



Partnership on Sustainable
Low Carbon Transport

NAMAs in the Transport Sector

Case Studies from Brazil, Indonesia, Mexico and
the People's Republic of China

Excerpted and adapted from the forthcoming
Climate Instruments for the Transport Sector
Consultants' Report by Cornie Huizenga and Stefan Bakker

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Abbreviations

ADB	Asian Development Bank
ASI	Avoid-Shift-Improve
AWG-KP	Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol
AWG-LCA	Ad-Hoc Working Group on Long Term Cooperative Action
BAU	Business as usual
BRT	Bus rapid transit
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
DOE	Designated Operational Entity
EB	Executive Board
EF	Emission factor
ERP	Electronic road pricing
GEF	Global Environment Facility
GHG	Greenhouse gas
GtCO ₂ -eq	Giga ton CO ₂ equivalent
IDB	Inter American Development Bank
IEA	International Energy Agency
IPCC	Intergovernmental Panel on Climate Change
MDBs	Multilateral development banks
MRV	Monitoring, reporting and verification
NAMAs	Nationally appropriate mitigation actions
NMT	Non-motorized transport
PoA	Program of Activities
SBLs	Standardized baselines
SLoCaT	Partnership on Sustainable, Low Carbon Transport
STI	Sustainable Transport Initiative
TDM	Transport demand management
UNEP	United Nations Environment Program
UNFCCC	United Nations Framework Convention on Climate Change
VKT	Vehicle Kilometers Traveled

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Executive Summary

Introduction

Transport is responsible for an important and growing part of global greenhouse gas (GHG) emissions, with most of the future increase expected to come from developing countries. The Copenhagen Accord¹ recommends limiting the increase in global temperature to 1.5-2.0° Celsius to avoid dangerous consequences from climate change. To achieve this, developed countries will need to reduce emissions by 25-40% below 1990 levels by 2020. During the same period, GHG emissions in developing countries will also need to be reduced by 15-30% below business as usual (BAU). For the transport sector, this would translate to 0.6-1.3 GtCO₂-eq/yr reduction by 2020. To reach the global goal of reducing GHG emissions by more than 50% below 1990 levels by the year 2050, significant emission reductions compared to BAU will be required in developing countries from 2020-2050. The manner in which developing countries develop their transport systems in the period leading up to 2020 will greatly determine the extent to which such longer-term emission reductions can be achieved.

So far, the impact of existing climate instruments on the transport sector has been limited. This is due to several reasons, namely:

- The relatively small amounts of funding available compared to the problem at hand.
- Competition between sectors to access available funds, combined with the perceived higher levels of uncertainty involved in reducing emissions from transportation compared to other sectors.
- The complexity of methods required to estimate, monitor and verify emissions reductions in the transport sector.

Discussions of post-2012 climate finance under the UNFCCC have occurred on two tracks, with one track focusing on how the current clean development mechanism (CDM) could function beyond 2012 in a new commitment period for the Kyoto Protocol (AWG-KP), and the other on a number of alternative climate instruments and policy options (AWG-LCA). A promising development has been the agreement that developing countries may voluntarily propose to undertake nationally appropriate mitigation actions (NAMAs).

The potential for NAMAs in the transport sector is significant, a point underscored by the expected availability in the coming years of considerably larger financial support for mitigation-related activities. The Copenhagen Accord (UNFCCC, 2009a)¹, for example, specifically includes provisions for NAMAs and notes that overall financial support for mitigation-related activities is expected to grow from USD 10 billion per year from 2010-2012 to USD 100 billion per year by 2020.

Negotiations continue on the appropriate design, finance and governance of NAMAs, including how to measure, report and verify (MRV) resulting emissions reductions and how to support NAMAs through finance, capacity building and technology transfer. However, little is known about the practical, on-the-ground issues involved in putting NAMAs into effect.

¹ A political document taken note of by the Conference of the Parties to the UNFCCC in December 2009

To help inform future discussions of NAMAs and to shed light on issues related to their implementation, the Inter-American Development Bank (IDB) and the Asian Development Bank (ADB) commissioned case studies in two Asian and two Latin American cities as part of the project Climate Instruments in the Transport Sector.

