Elements of T-NAMA MRV

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Our Aim

Clean Air Asia leads efforts to enable Asia's 1,000+ cities to reduce both air pollution and CO₂ emissions, and thereby contribute to more livable and healthy cities with blue skies and a low carbon footprint. Emissions can be reduced through policies, plans, programs, and concrete measures that cover air quality, transport and industrial emissions, and energy use.

Our Role

Decision makers use reliable analysis, knowledge, data and effective tools to understand the program and identify solutions.

Stakeholders at the city, national and regional level cooperate better through networks and partnerships.

Policies and programs are in place that are science-based, stakeholder-inclusive and effective.
MRV of Transport NAMAs

In-line with the priorities of the country (and/or locality)

Policy/programme/measure/project that reduces GHG emissions in the transport sector

Domestic MRV Guidelines:

“general, voluntary, pragmatic, non-prescriptive, non-intrusive and country-driven, take into account national circumstances and national priorities, respect the diversity of nationally appropriate mitigation actions, build on existing domestic systems and capacities, recognize existing domestic measurement, reporting and verification systems and promote a cost-effective approach.”
MRV Systems
Rationale for MRV

... facilitates the tracking of progress towards achieving mitigation goals

... supports decision-making and national planning in the host country

... highlights lessons and good practices

... supports implementation of NAMAs and generates feedback on NAMA effectiveness

... builds trust and increases the likelihood of gaining international support

... promotes coordination and communication amongst the different emitting sectors

... generates comparable, transparent information

The MRV approach ...

Source: GIZ TRANSfer Colombia. MRV of NAMAs and the case of the Colombian Freight NAMA
Challenges in T-NAMA MRV

- Unique nature of mobile sources of emissions in the transport sector
- Complexity and cost of data collection methods
- Lack of clear definitions
- No institutionalized data collection
- At this stage, TNAMAs can take different forms, non-GHG priorities can also be different → difficulties in pinning down indicators
- Lack of Cause-impact analysis guidance
The Unique-ness of NAMAs

<table>
<thead>
<tr>
<th>Reduction of air pollution</th>
<th>Increased energy efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improved mobility</td>
<td>Improved access</td>
</tr>
<tr>
<td>Reduced accidents</td>
<td>Improved economic efficiency</td>
</tr>
</tbody>
</table>

Transport-related priorities can include environmental, economic and social dimensions and can come in different forms.

Monitoring non-GHG impacts (positive and negative) pose additional challenges (as well as opportunities) to tNAMAs.
Transformational NAMAs

Scopes, cause-impact relations

Transformational impacts

Complexity in MRV
CO2 Impacts: BAU vs Mitigation (NAMA) Scenario

How do we construct the counter-factual scenario?

Business-as-usual scenario

“Mitigation” scenario

Emissions savings

How do we construct the counter-factual scenario?
General Estimation Approaches: CO2

Top –Down

- Aggregate fuel data

Bottom-up

- Transport activity-based
Advantages and Disadvantages

**Top-down approach**

+ • probability of data being available
  • consistency in data collection

- • low level of detail
  • limitations in assessing specific interventions

**Bottom-up approach**

+ • more detailed information allows better analysis of interventions
  • Enables analysis of other co-benefits

- • time and costs in data collection
  • standardized procedures for collecting specific data may not be available

National GHG inventories

NAMAs
Top Down

Volume of fuel consumed

Energy contained in fuel (MJ/kg of fuel)

Total Energy consumed (TJ)

Total CO2 emissions (tons CO2)

Carbon content per energy unit (ton Carbon/TJ)

Carbon to CO2 converter (44/12)

Fraction of fuel oxidized (%)
**Top Down (2) - Simplified**

- Tells you how much CO2 is emitted
- Doesn’t tell you much about the sources
- Doesn’t enable mitigation impacts analysis of interventions

**CO2 Emission Factor per amount of fuel consumed**
(e.g. kgCO2/liter of gasoline)

**Volume of fuel consumed**

**Total CO2 Emissions (kgCO2)**
Bottom-up

A Transportation Activity
S Structure of the transportation system
I Intensity of the transportation modes
F Emission Factors
Fitting ASIF

Activity
(Total Passenger-km or ton-km)

Structure
(% of PKM, TKM done by the different modes of transport)

Modal Energy Intensity
(person kilometer/unit of energy)

Total CO2 Emissions
(kgCO2)

Factor of Emissions
(e.g. kgCO2/liter of gasoline)

