] Rebound effect is "increase in travel demand resulting from reductions in cost (additional capacity, increased efficiency, etc.)" or something similar. http://www.economics.uci.edu/docs/2005-06/Small-03.pdf

[16] A panel established by the CDM Executive Board to develop recommendations on: i) guidelines for methodologies for baselines and monitoring plans; and ii) to prepare recommendations on submitted proposals for new baseline and monitoring methodologies.

applicability of approved methodologies has been difficult—for example, for BRT projects using AM31 (which was approved in 2006) and for producing biodiesel from waste fats using AM47 (which was approved in 2007). In late 2009, these methodologies were consolidated into ACM16 and ACM17, which were being used by three and four projects, respectively, as of July 2010.

The recent increase in submitted methodologies can be seen as a sign that there is scope for more transport projects in the CDM. However, the CDM in general is now being criticized for including projects that would have happened anyway (i.e., non-additional projects) (Bakker et al., 2010), and transport projects are among those having problems demonstrating additionality (Millard-Ball and Ortolano, 2010).

Olsen and Fenhann (2008) have reviewed the sustainable development criteria and processes for approval of CDM projects used by Designated National Authorities in various countries. They conclude that a trade-off exists between achieving sustainable development in host countries and assisting Annex I countries in achieving their emission reduction targets in a cost-efficient manner. If left to market forces, the balance of the trade-off would be in favor of cost-efficient emission reductions, and Olsen and Fenhann conclude that the CDM does not significantly contribute to sustainable development[17]. They proposed a taxonomy for better assessment of sustainable development benefits from CDM projects that includes economic, social, environmental and other benefits. Other studies and reports that address methodological issues on the assessment of sustainable development benefits of CDM projects emphasize the sustainable development orientation of CDM, though they acknowledge that the co-benefits generated through CDM projects generally are not well documented and do not play a major role in the approval or rejection of CDM projects (Sutter 2003; Schneider 2007; Sterk et al. 2010).

3.1.2 Global Environment Facility

In 2000, the GEF Council approved Operational Program #11 (OP 11– "Promoting Environmentally Sustainable Transport"), a program aimed at enhancing efforts in the transport sector. As of mid-2010, the GEF had funded 37 transportation projects in more than 73 cities worldwide. Initially, GEF support to the transport sector focused on technological solutions. However, more recently (GEF 4, 2006-10) GEF support has emphasized "non-technology" options, such as planning, modal shift to low-GHG-intensive transport modes and promotion of better-managed public transit systems. The strategic program on "sustainable innovative systems for urban transport" prioritized countries with rapidly growing small and medium-sized cities that have proposed urban planning, public transport investments (particularly BRT), transport demand management (TDM) and national policy development (GEF, 2009a). Very limited

[17] The contribution of projects to sustainable development is assessed by host country governments. However, cases where projects have been rejected based on this assessment are rare.

attention has been given to freight logistics, partly because of the urban focus of GEF transport operations and partly because of a general underrepresentation of freight logistics in climate change mitigation efforts in the transport sector.

During GEF 2-4, the GEF allocated approximately $201 million to sustainable urban transport projects, with an average of $5.4 million per project. This funding was supplemented by more than $2.47 billion in co-financing[18]. This co-financing ratio of 1 to 12.3 is the highest in all GEF programs, as it often requires large-scale investments to develop infrastructures. Figure 3 shows that the portfolio is quite diverse, with substantial support for BRT, vehicles (alternative fuels and engines) and NMT. Significant support was also given to capacity building, planning, awareness raising and policymaking (included in the "Other" category).

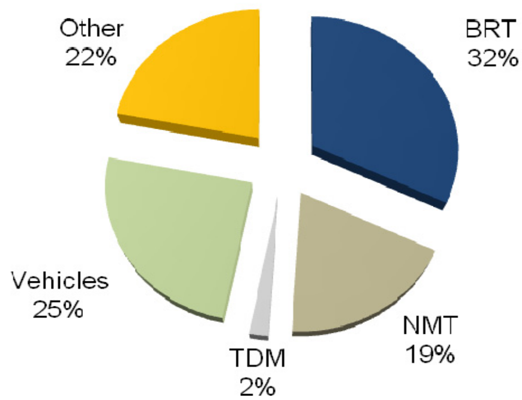

Figure 3: GEF transport funds breakdown
(Replogle and Hook, 2010)

The GEF is developing a methodology to estimate ex-ante GHG emission reduction from transport investments, which is to be used for projects starting in GEF 5. Under GEF 1-4, projects were free to decide what methodology to use to determine GHG reductions resulting from GEF-supported projects. The new methodology under development (GEF-STAP, 2010) is expected to focus on assessing the ex-ante GHG emissions reductions from activities that improve the efficiency of transportation vehicles and fuels, improve public and non-motorized transportation modes, improve transportation system pricing and management, and enhance driver performance, along with comprehensive approaches that combine such strategies into integrated implementation packages. For each of these types of interventions, a spreadsheet model and guidelines are being developed. In addition to estimating GHG savings, the methodology also seeks to estimate possible co-benefits.

[18] Co-financing as recorded by GEF is based on voluntary reporting, which is not subject to validation.

In line with the overall GEF approach to assessing GHG emissions, the new methodology accounts for three types of GHG emission reductions, each with its own character and degree of uncertainty:

1) Direct—i.e., as a result of the GEF-funded demonstration project. It is recommended that local data be used as much as possible. If local data are not available, observed impacts elsewhere and default emission factors can be used, examples of which are given in the methodologies.

2) Direct post-project—i.e., by investment supported by mechanisms that continue operating after the project has ended (e.g., revolving funds). This is based on the direct impacts multiplied by a "turn-over factor."

3) Indirect impacts—i.e., the replication potential of the project, based on a realistic estimation of the market potential (bottom-up or top-down). In this case it is assumed that the demonstration project has lowered barriers for or catalyzed similar projects. As the GEF has only a limited impact on the replication of a project, a "causality factor" is applied to determine the market or replication potential.

The objective of transport under GEF 5 (2010-2014) is: "Promote energy-efficient, low-carbon transport and urban systems" (GEF, 2010b). The movement towards a more comprehensive approach to reducing emissions from transportation initiated under GEF 4 will continue throughout GEF 5, with support for measures that promote energy efficient, low-carbon transportation systems, including support for public transit systems, improving the energy efficiency of the fleet, transport demand management and non-motorized transport. Support provided will broaden to include land use and transport planning options that lead to low-carbon-intensive transportation systems to reflect the importance of rapid urbanization as a key driver of future growth of GHG emissions in developing countries. This increased emphasis on urban systems reflects the "avoid" part of the ASI approach. An amount of $250 million has been allocated to transportation under GEF 5.

3.1.3 Climate Investment Fund / Clean Technology Fund

Under the CIF, two strategic funds were set up: the Clean Technology Fund (CTF) and the Strategic Climate Fund (SCF). The CTF is designed to fill an immediate financing gap—i.e., until an agreement on the post-2012 climate regime is worked out—and aims to provide scaled-up financing for "transformational actions" that contribute to demonstration, deployment and transfer of low-carbon technologies with significant potential for long-term GHG emissions reductions.

The CTF utilizes a range of concessional financing instruments, such as grants and concessional loans, along with risk-mitigation instruments, such as guarantees and equity investment. For the transport sector, measures that the CTF supports may include:

- Modal shift to low-carbon public transportation in major metropolitan areas, with a substantial change in the number of passenger trips by public transport.
- Modal shift to low-carbon freight transport, with a substantial shift in tonnage of freight moved by rail transport as opposed to road transport.
- Improvement of fuel economy standards and fuel switching.
- Deployment of electric and hybrid (including plug-in) vehicles.

As of March 2010, 12 country investment plans had been approved by the CTF. Transport is included in seven of the plans, all in the realm of public transport, particularly BRT (see Table 4). The total required investment for these measures was estimated to be $9.3 billion. The CTF funding for the transport measures adds up to $600 million, and the estimated annual emission reduction is about 10 $MtCO_2$ per annum (CTF, 2010).

The CTF investment plans are approved by the CTF Trust Fund Committee without their first having been submitted to an external expert panel for validation of the emission reductions. In its assessment, the Trust Fund Committee takes into account the potential "transformational" impacts of the

Table 4: Transport components under the Clean Technology Fund, March 2010

Country	Total investment cost transport component [million $]	Total size CTF allocation [million $]	CTF allocation to transport components [million $]	Transport components	Emission reductions from transport component [$MtCO_2$-eq/yr]
Egypt	865	300	100	BRT; light rail transit and rail links; clean technology bus	1.5
Morocco	800	150	30	BRT; tramway; light rail	0.54
Mexico	2,400	500	200	Modal shift to low-carbon alternatives (BRT); promotion of low-carbon bus technology; capacity building	2.0
Thailand	1,267	300	70	BRT corridors	1.16
Philippines	350	250	50	BRT Manila – Cebu; institutional development	0.6 – 0.8

Viet Nam	1,150	250	50	Enhancement urban rail	1.3
Colombia	2,425	150	100	Implementation of integrated public transit systems; scrapping of old buses; introduction of low-carbon bus technologies in the transit systems	2.8
Total	**9,257**	**1900**	**600**		**9.9-10.1**

Source: authors, based on country investment plans, available at http://www.climateinvestmentfunds.org

proposed actions and criteria such as GHG reduction potential, demonstration and scaling-up potential, development impact and additionality of CTF funding (CTF, 2009a). Of specific importance is the potential contribution of the project to the transformation of the sector and the related demonstration and scaling-up potential. The specific methodological guidelines on how to calculate the GHG reduction potential are outlined in CTF (2009b). An important difference with the GEF is that this methodology is not applied at the time of the initial approval of the investment program but is instead applied at the time of detailed project design[19]. Project developers are free to decide which specific methodology they use to assess the GHG emissions avoided by the project at the time of the initial approval of the country investment program. CTF is planning to use a three-tiered approach to assess impacts of investments (CTF, 2009b):

- Tier One: Transformational impacts of the CTF. This tier consists of indicators that demonstrate the extent to which CTF co-financing catalyzes lasting changes in the structure or functioning of sub-sectors, sectors or markets.
- Tier Two: Country outcomes indicators. This tier consists of indicators that measure aggregate country outcomes and global trends relevant to the CTF's objectives and cover such indicators as change in fuel mix, energy intensity in GDP and the extent to which donor contributions to the CTF are new and additional.
- Tier Three: CTF's contributions to country outcomes. This tier consists of indicators covering the CTF's contributions to country outcome indicators at three different levels:

[19] Since none of the transport components has reached the phase of review of detailed design by the Trust Fund Committee, no experience exists with the application of the CTF GHG assessment methodology.

1) Country. The preparation of country CTF Investment Plans will be monitored to measure progress in providing support for climate actions in country-led development processes.
2) Portfolio performance. These consist of five indicators to measure the MDBs' portfolio quality and organizational efficiency.
3) Project outputs. These measure the CTF's effectiveness in achieving its objective of scaling up low-carbon technologies—e.g., in terms of GWh renewable energy or energy savings, as well as leveraged financial resources.

3.1.4 Impact of climate instruments

The impact of climate instruments in emissions reductions is currently very limited (Table 5), amounting to approximately 16 $MtCO_2$-eq/yr, as compared to total transport emissions in developing countries of approximately 3,100 $MtCO_2$-eq/yr in 2005 (IEA/OECD, 2009b). Therefore, current climate mechanisms can only be expected to play a limited role in achieving a desired 15-30% reduction from baseline for all GHG emissions by 2020. The overall funding of $1.5 billion that has been made available is limited as well, considering the size of the transport sector.

Table 5: Overview of transport projects in existing climate instruments

	Year of 1st project	No. of projects	Funding [$ million]	Reported/expected emission reductions [$MtCO_2$-eq/yr]
CDM	2006	30 (3) [a]	672 (CERs) (63) [b]	3.1 (0.3)
GEF1-4	2006	37	201 (grants)	3.2[c]
CTF	2009	7	600 (loans)	10[d]

[a] in pipeline: registered, requesting registration and at validation; total CERs realized will most likely be lower than the number indicated; brackets show values for registered projects

[b] expected total undiscounted revenues at 10 $/CER, 3x7 years crediting, excluding transaction cost

[c] direct impact, annual emission reductions calculated based on assumed lifetime of 10 years

[d] annual emission reductions calculated based on assumed lifetime of 10-20 years, depending on type of investment

The relatively limited impact of these instruments in the transport sector is due to a combination of the following factors:

- The size of overall funding and funding allocated to the transport sector, both of which simply are too small to create transformational change in the transport sector (in the case of GEF and CTF); and

- Competition for funding between sectors, in which the transport sector has not been able to become one of the winners due to methodological requirements for GHG emissions reductions assessments (in the case of CDM) and the perceived costs and complexity of reducing transport GHG emissions.

3.2 Multilateral development banks

The World Bank has provided more than $30 billion ($2-5 billion/yr) in project lending to the transport sector in the past decade, or over 15 percent of its total lending commitments. The average project size was $150 million in 2005. Three-quarters of this has gone to roads, as shown in Figure 4.

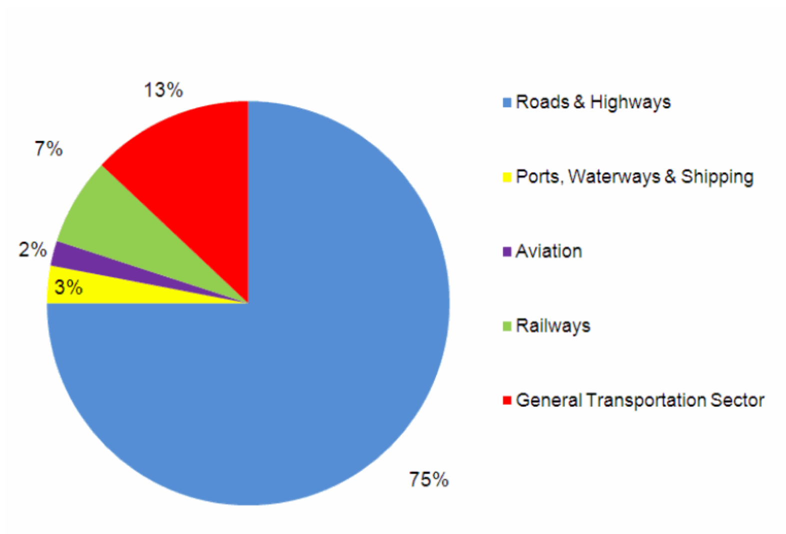

Figure 4: World Bank transport project lending breakdown in 2007 (World Bank, 2009a)

The IDB in 2008 provided $2.2 billion of lending to the transport sector, of which 87% was for roads (Targa, 2009). Within the roads sector, the emphasis initially was on the development and maintenance of primary roads. Recently, this has started to shift towards the development and maintenance of secondary and tertiary networks. In urban transport (18% of total transport lending between 2000 and 2010), a large part of IDB's experience has been with support for the establishment and expansion of BRT and metro systems. As part of its future action on climate change, the IDB (IDB, 2010) will support sustainable transport projects that reduce or avoid travel needs through measures such as better integration of land use and transport policies, transport demand management, regulations, information and technology. This includes projects that promote a shift from private vehicles to mass transit systems (BRT or rail) and/or to non-motorized transport (footpath and bike networks, bicycle taxis, etc.). Improvements in transport efficiency through application of fuel economy standards, new technologies, better practices on the part of private transport operators and capacity building will also be supported. The IDB is now developing a Regional Environmentally Sustainable Transport Action Plan

(REST) aimed at implementing a sustainable pathway for transport (both urban and freight) in the Latin American and Caribbean Region that limits GHG emissions from this sector and minimizes other negative externalities while fostering economic growth and social inclusion (Huizenga, 2009b).