Each of the case studies was performed by a different organization, and each takes a look at a different aspect of urban transport. Urban transport was chosen not only because of its relevance to climate change, but also because enough information was available to make it a good candidate for analysis. Although the studies focused on urban passenger transport, it is important to remember that this covers only part of the overall emission-reduction potential in the transport sector. Inter-city, rural and freight transport also play important roles.

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

None of the case studies provides a complete assessment of a NAMA, although some provide a more complete assessment than others. Taken together, however, the studies demonstrate that NAMAs in the transport sector have the potential to achieve significant GHG emissions reductions and provide a substantial contribution to sustainable development. They also give the first on-the-ground evidence of the policies and guidelines that will need to be in place in any post-2012 climate agreement for transport NAMAs to achieve their full potential.

What Are NAMAs?

In recent years, a shift in thinking has been taking place in the transport sector on how best to mitigate climate change. The new thinking moves away from a singular focus on measures to improve technology and places increasing emphasis on measures aimed at avoiding the need to travel by motorized transport and shifting travel to more sustainable, lower-carbon modes of transport. With its broader understanding of mitigation, this new “avoid-shift-improve” (ASI) approach has resulted in a number of transport policies and programs, including NAMAs, that can enable developing countries and cities to limit the growth in GHG emissions from both passenger and freight transport, while also generating substantial societal co-benefits, such as improving mobility, reducing congestion, improving air quality and increasing fuel security.

As their name implies, NAMAs are devised by the country where they will be implemented and are tailored to that country's specific situation, resources and priorities. The Bali Action Plan² states explicitly that NAMAs are to be implemented in the context of sustainable development. The plan also calls for NAMAs to be “supported and enabled by technology, financing and capacity building, in a measurable, reportable and verifiable manner.” Beyond that, however, the precise manner in which NAMAs are to be designed, reviewed, implemented and monitored remains unclear.

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

In today's international climate and development communities, it is generally accepted that a NAMA can be a policy, a program or a project. Most of the NAMAs proposed to the United Nations Framework Convention on Climate Change (UNFCCC) after the Conference of Parties (COP) 15 in 2009 are described at the sectoral level, though they generally do not specify whether they will be implemented at the national or sub-national level (UNFCCC, 2010a). It is also generally understood that NAMAs do not need to be restricted to investment activities that directly reduce GHG emissions and that they can also include actions, such as capacity building or training, that facilitate or enable the reduction of GHG emissions. Three types of NAMAs have been discussed in the negotiations of the UNFCCC:

- **Unilateral NAMAs**, which are implemented on a voluntary basis by developing countries without the expectation of external support.

- **Supported NAMAs**, which are supported and enabled by technology, financing and capacity building in a measurable, reportable and verifiable (MRV) manner.

- **Credited NAMAs**, in which the emissions reductions could generate credits tradable in market-based financial mechanisms, much like the current CDM.

No substantial discussion has taken place on the level of GHG emission reductions to be accomplished by these three types of NAMAs, or their expected relative contribution. The Copenhagen Accord includes an Annex in which developing countries can inscribe their proposed NAMAs; as of June 2010, 36 countries had done so (UNFCCC, 2010b).

The limited international discussion that has taken place has focused mostly on supported NAMAs, which are the focus of this report.

The Center for Clean Air Policy distinguishes three broad categories of potentially eligible supported NAMAs: 1) planning and research activities that support mitigation actions, such as national or sub-

national low-carbon transportation plans, public outreach, development of models, travel surveys and economic studies; 2) regulation and policy development, such as fuel standards, parking policies, congestion pricing and removal of subsidies; and 3) physical and technical infrastructure, such as bus rapid transit systems, bicycle lanes, biodiesel refineries, transfer of intellectual property rights. (CCAP, 2010a)

Supported NAMAs would be registered in a NAMA registry. The registration process would include entering the estimated amount of GHG emissions reductions to be achieved through the NAMA, and the registry would also record the external support provided to implement the NAMA.

