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Methodologies for GHG Baselines and Monitoring in the Transport Sector

Joint UNFCCC Secretariat / GIZ Webinar Series

Shift road freight transport to other modes

14 November 2018

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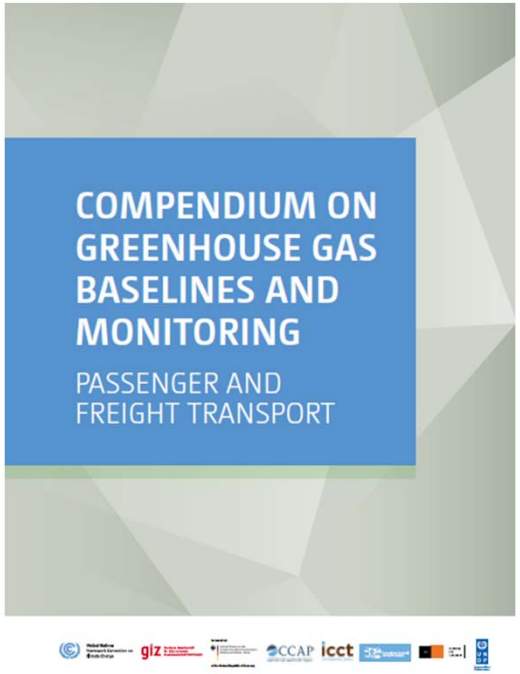
Compendium on GHG Baselines and Monitoring: Passenger and Freight Transport



Chapters of the Compendium

1. Intra-urban mass rapid transit investments
2. Comprehensive urban transport programmes
3. Vehicle efficiency improvement programmes
4. Alternative fuels incentives
5. Inter-urban rail infrastructure
6. **Freight transport infrastructure investments to shift mode**
7. National fuel economy standards
8. Fuel pricing policies

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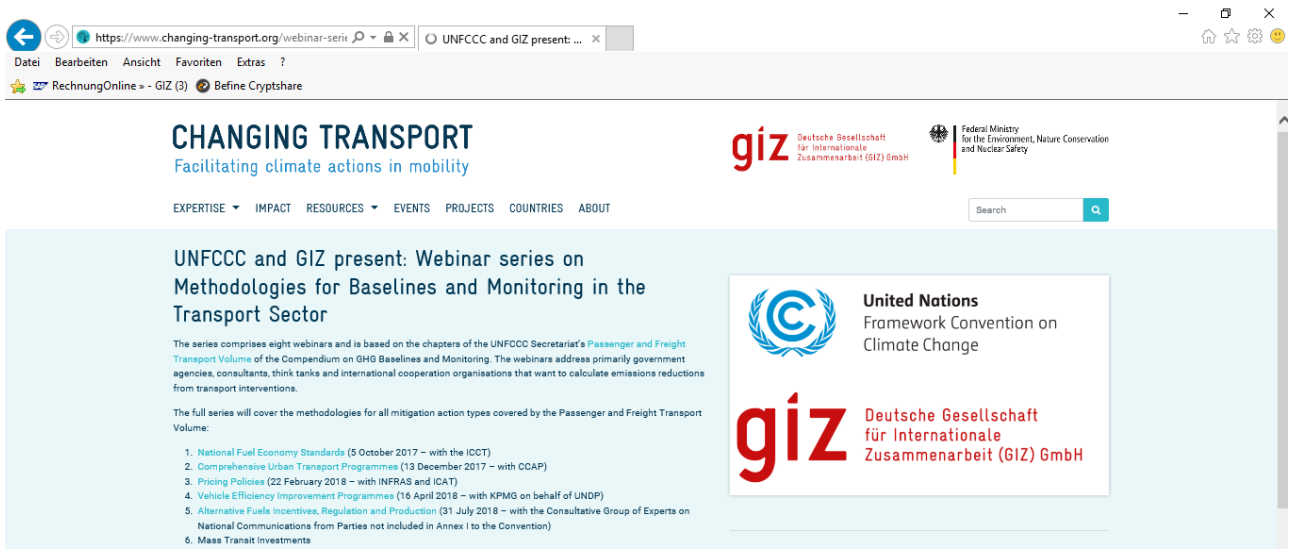

Link:
https://www.changing-transport.org/webinar-series-on-methodologies-for-baselines-and-monitoring-in-the-transport-sector/

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Functions of the control panel

