Applicability of post 2012 climate instruments to the transport sector

Final Consultants Report, July 2010

Cornie Huizenga, Stefan Bakker

This publication was prepared by consultants at the request of the Asian Development Bank (ADB) and the Inter-American Development Bank (IDB).

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
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
CTF	Clean Technology Fund
DALY	disability-adjusted life-year
EF	Emission factor
ERP	electronic road pricing
GEF	Global Environment Facility
GHG	greenhouse gasses
$GtCO_2$-eq	giga ton CO_2 equivalent
IDB	Inter American Development Bank
IEA	International Energy Agency
IPCC	Intergovernmental Panel on Climate Change
MAC	Marginal abatement cost
MDBs	multilateral development banks
NAMAs	nationally appropriate mitigation actions
NMT	non-motorized transport
OECD	Organization for Economic Cooperation and Development
PoA	Programme 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

Contents

Executive Summary

1. Discussions on existing and future climate instruments are ongoing in the international climate and development communities. This Climate Instruments for the Transport Sector (CITS) study, commissioned by the Asian Development Bank (ADB) and the Inter-American Development Bank (IDB), gives an assessment of the current state of affairs with regard to the impact on the transport sector in developing countries by the Clean Development Mechanism (CDM), Global Environment Facility (GEF) and the 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 scale-up of climate finance and capacity building, particularly by the use of Nationally Appropriate Mitigation Actions for the transport sector.

2. Transport is responsible for an important and growing part of global greenhouse gas (GHG) emissions with most of the future increase in emissions coming from developing countries. To keep global mean temperature increase below 2 degrees Celsius, as suggested in the Copenhagen Accord, developed countries will need to reduce emissions 25-40% below 1990 levels by 2020. In addition, developing countries would need to reduce GHG emissions of 15-30% below Business as Usual (BAU) by 2020. For the transport sector this would translate to 0.6-1.3 $GtCO_2$-eq/yr reduction by 2020. For comparison, Europe's total transport emissions were 1 $GtCO_2$-eq in the year 2000.

3. In the light of overall global GHG emission reduction targets of over 50% below 1990 levels, it can be expected that significant emission reductions are required in the transport sector in developing countries over the period 2020-2050 compared to a business-as-usual scenario. The manner in which developing countries develop their transport systems in the period up to 2020 will greatly determine the extent to which such larger emission reductions in the period 2020-2050 can be achieved.

4. Many countries, including developing countries, have started to issue policies and are taking 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 is however a growing number of scenario analyses for the transport sector which indicate that such emission reductions are feasible in the transport sector, in particular as in the transport sector, many co-benefits exist with air quality, congestion policy and energy security of supply.

5. There is a shift in thinking on how to best mitigate climate change in the transport sector away from a focus on purely technological fixes to include measures aimed at modal shift and avoidance of travel. The avoid-shift-improve (ASI) approach with its more broad understanding of mitigation is resulting in transport policies and programs which can enable developing countries and cities in limiting the growth in GHG emissions from both passenger and freight transport. Most of the measures generally considered under the ASI components have already been successfully applied in one or more developing countries and are now ready for replication and scaling up. More effective action on climate change in transport is also helped by a growing

understanding of methodological challenges related to climate change mitigation in the transport sector including the development of tools to assess GHG emission reductions in transport These developments could facilitate structural change of the transport sector in the developing countries. As a next step decision makers in developing countries will need to fully understand the emission reduction potential of various types of measures, especially the Avoid and Shift option. A second step is to assess what is the best mix of policy and institutional development as well as investments.

6. External assistance for developing countries could help to more quickly replicate and scale up GHG emission reduction activities in the transport sector. Such external assistance is required for capacity building and policy development but also for additional demonstration projects and infrastructure funding to leverage domestic funding. Such assistance to adopt a more low-carbon growth trajectory for the transport sector can come from existing special climate funds or mechanisms: CDM, GEF or CTF, or from development agencies especially the Multilateral Development Banks (MDBs). In addition there are new climate instruments under development, which include nationally appropriate mitigation actions (NAMAs), sectoral approaches, low-emission development plans and a Technology Mechanism. Of these, the discussion on NAMAs is the most advanced, but each instrument could play role in climate change mitigation, including the transport sector.

7. The overall impact of the existing climate has been modest in terms of direct emission reductions. For the GEF and the CTF, this is due to the size of overall funding for these instruments and the percentage of funding allocated to the transport sector which are too small to create transformational change in the transport sector. For the CDM, competition for funding between sectors in which transport sector has not been able to become one of the winners due to methodological requirements for GHG emissions reductions assessments and perceived costs and complexity of reducing transport GHG emissions are among the explanations.

8. 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 a realignment of funding priorities in transport sector away from road construction make it likely that MDBs can play a substantial role in assisting developing countries to replicate and scale up sustainable, low carbon transport policies, programs and projects. There appears to be a shared awareness that comprehensive approaches covering large parts of the transport sector will be required to best realize the mitigation potential in the transport sector. This is best characterized by the transformational approach currently promoted by the CTF.

9. CDM, when it continues beyond 2012, will most likely be implemented in the same manner as currently. A lowering of the transaction costs and a greater use of Program of Activities (PoA) carry some promise for the transport sector. Overall the role of CDM will remain limited due to its more stringent requirements for assessment of GHG emissions reductions compared to GEF, CTF and future climate mechanisms. The case study on standardized baselines revealed the difficulty to come 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 standardised values for vehicle characteristics, which may be useful for other climate instruments than CDM as well.

10. Although details are still missing, post-2012 climate instruments, particularly NAMAs, offer potential to strengthen climate change mitigation in the transport sector in developing countries. This is helped by the expected availability of considerably larger financial support:

$30 billion from 2010 to 2012 for mitigation and adaptation and $ 100 billion per year by 2020 for mitigation. Although international mechanisms can catalyse 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 MDB to catalyze and leverage domestic funding. There is a need for different funding streams to become truly complementary instead of operating in parallel. It is likely that in the future there will be more blended funding whereby external funding continues to be focused around MDB funded projects. To enable such blended funding arrangements institutional objectives and methodologies need to be in line with each other to be able to optimally leverage change. It may require a special sectoral window for transport to 'ring-fence' funding for this sector.

11. Case studies based on the ASI approach were carried out under the CITS project to explore how urban transport policies and programmes can be developed as supported NAMAs, Issues related to scope, institutions, finance and monitoring of NAMAs are covered. The case studies are: transport demand management by road pricing, parking policies and public transport in Jakarta; optimisation of the existing conventional bus system in Mexico-city and an integrated mobility plan covering investments in non-motorised and public transport infrastructure and combined land-use in Belo Horizonte. Another case study was done in Hefei to assess the potential for standardized base lines for public transportation, an important potential component for reducing the complexity of methodologies for assessing GHG emissions reductions. These case studies show that there are substantial local and global environmental benefits associated with the analysed urban transport NAMAs, as well as economic and social benefits.

12. Many of the policy options under the ASI approach are consistent with sustainable development and would generate substantial co-benefits related to reduced congestion, air pollution, road safety and fuel security. In fact many of these options are expected to be taken because of these co-benefits rather than the climate impact. These co-benefits therefore can play a decisive role in determining the extent to which a transport measure will be implemented. It is important therefore that supported NAMAs better acknowledge the importance of co-benefits than the existing climate instruments. A full acknowledgement of co-benefits needs however to go beyond recognition of co-benefits and will have to include a certain reward for realizing co-benefits. This could be realized by making the amount of overall financial support contingent on the degree in which co-benefits are being realized. To do this would require practical methodologies to monitor these co-benefits as part of a future MRV system.

13. A continued emphasis on incremental costs as one of the main criteria to decide on investment funding of supported NAMAs may further limit funding for climate change mitigation in the transport sector, which is known for its limited responsiveness to economic incentives and methodological challenges for assessing incremental cost. These challenges include properly taking into account the typically high investment costs and associated risks, implementation uncertainties and implementation costs, such as the preparation of policies and awareness campaigns. A strict application of the incremental cost criteria could discourage countries to undertake programs with high GHG reductions but with (apparently) low or negative incremental costs. Within transport it might lead to a focus on vehicle and fuel technology oriented NAMAs because these have generally high(er) incremental costs than NAMAs which would focus on the "avoid" and "shift" parts of the ASI approach. A new appraisal methodology will need to be developed to assess support to investment costs under a supported NAMA, which assesses how the NAMA would leverage or catalyze domestic climate action in the transport sector, and how it reduces emissions below BAU. This would need a thorough understanding of economic

(e.g. investment risks and implementation costs) and non-economic (i.e. political and consumer uncertainties).

14. Support for barrier removal and capacity building can help developing countries to catalyze the formulation and implementation of sustainable, low carbon transport policies, programs and projects. It is expected however 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 be required as well in order to mitigate risks associated with the high investments and the uncertainty of consumer behavior, and to create an additional incentive to governments to implement and maintain the measure.

15. Measuring, reporting and verification (MRV) should facilitate NAMAs rather than being a barrier. MRV of transport NAMAs could be facilitative by providing policy feedback on the successfulness and effectiveness of actions and provide a basis for sharing experiences. It also can 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 behavioural changes.

16. The case studies however demonstrate the complexity of MRV, in a context of limited availability of reliable data, which makes it hard 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 needs to be flexible and requires different types of indicators. The transport data availability and quality in most developing countries will determine the complexity of MRV approach that can be applied. The MRV approach should be based on generally available data, or data that can 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, are needed to enable ex-ante and ex-post estimation of emissions. In some cases dedicated surveys may also be used to assess the ex-post emission reductions. To ensure that transport mitigation efforts enabled by external assistance are of sufficient scale, the use of a range of MRV approaches should be allowed, including both direct GHG assessments as well as the use of proxy indicators.

17. Financing of supported NAMAs could be linked to the amount of GHG emissions reduced by the NAMAs, and a substantial part of the funding can be made available upfront, based on ex-ante emission reduction analysis. The MRV system for the NAMA can build in provisions that would reward or sanction the implementers of the NAMA in case GHG emission reductions deviate from the up-front estimations. 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 of such actions is not likely to be possible.

18. Considering the complexities of the transport sector we recommend setting up pilot projects and programmes of transport NAMAs. This will result in experience that is needed to make sure the transport sector achieves a share of the NAMA funding in proportion to its share in emissions, thereby avoiding the current virtual absence of transport in the CDM. This can already be done in the period 2010 – 2012 while making use of either fast track funding under the Copenhagen Accord or alternatively making use of other climate funds administered by MDBs or other organizations. The scope of the piloting should be amongst others on:

a) Suitability of NAMAs to promote measures under ASI approach for both passenger and freight transport.

b) Alternative MRV approaches, e.g. the use of proxy indicators vis-à-vis GHG assessments, or the integration of co-benefits in MRV procedures;

c) The development and testing of alternative assessment methodologies of the costs of NAMAs and their eligibility to be part of NAMA funding;

d) The use of NAMAs in support of specific investment programs e.g. Bus Rapid Transit (BRT), Infrastructure for walking and cycling versus NAMAs which are directed towards policy formulation, institutional strengthening and capacity building;

e) The use of supported NAMAs as stand-alone programs versus linking NAMAs to larger investment programs funded by MDBs; and

f) The relationship between supported NAMAs, unilateral NAMAs and credited NAMAs, and low-emission development strategies;

g) Exploring the possible application of the Technology Mechanism to the transport sector,

h) The role of capacity building

19. Such piloting should be conducted in a coordinated manner and results should be documented and shared widely with both United Nations Framework Convention on Climate Change (UNFCCC) and non-UNFCCC entities. The SLoCaT Partnership and the Bridging the Gap Initiative can play an important role in documenting and sharing the results of transport NAMAs. The initiative and involvement of developing country parties will be crucial, as isthe embedding in development strategies. Piloting transport NAMAs can be an important input in the development of detailed NAMA guidelines and can possibly help to ensure that the transport sector is appropriately represented in mitigation efforts in support of a post 2012 climate agreement.

1 Introduction

20. Although as of June 2010 the specifics of the post-2012 climate regime are far from clear, the new architecture is expected to open a new window for more ambitious greenhouse gas (GHG) emissions reduction actions. In order to achieve global long-term climate change mitigation objectives, it is essential for the transport sector in developing countries to 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 which 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 scale of emission reductions, lower barriers and reduce transaction costs, while maintaining the environmental integrity.
- *Emission Reductions which can be reported directly by developing countries to UNFCCC*. One instrument being discussed for this purpose is NAMAs.

21. The post 2012 Climate Instruments in the Transport Sector (CITS) project implemented by the ADB, in cooperation with the Inter-American Development IDB, 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. The CITS project is a contribution to the Partnership on Sustainable, Low Carbon Transport (SLoCaT)[1].

22. The CITS project is implemented over the period September 2009 – June 2010 and has the following outputs:

a) Synthesis of information on the GHG reduction and co-benefit potential of transport interventions and existing and planned climate change mitigation instruments. This includes the CDM, GEF, CTF and NAMAs;

b) 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;

c) 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.

23. This final report is based on the Interim Synthesis Consultants report released in December 2009 (Huizenga and Bakker, 2009), the four case studies mentioned above and discussions with a number of experts. The full reports of the case studies are available at www.slocat.net.

[1] The SLoCaT Partnership encourages its members to implement activities which improve the knowledge on sustainable low carbon transport, help develop better policies and catalyze their implementation, see www.slocat.net.

24. The format of the report is as follows. Chapter 2 explains the emission 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 assistance provided by MDBs for their effectiveness and relevance to the transport sector in terms of GHG emissions reductions. An overview of the discussions on post 2012 climate instruments and their significance for the transport sector is given in Chapter 4. A synopsis of the four case studies carried out under the CITS project is given in Chapter 5. Based on these discussions, Chapter 6 gives a proposal for NAMAs in the transport sector.

25. The report was written by Cornie Huizenga, Partnership for Sustainable Low Carbon Transport, and Stefan Bakker, the Energy research Center of the Netherlands, with support from the authors of case studies: EMBARQ/Word Resources Institute (Dario Hidalgo), for the Belo Horizonte case study; Wuppertal Institute (Frederic Rudolph, Urda Eichhorst and Wolfgang Sterk) for the Hefei case study; Transport Research Laboratory (Holger Dalkmann and Ko Sakamoto) for the Jakarta case study; and Ecofys (Martina Jung and Christian Ellermann) for the Mexico case study. The CITS project is guided by Jamie Leather and Sharad Saxena in ADB and Rafael Acevedo-Daunas, Maria Cordeiro and Vera Lucia Vicentini in the IDB.

2 CO_2 emission reductions in the Transport Sector

2.1 What is needed and what is being done?

26. The Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPPC) 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 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 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 25-40% compared to 1990 levels for developed countries, while the contribution by developing countries needs to be 15-30% compared to business as usual (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 where approximately 1 $GtCO_2$-eq (IEA, 2008)

27. Transport emissions are caused by transport of passengers and by transport of freight.[4] Substantially changing the trend for GHG emissions from transport will require the adoption of a range of available and new technologies as well as changing 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, pledged targets for GHG emission reductions. Fewer countries have also developed targets or goals 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 emission reduction targets for developing countries are usually framed in reductions against BAU scenarios or in terms of reducing GHG intensity per unit of GDP. GHG emission reductions for developing countries are in several cases 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 the transport sector are often expressed in terms of improvements in energy efficiency.

---

[2] This is based on a maximum concentration of GHG of 450 ppm in the atmosphere. Some climate scientists like 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 in 2005, which can be interpolated to 9.4 Gt in 2020, of which the non-OECD countries would take 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 the transport sector

Country	National Target	Transport 2020 target and main policies
EU	20 to 30% reduction by 2020 compared to 1990 levels[a]	• Sectors such as transport and agriculture which 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 2020[a]	
Japan	25% reduction by 2020 compared to 1990[a]	• Sectoral plan for transport under preparation[c]
South Korea	30% emissions reduction target with respect to projected baseline emissions by 2020[a]	• 33-37% below BAU by 2020, equivalent to 20~24% reduction by 2020 compared to n 2005 GHG emissions[d] -
Bhutan, Costa Rica, Maldives and Papua New Guinea	Carbon neutral by 2020[a]	• No details provided on implementation in the transport sector
Brazil	Emission reductions of 36.1% to 38.9% with respect to baseline by 2020[a]	
China	40-45% reduction of CO_2 emissions/GDP below 2005 levels by 2020[a]	• Reduction in energy consumption commercial trucks on a per unit basis 16% compared to 2005 • Reduction in energy consumption commercial ships on a per unit basis 20% compared to 2005 • Reduction in energy consumption commercial buses per units basis 5% compared to 2005[e]
Indonesia	26% to 41 % below BAU in 2020[a]	
India	Reduce by 2020 the emissions intensity of its GDP by 20-25% with respect to 2005 levels[a]	
Mexico	30% reduction with respect to BAU by 2020[a]	• Emission reductions of 11.35 Mt CO_2e from 2008-2012. It estimates the emissions of the sector for 2020, 2030 and 2050 as 186.5 MtCO2e, 185.0

Country	National Target	Transport 2020 target and main policies
		MtCO2e and 128.0 MtCO2e, respectively
Singapore	16% below BAU by 2020[a]	
South Africa	A 34% reduction with respect to baseline by 2020 and a 42% reduction below BAU by 2025[a]	

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

28. The nature of sustainable transport policy measures varies, but they can generally be seen to contribute to at least one of three fundamental strategies, which collectively are known as the Avoid-Shift-Improve approach (Dalkmannn and Brannigan, 2007):

- Avoiding the need to travel (Avoid);
- Shifting travel to more sustainable modes (Shift); or
- Improving the efficiency of modes (Improve).