Transport lending in the ADB in the period 2004-2008 was, on average, $2.19 billion per year, of which 81% was for roads and highways. It is expected that transport lending will increase to $5.89 billion per year in the period 2009-2011 (Duncan, 2009). The ADB Sustainable Transport Initiative (STI), which was approved in July 2010, includes climate change as one of its four main pillars, the others being urban transport, cross-border transport and logistics, and road safety and social sustainability (ADB, 2010). As indicated in Figure 5, a major shift away from road infrastructure investments and towards rail and urban transport is foreseen. The ADB STI specifically acknowledges the ASI approach as the basis for future support to climate change mitigation in the transport sector.

A recent Stockholm Environment Institute working paper reports that four major bilateral and multilateral development organizations (Agence Française de Développement, the German Development Bank, the Japan International Cooperation Agency and the European Investment Bank) in 2008 channeled € 7.345 billion in climate change mitigation relevant financing (both official development assistance and non-ODA), of which 32% was for mitigation in the transport sector (Atteridge, 2009).

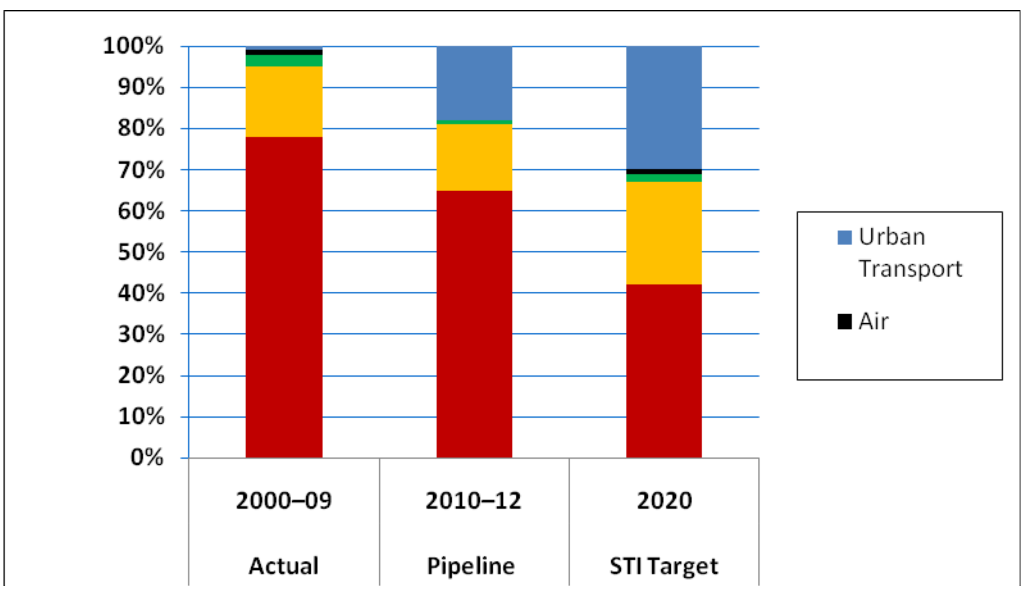

Figure 5: Subsector shares of ADB transport lending (ADB, 2010)

In a 2007 evaluation, the World Bank's Independent Evaluation Group (IEG) recommended that the bank reconsider its priorities and try, wherever possible, to make a difference by demonstrating new approaches in transport, including multimodal freight projects and sustainable urban transport. Barriers, however, include lengthy preparation time, the lack of support and incentives for staff to get involved in more intricate projects, and the World Bank's current restrictions on sub-sovereign lending directly to cities, which limits support to local governments. In an update of its strategy (Mitric, 2008), the World Bank indicates a shift in funding away from a focus on private vehicles and towards people-oriented and sustainable modes of urban transport. The World Bank strategy recommends placing increased emphasis on policy and institutional reform. Strategic building blocks for urban transport policies include:

- Allocation of road space among transport modes
- Time and price measures to manage the use of urban roads
- Ownership and regulation of public transport services
- Roles of public and private sectors in investments and operations
- Service-price policies for public transport services
- Transport expenditure policies of city governments
- Transport system funding and finance
- Land development policies

Several of the MDBs are currently developing a framework to measure carbon emissions of their investments in the transport sector. The ADB framework (Singru, 2010[20]) proposes a basket of three indicators:

- Output indicator—CO_2 intensity per km of infrastructure constructed
- Mobility indicators—CO_2 intensity per ton-km (freight) and per passenger-km
- Investment indicator—CO_2 intensity per $ million spent on transport projects

3.3 Summary

Climate instruments and MDBs have so far mobilized limited funding for sustainable, low-carbon transport in developing countries. In addition, the transport sector has experienced difficulties in accessing these funds, especially funds related to climate instruments. However, external assistance through GEF, CTF and (especially) MDBs is increasing. The majority of GEF and CTF funding so far has been programmed as co-financing for MDB projects. The growing importance of climate change mitigation in transport among MDBs is expected to result in additional funding, which initially will be directed largely towards urban transport (see, e.g., ADB, 2010). All major MDBs have expressed support for the ASI approach. Such an increased MDB engagement in climate action in transport could also improve participation of the transport sector in climate instruments because of MDBs' growing support for knowledge management and

[20] See http://www.adb.org/Documents/Evaluation/Knowledge-Briefs/REG/EKB-REG-2010-16.pdf

institutional development activities that serve to lower barriers to transport involvement.

Progress is being made on the development of methodologies to assess GHG reductions resulting from external assistance. All the transport methodologies have a common conceptual basis: the ASIF framework, which integrates total transport activity (A), modal split (S), modal energy intensity (I) and fuel type (F) (Schipper et al. 2000). There are differences, however, in the structure of the methodologies. It is important to note that local investments in transport in developing countries, which are by far the largest of all investments, are not submitted to any form of GHG impact assessment. Although all climate instruments, as well as MDB programs and projects, claim to be operating within the context of sustainable development, GHG methodologies that are being developed generally do not call for detailed, quantified assessments of co-benefits (see Table 6).

Table 6: Overview of funding streams for sustainable, low-carbon transport and requirements for assessments of GHG emission reduction and co-benefits[21]

	Size of funding	GHG emission reduction assessment requirements		Co-benefits assessment
National and local funds	Very large (*trillions of $*)	-	No GHG assessment requirements in place	Varies per country, generally low
Development bank funding	Large *(billions of $)*	*	Methodologies under development, not applied yet	Environmental/social externalities not included
CDM	Small (millions of $)	*****	Very strict, at entry and during project	Depends on country
GEF	Small (millions of $)	**	New methodology for 2011, only at project entry	New methodology recognizes but does not reward
CIF/CTF	Small (millions of $)	**	Emphasis is on sector transformation, detailed GHG assessment, not at project entry	Qualitative assessment

Under the current rules, it appears that the CDM is not likely to play a major role in a shift to sustainable transport systems—although, as we show in Chapter 4, the Program of Activities modality may result in some opportunities. Other financial mechanisms have put a larger share of their resources in the transport sector, both for lending and grants, but those investments have focused mainly on road infrastructure. Since the turn of the 21st century, there has been

[21] This excludes foreign direct investment in transport.

a tendency to look at transport more holistically and to invest more in modal shift. Capacity building and policy support are key areas where support is needed, even though the impact on emissions is difficult to quantify.

4 Instruments under development

The negotiations on a new, post-2012 climate regime started with the establishment of the Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol (AWG-KP) and the "dialogue on long-term cooperative action to address climate change by enhancing implementation of the Convention" at the Montreal climate conference in 2005. The Bali Action Plan[22] in 2007 transformed the "dialogue" into a second ad-hoc working group, the Ad Hoc Working Group on Long-term Cooperative Action under the Convention (AWG-LCA) (UNFCCC, 2007).

Negotiations are continuing in 2010 and 2011. It is expected that a mechanism supporting mitigation will be part of the new climate agreement. This is consistent with the Copenhagen Accord (UNFCCC, 2009a), which specifically includes provisions for NAMAs in developing countries and estimates financial support for mitigation of $10 billion per year up to 2012 and $100 billion per year by 2020.

These elements are also included in the AWG-LCA negotiation text of July 2010 (UNFCCC, 2010a). In addition, this text includes a section on a "Technology Mechanism" in the chapter on technology development and transfer. This mechanism would support activities such as technology transfer and deployment, capacity enhancement, technology innovation centers and national technology development plans. Finally, references are made to "low-emission development strategies" by developing countries, which could provide a framework for the way in which the sustainable development of a country could be implemented in a low-carbon fashion, or could also be seen as a vehicle to enable other instruments, such as the Technology Mechanism and NAMAs, to function. The Technology Mechanism and low-emission development strategies could play a role for the transport sector, as low-carbon technologies are crucial to achieving longer-term emission reductions, and the link between sustainable development and climate change mitigation is particularly strong in the transport sector. Discussions of these instruments in the climate negotiations, however, are at an early stage compared to discussions of NAMAs. This chapter therefore focuses on NAMAs and sectoral approaches, and the CDM post-2012. We analyze the current state of affairs in the negotiations and its potential relevance to the transport sector.

4.1 CDM post-2012

The discussions on the future of CDM and similar baseline-and-credit models are being conducted in the AWG-KP[23]. The carbon market currently is an important

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22 A comprehensive plan for international cooperation on climate mitigation that arose out of the 2007 U.N. Climate Change Conference in Bali and that calls for enhanced action in the areas of mitigation, adaptation and technology development.

23 See http://unfccc.int/kyoto_protocol/items/4577.php

source of financial flows and is expected to remain so. The European Commission estimates that by 2020, the international carbon market might provide up to €50 billion annually to support the implementation of climate change mitigation activities in developing countries (European Commission, 2009)[24].

4.1.1 Developments and trends

A number of themes and proposals have come up frequently in the discussion of CDM that are expected to contribute to shaping the future of CDM.[25] There is a desire among some groups, especially the developed countries, to increase the level of off-setting of emissions in developed countries through an expanded CDM. This could help realize more ambitious emission reduction targets in developed countries, as well as promote financial transfers to developing countries. Other groups, including some developing countries and NGOs, argue that the amount of emission reduction in developed countries to be achieved by off-setting of emissions (e.g., through CDM) should be limited. Their main argument is that this would help promote domestic action by developed countries. One suggestion is to limit off-setting achieved from projects in emerging economies (currently the main recipients of funding generated through CDM) and to prioritize off-setting achieved through projects implemented in least-developed countries.

Other frequently made proposals and suggestions include:

- Strengthen efficiency, predictability, consistency and transparency in the CDM management process. This could increase the volume of CDM projects.
- Improve regional distribution. Four countries currently account for more than 80% of all CERs from registered projects, with China alone accounting for 59%, followed by India (11%), Brazil (6.5%) and the Republic of Korea (4.6%).
- Increase differentiation among countries and project types to improve regional and sectoral balance. Suggestions include: 1) positive lists with respect to additionality; 2) negative lists (i.e., excluding countries or project types from the CDM); 3) preferential treatment in procedures and access to resources; 4) CER discounting, whereby one ton CO_2-eq reduced equals less than one CER; and 5) caps on CER issuance or allocation of CER demand to certain countries or sectors.
- Better recognition of environmental, social and economic co-benefits and the contribution to sustainable development. Currently, the appraisal of the contribution of CDM projects to sustainable development is done separately from the appraisal of its contribution to GHG emission

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[24] In 2008, transactions by the (primary) CDM recorded 389 MtCO2e in volume and $6,519 million in value (Capoor & Ambrosi, 2009)

[25] This section is based on Center for European Policy Studies (2009); Sanchez (2008); UNFCCC (2009a); UNFCCC (2009b); and UNFCCC (2009c)

reduction and is the responsibility of Designated National Authorities in the developing countries. There are no standardized methodologies for assessing contribution to sustainable development, and there is no regular reporting on the contribution of CDM projects to sustainable development, which is believed to be limited (Olsen and Fennhann, 2008). To enhance the environmental integrity, efficiency and regional distribution of the CDM, standardized baselines for specific project activity types and specific sectors or subsectors could be defined. Sectoral benchmarking in the CDM would establish a baseline that uses a pre-determined benchmark (e.g., for emissions per ton of production in the cement, power or steel industries) for a whole sector or sub-sector in a country or a region. This pre-determined benchmark would be regularly reviewed and adjusted to reflect technological improvements. Sectoral benchmarking in the CDM could improve the environmental integrity as well as predictability by simplifying additionality testing and by identifying the baseline scenario based on pre-determined, broadly applicable benchmarks that are below business-as-usual.

- Further facilitate the use of Program of Activities (PoA), also known as Programmatic CDM. A PoA is a voluntary action, coordinated by a private or public entity, that implements a policy/measure or stated goal (i.e., incentive schemes and voluntary programs) and results in measurable GHG emission reductions or avoidance that are additional to any that would have occurred in the absence of the PoA[26]. PoAs increase the possibility of registering a set of activities of the same type in a wide area under a single "programmatic" umbrella. The rationale behind this new modality is to enhance the efficiency of the operation process and increase its applicability as well as the volume of credits. It is also expected to facilitate access on the part of countries without a track record in the CDM by allowing the re-grouping of single projects that would otherwise be too small to be commercially attractive or viable.
- Discussions on a possible sectoral crediting mechanism (see Section 4.2)

4.1.2 Relevance for the transport sector

This section looks at how emerging developments, such as PoAs and standardized baselines, as well as other possible future changes being discussed in the AWG-KP, may affect the prospects for the transport sector in comparison to the current situation. For a more elaborate description of these changes, see Bakker et al. (2010), on which the assessment below is partly based.

Further strengthening of PoAs. Initially, only similar project activities using one baseline and monitoring methodology could be developed under a PoA. Later, the CDM Executive Board (EB) also allowed the use of multiple methodologies under a PoA. This development further enhanced opportunities, particularly for "mixed strategies" in which different kinds of activities of an

[26] Source: CDM Rule Book - http://cdmrulebook.org/pageID/452.

integrated sustainable transport strategy—e.g., those relating to fuels, vehicle technologies, public and non-motorized transport—are combined. This use of PoAs may improve conditions for transport to some extent and could reduce the uncertainty and transaction cost related to demonstrating additionality and application of the baseline methodology. The World Bank is currently developing a PoA in Cairo, Egypt that aims to reduce GHG emissions and air pollution associated with the aging fleet of taxis, microbuses, minibuses and buses through the scrapping and replacement of taxis in the Greater Cairo Region.[27] Another promising area for PoA could be freight and logistics, which generally has better data availability and quality because of its commercial nature and more-extensive private sector involvement. Data availability and quality, which have been constraining factors in transport CDM projects, can also be constraining factors in the case of a PoA approach, however.