A point of considerable debate in the AWG-LCA discussions thus far is the linkage of NAMAs to low emission development strategies or action plans, and the role that such strategies or plans would play in determining the level of external support to NAMAs. The European Union and Japan, amongst others, support such linkage; developing countries, through the Group of 77 and the People's Republic of China, have argued that linkage would infringe on the sovereignty of developing countries and be a step towards compulsory, rather than voluntary, emission reduction goals.

Most parties agree that a proper system of MRV is needed to monitor progress and to create transparency and trust between developed and developing countries, as well as between host countries and financial backers. Views differ, however, on what standard is required, as well as on which aspects of mitigation MRV should focus on. Questions also have arisen over the structure of financial support, appropriate oversight mechanisms and numerous other aspects of NAMAs implementation in the transport sector.

Findings and Recommendations

An analysis of each of the case studies follows. Although the proposed NAMAs vary widely in terms of scope, financing structure, MRV methods, types of institutions involved and other key aspects, the following considerations were found to apply in general:

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

- The close ties between climate change, other sustainability issues (e.g., pollution, congestion) and more general development issues such as energy security and urban development make it hard to determine the “additionality” of a specific transport intervention or measure. The concept of additionality was introduced to CDM to ensure the quality of off-sets realized. Because no off-setting takes place in the case of supported NAMAs, this criterion may be less important³. Nonetheless, there still will be a need to create trust that funds are being used for climate purposes, and to measure the global progress towards the ultimate objective of reducing GHG emissions.

- Because of the huge costs of accurate data collection, as well as the variety in local conditions, the monitoring of GHG impacts in the transport sector lends itself to a mixture of actual calculation of GHG emissions reductions, indirect or proxy indicators and, in some cases, process indicators. Direct GHG impact indicators represent the “gold standard” in terms of indicators. However, where it is possible to develop default values or standards, use could be made of proxy indicators (e.g., kilometers of bicycle lane constructed), or even process indicators (e.g., number of people trained). Because emissions estimates in the transport sector are surrounded by large uncertainties, both for current levels and (especially) for projected BAU emissions, consensus needs to be built around assumptions used by different groups in modeling the expansion of the transport sector. Efforts also must be undertaken to increase the availability of reliable activity data.

- In contrast to the electric energy and industrial sectors, the largest share of financing for transport in developing countries generally comes from the public sector, with the second largest source of funding being development assistance. In the Pittsburgh G20 meeting, agreement was reached on a 350 billion capital increase for MDBs⁴. MDBs have recognized the importance of the transport sector in terms of lending and have stated their intention to increase assistance for climate action in that sector. Because new UNFCCC mitigation and technology funds, as well as the Global Environment Fund (GEF) and other dedicated climate funds, will continue to provide only a small share of funding for mitigation of climate action in the transport sector⁵, the use of dedicated climate funding in the sector can be optimized if it is made available upfront to facilitate and catalyze the development and implementation of sustainable, low-carbon transport.

- Climate-related funding will be an important factor in bringing about projects in the transport sector, and the blending of resources from MDBs, climate funds and local and national sources will be necessary. Although international financial support for these instruments is expected to grow considerably in the coming years, it is important to remember that the bulk of investments for climate action in the transport sector will need to come from domestic sources. Therefore, it will become increasingly important for external funds—i.e., climate change funds and MDB—to help remove barriers to the implementation of projects and to catalyze and leverage domestic funding.

- Because of the special characteristics of the transport sector, including the difficulties involved in attaining MRV standards under the current CDM, a separate window for transport-related climate funding may need to be established within UNFCCC. This would help ensure that the transport sector received mitigation-related funding in proportion to its contribution to climate change.

3. 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.

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

5. 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.

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

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

8) The role of capacity building.

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

Case Studies

Case Study 1: Optimization of Conventional Bus System in Mexico City

Context

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

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

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

Proposed NAMA

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

The proposed NAMA comprises the following components:

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

Methodological Issues

Emission reductions of the NAMA derive from efficiency gains achieved through the optimization of the conventional bus routes. Direct emission reductions are expected due to:

- 1) a decrease in the overall number of buses;
- 2) a decrease in overall km-travelled by the buses due to better route design; and
- 3) modal shift—that is, passengers shifting from private vehicles to buses.