29. Transport policy instruments can be further divided into categories: planning, regulatory, economic, information and technological, as shown in Figure 1.

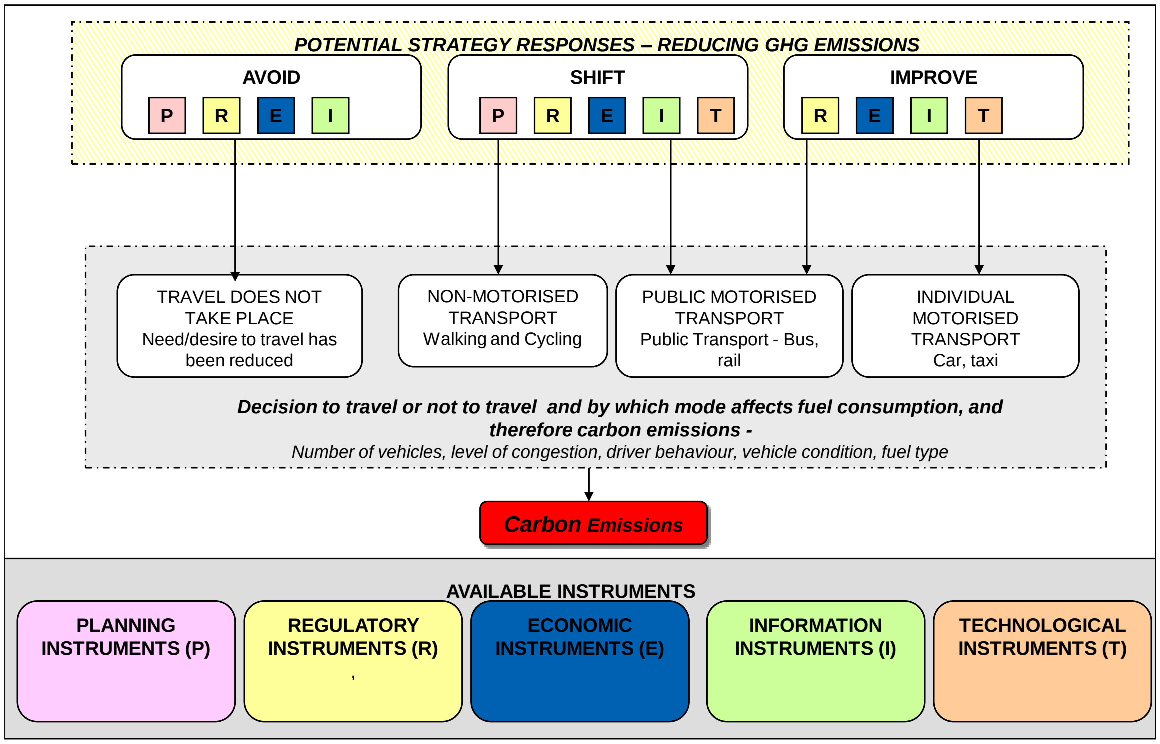

Figure 1: Strategies and instruments to reduce carbon from transport (Dalkmannn and Brannigan, 2007).

30. Transport policy measures can be implemented at different policy levels. Local policy often has a large degree of autonomy when it comes to issues such as parking and public transport, while regulatory standards guiding fuel efficiency are mostly directed by national level institutions. 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 taken at the national level, but often times coordination at the local level is needed (i.e., if a logistic platform it to be built). Moving towards sustainable transport can be done through projects, programmes or policies[5]. A sustainable transport approach requires comprehensive packages of interventions at all levels (national, local and others if applicable).

31. It should be noted that there is also a time dimension: the impact of measures on emissions in time differs for different policies and measures. The impact of improve policies and measures is usually more short-medium term when it concerns the introduction of available technologies. Radical technological change, e.g. large scale introduction of fuel cell vehicles and 4 wheeled electric vehicles are a long term change. Shift policies can have short or medium term change when it concerns behavioural change and alternatives are available, e.g. public transport and NMT infrastructure but may be medium to long term if they require the provision of

[5] A project is a single activity clearly defined in space and time. A programme 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).

large scale investments, e.g. the construction of rail infrastructure for freight transport. Avoid policies and measures usually have medium or long term impacts.

32. In current policy efforts as well as published literature on potential of emission reductions in transport, the category 'Improve' still dominates. Marginal abatement cost (MAC) curves for developing countries developed in the late 1990s and early 2000s in the framework of CDM strategies, 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 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 which 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 economic and financial analysis underpinning policy making and investment planning reflects all three components of the ASI approach.

33. In its overall potential assessment the IPCC in the fourth assessment report concludes '(t)he mitigation potential by 2030 for the transport sector is estimated to be about 1600–2550 $MtCO_2$ 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). It however acknowledges that integrated transport and land-use strategies including transport demand management and modal shift measures can be effective if rigorously implemented and supported. It also notes that the demand for vehicles, vehicle travel and fuel are significantly inelastic and therefore price increases need to be substantial to make a difference in GHG emissions. The IEA (2009b) in a forecasting study concludes that: "overall, with the efficiency, low-GHG fuels and advanced vehicles, and modal shift taken together, in the BLUE Map/Shifts scenario CO_2 emissions in transport are cut globally by 40% in 2050 compared to 2005, and by 70% compared to the baseline in 2050 This represents a 10 Gt reduction from the 14 Gt that would otherwise be emitted by the transport system in 2050 in the Baseline and a 14 Gt reduction compared to the 18 Gt in the High Baseline".

34. In recent studies the need for policies focusing on 'Avoid' and 'Shift' in order to achieve the necessary emission cuts is further acknowledged (Johansson, 2009; Hoen et al., 2009). Overall, 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.

---

[6] Andreas Merkl of the Climate Works Foundation announced at the recent ADB Transport Forum (May 27th to 29th 2010) that McKinsey with support from Climate Works is currently also working on a new global Marginal Abatement Cost Curve for transport which will include modal shift and behavioral change (Merkl, 2010).

35. It is generally acknowledged that, compared to technological options[7], the barriers for the options involving behaviour change are not as well understood and the reduction potential for these options is therefore 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 behaviour changes and modal shift. The abatement cost per tonne of CO_2 for these types of measures however is often low, or negative, even excluding co-benefits (OECD, 2005).

36. A recent study submitted by the USA Department of Transportation (2010) describes emission reductions up to 2050 that can be achieved by a range of measures: introduce low-carbon fuels; increase vehicle fuel economy; improve transportation system efficiency; reduce carbon-intensive travel activity; align transportation planning and investments to achieve GHG reduction objectives; and price carbon. Another multi-stakeholder study "The Moving Cooler" study (Cambridge Systematics, 2009) estimates the potential effectiveness of strategies to reduce GHG emissions 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), or 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.

37. The bulk of the studies related to mitigation in the transport sector is still for Annex I countries. Also these studies are most often more detailed in their quantitative and qualitative analysis than studies for the developing world. 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 on 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.

38. There has been recently an increase in studies which assess the mitigation potential in especially passenger transport sector in developing countries in more depth. Most of these recent studies address mitigation options include activities that fit in with the "shift" and "improve" component of the Avoid-Shift-Improve 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 from 'avoid' strategies, 5.5 from 'shift', and 4.8 from 'improve', with system abatement costs 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 Climatico 2008-2012, PECC) includes a transport cost curve for Mexico which covers, among others, 9

---

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

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

transport interventions (urban densification, BRT system, NMT, bus system optimization, vehicle fuel efficiency standards, Inspection and maintenance, border vehicle inspection, road freight logistics, railway freight) (Johnson et al. 2009).

- In a study for East Asian countries, the World Bank (2010) estimates a potential of 35% reduction 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 (TDM) (7%), and fuel standards in line with the EU targets (15%).
- Analysis of emission reduction potential in the transport sector conducted by the WB 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% through fuel switching, 16% through improved vehicle efficiency and 14% through demand management (BRT – LRT).

39. 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). To enable comprehensive GHG emissions reduction policies and programs there is however a need for much more analysis. The relative lack of detailed studies in developing countries so far may be explained by lack of resources, general low data availability on the transport sector, as well as a generally low priority towards GHG reduction as a goal in itself for governments in developing countries (Leather, 2009). More comprehensive policy analysis would have to include routine ex ante and ex post evaluations of the impact of policy interventions. This requires more detailed activity data and time series then are currently available in most developing countries, and would also include information on consumer behavior at the local level. Creating such data sets is resource intensive and requires significant capacity building and overhaul of transport data collection procedures and mechanisms.

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

- Rapid population growth and urbanisation
- A lower, but fast 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-motorised 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

41. Leather (2009) notes the potential for developing countries to leap-frog to integrated cleaner transport systems, rather than follow the same unsustainable path as developed

countries have done. The more intense transport problems developing countries face, the more likely this may provide an opportunity to move faster to a sustainable transport future.

2.3 Incremental cost of mitigation options

42. In the previous section we mentioned a number of mitigation studies. Incremental cost is a central concept in several of these studies and in the discussion on climate mitigation in the transport sector in general.[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.

43. First of all there is the question: what can be considered 'mitigation'? Reduction of emissions in the future implies one or more reference or baseline scenarios against which the GHG abatement is achieved. In transport sector studies, future emission trajectories are often based on historical trends (in contrast to an economic optimisation). Based on a correlation between economic growth and transport demand or projected vehicle stock, the total future transport volume in person/tonne-km is projected. The modal shares, fuels, technologies and emissions are further calculated based on historical trends in modal shares, projected vehicle sales and assumptions such as fuel prices, fuel efficiency improvements and elasiticities (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 achievements to reduce emissions below the baseline projection would be called mitigation. This is generally how national mitigation policies in the transport sector are being studied and designed.

44. This baseline approach for transport is different from e.g. the electricity sector, for which economic optimisation models are used to determine what electricity mix will fulfil the demand in the most cost-effective manner. This can be done as the electricity sector is very responsive to economic incentives, while non-economic aspects such as comfort or status are hardly an issue. For transport such an approach would be very difficult to carry out as this would mean all considerations by consumer would need to be translated into economic parameters. The baseline approach based on historical trends is therefore a pragmatic one..

45. Incremental cost (or abatement costs) represents the additional costs of resources that are aimed at reducing GHG emissions. These resources are measured against a 'no action' reference in which the economy follows its normal development (UNEP, 1999). Anable (2008) notes however that for transport policies (carbon reduction) cost effectiveness is of limited value, as carbon is usually not the main policy objective.

46. Costs of abatement options can be calculated from different perspectives, as shown in the table below:

---

[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 business as usual

Table 2. Abatement cost perspectives

Perspective	Approach	Example for BRT
Economic	Looks at costs from a national perspectives and in which taxes and subsidies are not taken into account, but policy implementation costs are. In this case, the discount rate[11] is set at a 'social' level	Costs for investment, implementation and operation are countered by a reduction in private vehicle fuel costs (excluding taxes), usually resulting in low or negative abatement costs. A relatively low discount rate would be used.
Private (investor / end-user)	Investor/enduser's point of view, in which the discount rate for future costs and revenues is set at a level applicable to investment decisions common to the private sector. Taxes and subsidies are included	For the investor the outcome will depend on the extent to which the investment (using a higher discount rate) and operation costs can be recovered by the ticket prices, and other possible revenues including investment support by the government and those related to carbon funding. In practice the investment will only be done if the abatement costs for the investor are below zero. For an end-user shift from a private vehicle to the BRT the abatement costs will be.
Social	The assumptions of the economic cost approach are used, but in addition externalities (costs assumed by society for the implications of the investment decisions, e.g. air pollution) are taken into account.	The abatement costs would be lower than those in the economic perspective, due to co-benefits.

47. In theory, each of these approaches should also take into account costs related to the loss of welfare due to enforced choices[12] are considered. The current reality shows that mobility based on private vehicles is preferred by many, even though public or non-motorised transport is cheaper, which could be explained by non-economic factors such as comfort or status. If road space is allocated in favour of a BRT this may imply a loss of welfare for car drivers, which could be taken into account a 'welfare-economic' analysis. However these welfare effects are

[11] The costs and benefits that accrue in the future are computed into net present values (NPV) through the discounting of these future revenues and costs. The discount rate can be understood as 1) An ethical description of how future benefits should be regarded (therefore a political choice of what is desirable); 2) a description of peoples´ behaviour in their daily decisions (i.e., equal to the capital's marginal rate of return) (UNEP,1999). The discount rate's proper value is a matter of large debate. In the Fourth Assessment Report, the IPCC uses a rate of 4%. Leduc and Blomen (2009) use 9% for the private perspective. UNEP (1999) recommends 3% as the central value with sensitivity calculations to be carried out using a range between 1 and 10%. In developing countries, capital is scarcer than in industrialised countries. Thus, the market discount rates may need to be higher than in developed countries.

[12] This applies in cases that 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 constitute a loss of welfare (Davidson et al., 2007)

highly context-dependent and difficult to quantify (Davidson et al., 2007), and this is rarely done in mitigation studies (be it for transport of for other sectors). Instead, it is mentioned that are other (i.e. non-economic) barriers.

48. Most transport abatement cost studies so far use 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 for the success of a measure, and therefore it can make sense to include taxes and subsidies. It is important to explicitly state the assumptions and perspective, as the taxes and subsidies greatly influence the abatement costs. This is not always clear in mitigation studies.

49. 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). 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: a) employment: if a project creates a job there is a benefit to society which is equal to the social cost of unemployment; b) income distribution and poverty: different income groups are affected (positively or negatively) by the mitigation action; c) environmental impacts: including air quality, biodiversity, and sustainability. Generally, in most mitigation studies, however, these types of impacts are not considered when determining the mitigation alternatives´ abatement cost. This is due, as previously discussed, to the high uncertainty as well as the general interest in producing results that are comparable to other studies.

50. Implementation costs are those additional to investment 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.

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

- avoid and shift: often low or negative costs from an economic perspective, due to large energy savings, and low discount rate (although implementation costs may be substantial), and even lower costs for the end-user and society due to the tax savings and the co-benefits respectively. It should be noted however that these negative cost options in MAC are a result of the two different approaches taken to calculate the baseline and the mitigation options. As the baseline is not based on economic calculations but on historical trends consumer preferences including non-economic aspects are implicitly taken into account. The mitigation costs on the other hand are fully based on an economic analysis where these welfare effects are disregarded, and this can result in negative cost options, indicating there are other barriers that prevent these options from being implemented.
- Improve: positive (and often 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; lower (often negative for energy efficiency options) for the end-user perspective

(somewhat compensated by the higher discount rate), and lower from the social perspective.

2.4 Understanding the co-benefits of mitigation actions in transport

52. Transport policies and programs usually target several policy objectives including improving mobility, reducing congestion, improving air quality, security of supply and climate change mitigation. Benefits of sustainable transport policies and projects can be distinguished into (Leather, 2009):

- *Benefits* –the primary intentional goal of policies and project, 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 project (e.g. reduced health impact and costs from air pollution).

53. "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).

54. Some specific studies show the large size of the co-benefits of sustainable transport projects and policies. For instance, at the programme level, Woodcock et al. (2009) estimate the health effects of alternative urban land transport scenarios for London, UK, and Delhi, India. The authors 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 (7332 disability-adjusted life-years [DALYs] in London, and 12 516 in Delhi in 1 year) than from the increased use of lower-emission motor vehicles (160 DALYs in London, and 1696 in Delhi). However, combination of active travel and lower-emission motor vehicles would give the largest benefits (7439 DALYs in London, 12 995 in Delhi), notably from a reduction in the number of years of life lost from ischaemic 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."

55. At the policy level, CTS Mexico (2009), show 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 a society as whole (Figure 2.). The only intervention with a positive social cost is bus hybridization.

