MIDAS includes the descriptions of models in use by the Commission in support to the policy cycle. MIDAS is developed and managed by the **Competence Centre on Modelling** of the European Commission.

Find out more at https://ec.europa.eu/knowledge4policy/modelling_en
Contact: EU-MIDAS@ec.europa.eu

Factsheet

SWD/2022/359

Impact Assessment accompanying the document Proposal for a Regulation of the European Parliament and of the Council on type-approval of motor vehicles and of engines and of systems, components and separate technical units intended for such vehicles, with respect to their emissions and battery durability (Euro 7) and repealing Regulations (EC) No 715/2007 and (EC) No 595/2009

Supporting model(s)

COPERT
SIBYL

Impact assessment
SWD/2022/359

Fact sheet on model contributions

Source: Commission modelling inventory and knowledge management system (MIDAS)

Date of Report Generation: 28/11/2022

Dissemination: Public

Contents

Overview of model contributions to the impact assessment SWD/2022/359

Title

Impact Assessment accompanying the document Proposal for a Regulation of the European Parliament and of the Council on type-approval of motor vehicles and of engines and of systems, components and separate technical units intended for such vehicles, with respect to their emissions and battery durability (Euro 7) and repealing Regulations (EC) No 715/2007 and (EC) No 595/2009

Document ID

SWD/2022/359

Year of publication

2022

Led by

GROW

Model(s) used

COPERT

SIBYL

Additional information

-

COPERT

Full title

Computer model to calculate emissions from road traffic

Run for this impact assessment by

EMISIA

Contributed to

Baseline and assessment of policy options

Helped to assess the following impacts

Impact Area	Impact Category	Impact Subcategory
Environmental	Climate	Emission of greenhouse gases
Environmental	Climate	Emission of ozone-depleting substances
Environmental	Air quality	Emissions of acidifying, eutrophying, photochemical or harmful air pollutants
Economic, Social & Environmental	Transport and the use of energy	Vehicle emissions
Economic, Social & Environmental	Transport and the use of energy	Energy and fuel consumption

SIBYL

Full title

Vehicle Stock Projection and Scenario Evaluation Software

Run for this impact assessment by

EMISIA

Contributed to

Baseline and assessment of policy options

Helped to assess the following impacts

Impact Area	Impact Category	Impact Subcategory
Economic	Conduct of business	Cost/availability of essential inputs (raw materials, machinery, labour, energy, ..)
Economic	Administrative costs on businesses	Information obligations placed on businesses
Economic	Public authorities	Budgetary consequences for public authorities
Economic	Public authorities	Costs on public authorities
Environmental	Climate	Emission of greenhouse gases
Environmental	Climate	Emission of ozone-depleting substances
Environmental	Air quality	Emissions of acidifying, eutrophying, photochemical or harmful air pollutants
Economic, Social & Environmental	Transport and the use of energy	Vehicle emissions
Economic, Social & Environmental	Transport and the use of energy	Energy and fuel consumption

Overview of models

COPERT

Overview

Acronym COPERT
Full title Computer model to calculate emissions from road traffic

Main purpose
A European emission inventory model used to calculate emissions from road transport and assess the progress towards emission targets

Summary
COPERT calculates emissions and energy consumption from road transport. The main purpose of the model is to facilitate national experts to compile their emissions inventory, but the scope of the model goes beyond that. COPERT can be used as a policy assessment tool for any type of environmental studies. The model can also act as a reference point for researchers to find information on the emission and energy consumption levels of any type of new vehicles existing on the European roads but also older vehicle technologies which might still exist.

The model consists of 3 main sections, the input section, the emission factor section, and the results section where the calculated emissions are presented. Estimated emissions are grouped in three sources: Emissions produced during thermally stabilized engine operation (hot emissions), emissions occurring during engine start from ambient temperature (cold-start and warming-up effects) and NMVOC emissions due to fuel evaporation. Non-exhaust PM emissions from tyre and break wear are also included. The total emissions are calculated as a product of activity data provided by the user and speed-dependent emission factors calculated by the software. The spatial scale of the model can range from a street to continental level. The temporal extend of COPERT can also range from annual to multi-annual, although it actually depends on the activity data provided. This means that the calculation period can range from one week to a number of years.

