Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

Advancing Transport Climate Strategies in Rapidly Motorising Countries (TraCS) Project

Insights from GIZ's support on establishing GHG inventory and developing future scenarios in Viet Nam

Elena Scherer, GIZ

International BUR Champions Workshops

Training on data access and MRV in the transport sector

Berlin, April 7, 2017

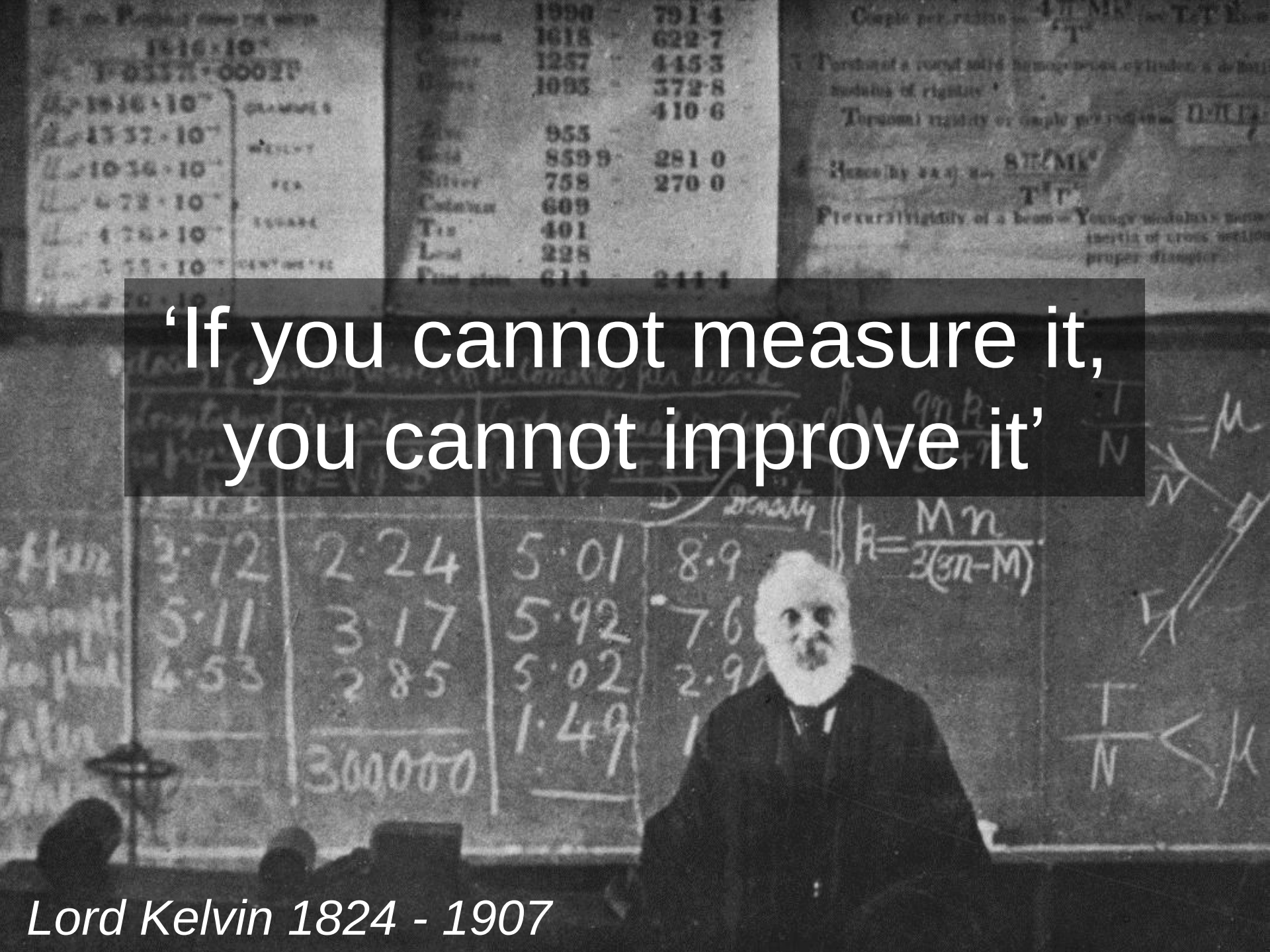
on behalf of

Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety

of the Federal Republic of Germany

Content

- Project overview
- Challenges, open issues and next steps
- Calculation exercise



Lord Kelvin 1824 - 1907

Advancing Transport Climate Strategies (TraCS)

Funding: International Climate Initiative of the German Ministry for Environment

Countries: Global project, Viet Nam and Kenya (tbc)

