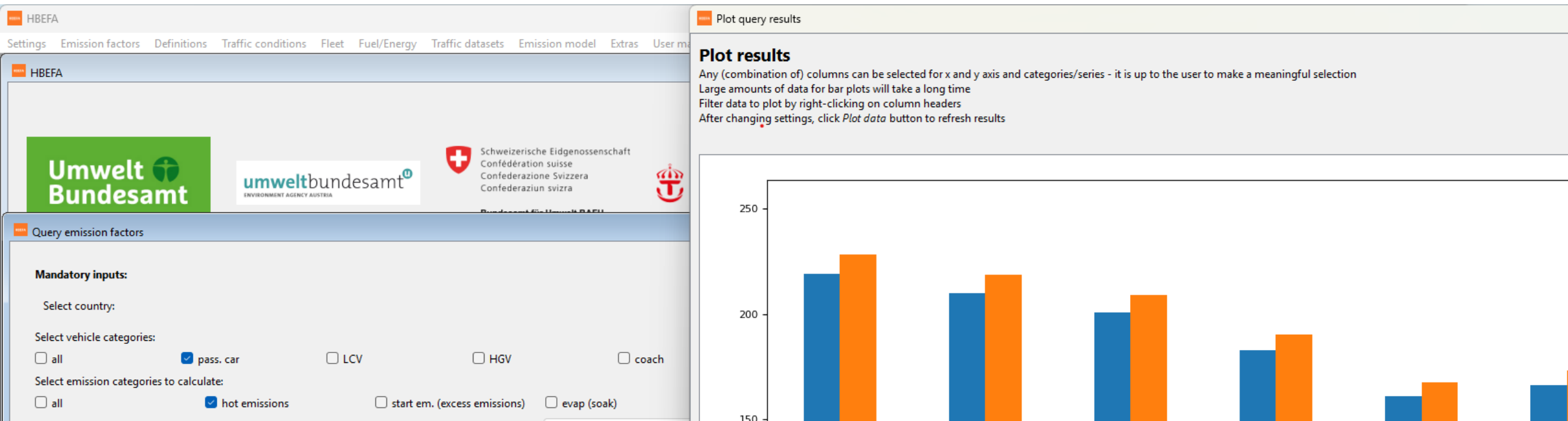


B. Notter, B. Cox

Handbook of Emission Factors for Road Transport (HBEFA)

Quick overview



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 (operational/TTW) emissions

Mandatory inputs:

Select country: Switzerland

Select vehicle categories:

☐ all
 ☒ pass. car
 ☐ LCV
 ☐ HGV
 ☐ coach
 ☐ urban bus
 ☐ motorcycle

Select emission categories to calculate:

☐ all
 ☒ hot emissions
 ☐ start em. (excess emissions)
 ☐ evap (soak)
 ☐ evap (diurnal)
 ☐ evap (running losses)

Select pollutants:

Select pollutants

Optional inputs:

Calculate using a weighted fleet composition? True

Select traffic scenarios: Traffic scenarios

Select years: Years

Select traffic situation aggregation level: Aggregate traffic situations

Select aggregate traffic situations: Aggregate traffic situations

Select ambient condition patterns: Ambient condition patterns

Calculate well-to-tank emission factors? False

Select energy mix (for well-to-tank): Energy mix

Calculation options:

Select fleet aggregation level of results: Fleet aggregation levels

Filter vehicles to be calculated: Fleet filters

Filter age class of vehicles to be calculated: Age class filter

Select energy aggregation level of results: Energy aggregation levels

View previous calculations: Previous calculations

Enter (optional) calculation name: enter optional calculation name here

Advanced calculation options:

Calculate without any correction factors? False

Select type of parameter columns in output: standard

Select option for results column titles: speaking

Load parameter as rows instead of columns in results: False

Include all aggregation columns in results: False

Select additional units for output: Additional units

Print detailed status information to terminal: False

Test outputs: False

Start calculation
Show EFA query inputs
Show pre-calculated efa result
(For debugging)

