

copert 
4  **5**

New elements

➤ Software improvements

- Improved software interface
- Calculation of long time series in one file
- Automated software updates
- Other software updates (e.g. import data from the standard Excel template for the CO₂ correction etc.)

➤ Methodological improvements

- Offering both a Tier 2 and a Tier 3 methodology
- Urban split to peak-off peak
- Energy calculation (in addition to fuel consumption)
- Uncertainty calculations
- Automated fuel balance
- Advanced vehicle technologies (e.g. plug-in hybrids, range extenders, etc.)

COPERT development support group

➤ 110 members

- 1st step – comments on COPERT 4
 - so far 65 replies
- 2nd step – debugging on draft version
 - has not started yet



Some statistics from the group

➤ Always – 5 : Never - 0

Question	Answer
Copert Usage	~ once a month
Save file	3.2
Wizard	2.4
Import data from Excel	3.1
Export data to Excel	3.3
Add new vehicle type	1.9
CO ₂ from A/C	1.5
Vehicle Load	1.5
Road Slope	1.6

Software improvements

- Interface: DevExpress
- Form design:
 - Filters
 - Pivot table format
 - Undo
 - Track changes
 - Import/Export
 - Copy and Paste



Form design (1 of 3)

Fleet activity

All

Import Export

Vehicles				Values		
Category	Segment	Euro	Fuel	Population [n]	Mileage [km]	Fleet Mileage [km]
Passenger Cars	Mini	Euro 4	Petrol Unleaded	10000	10000	10000
Passenger Cars	Mini	Euro 5	Petrol Unleaded	10000	10000	10000
Passenger Cars	Mini	Euro 6	Petrol Unleaded	10000	10000	10000
Passenger Cars	Mini	Euro 6c	Petrol Unleaded	10000	10000	10000
Passenger Cars	Small	PRE ECE	Petrol Leaded	10000	10000	10000
Passenger Cars	Small	ECE 15/00-01	Petrol Leaded	10000	10000	10000
Passenger Cars	Small	ECE 15/02	Petrol Leaded	10000	10000	10000
Passenger Cars	Small	ECE 15/03	Petrol Leaded	10000	10000	10000
Passenger Cars	Small	ECE 15/04	Petrol Leaded	10000	10000	10000
Passenger Cars	Small	Improved Conventional	Petrol Leaded	10000	10000	10000
Passenger Cars	Small	Open Loop	Petrol Unleaded	10000	10000	10000
Passenger Cars	Small	Euro 1	Petrol Unleaded	10000	10000	10000
Passenger Cars	Small	Euro 2	Petrol Unleaded	10000	10000	10000
Passenger Cars	Small	Euro 3	Petrol Unleaded	10000	10000	10000

OK Cancel Apply

Form design (2 of 3)

Emissions for year 2010

Pollutant

Export

Category	Segment	Fuel	Euro	Emission				
				Urban Peak [t]	Urban Off Peak [t]	Rural [t]	Highway [t]	Total [t]
Passenger Cars	Mini	Petrol Unleaded	Euro 4	552.6	552.6	1,446.9	1,643.0	4,195.2
			Euro 5	552.6	552.6	1,446.9	1,643.0	4,195.2
			Euro 6	552.6	552.6	1,446.9	1,643.0	4,195.2
			Euro 6c	552.6	552.6	1,446.9	1,643.0	4,195.2
		Petrol Unleaded Total	2,210.4	2,210.4	5,787.7	6,572.1	16,780.7	
	Small	Petrol Unleaded	Open Loop	625.7	625.7	1,787.6	2,234.0	5,273.0
			Euro 1	649.7	649.7	1,697.5	1,749.6	4,746.4
			Euro 2	688.1	688.1	1,606.7	1,662.5	4,645.5
			Euro 3	672.6	672.6	1,721.4	1,740.5	4,807.0
			Euro 4	718.6	718.6	1,771.5	1,856.2	5,065.0
			Euro 5	718.6	718.6	1,771.5	1,856.2	5,065.0
			Euro 6	718.6	718.6	1,771.5	1,856.2	5,065.0
			Euro 6c	718.6	718.6	1,771.5	1,856.2	5,065.0
			Petrol Unleaded Total	5,510.7	5,510.7	13,899.1	14,811.5	39,732.0
Petrol Leaded	PRE ECE	990.7	990.7	2,200.1	2,347.0	6,528.5		
	ECE 15/00-01	902.5	902.5	1,853.9	1,821.1	5,480.0		
	ECE 15/02	823.4	823.4	1,827.2	1,915.0	5,389.1		

