5 Traffic Congestion Mitigation / Modal Shift (Freight)

1. Typical Project

- Freight modal shift from existing transportation modes (e.g. trucks, trailers) to railway.
- A project to reduce greenhouse gas (GHG) emissions by promoting congestion mitigation of existing transportation facilities through road maintenance, bridge construction, double track, etc.

2. Applicability

(1) Development of transport system(s) that can realize an efficient freight transport such as railway. Or promoting congestion mitigation of existing transportation facilities through road maintenance, bridge construction, double track, etc.

(2) The baseline transport modes should be road transportations such as trucks and trailers etc.

3. Methodology of Emission Reduction Calculation

The emission reduction from the project activity is determined as the differences between the GHG emission of baseline scenario (existing mode of transportation, e.g. trucks and trailers) and project scenario (railway, road maintenance, bridge construction, double track, etc.).

$$ER_y = BE_y - PE_y$$

ER_y : GHG emission reduction through the project in year y (t-CO_2e/y)

BE_y : GHG emission from the baseline scenario in year y (t-CO_2e/y)

PE_y : GHG emission from the project scenario in year y (t-CO_2e/y)

The representative value of annual emission reductions should indicate the average value for the calculation period.

(1) Calculation of Baseline Emission

Baseline GHG emission is calculated based on the freight transportation activity/volume in ton-km, share of freight by baseline transport modes and CO2 emission factor per ton-km.

$$BE_y = \sum_i \left(BTKM_{by} \times MS_{bi} \times EF_{TKM,i} \right)$$

$BTKM_{by}$: Freight transportation activity/volume by the project in year y. In case of congestion mitigation, freight transportation activity/volume without the project activity in year y (t-km/y)

$MS_{i,y}$: Share of freight by transport mode i in the baseline scenario in year y.

$EF_{TKM,i}$: CO_2 emission factor per ton kilometer for transport mode i (t-CO_2/t-km)

(2) Calculation of Project Emission

2-1) Modal shift

- In the case of the project activity using electricity

It is estimated by multiplying annual electricity consumption of the project activity with the CO_2 emission factor of the grid

electricity.

$$PE_y = EC_{PJ,y} \times EF_{elec}$$

$EC_{PJ,y}$: Electricity consumption associated with the operation of the project activity in year y (MWh/y)

EF_{elec} : CO_2 emission factor of the grid electricity (t-CO_2/MWh)

- In the case the project activity using fossil fuel

It is estimated by multiplying annual fossil fuel consumption of the project activity with the CO_2 emission factor of the fuel.

$$PE_y = \sum_i (FC_{PJ,i,y} \times NCV_i \times EF_{fuel,i})$$

$FC_{PJ,i,y}$: Consumption of fuel i associated with the operation of the project activity in year y (t/y)

NCV_i : Net calorific value of fuel i (TJ/t)

$EF_{fuel,i}$: CO_2 emission factor of fuel i (t-CO_2/TJ)

2-2) Promoting congestion mitigation through road maintenance, bridge construction, double track, etc.

Project GHG emission is calculated based on the freight transportation activity/volume in ton-km, share of freight by project transport modes and CO2 emission factor per ton-km..

$$BE_y = \sum_i \left(BTKM_{py} \times MS_{pi} \times EF_{TKM,i}\right)$$

$BTKM_{py}$: Freight transportation activity/volume by the project in year y. (t-km/y)

$MS_{pi,y}$: Share of freight by transport mode i in the baseline scenario in year y (%)。

$EF_{TKM,i}$: CO_2 emission factor per ton kilometer for transport mode i (t-CO_2/t-km)

4. Data and Parameters Estimated and Need Monitoring

Data	Description	Data Sources			
		For baseline emission calculation		For project emission calculation	
		Ex-ante	Ex-post	Ex-ante	Ex-post
$BTKM_{by}$	Freight transportation activity/volume in the baseline scenario in year y (t-km/y). In the case of modal shift, it is the distance traveled by the project transportation.	A planned value	A monitored value	N/A	
$BTKM_{py}$	Freight transportation activity/volume by the project in year y (t-km/y)				

$MS_{bi,y}$	Share of freight by transport mode i in the baseline scenario in year y (%)				
$MS_{pi,y}$	Share of freight by transport mode i by the project in year y (%)				
$EF_{TKM,i}$	CO_2 emission factor per ton kilometer for transport mode i (t-CO_2/t-km)	A default value: Table 8, Appendix If there is no default value applied or if there is another appropriate value, that value may be used.			
$EC_{PJ,y}$	Electricity consumption associated with the operation of the project activity (railway) in year y (MWh/y)	N/A		A planned value	A monitored value (Electric meter or estimated by, e.g., annual total trip distances and specific electricity consumption)
$FC_{PJ,i,y}$	Consumption of fuel i associated with the operation of the project activity (railway) in year y (t/y)			A planned value	A monitored value (Purchase receipt of the fuel or estimated by, e.g., annual total trip distances and specific fuel consumption)
EF_{elec}	CO_2 emission factor of the grid electricity (t-CO_2/MWh)			A default value (Table 3, Appendix) If there is no default value applied or if there is another appropriate value, that value may be used.	
NCV_i	Net calorific value of fuel i (TJ/t)	A default value (Table 1 and 2, Appendix) If there is no default value applied or if there is another appropriate value, that value may be used.			
$EF_{fuel,i}$	CO_2 emission factor of fuel i (t-CO_2/TJ)				

5. Others

(1) Project Boundary

The physical boundary for estimating GHG emissions includes the operation of the railway.

(2) Leakage

There are indirect emissions that potentially lead to leakage due to activities such as productions and transportations of raw materials for MRT facilities and rolling stocks, and their constructions and productions. However, these emissions are temporary and negligible compare to the project scale. Therefore, it can be ignored. These indirect emissions are not counted in the CDM methodologies for MRT such as ACM0016 (Mass Rapid Transit Projects) and AM0031 (Bus rapid transit projects).

(3) Comparison with existing methodologies

The methodology is developed mainly based on the CDM methodology, AM0090 (Modal shift in transportation of cargo from road transportation to water or rail transportation). The CDM methodology is applicable for water transportation as well as railway transportation; however, this methodology is only applicable for railway transportation. The CDM methodology allows both in the baseline and project activity, only one type of cargo owned by the project participants and excludes mix of cargo. But

this methodology does not set any limitation for cargo type. The CDM methodology also has some strict applicability conditions regarding investments to the project and conditions for project participants; however, this methodology has no limitation for these conditions also.

(4) CH_4 and N_2O

Since methane (CH_4) and nitrous oxide (N_2O) do not have a significant impact on emission reductions by the project, they were not considered for simplification.