Query results

Warnings: None,
Errors: None,
Query date: Mon Oct 20 15:31:43 2025,
HBEFA 5.1 (admin),
Calculation parameters: ('Pollutant(s)':['CO2(rep)', 'CO2(total)', 'NOx', 'PM10-ex', 'PM10-mx'], 'Country': 'CH', 'Weighted with fleet comp.': True, 'Emission category(ies)':['hot'], 'Fleet aggregation level(s)':['emconcaggr', 'vehcat'], 'TS aggregation level': 'aggregate_ts', 'Year(s)':['2024'], 'IDVehCat(s)':['1'], 'IDTechnology(ies)':['1'], 'IDTraffic_Scen(s)':['1838'], 'IDTSGrad(s)':['300'], 'Calculate WTT CO2e EF': False, 'IDEnergyMix_Scen': [4], 'Do not calculate correction': False)
Calculation time: 00:00:07,
Produced: 2025-10-20 15:31

Plot results

Any (combination of) columns can be selected for x and y axis and categories/series - it is up to the user to make a meaningful selection
Large amounts of data for bar plots will take a long time
Filter data to plot by right-clicking on column headers
After changing settings, click Plot data button to refresh results

Aggr. emission concept	CO2(rep) (EFA)	CO2(total) (EFA)
PC P Euro-1	~220	~230
PC P Euro-2	~210	~220
PC P Euro-3	~200	~210
PC P Euro-4	~180	~190
PC P Euro-5	~160	~170
PC P Euro-6	~170	~180

Reference year	Country	Emission category	CO2(total)	REF CH HB51	ØCH	pass. car	PC P Euro-4	CH Ø 2017 HB42	unspecified	g/vehkm	0.04
2024	CH	hot	CO2(total)	REF CH HB51	ØCH	pass. car	PC P Euro-4	CH Ø 2017 HB42	unspecified	g/vehkm	0.04
2024	CH	hot	CO2(total)	REF CH HB51	ØCH	pass. car	PC P Euro-5	CH Ø 2017 HB42	unspecified	g/vehkm	0.12
2024	CH	hot	CO2(total)	REF CH HB51	ØCH	pass. car	PC P Euro-6	CH Ø 2017 HB42	unspecified	g/vehkm	0.40

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), ...



