Good practices of NAMAs and National MRV Systems

MRV in the Transport Sector

UNFCCC NAMA Workshop
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Friedel Sehlleier
Table of Content

• Setting the scene: Transport and Emissions
• Approaches to reduce emissions / Mitigation Actions
• Emission Quantification Methodologies
• Country Examples: China and Mexico
GIZ Projects in the Transport Sector

Germany:
- Transport Policy Advisory Services
- Project TRANSfer – Implementing Nationally Appropriate Mitigation Actions (NAMAs) in the Transport Sector
- "Twinning"-Projects

Ukraine:
- Ivano Frankivsk Mobil (PPP)
- Advisory Services for Municipal Administrations of EURO 2012 Host Cities

Afghanistan:
- Strengthening Air Traffic Control in Mazar-e-Sharif

Costa Rica:
- Low Carbon Mobility (Support of Costa Rican Strategy of Carbon Neutrality as a Model for Low-Carbon Development)
- Road Rehabilitation and Management (Advisory Services to the Costa Rican Ministry of Transport on the Rehabilitation and maintenance of the Cantonal Road Network)

Colombia:
- TRANSfer Partner

Liberia:
- Capacity Development in the Transport Sector

Bolivia:
- Project Management and Technical Assistance for Road Maintenance

Saudi Arabia:
- Advisory Services to Saudi Ports Authority (SEAPA)

Gabon:
- Road Rehabilitation and Management

Indonesia:
- Emission Reductions in Urban Transport Sustainable Urban Transport Improvement Project (SUTIF)
- TRANSfer Partner

Peru:
- Electromobility and Climate Protection
- Sino-German Climate Change Programme – Component 2: Low Carbon Transport Development
- Transport Demand Management in Peking – Emission Reduction in Urban Transport
- Green Logistics
- Low Carbon Mobility Management (PPP with Deutsche Telekom AG)
- Standardization of Electric Vehicles

ASEAN Programme: Cities, Environment and Transport in the ASEAN Region
- Projects:
  - Clean Air for Smaller Cities
  - Energy Efficient Transportation
  - Sustainable Port Development

Timor-Leste:
- Maritime Transport Services Development (MTSD)

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MRV in the Transport Sector
Transport…

• … provides personal **mobility**, enhances **equity & social inclusion**.

• … facilitates local & international **trade and economic growth**.

• … leads to productivity losses from **congestion**.

• … impacts human health from local **air pollution**.

• … contributes to climate change from **GHG emissions**.

... 24% energy-related CO2 em.

... fastest growing sector

... GHG em. projected to double by 2050 (BAU)

Source: WRI
Transport Sector CO2 Emission by Region
WEO Reference Scenario, 1980-2030, in million tonnes

- 13% of world GHG emissions (IEA 2009)
- The transport sector is the fastest growing sector in terms of CO₂ emissions in developing countries.

Source: Bongardt et.al. 2009 (based on IEA 2008)
Avoid – Shift - Improve:
Comprehensive Approach to GHG Reduction

AVOID unnecessary trips

SHIFT modes

REDUCE km

IMPROVE vehicles
low carbon fuels
How to measure transport emissions
GHG Measurement Approaches

Top Down
National level data

Bottom Up
Data gathered from more detailed sources
Top down vs bottom up

Fuel Consumption
In Energy (J), Mass (kg), or Volume (l)

Conversion Factor
In Mass (kg) per Fuel Unit

Emissions In Mass (kg)

Travel Activity X
In km

Fuel Consumption of Travel Activity X
In l, kg, or j per km

Conversion Factor
In kg per Fuel Unit

Emissions In Mass (kg)
## Comparison of Approaches

<table>
<thead>
<tr>
<th>Approach</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Top Down</strong></td>
<td>▪ National level data is normally available</td>
<td>▪ Relatively low level of detail</td>
</tr>
<tr>
<td></td>
<td>▪ National level datasets tend to be relatively high quality</td>
<td>▪ Lack of data can make use of emission inventories challenging</td>
</tr>
<tr>
<td></td>
<td>▪ Datasets are often consistent</td>
<td>▪ Not well suited to assessing impact of transport policies.</td>
</tr>
<tr>
<td></td>
<td>▪ Good for historic emission estimates.</td>
<td></td>
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<tr>
<td><strong>Bottom Up</strong></td>
<td>▪ Emission sources assessed in detail based on data from individual sources</td>
<td>▪ The most accurate estimates require a large number of different datasets.</td>
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<tr>
<td></td>
<td>▪ Allows information on local issues, such as congestion, to be identified</td>
<td>▪ Requires an extensive amount of data collection and handling</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▪ Datasets can be inconsistent or of a relatively low quality</td>
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</tbody>
</table>
How to calculate GHG emissions (bottom-up?)