Estimation (ex-ante) of GHG emission reductions could be based on simple but transparent assumptions, while MRV must provide the certainty that the estimated effects (e.g., actions linked to GHG

reductions) actually are realized. MRV, therefore, would 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;
- 3) the implementation is done effectively; and
- 4) the rough magnitude of estimated emission reductions is actually achieved (see Table 1 below).

For monitoring item 4, simple ASIF indicators derived from surveys, statistical measurement methods and secondary data (e.g., number of buses, overall km-travelled, modal split) could be used; the monitoring of items 1-3 could draw upon proxy indicators and established practices used in development finance.

Table1: Possible MRV indicators

Variable	Indicator
GHG reduction	
<i>Number of buses</i>	<i>Number of buses</i>
<i>Decrease in distances travelled by buses</i>	<i>Km-travelled by buses</i>
<i>Modal shift</i>	<i>Passengers shifting (from private vehicles) to buses</i>
Co-benefits	
<i>Reduced traffic accidents</i>	<i>Fatalities due to traffic accidents</i>
<i>Travel time savings</i>	<i>Reduction in travel time per trip</i>
<i>Reduced congestion</i>	<i>Average travel speed</i>
<i>Reduced air pollution (positive health effects)</i>	<i>Local measurements, statistics on air pollution</i>
Process indicators	
<i>Regulatory framework</i>	<i>Reformed regulatory institution(s), Operation and Maintenance entity established, etc.</i>
<i>Implementation of actions</i>	<i>e.g., reallocation of concessions finalized, route design plan elaborated</i>

Benefits

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

The bus system optimization brings various co-benefits, including:

- 1) less congestion;
- 2) time savings;
- 3) increased public transport quality;
- 4) positive health effects due to lower air pollution;
- 5) cost savings for operators/passengers; and
- 6) a decrease in accidents.

According to the MEDEC study, bus system optimization leads to higher benefits than costs. Net benefits of the bus system optimization are estimated to be around 96.6 \$/t CO₂-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).

Financing

While net benefits are significant, certain barriers inhibit the possible cost-savings from being realized. These include:

- 1) lack of information and data on possible benefits (informational barriers);
- 2) lack of the necessary institutions and regulations (institutional barriers);
- 3) high up-front cost that can only be recovered over longer time horizons (financial barriers); and

4) social barriers (e.g., expected pressure from bus drivers who fear losing their jobs). For interventions with negative costs, an incremental cost analysis is therefore not appropriate.

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

Institutional Involvement

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

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



Case Studies

Case Study 2: Transport Demand Management (TDM) in Jakarta, Indonesia

Context

Indonesia is proactively taking steps to address climate change mitigation at both the national and local level. Specifically, the Government of Indonesia is committed to a voluntary 26 percent reduction below the baseline by the year 2020 unilaterally, and a further 15 percent (total 41 percent reduction) with international support (Indonesian Ministry of Finance 2009)⁷. Furthermore, Jakarta set a 30 percent GHG emissions reduction target by 2030 (compared with BAU). Indonesia has also associated itself with the Copenhagen Accord and has submitted a proposed NAMA that includes “shifting to low-emission transportation mode.”

In taking mitigation actions in the transport sector, Indonesia faces a particular challenge. The number of vehicles in Indonesia is predicted to grow more than two-fold between 2010 and 2035, with the growth expected to be largest in two-wheelers and light

duty vehicles (ADB, 2006). Transport contributed to 23% of the total CO₂ 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.

Description of NAMA

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

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

Methodological Issues

In assessing and quantifying CO₂ and other co-benefits of TDM, the study suggested an approach that combines a transport demand model (i.e., one driven by data from household surveys and traffic counts) with information on the vehicle fleet (e.g., emission factors).

The model that was used provided a well-established list of output variables to express changes in CO₂ and key co-benefits, namely:

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

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

Expected Benefits

Scenario work using the TDM model has demonstrated that a typical combination⁸ of the three TDM policies would lead to a sustained reduction of total transport demand (in vehicle kilometers, within the wider Capital Region of Jakarta, and below the baseline⁹) of approximately 4-5%--but up to 40% when focusing on the central business district (CBD), where ERP would be targeted. This demonstrates the highly location-specific impacts of TDM policies.