Partners: Viet Nam Ministry of Transport

GIZ, Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH

Time: 06/2016 -01/2019

Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety

https://www.international-climate-initiative.com/en

TraCS project Overview

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Global level activities

- Methodologies & tools for MRV (e.g. emission factors and default data)
- Analysis of INDCs and dialogue between stakeholder
- Dissemination to further countries

Support countries in mitigation in the transport sector at strategic national level and improve emission quantification & monitoring capacities

Country 1: Viet Nam

- Data processing and management
- Transport emission inventory
- Development of scenarios and sectoral action plan

Country 2: Kenya

- Support establishing a climate desk at MoT
- Planning workshop on April 4/5, 2017

Background information on Viet Nam

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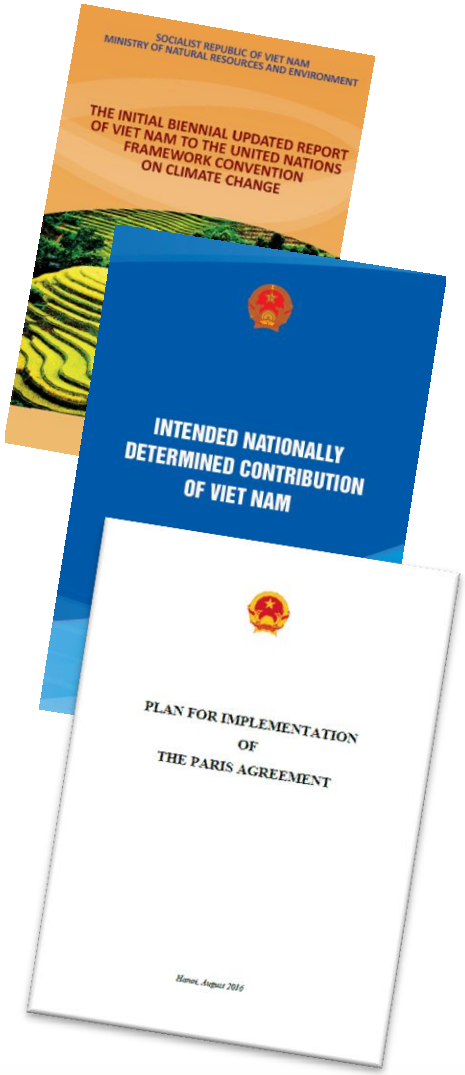
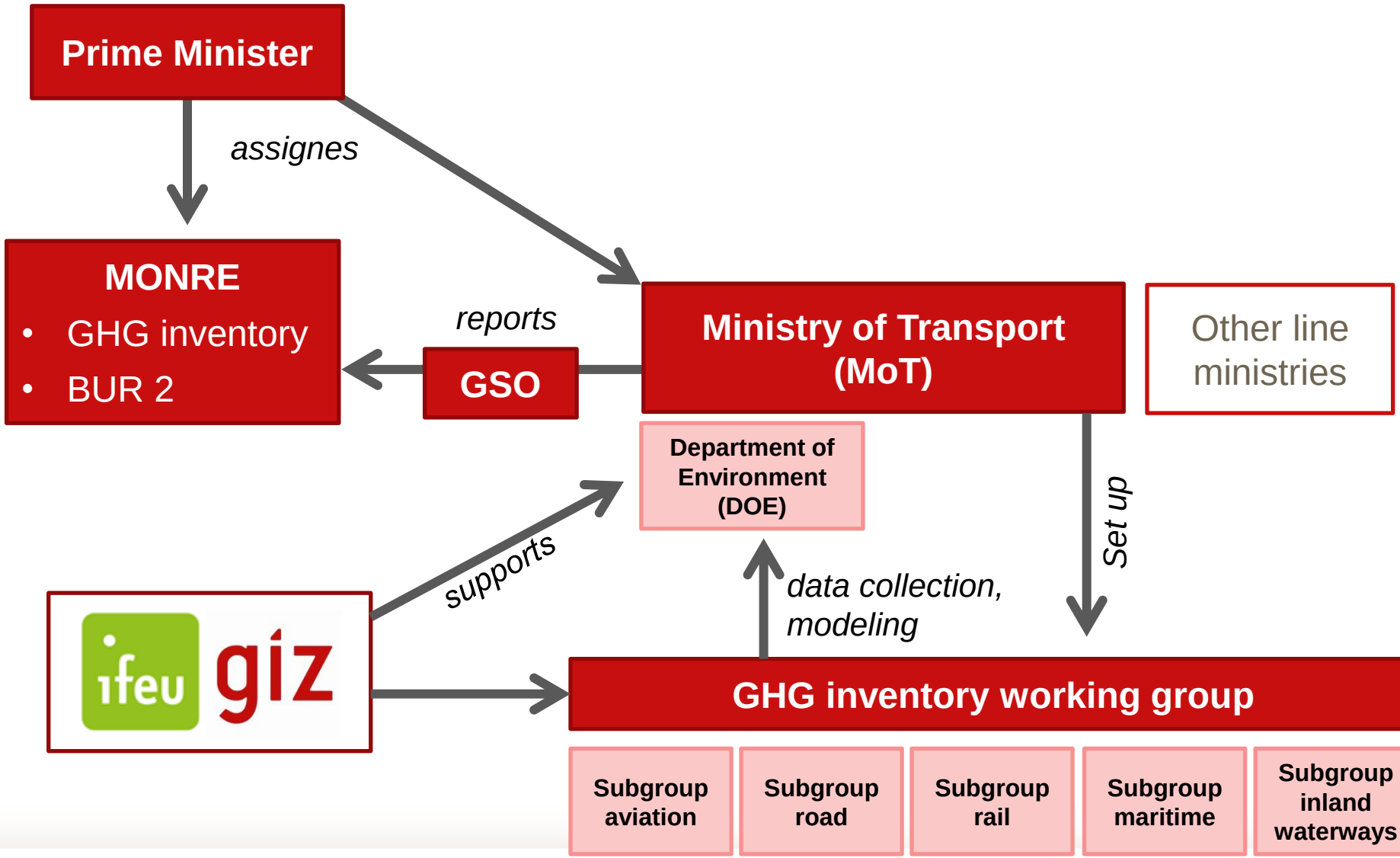
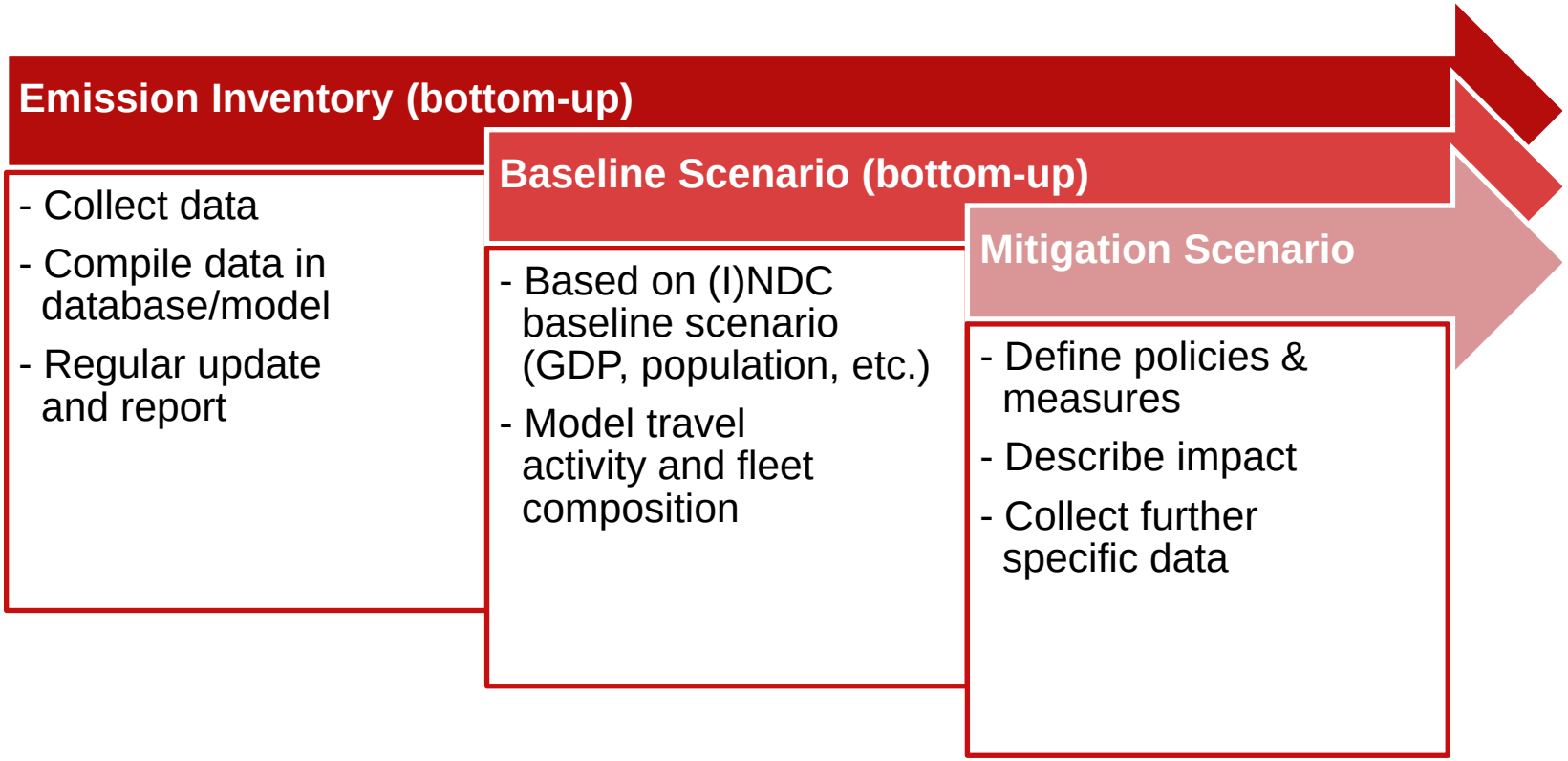
- Transport: Accounts for **23%** of Viet Nam's total **energy-based emissions** and is highlighted as a **focus area** in Viet Nam's Intended Nationally Determined Contribution (INDC).
- National GHG emission reduction goal: by **8%** by 2030 compared to the Business as Usual (BAU) scenario **using domestic resources**; **25% with international support**
- In 2016, Viet Nam signed the **Paris Agreement** and established a national plan for its implementation
- As part of the so-called "Non-Annex I Parties", Viet Nam is required to submit a **national inventory of man-made GHG emissions to the UNFCCC**