GHG emissions of transport = Transport demand x Emission Factor Database

Transport demand

VKT (vehicle kilometres travelled)

Transport performance (pass. Km; ton km)

Depends on

- Vehicle design
- Vehicle load
- Traffic conditions
- Driving behaviour

Emission Factor Database

Depends on

- Final energy carrier
- Considered GHG gases (CO$_2$, CH$_4$, N$_2$O)
- Inclusion of upstream GHG emissions (well-to-wheel)
Transport Demand Management in Beijing – Emission reduction in Urban Transport

**Objective:**
Effective measures for Transport Demand Management (TDM) will be proposed for implementation and tools for measuring impacts will be applicable.

<table>
<thead>
<tr>
<th>Components:</th>
<th>Partners</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Identification and development of effective TDM measures for reducing CO₂ emissions.</td>
<td>Beijing Municipal Commission for Transportation (BMCT)</td>
</tr>
<tr>
<td>2. Development of a model for transport related CO₂ emission reduction estimations</td>
<td>Beijing Transport Research Center (BTRC) – <em>implementing partner</em></td>
</tr>
<tr>
<td>3. Dissemination of measures and tools to other Chinese cities</td>
<td>National Development and Reform Commission (NDRC)</td>
</tr>
</tbody>
</table>
National GHG Inventories

“GHG Reporting and Inventorying in Germany – Assessing transport related emissions”

- Institutional set-up for GHG inventory planning, preparation and management at the national level in Germany
- General description of the data and methods used for the calculation of transport related emissions
- Tier 3 approach for GHG reporting considering traffic data and bottom up calculation (incl. CH4, N2O and cross-boundary traffic).
- [http://sustainabletransport.org/tag/giz-publication/](http://sustainabletransport.org/tag/giz-publication/)
Experience from China
Emission Modeling Package

China Handbook for Emissions Factors (CHEF-Model)

- A software package with adopted emission factors for China (CO2/km)
- Integration of all components of an emission model with a user friendly interface under development
- The objective is to estimate road traffic emissions with high temporal and spatial resolution
- delivered to local partners

Expressway/Los=5

[Graph showing emissions data]
Emission Quantification
Chinese emission factors to support scenario evaluation

CO₂ emissions for a standarised passenger car (Euro 3, 1.4-2.0 l)

Roadtype and LOS

Expressway
Major Arterial
Minor Arterial
Branch

Free flow
Saturated traffic
Heavy traffic
Stop and go
Heavy stop and go
Stop and go
Heavy stop and go
Free flow
Saturated traffic
Heavy traffic
Stop and go
Heavy stop and go
Free flow
Saturated traffic
Heavy traffic
Stop and go
Heavy stop and go

29/04/2014
China: Congestion in Beijing
Reduced traffic flow and network capacity

Sept 2007
(3.06 million, no restriction on traffic volume;
Congestion index: 7.95)

Sept 2009
(3.87 million, restricting traffic volume;
Congestion index: 5.93)

Sept 2010
(4.51 million, restricting traffic volume;
Congestion index: 7.80)

Sept 17, 2010
(Congestion index: 9.70)
Congestion Charging
Scenario analysis for optimal solutions

Policy description

Input data & criteria
- Travel time
- Travel distance
- Willingness-to-pay
- etc.

Traffic modelling
Mexico’s Road Freight Transport NAMA

**Objective:** Reduce emissions in Mexico’s Road Freight Transport sector with a focus on small and medium-sized enterprises.

**Cooperation** between the Ministry of Communication and Transport (SCT), the Ministry of Environment and Natural Resources (SEMARNAT) and GIZ.

In order to modernise the fleet and promote efficient usage, various activities are being supported:

1. Scrappage scheme to renew the fleet
2. “Transporte Limpio” to make the existing fleet more efficient
MRV approach for road freight transport NAMA Mexico

- Mitigation effect = baseline – NAMA scenario
- Baseline / NAMA scenario = activity x emissions factor

Indicators:
- GHG: (reduced) t CO2
- Transport: number of scrapped vehicles, vehicle age, remaining lifespan, emissions factors, distances traveled (tkm), fuel consumption, …
- Sustainable development benefits: PM, CO, NOx, accidents, jobs, …

- Difficulties for road freight
  - Multitude of small non-homogeneous sources
  - Direct and indirect impacts
  - Many factors to be taken into account: condition of streets, driver behaviour, …
Simple MRV Approach

