

B. Notter, B. Cox

Handbook of Emission Factors for Road Transport (HBEFA)

Quick overview

The screenshot displays the 'Case Definition' window of the HBEFA software. The window has a title bar with a red background and a white 'Access' button. Below the title bar is a menu bar with 'File', 'Case Definition', 'Results', 'Info', 'Help', and 'Exit'. The main content area is divided into three sections: 'Select VEHICLE CATEGORIES', 'Select COMPONENTS (Pollutants)', and 'Select YEARS'. Each section has a yellow header bar. The 'Select VEHICLE CATEGORIES' section includes checkboxes for PC (checked), LCV, HGV, Urban Bus, Coach, and MC. The 'Select COMPONENTS (Pollutants)' section includes checkboxes for regulated, Fuel consumption, CO2 rep., and others, along with a 'Construct your own list' button. The 'Select YEARS' section includes checkboxes for 1995, 2005, 2010, 2020, 2025, 2035, 2040, and 2050, along with a 'Construct your own list' button. On the right side of the window, there is a 'Selected Country:' label and a text box containing the letter 'D'. A red rectangular box highlights the three selection sections on the left.

File Case Definition Results Info Help Exit

Select all parameters for your case. Then specify a name for this set and let the program calculate the emission factors.

Select VEHICLE CATEGORIES

☒ PC ☐ LCV ☐ HGV ☐ Urban Bus ☐ Coach ☐ MC

Select COMPONENTS (Pollutants)

☐ regulated ☐ Fuel consumption ☐ CO2 rep. ☐ others

Select YEARS

☐ 1995 ☐ 2005 ☐ 2010 ☐ 2020 ☐ 2025 ☐ 2035 ☐ 2040 ☐ 2050

Selected Country:

Contents

- HBEFA is a database application for road transport emission factors containing:
 - Energy/fuel consumption, GHG, regulated and unregulated pollutant emission factors
 - For all relevant road transport vehicles (cars, vans, trucks, buses, coaches, motorcycles)
 - Emission factors available from very detailed level (vehicle type, technology, emission standard, traffic situation) to aggregated level (e.g. average car in country X and year Y)
- Scope:
 - Base emission factors are valid internationally
 - Background activity data for aggregations are currently available for 6 European countries and years 1990 to 2050 or 2060
 - Direct (TTW) emissions; CO₂e emission factors for WTT emissions

Emission factor query form

FileCase DefinitionResultsInfoHelpExit

New ...Edit ...Delete ...

Select all parameters for your case. Then specify a name for this set and let the program calculate the emission factors.

Select VEHICLE CATEGORIES

☒ PC☐ LCV☐ HGV☐ Urban Bus☐ Coach☐ MC

Select COMPONENTS (Pollutants)

☐ regulated☐ Fuel consumption☐ CO2 rep.☐ others

Construct your own list

Select YEARS

☐ 1995☐ 2005☐ 2020☐ 2035☐ 2050

☐ 2010☐ 2025☐ 2040

☐ 2000☐ 2015☐ 2030☐ 2045

Construct your own list

Select FLEET COMPOSITION (=traffic scenario)

☒ EF weighted with fleet composition☐ EF per subsegment (without weighting)

REF D HB41

☒ Specify parameters for HOT EMISSION FACTORS

☒ Individual TrafficSituations:

Gradients:

Construct your own list

☐ Aggregate TrafficSituations (incl. Gradient-Distribution):

Info: Amb. Temp.

Select a temperature distribution:

Germany

☒ Specify parameters for COLD START EXCESS EMISSION FACTORS

Calculate COLD START excess emission factors

Construct your own list

☒ Specify parameters for EVAPORATION EMISSION FACTORS

☒ Calculate EVAPORATION soak emission factors☒ Calculate EVAPORATION diurnal emission factors☒ Calculate EVAPORATION running losses emission factors

Construct your own list

☒ Compute CO2e WELL-TO-TANK (WTT) EMISSION FACTORS

Choose EnergyMix scenario

Scen. Energy Mix:

HB41 EnergyMix Europe

Selected Country:

D

Select aggregation level of output:

☒ per veh-category☐ per veh-category and technology/fuel type☐ per veh-category and emission concept☐ per veh-category and subsegment

Name of parameter set:

enter name (no blanks, no special cases):

enter comment:

display the list of the cases

☐ Save data in User-MDB only (without displaying them automatically)?