Standardized baselines (SBLs). Baselines can be established based on a benchmark for a particular type of activity and geographical area. SBLs are often mentioned in the context of the industry or power sector, in which an emission benchmark can be expressed per unit of product. Performance benchmarks and emission intensity values are already used within the CDM (e.g., in the power sector). For the transport sector, standardized baselines may be applicable as well; however, to date there are no concrete proposals. Possible examples that have been mentioned include modal splits, occupancy rates and emissions per unit of travel (Bongardt et al., 2009; Transport Research Laboratory, 2010), particularly for specific vehicle fleets such as taxis, buses or rail systems. Eichhorst et al. (2010) conclude that travel demand and modal split may not be easily standardized, but that modal energy and carbon intensity could provide better opportunities[28]. If standardized baselines could be developed and applied successfully, this would significantly reduce the methodological and (possibly) the data-related problems that transport-CDM projects currently face. However, developing broadly applicable baselines is likely to be a challenge due to the considerable differences in transportation systems in different cities and countries. The increased upfront burden of necessary data collection costs to construct performance standards or define adequate default values for SBLs is not to be underestimated, even if transaction costs at the project level would be reduced in the long run.

Currently, the CDM methodology for mass rapid transit systems (ACM16) applies a common practice analysis for demonstrating additionality, which implies that if more than 50% of the large cities (i.e., those with a population >1 million) in a country already have a BRT, LRT or MRT, the proposed project will be considered "non-additional." This means that for Argentina, for example,

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[27] See: http://web.worldbank.org/external/projects/main?pagePK=64283627&piPK=64290415&theSitePK=40941&menuPK=228424&Projectid=P119483

[28] Section 5.1 gives a more elaborate discussion and case study

which has three large cities and two (old) rail systems already, the CDM can no longer promote such projects.

CER discounting. Discounting is the application of a reduction factor to the certified emission reduction achieved in a project—i.e., 1 ton of CO_2-eq reduced would result in less than 1 CER. CER discounting is sometimes mentioned in the context of N_2O and HFC-23 destruction projects, which are cheap and easy to implement, yielding large amounts of CERs. Other arguments mentioned in support of CER discounting are to create a mechanism with overall net atmospheric benefits rather than pure off-setting, or the possibility to differentiate according to the contribution to sustainable development or between countries. If the CERs from transport projects would be discounted less (or not at all) compared to projects in other sectors, the transport sector would improve its comparative position[29]. The key difficulty for CER discounting, however, is the political feasibility of establishing the discount factors.

Allocated demand. Credit buyers could be required to procure a certain portion of their demand for CERs from certain sectors. If this could be done for the transport sector, its opportunities would greatly improve, as it would stimulate development of transport-CDM projects; however, achieving the required supply of successful projects may still be a challenge. In addition, this is a politically difficult differentiation option, although it could be pursued unilaterally by buying countries.

Co-benefits. It has been argued that the contribution of the CDM to sustainable development in the host countries has been limited (Olsen and Fenhann, 2008). Under the current rules, only the host country may assess the sustainable development contribution, with no role for the validator or the CDM Executive Board (EB). To improve the sustainability profile of the CDM, one suggestion is to explicitly recognize sustainable development benefits by setting a threshold and then requiring evaluation by the validator and/or the EB. Because many transport projects have very strong co-benefits (e.g., for air quality, reduced congestion, energy security and social equality) (see, e.g., ADB and CAI-Asia, 2010; CCAP, 2010a; Nemet et al., 2010), the transport sector is likely to benefit from such an approach. However, the prerogative of developing countries to asses projects against their own sustainable development criteria would be undermined, something that may not be politically feasible. Another possibility would be to apply CER discounting to projects with no or few demonstrated co-benefits.

Positive list. Project types on a positive list are deemed automatically additional and thus exempted from additionality testing. Because demonstrating additionality is often very difficult for transport sector projects, this could improve their prospects. However, because the reason for this difficulty is that

[29] Under the current CDM rules, host countries can also reject projects based on their contribution to sustainable development and thereby prioritize the more sustainable projects; however, no evidence has been found that this happened to date.

many objectives other than climate change mitigation justify undertaking a particular activity, and because the CER contribution to overall profitability is relatively low, it is hard to imagine that many transport sector project types would be included in a positive list (Bongardt et al., 2009).

Sectoral CDM. Taking the CDM from the level of a project-based instrument to the level of programs (as is being done in PoAs) or sector policies could enhance the opportunities for transport, particularly through the possibility of scaling up efforts that are now taken on a case-by-case basis. Examples of eligible activities would be land-use planning, voluntary agreements for energy efficiency, a congestion charge, or eco-driving training. However the methodological complexities and uncertainties are not likely to be reduced (Wittneben et al., 2009). (See also the discussion on sectoral crediting mechanisms in Section 4.2.)

This section has shown that several possible changes to the CDM may improve conditions for the transport sector, particularly by simplifying methodologies, demonstrating additionality and reducing the data needs. In addition, a broader application of the existing approved methodologies may also have a beneficial impact on the transport sector. However, at the end of the day much depends on the total demand for CERs post-2012. Many developed countries see a limited role for the CDM, focusing mostly on the least-developed countries, with other instruments (see below) and domestic actions becoming more important for the more advanced developing countries (e.g., CEC, 2009). If the CDM market is indeed limited in size, it is not likely that it can play a significant role for the transport sector.

4.2 Sectoral crediting mechanisms

Discussions on a possible sectoral crediting mechanism (UNFCCC, 2008)[30] suggest crediting emissions reductions from a covered sector as a whole against a threshold below the BAU scenario. Thresholds represent country performance and can be expressed in absolute terms (e.g., GHG emissions in sector x) as well as in intensity terms (e.g., GHG emissions/ton of cement). Sectoral crediting, however, is different from CDM as credits would be issued to the respective developing country government, which would have to provide the incentives for emission reductions to take place.[31] Sectoral crediting based on no-lose targets[32] intends to encourage emissions reductions (orchestrated by the host country) in key emitting sectors in developing countries.

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[30] Besides sectoral crediting, sectoral targets are being discussed under the UNFCCC. The difference from crediting is that targets lead to the issuance of allowances ex-ante and imply compliance, while credits within a sectoral crediting mechanism are issued ex-post.

[31] Sectoral mechanisms could also be broken down to the installation level, though for transport they would probably need to be operated at the government level.

[32] No-lose targets: no penalty applies if the threshold is not met.

A technical merit of sectoral crediting is its circumvention of the additionality test on a project basis, and reduction of the methodological requirements for assessments for baselines and leakage. Sectoral crediting assesses the performance of a whole sector instead of individual activities, although monitoring will still need to be performed at an installation level (in case of industry) for aggregation into a sector level. If this approach can be developed, it has great potential for the transport sector; however, establishing full sectoral, bottom-up emission inventories or sectoral benchmarks is likely to be a challenge (Bongardt et al., 2009).

The suitability of a sectoral approach for the transport sector was reviewed by Bodansky (2007), Meckling and Chung (2009), and Schmidt et al. (2008), Most of them focus on the sector-wide measures related to fuel economy, ignoring possible demand-reduction-oriented mitigation strategies (Huizenga et al., 2010). Limited discussion has taken place on how measures aimed at reducing the need for travel or modal shift could be incorporated into a sector approach.[33] Also, there has been little discussion on transport sub-sectoral approaches such as freight, where some of the methodological concerns on baseline and project boundaries could be more easily overcome because of the more homogenous character of this sub-sector and better data collection practices.

Sectoral crediting has the potential to greatly increase the supply of credits. This may result, however, in a downward pressure on credit prices if the supply is not matched by demand from increased mitigation targets of developed countries. Together with the methodological complexities, the political feasibility of sectoral approaches is the main obstacle, as many developing countries perceive this approach as an indirect manner to impose some sort of emission commitments.

4.3 NAMAs

Paragraph 1(b)(ii) of the Bali Action Plan calls for “NAMAs by developing country Parties in the context of sustainable development, supported and enabled by technology, financing and capacity building, in a measurable, reportable and verifiable manner”. While the main role of developing countries in the Kyoto Protocol regarding mitigation is as host countries in the CDM, the adoption of the NAMA concept would introduce a new form of participation by developing countries in global climate governance. It is important to note, however, that NAMAs are different from Annex I country targets, as they will be met voluntarily by the developing country.

The Ad-Hoc Working Group on Long Term Cooperative Action (AWG-LCA) was tasked at the Conference of Parties (COP) 13 meeting in 2007 with developing proposals on, among other instruments, the NAMA concept. In the

[33] An exception being the studies on sectoral crediting carried out by Ecofys, see www.sectoral.com and Ellerman et al., (2010) and Wittneben et al. (2009).

latest AWG-LCA negotiation text (UNFCCC, 2010a) the topic of mitigation by developing countries is covered by NAMAs.

4.3.1 Review of NAMA Concept

The manner in which NAMAs are to be designed, reviewed, implemented and monitored remains largely unclear. Some of the key features of the NAMA concept are briefly discussed below, based mainly on UNFCCC (2009c; 2010a):

- *Sustainable development*. The Bali Action Plan is explicit that NAMAs will be implemented in the context of sustainable development. Yet, little discussion has been conducted on how this can best be accomplished. NAMAs are intended to be country driven and appropriate to the specific national context of the country where they are situated. This implies that there will be differences between countries in the detailed definition of similar types of NAMAs.
- *Definition of NAMA*. It is generally accepted so far that a NAMA can be a policy, a program or a project. Most of the NAMAs proposed to UNFCCC after COP 15 are described at the sectoral level, without any specification as to whether the NAMA will be implemented at the national or sub-national level (UNFCCC, 2010b). The general understanding so far is that NAMAs are not restricted to investment activities that directly reduce GHG emissions but can also include actions that will facilitate or enable the reduction of GHG emissions, such as capacity building or training. Policy-based supported NAMAs would have many similarities with programmatic approaches applied in development assistance by MDBs. International decisions on the structuring of NAMAs could therefore evaluate such already-existing experiences in support of the detailed modalities and procedures for NAMAs.
- Three possible types of NAMAs are generally distinguished: 1) unilateral NAMAs, which are implemented on a voluntary basis by developing countries without the expectation of external support, 2) supported NAMAs, which are to be supported and enabled by technology, financing and capacity building in a measurable, reportable and verifiable manner; and 3) credited NAMAs, of which the emissions reductions could become part of market mechanisms like the CDM (UNFCCC, 2009c; 2010a). There has been no substantial discussion on the GHG emission reductions to be accomplished by these three types of NAMAs, or on their relative contribution to emissions reductions. The absence of such a discussion hampers the development of detailed sectoral guidelines for NAMAs. In terms of discussion of guidelines, the limited international discussion that has taken place so far has focused mostly on supported NAMAs.
- Supported NAMAs would be registered in a NAMA registry, with unilateral NAMAs being reported through National Communications. The registration process would include the amount of emission reductions estimated to be accomplished through the NAMA, as well as

the external support provided to support the implementation of the NAMA. The Copenhagen Accord includes an Annex in which developing countries can inscribe their proposed NAMAs; as of June 2010, 36 countries had done so (UNFCCC, 2010b).

- A point of considerable debate in the AWG-LCA discussions thus far is the linkage of NAMAs to low emission development strategies or action plans, and the role that such strategies or plans would play in determining the level of external support to NAMAs. The European Union and Japan, amongst others, support such linkage; developing countries, through the Group of 77 and China, have argued that linkage would infringe on the sovereignty of developing countries and be a step towards compulsory, rather than voluntary, emission reduction goals.
- NAMAs shall be supported and enabled by technology, financing and capacity building in a measurable, reportable and verifiable manner. Few details are available on the manner in which the NAMAs will be financially structured. Is there a linkage between the financial payment and the amount of GHG emission reduced under NAMAs? Will payments related to NAMA support be made upfront, ex-post or on an annual basis? Apart from references in the AWG-LCA draft text to the principle of "full incremental costs" as the basis for NAMA support—and that external support for specific NAMAs may include support related to enhancing capacity for the design, preparation and implementation of such actions (UNFCCC, 2010a)—little is yet known.
- NAMAs and support need to be measurable, reportable and verifiable in order to create transparency and trust between developed and developing countries that the support is being delivered and used for the purpose(s) for which it was intended. MRV also is needed to monitor the progress towards the ultimate objective of the UNFCCC—i.e., reducing GHG emissions so that dangerous human interference with the climate is prevented. The AWG-LCA is still discussing the desirability of external technical analysis of the methodologies used to estimate the incremental costs and the expected emissions reductions (UNFCCC 2010a). MRV can be important for sharing experiences about best practices and creating incentives for action (Bakker et al., 2010b). A proper system of MRV is therefore of high importance; however, the bar for supported and unilateral NAMAs might be placed lower than in the case of CDM because, under supported NAMAs, no emission reductions would be generated that could count as offsets for developed country emissions. MRV can focus on different aspects of mitigation actions (based on Neuhoff et al., 2009; Jung et al., 2010):
    - Input (e.g., the financial resources used to implement a policy)
    - The process of developing a policy (e.g., development of a low-emission development strategy
    - Outputs that are a direct result of a policy (e.g., increased consumption of renewable energy)

  - Outcomes that relate to policy objectives (e.g., GHG emission reductions)

- A strong emphasis has been placed, especially by the developing countries, on the need for NAMA-related funding to be predictable, measurable, reportable and verifiable. Also, mitigation funding should be clearly separated from and in addition to development assistance. In the Copenhagen Accord, $30 billion of additional finance has been promised by developed countries for adaptation and mitigation in developing countries in the period 2010-12, and $100 billion per year in 2020 (UNFCCC, 2009a; 2010a). Although the EU has pledged €7.2 billion for the period 2010-2012, it is not fully clear where the remainder of the "fast start" financing would come from, the extent to which it would consist of new funding, and how the funding could be delivered, although a Copenhagen Green Climate Fund is mentioned [34]. Considering the emerging consensus on the definition of NAMAs, which appears to indicate that funding will be available, a different disbursement mechanism for both emission reduction and enabling activities [35] will have to be found under supported NAMAs than is currently the case under CDM.

4.3.2 Relevance to the transport sector

The manner in which the NAMA discussion is unfolding—i.e., emphasis on policy, co-benefits, support to enabling activities and less-stringent MRV than in the case of CDM—holds promise for the transport sector. Although many of the details still need to be settled, the NAMA instrument might have the potential, more so than the CDM, to help put the transport sector on a more sustainable growth trajectory (CCAP, 2010a; Dalkmann et al., 2010). In their NAMA proposals for the Copenhagen Accord Annex II, many developing countries have included the transport sector. As of May 2010, 25 out of 36 submissions explicitly included the transport sector. A range of actions is proposed, including infrastructure development, energy efficiency, biofuels, regulatory measures and fiscal incentives for electric vehicles. (Binsted and Sethi, 2010). The submissions generally do not provide details on how these actions are going to be implemented or the GHG emissions reductions for the transport sector that are expected.