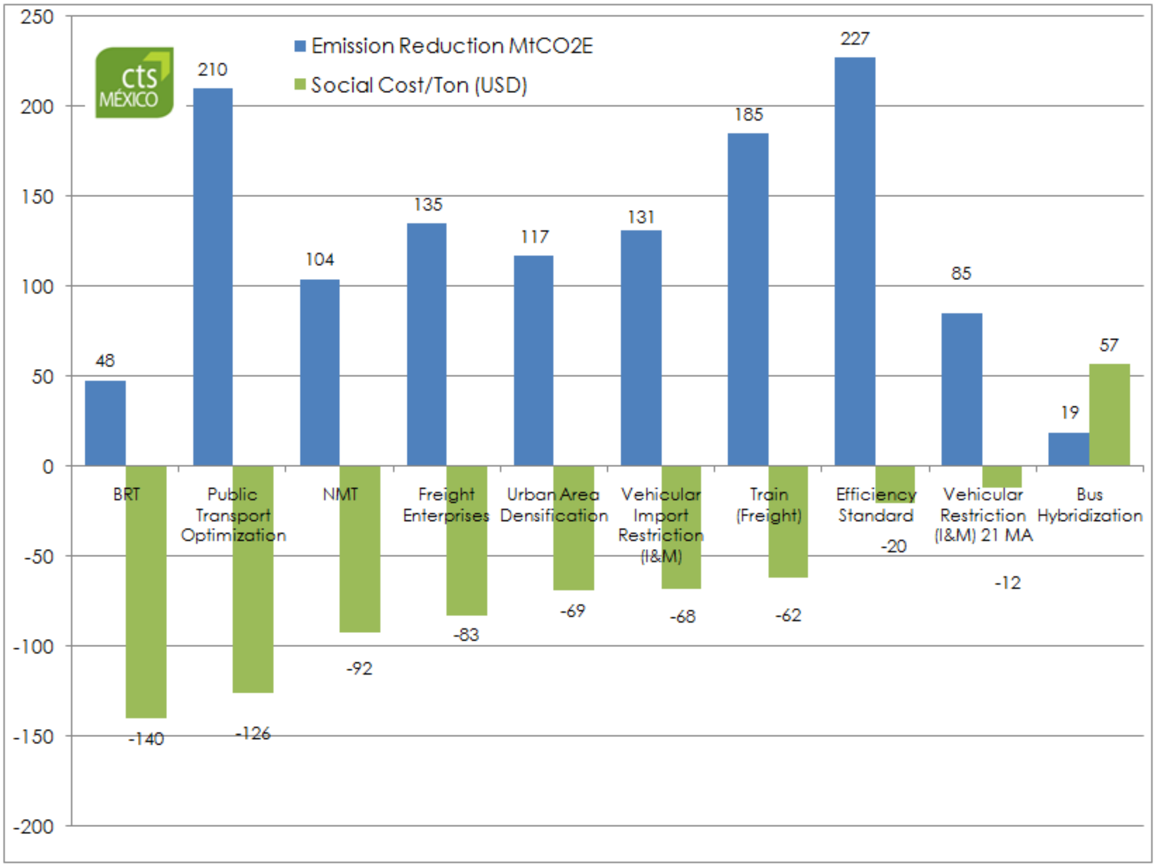

Fig. 2: Emission reduction potential and associated social costs (Johnson et al., 2009)

56. At the project level, 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 carbon dioxide emissions, and net benefits from health impacts, travel time and project costs of USD 12.3 million., .

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

58. Quantification of co-benefits remains challenging, and often subjective, with no widely accepted approach present 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 activity data which hampers GHG emissions reduction is a barrier towards co-benefit quantification. Leather (2009) has however proposed an approach

[13] One important reason to address black carbon and ozone is that these have a much shorter life-span than CO_2 as warming agents. The long(er) term impact of aerosols is still uncertain.

towards explicitly including transport related co-benefits in policy evaluation, based on sustainable development priorities of a country, and ex ante and post assessment of benefits. Japan Ministry of Environment (2009) also developed an assessment framework and methodology including qualitative and quantitative indicators for co-benefits of GHG reduction measures.

2.5 Summary

59. 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. These are however still short 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 which 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 co-benefits of GHG emission reduction strategies are more explicitly acknowledged. There is substantial uncertainty with regard to abatement costs in the transport sector due to differences in methodological choices and uncertainty in future energy prices and consumer behaviour.

3 Applicability of Existing Climate Instruments to the Transport Sector and relevance of MDB financing

60. 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 Annex I countries to offset their emissions purchasing of 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 before further details of the future climate regime are worked out. Finally it assesses transport lending of MDBs for its relevance in terms of climate change mitigation. This because MDB funding is so far the most important external funder of transport programs in developing countries.

3.1 Climate Instruments

3.1.1 CDM

61. To date, the transport sector has played a very limited role in the CDM. As of July 2010, 30 out of 5312 projects in the pipeline are related to transport (including biofuels) (UNEP/Risø, 2010). Out of these 30 projects only 3 are registered. The pipeline[14] includes all projects and PoAs that are under validation by an operational entity, have been validated, are registered by the CDM Executive Board, or are requesting registration. Together the current 29 transport projects are expected to reduce 3.2 $MtCO_2$-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 ($ktCO_2$/yr)
Biodiesel from waste oil		AM47 / ACM17	1	226
Biodiesel for transport		AMS-III.T. / ACM17	5	495
Bus Rapid Transit		AM31 / ACM16	11	1467
Cable cars		AMS-III.U.	1	17
Metro: efficient operation		AMS-III.C.	1	16
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	3153

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

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

62. Compared to its share in global GHG emissions the transport sector is highly underrepresented. A first explanation lies in the fact that across the globe, transport sector emissions are found 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, e.g. 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 e.g. 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 recommendations;
- Specifically for biofuels: difficulty in determining life cycle emissions.

63. 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 applicability of approved methodologies has been difficult, e.g. for BRT projects using AM31, which has been approved in 2006, and biodiesel from waste fats using AM47 (approved in 2007). In late 2009 these methodologies have been consolidated in ACM16 and ACM17, which are now used by three and four projects respectively as of July 2010.

64. 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 anyhow (i.e. non-additional projects, Bakker et al., 2010), and transport projects are among those having problems demonstrating additionality (Millard-Ball and Ortolano, 2010).

65. 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-1 countries in achieving their emission reduction targets in a cost-efficient manner. If left to the market forces, the balance of the trade-off is in favor of cost efficient emission reductions and Olsen and Fenhann conclude that the CDM does not significantly contribute to sustainable development. They proposed a taxonomy for better

[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

assessment of sustainable development benefits from CDM projects which 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 include Sutter (2003), Schneider (2007) and Sterk et al. (2010). While the sustainable development orientation of CDM is often emphasized, co-benefits generated through CDM projects are generally not well documented and they do not play a major role in the approval or rejection of CDM projects.

3.1.2 Global Environment Facility

66. 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 worldwideInitially, GEF support to the transport sector focused on technological solutions. However more recently (GEF-4, 2006–10) 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-size cities, which includes urban planning, public transport investments (particularly BRT), TDM and national policy development (GEF, 2009a). Very limited attention was 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.

67. During GF 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[16]. 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 ('other').

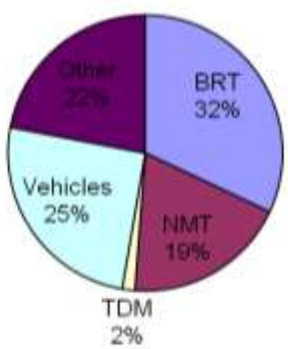

Figure 3. GEF Transport funds breakdown (Replogle and Hook, 2010)

68. The GEF is developing a methodology to estimate ex-ante GHG emission reduction from transport investments, to be used for projects starting in GEF 5. (Under GEF 1-4 projects were free to decide what methodology to use to determine the GHG reductions resulting from the

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

GEF supported projects. The new methodology under development (GEF-STAP, 2010) focuses on assessing the ex-ante GHG emissions reduction 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.

69. In line with the overall GEF approach for assessing GHG emissions it accounts for three types of GHG emission reductions, each with their own character and degree of uncertainty:

a. Direct, i.e. as a result of the GEF funded demonstration project. It is recommended that local data are used as much as possible. If not available observed impacts elsewhere and default emission factors can be used as well, examples of which are given in the methodologies.
b. Direct post-project, i.e. by investment supported by mechanisms that continue operating after the project (e.g. revolving funds). This is based on the direct impacts multiplied by a ‘turn-over factor’.
c. Indirect impacts, i.e. the replication potential of the project, based on a realistic estimation of the market potential (bottom-up or top-down). Here it is assumed that the demonstration project has lowered barriers for, or catalysed similar projects. As the GEF has only a limited impact on the replication of project, a ‘causality factor’ is applied to determine the market or replication potential.

70. 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 towards reducing emissions from transportation initiated under GEF 4 will continue throughout GEF-5 supporting measures promoting energy-efficient, low carbon transportation systems support for public transit systems, energy efficiency improvement of the fleet, transport demand management, and non-motorized transport. Support provided will broaden to include land use and transport planning options leading to low carbon intensive transportation systems to reflect the importance of rapid urbanization as 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

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

72. The CTF utilizes a range of concessional financing instruments, such as grants and concessional loans, and risk mitigation instruments, such as guarantees and equity investment. For the transport sector, measures which 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 change in tonnage of freight moved by road transport to rail;
- Improvement of fuel economy standards and fuel switching;
- Deployment of electric and hybrid (including plug-in) vehicles.

73. As of March 2010, twelve country investment plans have been approved by the CTF transport is included in seven of the country investment 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 add up to $ 600 million and the estimated annual emission reduction is about 10 $MtCO_2$ per annum (CTF, 2010).

Table 4: Transport components under the Clean Technology Fund, March 2010[17]

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

[17] The country investment plans available at http://www.climateinvestmentfunds.org.

74. The CTF investment plans are approved by the CTF Trustfund Committee without having been submitted to an external expert panel for the validation of the emission reductions. In its assessment the Trustfund committee takes into account the potential 'transformational' impacts of the proposed actions, and criteria such as GHG reduction potential, demonstration and upscaling 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 upscaling 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 only at the time of detailed project design[18]. Project developers are free to decide what 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.

- For the future assessment of the results of its investments and tracking the fulfillment of its objectives CTF will use a three-tiered approach (CTF, 2009b): 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;
- Country outcomes indicators, which measure aggregate country outcomes and global trends relevant to the CTF's objectives;
- Monitoring the CTF's contributions to country outcomes: this tier consists of indicators covering the CTF's contributions to country outcome indicators at three different levels:
    a. 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;
    b. Portfolio performance: These consist of indicators to measure the MDBs' portfolio quality and organizational efficiency;
    c. Project outputs, which measure the CTF's effectiveness in achieving its objective of scaling up low carbon technologies.

3.1.4 Impact of Climate Instruments

75. Table 5 provides an overview of the impact of investments from climate mechanisms on the transport sector. It appears the CTF in its short history has initiated activities that will make a bigger impact in developing projects to reduce transport emissions than the CDM and the GEF combined, which have been operational for a longer period of time. The overview also shows that the impact of climate instruments is currently very limited, i.e. approximately 16 $MtCO_2$-eq/yr, as compared to 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 15-30% reduction deviation from baseline for all GHG emissions by 2020. The overall funding made available of $ 1.5 billion is limited as well considering the size of the transport sector.

[18] 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.

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 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 10 years lifetime; [d] annual emission reductions calculated based on assumed life time 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: (a) the size of overall funding and funding allocated to the transport sector which are both simply too small to create transformational change in the transport sector (in the case of GEF and CTF); (b) competition for funding between sectors in which 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 perceived costs and complexity of reducing transport GHG emissions.

3.2 Multilateral Development Banks

76. The World Bank has provided more than $30 billion ($ 2 - 5 billion / yr) 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 go to roads, as shown in Figure 4. 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. The focus on roads in transport lending is similar for other development banks such as ADB and IDB. It is expected that transport lending will increase to $ 5.89 billion per year in the 2009 – 2011 period (Duncan, 2009). The ADB Sustainable Transport Initiative (STI) which was approved in July 2010 has climate change as one of its four main pillars, the others being urban transport, addressing climate change in transport, cross-border transport and logistics, and road safety and social sustainability (ADB, 2010). As can be seen from Figure 5, a major shift away from road infrastructure investments 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. The ADB, together with the IDB, has been the main initiator of the SLoCaT Partnership to accelerate broad based action to mitigate climate change in the transport sector.

77. The IDB in 2008 provided $ 2.2 billion of lending to the transport sector of which 87% was for roads (Taga, 2009). Within the roads sector the emphasis was initially 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 the support for the establishment and expansion of BRT systems. The Bank (IDB, 2010) as part

of its future action on climate change will support sustainable transport projects that reduce or avoid travel needs through measures such as better integration of land use and transport policies, demand management measures, regulations, information and technology. This includes systems that promote a shift from private vehicles to mass transit systems (BRT or rail) and/or to nonmotorized 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) aiming 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, fostering economic growth and social inclusion (Huizenga, 2009b).

78. 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 the European Investment Bank) in 2008 channeled € 8 billion in climate change mitigation relevant financing (both ODA and non-ODA) of which 32% was for mitigation in the transport sector (Atteridge, 2009).

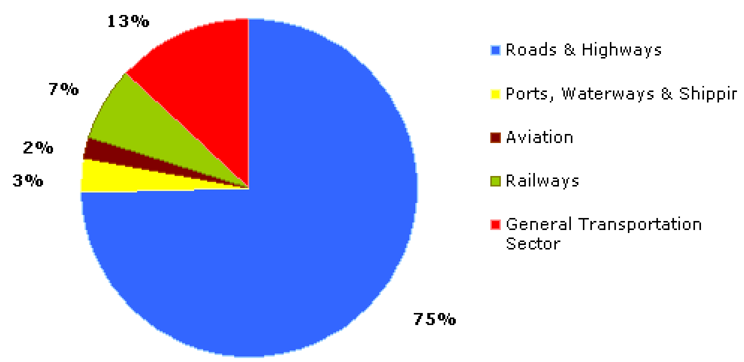

Figure 4. World Bank transport project lending breakdown in 2007 (World Bank, 2009a)

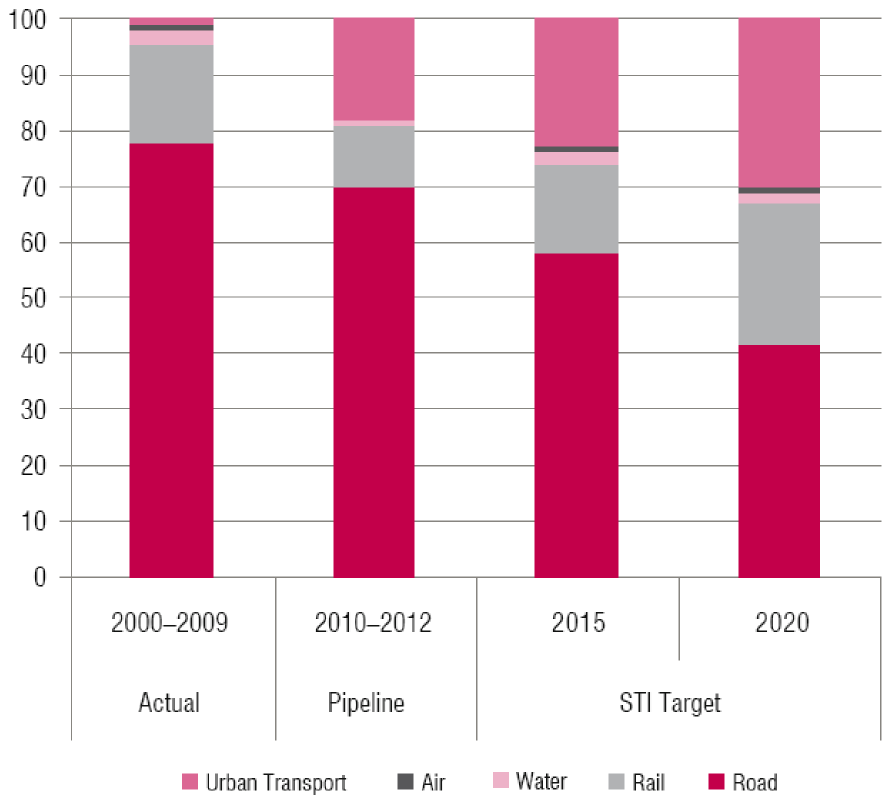

Figure 5. Subsector shares of ADB transport lending (ADB, 2010)

79. In an evaluation IEG (2007) recommended the World Bank to 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, and the lack of support and incentives for staff to get involved in more intricate projects, and the WB's current restrictions on subsovereign lending[19]. In an update of its strategy (Mitric, 2008) the World Bank indicates a shift away from private vehicles towards people-oriented and sustainable modes of urban transport. In its recommended structure of a typical WB funded urban transport project the importance of policy and institutional reform is reflected. 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

[19] Traditionally multilateral development banks loans have been with national governments. Under sub-sovereign lending loans can also be made to local governments.