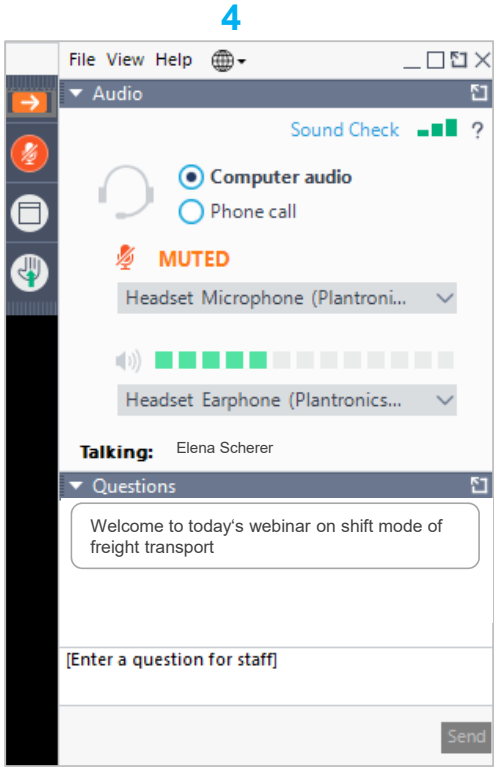
Questions Pane:

1. Type questions to the presenters and click „send“

Grab Tab: From the Grab Tab, you can

2. Hide the Control Panel
3. View the webinar in full screen
4. Change language

You’re muted during the webinar.



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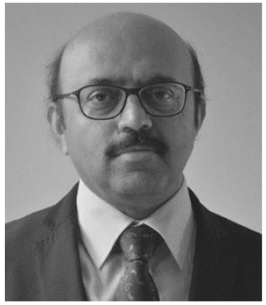
Agenda (60 minutes)

1. Welcome and introduction by the CGE (The Consultative Group of Experts) (CGE Mr. Fernandez) (5 min)
2. Chapter 6 on Shift Mode of Freight Transport (Mrs. Scherer, GIZ) (10 Min)
3. Application of CDM methodologies (Mr. G Hedge; Mr. E. Cardoso Filho) (15 min)
4. Q&A (30 Min) moderated by Mr. Pillay (UNFCCC)v


Gajanana Hegde


Ricardo Fernandez


Elena Scherer


Eduardo Cardoso


Marlan Pillay

Today‘s speakers & moderator

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Webinar introduction by the Consultative Group of Experts (CGE)

CGE Webinar series #11

14 November 2018

Objectives

- ✓ Overall: To help developing countries improve their technical capacity regarding some of the methods they can use to better estimate and report on GHG reductions/removals from the implementation of mitigation action
- ✓ Specific: To provide a short overview of chapter 6 of the Compendium on ‘GHG baselines and monitoring: Passenger and Freight transport – Freight transport infrastructure investments to shift mode’

Short introduction to the topic

- *Current emission trends* > Transport is a key source of emissions and it is growing rapidly worldwide (both for freight & passenger)
- *Impacts/effects* > on climate (GHG emissions from fossil-fuel transport systems) and on health (air pollution and air quality)
- *Future emission trends:*
  - IPCC has found that without mitigation actions, transport emissions could reach 12 Gt CO2 eq/year by 2050 (Sims et al., 2014)
  - Transport demand in developing countries is expected to increase at a faster rate due to rising incomes and development of infrastructure
- *Need of mitigation actions* > Fall into four categories:
  1. Avoiding journeys where possible;
  2. Modal shift to lower-carbon systems (focus of this webinar);
  3. Improving the energy intensity of travel per passenger kilometre or ton kilometre;
  4. Reducing carbon intensity of fuels.

Accessing UNFCCC tools and training materials

The CGE's key objective is to support developing countries improve their technical capacity regarding climate action and report through the NCs and BURs. To achieve this, the CGE:

- Regularly conducts webinars
- Regularly organises regional hands-on training workshops
- Develops training materials (NCs, BURs, technical analysis ICA process)

  e.g. The UNFCCC together with partner organizations have developed a Compendium on national and sector specific 'GHG Baselines and Monitoring' that countries could use to better estimate and report on GHG reductions/removals from the implementation of mitigation actions.

Available on UNFCCC webpages:

- **Tools and Training Materials for non-Annex I Reporting**
- **e-Network**
- **Contact: Transparency Implementation Support Unit (tisu@unfccc.int)**

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Chapter 6: Shift Mode of Freight Transport

