

# A Beginners Guide to Emissions Accounting in Transport

This brief guide outlines key principles for quantifying greenhouse gas (GHG) emissions in transport and gives hints for further reading. Accounting emissions is increasingly important in the sector since in 2015 the 197 Parties to the UNFCCC (United Nations Framework Convention on Climate Change) agreed on the Paris Agreement. Each country is now committing to emission reductions in their Nationally Determined Contribution (NDC). GIZ on behalf of the German Federal Ministry for Environment, Nature Conservation and Nuclear Safety has been supporting its partners in measuring, reporting and verifying (MRV) emissions for many years.

## Good data are essential for raising ambition

Planners and policymakers have many options to combine plans, programmes, projects, incentives and regulations in an effort to develop sustainable transport systems and reduce GHG emissions. In order to be successful, decision makers need to be able to choose the most effective strategies for the future and to understand the impacts of their past actions. Robust analysis methodologies, tools and data are essential to these efforts. Only if countries are confident about their options, they are likely to increase mitigation ambition in the sector.

## Reliable MRV systems help accessing climate finance

Parties to the UNFCCC have to report on emissions and actions. In addition, providers of support and finance often require projects to identify their mitigation contribution. MRV is key to building pipelines of transport actions ready to access international climate finance.

## MRV guidance is readily available

International cooperation makes understanding and monitoring mitigation actions easier through sharing of methodologies, default data and lessons learnt. As an entry point for practitioners to build capacities on quantifying transport-related emissions the following pages put key publications on MRV into context. Report titles are highlighted in bold and listed in full on page 4. For further training needs, do not hesitate to contact GIZ.



In order to support its partners in developing countries, GIZ works in partnerships with leading institutions such as the Institute for Energy and Environment in Heidelberg (IFEU) or the Federal Environmental Agency (UBA), who maintain the Transport Emission Model (TREMOD) used for official reporting in Germany. Internationally, GIZ cooperates closely with the UNFCCC secretariat and many think tanks such as the International Council for Clean Transportation (The ICCT).



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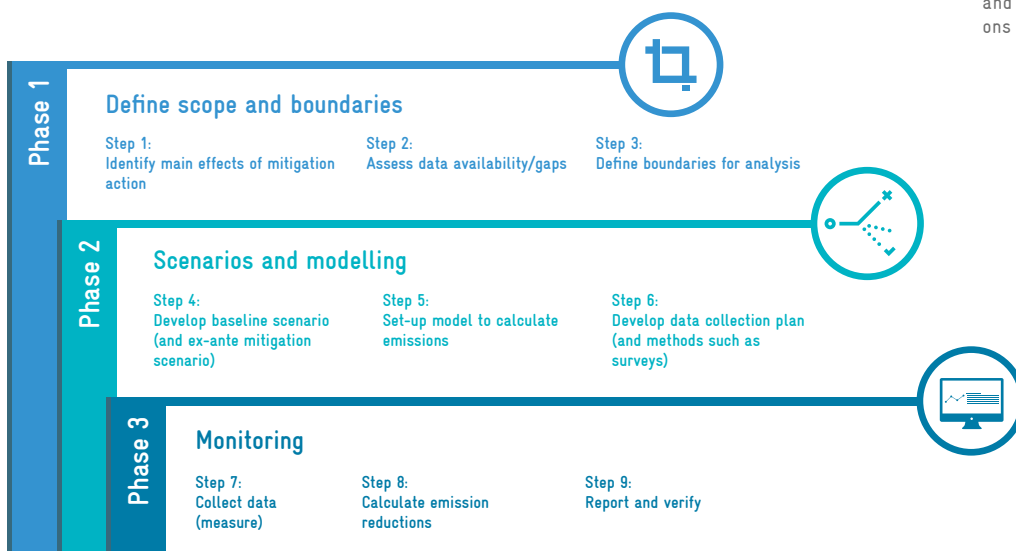
On behalf of:

## Emissions accounting is based on transport data

The **Reference Document on Transparency in the Transport Sector** proposes a three-phase, nine-step process for setting up an MRV system for mitigation actions (see figure below). Regardless of methodology, the foundation for transparency and any MRV system is the general transport data that are collected in the sector. For transport emission accounting, two basic statistical systems are important:

1. The transport data system (e.g. information on vehicle stock and characteristics, transport infrastructure and travel activities);
2. A GHG emission factor database matching the vehicle statistics.

The good news is that countries, federal states, regional governments or cities collect an abundance of transport data on a regular basis (e.g. statistical data like vehicle registration data). In addition, transport activity data are also collected irregularly on demand for the assessment of new policies and planning processes.