Calculate

Reset to default

Return

Result tables

Hot emission factors (per veh cat)

Case	Veh category	Year	Fleet Comp.	Type Fleet Comp.	Comp/ Pollu- tant	Traffic situation	Grad.	Temperature distribution	Speed	EFA	WTT EFA	W/TW EFA
									km/h	g/km	g/km	g/km
Demo[4.1.2]	pass. car	2020	REF D HB41	unspec	CO	0	0	Germany	53.7	0.875		
Demo[4.1.2]	pass. car	2020	REF D HB41	unspec	CO2(rep)	0	0	Germany	53.7	163.003		

Cold start emission factors (per veh cat)

Case	Veh category	Year	Fleet Comp.	Type Fleet Comp.	Comp/ Pollu- tant	AmbientCond Pattern	EFA (weighted)	WTT EFA (weighted)	W/TW EFA (weighted)
							g/start	g/start	g/start

Evap emission factors (running losses) (per veh cat)

Case	Veh category	Year	Fleet Comp.	Road category	Comp/ Pollu- tant	AmbientCond Pattern	EFA (weighted)
							g/km

Evap emission factors (diurnal) (per veh cat)

Case	Veh category	Year	Fleet Comp.	Type Fleet Comp.	Comp/ Pollu- tant	AmbientCond Pattern	EFA (weighted)
							g/day/veh
Demo[4.1.2]	pass. car	2020	REF D HB41	Urban	HC	Germany	0.726

Evap emission factors (soak) (per veh cat)

Case	Veh category	Year	Fleet Comp.	Type Fleet Comp.	Comp/ Pollu- tant	AmbientCond Pattern	EFA (weighted)
							g/soak
Demo[4.1.2]	pass. car	2020	REF D HB41	Urban	HC	Germany	0.024

INFRAS | HBEFA overview | January 11, 2023 | Benedikt Notter

3

Uses/applications

- HBEFA is used for:
 - environmental impact assessments
 - air pollution inventories from city to national level
 - climate/GHG reporting
 - energy and climate impact scenarios
 - as an input for many third-party applications such as COPERT, EcoTransIT, LCA tools (e.g. ecoinvent), PTV transport/logistics suite etc.

Institutional background

- HBEFA is commissioned by the environment/transport agencies of 6 European countries (Germany, France, Austria, Switzerland, Sweden, Norway)



Germany



Austria



Switzerland



Sweden



France



Norway

- INFRAS develops the software and coordinates the methodology development of HBEFA
- Methodology partners:
 - Technical University of Graz, Austria
 - Ifeu (Institute for energy and environment), Heidelberg, Germany
 - WSP Sweden
- Additional partners and input data providers: EMPA (CH) IVL, AVL MTC (SE), Université Gustave Eiffel (FR), JRC/ERMES Group (EU), LAT/Emisia (GR), TNO (NL), HSDAC (DE), ...