14 November 2018

Elena Scherer, Advisor, GIZ

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Chapter 6: Content

6.1 Description and characteristics of freight modal shift mitigation actions.

6.2 Structure of mitigation effects

6.3 Determining the baseline and calculating emission reductions

6.4 Guidance on the selection of analysis tools for freight modal shift projects

6.5 Monitoring

6.6 EXAMPLE – Switching freight to short sea shipping

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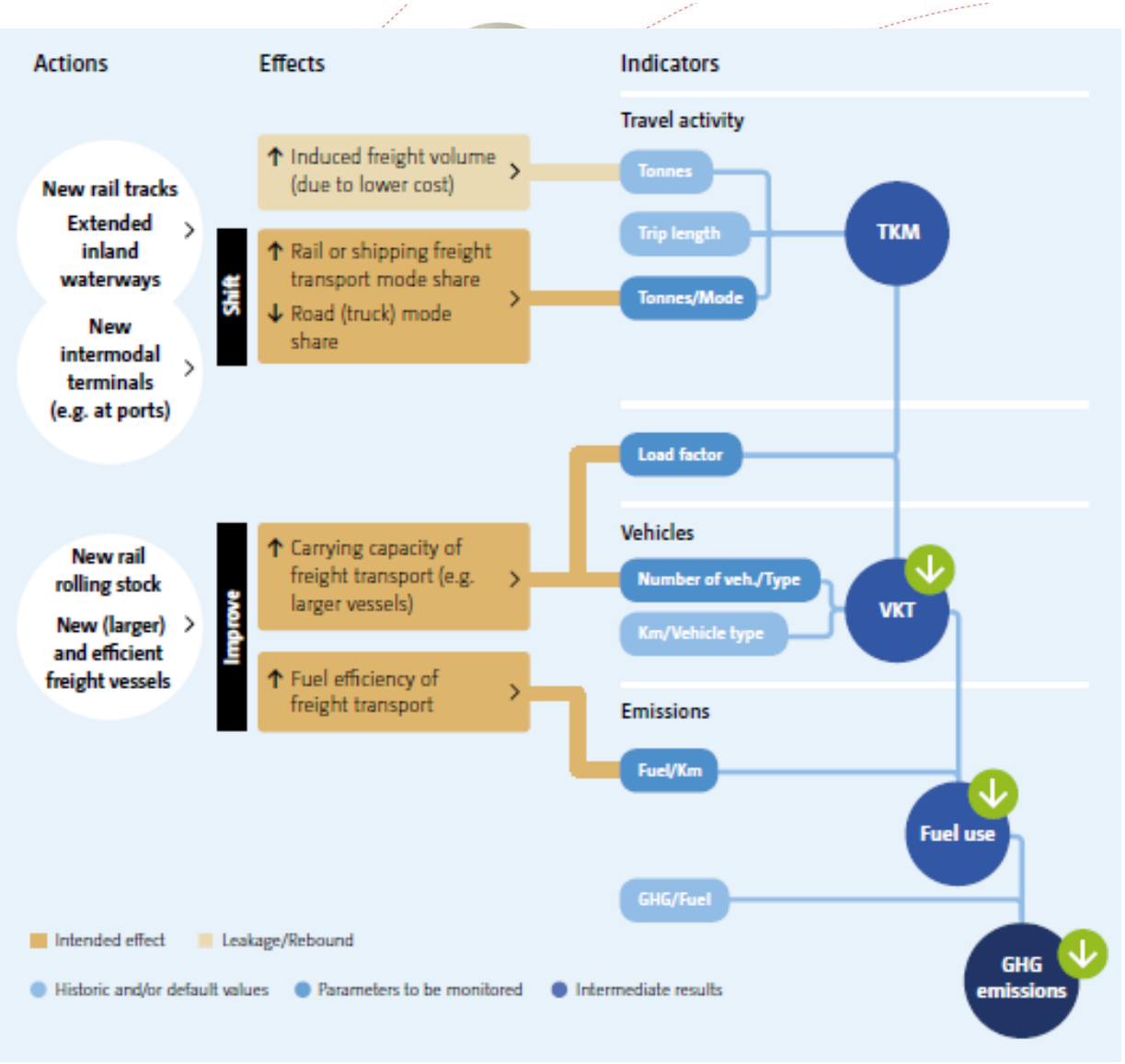
6.1 Description and characteristics of freight modal shift mitigation actions

Freight modal shift mitigation actions:
Projects and policies that activities that result in modal shift in transportation of a specific cargo (excluding passengers) from road transportation using trucks to water transportation using barges or ships or rail transportation.

Methodology:
Covers investments that increase the capacity and/or decrease the cost of rail or water transport modes

Outcomes:
Reduction of fuel use and GHG emissions in cargo transport by decreased TKM moved by truck, decreased truck VKT and a shift of TKM to more efficient rail or water modes

Side effects:
E.g. decreased congestion and noise due to fewer trucks on the road; increased road safety by reducing traffic; reduced toxic air pollution (especially when moving freight to electric rail)



Source: Causal chain: Figure 19 of the Compendium

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6.2 Structure of mitigation effects: Cause-impact chain

Shows the variables that are targeted by the mitigation action components and how they should be affected

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6.2 Structure of mitigation effects: Boundary setting

Dimensions of boundary setting of freight modal shift mitigation actions

Dimension	Options for boundary setting
Geographical	National, regional, specific freight corridor
Temporal	10–20 years
Upstream/downstream	Energy sector (conventional fuels, electricity, biofuels), may also consider infrastructure construction
Transport subsector	Freight transport
Emissions gases	CO_2eq (may include CH_4, N_2O)