COPERT can be used for policy anticipation, implementation and evaluation for air quality related policies. It can be used for trend analysis, and input for air quality modelling and impact assessment studies, either directly or after some modifications, sometimes in combination with other emission models. It has been recently used for the assessment of the upcoming Euro 5 emission standards for the L-category vehicles, and the revised type approval procedure for evaporation emissions from Euro 6 vehicles.

Keywords
Transport Model; Emission Inventory Tool; Emission Forecast; Emission Factors; Fuel Consumption

Model category (thematic)

Miscellaneous

Model home page

http://www.emisia.com/copert/

Ownership & license

Ownership

Third-party ownership (commercial companies, Member States, other organisations, …)

Ownership details

The development of COPERT is coordinated by the European Environment Agency (EEA), in the framework of the activities of the European Topic Centre for Air Pollution and Climate Change Mitigation. The European Commission's Joint Research Centre manages the scientific development of the model. The IPR for the methodology and the software code rests with the EMISIA company.

Licence type

Non-Free Software licence. The license has one or more of the following restrictions: it prohibits creation of derivative works; it prohibits commercial use; it obliges to share the licensed or derivative works on the same conditions.

Details

COPERT structure and approach

COPERT applies EEA's EMEP/EEA air pollutant emission inventory guidebook version 2016, and more specifically chapter 1.A.3.b.i-iv Road transport 2017. The model structure is split in three parts, input, emission factor calculation and results.

Input and parametrization

Inputs: for each of the 373 vehicle categories (137 cars, 54 vans, 99 trucks, 47 busses, 36 motorcycles) divided per load capacity (trucks & busses) of engine capacity (other vehicles), Euro emission standard, fuel type:

- Population
- Mileage
- Lifetime cumulative activity
- Average speed in urban/rural/highway streets
- Share of km run in urban/rural/highway streets
- Load factor and road slope for trucks and busses
- Size of tank and canister (for the evaporative part of the emissions only)
- Percentage of evaporation in urban/rural/highway streets (for the evaporative part of the emissions only)

For the environmental conditions:

- Minimum and maximum monthly average temperature (for the evaporative part of the emissions only)
- Humidity (for the impact of the A/C use)

For each fuel type:

- The content of metals in the fuel
- The ration of hydrogen to carbon and oxygen to carbon
- Heavy metal content
- Density
- Fuel energy content

Parametrisations: The model contains a dataset of emission factors (grams of pollutants per kilometre and energy consumption per kilometre) derived from measurements. for urban/rural/highway operations. Depending on the input vehicle speed, the model calculates the appropriate emission or energy consumption factor. Using the vehicle population, mileage and share of kilometres driven in each road type the model calculates the total emissions and energy consumption. If more detailed information is available the user can provide his own emission factors to be used for the calculation of emissions.

The model also contains parametrisations for simulating additional CO_2 emissions due to:

- using the air condition
- lube oil consumption using different SCR rates (an abaitment technology for NOx)

or improve emission calculation for NOx, CO and VOC by taking into account the vehicle age.

CO2 emission calculation can be further improved by providing information on the type approval CO2 for passenger cars.

If statistics on the energy/fuel consumption (sales) are provided as input to the model, the emissions are rescaled and adjusted to reach consistency.

Main output

The output are:

- emissions of CO2
- pollutants (CO, NMVOC, CH4, NOx, NO, NO2, NH3, SO2)
- metals (Pb, Cd, Cu, Cr, Ni, Se, Zn, Hg, As)
- dioxins and furans
- PM2.5, PM10, elementary carbon, organic matter
- energy consumption

for each vehicle category in each road type (urban, rural, highway).