GIZ support on inventory



TraCS in Vietnam



Terminology: top-down vs. bottom-up

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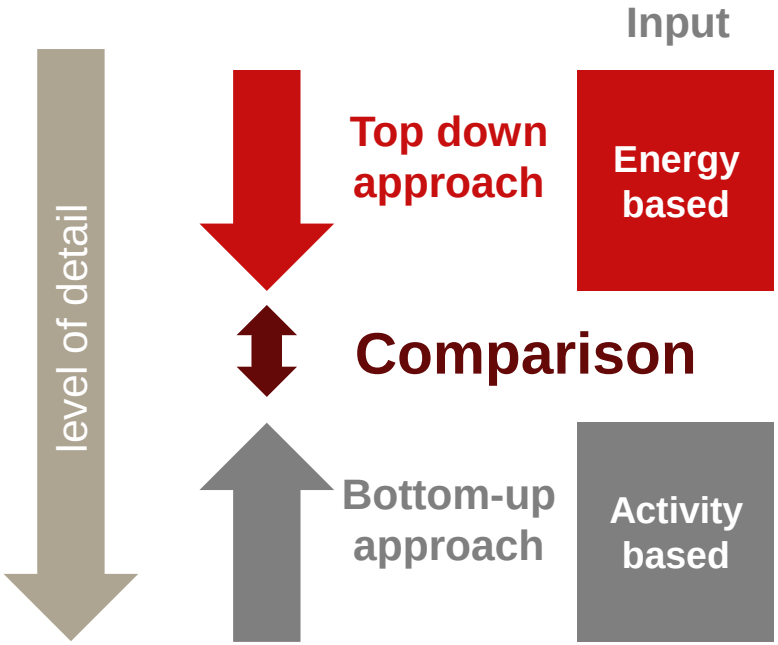


Calculation of GHG emissions:

Emission factor × **Total fuel consumption**

default values (IPCC Tier 1)

National energy balance

Total Activity × **Specific fuel consumption** = **Total fuel consumption** × **Emission factor**