Calculate all years

Close

Form design (3 of 3)

Emissions for year 2010

Pollutant Euro Segment Export

Category	Fuel	Emission					Cold
		Hot					
		Urban Peak [t]	Urban Off Peak [t]	Rural [t]	Highway [t]	Total [t]	
Passenger Cars Total		100,746.6	100,746.6	269,392.4	285,419.0	756,304.5	26,025.1
Light Commercial Vehicles	Petrol Unleaded	23,366.4	23,366.4	51,978.8	49,442.2	148,153.9	8,652.0
	Petrol Leaded	3,456.3	3,456.3	7,522.8	7,004.4	21,439.8	1,056.0
	Diesel	22,538.0	22,538.0	58,711.1	68,847.7	172,634.9	4,369.0
Light Commercial Vehicles Total		49,360.8	49,360.8	118,212.7	125,294.4	342,228.6	14,077.0
Heavy Duty Trucks	Petrol Leaded	2,101.9	2,101.9	5,769.5	5,969.4	15,942.6	
	Diesel	311,528.6	311,528.6	727,703.7	661,416.9	2,012,177.7	
Heavy Duty Trucks Total		313,630.4	313,630.4	733,473.2	667,386.3	2,028,120.3	
Buses	Diesel	119,091.3	119,091.3	272,943.1	240,579.2	751,704.8	
	CNG	23,536.4	23,536.4	81,280.6	79,524.0	207,877.3	
	Biodiesel	21,489.4	21,489.4	52,455.9	48,568.0	144,002.7	
Buses Total		164,117.0	164,117.0	406,679.6	368,671.2	1,103,584.9	
L-Category	Petrol Unleaded	6,269.4	6,269.4	18,054.8	20,789.9	51,383.5	
	Petrol Leaded	8,555.7	8,555.7	25,554.4	29,125.4	71,791.3	
	Diesel	2,793.2	2,793.2	7,777.4	8,265.2	21,628.9	541.0
L-Category Total		17,618.2	17,618.2	51,386.7	58,180.5	144,803.7	541.0

Calculate all years Close

Other improvements

Time series

	COPERT 4	COPERT 5
COPERT file	Access mdb file	SQL compact
Temporal analysis	7-10 years in one file	80 years
Calculation time	2 min per year	10 sec per year
File size	Unzipped file	Zipped file