Spatial - temporal extent

The output has the following spatial-temporal resolution and extent:

Parameter	Description
Spatial Extent / Country Coverage	All Countries of the world From street level to continental level.
Spatial resolution	National; Entity Emission inventories are provided at country level, but one can also arrive at street level.
Temporal extent	Short-term (from 1 to 5 years); Medium-term (5 to 15 years); long-term (more than 15 years) Annual to multi-annual. The temporal extent depends on the number of years (or time steps - see temporal resolution) in the input file.
Temporal resolution	Years Annual. Generally the model is used to provide annual emissions for an unlimited number of years. The user can also decide to provide two or more years at different intervals since each time step is independent from the others. The user can also provide input for different resolutions (eg. weekly or daily data). The model will return emissions based on the input data. The user needs to bear in mind however that the model is build for calculating annual emissions, e.g. it calculates evaporative emissions based on monthly average temperatures.

Quality & transparency

Quality

Question	Answer	Details
Models are by definition affected by uncertainties (in input data, input parameters, scenario definitions, etc.). Have the model uncertainties been quantified? Are uncertainties accounted for in your simulations?	Yes	
Sensitivity analysis helps identifying the uncertain inputs mostly responsible for the uncertainty in the model responses. Has the model undergone sensitivity analysis?	Yes	Uncertainty estimates and guidance for road transport emission calculations (Kouridis et al. Dec 2009).
Have model results been published in peer-reviewed articles?	Yes	
Has the model formally undergone scientific review by a panel of external experts? (Please note that this does not refer to the cases when model results were validated by stakeholders)	No	It however has been reviewed in a multitude of scientific papers.
Has model validation been done? Have model predictions been confronted with observed data (ex-post)?	Yes	Emission levels have been verified according to laboratory measurements.

Transparency

Question	Answer	Details
To what extent do input data come from publicly available sources? (Note: this may include sources accessible upon subscription and/or payment)	No info	
Is the full model database as such available to external users? (The answer 'yes' comprises the cases when access to the database implies a specific procedure or a fee)	Yes	

Have model results been presented in publicly available reports?	Yes	
Have output datasets been made publicly available? (Note: this could also imply a specific procedure or a fee)	No info	
Is there any user-friendly interface presenting model results – such as dashboards or interactive interfaces – that is accessible to the public?	No info	
Is the model code open source?	Yes	The model can be downloaded at: https://www.emisia.com/utilities/copert/
Can the code be accessed upon request?		
Has the model been documented in a publicly available dedicated report or a manual? (Note: this excludes IA reports)	Yes	Documentation is available from the COPERT website.
Is there a dedicated public website where information about the model is provided?	Yes	https://www.emisia.com/utilities/copert/

The model's policy relevance and intended role in the policy cycle

The model is designed to contribute to the following policy areas

- Climate action
- Environment
- Institutional affairs
- Transport

The model is designed to contribute to the following phases of the policy cycle
- Anticipation
- Formulation
- Implementation
- Evaluation

The model's potential

COPERT, through its links to TREMOVE and DIONE, has been used in impact assessment studies of the European Commission to evaluate the impact of proposed technological and legislative measures to road transport. Examples include measures to reduce CO2 emissions from passenger cars, the introduction of EURO VI standards for heavy duty vehicles, effects of the internalisation of external costs, and others.

COPERT is most suitable to support the policy cycle. It has been used, amongst others in: Clean Air For Europe (CAFE), National Emission Ceilings Directive (NECD), Contributions to the National and EU submissions of Emission Inventories for CLRTAP (Convention for Long Range Transport of Air Pollutants) and UNFCC.

Previous use of the model in ex-ante impact assessments of the European Commission

Use of the model in ex-ante impact assessments <u>since July 2017</u>.