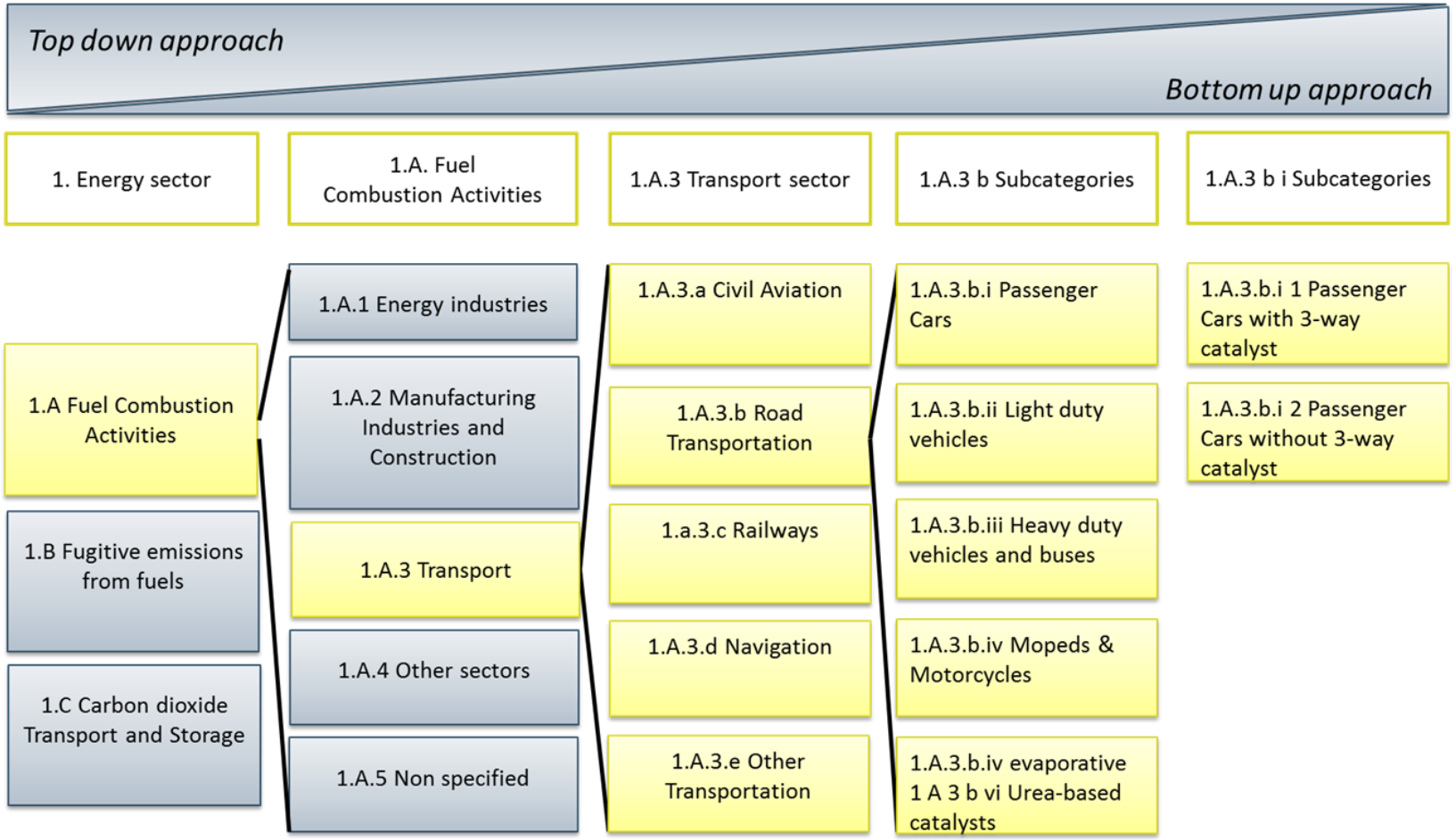
e.g. VKT=Number of vehicles X average VKT

e.g. l/ 100 km

Registration offices,, Surveys (interviews, tachometer data)

Surveys (interviews, tests)

Terminology: top-down vs. bottom-up



Source: Ifeu 2017 based on IPCC 2006

GHG inventory tool

Subsector Modules

AVIATION TOOL	RAILWAY TOOL	ROAD TOOL	MARITIME TOOL	INLAND WATERWAY TOOL
Top-down approach	Top-down approach	Bottom-up approach	Bottom-up approach	Bottom-up approach

Validation

Merger TOOL
(and scenarios)

Total fuel consumption

Number of ships x average operating hours x average engine power x load factor x engine specific fuel consumption

Emissions

Population x Power x Use x Emission factor

GHG inventory tool

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Subsector Modules

AVIATION TOOL	RAILWAY TOOL	ROAD TOOL	MARITIME TOOL	INLAND WATERWAY TOOL
Top-down approach	Top-down Approach	Bottom-up approach	Bottom-up approach	Bottom-up approach

Validation

Merger TOOL
(and scenarios)