80. The ADB is currently developing a framework to measure carbon emissions of its investments in the transport sector. This to comply with ADB's Safeguards Policy Statement requires quantification of emissions linked to development and operations of its projects. This framework will help monitor carbon emissions at project, portfolio, and corporate levels. (Singru, 2010). The framework [20] proposes a basket of three indicators:

- Output Indicator - CO_2 intensity per km of infrastructure constructed
- Mobility Indicators - CO_2 intensity per tonne-km (freight) and per passenger-km
- Investment Indicator - CO_2 intensity per $ million spent on transport projects

3.3 Summary

81. Climate instruments and MDBs have so far mobilized limited funding for sustainable, low carbon transport in developing countries. In addition there have been difficulties in accessing these funds, especially climate instruments related funding, for transport sector. External assistance through GEF, CTF, and especially MDBs is increasing however. The Climate instruments and MDBs are closely linked, the majority of GEF and CTF funding so far has been programmed as co-financing for MDB projects. The growing importance for climate change mitigation in transport among MDBs is expected to result in additional funding which initially will be largely directed towards urban transport. All major MDBs have expressed support for the ASI approach. Such an increased MDB engagement in climate action in transport could possibly also improve participation of the transport sector in climate instruments because of MDB action to lower barriers for involving transport by their growing support for knowledge management and institutional development activities.

82. Progress is being made with 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 **A**ctivity, modal **S**plit, modal energy **I**ntensity and **F**uel type (Schipper et al. 2000). There are differences however in the structure of methodologies whereby the methodology for transport CDM projects have the most rigid requirements. It is important to note that local investments in transport in developing countries which are by far the largest 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 a 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

	Size of funding	GHG emission reduction assessment requirements		Co-benefits assessment
National and local funds	Very large ***Trillions***	-	No GHG assessment requirements in place	Varies per country, generally low
Development bank funding	Large ***Billions***	*	Methodologies under development, not applied	Environmental/Social Externalities not

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

	Size of funding	GHG emission reduction assessment requirements		Co-benefits assessment
			yet	included
CDM	Small ***Millions***	*****	Very strict, at entry and during project	Depends on country
GEF	Small ***Millions***	**	New Methodology for 2011, only at project entry	New methodology recognizes but does not reward
CIF/CTF	Small ***Millions***	**	Emphasis is on sector transformation, detailed GHG assessment not at project entry	Qualitative assessment

83. From this chapter it appears that the CDM under the current rules is not likely to play a major role in a shift to sustainable transport systems, although PoAs may result in some opportunities (see Chapter 4). Other financial mechanisms have put in a larger share of their resources in the transport sector, both for lending and grants, but mainly in road infrastructure. Since the turn of the century there is a tendency to look at transport more holistically and 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

84. 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 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 mechanisms supporting mitigation and financial support will be part of the new climate agreement. This is also included in the Copenhagen Accord (UNFCCC, 2009a), which includes provisions for NAMAs in developing countries, and financial support of $10 billion per year up to 2012 and $ 100 billion per year by 2020.

85. 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 could support activities such as technology transfer and deployment, capacity enhancement, technology innovation centres 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 can be implemented in a low-carbon fashion. It can also be seen as a vehicle that could help other instruments such as the Technology Mechanism and NAMAs to function.

86. Both instruments could play a role for the transport sector, as low-carbon technologies are crucial to achieve longer-term emission reductions, and the link between sustainable development and climate change mitigation is particularly strong in the transport sector. However compared to NAMAs the negotiations do not provide a lot of clarity with respect to these instruments. This chapter therefore focuses on NAMAs and sectoral approaches, and the CDM post-2012. We analyse the current state of affairs in the negotiations and its potential relevance to the transport sector.

4.1 CDM post-2012

87. The discussions on the future of CDM and similar baseline-and-credit models are conducted in the AWG-KP[21]. The carbon market is an important source of financial flows currently 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)[22].

---

[21] See http://unfccc.int/kyoto_protocol/items/4577.php

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

4.1.1 Developments and Trends

88. There are a number of themes and proposals that come up frequently in the discussion of CDM and which will contribute to shaping the future of CDM[23:]

- There is a desire among some groups, especially developed countries, to increase the level of off-setting of emissions in developed countries through expanded CDM. This could help towards realizing more ambitious emission reduction targets in developed countries. Another argument given is that this would 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 offsetting of emissions (e.g. through CDM) should be limited. Their main argument is that this would help promote domestic action by developed countries. It has been suggested to limit off-setting achieved from projects in emerging economies (currently the main recipients of funding generated through CDM) and prioritize off-setting achieved through projects implemented in least developed countries.

- Strengthen efficiency, predictability, consistency and transparency in CDM management process. This could increase the volume of CDM projects.

- Regional distribution: four countries currently account for more than 80% of all CERs from registered projects, with China alone accounting for 59% of expected average annual CERs from registered projects by host party, followed by India (11%), Brazil (6.5%) and the Republic of Korea (4.6%).

- Differentiation among countries and project types to improve regional and sectoral balance: (a) positive lists with respect to additionality, b) negative lists: excluding countries or project types from the CDM, (c) preferential treatment in procedures, access to resources; (d) CER discounting whereby one tonne CO_2-eq reduced equals less than one CER, e) 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 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, define standardized baselines for specific project activity types, and specific sectors or subsectors. Sectoral benchmarking in the CDM establishes a baseline based on a pre-determined benchmark (e.g. for emissions per tonne of production) for a whole sector (e.g. cement, power and steel have been suggested) or sub-sector in a country or a region. This pre-determined bench mark is regularly reviewed and adjusted to reflect

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

technological improvements. Sectoral benchmarking in the CDM could improve environmental integrity as well as predictability by demonstrating additionality and setting the baseline with stringent and differentiated pre-determined benchmarks.

- Further facilitate the use of PoA, also known as Programmatic CDM. A PoA is a voluntary action, coordinated by a private or public entity, implementing a policy/measure or stated goal (i.e. incentive schemes and voluntary programmes), resulting in measurable GHG emission reductions, or avoidance that are additional to any that would occur in the absence of the PoA[24]. PoAs increase the possibility to register 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 4.2)

4.1.2 Relevance for the transport sector

89. In the following we discuss how emerging developments such as Programmes of Activities and standardized baseline, and possible other future changes as being discussed in the AWG-KP may affect the prospects for the transport sector, as compared 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.

90. *Further strengthening of Programmes of Activities.* Initially only similar project activities using one baseline and monitoring methodology can be developed under a PoA. Later the CDM Executive Board also allowed the use of multiple methodologies under a PoA. This further enhances opportunities, particularly for 'mixed strategies' in which different kinds of activities of an integrated sustainable transport strategy relating to e.g. fuels, vehicle technologies, public and non-motorised 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 additionality demonstration and application of the baseline methodology. The World Bank is currently developing a PoA in Cairo, Egypt which aims to reduce GHG emissions and air pollution associated with the aging fleet of taxi, microbuses, minibuses and buses in Egypt, through scrappage and replacement of taxis in the Greater Cairo Region.[25] Another promising area for PoA could be freight and logistics which generally has better data availability and quality because of more extensive private sector involvement and its commercial nature. Data availability and quality which has been a constraining factor in transport CDM projects can be a constraining factor, however, also in the case of a PoA approach.

91. *Standardized baselines*. Baselines can be pre-determined based on a benchmark for a particular type of activity for a particular geographical area. Standardized baselines are often

---

[24] Source: CDM Rule Book - http://cdmrulebook.org/pageID/452.
[25] See: http://web.worldbank.org/external/projects/main?pagePK=64283627&piPK=64290415&theSitePK=40941&menuPK=228424&Projectid=P119483

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 there are no concrete proposals as yet. Possible examples mentioned include modal splits, occupancy rates and emissions per unit of travel (Bongardt et al., 2009; TRL, 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 standardised, but that modal energy and carbon intensity could provide better opportunities[26]. 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 which taxis or buses operate in different cities. The increased upfront burden of necessary data collection costs to construct performance standards or define adequate default values for standardised baselines is not to be underestimated either, even if transaction costs at the project level would be reduced in the long run.

92. Currently the 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 (population >1 million) in a country already have a BRT, LRT or MRT, the proposed project will be considered as non-additional. This means that for Argentina, which has three large cities and already two (old) rail systems the CDM cannot promote such projects anymore.

93. *CER discounting.* Discounting is the application of a reduction factor to the emission reductions achieved in a project: 1 tonne of CO_2-eq reduced results 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 actions, yielding large amount of CERs. Other arguments mentioned in support of CER discounting are to create a mechanism with overall net atmospheric benefits rather than pure offsetting, 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. The key difficulty for CER discounting is however the political feasibility of establishing the discount factors.

94. *Allocated demand.* Credit buyers can be required to procure a certain portion of their demand for CERs to certain sectors. If this can be done for the transport sector it will greatly improve its opportunities. It will 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, but could be pursued by unilaterally by buying countries.

95. *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. In order to improve the sustainability profile of the CDM it has been suggested to explicitly recognize sustainable development benefits by setting a threshold, and the requirement for evaluation by the validator and/or the Executive Board. As many transport projects have very strong co-benefits, e.g. for air quality,

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

reduced congestion, energy security and social equality (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 is undermined, something which may not be politically feasible. Another possibility would be to apply CER discounting to projects with no or few demonstrated co-benefits.

96. *Positive list.* Project types on a positive list are deemed automatically additional and thus exempted from additionality testing. As demonstrating additionality is often very difficult for transport sector projects this could improve their prospects. However as the reasons for this difficulty is that there are many objectives other than climate to undertake a certain activity and the CER contribution to overall profitability is relatively low, it is hard to imagine that many transport sector project types will be included in a positive list (Bongardt et al., 2009).

97. *Sectoral CDM*. Taking the CDM from the level of a project-based instrument to the level of programmes (as being done in PoAs) or sector policies could enhance the opportunities for transport, particularly by the possibility for 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)

98. This section has shown that several possible changes to the CDM may improve conditions for the transport sector by simplifying methodologies, demonstration of additionality, and reducing the data needs. In addition a broader application of the existing approved methodologies may also have a beneficial impact for 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

99. Discussions on a possible sectoral crediting mechanism (UNFCCC, 2008)[27] suggest to credit emissions reductions from a covered sector as a whole against a threshold below the business as usual scenario. Thresholds represent country performance and can be expressed in absolute (e.g. GHG emissions in sector x) as well as intensity terms (e.g. GHG emissions/ton of cement). Sectoral crediting is however 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.[28] Sectoral crediting based on no-lose targets[29] intends to encourage emissions reductions (orchestrated by the host country) in key emitting sectors in developing countries.

---

[27] Beside sectoral crediting, also sectoral targets are discussed in the negotiations. The difference to 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.

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

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

100. 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 (in case of industry) level 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).

101. 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). There is limited discussion on how measures aimed at reducing the need for travel or modal shift can be incorporated into a sector approach.[30] Also, there is 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.

102. Sectoral crediting has the potential of greatly increasing the supply of credits. This may, however, result 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 are the main obstacles, as many developing countries perceive this approach as an indirect manner to impose some sort of emission commitments.

4.3 NAMAs

103. 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 developing countries participation in global climate governance. It is important to note that NAMAs are however different from Annex I country targets as they will be proposed voluntarily by the developing country.

104. The Ad-Hoc Working Group on Long Term Cooperative Action (AWG-LCA) was tasked at the COP 13 meeting in 2007 to develop proposals on amongst others the NAMA concept. In the 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

105. There is still a great deal of lack of clarity on the manner in which NAMAs will be designed, reviewed, implemented and monitored. Some of the key features of the NAMA concept are briefly discussed below, mainly based on UNFCCC (2009c; 2010a).

---

[30] 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).

- 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 be best accomplished. NAMAs are intended to be country driven and appropriate for 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 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, mostly without any specification on whether the NAMA will be implemented at the national or the local or city level (UNFCCC, 2010b). The general understanding so far is that NAMAs are not restricted to investment activities which directly reduce GHG emissions but that they can also include actions which 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 Multilateral Development Banks. International decisions on 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: (a) unilateral NAMAs, which are implemented on a voluntary basis and developing countries are expected to implement these without external support, (b) supported NAMAs, these are to be supported and enabled by technology, financing and capacity building, in a measurable, reportable and verifiable manner, and (c) 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 the three types of NAMAs, or on the relative contribution by the three types of NAMAs. 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 was focused mostly on supported NAMAs.

- It is intended that 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. The NAMA registry would also record 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 in. As of June 2010, 36 countries have done so (UNFCCC, 2010b).

- A point of considerable debate is the linkage of NAMAs to Low Emission Development Strategies, as advocated amongst others by the European Union (CEC, 2009) and Japan, and the role that such strategies and/or action plans would play in determining the level of external support to the NAMAs. In the AWG-LCA discussions developing countries through the Group of 77 and China have argued that such a linkage would infringe on the sovereignty of developing countries and be a step towards compulsory 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 up front, 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 delivered and used for the purpose it was intended for, and 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 there would be no emission reductions generated which can 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;
    - Output, which are a direct result of a policy, e.g. increased consumption of renewable energy;
    - Outcome, which relates to policy objectives, e.g. GHG emission reductions.

- Large emphasis has been placed, especially by the developing countries, on the need that NAMA related funding is predictable, measurable, reportable and verifiable. Also, mitigation funding should be clearly separated from and additional 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 Euro 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 consist of new funding , and how the funding could be delivered, though a Copenhagen Green Climate Fund is mentioned[31]. Considering the emerging consensus on the definition of NAMAs which appears to indicate that funding would be available, under supported NAMAs, for both emission reduction and enabling activities[32] a different disbursement mechanism will have to be found than in the case of CDM.

---

[31] 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)

[32] 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.

4.3.2 Relevance to the transport sector

106. The manner in which the NAMA discussion is unfolding -: 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. Yet, the emphasis on incremental cost as basis for NAMA funding also raises concerns considering that many sustainable, low carbon transport activities have negative incremental costs. As many of the details still need to be settled the NAMA instrument might have the potential, more so than 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 included the transport sector explicitly. A range of actions is proposed, including infrastructure development, energy efficiency, biofuels, electric vehicles fiscal incentives and regulatory measures (Binsted and Sethi, 2010). The submissions do generally not provide details on how these actions are going to be implemented and what the expected GHG emissions reductions for the transport sector would be.

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

- Non-climate benefits from interventions in the transport sector are often much larger than climate benefits (if both are monetized). This would make it important that specific guidelines for (transport related) NAMAs explicitly include non-climate related benefits in financing, MRV and institutional arrangements. This should however not lead to unassailable methodological requirements.

- Many of the transport interventions have no, or limited incremental costs particularly if all co-benefits are fully monetized. The fact however that these actions are still not implemented show there are other barriers that inhibit these measures. NAMAs finance may play a role in addressing these barriers. In addition , depending on what is defined as NAMA, capacity building and other non-investment elements (e.g. development of strategies, regulatory changes) could be supported based on the full cost. Therefore supported NAMAs are expected not to include only direct GHG emission reduction activities (which often favor a technological approach) but also enabling capacity and institution building, removal of regulatory barriers activities. This is of particular relevance to the transport sector (CCAP, 2010a) where large scale emission reductions will require a combination of measures aimed at changing transport systems (i.e. reducing the need for travel through better land use planning, restraining the use of private vehicles, promoting public transport and non-motorized transport) with measures aimed at improving the fuel efficiency of individualized motorized transport.

- Sequencing of interventions in the transport sector is important. Technologically oriented activities will often generate benefits in a shorter time than measures aimed at modal shift or at changing land use patterns. The latter can take well over 10 years. The different time perspective of transport interventions will have to be taken in account in designing detailed NAMA guidelines. Also, capacity building and policy formulation often needs to precede actual investments in the transport sector for the latter to be effective.

- Because of the close linkages between climate change and other sustainability issues (pollution, congestion) and more general development issues such as energy security and urban development it is hard to determine the "Additionality" of a specific transport intervention or measure. Additionality is a concept derived from CDM and was introduced to ensure the quality of off-sets realized. Since in the case of supported NAMAs no off-setting takes place this criterion may be less important.[33] There will be still a need to create trust that funds are used for climate purposes, and to measure the global progress to the ultimate objective of reducing GHG emissions. Emission estimates are surrounded by large uncertainties both for current levels and especially so for projected BAU emissions in the transport sector. There is need for consensus building around assumptions used by different groups in modeling of the expansion of transport sector and to increase the availability of reliable activity data.

- MRV of GHG impacts could be a mixture from actual calculation of GHG emissions reductions and indirect or proxy indicators and in some cases process indicators. Direct GHG impact indicators represent the "gold standard" in terms of indicators. Where such direct indicators are not available use can be made of proxy indicators (for example kilometers of bicycle lane constructed), or even of process indicators (number of people trained).

- Taking into account existing funding of transport in developing countries it is expected that funding for development of the land transport sector in developing countries will continue to come primarily from resources in the developing countries themselves (Huizenga et al., 2010). Unlike the energy and industry sector the largest share for transport will come from the public sector in developing countries and not the private sector. The second largest source of funding is and will be development assistance. In the Pittsburgh G20 meeting agreement was reached on a $350 billion capital increase for MDBs.[34] Section 3.2 described the importance of transport sector in terms of lending and the MDBs intention to increase assistance for climate action in the transport sector. New UNFCCC mitigation and technology funds as well as GEF and other dedicated climate funds will continue to provide only a small share of funding for mitigation of climate action in the transport sector[35]. The use of dedicated climate funding in the transport sector can be optimized if it is available upfront to facilitate and catalyze the development and implementation of sustainable, low carbon transport.