Source: Dimensions of boundary setting: Table 41 of the Compendium

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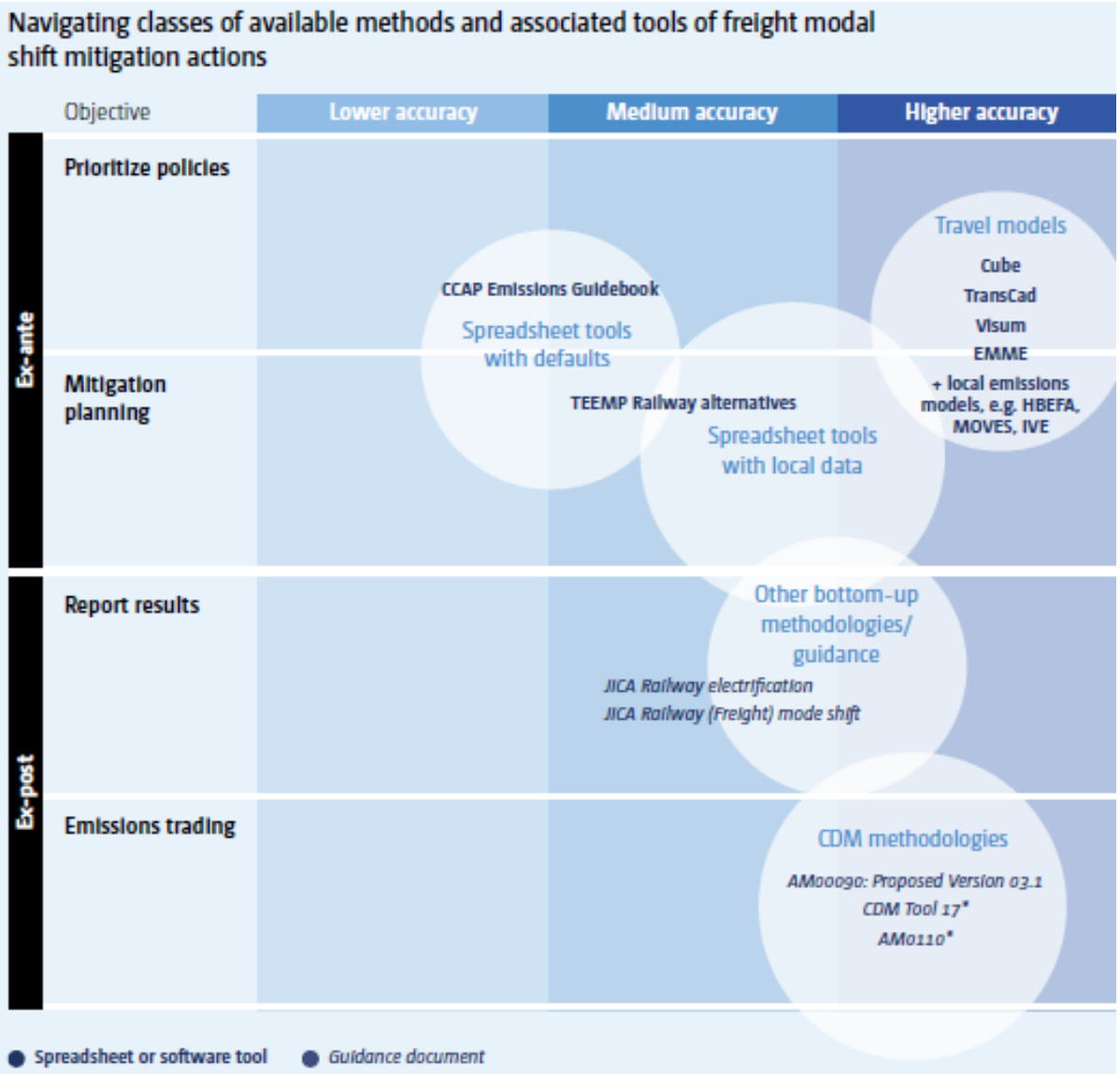
6.3 Determining the baseline and calculating emission reductions

Analysis approach:

There are four general approaches for baselines or mode shift scenarios:

1. National or regional freight models – based on commodity flow and/or spatial inputs
2. Growth factor methods based on direct economic projections
3. Expert judgment based on historical trends, using time series data gathered ideally for at least 10 years
4. Survey or data collection from shippers including state preference surveys.