Total fuel consumption — Total VKT X Specific Fuel consumption

Emissions — Total fuel consumptionx Emission factor

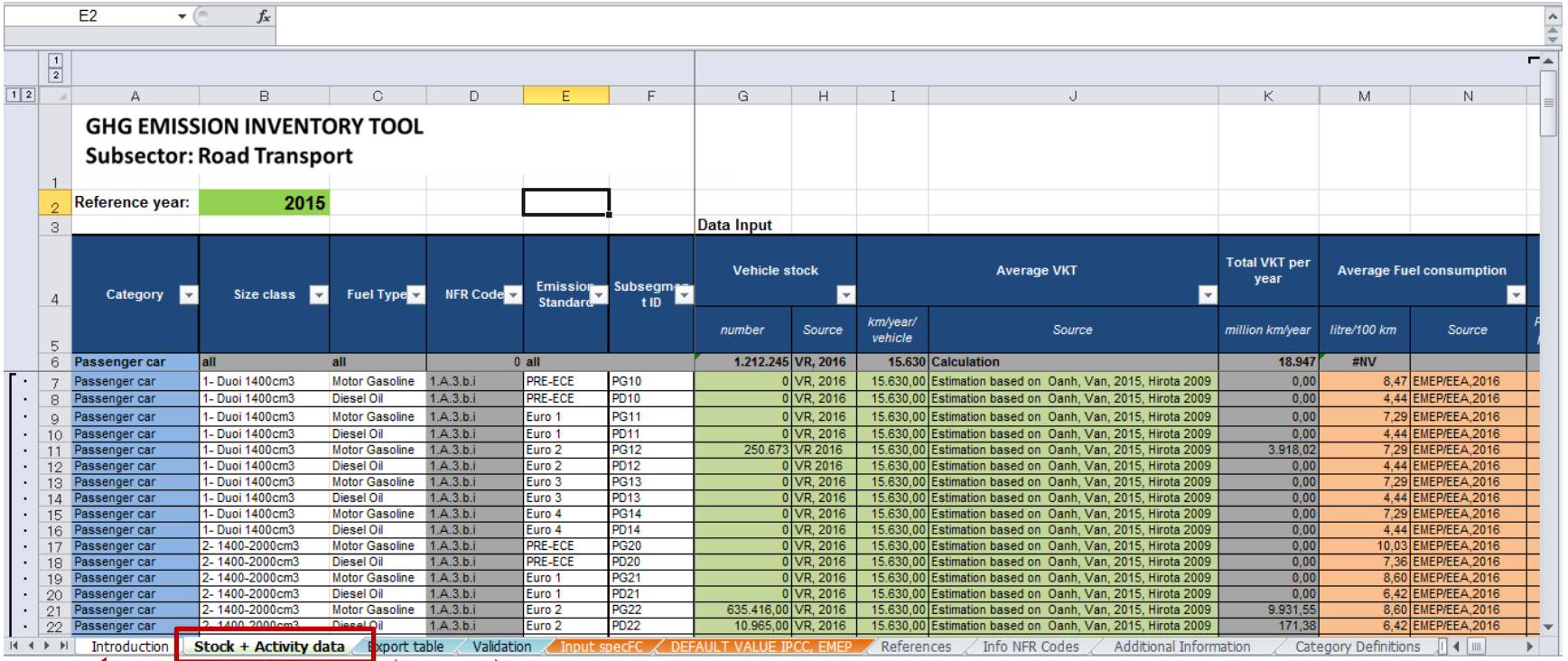
GHG inventory tool

Values to enter

Calculated values

Default Values

Example: Data input sheet; road sector tool



GHG EMISSION INVENTORY TOOL
Subsector: Road Transport

Reference year: 2015

Data Input

Category	Size class	Fuel Type	NFR Code	Emission Standard	Subsegment ID	Vehicle stock		Average VKT		Total VKT per year	Average Fuel consumption		
						number	Source	km/year/ vehicle	Source	million km/year	litre/100 km	Source	
Passenger car	all	all	0	all		1.212.245	VR, 2016	15.630	Calculation	18.947	#NV		
Passenger car	1- Duoi 1400cm3	Motor Gasoline	1.A.3.b.i	PRE-ECE	PG10	0	VR, 2016	15.630,00	Estimation based on Oanh, Van, 2015, Hirota 2009	0,00	8,47	EMEP/EEA,2016	
Passenger car	1- Duoi 1400cm3	Diesel Oil	1.A.3.b.i	PRE-ECE	PD10	0	VR, 2016	15.630,00	Estimation based on Oanh, Van, 2015, Hirota 2009	0,00	4,44	EMEP/EEA,2016	
Passenger car	1- Duoi 1400cm3	Motor Gasoline	1.A.3.b.i	Euro 1	PG11	0	VR, 2016	15.630,00	Estimation based on Oanh, Van, 2015, Hirota 2009	0,00	7,29	EMEP/EEA,2016	
Passenger car	1- Duoi 1400cm3	Diesel Oil	1.A.3.b.i	Euro 1	PD11	0	VR, 2016	15.630,00	Estimation based on Oanh, Van, 2015, Hirota 2009	0,00	4,44	EMEP/EEA,2016	
Passenger car	1- Duoi 1400cm3	Motor Gasoline	1.A.3.b.i	Euro 2	PG12	250.673	VR 2016	15.630,00	Estimation based on Oanh, Van, 2015, Hirota 2009	3.918,02	7,29	EMEP/EEA,2016	
Passenger car	1- Duoi 1400cm3	Diesel Oil	1.A.3.b.i	Euro 2	PD12	0	VR 2016	15.630,00	Estimation based on Oanh, Van, 2015, Hirota 2009	0,00	4,44	EMEP/EEA,2016	
Passenger car	1- Duoi 1400cm3	Motor Gasoline	1.A.3.b.i	Euro 3	PG13	0	VR, 2016	15.630,00	Estimation based on Oanh, Van, 2015, Hirota 2009	0,00	7,29	EMEP/EEA,2016	
Passenger car	1- Duoi 1400cm3	Diesel Oil	1.A.3.b.i	Euro 3	PD13	0	VR, 2016	15.630,00	Estimation based on Oanh, Van, 2015, Hirota 2009	0,00	4,44	EMEP/EEA,2016	
Passenger car	1- Duoi 1400cm3	Motor Gasoline	1.A.3.b.i	Euro 4	PG14	0	VR, 2016	15.630,00	Estimation based on Oanh, Van, 2015, Hirota 2009	0,00	7,29	EMEP/EEA,2016	
Passenger car	1- Duoi 1400cm3	Diesel Oil	1.A.3.b.i	Euro 4	PD14	0	VR, 2016	15.630,00	Estimation based on Oanh, Van, 2015, Hirota 2009	0,00	4,44	EMEP/EEA,2016	
Passenger car	2- 1400-2000cm3	Motor Gasoline	1.A.3.b.i	PRE-ECE	PG20	0	VR, 2016	15.630,00	Estimation based on Oanh, Van, 2015, Hirota 2009	0,00	10,03	EMEP/EEA,2016	
Passenger car	2- 1400-2000cm3	Diesel Oil	1.A.3.b.i	PRE-ECE	PD20	0	VR, 2016	15.630,00	Estimation based on Oanh, Van, 2015, Hirota 2009	0,00	7,36	EMEP/EEA,2016	
Passenger car	2- 1400-2000cm3	Motor Gasoline	1.A.3.b.i	Euro 1	PG21	0	VR, 2016	15.630,00	Estimation based on Oanh, Van, 2015, Hirota 2009	0,00	8,60	EMEP/EEA,2016	