Before discussing the NAMA case studies in Chapter 5, we first provide a few general considerations related to transport NAMAs:

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[34] A high-level Advisory Group on Financing was created by the UN General Secretary which is currently conducting a study of various funding options (http://www.un.org/wcm/content/site/climatechange/pages/financeadvisorygroup)

[35] Those activities that do not reduce emissions by themselves, but which are required to successfully implement mitigation actions, such as institutional reform, capacity building and data gathering.

- Non-climate benefits from interventions in the transport sector are often much larger than climate benefits (if both are monetized). This makes it important that specific guidelines for transport-related NAMAs explicitly take into account non-climate-related benefits in financing, MRV and institutional arrangements. The inclusion of these additional criteria in the selection process, however, should not lead to the imposition of unreasonably stringent methodological requirements.
- Many of the interventions aimed at reducing emissions from the transport sector have limited or no incremental costs, particularly if all co-benefits are fully monetized. The fact that these actions still are not being implemented shows that other barriers inhibit them. Financing of NAMAs may play a role in addressing these barriers. Supported NAMAs in all sectors are expected to include not only direct GHG emission reduction activities, but also activities that enable capacity and institution building or help to remove planning, regulatory, financial, informational or other institutional barriers. This is of particular relevance to the transport sector, where large-scale emission reductions will require a combination of measures aimed at changing transport systems (e.g., reducing the need for travel through better land-use planning, restraining the use of private vehicles, promoting public transport and non-motorized transport) and measures aimed at improving the fuel efficiency of individualized motorized transport.
- Timing, packaging and sequencing of interventions in the transport sector are important. Improvements in technology, especially those with options that are commercially available, often can generate benefits in less time than can measures aimed at broader changes, such as shifting to lower-emission modes of transport or changing land-use patterns. To achieve scale in emissions reductions, however, a combination of measures may need to be implemented, including those that will generate emissions reductions further into the future. In addition, capacity building activities and policy formulation may need to precede infrastructure investments in some countries for these measures to be effective.
- Because the transport sector is known for its limited responsiveness to economic incentives and to methodological challenges for assessing incremental cost, the exclusive use of the incremental cost criterion in investment funding, without taking into account other available criteria such as barrier removal ability and cost-effectiveness per unit of emission reduction, could limit funding for climate change mitigation in the sector and discourage countries from undertaking programs that lead to high GHG reductions but that entail (apparently) low or negative incremental costs. Within transport, that approach might lead to a focus on vehicle and fuel technology-oriented NAMAs, which generally would have high(er) incremental costs than would NAMAs that focused on the "avoid" and "shift" parts of the ASI approach. Although a NAMA might have negative incremental costs overall, there are transition costs for transport systems that would justify a contribution to investment costs.

A new appraisal methodology will need to be developed under a supported NAMA—i.e., a new methodology that evaluates the impact of transition financing and how the NAMA would leverage or catalyze domestic climate action in the transport sector, and how it would reduce emissions below BAU. This would require a thorough understanding of economic and non-economic factors, including investment risks, implementation costs, and political and consumer uncertainties.

- The close ties between climate change, other sustainability issues (e.g., pollution, congestion) and more general development issues such as energy security and urban development make it hard to determine the "additionality" of a specific transport intervention or measure. The concept of additionality was introduced to CDM to ensure the quality of off-sets realized. Because no off-setting takes place in the case of supported NAMAs, this criterion may be less important.[36] Nonetheless, there still will be a need to create trust that funds are being used for climate purposes, and to measure the global progress towards the ultimate objective of reducing GHG emissions.
- Because of the huge costs of accurate data collection, as well as the variety in local conditions, the MRV of GHG impacts in the transport sector lends itself to a mixture of actual calculation of GHG emissions reductions, indirect or proxy indicators and, in some cases, process indicators. Direct GHG impact indicators represent the "gold standard" in terms of indicators. However, where it is possible to develop default values or standards, it is suggested that use could be made of proxy indicators (e.g., kilometers of bicycle lane constructed), or even process indicators (e.g., number of people trained). Because emissions estimates in the transport sector are surrounded by large uncertainties, both for current levels and (especially) for projected BAU emissions, consensus needs to be built around assumptions used by different groups in modeling the expansion of the transport sector. Efforts also must be undertaken to increase the availability of reliable activity data.
- In contrast to the electric energy and industrial sectors, the largest share of financing for transport in developing countries generally comes from the public sector, with the second largest source of funding being development assistance. In the Pittsburgh G20 meeting, agreement was reached on a $350 billion capital increase for MDBs.[37] MDBs have recognized the importance of the transport sector in terms of lending and have stated their intention to increase assistance for climate action in that sector. Because new UNFCCC mitigation and technology funds, as well as the Global Environment Facility (GEF) and other dedicated climate funds, will continue to provide only a small share of funding for

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36 Additionality has not been included as a criterion for external support for NAMAs in draft negotiation text of AWG-LCA unlike incremental costs which is specifically mentioned.

37 See: (http://g20.gc.ca/toronto-summit/summit-documents/the-g-20-toronto-summit-declaration/)

mitigation of climate action in the transport sector,[38] the use of dedicated climate funding in the sector can be optimized if it is made available upfront to facilitate and catalyze the development and implementation of sustainable, low-carbon transport.

- Climate-related funding will be an important factor in bringing about projects in the transport sector, and the blending of resources from MDBs, climate funds and local and national sources will be necessary. Although international financial support for these instruments is expected to grow considerably in the coming years, it is important to remember that the bulk of investments for climate action in the transport sector will need to come from domestic sources. Therefore, it will become increasingly important for external funds—i.e., climate change funds and MDB—to help remove barriers to the implementation of projects and to catalyze and leverage domestic funding.
- Because of the special characteristics of the transport sector, including the difficulties involved in attaining MRV standards under the current CDM, a separate window for transport-related climate funding may need to be established within UNFCCC. This would help ensure that the transport sector received mitigation-related funding in proportion to its contribution to climate change.

4.4 Summary

The discussions on the post-2012 climate governance have also resulted in a discussion on how CDM could function beyond 2012 in a new commitment period for the Kyoto Protocol. Although some of the changes discussed, especially those related to reducing the transaction costs and PoAs, might improve the track record of the transport sector under CDM, it is felt that CDM in the post-2012 period will not be a major impetus for change in the transport sector in developing countries.

NAMAs are an important new mechanism that can enable developing countries to initiate and implement climate change mitigation policies, including in the transport sector. Conceptually, supported NAMAs—which are expected to be an important channel to transfer financial support for climate change mitigation—appear to be a continuation of current climate finance mechanisms. Depending on how it is applied, the continued use of incremental costs in their current form as the basis for funding of supported NAMAs may continue to limit funding to those additional efforts that are required to make developmental efforts low-carbon. On the other hand, the proposal to allow support to be used for barrier removal and capacity building could help developing countries to catalyze the formulation and implementation of sustainable, low-carbon transport policies, programs and projects.

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[38] The European Commission proposed € 10-20 billion per year by 2020. Assuming that transport would get 20-25% (equivalent to share of emissions for transport sector) this would be € 2-4 billion per year which is well below the current and expected transport lending by MDBs.

5 Case Studies

Four case studies were introduced into the *CITS* project to help ensure that the recommendations to be formulated at the end of the project would reflect the reality on the ground in developing countries. Case studies were conducted in Brazil, Indonesia, Mexico and the Peoples Republic of China (PRC). The case studies were implemented by four different organizations, all of which worked with local organizations in their respective countries. This collaboration has been instrumental in building capacity for participation of the transport community in the formulation of guidelines for post-2012 climate instruments.

All four case studies focused on urban passenger transport systems. The expected rapid urbanization in developing countries has the potential to greatly increase GHG emissions from transport. Urban passenger transport, however, covers only part of the overall reduction potential in the transport sector. Inter-city, rural and freight transport also are important for emissions reductions. This chapter gives a summary and lessons learned from the case studies.[39]

5.1 Optimization of conventional bus system NAMA in Mexico City, Mexico

5.1.1 Context description

Due to low fuel prices, the poor quality of public transportation and the availability of inexpensive vehicles on the market, transport is the largest and fastest-growing sector in Mexico with regard to energy consumption and GHG emissions. The overall transport sector is responsible for around 18 % of total GHG emissions in the country, with road-transport making up the majority (90%) of sector's emissions (Johnson et al., 2009).

Mexico has published a national climate plan, called "Programa Especial de Cambio Climático 2009-2012" (PECC) (SEMARNAT, 2009), in which it specifies goals to achieve and actions to take in the different sectors. In the PECC, eight transport-related goals and 12 actions are specified.

A network of more than 28,000 privately owned microbuses (as of 2007) operates in the valley of Mexico, surpassing by far the capacity of the metro and the other public transport modes. Due to poor regulation and lack of system planning, a system of single-owner-operated buses has developed. This has resulted in the so-called "War for the Peso," with drivers competing against each other for clients and routes, as opposed to being part of an optimized system at the city level. This situation contributes to pollution, traffic congestion and high accident rates; it has also led, in general, to poor service quality.

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[39] Detailed case studies will be made available online at www.slocat.net/cits

5.1.2 Description of the proposed NAMA

The proposal for a supported NAMA focuses on the optimization of the conventional bus system in the valley of Mexico. While the expansion of BRT systems is already planned and financed by a number of sources (e.g., through the Clean Technology Fund), the financial sources for the optimization of the conventional bus system have not yet been identified.

The proposed NAMA comprises the following components: 1) the establishment of the appropriate institutional and regulatory framework needed for the optimization of the bus system; 2) the implementation of changes in the bus system, such as the reorganization of routes and concession management; 3) public awareness raising and outreach; and 4) the implementation of a transport monitoring system.

5.1.3 Methodological issues in determining the CO2 reductions

Emission reductions of the NAMA derive from efficiency gains achieved through the optimization of the conventional bus routes. Direct emission reductions are expected due to the following factors: 1) a decrease in number of buses; 2) a decrease in overall km-travelled by buses due to better route design; and 3) modal shift—i.e., passengers shifting from private vehicles to buses.

Estimation (ex-ante) of GHG emission reductions could be based on simple but transparent assumptions, while monitoring, reporting and verification (MRV) must provide the certainty that the estimated effects (e.g., actions linked to GHG reductions) actually are realized. MRV, therefore, would not necessarily need to be based on GHG metrics, but should provide certainty that: 1) the financing is used for the stated purpose; 2) the actions are actually undertaken; 3) the implementation is done effectively; and 4) the rough magnitude of emission reductions estimated are actually achieved (see Table 7). For monitoring item 4 above, simple ASIF indicators derived from surveys, statistical measurement methods and secondary data (e.g., number of buses, overall km-travelled, modal split) is recommended; the monitoring of items 1-3 could draw upon proxy indicators and established practices used in development finance.

Table 7: Possible MRV indicators

Variable	Indicator
GHG reduction	
Number of buses	Number of buses
Decrease in distances travelled by buses	Km-travelled by buses
Modal shift	Passengers shifting (from private vehicles) to buses
Co-benefits	
Reduced traffic accidents	Fatalities due to traffic accidents
Travel time savings	Reduction in travel time per trip
Reduced congestion	Average travel speed
Reduced air pollution (positive health effects)	Local measurements, statistics on air pollution

Process indicators	
Regulatory framework	Reformed regulatory institution(s), operation and maintenance entity established, etc.
Implementation of actions	Reallocation of concessions finalized, route design plan elaborated, etc.

Source: Authors of Mexico City case study –Ecofys, CTS Mexico

5.1.4 Expected CO_2 benefits and associated co-benefits

Bus system optimization is the intervention with the highest emission reduction potential of all nine interventions analyzed in the 2009 World Bank MEDEC study of low-carbon development for Mexico.

The bus system optimization brings various co-benefits, including: 1) less congestion; 2) time savings; 3) increased public transport quality; 4) positive health effects due to lower air pollution; 5) cost savings for operators/passengers; and 5) a decrease in accidents.

According to the MEDEC study, bus system optimization leads to higher benefits than costs. Net benefits of the bus system optimization are estimated to be around 96.6 $/t CO_2-eq (when considering such co-benefits as travel time savings and health effects). Bus system optimization is also the transport intervention with the highest net benefits (Johnson et al., 2009).

5.1.5 Financing approach for the NAMA

While net benefits are significant, certain barriers inhibit the possible cost-savings from being realized. These include: 1) lack of information and data on possible benefits (informational barriers); 2) lack of the necessary institutions and regulations (institutional barriers); 3) high upfront cost that can only be recovered over longer time horizons (financial barriers); and 4) social barriers (e.g., expected pressure from bus drivers who fear losing their jobs). For interventions with negative costs, an incremental cost analysis is therefore not appropriate.

Climate finance in the form of a supported NAMA can play an important role in removing the above-mentioned barriers (e.g., through institution building, capacity building and awareness-raising). The fact that the supported NAMA would be registered under the UNFCCC would provide international credibility for the instrument and help to generate additional commitments from the international financial community.

5.1.6 Institutional approach for the planning, review, implementation, monitoring and reporting of the NAMA

The Transport Ministry at the state/local level would be responsible for the planning, implementation and MRV of the NAMA (as described above), while consistency with national reporting would have to be addressed at the national level.

An alternative definition of the NAMA boundary would be possible theoretically. The NAMA could be defined at the federal level—e.g., the NAMA would not need to be the individual bus optimization measure but could instead be a national program to strengthen public transport, which would then channel funding to the local/regional level. With such an approach, it would be possible to build on and expand existing programs like the PROTRAM program (Programa de Apoyo Federal al Transporte) of FONADIN (Fondo Nacional de Infrastructura), a fund within the national development bank Banobras.

5.2 Transport demand management NAMA in Jakarta, Indonesia

5.2.1 Context description

Indonesia is proactively taking steps to address climate change mitigation at both the national and local level. Specifically, the Government of Indonesia is committed to a voluntary 26 percent reduction below the baseline by the year 2020 unilaterally, and a further 15 percent (total 41 percent reduction) with international support (Indonesian Ministry of Finance 2009)[40]. Furthermore, Jakarta set a 30 percent GHG emissions reduction target by 2030 (compared with BAU). Indonesia has also associated itself with the Copenhagen Accord, and has submitted a proposed NAMA that includes "shifting to low-emission transportation mode."

In taking mitigation actions in the transport sector, Indonesia faces a particular challenge. The number of vehicles in Indonesia is predicted to grow more than two-fold between 2010 and 2035, with the growth expected to be largest in two-wheelers and light duty vehicles (ADB, 2006). Transport contributed to 23% of the total CO_2 emissions of the energy sector in 2005, with emission levels expected to increase roughly three-fold over the next 20 years (Triastuti, 2010). The rapid growth of car ownership is also leading to chronic congestion and increasing levels of air pollution, noise/vibration and road safety issues.

5.2.2 Description of the proposed NAMA

The Jakarta study looked at transport demand management (TDM) and provided a working example of how a local-level NAMA in the transport sector might contribute to the mitigation of transport emissions. Specifically, the study looked at three elements of TDM: electronic road pricing (ERP), parking restraint and BRT. Each of these elements reflected existing local priorities and also was included in the Jakarta Transport Master Plan. The study also examined the applicability the three potential types of NAMAs—unilateral, supported and credited—to TDM in Jakarta.