Expected CO₂ 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.¹⁰ A sustained reduction of between 20-30% compared to BAU was shown for an area within the Jakarta Outer Ring Road, and even larger levels for the central business district. 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, these findings demonstrate how TDM, especially when coupled with other measures such as fuel economy improvements, could assist in meeting the local target of 30% by 2030.

The approach also allows key co-benefits to be modeled, including:

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

8. 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.

9. 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.

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

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

Financing

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

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

Institutional Involvement

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

- The responsibility for planning and implementation of TDM activities would fall on the local level, whereby the overall policy direction would be set by the Governor/Deputy Governor of Jakarta in close coordination with the Regional Transport Agency (DISHUB) and other implementing agencies.
- MRV of the TDM NAMA could be coordinated by the Regional Environment Agency (BPLHD), based on a city level GHG inventory and possibly guided by the Ministry of Environment to allow it to be compatible with the national approach.
- A clear benefit could derive from developing methodologies to measure transport emissions in close coordination with the Regional Transport Agency and (National) Ministry of Transportation to ensure that the approach was compatible with the characteristics and practical requirements of the transport sector. In the case of a supported NAMA, MRV methodologies would also be reviewed internationally. Methodologies and associated data should be openly shared to allow maximum transparency and to invite continuous improvement by third parties and to contribute to an international effort to harmonize MRV methodologies.

- Financing under a unilateral or supported NAMA could mainly involve the local budgetary process, with the potential for partial support coming from national sources (e.g., for capacity building). International funding could be matched against local actions through the national government. Direct support to the local government (bypassing national government) should not be ruled out, particularly if it came through bilateral/multilateral climate funds and official development assistance channels. Under a credited NAMA, Jakarta as a city would be expected to become the market entity, receiving financing either from the UNFCCC-administered trading mechanism or from non-UNFCCC carbon markets in return for MRVed emission reduction. In pursuing a city-wide approach with sectoral baselines for all major emitting sectors (and potentially also for supported NAMAs), consideration could be given to the establishment of a coordination office that overlooks MRV efforts.

Roadmap for the Future

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

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

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

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

An overview of the roadmap is provided in Figure 1 below, showing how the TDM NAMA could be developed under each approach.

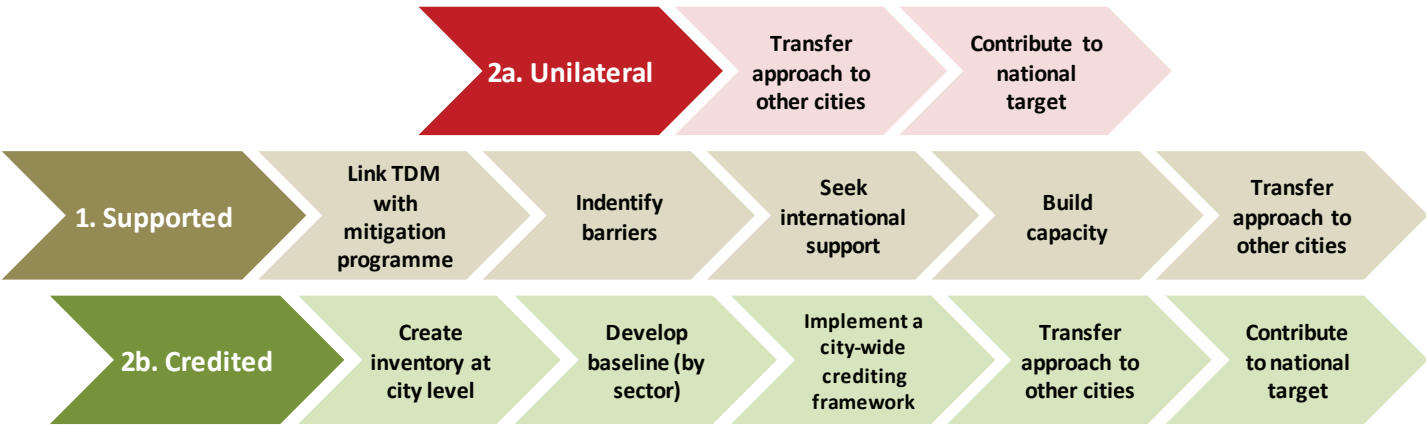


Figure 1: Roadmap for the future TDM NAMA in Jakarta



Case Studies

Case Study 3: Comprehensive Urban Mobility Plan in Belo Horizonte, Brazil

Context

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

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

The city developed a Comprehensive Mobility Plan—“planmobBH”¹¹—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.