4.4 Summary

108. 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 abysmal track record of the transport sector under CDM, it is felt that CDM will also in the post 2012 period not be a major impetus for change in the transport sector in developing countries.

---

[33] 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.

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

[35] 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.

109. NAMAs are an important new mechanism which 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. The proposed continued use of incremental costs as the basis for funding of supported NAMAs may continue to limit funding to additional efforts required to make developmental efforts low carbon, depending on how it is applied. On the other hand the proposal to allow support to be used for barrier removal and capacity building can help developing countries to catalyze the formulation and implementation of sustainable, low carbon transport policies, programs and projects.

5. Case Studies

110. 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 the 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, who are all working together with local organization(s) in the case study countries. This has also been instrumental in building capacity for participation of the transport community in the formulation of guidelines for post 2012 climate instruments. For the ADB and the IDB the discussion on, and involvement in case studies, has been of great value in providing focus to their respective efforts to strengthen lending and non-lending assistance to sustainable, low carbon transport. All four case studies focus on urban passenger transport systems, which are a key part of the overall transport sector, and probably the area where the link with sustainable development is strongest. The rapid expected urbanization in developing countries has the potential to greatly increase GHG emissions from transport. It is clear however that urban passenger transport covers only a part of the overall reduction potential in the transport sector. Inter-city, and rural transport are important as well as is freight transport. This chapter gives a summary and lessons learnt of the case studies.[36] ,.

5.1 Standardized Baselines (SBL)s for BRT, lessons from current climate finance and local conditions in Hefei, China

5.1.1 Context description

111. The development of standardized baselines (SBLs) has been discussed under the UNFCCC as a method to simplify the calculation of emission reductions in CDM projects since the late 1990s. To date, increasing numbers of default values are available for many tools and methodologies and several methodologies rely on benchmarking. In transport, so far only default values for fuel emissions and vehicle efficiency are employed. The discussion of SBLs gained further momentum as part of proposals for structurally improving the CDM. The Subsidiary Body for Scientific and Technological Advice is requested to forward 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).

112. Apart from vehicle efficiency, most of the 30 transport CDM projects in the UNFCCC pipeline are BRT projects.[37] Also outside of the CDM, BRT interventions have benefited from climate finance (e.g. through the GEF and the Clean Technology Fund). BRT developments are also expected to continue further. Thus BRT baseline methodologies provide a good example to assess possibilities for standardization in the transport sector.

113. This theoretical case study employed the ASIF model (Schipper et al., 2000) as analytical framework to assess which indicators influencing emissions of BRT projects are suitable for standardization. Apart from CDM methodologies for BRT the draft GEF GHG

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

[37] As of 1 June 2010 (Fenhann, 2010) ten BRT projects are at validation, one registered (Transmilenio Bogotá), one negatively validated (BRT Seoul) by the CDM Executive Board.

manual BRT model (GEF-STAP, 2010) and the CTF methodology for transport emissions (CTF, 2009b) were analyzed, 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 like modal split and trip length.

114. In Hefei, the capital of Anhui Province, the demand for transport is rapidly growing. At the end of 2008, Hefei had a total of 4.87 million inhabitants with around 2 million living in the urban center. The number of daily bus passengers has increased steadily from 700,000 in 2003 to around 1.8 million in 2010, and the number of individual cars grows by 200-300 per day. Against this background a transit-oriented development is envisaged, including the extension of BRT and the development of a metro system. BRT was introduced in Hefei in 2009 and now three lines are operating. Plans foresee 7 BRT lines with 200 km in length in 2020. The average speed of regular buses in Hefei is 16 to 18 km/h, while BRT buses reach an average of 22 to 25 km/h. These values may vary significantly from line to line and from district to district. Due to widespread construction efforts and associated rerouting, trip lengths and speeds are often severely impacted.

5.1.2 Methodological issues and data requirements

115. So far, SBLs have mostly been developed in more or less homogeneous sectors, such as cement or power generation, where a large body of data was already 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.

116. Subsequently, 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.

117. 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 will not be able to capture country- or region-specific differences.

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

119. An adequate interval for updating SBLs will have to be defined. If rather short update periods are required, the effort to gather the necessary data for SBLs may not be significantly smaller compared to 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 constantly updated. This raises the question whether the effort to gather the necessary data for standardized baselines would in fact be significantly smaller compared to a project-based approach.

5.1.3 Possibilities for standardisation of BRT baselines

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

121. Looking at the 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 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 absence of the BRT system. Both are dependent on the local context. Coherently, 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.

122. An exception is the GEF GHG model (GEF-STAP, 2010) for BRT which provides a default factor of 6km as average passenger trip length on the existing bus system to be used as a fallback option in case that no standard values are available from household or spot surveys. This introduces considerable uncertainties; likely underestimating trip distances especially in (monocentric) and big megacities. Obviously, underestimating trip lengths in the baseline result in a very ambitious baseline. On the one hand, this is positive for the environmental integrity of the mechanism, but on the other hand 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 could be conducted to identify if robust default values can be established for different sets of cities within a certain scope and what level of uncertainty this would potentially entail. For instance, 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.

123. 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 IPCC values 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 standardization of modal energy intensity, standard values would be needed for the average vehicle technology and age, average occupancy rates and speeds. All these factors vary according to local circumstances, such as wealth, local transport systems, level of motorization, mobility culture etc.

124. Developing a default value for average vehicle technology and age can essentially be seen as a benchmark for vehicle efficiency, when combined with existing defaults for fuel consumption (IPCC or national values). One step further, several institutions have suggested (IETA, 2010; TRF, 2010) that energy intensity benchmarks could be developed for public and commercial vehicle fleets. This would require gathering substantial amounts of data on fleet ages, vehicle technologies and related fuel consumption to be representative. To avoid overcrediting, the benchmark would have to be conservative and ultimately require a political decision at which level to set the crediting baseline.

125. 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 can be regarded as representative remains to be seen. The comparability of occupancy rates will largely depend on the geographical scope and socio-economic indicators, such as average income or overall level of motorization.

126. Speed is highly dependent on local characteristics of the transport system, as well as on mobility culture. In Hefei average speed even varies substantially within the city with higher levels of congestion in the center. It does not appear 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.

127. 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. It is furthermore standard in the CDM to calculate emissions from the biofuel share in blended fuels as equal to zero. Upstream emissions from fuel production are usually 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.

5.1.4 Financing the development of SBLs and default values

128. Financial support for data gathering will have to be made available internationally to facilitate the development of SBLs or default values, since the common good nature of methodologies and the significant cost of data gathering is a disincentive for project proponents alone to move towards standardization. This will be particularly important in less or least developed regions where institutional capacity to gather transport data is low.

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

5.1.5 Institutional approach for the development of SBLs

130. The CDM Executive Board should play an active role in the development of SBLs, but the transport expertise in the EB and its support structure will 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.

131. At the same time standardization initiatives by other stakeholders should also be encouraged, supported and considered by the EB. International financial institutions can 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.

132. In particular where the level of aggregation is confined to a national or regional scope, the EB will have to rely on existing capacity of national institutions in data gathering and adaptation of the proposed baselines to local data. Capacity building may be necessary.

133. DOEs 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.

5.1.6 Conclusion of the case study

134. 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. Further research into default values or benchmarks for modal energy intensity and average trip lengths by mode nevertheless holds potential for simplifying at least some steps in baseline setting for BRT in the future.

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

136. 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 prevail. 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 can 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 may therefore be contradictory to developing locally appropriate transport policies and measures.

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

138. 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 not least until a benchmark level can be agreed. 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.

5.2 Jakarta, Transport Demand Management (TDM) NAMA

5.2.1 Context description

139. Indonesia is proactively taking steps to address climate change mitigation at both national and local level. 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) [38] .

[38]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%

Furthermore in Jakarta, a 30% reduction target by 2030 (compared with BAU) has been set. Indonesia has also associated itself to the Copenhagen Accord, and has made a submission of its proposed NAMAs which includes "shifting to low-emission transportation mode".

140. Indonesia faces a particular challenge in taking mitigation actions in the transport sector. The number of vehicles in Indonesia is predicted to grow by more than 2-fold between 2010 and 2035, with the growth expected to be largest in two wheelers and light duty vehicles (ADB, 2006). Transport made up 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

141. To provide a working example of how a local-level NAMA in the transport sector may contribute to the mitigation of transport emissions, this study examined TDM in Jakarta, Indonesia.

142. Reflecting existing local priorities, and noting their inclusion in the Jakarta Transport Masterplan, three specific elements of TDM were examined, namely Electronic Road Pricing (ERP), parking restraint and BRT. The TDM NAMA was studied in light of the three potential types of NAMAs, i.e. unilateral, supported and credited.

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

143. In assessing and quantifying CO_2 and other co-benefits of TDM, the study suggested an approach that combines a transport demand model (driven by data from household surveys and traffic counts) with information on the vehicle fleet (e.g. emission factors). The results could be cross-checked using top-down methods utilising (regional) fuel sales data, to improve the robustness.

144. 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 tonne kilometres (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 as e.g. average level of pollution within a designated zone

145. 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 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.

---

target at the national level. Such indicative figures have not been provided for the -41% target with support, nor for the local (Jakarta) target of -30% by 2030.

5.2.4 Expected CO_2 benefits and associated co-benefits

146. Scenario work using the TDM model has demonstrated that a typical combination[39] of the three TDM policies leads to a sustained reduction of total transport demand (in vehicle kilometers, within the wider Capital Region of Jakarta, and below the baseline[40]) by approximately 4-5%, but up to 40% when focusing on the central business district (CBD) where ERP would be targeted at. This demonstrates the highly location-specific impacts of TDM policies.

147. 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.[41] A sustained reduction of between 20 and 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. 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 approach also allows key co-benefits to be modeled, including;

- Congestion levels, expressed as e.g. average speeds on the network
- Air Quality Pollutant Emissions, expressed as e.g. average level of pollution within a designated zone.

148. The results need to be treated with a degree of caution, due to limitations in the quality of input data and the large number of assumptions which 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 tradable NAMA. Such efforts would also ensure that co-benefits could be better monitored. Such types of capacity building could be provided as part of supported NAMA, or through other channels such as development aid.

5.2.5 Financing approach for the NAMA

149. Generally, TDM measures (and particularly those being considered under this particular case study) were shown to be revenue positive for the local authority from a financial analysis perspective and possess very short payback periods. Also from a welfare point of view it is expected to be positive; this because of the reduction in GHGs but also because of the benefits to society through reduced congestion. However, the fact that currently TDM measures are not implemented suggests the need for 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).

---

[39] 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.

[40] 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.

[41] Results are presented in percentage terms given the very large uncertainties surrounding the modeling assumptions.

150. The way in which the TDM NAMA would be financed would depend greatly on the type of NAMA assumed. As a unilateral NAMA, the majority the financing for TDM would be financed through the general budget of Jakarta. As a supported NAMA, funds may either 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 a combination of the three. Under a tradable 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

151. There are a large number of institutions at the national and local level who 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.

- The 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.

- There could be a clear benefit in developing methodologies to measure transport emissions in close coordination with the Regional Transport Agency, as well as the (National) Ministry of Transportation to ensure that the approach is 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 e.g. third parties, as well as contributing to an international effort in harmonizing MRV methodologies.

- Financing under a unilateral or supported NAMA could mainly involve the local budgetary process, with partial support potentially coming from national sources for e.g. capacity building support. International funding would be matched against local actions through the national government. Direct support to the local government (bypassing national government) is also not ruled out, particularly if it concerns bilateral/multilateral climate funds and ODA channels. Under a tradable 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 efforts on MRV.

5.2.7 Roadmap for the future

152. Based on the analysis of the current situation, a roadmap for the future was developed, which 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 (in e.g. ERP design, BRT routing/ticketing, optimization of parking charges), and capacity building on MRV.

153. Such ex-ante support may also be provided by development agencies including the ADB, particularly in the areas of data collection, further pilot projects and capacity building. Such actions can commence prior to the NAMA 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) may reduce any potential cases of free-riding.

154. This could allow TDM to move increasingly towards;

- A unilateral NAMA, whereby TDM becomes financially self-servicing, and “graduates” from international support, but MRV is continued to allow the TDM NAMA to contribute to meet national targets.
- A tradable NAMA, whereby the MRV is strengthened and becomes robust enough for TDM to generate credits for the local government as a component of a city-wide programme.

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

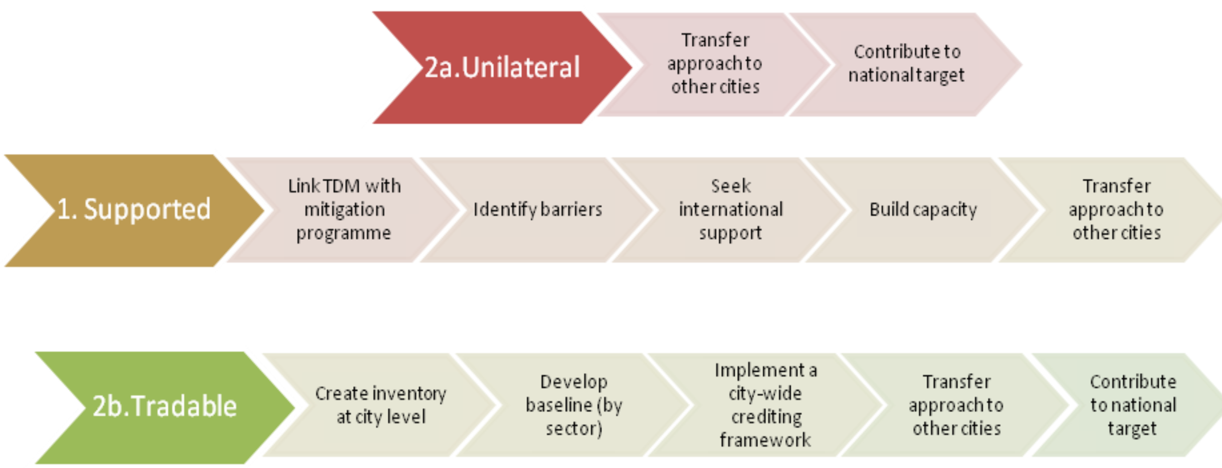

Figure 6 Roadmap for the future TDM NAMA in Jakarta

5.3 Belo Horizonte, Urban Transport NAMA

155. An urban transport NAMA is expected to help in removing barriers for implementation of integral mobility plans, namely shortage of funding and permanence over time. The NAMA will also help in increasing public acceptance by making explicit the broad range of co-benefits and providing a solid framework to follow-up impacts. This case study explores needs, methodological and practical issues of application of NAMAs in the urban transport sector, with a particular application in a midsize Brazilian city: Belo Horizonte.

156. Belo Horizonte is the capital of the state of Minas Gerais and is located in the southeastern region of Brazil. It is the third-largest metropolitan area in the country. Belo Horizonte has a population of over 2.4 million, with almost 5.4 million in the official Metropolitan Area.

157. Belo Horizonte developed a Comprehensive Mobility Plan – "planmobBH"42, which includes extensive transport data collection and modeling efforts. The proposed NAMA framework goes beyond the standard transportation planning analysis, by quantifying the greenhouse gas reductions, travel time savings, travel cost savings and air pollutant emission reductions in an integrated approach.

5.3.1 Policy Objective for the NAMA

158. The NAMA on integral urban mobility in Belo Horizonte seeks an increase in active (non-motorized) and public transport shares of the total trips to generate reductions in GHG emissions from urban transport and to improve transport conditions and the local environment.

159. By 2020 the integral 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 expected reductions are 36% in GHG, 25% in travel time, 19% in transport costs and 39% in particulate matter.

5.3.2 Description of the NAMA

160. The proposed NAMA on integral urban mobility includes enhancement of public transport (BRT and Metro), metropolitan fare integration, construction of infrastructure 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 7). Out of the total investment, USD 1.6 billion correspond to on-going activities, already committed by the city. These investments are considered the baseline scenario.

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

Table 7. Physical goals and financial cost Baseline and Integral Mobility Plan

	Baseline	Integral Mobility Plan	Difference
Bikeways (km)	14	300	286
Buslanes (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 (tonnes CO_2-eq) 2008-2030	44,775,918	35,624,604	-9,151,315

5.3.3 Greenhouse Gas Emission Reductions

161. By the final year 2030, the urban mobility scenario will save an estimated 1 $MtCO_2$-eq tons as compared to the baseline (Table 7). Figure 7 presents the estimates of the GHGs emissions in the integral mobility scenario relative to the baseline. The net cumulative GHG emission savings over the 22 year period 2008-2030 are estimated in 9 million CO_2-eq tons.