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[40] Sector-specific targets are currently being set. According to the Indonesian Climate Change Sectoral Roadmap (Triastuti, 2010), it is suggested that transport could be responsible for roughly 2% of the 26% emissions reduction target at the national level. Such indicative figures have not been provided for the 41% emissions reduction target, nor for the local (Jakarta) emission reduction target of 30% by 2030.

5.2.3 Methodological issues in assessing/quantifying the CO_2 and other co-benefits

In assessing and quantifying CO_2 and other co-benefits of TDM, the study suggested an approach that combines a transport demand model (i.e., one driven by data from household surveys and traffic counts) with information on the vehicle fleet (e.g., emission factors).

The model was shown to provide a well-established list of output variables to express changes in CO_2 and key co-benefits, namely:

- Traffic volumes in terms of passenger and ton kilometers (which can be translated into carbon emissions by multiplying them with emission factors derived from a set of assumptions on the vehicle fleet)
- Congestion levels, expressed as average speeds on the network
- Air quality pollutant emissions, expressed (e.g.) as an average level of pollution within a designated zone

The case study noted the importance of considering the MRV of the TDM NAMA as part of a city-wide approach, whereby GHG inventories would be created at the city level, sectoral baselines would be drawn and actions for mitigation would be seen as contributing to a local city-wide mitigation target. Further methodological work would be required to isolate the specific contribution of individual mitigation actions to city-wide mitigation actions in the transport sector.

5.2.4 Expected CO_2 benefits and associated co-benefits

Scenario work using the TDM model has demonstrated that a typical combination[41] of the three TDM policies would lead to a sustained reduction of total transport demand (in vehicle kilometers, within the wider Capital Region of Jakarta, and below the baseline[42]) of approximately 4-5%--but up to 40% when focusing on the central business district (CBD), where ERP would be targeted. This demonstrates the highly location-specific impacts of TDM policies.

Expected CO_2 reductions (expressed as changes to fuel consumption, a direct proxy) were calculated by combining specific data provided by the modeling, including km-travelled, with vehicle characteristics.[43] A sustained reduction of between 20-30% compared to BAU was shown for an area within the Jakarta Outer Ring Road, and even larger levels for the CBD. Such levels of reduction in transport emissions would translate into approximately 4-7% saving of the entire city's carbon profile, relative to the baseline in both 2010 and 2020.

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41 For example, an illustrative scenario combined a IDR 5,500 (USD 0.6) entry price in the ERP zone, a parking charge of Rp. 4,000 (USD 0.43) and a network of 8 BRT lines.

42 Based on an O-D matrix from 2008, and extrapolating based on certain assumptions on traffic volume, modal split, etc. See full report for details.

43 Results are presented in percentage terms given the very large uncertainties surrounding the modeling assumptions.

Although years further into the future were not modeled, this demonstrates how TDM, especially when coupled with other measures such as fuel economy improvements, would assist in meeting the local target of 30% by 2030.

The results need to be treated with a degree of caution, however, due to limitations in the quality of input data and the large number of assumptions that dictate the final outcome. Capacity building in the area of data collection, database development and management is seen as a key priority in ensuring MRV of mitigation actions in the future, particularly in allowing TDM to be implemented as a credited NAMA. Such efforts would also ensure that co-benefits could be better monitored. Capacity building of this type could be provided as part of a supported NAMA, or through other channels such as development aid.

5.2.5 Financing approach for the NAMA

Generally, TDM measures (and particularly those being considered under this case study) were shown to be revenue positive for the local authority and possess very short payback periods. From a welfare point of view, the outcomes also are expected to be positive, not only because of the reduction in GHGs but also because of the benefits to society of reduced congestion. However, the fact that TDM measures currently are not being implemented suggests the need for international support, particularly if targeted at "bottlenecks," including the transfer of key technologies (e.g., for ERP), infrastructure for expansion of BRT, technical assistance and capacity building on MRV. The support for most of these elements would ideally be made available upfront (ex-ante).

How the TDM NAMA would be financed would depend greatly on the type of NAMA assumed. As a unilateral NAMA, the majority the financing would come through the general budget of Jakarta. As a supported NAMA, funds could flow directly from a non-UNFCCC donor such as a multilateral or bilateral donor agency, through the national level (e.g., the Indonesia Climate Change Trust Fund), through a nationally administered NAMA registry or through a combination of the three. Under a credited NAMA approach, the city would receive funding against carbon credits generated by its mitigation actions.

5.2.6 Institutional approach for the planning, review, implementation, monitoring and reporting of the NAMA

A large number of institutions at the national and local level would be involved in the implementation of the NAMA. Extensive consultations with local, national and international stakeholders revealed that:

- The responsibility for planning and implementation of TDM activities would fall on the local level, whereby the overall policy direction would be set by the Governor/Deputy Governor of Jakarta in close coordination with the Regional Transport Agency (DISHUB) and other implementing agencies.

- MRV of the TDM NAMA could be coordinated by the Regional Environment Agency (BPLHD), based on a city level GHG inventory and possibly guided by the Ministry of Environment to allow it to be compatible with the national approach.
- A clear benefit could derive from developing methodologies to measure transport emissions in close coordination with the Regional Transport Agency and the (National) Ministry of Transportation to ensure that the approach was compatible with the characteristics and practical requirements of the transport sector. In the case of a supported NAMA, MRV methodologies would also be reviewed internationally. Methodologies and associated data should be openly shared to allow maximum transparency and to invite continuous improvement by third parties and to contribute to an international effort to harmonize MRV methodologies.
- Financing under a unilateral or supported NAMA could mainly involve the local budgetary process, with the potential partial support potentially coming from national sources (e.g., for capacity building). International funding could be matched against local actions through the national government. Direct support to the local government (bypassing national government) should not be ruled out, particularly if it came through bilateral/multilateral climate funds and official development assistance (ODA) channels. Under a credited NAMA, Jakarta as a city would be expected to become the market entity, receiving from either the UNFCCC-administered trading mechanism or non-UNFCCC carbon markets financing in return for MRVed emission reduction. In pursuing a city-wide approach with sectoral baselines for all major emitting sectors (and potentially also for supported NAMAs), consideration could be given to the establishment of a coordination office that overlooks MRV efforts.

5.2.7 Roadmap for the future

Based on the analysis of the current situation, a roadmap for the future was developed. The roadmap suggests that, in the short term, TDM would be most appropriate as a supported NAMA, whereby upfront support could be provided to reduce several “bottlenecks” to implementation, including the transfer of key technologies (e.g., for ERP), infrastructure for BRT, technical assistance (e.g., in such areas as ERP design, BRT routing/ticketing, and optimization of parking charges) and capacity building on MRV.

Ex-ante support of this type could also be provided by development agencies, including the ADB, particularly in the areas of data collection, further pilot projects and capacity building. Such actions could commence prior to the NAMA’s framework being fully in place, and would serve an important, transitional role to enable transport NAMAs. Linking a certain proportion of support to actual implementation of the NAMA (monitored through ex-post evaluations) would reduce any potential cases of free-riding.

Support of this type would allow TDM to move increasingly towards:

- A unilateral NAMA, whereby TDM would become financially self-servicing and would "graduate" from international support, but where MRV was continued to allow the NAMA to contribute to meeting national targets.
- A credited NAMA, whereby the MRV would be strengthened so that it became robust enough for TDM to generate credits for the local government as a component of a city-wide program.

An overview of the roadmap is provided in Figure 6 below, showing how the TDM NAMA could be developed under each approach (see full case study report for details).

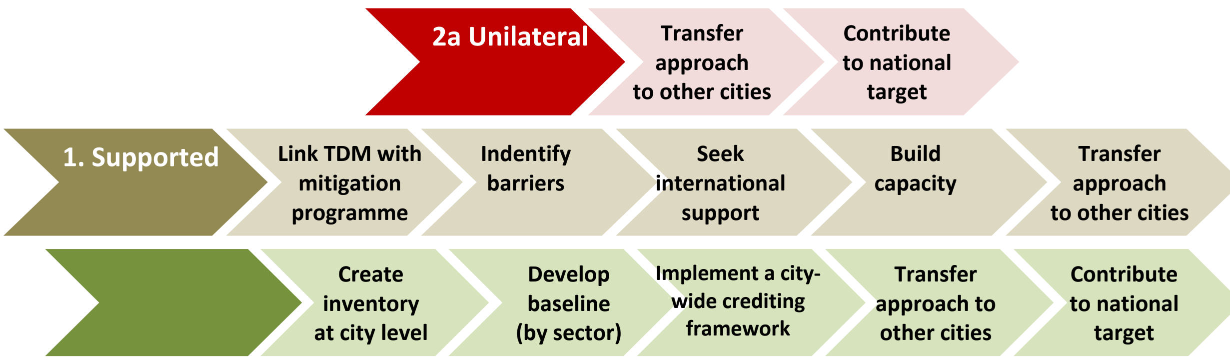

Figure 6. Roadmap for the future TDM NAMA in Jakarta (source: TRL)

5.3 Integrated mobility plan NAMA in Belo Horizonte, Brazil

Support for an urban transport NAMA is expected to help remove barriers to implementation of integrated mobility plans—namely, shortage of funding and permanence over time. Support is also expected to help increase public acceptance by making explicit the broad range of co-benefits and by providing a solid framework on which to follow up impacts. This case study explores needs, methodological issues and practical issues for financial support of NAMAs in the urban transport sector, with particular application the midsize Brazilian city of Belo Horizonte.

Located in the southeastern region of Brazil, Belo Horizonte is the capital of the state of Minas Gerais. Its metropolitan area is the third-largest in the country, with almost 5.4 million people. Belo Horizonte itself has a population of over 2.4 million.

The city developed a comprehensive mobility plan—"planmobBH" 44 — which includes extensive transport data collection and modeling efforts. The proposed NAMA framework goes beyond the standard transportation planning analysis by quantifying the GHG reductions, travel time savings, travel cost savings and air pollutant emission reductions in an integrated approach.

5.3.1 Policy objective for the NAMA

The NAMA seeks to increase active (i.e., non-motorized) and public transport shares of the metropolitan area's total trips in order to generate reductions in GHG emissions from urban transport and improve transport conditions and the local environment.

By 2020 the integrated mobility plan seeks reductions of 27% in GHG, 23% in travel time, 18% in transport costs and 40% in particulate matter as compared with a projected baseline. By 2030, the plan's final year, the expected reductions would be 36% in GHG, 25% in travel time, 19% in transport costs and 39% in particulate matter.

5.3.2 Description of the NAMA

The proposed NAMA includes enhancement of public transport (BRT and metro), metropolitan fare integration, construction of infrastructure for and promotion of non-motorized transportation (NMT) (walking and cycling), and combined land use and parking policies, with a total investment of USD 4.2 billion (Table 8). Of the total investment, USD 1.6 billion corresponds to on-going activities and is already committed by the city. These investments are considered the baseline scenario.

Table 8. Physical goals and financial cost:
Baseline and Integrated Mobility Plan (Logit, 2009)

	Baseline	**Integrated Mobility Plan**	**Difference**
Bikeways (km)	14	300	286
Bus lanes (km)	14	72	58
BRT (km)	0	80	80
Metro (km)	29	65	36
Road Investment (USD Million)	38.4	982.8	944.4
Capital Cost (USD Million)	1,551.7	4,215.2	2,663.5
Total GHG Emissions (ton CO_2-eq) 2008-2030	**44,775,918**	**35,624,604**	**-9,151,315**

[44] Logit, BHTRANS, Prefeitura de Belo Horizonte "Plano de Mobilidade Urbana de Belo Horizonte: Diagnóstico, Cenários e Resultados", October 2009.

5.3.3 Greenhouse gas emission reductions

The net cumulative GHG emission savings over the 22-year period 2008-2030 are estimated in 9 $MtCO_2$-eq (Table 7). Figure 7 presents year-by-year estimates of GHG emissions over the course of the plan relative to the baseline.

These estimations incorporate demand projections using a detailed transport planning model, assumptions on the fleet composition and types of fuels, and emission factors from an approved CDM methodology,[45] including upstream fuel production and transport. GHG emissions from construction activities and vehicle manufacturing are added.

5.3.4 Co-benefits

The transport modeling process provides the inputs needed to calculate travel time savings, including walking, waiting and in-vehicle time. In 2030, estimated travel time savings of 182 million hours for public transport and 170 million hours for private transport are expected. By 2030, the economic equivalent of the cumulative travel time savings would reach nearly USD 1.3 billion (present value at a discount rate of 12%).

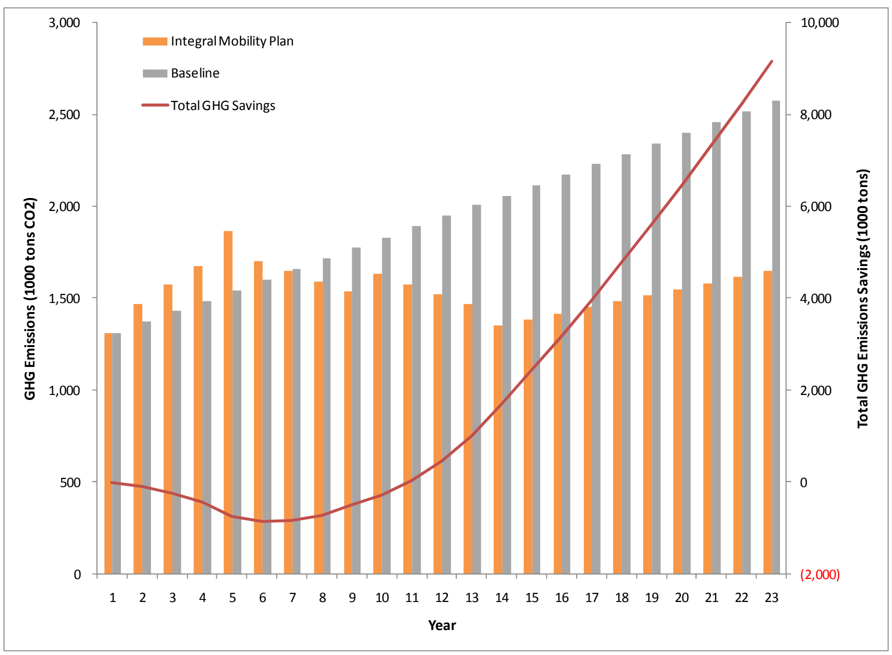

Figure 7: Estimated GHG Emissions and Savings Compared to Baseline

Travel cost savings are the result of changes in vehicle activity (vehicle-km). By 2030, the economic value of the cumulative travel cost savings is estimated to exceed USD 900 million (present value at a discount rate of 12%).

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The estimation involves an increase in GHG emissions during the first years as compared with the baseline scenario. This is the result of infrastructure construction and vehicle manufacturing emissions, as well as increased vehicle kilometers traveled by public transport vehicles in the BRT system and private vehicles in the new roads included in the plan. As modal shift from private vehicles to public transport progresses, the vehicle-km from private transport would be significantly reduced; generating emission savings of ~1 $MtCO_2$-eq per year in about Year 15 of the plan, with significantly higher savings thereafter.