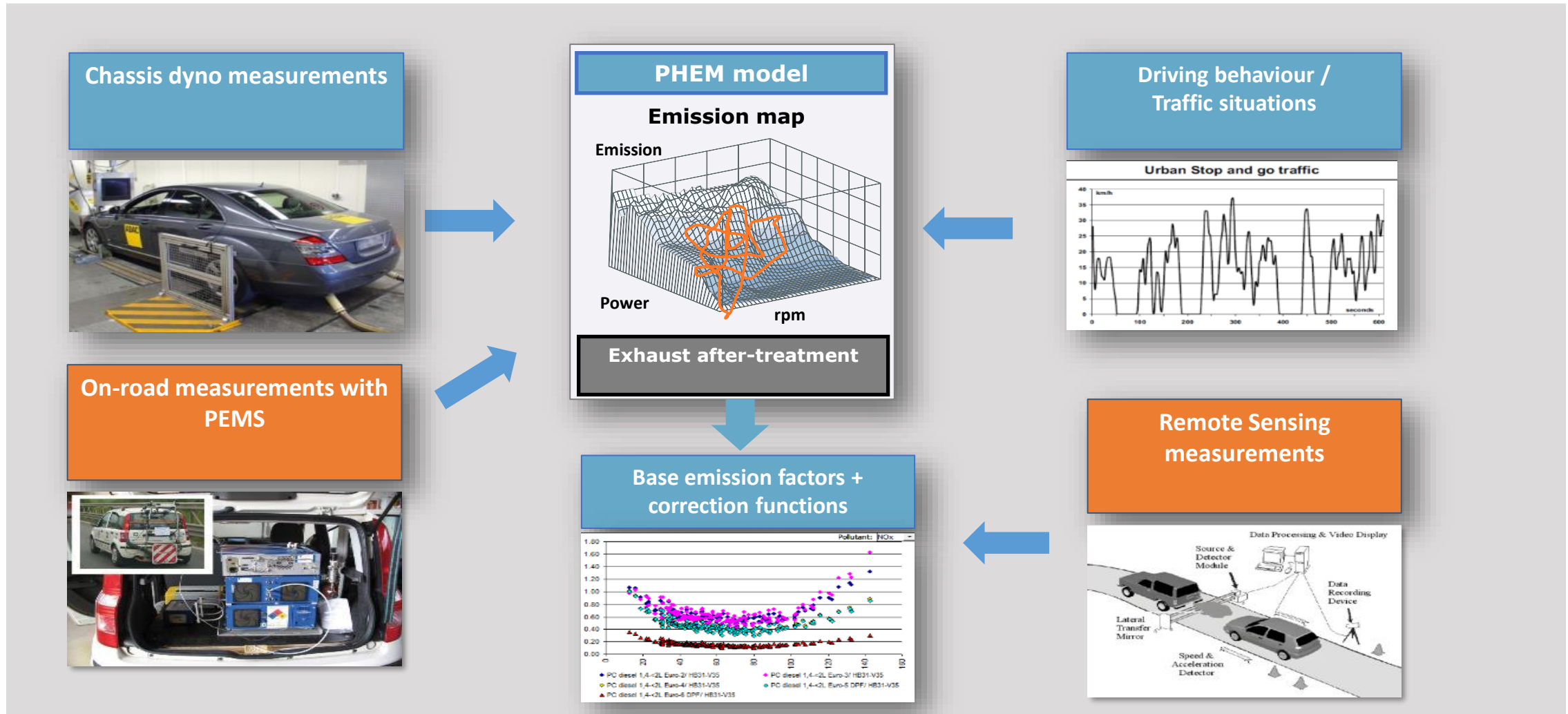
Versions

- 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 5.1 (published 2025)