162. 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[43], including upstream fuel production and transport. GHG emissions from construction activities and vehicle manufacturing are added.

5.3.4 Co-Benefits

163. The transport modeling process provides the inputs needed to calculate travel times savings, including walking, waiting and in-vehicle time. In the final year 2030 there are estimated travel time savings of 182 million hours for public transport and 170 million hours for private transport. By year 2030, the economic equivalent of the cumulative travel time savings is nearly USD 1,300 million (present value at a 12% discount rate).

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

[43] Methodology AM0031

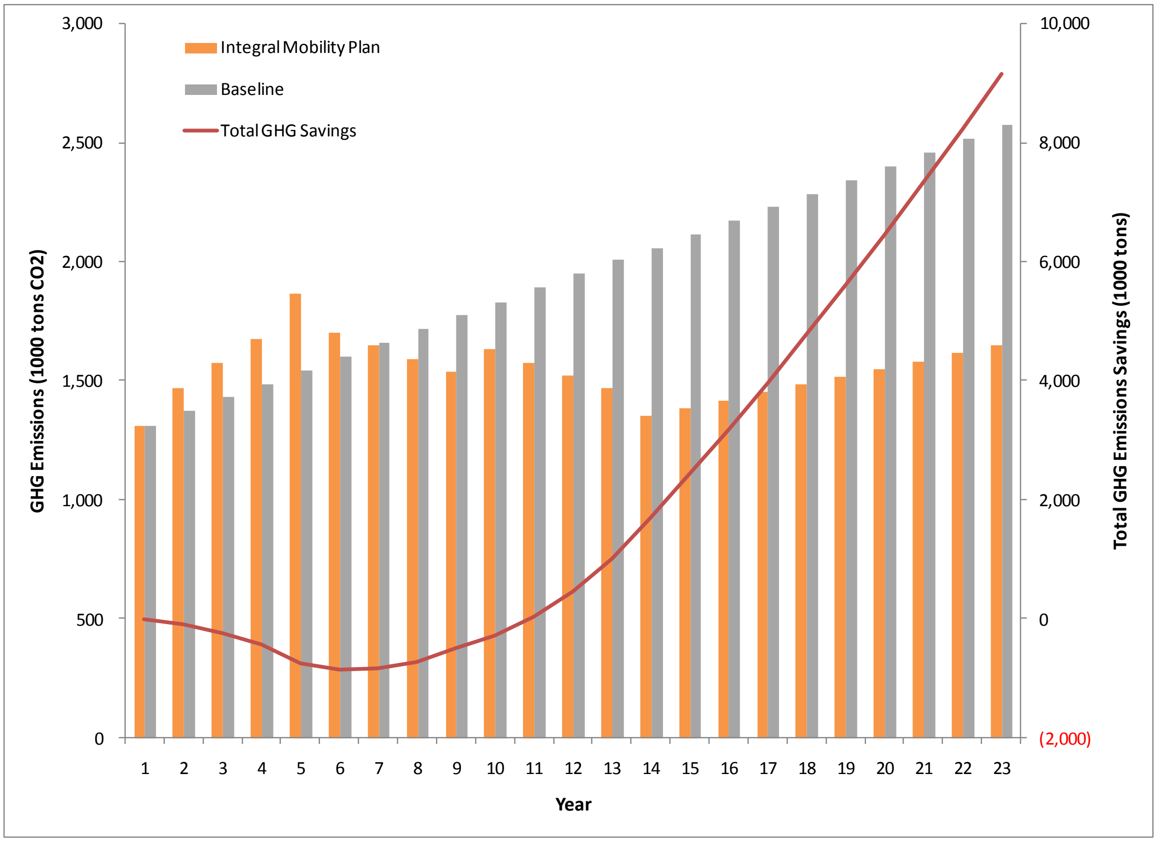

Figure 7: Estimated GHG Emissions and Savings Compared to Baseline

165. 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 kilometers from private transport are significantly reduced; generating emission savings of ~1 million CO2eq tones per year in the medium and long term.

166. Based on the vehicle-km and using emission factors, it is possible to estimate criteria pollutant emissions for the baseline and integral mobility 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 integral mobility scenario with respect to the baseline scenario indicates that the public transport investment has 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 it requires detailed modeling and data, not readily available.

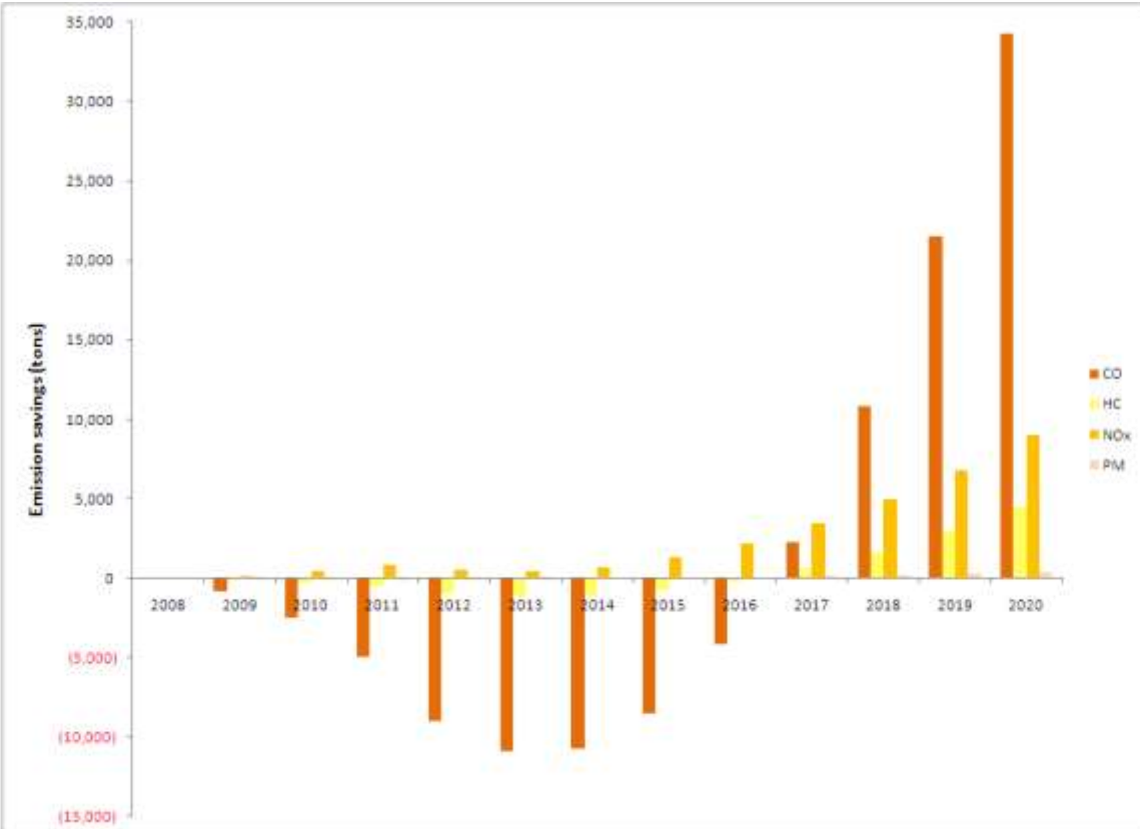

Figure 8: Air Pollutant Emission Reductions

5.3.5 Measurement, Reporting and Verification

167. A citywide 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, for a total 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 will be combined with emission factors and fleet composition data. This monitoring approach does not require detailed transport planning studies,

168. Beyond the CO2 mitigation and co-benefits it will also be important to monitor how the project helps in removing financial, institutional, permanence and public acceptance barriers. 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 are usually sizeable, a combination of local, state and national or federal funds is customary. Making explicit the GHG reduction potential, establishing quantitative goals for GHG emissions reductions and an MRV mechanism, is expected to increase the likelihood of receiving funding from national or federal government as the local plan helps achieving national goals in limiting GHG. It may also bring additional financing form international financial flows interested in

climate change and development issues in the form of grants and loans. Finally it will provide the opportunity to use climate financial instruments, very particularly supported NAMAs.

169. 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 will provide continuity over the election cycles through the monitoring, reporting and verification MRV mechanism and the provisions adopted to assure compliance of the mitigation and co-benefit goals.

170. The NAMA will tackle public acceptance and support as it highlights benefits that go beyond the direct transport benefits (reduced travel time and congestion). Public health benefits due to reduced air pollutant emissions and accidents, and increased physical activity are very important for the community at large. At the same time there is a growing concern for climate change. The public is more likely to support measures that bring complementary benefits, including climate change mitigation, than projects aimed to just reduce congestion or improve connectivity. A NAMA for Urban Transport can not only make explicit the broad range of co-benefits, but provide a solid framework for following up the impacts.

171. At the city level reporting could be assigned to a joint committee of transport and environment agencies, which will generate annual report. City reports will 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 may be considered as part of the overall plan.

172. Reports should be verified at two levels: review of the quality of the data collection and analysis efforts, and contrast of the reports with secondary data (e.g. air quality data, fuel sales). Independent peer review of the reports is suggested as well as quality assurance certification for the reporting process (e.g. ISO 9001-200044).

5.3.6 Risk Analysis

173. Risks have two dimensions: plan implementation and MRV processes. Plan implementation depends on the local political agenda, solving natural resistance of affected parties (e.g. existing transit providers, community in the area of influence of terminals, businesses during construction, etc.) and funding availability. Political and community risks can be mitigated through adequate community involvement. Funding risks can be solved through proactive involvement of other levels of government and seeking international financial flows (grants and loans by national and international funding agencies).

5.3.7 Financing

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). The estimated additional investment of the 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

[44] http://www.iso.org/iso/iso_catalogue/management_standards/iso_9000_iso_14000.htm

36 Million (1.4% of the marginal cost of the urban mobility 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 : Climate change funding [USD]

: Baseline GHG emissions in year *y* (without the NAMA)

: Scenario *s* GHG emissions in year y (with the NAMA)

: 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)

: Multiplier factor, we assume a value of 2: Annual discount rate (e.g. 12%)

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

174. While the expected income from the supported NAMA is small as compared with the funding requirements of the plan, it is very attractive: it will be either a grant or a concessional loan (i.e. with low interest and long repayment period). Having this funding up front is expected to facilitate the plan implementation. If this funding is provided up-front, it is also recommended to have a financial mechanism to motivate/penalize compliance under the MRV process.

175. Funding for the Integral Mobility Plan may come from several sources: local, state and federal budgets, credit from commercial and export banks, and loans from multilateral development organizations, among other. 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

176. A suggested assignment of responsibilities at the local level is presented in Table 8. 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 (Ministry of the Environment).

Table 8 – Suggested Assignment of Responsibilities at the City Level

Activity	Responsible for Execution	Responsible for Oversight	External Stakeholders
Planning	Transport Planning Agency – BHTRANS in coordination with the Urban and Regional Planning Agency (Secretaria Municipal de Planejamento, Orçamento e Informação)	• Head of Government (Prefeito Municipal de BH) • Finance Agency (Secretaria Municipal de Finanças) • Environmental Agency (Secretaria Municipal de Meio Ambiente)	• Surrounding municipalities • State Government • Community at large • National Financing Institutions • International Financing Institutions • Community at large • Private transit operators
Funding	Finance Agency - Secretaria Municipal de Finanças	• Head of Government (Prefeito Municipal de BH)	
Project	Transport Agency –	• Head of Government (Prefeito	

Activity	Responsible for Execution	Responsible for Oversight	External Stakeholders
Development	BHTrans	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)	
Monitoring and Reporting	Urban and Regional Planning Agency – Secretaria Municipal de Planejamento, Orçamento e Informação	• Head of Government (Prefeito Municipal de BH) • Finance Agency (Secretaria Municipal de Finanças) • Environmental Agency (Secretaria Municipal de Meio Ambiente)	
Verification	External agent	• Ministry of the Environment • UNFCCC	

5.3.9 Conclusions

177. Application of the framework to a specific case study 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 a 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 implementation barriers.

5.4 Mexico, Optimization of conventional bus system NAMA

5.4.1 Context description

178. Helped by low fuel prices, bad 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 emissions from the transport sector (Johnson et al., 2009).

179. Mexico has published a national climate plan, called ‘Programa Especial de Cambio Climático 2009-2012’ (PECC) (SEMARNAT (2009), in which it specifies objectives and goals (actions) to achieve in the different sectors. In the PECC, 8 transport-related objectives (and 12 goals) are specified.

180. A big network of privately owned microbuses (peseros) operates in the valley of Mexico. A fleet of more than 28,000 peseros (as of 2007) transports an important part of Mexico City's public transport passengers, surpassing by far the capacity of the metro or 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. This system contributes to pollution, traffic congestion, high accident rates as well as poor service quality.

5.4.2 Description of the proposed NAMA

181. The 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 through other sources (e.g. Clean Technology Fund), the optimization of the conventional bus system is not addressed by unilateral or other financing sources so far. Components of the NAMA comprise (a) the establishment of the appropriate institutional and regulatory framework needed for the optimization of the bus system, (b) the implementation of changes in the bus system, like the reorganization of routes and concession management, (c) public awareness raising and outreach as well as (d) the implementation of a transport monitoring system.

5.4.3 Methodological issues in determining the CO2 reductions

182. Emission reductions of the NAMA are deriving from efficiency gains achieved through the optimization of the conventional bus routes. Direct emission reductions are expected due to: (a) a decrease in number of buses, (b) a decrease in overall km-travelled (by buses) due to better route design and (c) modal shift (passengers shifting from private vehicles to buses).

183. Estimation (ex ante) of GHG emission reductions could be based on simple, but transparent assumptions, while monitoring, reporting and verification has to provide the certainty that the estimated effects (e.g. actions linked to GHG reductions) actually occur. MRV does therefore not necessarily have 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 and (3) the implementation is done effectively and (4) the rough magnitude of emission reductions estimated are actually achieved (see Table below). While for monitoring (4) we propose simple ASIF indicators derived from surveys, statistical measurement methods and secondary data (e.g. number of buses, overall km-travelled, modal split), monitoring of (1) – (3) could draw upon proxy indicators and established practices used in development finance.

Table 9: 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

Variable	Indicator
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	e.g. reallocation of concessions finalized, route design plan elaborated

5.4.4 Expected CO_2 benefits and associated co-benefits

184. Bus system optimization is the intervention with the highest emission reduction potential of all 9 interventions analyzed in the 2009 World Bank MEDEC study.

185. The bus system optimization brings various co-benefits: (a) less congestion, (b) time savings, (c) increased public transport quality, (d) positive health effects due to lower air pollution, (e) cost savings for operators/passengers, and (f) decrease in accidents.

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

5.4.5 Financing approach for the NAMA

187. While net benefits are significant, certain barriers inhibit the possible cost-savings from being realized, e.g. lack of information and data on possible benefits (informational barriers), lack of the necessary institutions and regulations (institutional barriers), high up-front cost which can only be recovered over longer time horizons (financial barriers), as well as social dimensions (e.g. expected pressure from bus drivers who fear to lose their jobs)). For interventions with negative costs, an incremental cost analysis is therefore not appropriate.

188. Climate finance in the form of a supported NAMA can play an important role in removing the above mentioned barriers (e.g. institution and capacity building, awareness raising) and can support the implemented measures by adding an international dimension.

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

189. 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 has to addressed by the national level.

190. 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 be the individual bus

optimization measure, but instead a national program to strengthen public transport, which then would channel funding to the local/regional level. With such an approach, it is 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.

5.5 Summary of Case studies

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

Table 10: Summary of three NAMA case studies

	Belo Horizonte	Mexico-City	Jakarta
Scope	Integral urban mobility plan (BRT, MRT, NMT investments, land-use, road improvements)	Optimisation 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 Metro Mexico, 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
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 modelling	NAMA as part of city-wide approach to mitigation Bottom up methodology (model by ITB), cross-checked with fuel sales * priorities for data improvement given * baselines likely to remain issues
Finance	Proposal to base amount of (up-front) finance on estimated emission reduction , possibility with multiplier (1.4% of total investment @ 17$/$tCO_2$)	Full financing of barrier removal costs: • Information • Institutional barriers • Social barriers Soft loans for investments	Budgetary support for capacity building to local gov. National climate change fund (ICCTF) can provide channel; non-climate sources also possibility

	Belo Horizonte	Mexico-City	Jakarta
Institutions	Local transport planning , urban planning and finance agency	Min. 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 w 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

:

- In all the cases there is a policy context which shows an awareness of the need to improve sustainability and a willingness to consider a range of measures which would structurally alter the transport system in the concerned city;
- With regard to scope there seems to be wide agreement that single measures should be embedded in a larger national (urban) transportation strategy. In the case of Belo Horizonte the proposed NAMA would implement part of an already comprehensive mobility plan; in Mexico City the proposed NAMA would translate part of a national level plan to the local level. In Jakarta the proposed NAMA could be an important contribution to the formulation of a city-wide TDM and mobility policy.
- All three NAMA case studies have adopted an approach in which ex-ante (before project start) assessment is made of the GHG reductions, although the methodology varies. The three NAMA case study teams acknowledge the need for, but differ in how to approach the, monitoring (MRV) during and following the project (ex-post). For some it seems feasible to actually measure the GHG reductions from the measures, while others instead focus on output and process indicators that show the measures are being implemented. One case study proposed a city level GHG inventory as the basis for assessing GHG emissions reductions.
- In all cases the availability for funding for data collection would greatly enhance planning and most likely increase buy-in from local stakeholders for the proposed intervention. All four case studies face varying degrees of difficulties in ensuring data

availability to determine both local and global benefits of the proposed measures. In some cases the required data systems are not in place, In other cases there are budgetary constraints in the regular updating of data;

- There are differences with regard to the extent and types of support needed. Two of the NAMA case studies would involve financial support for the removal of institutional, social and information barriers, while one other assumes up-front contribution to the investment costs based on the expected emission reductions. One NAMA specifically recommends finance and capacity building for data collection and technology transfer.
- All three NAMA case studies have addressed the issue of scaling up the activities developed under the NAMA. In one case proposals are made to enable the supported NAMA to evolve into a unilateral NAMA and then into a credited NAMA.