Policy Objectives

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

By 2020, the 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 plan’s final year, the expected reductions would be 36% in GHG, 25% in travel time, 19% in transport costs and 39% in particulate matter.

Description of NAMA

The proposed NAMA includes enhancement of public transport (BRT and metro), metropolitan fare integration, construction of infrastructure for and promotion of non-motorized transportation (NMT) (walking and cycling), and combined land use and parking policies, with a total investment of USD 4.2 billion (Table 2). Of the total investment, USD 1.6 billion corresponds to ongoing activities and is already committed by the city. These investments are considered the baseline scenario.

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

Table2: Physical goals and financial cost: Baseline and Integral Mobility Plan

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

GHG Emission Reductions

The net cumulative GHG emission savings over the 22-year period 2008-2030 are estimated at 9 MtCO₂-eq . Figure 2 presents year-by-year estimates of GHG emissions over the course of the plan relative to the baseline.

These estimations incorporate demand projections using a detailed transport planning model, assumptions on the fleet composition and types of fuels, and emission factors from an approved CDM methodology¹², including upstream fuel production and transport. GHG emissions from construction activities and vehicle manufacturing are added.

Co-Benefits

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

Travel cost savings are the result of changes in vehicle activity (vehicle-km). By 2030, the economic value of the cumulative travel cost savings is estimated to

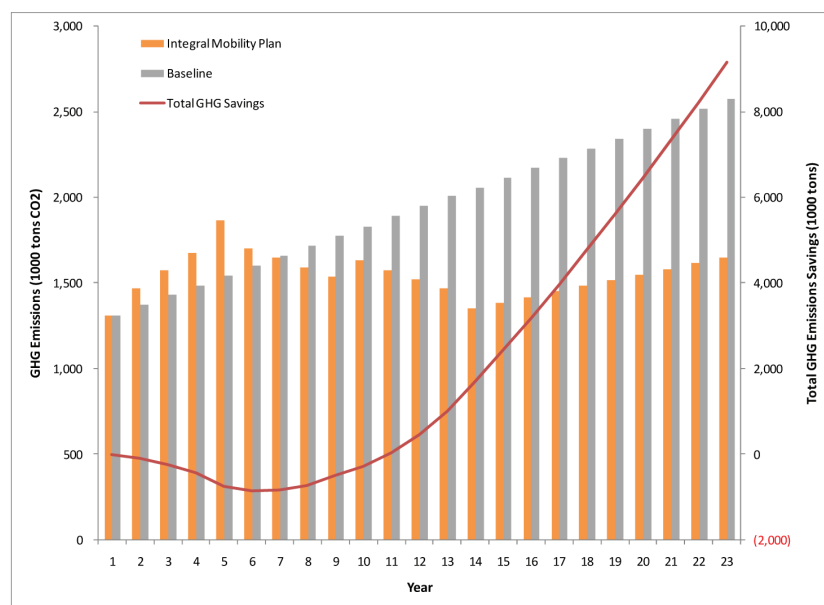


Figure 2: Estimated GHG Emissions and Savings Compared to Baseline

exceed USD 900 million (present value at a discount rate of 12%).

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-km traveled by public transport vehicles using the BRT system and private vehicles using the new roads included in the plan. As modal shift from private vehicles to public transport progresses, the vehicle-km from private transport would be significantly reduced, generating emission savings of ~1 MtCO₂eq per year in about Year 15 of the plan, with significantly higher levels thereafter.