Based on the vehicle-km and using emission factors, it is possible to estimate air pollutant emissions for the baseline and integrated mobility plan scenarios. The relative differences in carbon monoxide (CO), hydrocarbons (HC), nitrogen oxides (NOx) and particulate matter (PM) emissions were estimated; while the estimation of local emissions has significant uncertainty, the calculated savings of the mobility plan scenario with respect to the baseline scenario indicates that the public transport investment would have a positive impact by reducing CO, HC, NOx and PM emissions. The air pollutant emissions savings are presented in Figure 8. Economic benefits from the reduced tailpipe emissions are not calculated, as doing so would require detailed modeling and data that are not readily available.

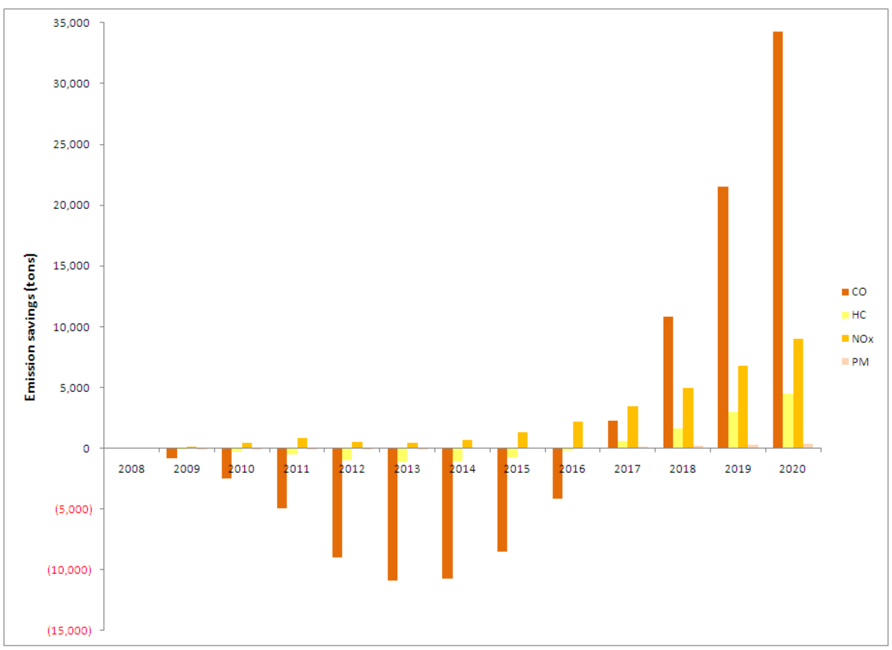

Figure 8: Air Pollutant Emission Reductions

5.3.5 Measurement, reporting and verification

A city-wide survey is proposed to monitor the activity data. To assure adequate representation, a categorized random survey with a 5% error and a 95% confidence interval is suggested, with a total sample size of 5,400 surveys. Approximate cost per survey is USD 4-6, for a total cost of USD 21,600 to 27,000, including analysis and reporting. Activity data would be combined with emission factors and fleet composition data. This monitoring approach would not require detailed transport planning studies.

The NAMA is expected to address financial barriers in three general ways: general funding from different levels of government, general international financial flows, and specific climate funding mechanisms.

Since the financial requirements for urban transport infrastructure usually are sizeable, a combination of local, state and national or federal funds is customary. The likelihood that the NAMA would receive funding from the national or federal government—considering that the local plan would help to achieve national goals in limiting GHG—would be increased by making explicit the GHG reduction potential, establishing quantitative goals for GHG emissions reductions and setting up a proper MRV mechanism. The NAMA may also attract additional financing, in the form of grants and loans, from international financial sources interested in climate change and development issues. Finally, it would provide the opportunity for financial entities to use climate financial instruments—in particular, supported NAMAs.

The NAMA is also expected to deal with permanence over time, as the plan will be implemented over a long period, covering several terms for local elected officials. The NAMA would provide continuity over the election cycles through the MRV mechanism and the provisions adopted to assure compliance of the mitigation and co-benefit goals.

Public acceptance and support for the NAMA would be won by highlighting the significant benefits beyond the direct transport benefits—e.g., reduced travel time and congestion—that would result. For the community at large, the public health benefits resulting from reduced air pollutant emissions and fewer accidents, as well as from increased physical activity, are very important. What's more, as worldwide concern for climate change grows, the public is more likely to support measures that bring complementary benefits than projects aimed at a single issue, such as reducing congestion or improving connectivity. A NAMA for urban transport could make explicit the broad range of co-benefits in addition to climate change mitigation, and could also provide a solid framework for following up on the impacts.

At the city level, reporting could be assigned to a joint committee of transport and environment agencies, which would generate annual reports. City reports would be collected and reviewed by the national authority in charge of submitting, monitoring and reporting NAMAs to the UNFCCC. Funding for data collection and analysis should be assigned accordingly. Development of technical capacity to conduct the required studies and complete the reports could be considered as part of the overall plan.

Reports could be verified in two ways: by reviewing the quality of the data collection and analysis efforts, and by contrasting the reports with secondary data (e.g., air quality data, fuel sales, etc.). Independent peer review of the reports is also suggested, as is quality assurance certification for the reporting process (e.g., ISO 9001).

5.3.6 Managing risks

Risks can be found during implementation of the NAMA and when carrying out the MRV processes. NAMA implementation depends on the local political agenda, on addressing vested interests (e.g., existing transit providers, community in the area of influence of terminals, businesses during construction, etc.) and on funding availability. Political and community risks can be mitigated through adequate community involvement. Funding risks could be solved by the proactive involvement of other levels of government and by seeking international financial flows (grants and loans by national and international funding agencies). The MRV process is subject to problems in data collection, modeling and lack of technical expertise on data analysis. These risks can be mitigated with formalization and standardization of the procedures, and quality assurance (ISO certification).

5.3.7 Financing

The estimated additional investment for Belo Horizonte's integrated urban mobility plan is USD 2.7 billion. Based on the expected emission reductions and carbon price, the total expected income for a supported NAMA is USD 36 Million (1.4% of the marginal cost of the plan). The following equation is used to calculate the expected income:

$$CLFD_s = \sum_{y=1}^{Y} (GHG_{y1} - GHG_{ys}) * ERC * FX * \frac{1}{(1+DR)^y}$$

Where $CLFD_s$: Climate change funding [USD]

GHG_{y1} : Baseline GHG emissions in year *y* (without the NAMA)

GHG_{ys} : Scenario *s* GHG emissions in year y (with the NAMA)

ERC : Emission reduction certificate market value (13.02 Euro equivalent to 17.58 USD per ton CO_2eq according to http://www.ecx.eu/ April 15, 2010)

FX : Multiplier factor, we assume a value of 2:

DR: Discount rate (e.g. 12%)

Y : Period of performance (e.g. lifecycle of the infrastructure 2030)

While the expected income from the supported NAMA is small as compared to the plan's funding requirements, the climate funds are still very attractive due to their format as a grant or a concessional loan (i.e., one with low interest and a long repayment period). Having this funding upfront is also expected to facilitate the plan's implementation. If this funding is provided upfront, it is also recommended that there be a financial mechanism to motivate/penalize compliance under the MRV process.

Funding for the NAMA could come from several sources, including local, state and federal budgets; credit from commercial and export banks; and loans from multilateral development organizations. Further development of the funding conditions is required, as well as agreements and approvals from the designated agencies in Brazil.

5.3.8 Institutional framework

A suggested assignment of responsibilities at the local level is presented in Table 9. NAMAs from individual cities will be reviewed and approved by the national authority in charge of submitting NAMAs to UNFCCC or other internationally designated bodies.

Table 9: Suggested Assignment of Responsibilities at the City Level

<table>
<tr><th>Activity</th><th>Responsible for Execution</th><th>Responsible for Oversight</th><th>External Stakeholders</th></tr>
<tr><td>Planning</td><td>Transport Planning Agency – BHTRANS in coordination with the Urban and Regional Planning Agency (Secretaria Municipal de Planejamento, Orçamento e Informação)</td><td>Head of Government (Prefeito Municipal de BH)
Finance Agency (Secretaria Municipal de Finanças)
Environmental Agency (Secretaria Municipal de Meio Ambiente)</td><td rowspan="5">Surrounding municipalities
State Government
Community at large
National Financing Institutions
International Financing Institutions
Community at large
Private transit operators</td></tr>
<tr><td>Funding</td><td>Finance Agency -Secretaria Municipal de Finanças</td><td>Head of Government (Prefeito Municipal de BH)</td></tr>
<tr><td>Project Development</td><td>Transport Agency – BHTrans</td><td>Head of Government (Prefeito Municipal de BH)
Urban and Regional Planning Agency (Secretaria Municipal de Planejamento, Orçamento e Informação)
Finance Agency (Secretaria Municipal de Finanças)
Environmental Agency (Secretaria Municipal de Meio Ambiente)</td></tr>
<tr><td>Monitoring and Reporting</td><td>Urban and Regional Planning Agency – Secretaria Municipal de Planejamento, Orçamento e Informação</td><td>Head of Government (Prefeito Municipal de BH)
Finance Agency (Secretaria Municipal de Finanças)
Environmental Agency (Secretaria Municipal de Meio Ambiente)</td></tr>
<tr><td>Verification</td><td>External agent</td><td>Ministry of the Environment
UNFCCC</td></tr>
</table>

Source: Authors of Belo Horizonte case study

5.3.9 Summary

Application of Belo Horizonte's proposed framework for data collection and modeling efforts shows its practical feasibility. Activity information was extracted from a fairly sophisticated transport model and combined with emission factors and fleet composition available for Brazil. Despite the natural gaps in data quality and intrinsic uncertainty involved with projections for a 22-year period (2008-2030), the overall calculations provide good initial GHG and co-benefits estimates.

Further development and enhancement of this framework is encouraged. Expansion of the results from Belo Horizonte to 40 Brazilian cities larger than 500,000 inhabitants shows potential savings of 1 to 10 million CO_2-eq tons per year (low to high investment). Climate instruments are expected to provide a relatively small percentage of the total costs required for urban mobility plans, but this funding will be critical in removing barriers to their implementation.

5.4 Standardized baselines for public transport in Hefei, PRC

5.4.1 Context description

The demand for transport in Hefei, the capital of Anhui Province, is growing rapidly. At the end of 2008, Hefei had a total of 4.87 million inhabitants, with around 2 million living in the urban center. In recent years, the number of daily bus passengers has increased steadily, from 700,000 in 2003 to around 1.8 million in 2010. In addition, the number of individual cars is growing by 200-300 per day.

Against this background, authorities envision a significant restructuring/overhaul of the transit system, including the extension of BRT and the development of a metro system. BRT was introduced in Hefei in 2009, and three lines currently are operating. Plans call for seven BRT lines totaling 200 km in length to be operating by 2020.

The Hefei case study focused on assessing the feasibility of developing standardized baselines (SBLs) for BRT projects. This theoretical case study employed the ASIF model (Schipper et al., 2000) as an analytical framework to assess which indicators influencing emissions from BRT projects are suitable for standardization. Apart from CDM methodologies for BRT, the draft GEF GHG manual BRT model (GEF-STAP, 2010) and the CTF methodology for transport emissions (CTF, 2009b) also were analyzed with an eye to examining the suitability of the different ASIF elements for standardization. The city of Hefei serves to illustrate the opportunities and challenges of standardized baselines regarding (in particular) travel behavior such as modal split and trip length.

The development of SBLs has been discussed under the UNFCCC as a method for simplifying the calculation of emission reductions in CDM projects since the late 1990s. Over time, greater and greater numbers of default values have become available for many tools and methodologies, with several methodologies relying on benchmarking. In transport, however, default values are employed only for fuel emissions and vehicle efficiency. The discussion of SBLs gained further momentum as part of proposals for structurally improving the CDM. The Subsidiary Body for Scientific and Technological Advice forwarded recommendations on modalities and procedures for the development of SBLs to the Conference of the Parties (COP) serving as the Meeting of the Parties to the Protocol held in Cancún in November 2010 (CMP 6).

Apart from vehicle efficiency, most of the 30 transport CDM projects in the UNFCCC pipeline are BRT projects. Outside of the CDM, BRT interventions have benefited from climate finance through such entities as the Global Environment Facility (GEF) and the Clean Technology Fund (CTF). Because BRT projects are expected to continue to develop, BRT baseline methodologies provide a good area for assessing possibilities for standardization in the transport sector.

5.4.2 Methodological issues and data requirements

So far, SBLs have been developed mostly in more or less homogeneous sectors, such as cement or power generation, where a large body of data already is available (Spain and EC, 2010). The transport sector, however, encompasses multiple mobile emitters, is very diverse and suffers from notoriously poor data availability or quality, especially in developing countries.

The two largest challenges of developing SBLs for BRT are: 1) defining a system boundary suitable for standardization; and 2) the increased upfront burden of extensive data collection to construct intensity benchmarks or define default values that are robust and representative. To establish baseline curves and distinguish between business-as-usual and superior practices, data needs to be disaggregated and recent.

Setting an appropriate aggregation level is a key determinant of how effective a SBL is likely to be. Aggregation can be done according to transport sub-sector, technology and geographical area. Aggregation at a high level will facilitate project development, as these SBLs would be applicable to high numbers of projects. However, highly aggregated SBLs would not be able to capture country- or region-specific differences.

Due to the high diversity in transport characteristics and behavior both across and within countries, relatively small geographical scopes will be required for comparable standards in transport. Compared to more homogenous sectors, this increases the data requirements and makes standardization more difficult.

An adequate interval for updating SBLs will have to be defined. If relatively short update periods are required, the effort to gather the necessary data for SBLs may not be significantly smaller than that required for a project-based approach. The example of Hefei illustrates how the rapid urbanization dynamics that are taking place in most developing countries make standardization even more difficult and costly, because data needs to be updated constantly. This raises the question of whether the effort to gather the necessary data for standardized baselines would in fact be significantly smaller than that required for a project-based approach.

5.4.3 Possibilities for standardization of BRT baselines

The study showed that only partial standardization of BRT baselines will be possible due to local diversity. An all-encompassing intensity benchmark for BRT is not achievable.

Looking at the Activity-Structure-Intensity-Fuel (ASIF) elements, total transport activity encompassing the total passenger travel for each mode (A) and modal structure (S) are the most variable parameters and, therefore, the least suitable for standardization. For BRT baselines, the (expected) total number of passengers (A) on the new system must be known in order to assess the baseline emissions of those passengers. This information is clearly project-specific and cannot be standardized. The prevailing modal structure (S) in a project city (or project area) is relevant for emissions calculation through the trip length and transport modes used in the absence of the BRT system. Both are dependent on the local context. Consequently, BRT methodologies generally require these data to be assessed locally, either on the basis of existing statistics or on the basis of targeted traffic counts and new surveys.

