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-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)

   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.

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

\( BTKM_{by,x} \): 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)

\( MS_{iy} \): Share of freight by transport mode \( i \) in the baseline scenario in year \( y \).

\( EF_{TKM,i} \): CO2 emission factor per ton kilometer for transport mode \( i \) (t-CO2/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 CO2 emission factor of the grid...
electricity.

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

- In the case the project activity using fossil fuel

It is estimated by multiplying annual fossil fuel consumption of the project activity with the CO2 emission factor of the fuel.

\[ PE_y = \sum_{i} (FC_{PJ,i,y} \times NCV_{i} \times EF_{fuel,i}) \]

- 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.

\[ BE_y = \sum_{i} (BTKM_{py} \times MS_{pi,y} \times EF_{TKM,i}) \]

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

<table>
<thead>
<tr>
<th>Data</th>
<th>Description</th>
<th>Data Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>BTKMpy</td>
<td>Freight transportation activity/volume by the project in year y (t-km/y)</td>
<td>For baseline emission calculation</td>
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<td>Ex-ante</td>
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<tr>
<td>BTKMpy</td>
<td>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.</td>
<td>A planned value</td>
</tr>
</tbody>
</table>
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) 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.