Notification for software updates

Import/Export for all input information and results

Methodological improvements

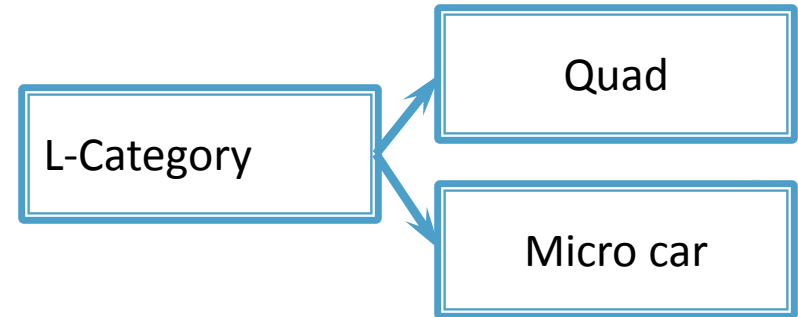
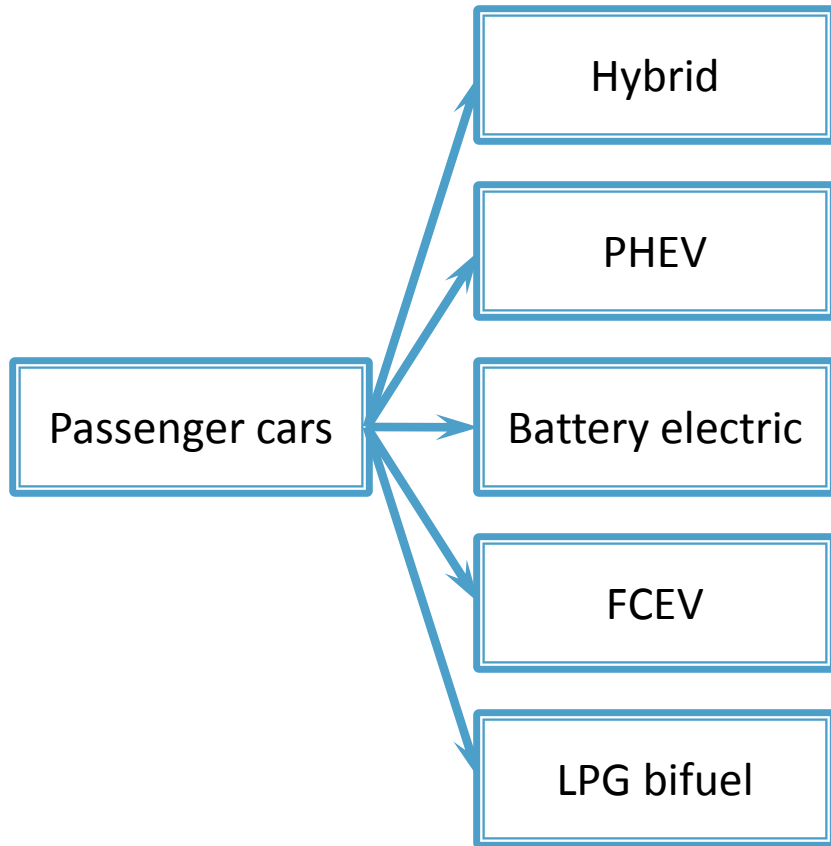
- Tier 2 and a Tier 3 methodology
 - Tier 3 structure is in being tested
 - Tier 2 under development
- Uncertainty calculations
 - Under development
- Automated fuel balance
 - Step 1: fuel consumption calculation
 - Step 2: statistical fuel consumption user data input
 - Step 3: mileage correction based on statistical fuel consumption
 - Step 4: remaining pollutants emission calculation



Extension of vehicle categories

Category	Segment		Category	Segment
Passenger Cars	Mini		Buses	Urban Buses Midi <=15 t
Passenger Cars	Small		Buses	Urban Buses Standard 15 - 18 t
Passenger Cars	Medium		Buses	Urban Buses Articulated >18 t
Passenger Cars	Large-SUV-Executive		Buses	Coaches Standard <=18 t
Light Commercial Vehicles	Petrol N1-I		Buses	Coaches Articulated >18 t
Light Commercial Vehicles	Petrol N1-II		Buses	Urban CNG Buses
Light Commercial Vehicles	Petrol N1-III		Buses	Urban Biodiesel Buses
Light Commercial Vehicles	Diesel N1-I		L-Category	Mopeds 2-stroke <50 cm ³
Light Commercial Vehicles	Diesel N1-II		L-Category	Mopeds 4-stroke <50 cm ³
Light Commercial Vehicles	Diesel N1-III		L-Category	Motorcycles 2-stroke >50 cm ³
Heavy Duty Trucks	Gasoline >3,5 t		L-Category	Motorcycles 4-stroke <250 cm ³
Heavy Duty Trucks	Rigid <=7,5 t		L-Category	Motorcycles 4-stroke 250 - 750 cm ³
Heavy Duty Trucks	Rigid 7,5 - 12 t		L-Category	Motorcycles 4-stroke >750 cm ³
Heavy Duty Trucks	Rigid 12 - 14 t		L-Category	Quad
Heavy Duty Trucks	Rigid 14 - 20 t		L-Category	Micro-car
Heavy Duty Trucks	Rigid 20 - 26 t			
Heavy Duty Trucks	Rigid 26 - 28 t			
Heavy Duty Trucks	Rigid 28 - 32 t			
Heavy Duty Trucks	Rigid >32 t			
Heavy Duty Trucks	Articulated 14 - 20 t			
Heavy Duty Trucks	Articulated 20 - 28 t			
Heavy Duty Trucks	Articulated 28 - 34 t			
Heavy Duty Trucks	Articulated 34 - 40 t			
Heavy Duty Trucks	Articulated 40 - 50 t			
Heavy Duty Trucks	Articulated 50 - 60 t			