An exception is the GEF GHG model (GEF-STAP, 2010) for BRT, which provides a default factor of 6km as the average passenger trip length on the existing bus system. This default is to be used as a fallback option in case no standard values are available from household or spot surveys. Use of the default factor, however, introduces considerable uncertainties and is likely to result in an underestimation of trip distances, especially in (monocentric) and big megacities.

For example, the average trip length on buses in Hefei is 7km, which is not too far off the GEF default. But a difference of just one kilometer translates into a deviation of 15%, which has a significant impact on the calculation of the resulting emissions.

Underestimating trip lengths would result in a very ambitious baseline. While this would be positive for the environmental integrity of the mechanism, projects might find it difficult to beat such a baseline. Further research comparing average trip lengths on bus systems from different cities of comparable size and spatial structure for different countries should be conducted to identify if robust default values could be established for different sets of cities within a certain scope, and what level of uncertainty these defaults would potentially entail.

Modal energy intensity (I) is a compound of vehicle efficiency, usage and occupancy. Several methodologies already use default factors for fuel efficiency of different vehicle types and fuels based on Intergovernmental Panel on Climate Change (IPCC) values that have been adjusted to local vehicle technology and age. The GEF also uses default factors for fuel efficiency at 50kmph in combination with fixed speed adjustment factors for emissions. To take a further step in the standardization of modal energy intensity, standard values would need to be developed for the average vehicle technology and age, average occupancy rates and average speeds. However, all these factors vary according to local circumstances, such as wealth, local transport systems, level of motorization, mobility culture etc.

Developing a default value for average vehicle technology and age, when combined with existing defaults for fuel consumption (IPCC or national values), could essentially be seen as a benchmark for vehicle efficiency, One step further, several institutions have suggested (IETA, 2010) that energy intensity benchmarks could be developed for public and commercial vehicle fleets. For this default factor to be truly representative, substantial amounts of data on fleet ages, vehicle technologies and related fuel consumption would need to be gathered. What's more, to avoid over-crediting, the benchmark would have to be conservative. Ultimately, determining the level at which the crediting baseline is set would require a political decision.

For occupancy rates of vehicles, the Clean Technology Fund (CTF 2009b) expects that default values will soon be established based on the analysis and data from initial CTF projects. To what extent these defaults could be regarded as representative remains to be seen. The comparability of occupancy rates would depend largely on the geographical scope and socio-economic indicators, such as average income or overall level of motorization.

Speed is highly dependent on local characteristics of the transport system, as well as on mobility culture. In Hefei, as is the case in many other cities, average speed varies substantially within the city, with higher levels of congestion in the center. Thus, speed does not appear to be suitable for standardization in terms of a fixed default value. Instead, fixed speed emission adjustment factors as used in the GEF draft BRT model could be applied to account for emission differences due to speed.

Using default values for the carbon content of fossil fuels (F) is already common practice, with projects relying on conservative IPCC values if national or local fuel emission standards are not available. Furthermore, it is standard in the CDM to calculate emissions from the biofuel share in blended fuels as equal to zero. Upstream emissions from fuel production usually are not included in these default values and need to be assessed separately. Where upstream emissions from fossil fuels are considered, a conservative default value of 14% (based on L-B-Systemtechnik GmbH, 2002) is often used in CDM methodologies. The authors are not aware of any standard value for upstream emissions from biofuels.

5.4.4 Financing the development of SBLs and default values

Financial support for data gathering would have to be made available internationally to facilitate the development of SBLs or default values. That is because the "common good" nature of methodologies, as well as the significant cost of data gathering, would be considered to be disincentives for project proponents alone to move towards standardization. Support for data gathering will be particularly important in less-developed and least-developed regions, where institutional capacity to gather transport data is low.

Financial resources to develop SBLs in transport could come from the CDM Executive Board (EB), existing carbon finance mechanisms targeted at the transport sector (such as the CTF and GEF) and, in the future, from the financial support for NAMAs, since SBLs and default values for transport will be suitable not just for CDM projects.

5.4.5 Institutional approach for the development of SBLs

The EB could play an active role in the development of SBLs, but the transport expertise in the EB and its support structure would have to be strengthened to ensure that transport will not fall through the cracks of top-down development of SBLs and default values. A special purpose panel under the EB for support and advice on the development of SBLs is recommended.

At the same time, standardization initiatives by other stakeholders should be encouraged, supported and considered by the EB. International financial institutions could play a strong role in gathering and sharing information as part of their past and ongoing project activities. Regional multilateral organizations could coordinate efforts to gather necessary data and develop SBLs or defaults for consideration by the EB.

Where the level of aggregation is confined to a national or regional scope, the EB will have to rely on the existing capacity of national institutions to gather data and will have to adapt the proposed baselines to local data. Capacity building may be necessary.

Designated Operation Entities or another mandated independent agency could verify the database used for standardization through spot checks. Baselines and data collected should also be made available to the public for peer-review and comments early in the process according to current CDM procedures.

5.4.6 Conclusion of the case study

BRT baselines largely depend on modal structure, which differs from city to city, making baselines not easily comparable across projects. In the end, no single benchmark can be developed for BRT interventions, since baseline emissions depend on many different indicators that cannot be easily aggregated into one unit. Nevertheless, further research into default values or benchmarks for modal energy intensity and average trip lengths by mode holds potential for simplifying at least some steps in baseline setting for BRT in the future.

To be reliable and to overcome uncertainties, standardization of transport parameters will necessarily entail complex data gathering. The high local variability of transport systems calls for the use of a larger sample than is necessary in more homogenous sectors in order to ensure comparability. In addition, the rapid dynamics in transport developments in developing countries will require constant updates of SBLs.

Further work is needed to determine the appropriate geographical scope for different standards. A trade-off between simplification through standardization and the ability to grasp local circumstances will always be required. Highly aggregated SBLs would be applicable to high numbers of projects. However, they would not be able to capture regional differences and may thus easily lead to over- or under-crediting of reductions. Neglecting to gather detailed local data could also impair the ability to design locally appropriate transport policies and measures. The objective for standardization to lower transaction costs for individual projects in the longer term could therefore be contradictory to developing locally appropriate transport policies and measures.

Standardized baselines may be able to reduce the transaction costs of CDM projects in the future, but they will not solve the problem of demonstrating additionality for NAMAs, because carbon revenue will always be minimal relative to the overall investments and co-benefits in BRT (and other actions). However, establishment of transport SBLs and default values could also be useful for the development of transport NAMAs and related MRV, as well as for improving the database for transport decision-making in general and improving GHG inventories.

Clearly, standardizing BRT baselines or parts thereof is not a quick-fix solution. It will take considerable time and resources until representative data is gathered and analyzed—and even more time until a benchmark level can be agreed upon. Even then, data on modal split and passenger activity will always have to be project-specific to capture the effects of behavioral changes, such as modal shift.

5.5 Summary of NAMA case studies

Table 10 summarizes the three NAMA case studies in terms of scope; ex-ante GHG reduction estimation; MRV; Finance; and Institutions.

Table 10: Summary of three NAMA case studies

	Belo Horizonte	Mexico City	Jakarta
Scope	Integrated urban mobility plan (BRT, MRT, NMT investments, land-use, road improvements)	Optimization of conventional bus system: Institutional structure Planning Implementation	TDM: Electronic road pricing Parking policies BRT expansion
Ex-ante GHG reduction estimation	Scenario analysis shows approximately 30% emission reduction vs. BAU (0.5 – 0.9 $MtCO_2$/yr); co-benefits also estimated	Estimate emissions in the metropolitan area, establish baseline and reductions	Scenario work based on modeling showed 4-7% reduction in CO_2 emissions compared to baseline at city-wide scale, and about 20-30% for specific project area

	Belo Horizonte	Mexico City	Jakarta
MRV	GHG, based on city-level annual surveys of trips and modal shares, and co-benefits	Output and process indicators: No. of buses VKT of buses Modal split Progress in implementation No modeling	NAMA as part of city-wide approach to mitigation Bottom-up methodology (model by ITB), cross-checked with fuel sales * Includes detailed assessment of data availability and priorities for improvement * Establishing plausible baselines is likely to remain an issue
Finance	Proposal to base amount of (upfront) finance on estimated emission reduction possibility, with multiplier (1.4% of total investment @ 17$/t$CO_2$)	Full financing of barrier removal costs: Information Institutional barriers Social barriers Soft loans for investments	Budgetary support for capacity building to local government. National climate change fund (ICCTF) can provide channel; non-climate sources also possibility
Institutions	Local transport planning, urban planning and finance agency	Ministry of Transport (SETRAVI) and state Ministry, and a regulatory entity to be established; FONDADIN; Ministry of Environment and planning	Local planning/ implementation agencies in cooperation with Deputy Governor; MRV by regional environment agency, in cooperation with national ministry; various options for financial support (e.g., through national NAMA agency)
Scaling up	Replication of NAMA in 40 other Brazilian cities	Adding bus optimization component to national urban transport program	Evolution from supported NAMA to unilateral NAMA to credited NAMA. Roll-out to other cities in Indonesia
Other issues		Possible interaction with development finance	Technology transfer for ERP, capacity building for MRV; NAMA could start as supported, transition to unilateral or credited

6 NAMAs in the transport sector: proposal for a framework

Drawing on experiences with existing instruments (CDM, GEF and CTF), the four case studies, recent literature on climate change mitigation in the transport sector and existing thinking on mitigation levels required from developing countries after 2012, this section discusses a possible way forward for supported NAMAs to be successful in catalyzing a shift towards low-carbon sustainable transport. Focus is placed on supported NAMAs because the immediate potential for credited NAMAs to support the transport sector is small and because unilateral NAMAs, by definition, will not be entitled to external support.

This does not mean that the potential impact of unilateral NAMAs will be smaller than that of supported NAMAs. Huizenga et al. (2010) observe that the impact of currently unreported domestic actions will remain the most important in terms of GHG reductions, notwithstanding increased involvement of other instruments. These unreported domestic actions could possibly become the basis of unilateral NAMAs, and it is important that additional study is conducted on how to formulate and MRV unilateral transport NAMAs.

6.1 Scope

IEA/OECD (2009) conclude that all types of mitigation activities in the transport sector that incorporate the ASI approach (as described in Chapter 1) may be required to enable developing countries to achieve low-carbon transport; therefore, a framework for supported transport NAMAs needs to enable the full range of possible interventions.

The Center for Clean Air Policy (CCAP, 2010a) distinguishes three broad categories of potentially eligible supported NAMAs: 1) planning and research activities that support mitigation actions, such as national or sub-national low-carbon transportation plans, public outreach, development of models, travel surveys and economic studies; 2) regulation and policy development, such as fuel standards, parking policies, congestion pricing and removal of subsidies; and 3) physical and technical infrastructure, such as bus rapid transit systems, bicycle lanes, biodiesel refineries, and transfer of intellectual property rights.

The size of the mitigation challenge in the transport sector up to 2020 and beyond supports the suggestion by Jung et al. (2010) that single NAMAs need to be embedded in a sectoral strategy at the national or city level, which sets an overall course of action. This can be promoted by making sure that different measures not only are compatible but that they also enhance each other. This is consistent with the CTF as well as the current GEF transport approach, both of which attach a high priority to a sector-wide focus. It is also in line with the observed trend that countries are starting to put in place more comprehensive, economy-wide GHG emission reduction strategies. This is an attractive argument for the transport sector, where a range of different measures is necessary to achieve the objectives. (For example, to be effective, parking policies need NMT and public transport incentives as well as the raising of public awareness.)

NAMAs by definition will have to be appropriate to the national context of the country in which they are implemented, yet many transport NAMAs aimed at improving transport systems (e.g., public transport or NMT) are most likely to be local-level NAMAs,[46] while transport NAMAs aimed at influencing standards and technology dissemination are more likely to originate at the national level. Both are equally important elements. A clear national-level guidance, policy or regulation would also enhance the effects of local-level activities aimed at strengthening transport systems. Local context may determine whether having a sectoral strategy at the national level is required in order to have an effective transport NAMA, or whether an integrated strategy at the city level could also establish such policy coherence and support.

A NAMA could, following the concept of sectoral crediting, also cover the transport sector (or a sub-sector) of a country, region or city, in which a bottom-up analysis is undertaken to propose a baseline reference for GHG emissions, and financing is allocated relative to achieving reductions below the baseline, irrespective of the policies implemented to achieve the reductions (Jung et al., 2010). In any case, if a bottom-up sectoral analysis is undertaken, it is recommended that a credible baseline for freight and passenger transport be established. The policies and measures that reduce emissions below this level could be considered NAMAs–unilateral, supported or credited.

6.2 Assessment of NAMA proposals

How can a limited amount of finance, technology and capacity building be allocated to potentially competing proposals from developing countries? All three types of support are likely to be important for NAMAs in the transport sector, and the type and extent of support can be included in the submission of a NAMAs proposal.

With respect to financial assessment of NAMA proposals, cost-effectiveness, as calculated by dividing the full incremental cost of an action by the total GHG reduction over the lifetime of the action, is a logical criterion from the point of view of getting the largest amount of atmospheric benefits against lowest cost. However, for the transport sector, the current concept of cost-effectiveness has limited value due to the following factors[47]:

- Cost-effectiveness cannot be quantified with a high degree of certainty.
- Some actions, such as enabling activities, produce only indirect benefits, even though these are necessary for other measures to take effect.
- Co-benefits (e.g., improved local air quality or reduced congestion) are not taken into account, giving a skewed picture of costs and benefits.

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[46] Local-level NAMAs are also "nationally appropriate" and may not be fundamentally different from actions at the sectoral level, apart from having a smaller scale.

[47] Based on CCAP (2010), which, as an alternative, proposes to look at cost-effectiveness of a bundle of transport measures.

- Many measures have negative cost, particularly when co-benefits for air quality are taken into account (Johnson et al., 2009). Such positive benefits often accrue to society and not to the entities that incur the costs of the actions.
- In many cases, upfront costs for investments in infrastructure are high, and the (monetary) benefits will only be reaped in the longer term. In order to achieve deep cuts in emissions, transformational measures (e.g., infrastructure for electric vehicles or a change in spatial planning) are required.
- Climate finance is only a small part of the total investment in the transport sector. In order to make a difference, it needs to catalyze a redirection of BAU investment towards low-carbon transport.

The draft text for the June 2010 meeting of the AWG-LCA (UNFCCC 2010a) indicates that support for NAMAs would consist of incremental costs linked to the implementation of the NAMA and support related to enhancing capacity for the design, preparation and implementation of such actions. A strict application of the incremental cost criteria for supported NAMAs could have several unwanted consequences for the transport sector.

First, it could discourage countries from undertaking programs with high carbon reductions but with low or negative incremental costs. Within the transport sector, this might lead to a focus on technology-oriented NAMAs because these generally have high(er) incremental costs than do NAMAs that focus on the "avoid" and "shift" parts of the ASI approach.

What's more, it would draw funds away from the transport sector to sectors with relatively higher incremental costs (e.g., energy). All in all, a strict application of the incremental cost criteria could lead to a continued under-representation of transport in mitigation activities. This would be counterproductive to the underlying objective of NAMA as an instrument, which is to change the development path of economies in developing countries to one that produces less carbon.