Source: Navigation: Figure 20 of the Compendium

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6.4 Guidance on the selection of analysis tools

Navigation maps help users judge

- Level of accuracy
- Objective of analysis
- Nature of tool

In addition to the maps the Volume also has a tabular guide and descriptions

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6.4 Guidance on the selection of analysis tools

Travel demand models for freight modal shift mitigation actions

Ease of use/data collection: Highly resource and data intensive

Name	Application / summary	Scope	Developer	Methodology documentation	Data collection guidance	Defaults provided	Cost of tool
AM00090 Proposed Version 03.1	Shift cargo among trucks barges, ships and trains	Ex-post, upstream including construction, electric grid factor	UNFCCC	Good	Brief "Measurement procedures" for all variables	Default emission factors for diesel for trucks, barges and ship fuel oils	Free
CDM Tool 17: Baseline emissions for modal shift measures in inter-urban cargo transport	Modal shift from road to waterborne (using barges or domestic ships) or rail transportation	Ex-post, no upstream emissions except electric grid factor	UNFCCC	Good	Brief "Measurement procedures" for only some variables	Default emission factors for rail, water and road disaggregated by some cargo types	High
MRV-Blueprint: India Railways NAMA	National rail infrastructure programme NAMA	Passenger and freight mode shift from road or air modes	Grütter Consulting	Very good	Good, brief recommendations for data sources at national level	No	High
AM0110 Large-scale methodology: Modal shift in transportation of liquid fuels Version 01.0.0	Shift in mode of transportation of liquid fuels from road transportation using trucks to pipeline transportation	Ex-post, includes upstream electric emissions, trucks to transport fuel for pipeline and land use changes from pipeline	UNFCCC	Good	Brief "Measurement procedures" for only some variables	Includes a single default value for truck fuels	High

Source: Travel demand models: Table 45 of the Compendium

The Volume has a tabular guide and descriptions of existing tools – differentiated by their ease of use and data intensity

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6.4 Guidance on the selection of analysis tools

Partially aggregated bottom-up spreadsheet tools with defaults for freight modal shift mitigation actions

Ease of use/data collection – moderate

Name	Application / summary	Scope	Developer	Methodology documenta-tion	Data collection guidance	Defaults provided	Cost of tool
TEEMP Railway alternatives	Shift of passengers and/or freight between road and rail	Manual entry of expected mode shift by percent	Clean Air Asia/ITDP/ ADB	General guide for all spreadsheets	Some guid-ance with defaults	Emission factors for passenger and tonne kilometre for highway and rail Defaults for trip lengths	Free

Source: Partially aggregated bottom-up spreadsheet tools: Table 46 of the Compendium

The Volume has a tabular guide and descriptions of existing tools-differentiated by their ease of use and data intensity

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6.4 Guidance on the selection of analysis tools

Simple bottom-up tools with mostly default data for freight modal shift mitigation actions

Ease of use/data collection: Moderate to low

Name	Application / summary	Scope	Developer	Methodology documentation	Data collection guidance	Defaults provided	Cost of tool
JICA Railway electrification	GHG reduction from electrification of rail	Includes mode shift effects Includes upstream grid factor	JICA	Limited	Fair	Refers to appendix	Free
JICA Railway (Freight) mode shift	Mode shift of freight from truck to rail	Includes upstream grid factor	JICA	Limited	Fair	Refers to appendix	Free
CCAP Emissions Guidebook	Mode shift from truck to rail or barge	Ex-ante tool; sketch planning estimates based on reduction in number of trucks (and/or change in loading)	CCAP	Good	Fair	United States energy and emission factors for trucks	Free

Source: Simple bottom-up tools models. Table 47 of the Compendium

The Volume has a tabular guide and descriptions of existing tools- differentiated by their ease of use and data intensity

6.5 Monitoring

Category	Indicator	Normal monitoring fequency
Implementation indicator	Construction of new rail or water infrastructure	Onetime or by construction phase
Performance indicators	Mode shift in percent	Annual
	Annual tonnes of cargo by mode	Annual
Impact indicators	Calculated cargo tonne kilometres by mode	5 years
	Latest emission rates by mode	5 years
	Calculated emissions in study area	5 years

Source: based on. Minimum indicator set: Table 48 of the Compendium

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Thank you for your attention

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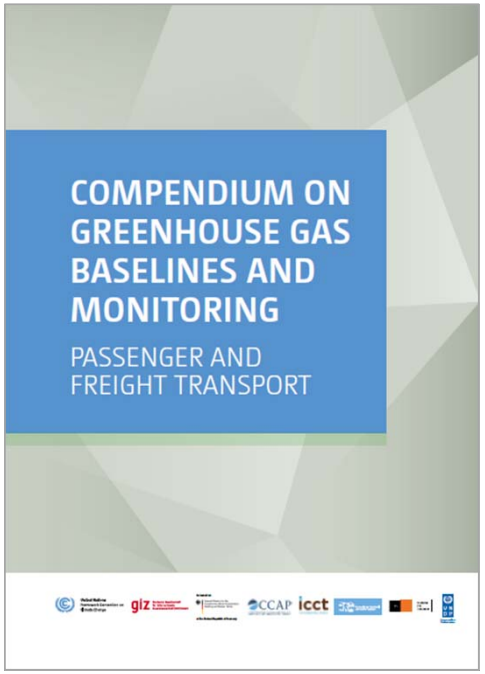