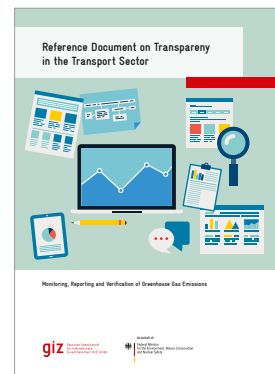


Three phases for setting up an MRV system

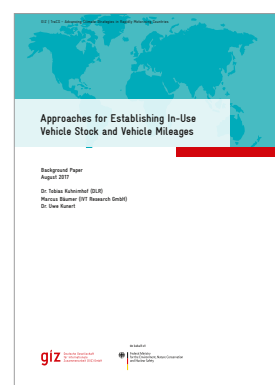
The background paper **Approaches for Establishing In-Use Vehicle Stock and Vehicle Mileages** and the practical guide on **Monitoring Greenhouse Gas Emissions of Transport Activities in Chinese Cities** can help establish a monitoring system for collecting data. Unfortunately, many countries lack emission factor databases, so usually international defaults are used. To increase data accuracy, GIZ and INFRAS institute have developed an approach to adapt the **European Handbook for Emission Factors for Road Transport (HBEFA)** to local circumstances (e.g. in China).

## Transport GHG inventory tools are elementary for MRV systems

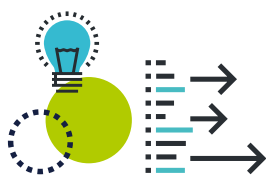
Ideally, both national GHG inventories and MRV of transport mitigation actions use consistent data. While national inventories are done at national scale, many mitigation actions take place at the regional or local level. The challenge is to fit disparate analysis into a comprehensive MRV system. Not only ex-ante and ex-post analysis need to be consistent, MRV of actions should also align with and consider the national GHG inventory system.



The Reference Document explains key concepts, methodological approaches and principles on quantifying emissions in transport.



Detailed vehicle statistics and mileage surveys are key for reliable bottom-up emission modelling but often not available.



Preferably, a national bottom-up data management system is able to consolidate, generate or share data at appropriate levels of disaggregation. The report **Bottom-Up GHG Inventory and MRV of Measures** explores to what extent inventories can be used to monitor single mitigation measures. A case study on **Responsibilities, Procedures and Regulations for GHG Inventory Creation in Germany** provides useful background information for transport authorities, including templates for data requests and a sample data sharing agreement.

In many developing countries bottom-up analysis tools and disaggregated data are not available. The lack of bottom-up emission models can be overcome by adapting inventory tools from developed countries or non-governmental organisations.

GIZ is currently supporting partner countries like Vietnam or Tunisia in developing their own inventory tool and in training their staff in data collection. As a result from these experiences, GIZ released a simple bottom-up spreadsheet model that can be easily adapted to any countries' needs. The **Transport Inventory Greenhouse Gas Emissions Reporting (TRIGGER)** tool with sample data from Germany is freely available.

On city-level, a GHG inventory of transport emissions can also help to engage in international initiatives or partnerships. For example the MobiliseYourCity Partnership (MYC) provides a framework for 100 cities to develop Sustainable Urban Mobility Plans (SUMP). As these plans bundle a number of actions in a defined territory, GHG inventories can be used to monitor the impacts of the plan. The **MYC Monitoring & Reporting Approach for GHG Emissions** describes the principles for participating cities. The paper **Balancing Transport Greenhouse Gas Emissions in Cities** reviews emission accounting practices in Germany and illustrates how six cities cope with the challenge.



The MobiliseYourCity Partnership (implemented by GIZ and AFD) provides guidance for partner cities to quantify emissions of SUMP.

## Various methodologies exist for accounting of climate actions

At the level of single mitigation actions, many tools and methodologies exist for estimating baselines and emission reductions from the baseline due to transport mitigation actions. For example, methodologies of the Clean Development Mechanism (CDM) or the TEEMP Spreadsheet Tools developed for the Global Environment Facility (GEF). There is a huge variety of bottom-up models made for different purposes and often allowing varying degrees of accuracy.

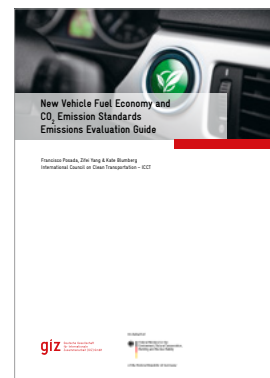
Selecting an existing tool or methodology can make emissions accounting easier and quicker by offering prepared sets of variables, supplying the model equations and even providing default data or data collection guidance. Still, any user must make their own decisions about what is appropriate for their purposes. The **Passenger and Freight Transport Volume of the Compendium on Greenhouse Gas Baselines and Monitoring** guides readers through existing methodologies for quantifying GHG emissions for several mitigation action types. The guide helps practitioners choose the best methodology for their purpose and local circumstances, balancing the need for accuracy with cost, availability of data and expertise. Some tools and methodologies in this report may be most suitable for ex-ante planning purposes, whereas others are designed for ex-post reporting or even emissions trading.

An example for a tool allowing ex-ante estimates of GHG reduction effects is the **Fuel Economy Standard Evaluation Tool (FESET)**. FESET focuses on passenger cars. It is a practical open source spreadsheet tool for a developing country context including sample data from Mexico. A step-by-step guide is available describing how to apply the FESET along the Mexican example.