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 is highly uncertain, the calculated savings of the integral mobility scenario with respect to the baseline scenario indicates that the public transport investment would have a positive impact by reducing CO, HC, NOx and PM emissions. The air pollutant emissions savings are presented in Figure 3. Economic benefits from the reduced tailpipe emissions are not calculated, as doing so would require detailed modeling and data that are not readily available.

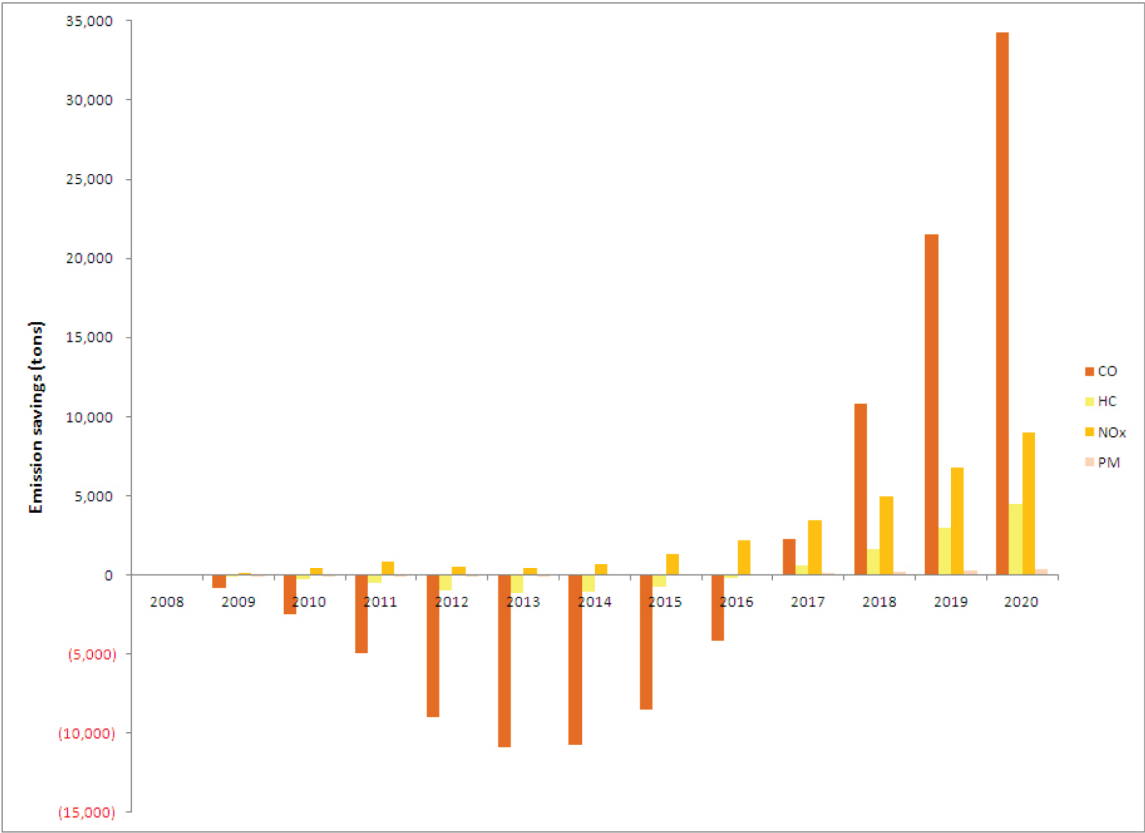


Figure 3: Air Pollutant Emission Reductions

MRV

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

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

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

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

Public acceptance and support for the NAMA would be won by highlighting the significant benefits beyond direct transport benefits that would result—

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

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

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

Managing Risks

Risks can be found during implementation of the NAMA and when carrying out the MRV processes. NAMA implementation depends on the local political agenda, on addressing vested interests (e.g., existing transit providers, community in the area of influence of terminals, businesses during construction, etc.) and on funding availability. Political and community risks can be mitigated through adequate community involvement. Funding risks could be solved by the proactive involvement of other levels of government and by seeking international financial flows (grants

and loans by national and international funding agencies). The MRV process is subject to problems in data collection, modeling and lack of technical expertise on data analysis. These risks could be mitigated with formalization and standardization of the procedures, as well as with quality assurance (ISO certification).