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Webinar series on Methodologies for Baselines and Monitoring in the Transport Sector

Episode 6: Shift Mode of Freight Transport from Road to other modes

CDM Methodologies of Shift Mode of Freight Transport from Road to other modes

Gajanana Hegde & Eduardo Cardoso Filho
UNFCCC Secretariat
SDM programme

CDM in the Transport Sector

- 20 approved methodologies:
  - Modal shift in passenger transportation (5 methodologies);
  - Modal shift in freight transportation (2 methodologies);
  - Energy efficiency measures (4 methodologies);
  - Production of biodiesel (3 methodologies);
  - Fuel swtiching and Electric/Hydbrid vehicles (4 methodologies);
  - Aviation (2 methodologies).

- 3 methodological tools:
  - Emissions from transportation of freight;
  - Baseline emissions for modal shift in cargo transport;
  - Baseline emissions for modal shift in passenger transport.

CDM in the Transport Sector

- 30 registered projects:
  - 20 projects involving modal shift in passenger transport (BRTs, MRTS, Cable cars);
  - 7 projects involving fuel switching and electric/hydbrid vehicles;
  - 2 projects involving the production of biodiesel;
  - 1 project involving modal shift in freight transport (from road to rail).

- 1 registered PoA:
  - 1 CPA involving modal shift in freight transport (from road to rail).

Review of modal shift in freight transportation methodologies

AM0090

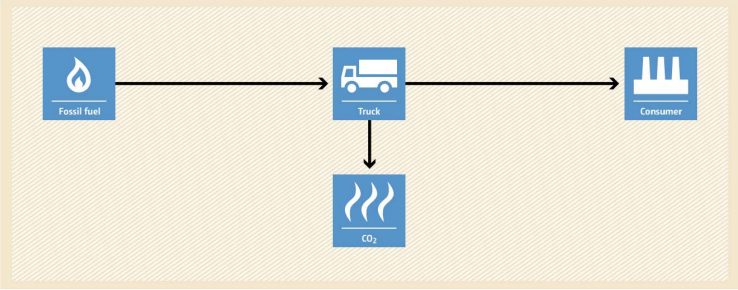
Modal shift in transportation of cargo from road transportation to water or rail transportation

- **Typical project:** transportation of cargo using barges, ships or trains;
- **Baseline scenario:** cargo is transported using trucks;

AM0110

Modal shift in transportation of liquid fuels from road transportation to newly constructed pipeline

- **Typical project:** transportation of cargo using newly constructed pipeline;
- **Baseline scenario:** cargo is transported using trucks;

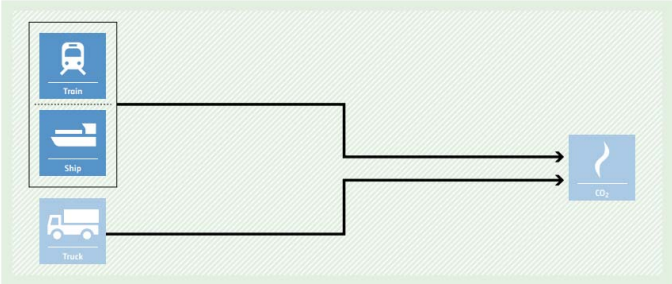


Review of modal shift in freight transportation methodologies

AM0090

Modal shift in transportation of cargo from road transportation to water or rail transportation

- **Project scenario:** cargo is transported using barges, ships or trains;

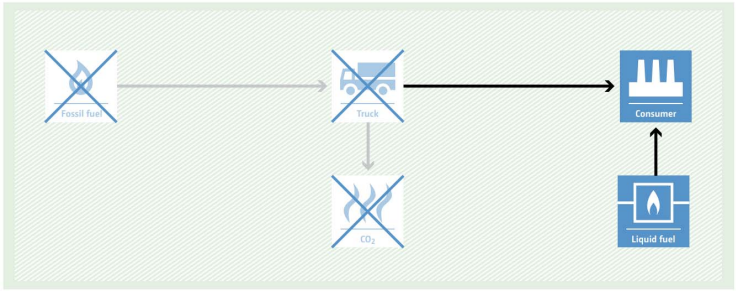


- **Relevant applicability conditions:**
  - a) Both in the baseline and project, only one type of cargo is transported and no mix of cargo is permitted;
  - b) Distance of the baseline trip route (both forward and return trips) shall be identified and not be altered during the project lifetime.

AM0110

Modal shift in transportation of liquid fuels from road transportation to newly constructed pipeline

- **Project scenario:** cargo is transported using pipeline;



- **Relevant applicability conditions:**
  - a) Both in the baseline and project, only one type of liquid fuel is transported and no mix of cargo is permitted;
  - b) Road transportation capacity to transport the liquid fuel by trucks in the baseline is sufficient.