Any methodology that is developed or selected needs to consider the causal chain of the mitigation mechanism, i.e. what are key impact factors on reducing emissions (e.g. shifting travellers to other modes, improving efficiency of vehicles or changing carbon content of fuels). It further needs to specify data that are obtainable from existing sources or within the given budget and meet the accuracy and verifiability requirements appropriate to the purpose of analysis.



Together with the UNFCCC secretariat and other partners, GIZ compiled more than 30 methodologies for 8 different transport mitigation actions.



FESET enables countries to analyse impacts of Fuel Economy Standards, one of the most effective transport mitigation actions (in partnership with the ICCT).



## Recommended Reading on Transparency and MRV of Transport

### Reference Document on Transparency in the Transport Sector – Monitoring, Reporting and Verification of Greenhouse Gas Emissions (04/2018, 2nd edition)

This report informs on how to develop comprehensive and consistent national systems for MRV of transport related emissions. It includes practical guidance and four detailed case studies on freight in Brazil, rail in India, fuel efficiency in the US, and transit-oriented development in Colombia.

**Download:**

<https://www.changing-transport.org/publication/reference-document-transparency/>

### Approaches for Establishing In-Use Vehicle Stock and Vehicle Mileages (08/2017)

Many developing and emerging countries lack reliable statistics on in-use vehicles and average mileages, both essential for calculating emissions. The paper outlines methodologies for establishing mileage surveys and adjusting vehicle registers including two-wheelers. Discussing strengths and weaknesses of the methods helps to choose appropriate approaches.

**Download:**

<https://www.changing-transport.org/publication/in-use-vehicle-stock-and-mileages/>

### Bottom-Up GHG Inventory and MRV of Measures – Synergies and Limitations in the Transport Sector (05/2017)

The report explores to what extent inventories can monitor single mitigation measures. In comparison to top-down assessments in national inventories, bottom-up inventory models allow a more detailed analysis, but require extensive data collection.

**Download:**

<https://www.changing-transport.org/publication/bottom-up-ghg-inventory-and-mrv-of-measures-synergies-and-limitations-in-the-transport-sector/>

### Responsibilities, Procedures and Regulations for GHG Inventory Development in Germany – Background Information for Transport Authorities (06/2017)

This paper gives a quick overview of the German framework for greenhouse gas emission inventory development. It focuses on institutional arrangements and procedures and gives insight into organising data provision in the transport sector.

**Download:**

<https://www.changing-transport.org/publication/responsibilities-transport-ghg-inventory-germany/>

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### Monitoring Greenhouse Gas Emissions of Transport Activities in Chinese Cities – A Step-by-Step Guide to Data Collection (04/2016)

The guide aims at enabling environmental authorities in cities to generate a regular emissions inventory of the transport sector. Considering local traffic situations and data availability, it outlines a basic, an advanced and a developed approach to calculate transport activities according to different needs and data availability.

**Download:**

<https://www.changing-transport.org/publication/monitoring-ghg-in-cities-data-guide/>

### Mobilise Your City (MYC) Monitoring & reporting approach for GHG emissions (10/2017)

This paper describes the greenhouse gas monitoring and reporting principles for the MobiliseYourCity Partnership. The approach to monitoring and reporting proposes that participating cities track the development of transport related GHG emissions at city level rather than per measure. Sustainable Urban Mobility Plans (SUMP) form packages of measures that interact with each other and consequently have a bigger impact on emissions than the sum of single measures.

**Download:**

[http://mobiliseyourcity.net/wp-content/uploads/sites/2/2017/09/MobiliseYourCity\\_MRV\\_Approach.pdf](http://mobiliseyourcity.net/wp-content/uploads/sites/2/2017/09/MobiliseYourCity_MRV_Approach.pdf)

### Balancing Transport Greenhouse Gas Emissions in Cities – A review of Practices in Germany (01/2012)

The paper gives an overview of common methods and practical experiences with modelling GHG emissions from transport in German cities. Information on German practice includes an overview on emission factor databases and inventory models as well as the available transport data sources. Finally, it concludes what should be considered for GHG balancing of the transport sector in developing cities.

**Download:**

<https://www.changing-transport.org/publication/balancing-transport-ghg-emissions/>

### UNFCCC's Compendium on GHG Baselines and Monitoring: Passenger and Freight Transport Volume (02/2018, 2nd edition)

The comprehensive guide coordinated by the UNFCCC and GIZ illustrates existing methodologies for greenhouse gas quantification of different types of transport mitigation actions. It covers more than 30 methodologies and tools for eight different types of actions, e.g. intra-urban mass rapid transit investments, vehicle efficiency improvement programmes, freight transport infrastructure investments to shift mode and pricing policies.

**Download:**

<https://www.changing-transport.org/publication/the-passenger-and-freight-transport-volume-of-the-compendium-on-ghg-baselines-and-monitoring/>

**Project**

Advancing Transport Climate Strategies in Rapidly Motorising Countries

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