- Grouping of the fleet (vehicle type): C2, C3, T2, T3

- GHG reductions during remaining lifespan (of old vehicle)
  - Direct: \( tkm_{old\_per\_year} \times (EF_{old} - EF_{new}) \)
  - Indirect: \( (tkm_{new\_per\_year} - tkm_{old\_per\_year}) \times (EF_{fleet} - EF_{new}) \)

- GHG reductions after remaining lifespan (of old vehicle)
  - \( tkm_{new\_per\_year} \times (EF_{new\_without\_NAMA} - EF_{new}) \)

- Data requirements:
  - \( tkm_{annually} \) for each group
  - Emissions Factor (EF) for each group
  - Age and remaining lifespan of scrapped vehicles
**Key issue: The fleet age among different sectors**

<table>
<thead>
<tr>
<th>Fleet age</th>
<th>Freight</th>
<th>Passenger</th>
<th>Tourism</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - 10 years</td>
<td>122,984</td>
<td>23,600</td>
<td>15,306</td>
<td>161,890</td>
</tr>
<tr>
<td>11 - 20 years</td>
<td>90,629</td>
<td>16,491</td>
<td>13,977</td>
<td>121,097</td>
</tr>
<tr>
<td>21 - 30 years</td>
<td>63,023</td>
<td>5,016</td>
<td>5,708</td>
<td>73,747</td>
</tr>
<tr>
<td>31 - 40 years</td>
<td>62,144</td>
<td>2,065</td>
<td>3,735</td>
<td>67,944</td>
</tr>
<tr>
<td>41 or more</td>
<td>12,925</td>
<td>-</td>
<td>367</td>
<td>13,292</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>351,705</strong></td>
<td><strong>47,172</strong></td>
<td><strong>39,093</strong></td>
<td><strong>437,970</strong></td>
</tr>
<tr>
<td>Fleet aged above 20 years</td>
<td>138,092</td>
<td>7,081</td>
<td>9,810</td>
<td>154,983</td>
</tr>
<tr>
<td>Share of total</td>
<td><strong>39.3</strong></td>
<td><strong>15.1</strong></td>
<td><strong>25.1</strong></td>
<td><strong>35.4</strong></td>
</tr>
</tbody>
</table>

MRV of Transport NAMAs

April 11, 2014
Data survey: efficiency

- $y = -0.0285x + 3.6222$
- $y = -0.0429x + 3.4472$
- $y = -0.0099x + 2.3394$
- $y = -0.0114x + 2.321$
- $y = -0.0429x + 3.4472$

Vehicle age

MRV of Transport NAMAs

April 11, 2014
Data survey: km traveled

Km/month traveled for each group between 1979 and 2014
(T2 is not representative)

Km/month

Mexico's Road Freight Transport NAMA: Lessons learnt

- There is a "perfect vehicle scrap age"
- Among the different types of trucks the most significant mitigation potential lies in scrapping C3
  - MRV as means to improve the programme

- Fleet renovation is more effective than solely scrapping
- Environmental impact of scrapping alone is relatively small
  - Do not only focus on the scrapping alone but complement it with further measures (quality standards, driver trainings, ...)
  - Scrapping alone is not enough to tackle the emissions in the transport sector

- Data need to be collected and updated, but expenses in general for MRV approach are reasonable.
  - MRV can be built and improved step-by-step
MRV Roadmap process

Aim of this undertaking:

- lower the barriers to establish MRV
- contribute to a common understanding of elements of MRV
- facilitate developing and implementing transport NAMAs

- Establishment of an interdisciplinary expert group
- Reference document on “How to develop a roadmap for MRV systems in the transport sector?”
- Set of peer-reviewed MRV Blueprints for Transport NAMAs
- Country Case Studies
MRV Expert Workshop

- 2\textsuperscript{nd} Workshop in Leipzig (Germany) on 20\textsuperscript{th} May 2014
- Organisations involved:
  - UNECE
  - CCAP
  - IEA
  - ADB
  - IDB
MRV of Transport NAMAs: Challenges

• No clear definitions of MRV
• No standardized process
• Expectations of donors are partly unclear
• Availability and accessibility of data
• Fear of complexity
MRV of Transport NAMAs: Key messages

- MRV of Transport NAMAs is feasible (even for complex NAMAs)
- No need to replicate the CDM
- Start with the existing data, improve MRV system over time
- Understand MRV as means to improve policies and measures: MRV leads to improved transport policy
Thank you for your attention!

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Energy Efficiency and Climate Change Mitigation in the Land Transport Sector in the ASEAN Region

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