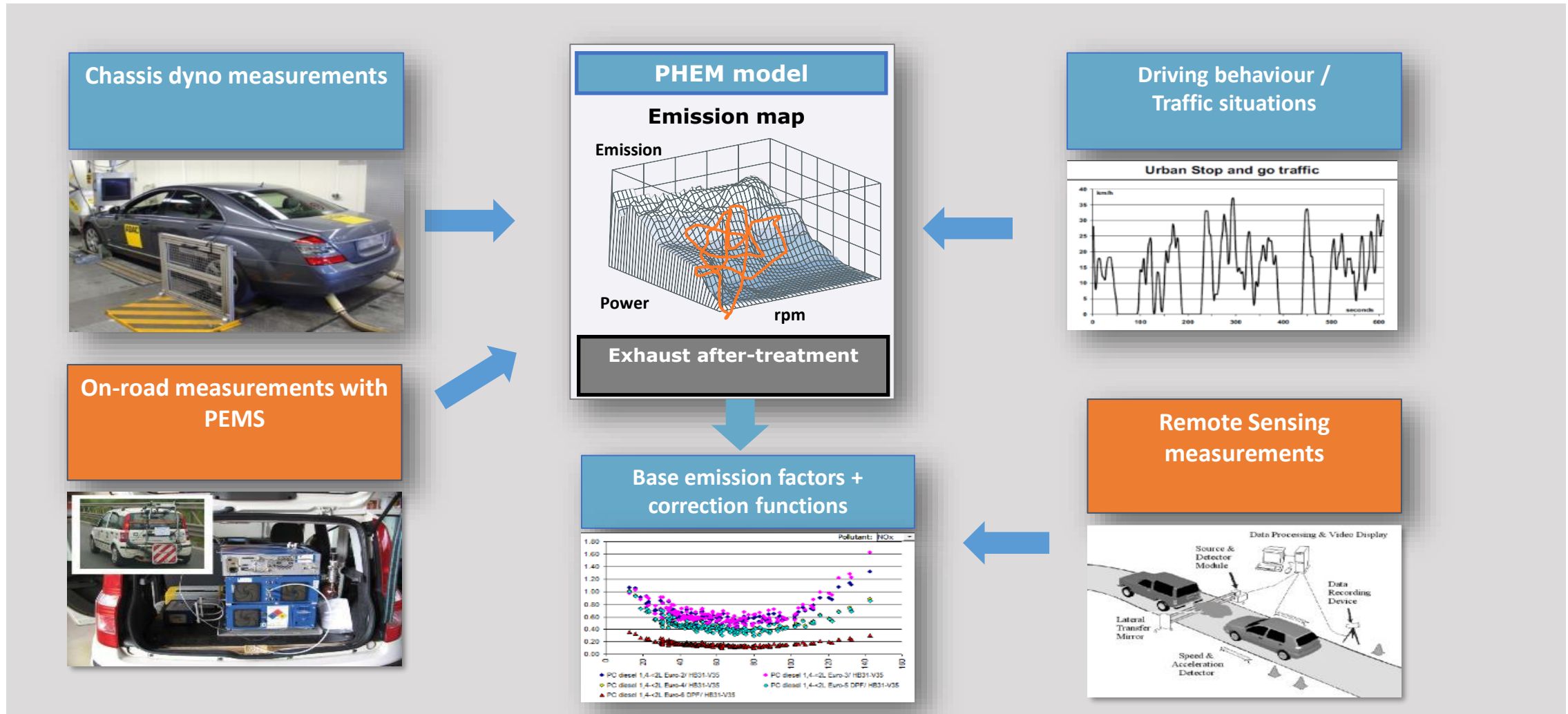
Versions

- HBEFA 1.1 was published in 1995
- Since then, new versions have been published approximately every 3 – 5 years based on the latest measurement and transport data the latest state of scientific knowledge
- The current version is HBEFA 4.2 (published 2022)

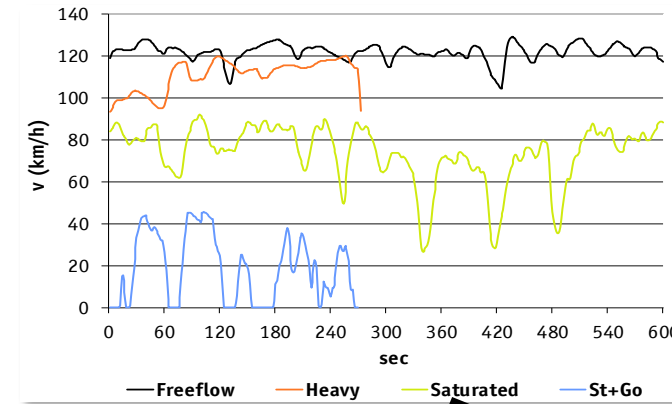
Availability and licensing

- The HBEFA «Public Version» can be ordered at www.hbefa.net
- Single use licenses are available for 250 EUR/300 CHF for new users, and 150 EUR/180 CHF for users of previous versions
- Commercial licenses (allowing the reproduction of HBEFA contents in third-party software tools) are available for 2500 – 20'000 EUR, depending on the number of users.
- More information is available on request to hbefa@infras.ch