6. NAMAs in the transport sector: proposal for a framework

192. Drawing on experiences with existing instruments (CDM, GEF and CTF), the four case studies from Chapter 5, recent literature on climate change mitigation in the transport sector, and existing thinking on mitigation levels required from developing countries after 2012 , in the following we discuss a possible way forward for supported NAMAs to be successful in catalyzing a shift towards low-carbon sustainable transport. We focus on supported NAMAs. Credited NAMAs may not have an immediate large potential as these are likely to face similar problems as transport projects under the CDM. Unilateral NAMAs fall outside the scope of the paper, because by definition unilateral NAMAs 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

193. IEA/OECD (2009) conclude that all types of mitigation activities in the transport sector which were grouped in Section 1 under Avoid-Shift-Improve, may be required to enable developing countries to achieve low-carbon transport and therefore a framework for supported transport NAMAs needs to enable the full range of possible interventions.

194. 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, 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, transfer of intellectual property rights.

195. The size of the mitigation challenge in the transport sector up to 2020 and beyond (described in Chapter 2) support 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 are not just compatible but that they enhance each other. This follows the approach of the CTF as well as current GEF transport approaches which both attach a high priority to a sector wide approach. It is also in line with the observed trend in Chapter 2 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 are necessary in order to achieve the objectives (e.g. parking policies need NMT and public transport incentives as well as awareness raising to be effective).

196. 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[45] level NAMAs, while transport NAMAs aimed at influencing standards and technology dissemination will be more likely at the national level. Both are equally important element. A clear national level guidance, policy or regulation would also enhance the effects of local level activities aimed at strengthening transport systems. It may depend on the local context whether it is required to have a sectoral strategy at the national level 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.

197. A NAMA could, following the concept of sectoral crediting (described in 4.2) 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 reference (BAU) GHG emissions (intensity) baseline 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 it is recommendable if a bottom-up sectoral analysis is undertaken to establish a credible baseline for freight and passenger transport. The policies and measures which reduce emissions below this level could be considered NAMAs – unilateral, supported or credited.

6.2 Assessment of NAMA proposals

198. 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.

199. 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 as such 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 simple concept of cost effectiveness has limited value due to the following factors[46]:

- Cost-effectiveness cannot be quantified with a high degree of certainty;
- Some actions produce only indirect benefits, such as enabling activities, even though these are necessary for other measures to take effect;
- Co-benefits for e.g. local air quality or reduced congestion are not taken into account, giving a skewed picture of costs and benefits;
- 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 which incur the costs of the actions;
- In many cases up-front 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 catalyse a redirection of business-as-usual investment towards low-carbon transport.

---

[45] 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.

[46] Based on CCAP (2010), who as an alternative propose to look at cost-effectiveness of a bundle of transport measures

200. 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: (a) It could discourage countries to undertake 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 have generally high(er) incremental costs than NAMAs which would focus on the “avoid” and “shift” parts of the ASI approach; (b) 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 objectives of NAMA as an instrument which is to change the development path of economies in developing countries to a more low-carbon development path.

201. The incremental cost criterion was originally introduced in the discussion on climate change mitigation strategies to help ensure that that all incremental cost related to climate change mitigation be covered by developed countries and that additional finances would be used strictly only for the purpose of making developmental activities more low carbon and that 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 respond well to economic incentives and where the low carbon version 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 instead will be interested in identifying and undertaking climate mitigation action ions which have negative incremental costs, i.e. in win-win situations. To encourage climate action on the transport sector by developing countries it would be 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 (see section 3.1.3).

202. 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 activities is important as was argued in Chapter 2 but it unclear whether this would generate emission reductions in the transport sector on a scale as suggested by a 2° Celsius temperature stabilization scenario. The changes that developing countries will undertake comprehensive mitigation action will be enhanced if assistance for barrier removal is combined with investment support.

203. This report argues that 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 that it will not be advisable or practical to think of supported NAMAs as a separate category of measures under which investment support would only be limited 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.

204. The attractiveness of a supported NAMA would increase if it has provisions that promote the replication or scaling up of activities supported by the NAMA and which in turns triggers further emission reductions. This aspect is reflected in the indirect emissions of GEF projects and the transformational impacts of CTF Projects. NAMA proposals may also consider to make an assessment of such broader impacts.

205. 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 analyse how for support to investment costs would leverage or catalyze domestic climate action in the transport sector and how NAMA support would increase emission reductions below business as usual. 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

206. Important policy goals associated with transport projects, apart from GHG reductions, are: congestion reduction, road safety, air quality, and noise. 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 or not. In addition the co-benefits to be realized can influence the scale of a program. It is increasingly acknowledged that it is important to recognize the co-benefits associated with projects, either qualitative or in quantitative terms.

207. A full acknowledgement of co-benefits would however have to go beyond recognition of co-benefits and would have to include a certain reward for realizing co-benefits. This could be realized by making the amount of overall financial support contingent on the degree in which co-benefits are being realized, whereby co-benefits realized would result in a premium on top of the support received for GHG emissions reduced. Linking overall financial support to co-benefits realized would be justified based on the likely indirect GHG impact the action would have due to its replication potential. It would not affect the environmental integrity (misrepresentation of GHG emissions reduced) of the NAMA 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 are rewarded or not. Rewarding co-benefits would be one of the best ways to help ensure that the transport sector can participate fully in NAMAs. If co-benefits are to be recognized and rewarded in transport NAMAs 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 which is required for MRV of supported NAMAs should also be able to generate quantified estimates of selected co-benefits.

6.4 MRV

208. 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, e.g. fuel sales. However, a particular problem for transport NAMAs, especially for bottom-up modeling is the requirement for data. In many cases such data will not all 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.

209. 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 Business as Usual scenario[47]. To illustrate, Gotha (2010) shows that transport emission estimates and vehicle ownership in India differs strongly including for studies covering same years..

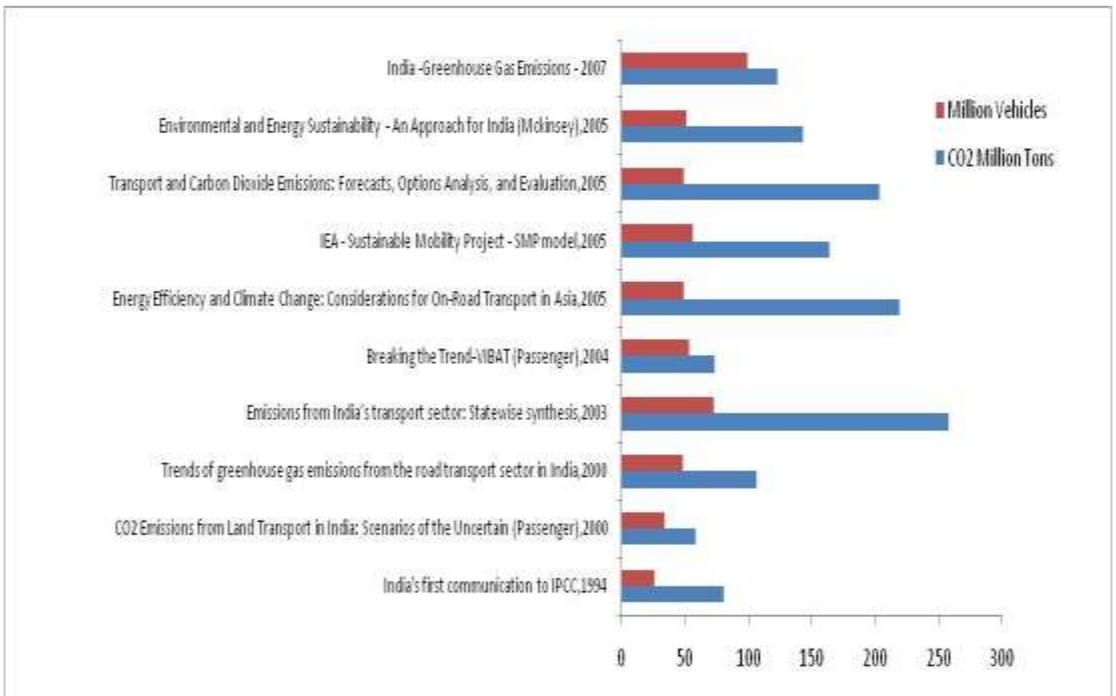

Fig. 9 Vehicle numbers and CO_2 emissions in India
Source: Sudhir Gotha http://cai-asia.blogspot.com/2010/05/india-transport-emissions-2007.html

210. MRV of sector-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 e.g. fuel sales. The difficulties are however to some degree shifted to the setting of an acceptable reference baseline in the prior proposal stage of the NAMA for which acceptable forecasts would be required on number of

[47] 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%.

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.

211. Given the complexity of GHG MRV, other options for indicators or metrics could be considered. This could also help to address the timelags 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, such as number of vehicles, share of biofuel in the mix, modal split, quantity of infrastructure built, etc, or process indicators such as existence of transportation planning. For each type of action suitable indicators could be developed which 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 possibly also on the expected quantified GHG emission reductions in specific operational conditions.

212. Such an approach would make it most likely 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 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 there will be facility available which would support the development of a NAMA and especially its MRV prior to the formal submission of a NAMA request.

6.5 Institutions

213. 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 acknowledges and addresses 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 national and local level.

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

6.6 Finance

215. 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 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 in 5.3.7) or whether this is based on other criteria as is currently the case in GEF and CTF. Linking the level of support to emission reductions required will strengthen the environmental integrity of the NAMA. In the case of the Belo Horizonte case study, to ensure a difference with current CDM schemes, a multiplier was introduced to increase the emission reductions, which can be a negotiated value. Linking

payments to direct GHG emissions will however be more difficult to do if financial support for the NAMA is mainly to enhance capacity for the design, preparation and implementation of GHG emission reduction actions.

216. Apart from the amount of financial support allocated to a specific supported transport NAMA it is also important when such funding is made available. Unlike in the case of CDM it is recommended that funding for supported NAMAs is available upfront. By providing substantial part of the NAMA support upfront it becomes more difficult to link the provision of NAMA support to the GHG emissions reduced. 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 build in which 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 based on which financial support would be provided are actually realized.

217. To ensure a representative coverage of transport under future NAMAs, it can be considered to allocate a specific part of future NAMA funding to the transport sector. This would besimilar 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 is also used already by GEF under its different Strategic Programs. GEF 5, is expected to allocate $ 250 million to transport.

218. 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. As indicated in Chapter 3 and by Huizenga (2010) 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 developing countries. The second largest source of funding will be the Multilateral Development Banks, several of which will increase their funding for transport significantly in the coming years.

219. 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 which might prevent the replication and scaling up of the activities supported through the NAMA. Equally important is 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

220. 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 and it suggested to work towards new and more appropriate evaluation criteria for supported transport NAMAs 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 or not. It is important therefore that co-benefits are included in the design of transport NAMAs and that they 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 that determining the GHG emission reductions can possibly also be based on proxy indicators instead of 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 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 will also be able to contribute towards investment costs and not just barrier removal costs. The MRV for the NAMA can build in provisions which would reward or sanction the implementers of the NAMA in case GHG emission reductions deviate from the up-front 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 of such actions is not likely to be possible.

References

ADB (2006). *Energy Efficiency and Climate Change Considerations for On-road Transport in Asia*

ADB (2007). *Evaluation on Policy based lending: Emerging Practices in Supporting Reforms in Developing Member Countries*. http://www.adb.org/Documents/SES/reg/policy-based-lending/EVU-OTH-2007-18.asp

ADB (2008). *Clean Energy Financing Partnership Facility - Semi Annual Progress Report, January – June 2008.* URL: http://www.adb.org/Documents/reports/CEFPF/CEFPF-Semiannual-Progress-Report.pdf

ADB (2009). *Transport Operations* URL: http://www.adb.org/Transport/operations.asp

Aeree Kim, J., J. Corfee-Morlot and P. de T'Serclaes, *Linking Mitigation Actions in Developing Countries with Mitigation Support: a Conceptual Framework*, IEA-OECD, 2009

African Development Bank (1997) *An evaluation of bank group policy-based lending operations, 1986-97*. http://www.afdb.org/fileadmin/uploads/afdb/Documents/Evaluation-Reports/00157913-EN-EVALUATION-POLICY-BASED-LENDING.PDF

Anable, J. (2008) ', www.bettertransport.org.uk/system/files/Carbon_abatement_research.pdf

Atteridge, A., C. Kehler Siebert, R. J. T. Klein, C. Butler, and P. Tella (2009*). Bilateral Finance Institutions and Climate Change: A Mapping of Climate Portfolios*. Stockholm Environment Institute Working Paper 2009

Bakker, S., C. Haug, H. van Asselt, R. Saïdi, J. Gupta (2010a, forthcoming). Future of CDM: same same but differentiated? Forthcoming in *Climate Policy* xx (2010) pp xx-xx.

Bakker, S., A. De Vita, J. Olivier (2010b, forthcoming) *Measuring and reporting emissions and reductions in the post-2012 regime*. Netherlands Environmental Assessment Agency, WAB report 5000102034.

Barías, J. Browne, J. Sanhueza, E. Silsbe, E. Winkelman, S. Zegras, C. (2005) *Getting on Track: Finding a Path for Transportation in the CDM,* International Institute for Sustainable Development, Winnipeg, Canada

Bellagio Declaration on Transportation and Climate Change. http://www.sutp.org/bellagio-declaration

Bodansky, D. (2007) '*International sectoral agreements in a post-2012 climate framework*', Working Paper Prepared for the Pew Center on Global Climate Change, Pew Center, Washington DC, USA

Bole, T., S. Bakker, M. Saïdi (2009). *Balancing the carbon market. Carbon market impacts of developing country emission reduction targets*. PBL/ECN report WAB 500102 030, available from www.pbl.nl

Bongardt, D., W. Sterk, F. Rudolph (2009). Achieving Sustainable Mobility in Developing Countries: Suggestions for a Post-2012 Agreement. *GAIA* **18/4** (2009): 307–314; available at www.slocat.net

Cambridge Systematics Inc. (2009) *Moving Cooler. An analysis of transportation strategies for reducing greenhouse gas emissions*. Urban Land Institute

Capoor, K., and P. Ambrosi (2009). *State and Trends of the Carbon Market 2009*. World Bank. Available from http://wbcarbonfinance.org

CDM Rule Book. Available at http://cdmrulebook.org/
CEC (2009) *Stepping up international climate finance: A European blueprint for the Copenhagen deal*. Commission of the European Communities, COM(2009) 475/3,
Center for Clean Air Policy, (2010a). *Transportation NAMAs: A Proposed Framework*. Washington, 14 January 2010.
Center for Clean Air Policy, (2010b), *Data & Capacity Needs for Transportation NAMAs.* Washington, May 2010
Center for European Policy Studies (2009). *Flexible Mechanisms in support of a new climate change regime- the Clean Development Mechanism and beyond*, Taskforce Report, Brussels, 2009,
Clapp, C., K. Karousakis, B. Buchner, and J. Chateau (2009). National and sectoral GHG mitigation potential: a comparison across models. IEA/OECD, Paris.
Co-Benefits Approach to Climate Change Projects. Version 1.0. available from www.unfccc.int
CTF (2009a) *Clean Technology Fund Investment Criteria for Public Sector Operations*. http://www.climateinvestmentfunds.org/cif/sites/climateinvestmentfunds.org/files/CTF_Investment_Criteria_Public_sECTOR_revisedFeb9.pdf
CTF (2009b) *Clean Technology Fund result measurement system*. CTF/TFC.3/8. http://www.climateinvestmentfunds.org/cif/sites/climateinvestmentfunds.org/files/CTFresultsmeasurement.pdf
CTF (2010). *Country and Regional Investment Plans* http://www.climateinvestmentfunds.org/cif/Country%20Investment%20Plans
Dalkmann, H. and C. Brannigan (2007). *Module 5e. Sustainable Transport: A Sourcebook for Policy-makers in Developing Cities.* GTZ.
Davidson et. al. (2007). *Climate Policy Costing Methodologies. A comparative analysis for the transport sector*. CE Delft report 07.7480.48, December 2007.
den Elzen, M. and Höhne, N. (2008) Reductions of greenhouse gas emissions in Annex I and non-Annex I countries for meeting concentration stabilisation targets *Climatic Change* vol 91, no 3-4, pp249–274
Dongchang Dai (2010). *Moving Towards Sustainable Transport Development in China*. Presentation at ADB Transport Forum 2010.
Duncan, T., (2009) Financing *Mechanisms for Sustainable Transport. ADB Presentation at High Level Meeting on global Environment and Energy in the Transport Sector*, Japan
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 option*s
Essen, H. van (2009) *Modal shift and decoupling transport growth from GDP growth for freight transport*. Presentation, available from http://www.eutransportghg2050.eu/cms/assets/Freight-demand-management-070709.pdf
European Commission (2009). Climate change: Commission sets out global finance blueprint for ambitious action by developing nations. Press release. Available at http://europa.eu/rapid/pressReleasesAction.do?reference=IP/09/1297&format=HTML&aged=0&language=EN&guiLanguage=en.
GEF (2008b). *Manual for calculating GHG benefits of GEF projects: Energy Efficiency and Renewable Energy Projects*
GEF (2008a). Transfer of environmentally sound technologies: the GEF Experience.
GEF (2009a). *Investing in Sustainable Urban Transport. The GEF Experience*
GEF (2009b) *GEF-5 focal area strategies*. GEF/R.5/Inf.21. http://www.thegef.org/gef/node/1974
GEF (2010b), *Summary of Negotiations Fifth Replenishment of the GEF Trust fund*. GEF/C.37/3

GEF-STAP (2010). *Manual for calculating GHG benefits of GEF projects: Environmentally sustainable transport projects*. In preparation.