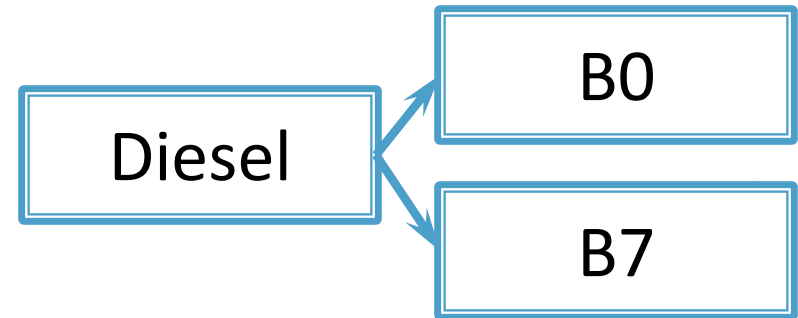
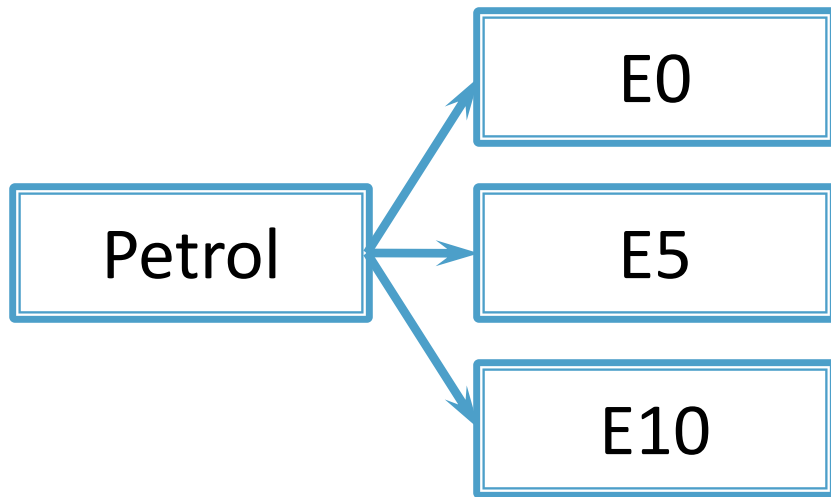
Advanced vehicle technologies



New engine technology split

Category	Fuel 1	Fuel 2	Tech 1	Tech 2	Tech 3	Tech 4
Passenger Cars	Petrol		PFI	GDI		
Passenger Cars	Diesel		-	DPF		DPF+SCR
Passenger Cars	H2					
Passenger Cars	LPG	Petrol Unleaded				
Passenger Cars	CNG	Petrol Unleaded				
Passenger Cars	Electricity	Petrol Unleaded				
Light Commercial Vehicles	Petrol Unleaded		PFI	GDI		
Light Commercial Vehicles	Diesel		-	DPF		DPF+SCR
Heavy Duty Trucks	Diesel		-	DPF	SCR	DPF+SCR
Buses	Biodiesel		-	DPF	SCR	DPF+SCR
L-Category	Petrol Leaded					
L-Category	Petrol Unleaded					
L-Category	Diesel					

Biofuels



Examples of vehicle “objects”

Category	Segment	Euro	Fuel Label		Fuel 1	Fuel 2		Tech 1	Tech 2	Tech 3	Tech 4
Passenger Cars	Small	Euro 4	Petrol		Petrol	-		PFI	GDI	-	-

Category	Segment	Euro	Fuel Label		Fuel 1	Fuel 2		Tech 1	Tech 2	Tech 3	Tech 4
Heavy Duty Trucks	Rigid <=7,5 t	Euro V	Diesel		Diesel	-		-	DPF	SCR	DPF+SCR