Occupancies; average energy efficiencies (km/liter); fleet composition

Energy content of fuels
<table>
<thead>
<tr>
<th>Area</th>
<th>Data Type</th>
<th>Data Usage</th>
<th>Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuels</td>
<td>Fuel quantity</td>
<td>Inventory, top-down GHG calculation, national reports</td>
<td>Tax base (quantities and types) and fuel regulations</td>
</tr>
<tr>
<td></td>
<td>Fuel type</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Fuel quality</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vehicles</td>
<td>Number of vehicles per category</td>
<td>Inventory, top-down GHG calculation, national reports</td>
<td>Vehicle registration systems, vehicle tax collection, specific surveys</td>
</tr>
<tr>
<td></td>
<td>age structure</td>
<td></td>
<td>(e.g. mileage)</td>
</tr>
<tr>
<td></td>
<td>annual mileage</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>emission category</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emission</td>
<td>Fuel consumption</td>
<td>CO2 per km per vehicle category</td>
<td>Vehicle registration, modelling, sampling studies, company statistics</td>
</tr>
<tr>
<td>Factors</td>
<td>Emission factors</td>
<td>Impact of measures to improve transit</td>
<td></td>
</tr>
<tr>
<td>Modes</td>
<td>Occupation rates / average trip</td>
<td>CO2 per PKM per vehicle category</td>
<td>Surveys (passengers and/or households), traffic studies, visual</td>
</tr>
<tr>
<td></td>
<td>distance</td>
<td>Impact of measures to shift transit</td>
<td>observation studies</td>
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<tr>
<td></td>
<td>Trip share per mode (as % of trip</td>
<td></td>
<td>Modelling or surveys for baseline</td>
</tr>
<tr>
<td></td>
<td>distance)</td>
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</tr>
<tr>
<td></td>
<td>Trip share per mode baseline</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trips</td>
<td>Trip distance per mode per annum</td>
<td>gCO2 for transit per inhabitant</td>
<td>Household surveys, traffic observation</td>
</tr>
<tr>
<td></td>
<td>per inhabitant</td>
<td>Impact of measures to avoid transit</td>
<td>Modelling or surveys for baseline</td>
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<tr>
<td></td>
<td>Trips baseline</td>
<td></td>
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</tr>
<tr>
<td>SD</td>
<td>Air quality</td>
<td>SD impact of measures</td>
<td>Measurements, surveys, traffic observation studies, modelling</td>
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<td></td>
<td>Time required for transit</td>
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<tr>
<td></td>
<td>Accident, mortality and morbidity</td>
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<tr>
<td></td>
<td>rate transit</td>
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<td></td>
<td>Health costs air pollution</td>
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<td></td>
<td>Income/wealth distribution impact</td>
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Source: PMR Colombia, 2014 as quoted in the powerpoint presentation by GIZ TRANSfer Colombia. MRV of NAMAs and the case of the Colombian Freight NAMA
Overview of Data Availability of Input Parameters for Each Country

Data Access

Data Availability

Data quality checks
Potential errors and uncertainties
Easily accessible to data users
Data availability
Easyness of accessibility

Impacts Measurement: Timing

Ex-ante estimation

- Establish BAU emissions
- Inform intervention selection
- Inform reduction goals
- Attract financial support

• What is the potential emissions reduction impact of the intervention?
• Baseline study needed

Start of intervention

Monitoring and Ex-post evaluation

• Evaluate intervention effectiveness
• Meet funder requirements
• Improve intervention design

• Is the intervention delivering the emission reduction as expected? Why?
• Monitoring plan and actual monitoring
Ex-post

Is the intervention delivering the emissions reductions that it has promised?

Data to be monitored:
- What
- Why
- When
- Where
- How
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<tr>
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<tbody>
<tr>
<td>Passengers transported by project (million)</td>
<td>Actual</td>
<td>Expected</td>
<td>Actual</td>
<td>Expected</td>
</tr>
<tr>
<td></td>
<td>94</td>
<td>147</td>
<td>118</td>
<td>356</td>
</tr>
<tr>
<td>Share of passengers which would have used passenger cars (%)</td>
<td>4.3</td>
<td>5.5</td>
<td>2.4</td>
<td>5.5</td>
</tr>
<tr>
<td>Share of passengers which would have used taxis (%)</td>
<td>5.5</td>
<td>5.6</td>
<td>5.5</td>
<td>5.6</td>
</tr>
<tr>
<td>Share of passengers which would have used buses (%)</td>
<td>89.1</td>
<td>88</td>
<td>91.4</td>
<td>88</td>
</tr>
<tr>
<td>Share of passengers which would have used NMT or not made the trip (%)</td>
<td>1.1</td>
<td>0.8</td>
<td>0.7</td>
<td>0.8</td>
</tr>
<tr>
<td>Emission reductions</td>
<td>-40%</td>
<td>-70%</td>
<td>-74%</td>
<td>-74%</td>
</tr>
</tbody>
</table>

BRT Bogotá, Colombia: TransMilenio Phase II To IV (monitoring report 2010)
Construction and Operations (% of total CO2 footprint of projects)
ASI and ASIF: General Relationships

- Activity: How much is the reduction in travel demand?
- Structure: Was there a shift towards more environmentally-friendly modes?
- Intensity: Was there an improvement in fuel efficiency?
- Factor of emissions: Was there a reduction in the emission factor? (e.g. shift to lower carbon-intensive fuel?)
ASIF Approach Enables Co-benefits Analysis

- The data needed for calculating CO2 impacts can be used in analyzing other co-benefits.
## CDM : BRT – Bogota Transmilenio

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BRT Bogotá, Colombia: TransMilenio Phase II To IV (monitoring report 2010)
Summary

- Maximize the opportunities presented by the NAMAs to build capacity on MRV
- Collective knowledge sharing is important for developing countries
- Build on existing resources
- Low cost data collection methods must be explored (maximize the opportunities brought by modern technologies)
- Clear guidance on how to go about MRVing at different stages is needed
- MRV of NAMAs is also nationally-appropriate
- Flexibility to achieve balance (robustness of MRV, feasibility of MRV)
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Clean Air Asia Country Networks
China • India • Indonesia • Nepal • Pakistan • Philippines • Sri Lanka • Vietnam

<table>
<thead>
<tr>
<th>Clean Air Asia Center Members</th>
<th>240 Clean Air Asia Partnership Members</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Shell</td>
<td>• Cities</td>
</tr>
<tr>
<td>• Asia Clean Fuels Association</td>
<td>• Environment ministries and government agencies</td>
</tr>
<tr>
<td>• Corning</td>
<td>• Development agencies and foundations</td>
</tr>
<tr>
<td></td>
<td>• Non-government organizations</td>
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<tr>
<td></td>
<td>• Academic and research institutions</td>
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<tr>
<td></td>
<td>• Private sector companies and associations</td>
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Donors in 2012 to 2013
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