Passenger car	2- 1400-2000cm3	Diesel Oil	1.A.3.b.i	Euro 1	PD21	0	VR, 2016	15.630,00	Estimation based on Oanh, Van, 2015, Hirota 2009	0,00	6,42	EMEP/EEA,2016	
Passenger car	2- 1400-2000cm3	Motor Gasoline	1.A.3.b.i	Euro 2	PG22	635.416,00	VR, 2016	15.630,00	Estimation based on Oanh, Van, 2015, Hirota 2009	9.931,55	8,60	EMEP/EEA,2016	
Passenger car	2- 1400-2000cm3	Diesel Oil	1.A.3.b.i	Euro 2	PD22	10.965,00	VR, 2016	15.630,00	Estimation based on Oanh, Van, 2015, Hirota 2009	171,38	6,42	EMEP/EEA,2016	

Introduction | Stock + Activity data | Export table | Validation | Input specFC | DEFAULT VALUE IPCC, EMEP | References | Info NFR Codes | Additional Information | Category Definitions

Introduction sheet

Data input sheet

Export table

Validation options

Default values

References

Main challenges for data collection

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All sectors

- No country-specific emission factors and carbon fuel content available (use of IPCC 2006 values)
- Uncertainties in energy balances and statistic data of the General Statistic Office are causing difficulties for cross-checking/ validation

Impact on GHG inventory result	Low uncertainty	Medium uncertainty	High uncertainty
Low impact	Rail	Maritime	
Medium impact	Aviation		Inland Navigation
High impact			Road

Main challenges for data collection

1 example: Road Sector

- Only total number of registered number of motorbikes is available, not the total number of vehicles in use
- Default data on vehicle kilometers travelled (VKT) for all vehicle categories are highly uncertain
- No country specific data on specific fuel consumption (use of European values from EMAP/ EEA 2016)
- No information about driving behavior and road types

Foto: Giz

Open issues for inventory development

- Evaluate and minimize uncertainties
  - Improve / verify **population data of motorbikes & inland ships**
  - Improve **performance parameters** (VKT, operating hours, load factors) for bottom-up tools (Road, Inland waterway, Maritime)
  - *If possible:* comparison of bottom-up and top-down results – but energy balances also include high uncertainties!
- **Collect data** for 2013 (BUR 2) and 2014 (Task of WG by Minister)
- **Test tool** and insert data of 2013 / 2014 (and before if possible!)
- Organizing **procedures** for tool maintenance (subsector and merger tool)

Exercise 1

Emission Quantification

Time: 25 minutes

1. Top-down approach

In 2010, city consumed 500.0 million Liter of gasoline, 200.0 million Liter of diesel and 100 tons of Compressed Natural Gas (CNG), and 90% of gasoline, 40% of diesel and 80% of CNG was consumed by transport sector.