Financing

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

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

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

Table 3: 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 Development	Transport Agency – BHTrans	Head of Government (Prefeito Municipal de BH) Urban and Regional Planning Agency (Secretaria Municipal de Planejamento, Orçamento e Informação) Finance Agency (Secretaria Municipal de Finanças) Environmental Agency (Secretaria Municipal de Meio Ambiente)	
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	

Institutional Framework

A suggested assignment of responsibilities at the local level is presented in Table 3. NAMAs from individual cities would be reviewed and approved by the national authority in charge of submitting NAMAs to UNFCCC or other internationally designated bodies.

Summary

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

Further development and enhancement of this framework is encouraged. Expansion of the results from Belo Horizonte to 40 Brazilian cities larger than 500,000 inhabitants shows potential savings of 1 to 10 million CO₂-eq tons per year (low to high investment). Climate instruments are expected to provide a relatively small percentage of the total costs required for urban mobility plans, but this funding will be critical in removing barriers to their implementation.



Case Studies

Case Study 4: Standardized Baselines for Public Transport in Hefei, People's Republic of China

The Hefei case study focused on assessing the feasibility of developing standardized baselines (SBLs) for BRT projects. The development of SBLs has been discussed under the UNFCCC as a method for simplifying the calculation of emission reductions in CDM projects since the late 1990s. Over time, greater and greater numbers of default values have become available for many tools and methodologies, with several methodologies relying on benchmarking. In transport, however, default values are employed only for fuel emissions and vehicle efficiency. The discussion of SBLs gained further momentum as part of proposals for structurally improving the CDM. The Subsidiary Body for Scientific and Technological Advice is expected 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).

Context

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

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

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

Methodological Issues

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

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

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

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

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

and costly, because data needs to be updated constantly. This raises the question of whether the effort to gather the necessary data for standardized baselines would in fact be significantly smaller than that required for a project-based approach.

Possibilities for Standardization

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

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

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

For example, the average trip length on buses in Hefei is 7km, which is not too far off the GEF default. But a difference of just one kilometer translates into

a deviation of 15%, which has a significant impact on the calculation of the resulting emissions.

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

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

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

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

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

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

Financing the Development of SBLs

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

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

Institutional Involvement

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

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

Where the level of aggregation is confined to a national or regional scope, the EB will have to rely on

the existing capacity of national institutions to gather data and will have to adapt the proposed baselines to local data. Capacity building may be necessary. Designated Operation Entities or another mandated independent agency could verify the database used for standardization through spot checks. Baselines and data collected should also be made available to the public for peer-review and comments early in the process according to current CDM procedures.

Conclusion

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

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

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

therefore be contradictory to developing locally appropriate transport policies and measures.

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

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

Appendix A: Summary of Case Studies

	Belo Horizonte	Mexico City	Jakarta
Scope	Integral urban mobility plan (BRT, MRT, NMT investments, land-use, road improvements)	Optimization of conventional bus system: Institutional structure Planning Implementation	TDM: Electronic road pricing Parking policies BRT expansion
Ex-ante GHG reduction estimation	Scenario analysis shows approximately 30% emission reduction vs. BAU (0.5 – 0.9 MtCO ₂ /yr); co-benefits also estimated	Estimate emissions in 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 modeling	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 link the amount of (upfront) finance to 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 government. National climate change fund (ICCTF) can provide channel; non-climate sources also a possibility
Institutions	Local transport planning, urban planning and finance agency	Ministry of Transport (SETRAVI) and state Ministry, and a regulatory entity to be established; FONDADIN; Ministry of Environment and planning	Local planning/ implementation agencies in cooperation with Deputy Governor; MRV by regional environment agency, in cooperation with national ministry; various options for financial support, e.g. through national NAMA agency.
Scaling up	Replication of NAMA in 40 other Brazilian cities	Adding Bus optimization component to national urban transport program	Evolution from supported NAMA to unilateral NAMA to credited NAMA. Roll-out to other cities in Indonesia
Other issues		Possible interaction with development finance	Technology transfer for ERP Capacity building for MRV; NAMA could start as supported, transition to unilateral or credited

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