Methodology: Measurements and emission factor derivation



Methodology: Traffic situations



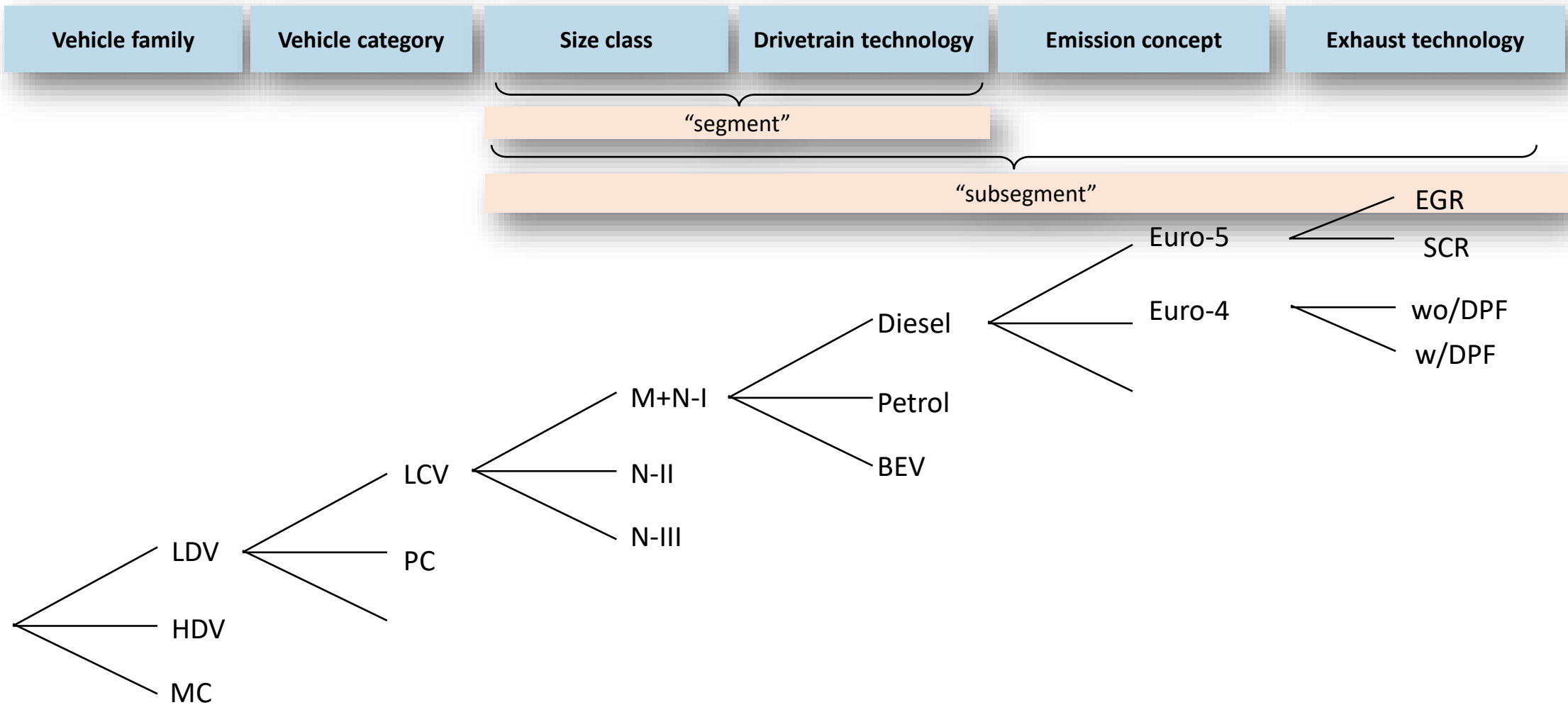
			Speed Limit [km/h]												
Area	Road type	Levels of service	30	40	50	60	70	80	90	100	110	120	130	>130	
Rural	Motorway-Nat.	5 levels of service													
	Semi-Motorway	5 levels of service													
	TrunkRoad/Primary-Nat.	5 levels of service													
	Distributor/Secondary	5 levels of service													
	Distributor/Secondary(sinuuous)	5 levels of service													
	Local/Collector	5 levels of service													
	Local/Collector(sinuuous)	5 levels of service													
	Access-residential	5 levels of service													
Urban	Motorway-Nat.	5 levels of service													
	Motorway-City	5 levels of service													
	TrunkRoad/Primary-Nat.	5 levels of service													
	TrunkRoad/Primary-City	5 levels of service													
	Distributor/Secondary	5 levels of service													
	Local/Collector	5 levels of service													
	Access-residential	5 levels of service													

Assigned Fleet Compositions:

- Motorway
- Rural
- Urban

- HBEFA contains EF by traffic situations, which are assigned representative, real (measured) driving profiles
- HBEFA 4.x contains 365 traffic situations differentiating area type, road type, speed limit, and traffic density (5 Levels of Service)

Methodology: Fleet segmentation and modelling



- HBEFA currently contains emission factors for 833 «subsegments»

Columns in the emission factor query output

Column title	Explanation
Case	Name of the query (user-defined)
VehCat	Vehicle category
Year	Year. If «unweighted» option: 2015 (default)
TrafficScenario	Fleet composition
Component	Pollutant (or consumption)
RoadCat	Motorway/rural/urban/overall average
TrafficSit	Traffic situation
Gradient	Gradient class
IDSubsegment	ID of the most detailed vehicle type («subsegment»)
Subsegment	Name of the most detailed vehicle type («subsegment»)
Technology	Drivetrain technology (e.g. petrol, diesel, BEV, etc.)
SizeClasse	Size class
EmConcept	Emission standard
KM	Average cumulated mileage («odometer reading») in km (50'000 with "unweighted» option)
%Of<AggregationLevel>	Share of VKT in total of vehicle category
V	Velocity/speed (km/h)
EFA	Emission factor in g/vehkm (hot, running losses), g/start or stop (cold start, evap soak), g/day (evap. diurnal) (for HDV: at 50% load)
V_weighted	Weighted average of speed (for «weighted with fleet composition» option)
EFA_weighted	Weighted average of emission factor (for «weighted with fleet composition» option)
AmbientCondPattern	Ambient condition pattern (temperature, humidity, trip length and parking duration distributions etc.)
EFA_km_weighted	Only for Cold start: emission factor in g/km
<Parameter>_0%	Parameter at 0% load (HDV only)
<Parameter>_100%	Parameter at 100% load (HDV only)