Task 1: Please calculate the total tank-to-wheel* greenhouse gas emissions emitted from the transport sector.

**Tank-to-wheel:* Emissions from fuel combustion during operation of the vehicle

Well-to wheel: Consisting of “tank-to-wheel and “well-to-tank” (emissions from fuel production and distribution).

Fuel Type	Conversion Factor					
	tank-to-wheel			well-to-wheel		
	gCO2/MJ	kgCO2/kg	kgCO2/l	gCO2/MJ	kgCO2/kg	kgCO2/l
Gasoline	73.4	3.17	2.36	87.5	3.78	2.82
Ethanol	0	0	0	28.0	0.75	0.60
Diesel	73.3	3.16	2.63	89.1	3.84	3.19
Biodiesel	0	0	0	16.9	0.62	0.55
Liquefied Petroleum Gas (LPG)	65.7	3.02	1.66	73.2	3.37	1.85
Compressed Natural Gas (CNG)	56.2	2.54	x	61.7	2.78	x

2. Bottom-up approach

City A has 500,000 light duty passenger cars, in which 100,000 vehicles are small-sized cars (engine capacity <=1.0L), 300,000 vehicles are medium-sized cars (engine capacity 1.0 -2.0L), and 100,000 vehicles are large-sized cars (engine capacity >2.0L). All cars are fueled by gasoline. Annual average kilometers travelled and average carbon emission factors for each of the three vehicle categories are shown in the below table.

Task 2: Please calculate the annual greenhouse gas emissions caused by the gasoline-fueled passenger cars.

Vehicle category	Annual average kilometres travelled	Average emission factor (CO2 g/km): tank-to-wheel
small size car	11,000	120
medium size car	13,000	160
large size car	15,000	200

Group Task

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Compare the tank-to-wheel emissions calculated by using the bottom-up approach with the results based on the top-down approach (only gasoline).

What are reasons for differences between both results?

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Solution

Top-down: CO2 Emissions

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- **Emissions from Gasoline**
- 500.0 million Liter X 90% X 2.36 kg/L / 1000 = **ton** **1,062,000**
- **Emissions from Diesel**
- 200.0 million Liter X 40% X 2.63 kg/L / 1000 = **ton** **210,400**
- **Emissions from CNG**
- 100 tons X 80% X 2.54 kg/kg / 1000 = **ton** **203**

- **Total** **1,272,403 ton**

Bottom up: CO2 Emissions

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- **Small cars**
- 100,000 cars X 11,000km *120 g/km = **132,000 ton**
- **Medium cars**
- 300,000 cars X 13,000km *160 g/km = **624,000 ton**
- **Large cars**
- 100,000 cars X 15,000km *200 g/km = **300,000 ton**

- **Total** **1,056,000 ton**

Our offer: Capacity development

Trainings (also on the job):

- IPCC conform national GHG accounting
- Institutional support for developing national MRV systems
- Sector-specific training on bottom-up GHG accounting
- Model development for bottom-up GHG inventories in the transport sector
- Data collection and maintenance guidance for bottom-up GHG inventories
- MRV of measures

Study tours in Germany :

- Organisation
- Provision of technical inputs

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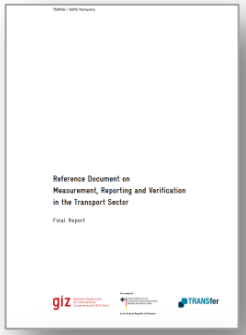
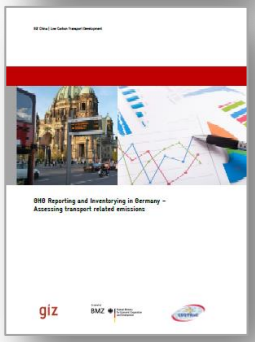
Related knowledge products (GHG inventories and MRV)





- **Reference Document on MRV in Transport**

Available at: http://transport-namas.org/

- **GHG Reporting and Inventorying in Germany – Assessing transport related emissions .**

Available at http://www.sutp.org/files/contents/documents/resources/B_Technical-Documents/GIZ_SUTP_TD_%20GHG-Reporting-and-Inventorying_EN.pdf

- **Webinar : GHG inventory in the transport sector: https://www.youtube.com/watch?v=mFIaEp_Ps_8.**

Upcoming in 2017

- **Transport Volume, UNFCCC Compendium**

(Preview: http://transport-namas.org/wp-content/uploads/2016/11/Preview-Transport-Volume_Compendium_draft-for-comments.pdf)

- **Bottom-up GHG Inventory and MRV of Measures** – Synergies and Limitations in the Transport Sector http://capsut.org/events/emission-inventory-in-the-transport-sector

Thank you!

Please do not hesitate to contact the TraCS project for further questions.

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