Gotha, S., (2010) *My Critique on India's GHG Emissions 2007 - Transport Estimates*. http://cai-asia.blogspot.com/2010/05/india-transport-emissions-2007.html

Hoen, A., K. Geurs, H. de Wilde, C. Hanschke, M. Uyterlinde (2009). *CO_2 emission reduction in transport. Confronting medium-term and long term options for achieving climate targets in the Netherlands*. PBL publication 500076009.

Huizenga, C. (2010). "*Financing of sustainable, low carbon transport in developing countries: improving existing instruments and creating new instruments*" Presentation made at" Next Steps after Copenhagen: Opportunities and Challenges in the Transport Sector, Transforming Transportation 2010, Washington DC January 2010.

Huizenga, C., H. Dalkmann, S. Sanchez (2010, forthcoming) *The Future Climate Regime and the Transport Sector"* in Developing Asia: The Importance of Local Action, London, Earthscan

Huizenga, C., (2009a). *Global Policy for Sustainable Low Carbon Transport in Developing Countries*.

Asilomar 2009 *Conference on Transport and Climate Change*. Available at http://www.its.ucdavis.edu/events/outreachevents/asilomar2009/presentations/Session%201/Huizenga_Asilomar_2009.pdf

Huizenga, C., (2009b). REST description and outreach. Presented at IDB Transport week 2009, Sao Paolo, Brazil

Huizenga, C., S. Bakker (2009). *Applicability of post 2012 climate instruments to the transport sector*, Draft Interim Synthesis Consultant Report. Available at: http://www.sutp.org/slocat/wp-content/uploads/2009/12/CITS-Interim-Report-draft-11-December.pdf

Huizenga, C. Castillo, C.K. Ajero, M. and Sanqui, D.C. (2008) '*The co-benefits approach: an integrated policy response to climate change and development in Asia*' in Loh, C. Stevenson, A. and Tay, S. (eds) Climate Change Negotiations, Can Asia Change the Game, Civic Exchange, Hong Kong

IDB (2010) Strategic Framework for Supporting Climate Change Action in Latin America and the Caribbean. Climate Change Strategy Profile.

IEA (2009a). *World Energy Outlook 2009*. ISBN: 978 92 64 06130 9, Paris.

IEA/OECD (2009b) *Transport, Energy and CO_2. Moving toward sustainability*. ISBN 978-92-64-07316-6, Paris.

IETA (2010) *IETA response to the call for input on modalities and procedures for standardised baselines.* 22 March 2010. Available online at: http://unfccc.int/resource/docs/2010/smsn/ngo/186.pdf.

Indonesian Ministry of Finance (2009) *Ministry of Finance Green Paper: Economic and Fiscal Policy Strategies for Climate Change Mitigation in Indonesia*, Ministry of Finance and Australia Indonesia Partnership, Jakarta. URL: http://www.fiskal.depkeu.go.id/webbkf/siaranpers/siaranpdf%5CGreen%20Paper%20Final.pdf

Instituto Nacional de Ecologia, INE (2008). *The Benefits and Costs of a Bus Rapid Transit System in Mexico City*, Final Report, May 2008.

IPCC (2006). *2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2: Energy, Chapter 3 Mobile Combustion*. Available at http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_3_Ch3_Mobile_Combustion.pdf

Japan Ministry of Environment (2009). *Manual for Quantitative Evaluation of the co-benefits of transport projects*.

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

Johansson, B. (2009) Will restrictions on CO_2 emissions require reduction in transport demand? *Energy Policy* **37**(2009) 3212–322

Johnson, T., C. Alatorre, Z. Romo, F. Liu (2009) *Low-carbon development for Mexico*. Published by The World Bank

Jung, M., M. Vieweg, K. Eisbrenner, N. Höhne, C. Ellermann, S. Schimschar, C. Beyer (2010) *Nationally appropriate mitigation actions. Insights from example development*. Ecofys report http://www.ecofys.com/com/publications/brochures_newsletters/documents/Report_Ecofys_NAMA_overview_ENG_04_2010.pdf (accessed 22 April, 2010)

Kahn Ribeiro, S., S. Kobayashi, M. Beuthe, J. Gasca, D. Greene, D. S. Lee, Y. Muromachi, P. J. Newton, S. Plotkin, D. Sperling, R. Wit, P. J. Zhou, 2007: *Transport and its infrastructure*. In Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [B. Metz, O.R. Davidson, P.R. Bosch, R. Dave, L.A. Meyer (eds)], Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

Karousakis, K. Guay, B. and Philibert, C. (2008) *Differentiating Countries in Terms of Mitigation Commitments, Actions and Support*, OECD – IEA, Paris, France

Leather, J., and CAI-Asia Center Team (2009), *Rethinking Transport and Climate Change*.

Leduc, G., E. Blomen (2009). Sectoral Emission Reduction Potentials and Economic Costs for Climate Change (SERPEC-CC).Transport – Passenger cars, road freight and aviation

Logit, BHTRANS, Prefeitura de Belo Horizonte “Plano de Mobilidade Urbana de Belo Horizonte: Diagnóstico, Cenários e Resultados”, October 2009

McKinsey (2009a). *Roads Towards a Low Carbon Future: Reducing CO2 Emissions from Passenger Vehicles in the Global Road Transportation System*.

McKinsey (2009b) Indian cost curve.

Meckling, J O. and Chung, G.Y. (2009) ‘*Sectoral approaches to international climate policy: a typology and political analysis*’, Discussion Paper 2009-02, Belfer Center for Science and International Affairs, Cambridge, Massachusetts, USA

Merkl, A., (2010) Mitigating carbon in the transport sector. Presentation at the ADB Transport Forum 2010

Millard-Ball, A., and L. Ortolano, (2010). *Constructing carbon offsets: The obstacles to quantifying emission reductions. Energy Policy* **38** (2010) 533–546

Mitric, S. (2008) *Urban transport for development*. Towards an Operationally-Oriented Strategy. Transport Paper TP-22, The World Bank Group, Washington D.C.

Nakhooda, S., (2009) *Catalyzing Low Carbon Development? The Clean Technology Fund*. WRI Working Paper. World Resources Institute, Washington DC. Online http://www.wri.org/iffe

Nemet, G. T. Holloway, P. Meier (2010) Implications of incorporating air-quality co-benefits into climate change policymaking. *Environmental Research Letters* **5** (2010) 1, art. No 14007-14007, pp xx-xx.

Neuhoff (ed., 2009). International support for domestic climate policies in developing countries. *Climate Policy* (**9**) 5, special issue October 2009, ISBN 9781844078721

OECD/IEA (2005) *Saving oil in a hurry*. Paris.

Olsen, K.H., and J. Fenhann (2008). Sustainable development benefits of clean development mechanism projects. A new methodology for sustainability assessment based on text analysis of the project design documents submitted for validation. *Energy Policy* **36**, 2819-2830.

Replogle, M. and W. Hook, (2010) *Proposed Methodology for Calculating GHG Benefits of GEF Transportation Projects*. Presentation at workshop: "Towards Measuring GHG Mitigation Potential of Land Transportation Projects in the GEF", Manila 17-18 February 2010.

Republik of Indonesia, 2009. *Indonesia's Technology Needs Assessment on climate change mitigation.* Synthesis report, March 2009.

Sanchez, S., (2008). *Reforming CDM and Scaling-Up Finance for Sustainable Urban Transport, in: "A Reformed CDM – including new Mechanisms for Sustainable Development*, UNEP-RISOE Center, Perspective Series 2008

Schipper, L., Marie-Lilliu, M., Gorham, R. (2000). *Flexing the Link between Transport Greenhouse Gas Emissions: A Path for the World Bank*. International Energy Agency, Paris June. http://www.iea.org/ textbase/nppdf/free/2000/flex2000.pdf

Schmidt, J. Helme, N. Lee, J. Houdashelt, M. (2008) '*Sector-based approach to the post-2012 climate change policy architecture*'. Climate Policy vol 8, no 5, pp494–515

Schneider, L., (2007). *Is the CDM fulfilling its environmental and sustainable development objectives? An evaluation of the CDM and options for improvement*. Report prepared by Öko-Institut for WWF.

SEMARNAT (2009). *Programa Especial de Cambio Climático 2009-2012*. Available at http://www.semarnat.gob.mx/queessemarnat/politica_ambiental/cambioclimatico/Pages/pecc.aspx

Singru, N. *Carbon Footprinting of ADB's Transport Projects*. Presented at the ADB Transport Forum, 25 May 2010

Skeie, R., J. Fuglestvedt, T. Berntsen, M. Lund, G. Myhre, K. Rypdal (2009) Global temperature change from the transport sectors: Historical development and future scenarios, *Atmospheric Environment* **43** (2009) 39, pp6260-6270.

Sterk, W., F. Rudolph, ; C. ArensU. Eichhorst, D. Kiyar., H. Wang-Helmreich, , M. Swiderski. (2010): Further Development of the Project-Based Mechanisms in a Post-2012 Regime. Final Report of the Project Commissioned by the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety. Wuppertal: Wuppertal Institute for Climate, Environment, Energy.

Spain and the European Commission on behalf of the European Union and its Member States (2010) *Modalities and procedures for the development of standardized baselines* (SBSTA), Paper No. 3 in UNFCCC – Subsidiary Body for Scientific and Technological Advice: Views related to modalities and procedures for the development of standardized baselines from the clean development mechanism. Submissions from Parties and relevant organizations. Available online at: http://unfccc.int/resource/docs/2010/sbsta/eng/misc03r01.pdf.

Sutter, C., (2003). *Sustainability Check-up for CDM Projects*. Ph.D. Thesis.

Taga, F., (2009). Hacia un transporte sustentable de bajo carbono en LAC: Experiencia del BID. Side Event: Promoting a Regional Approach to Environmentally Sustainable Transport in LAC, IDB – CAI – CTS México.

Transport Research Foundation (2010) *Submission on modalities and procedures for the development of standardised baselines, 22nd March 2010*. Available online at: http://unfccc.int/resource/docs/2010/smsn/ngo/185a.pdf

Triastuti (ed., 2010) *Indonesia Climate Change Sectoral Roamap. Synthesis report*. BAPPENAS, 1st Edition, ISBN 978-979-3764-49-8. http://www.icctf.org/site/en/indonesia-climate-change-sectoral-roadmap.html

TRL (2010) *Submission on modalities and procedures for the development of standardized baselines*. Available from www.transport2012.org

U.S. Department of Transport, (2010) *Transportation's Role in Reducing U.S. Greenhouse Gas Emissions.* Report to Congress

UNEP (1999) Economics of greenhouse gas limitation, main report. Methodological guidelines. ISBN 87-550-2490-4.

UNEP/Risø (2010*). CDM pipeline July 1, 2010*. www.cdmpipeline.org

UNFCCC (2005). *Modalities and procedures for clean development project activities.*

UNFCCC (2007). *Bali Action Plan*. FCCC/CP/2007/6/Add.1

UNFCCC (2008), *Analysis of Possible Means to Reach Emission Reduction Targets and of Relevant Methodological Issues.* Technical Paper, FCCC/TP/2008/2.

UNFCCC (2009c) *Nationally appropriate mitigation actions by developing country Parties. Non-paper by the facilitator*. Non-paper No. 51. 6 November 2009.

UNFCCC (2009b). Item 3 of the provisional agenda: "Consideration of further commitments for Annex I Parties under the Kyoto Protocol". AWG-KP, 10th Session, Copenhagen, December 2009. FCCC/KP/AWG/2009/10/Add.3/Rev.3

UNFCCC (2009a), *Copenhagen Accord.* Decision -/CP.15. Advance unedited version, 18 December 2009.

UNFCCC (2009d), *Further guidance to the clean development mechanism*. Draft decision -/CMP.5, advanced unedited version, www.unfccc.int (accessed 25 January 2010).

UNFCCC (2010a) *Text to facilitate negotiations among Parties. Note by the Chair*. FCCC/AWGLCA/2010/8, 9 July 2010, advance version.

UNFCCC (2010b). *Appendix II - Nationally appropriate mitigation actions of developing country Parties*. http://unfccc.int/home/items/5265.php

UNFCCC (2010c), *Annex 11 – Draft Guidelines for the demonstration of additionality for CDM Programme of Activities.* http://cdm.unfccc.int/EB/051/eb51annagan11.pdf.

Unger, N., T. Bond, J. Wang, D. Koch, S. Menon, D. Shindell, S. Bauer (2010) Attribution of climate forcing to economic sectors. *Proceedings of the National Academy of Sciences* **23** (2010) 107, pp. 3382-3387

US Department of Transportation (2010) *Transportation's Role in Reducing Greenhouse Gas Emissions.* Report to Congress

Wittneben, B. Bongardt, D. Dalkmann, H. Sterk, W. Baatz, C. (2009) 'Integrating sustainable transport measures into the clean development mechanism', *Transport Reviews*, **29**, 1, pp91-113

Woodcock, J., P.Edwards, C. Tonne, B. G. Armstrong, O. Ashiru, D. Banister, S. Beevers, Z. Chalabi, Z. Chowdhury, A. Cohen, O. H. Franco, A. Haines, R. Hickman, G. Lindsay, I. Mittal, D. Mohan, G. Tiwari, A. Woodward, I. Roberts, Public health benefits of strategies to reduce greenhouse-gas emissions: urban land transport. *The Lancet*, Health and Climate Change 2, Published Online November 25, 2009.

World Bank (2007). *A Decade of Action in Transport – An Evaluation of World Bank Assistance to the Transport Sector, 1995-2005.* URL: http://web.worldbank.org/WBSITE/EXTERNAL/EXTOED/EXTTRANS/0,,contentMDK:21174378~pagePK:64168427~piPK:64168435~theSitePK:3300525,00.html

World Bank (2008b). *Clean Technology Fund*. http://www.climateinvestmentfunds.org/cif/sites/climateinvestmentfunds.org/files/Clean_Technology_Fund_paper_June_9_final.pdf

World Bank (2008a). *Safe, Clean, and Affordable…Transport for Development*. The World Bank Group's Transport Business Strategy for 2008-2012

World Bank (2008c). *Illustrative Investment Programs for Clean Technology Fund*. Design Meeting on Climate Investment Funds Washington, D.C. April 14-15, 2008. Available at http://siteresources.worldbank.org/INTCC/Resources/Illustrative_Investment_Programs_for_Clean_Technology_Fund.pdf

World Bank (2009a). *Transport Lending Trends 1996–2007*. http://go.worldbank.org/KM9OPODLQ0
World Bank 2009b. . Washington, DC: South Asia Region
World Bank (2010) *Winds of change. East Asia's sustainable energy future*. Washington, April 2010.
Yao, X., (2009*). Helping Achieve Seamless, Sustainable and Open Transport Systems in Asia*. 6th APEC Transportation Ministerial Meeting (TMM6), 27-29 April 2009, Manila, Philippines