

4. Transport / Measures on road congestion

1. Typical Project

- A project to promote traffic congestion mitigation through road development, bridge construction, double track, etc.

2. Applicability

- (1) Promoting traffic congestion mitigation of existing transportation facilities through road development, bridge construction, double track, etc.
- (2) The baseline transport modes should be buses, private cars, taxis, motorbikes, trucks, 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 (e.g. continuation of the use of existing road network) and project scenario (realization of traffic congestion mitigation through road development, bridge construction, double track)¹.

Details of sources of each data in the following formulae are provided in “4. Data and Parameters for the Estimation”.

$$ER_y = BE_y - PE_y$$

ER_y : GHG emission reduction through the project in year y (t-CO₂e/y)

BE_y : GHG emission from the baseline scenario in year y (t-CO₂e/y)

PE_y : GHG emission from the project scenario in year y (t-CO₂e/y)

(1) Calculation of Baseline Emission

Baseline GHG emission is calculated based on the traffic volume by types of vehicles, road length, vehicle CO₂ emission factor by speed category in the baseline scenario (e.g. without the project). The emission is calculated on road link basis, and sum up the emissions for all the target road links.

The traffic volume and average vehicle speed can be obtained through outputs of a traffic demand model.

$$BE_y = \sum_{i,j} (D_{BL,j} \times TV_{BL,i,j} \times EF_{i,v_BL})$$

$D_{BL,j}$: Road length of the road link j in the baseline scenario (km)

$TV_{BL,i,j}$: Traffic volume of vehicle type i in the road link j in the baseline scenario (unit/year)

EF_{i,v_BL} : CO₂ emission factor of vehicle type i on average vehicle speed v_{BL} (t-CO₂/km)

v_{BL} : Average vehicle speed of the road link j in the baseline scenario (km/h)

i : Vehicle types such as passenger car, bus, truck

j : Road link (the links would be not same/consistent in baseline and project cases)

(2) Calculation of Project Emission

Project GHG emission is calculated based on the traffic volume by types of vehicles, road length, vehicle CO₂ emission factor by speed category in the project case (with the project). The emission is calculated on road link basis, and sum up the emissions for

¹ The target year shall be a representative year under average operation or an annual average of multiple years.

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all the target road links.

The traffic volume and average vehicle speed can be obtained through outputs of a traffic demand model.

$$PE_y = \sum_{i,j} (D_{PJ,j} \times TV_{PJ,i,j} \times EF_{i,v_PJ})$$

$D_{PJ,j}$: Road length of the road link j in the project (km)

$TV_{PJ,i,j}$: Traffic volume of vehicle type i in the road link j in the project (unit/year)

EF_{i,v_PJ} : CO₂ emission factor of vehicle type i on average vehicle speed v_PJ (t-CO₂/km)

v_PJ : Average vehicle speed of the road link j in the project (km/h)

4. Data and Parameters for the Estimation

Data	Description	Data Sources	
		For baseline emission calculation	For baseline emission calculation
$D_{BL,j}$ $D_{PJ,j}$	Road length of the road link j (km)	A planned value or actual value	
$TV_{BL,i,j}$	Traffic volume of vehicle type i in the road link j in the baseline scenario (unit/year)	Outputs of a traffic demand model	N/A
$TV_{PJ,i,j}$	Traffic volume of vehicle type i in the road link j in the project (unit/year)	N/A	Outputs of a traffic demand model
EF_{i,v_BL}	CO ₂ emission factor of vehicle type i on average vehicle speed v_BL (t-CO ₂ /km)	Use appropriate values in “Grounds for the Calculation of Motor Vehicle Emission Factors using Environment Impact Assessment of Road Project etc., National Institute for Land and Infrastructure Management, and, Ministry of Land, Infrastructure, Transport and Tourism, Japan (2012)” ² . In case published values in the country are available, apply these values. Average vehicle speed should be set by each road link.	N/A
EF_{i,v_PJ}	CO ₂ emission factor of vehicle type i on average vehicle speed v_PJ (t-CO ₂ /km)	N/A	Use appropriate values in “Grounds for the Calculation of Motor Vehicle Emission Factors using Environment Impact Assessment of Road Project etc., National Institute for Land and Infrastructure Management, and, Ministry of Land, Infrastructure, Transport and Tourism, Japan (2012)” ² . In case published values in the country are available, apply these values. Average vehicle speed should be set by each road link.

² <http://www.nilim.go.jp/lab/bcg/siryounn/tnn/tnn0671pdf/ks0671.pdf>

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5. Others

(1) Project Boundary

The physical boundary for estimating GHG emissions includes the roads which are directly and indirectly affected by the project activity. In case traffic demand simulation was conducted for the project, it is recommended to set the boundary based on the simulation results.

(2) Leakage

For simplicity, construction emissions are not considered, since setting baseline scenario on the construction and estimation of its emissions are often complicated.

(3) Comparison with existing methodologies

The methodology is developed mainly referring to “Guidelines on environmental impact assessment of GHG emissions of road development projects. Ministry of the Environment, Japan. March 2020.”

(4) CH₄ and N₂O

Since methane (CH₄) and nitrous oxide (N₂O) do not have a significant impact on emission reductions by the project, they were not considered for simplification.

(5) Revision history

Version	Year/Month	Revisions
2.0	March 2014	<ul style="list-style-type: none"> • Integrated and recategorized the calculation methodologies as follows based on objects (passengers/ freights) and measures (modal shift/ electrification) <ul style="list-style-type: none"> - Railway /passenger (Modal Shift) - Railway /passenger (Electrification) - Railway /Freight (Modal Shift) - Railway /Freight (Electrification) • Amended the calculation method for baseline emissions to calculate emissions per passenger-kilometer
3.0	September 2019	<ul style="list-style-type: none"> • Amended the calculation method to calculate emissions based on consumption of fuel • Added instructions to calculate annual emission reductions by using an average for the calculation period • Added a method for road congestion • Prioritized the use of default values • Added instructions not to consider CH₄ and N₂O emissions
4.0	March 2023	<ul style="list-style-type: none"> • In the methodology "3. Traffic Congestion Mitigation / Modal Shift (Passenger), version 3.0)", both modal shift and congestion mitigation were involved in the same methodology. However, since the emission reduction logic differs between the two components, the methodology was

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		<p>separated into "3. Transport / Modal Shift (Passenger)" and "4. Transport / Measures on road congestion".</p> <ul style="list-style-type: none"> • In order to be able to estimate emission reductions due to increased vehicle speed, the calculation of emissions ((activity) x (emission factor)) uses the number of vehicle kilometers traveled by vehicle type and the CO₂ emission factor (or fuel consumption) by vehicle speed and vehicle type. Since it is difficult to obtain those emission factors specific to developing countries, the Japanese case is referred as a default value. • In the description of the calculation method and necessary data of baseline emissions, the words "before project implementation" was revised to use "the baseline scenario". The baseline scenario is the scenario that would have occurred in the absence of the project, such as continuation of the pre-project conditions. • Deleted the column "Ex-post" in "4. Data and Parameters Estimated and Need Monitoring": current version of Climate-FIT aims to quantify GHG emission reductions in the "planning phase").
5.0	March 2024	<ul style="list-style-type: none"> • No revision.