Review of modal shift in freight transportation methodologies

AM0090

Modal shift in transportation of cargo from road transportation to water or rail transportation

- **Baseline emissions:** emissions that would have taken place if the same amount of cargo would be transported by road;

$$BE = T_y \times AD \times EF_{BL}$$

BE_y = Baseline emissions in year y (tCO_2e)

T_y = Amount of cargo transported by the project transportation mode in year y (tonne)

AD = Distance of the baseline trip route (km)

EF_{BL} = Baseline emission factor for transportation of cargo (tCO_2e/tkm)

- conservative default factors for different types of cargo transported
- historical data (fuel consumed, cargo transported, distance of baseline trip route, factor to account for non-empty return trips)

AM0110

Modal shift in transportation of liquid fuels from road transportation to newly constructed pipeline

- **Baseline emissions:** emissions that would have taken place if the same amount of liquid fuels would be transported by road;

$$BE_y = \sum_j \left(T_{j,y} \times AD_j \times EF_{BL,j}\right)$$

BE_y = Baseline emissions in year y (tCO_2e)

T_y = Amount of liquid fuel transported by the pipeline in route j in year y (tonne)

AD = Distance of the baseline route j (km)

EF_{BL} = Baseline emission factor for transportation of liquid fuel in route j (tCO_2e/tkm)

- conservative default factors of 76 gCO_2e/tkm (for trucks consuming petrol or gasoline)
- historical data (fuel consumed, liquid fuel transported including return freight, distance of baseline trip route including return trip)

Review of modal shift in freight transportation methodologies

AM0090

Modal shift in transportation of cargo from road transportation to water or rail transportation

- **Project emissions:** emissions due to the consumption of fossil fuel and electricity by the trains transporting the cargo and fuel consumed by trucks in complementary routes

$$PE = \left(PE_{FC,y} + PE_{EC,y}\right) \times F_{RT,PJ,y} + PE_{CR,y}$$

$PE_{FC,y}$ = emissions from fossil fuel combustion in year y (tCO_2)

$PE_{EC,y}$ = emissions from electricity consumption in year y (tCO_2)

$F_{RT,PJ,y}$ = factor to account for non-empty return trips in the project scenario in year y (fraction)

$PE_{CR,y}$ = emissions from transportation of cargo in complementary routes in trucks in year y (tCO_2)

AM0110

Modal shift in transportation of liquid fuels from road transportation to newly constructed pipeline

- **Project emissions:** emissions due to the consumption of fossil fuel and electricity to operate the pipeline, the fuel consumed by trucks in complementary routes and the emissions due to land clearance for construction of the pipeline

$$PE = PE_{FC,y} + PE_{EC,y} + PE_{CR,y} + PE_{CL}$$

$PE_{FC,y}$ = emissions from fossil fuel combustion in year y (tCO_2)

$PE_{EC,y}$ = emissions from electricity consumption in year y (tCO_2)

$PE_{CR,y}$ = emissions from transportation of cargo in complementary routes in trucks in year y (tCO_2)

PE_{CL} = emissions from clearance of land to construct the pipeline (tCO_2)

Review of modal shift in freight transportation methodologies

AM0090

Modal shift in transportation of cargo from road transportation to water or rail transportation

- **Monitored parameters:**
  - Fuel and/or electricity consumption by the project transportation mode;
  - Amount of cargo transported by the project transportation mode (both forward and return trips).

AM0110

Modal shift in transportation of liquid fuels from road transportation to newly constructed pipeline

- **Monitored parameters:**
  - Fuel and/or electricity consumption to operate the pipeline;
  - Amount of liquid fuel transported by the pipeline.

Review of the TOOL17 : Baseline emissions for modal shift measures in inter-urban cargo transport

- **Applicability:** to develop standardized baselines or to calculate baseline emissions from transport projects implementing modal shift measures in inter-urban cargo transport.
- **Step-wise approach to determine the baseline emissions:**

  a) Determine relevant cargo types;

  b) Determine the mode share for each relevant cargo type (TKM of specific cargo type transported by the specific mode divided by the total TKM for that cargo type transported in the same time period and the region/province/country);

  c) Determine the average specific emission factor per TKM for cargo type for the different transport modes (historical data, conservative default values):

  - Rail;
  - Water;
  - Pipeline;
  - Road.

  d) Calculate the **weighted average emission factor** of the cargo type based on the different modes of transport.