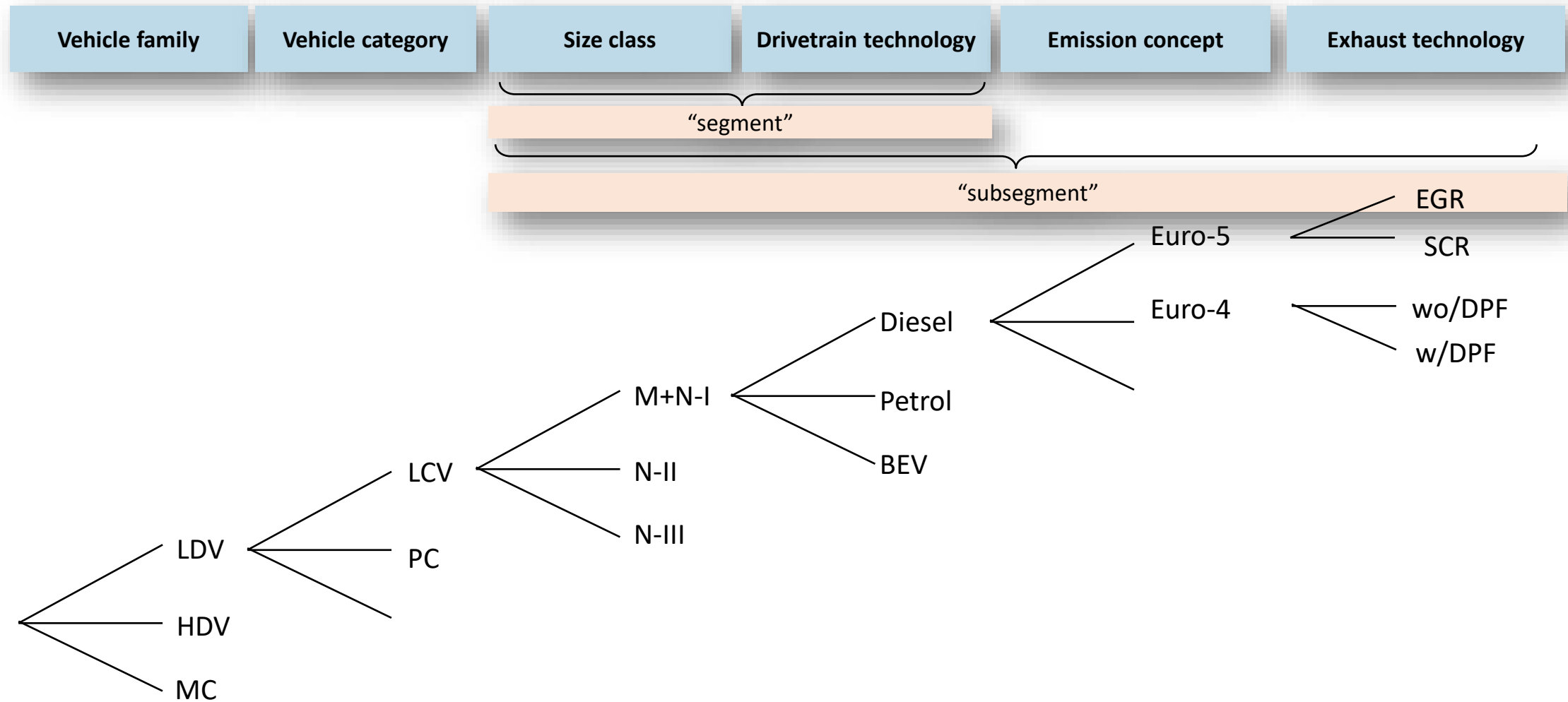
Availability and licensing

- The HBEFA «Public Version» can be ordered at www.hbefa.net
- Single use licenses are available for 350 EUR for new users, and 210 EUR for users of previous versions
- Commercial licenses (allowing the reproduction of HBEFA contents in third-party software tools) are available for 3500 – 28'000 EUR, depending on the number of users.
- More information is available on request to hbefa@infras.ch

Methodology: Measurements and emission factor derivation

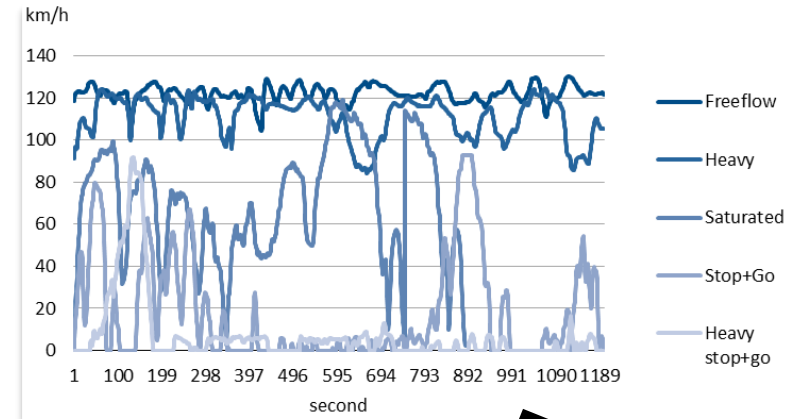


Methodology: Fleet segmentation



- HBEFA currently contains emission factors for 1375 «subsegments»

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 5.x contains 365 traffic situations differentiating area type, road type, speed limit, and traffic density (5 Levels of Service)

Columns in the emission factor query output

Column	Description
Reference year	Year the EF results are valid for. For "unweighted" option: Default year (currently 2020)
Country	1- or 2-letter code for the country
Emission category	Emission category (hot, cold start, evap diurnal/soak/running losses)
Pollutant	Pollutant or "component" (i.e. energy consumption, positive engine work)
Traffic scenario	Traffic scenario (scenario for fleet composition/fleet data). Remains empty in case of an "unweighted" query.
Ambient cond. pattern	Ambient condition pattern (contains climate and RVP data; can also imply traffic/trip length/parking time distributions)
Vehicle category, Technology, (Aggregated) Size class, Segment, (Aggregated) emission concept, Subsegment	Fleet aggregation levels; these columns are included either if the option has been selected as a fleet aggregation level, or if a lower level has been selected and "include all aggregation levels in results" has been set to True under "Advanced calculation options".
IDSubsegment	The IDSubsegment is the only ID that is output in the "Standard" column output option. For all parameters, the inclusion of ID columns can be controlled with the "Select detail level of results columns" option under "Advanced calculation options".
Energy	Energy carrier. Left blank if not unique.
Aggr. traffic situation	Aggregated traffic situation. Shown if the traffic situation aggregation level has been set to "aggregated traffic situations".
Road category	Road category (MW/Rural/Urban or unspecified). Shown if the traffic situation aggregation level has been set to "aggregated traffic situations".
Traffic situation	Individual traffic situation. Shown if the traffic situation aggregation level has been set to "individual traffic situations".
Gradient	Gradient class. Shown if the traffic situation aggregation level has been set to "individual traffic situations".
Weight	Fleet weight - either mileage or stock share of the current vehicle type in the current vehicle category.
v	Average speed of the driving profile assigned to the traffic situation(s) [km/h].
v_0%	Average speed of the driving profile assigned to the traffic situation(s) at empty load (given for HDV only) [km/h]
v_100%	Average speed of the driving profile assigned to the traffic situation(s) at full load (given for HDV only) [km/h]
EFA	Emission factor
EFA_0%	Emission factor at empty load (given for HDV only)
EFA_100%	Emission factor at full load (given for HDV only)
EF unit	Emission factor unit
Cum. mileage	Cumulative mileage [km]