The incremental cost criterion was originally introduced in the discussion on climate change mitigation strategies to help ensure that: 1) all incremental cost related to climate change mitigation would be covered by developed countries; 2) additional finances would be used only for the purpose of making developmental activities less carbon-intensive; and 3) climate funding would not be used for other more general developmental activities. This approach worked well as long as climate finance was applied to activities in which the actors responded well to economic incentives and where the low-carbon option was more expensive than the traditional approach (e.g., wind energy versus coal). The concept of positive incremental costs also worked well in allocating scarce external assistance to mitigation actions.

With a shift towards broad-based domestic mitigation action by developing countries, the role of the incremental cost concept changes. Governments and other private sector stakeholders are no longer interested primarily in identifying actions with positive incremental costs but are instead interested in identifying and undertaking climate mitigation actions that have negative incremental costs—i.e., win-win situations. To encourage climate action in the transport sector by developing countries, it is important that mitigation analysis clearly demonstrates the policy options for which such negative external costs exist. Such actions could also be the basis for unilateral NAMAs undertaken by developing countries' own resources. International finance (both MDB funding as well as special climate funds such as GEF and CTF) could, however, also be used to support these in order to mitigate the risks associated with high investments and to create an additional "push" for governments to implement the measure. These arguments are also used by the host countries in their investment plans for the CTF.

A second criterion for supported NAMAs mentioned in draft AWG-LCA text is support for "enhancing capacity for the design, preparation and implementation of GHG emission reduction actions" (UNFCCC, 2010a). This type of barrier removal activity is important, but it is unclear whether this would generate emission reductions in the transport sector on a scale as that suggested by a 2° Celsius temperature stabilization scenario. The chances that developing countries will undertake comprehensive mitigation action will be enhanced if assistance for barrier removal is combined with investment support.

Considering the scale of the mitigation required in the transport sector in developing countries and the comprehensive and integrated nature of different types of mitigation measures, it will not be advisable or practical to think of supported NAMAs as a separate category of measures under which investment support would be limited only to activities aimed at improving technical performance of vehicles and fuels because of their expected positive incremental costs. This would undermine the new ASI paradigm for climate action in the transport sector.

The attractiveness of a supported NAMA would increase if it had provisions that promoted the replication or scaling up of activities supported by the NAMA, which in turn would trigger further emission reductions. This aspect is reflected in the indirect emissions reductions achieved by GEF projects and the transformational impacts of CTF projects. NAMA proposals might also consider making an assessment of such broader impacts.

It is clear that abandoning the traditional cost-effectiveness approach as well as the positive incremental cost criterion would require the development of new and more appropriate evaluation criteria for supported transport NAMAs. A key element in such a new appraisal methodology would be to analyze how support for investment costs would leverage or catalyze domestic climate action in the transport sector, and how NAMA support would increase emission reductions below BAU. A thorough understanding of economic (e.g., investment risk) and non-economic (e.g., uncertainty related to consumer behavior) barriers of the proposed NAMA could be part of such an assessment and its methodology.

6.3 Acknowledgement of co-benefits

Apart from GHG reductions, important policy goals associated with transport projects include congestion and noise reduction, as well as road safety and air quality improvement. Co-benefits are of special significance in the case of various transport programs and measures, and they can play a decisive role in determining whether a measure with a certain GHG emission reduction potential will or will not be implemented. In addition, the co-benefits to be realized can influence the scale of a program. Thus, the importance of recognizing the co-benefits associated with projects, either qualitatively or in quantitative terms, has been increasingly acknowledged.

A full acknowledgement of co-benefits, however, would have to go beyond recognition of co-benefits to include a certain reward for realizing those co-benefits. This could be achieved by making the amount of overall financial support contingent on the degree to which co-benefits are being realized, whereby realized co-benefits would result in a premium on top of the support received for reducing GHG emissions. Linking overall financial support to co-benefits realized would be justified based on the likely indirect GHG impact that the action would have due to its replication potential. It would not affect the environmental integrity of the NAMA (i.e., misrepresentation of GHG emissions reduced), as the amount of GHG emissions reduced and reported for inclusion in the NAMA registry maintained by UNFCCC would be the same whether co-benefits were rewarded or not. Rewarding co-benefits would be one of the best ways to help ensure that the transport sector could participate fully in NAMAs. If co-benefits are to be recognized and rewarded in transport NAMAs, then they need to be part of the MRV of the NAMA, which means that they need to be part of the ex-ante, the intermediary and the ex-post MRV framework (see below). The improved data availability and quality that is required for MRV of supported NAMAs should also be able to generate quantified estimates of selected co-benefits.

6.4 MRV

Assessment of GHG emissions under the MRV for transport NAMAs could consist of a combination of bottom-up modeling, based on the ASIF concept, and top-down approaches, such as fuel sales. However, a particular problem for transport NAMAs, especially for bottom-up modeling, is the requirement for data. In many cases, complete data will not be available at the start of a project (CCAP, 2010b), and many assumptions will need to be made. To address the data problem, consideration could be given to the use of default values to describe the impacts of certain interventions. Lessons can be learned from the GEF GHG manual for transport (GEF-STAP, 2010), which will include default values.

There remain serious questions whether a methodological approach with so many uncertainties can be used for arriving at a reliable estimate of emission reductions if these are often expected to be less than 10% below the BAU scenario[48]. To illustrate, Gotha (2010) shows that transport emission estimates and vehicle ownership in India differ strongly, including for studies covering same years.

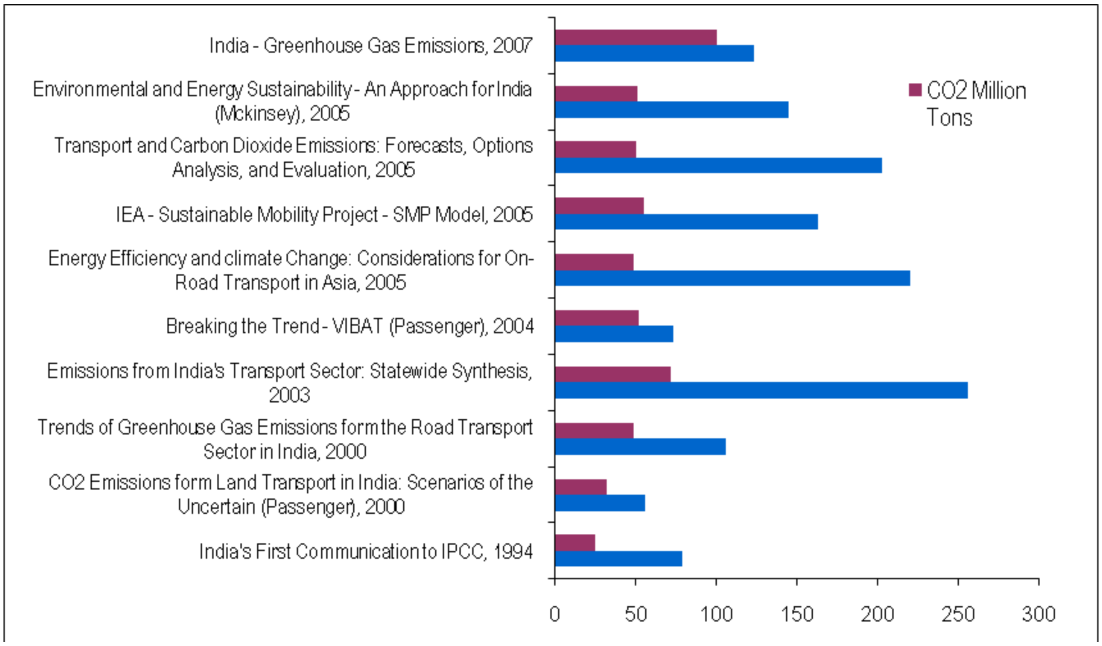

Figure 9. Vehicle numbers and CO_2 emissions in India

Source: Sudhir Gotha http://cai-asia.blogspot.com/2010/05/india-transport-emissions-2007.html

MRV of sector-wide NAMAs based on proposed sectoral emissions baselines could circumvent some of these methodological problems, as the baseline could directly be compared to a single output parameter of GHG emissions derived from a measure such as fuel sales. The difficulties, however, are shifted to some degree to the setting of an acceptable reference baseline in the (prior) proposal stage of the NAMA, for which acceptable forecasts would be required on the number of vehicles, technological level and distance travelled (Jung et al., 2010). In addition, small impacts of single measures may not be visible at the sectoral level; therefore, this may be a feasible approach only when a comprehensive sectoral implementation plan is in place that ensures significant deviation from the baseline.

Given the complexity of GHG MRV, other options for indicators or metrics could be considered. This could also help to address the time lags that occur in several cases before measures are effective in reducing emissions (e.g., Jung et al, 2010). These alternative metrics would include output indicators (e.g., number of vehicles, share of biofuel in the mix, modal split, quantity of infrastructure built, etc.) or process indicators (e.g., existence of transportation planning). For each

48 The U.S. Department of Transport (2010) estimates that many of the possible mitigation strategies in the transport sector will, on the short to medium term, have emission reductions of less than 10%.

type of action, suitable indicators could be developed that together would define the impact of the transport NAMAs. This approach would require an internationally established consensus on the existence of causal linkages between specific indicators, and it might also require consensus on the expected quantified GHG emission reductions in specific operational conditions.

Such an approach would most likely make it easier to integrate the MRV for capacity building support and technology transfer in an overall MRV framework for transport NAMAs. The results of three NAMA case studies (Belo Horizonte, Jakarta and Mexico City) indicated the importance of including strengthening of data-gathering capacity as part of a supported NAMA. It would also be good for the transport sector if assistance were available to support the development of a NAMA—and especially its MRV—prior to the formal submission of a NAMA request.

6.5 Institutions

The institutional structure for NAMAs is still evolving, both at the national and the international level. From the perspective of the transport sector, it is important that the future NAMA design adequately acknowledge and address the multi-sectoral character of the transport sector, which will require well-defined institutional coordination mechanisms. Also, local governments in most developing countries are responsible for the development and management of the transport sector. The future institutional structure for NAMAs will need to reflect these institutional mandates and support actions at both the national and local level.

The final design of the MRV framework for transport NAMAs will have implications for the international institutional framework for NAMAs in general. Apart from the regular review function of NAMA proposals, there is expected to be a need for a panel of experts who, if an MRV framework based on bottom-up modeling-based methodologies is adopted, would review default values on a regular basis. If an MRV framework is chosen that makes use of output or process indicators, an expert panel will be needed to determine acceptable indicator categories and their relative weight.

6.6 Finance

When discussing financing of transport NAMAs, a distinction needs to be made between the financing of individual transport NAMAs and the overall funding for supported transport NAMAs as part of the funding of all supported NAMAs. In setting the level of financial support for a transport NAMA, it is important to decide whether the support is linked to the emission reductions achieved (see the Belo Horizonte case study) or whether the support is based on other criteria, as is currently the case with the GEF and CTF. Linking the level of support to emission reductions realized will strengthen the environmental integrity of the NAMA. In the Belo Horizonte case study, a multiplier was introduced to increase the emission reductions so as to ensure a difference with current CDM schemes (the multiplier can be a negotiated value). Linking payments to direct GHG emissions, however, will be more difficult if financial support for the NAMA is intended mainly to enhance capacity for the design, preparation and implementation of GHG emission reduction actions.

In addition to the amount of financial support allocated to a specific supported transport NAMA, the timing of when such funding is made available is also important. Unlike the case of CDM, it is recommended that funding for supported NAMAs be made available upfront. Providing a substantial part of the NAMA support upfront makes it more difficult to link the provision of NAMA support to the realization of GHG emission reductions. This is a similar problem encountered in the methodologies that are being developed by GEF and CTF; both focus essentially only on the ex-ante assessment of GHG emission reductions, and there are no mechanisms built in that substantially alter the level of support if objectives of the project are not realized. The Belo Horizonte case study proposes a system of bonuses and penalties to ensure that ex-ante estimated emissions, on which financial support would be provided, are actually realized.

To ensure a representative coverage of transport under future NAMAs, allocating a specific portion of future NAMA funding to the transport sector could be considered. This would be similar to the “allocated demand” principle described above for CDM. The Bellagio Declaration on Transportation and Climate Change and CCAP (2010a) propose a specific window within the funds for transport, in order to ensure that the sector does not get crowded out due to competition with other sectors. The principle of sectoral allocations already is used by GEF under its different Strategic Programs; GEF 5 is expected to allocate USD 250 million to transport.

NAMA financing will only cover a small part of the cost of individual programs or projects to which transport NAMAs will contribute. Based on an assessment of current financing structures for transport in developing countries, the contribution of climate finance to the development of sustainable, low-carbon transport in developing countries is likely to be modest compared to other financing sources. The largest source of funding will be domestic financing from the public and private sector in the developing countries. The second-largest source of funding will be the MDBs, several of which will increase their funding for transport significantly in the coming years.

The impact of providing, in overall terms, limited climate finance through NAMAs will not substantially alter the trajectory of GHG emissions in the transport sector. This means that the overall impact that NAMA funding could have in the transport sector depends on how much it can leverage other financial flows, particularly domestic financing. NAMAs will therefore have to ensure that activities supported in the transport sector address barriers that might prevent the replication and scaling up of the activities supported through the NAMA. It is equally important to develop agreement on how the objectives of climate instruments can complement objectives for other funding streams in the transport sector, and how impact assessment methodologies can be harmonized.

6.7 Summary

NAMAs can be an important instrument to support developing countries in mitigating climate change in the transport sector. For NAMAs to be effective in achieving comprehensive change, they should incorporate all three components of the ASI approach. The impact of transport NAMAs will increase if they cover larger parts of the transport sector.

The traditional cost-effectiveness approach, as well as the positive incremental cost criterion as currently suggested in the draft negotiation text on a post-2012 climate agreement, will hamper the participation of the transport sector. Therefore, it is suggested that new and more appropriate evaluation criteria for supported transport NAMAs be developed.

Co-benefits are of special significance in the case of various transport programs and measures, and they can play a decisive role in determining whether a measure with a certain GHG emission reduction potential will be implemented. Therefore, it is important that co-benefits are included in the design of transport NAMAs and that they also are part of the MRV and financial support framework for NAMAs.

MRV for supported transport NAMAs is dependent on often-incomplete and unreliable data. It is suggested, therefore, that determining the GHG emission reductions could be based on proxy indicators instead of on direct assessments of GHG emission reductions.

The institutional structure for NAMAs will need to be guided by the activities included under NAMAs. The trend towards more comprehensive emission reduction programs based on the ASI approach can result in more complex structures.

Financing of supported NAMAs could be linked to the amount of GHG emissions reduced by the NAMAs, with a substantial part of the funding made available upfront. It is important that NAMAs also be able to contribute towards capital investment costs and not just barrier removal costs. The MRV for the NAMA can build in provisions that would reward or sanction the implementers of the NAMA in case GHG emission reductions deviated from the upfront estimated GHG emissions reductions. For removal of barriers, the full incremental cost can be funded, and only monitoring of the implementation would be necessary, as ex-post assessment of GHG reductions probably would not be possible.

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