Example of project activities and CPAs using freight transportation methodologies

CPA 9801-0001	Railway Project West Aconcagua River to Quilicura
CPA description	The project involves the construction of a new rail system (deviation railways to the main railway, conveyor belts from the deviation railways to the loading and unloading points, new wagons) to replace the transportation of cement aggregate by trucks.
Methodology:	AM0090 v1.1.0
Host country:	Chile
Amount of reductions (tCO_2/year)	5,671
Main figures of the project	- Baseline route: 89.21 km by road; - Project route: 93.77 km by rail; - 852 meters of deviation railways built at loading point; - 620 meters of deviation railways built at unloading point; - Improvements to optimize the loading and the unloading; - Transportation of 1,612,820 t/year of aggregates; - Baseline emission factor = 70 gCO_2e/TKM (default value for "Other crude and manufactured minerals and building materials").

Example of project activities and CPAs using freight transportation methodologies

PA 4066	Modal Shift from Road to Train for transportation of cars
Project description	The project involves the use of railway to transport cars, replacing the use of trucks (roads). The cars are transported to the nearest railway station (in Manesar), where it is loaded onto the wagons and the loaded wagon is transported to Mundra.
Methodology:	AMS-III.C v11
Host country:	India
Amount of reductions (tCO_2/year)	23,001

Main figures of the project	- Baseline: cars are transproted by trailers;
	  - Specific fuel consumption of trailers = 0.36 kg_{diesel}/km;
	  - Capacity of trailers = 10 goods (cars)/trailer;
	  - Total goods (cars) transported = 200,000 units/year;
	  - Distance origin-destination = 1,142 km
	
	- Project: cars are transported by rail
	  - Total goods (cars) transported = 200,000 units/year;
	  - Weight of one car = 0.91 t;
	  - Specific fuel consumption of railway = 0.003543 kg_{diesel}/tkm;
	  - Distance origin-destination = 1,142 km

Where to find the CDM Methodologies

- Large-scale methodologies: http://cdm.unfccc.int/methodologies/PAmethodologies/approved

- Small-scale methodologies: http://cdm.unfccc.int/methodologies/SSCmethodologies/approved

Thank You

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UNFCCC Secretariat
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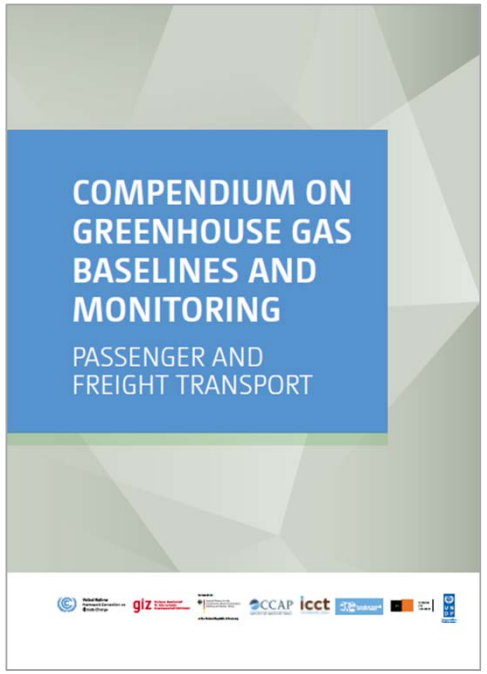

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Thank you!

Next webinar of our series upcoming in early 2019!

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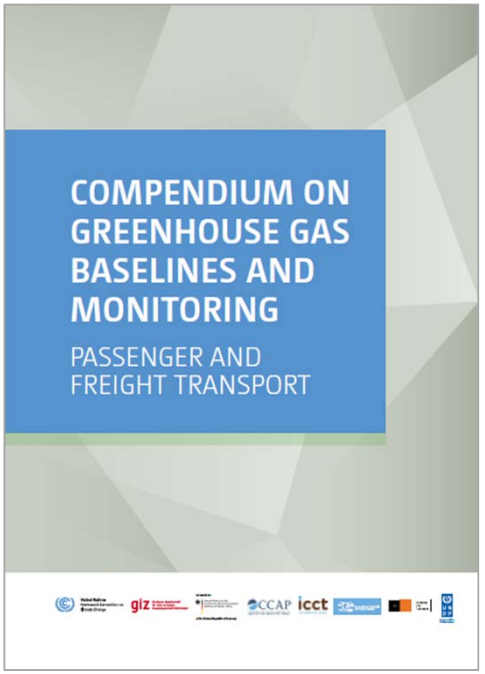

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6.2 Double counting concerns

Other policies and actions taken to mitigate GHG emissions may have synergistic or interaction effects on freight mode shift actions.

Table 42

Actions with potential for double counting of freight modal shift mitigation actions

Mitigation action	May affect this variable
Fuel cost (taxes or subsidy removal)	Mode share
Logistics facilities investment	Induced trips, mode share
Fuel economy standards or measures for trucks	Mode share, truck transport costs
Improved logistics practices (e.g. alliances of small truckers)	Mode share, truck transport costs

Source: Actions with potential for double counting. Table 42 of the Compendium