In the Year	COPERT contributed to the Impact assessment called	Led by	By providing input to the	The model was run by	Details of the contribution
2022	Impact Assessment accompanying the document Proposal for a Regulation of the European Parliament and of the Council on type-approval of motor vehicles and of engines and of systems, components and separate technical units intended for such vehicles, with respect to their emissions and battery durability (Euro 7) and repealing Regulations (EC) No 715/2007 and (EC) No 595/2009 SWD/2022/359	GROW	Baseline and assessment of policy options	*EMISIA*	The model helped to assess the following impacts: - Emission of greenhouse gases - Emission of ozone-depleting substances - Emissions of acidifying, eutrophying, photochemical or harmful air pollutants - Vehicle emissions - Energy and fuel consumption

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SIBYL

Overview

Acronym SIBYL

Full title Vehicle Stock Projection and Scenario Evaluation Software

Main purpose

-

Summary

SIBYL has been envisaged as a vehicle stock projection tool with internal energy consumption, emission and cost estimation capabilities. It allows the formation and execution of scenarios, policy assessment and target setting. A detailed EU-wide vehicle stock baseline database has been hardcoded in the application so that the user can evaluate custom scenarios on real – life data.

Keywords

Road Transport; Emissions; Scenarios

Model category (thematic)

Miscellaneous

Model home page

http://www.emisia.com

Ownership & license

Ownership

Third-party ownership (commercial companies, Member States, other organisations, …)

Ownership details

The model is developed and owned by EMISIA.
A free beta version is available for donwload.

Licence type

Non-Free Software licence. The license has one or more of the following restrictions: it prohibits creation of derivative works; it prohibits commercial use; it obliges to share the licensed or derivative works on the same conditions.

Details

SIBYL structure and approach

Not provided

Input and parametrization

The model takes as input data on vehicle technologies available in the market, or future, activity, fleets, as well as more technical details, like survival rates, km travelled, etc.

Main output

The model provides as output the mean CO_2 and other pollutant emissions, the energy needs, the fuel consumed for all the years in the scenario.

Spatial - temporal extent

The output has the following spatial-temporal resolution and extent:

Parameter	Description
Spatial Extent / Country Coverage	EU Member states 27
Spatial resolution	National
Temporal extent	Medium-term (5 to 15 years) up to 2030
Temporal resolution	Years

Quality & transparency

Quality

Question	Answer	Details
Models are by definition affected by uncertainties (in input data, input parameters, scenario definitions, etc.). Have the model uncertainties been quantified? Are uncertainties accounted for in your simulations?	No Info	
Sensitivity analysis helps identifying the uncertain inputs mostly responsible for the uncertainty in the model responses. Has the model undergone sensitivity analysis?	No Info	
Have model results been published in peer-reviewed articles?	No Info	
Has the model formally undergone scientific review by a panel of external experts? (Please note that this does not refer to the cases when model results were validated by stakeholders)	No Info	
Has model validation been done? Have model predictions been confronted with observed data (ex-post)?	No Info	

Transparency

Question	Answer	Details
To what extent do input data come from publicly available sources? (Note: this may include sources accessible upon subscription and/or payment)	No Info	
Is the full model database as such available to external users? (The answer 'yes' comprises the cases when access to the database implies a specific procedure or a fee)	No Info	

Have model results been presented in publicly available reports?	No Info
Have output datasets been made publicly available? (Note: this could also imply a specific procedure or a fee)	No Info
Is there any user-friendly interface presenting model results – such as dashboards or interactive interfaces – that is accessible to the public?	No Info
Is the model code open source?	No Info
Can the code be accessed upon request?	No Info
Has the model been documented in a publicly available dedicated report or a manual? (Note: this excludes IA reports)	No Info
Is there a dedicated public website where information about the model is provided?	No Info

The model's policy relevance and intended role in the policy cycle

The model is designed to contribute to the following policy areas

- Climate action
- Energy
- Environment
- Transport

The model is designed to contribute to the following phases of the policy cycle

No information

The model's potential

The model can be used to assess the impact to CO2 and pollutant emissions, energy needs and fuel consumption of detailed and aggregated technological changes for road transport sector.

The model can be used in order to assess scenarios of road transport developments in the future.

Previous use of the model in ex-ante impact assessments of the European Commission

Use of the model in ex-ante impact assessments <u>since July 2017</u>.

In the Year	SIBYL contributed to the Impact assessment called	Led by	By providing input to the	The model was run by	Details of the contribution
2022	Impact Assessment accompanying the document Proposal for a Regulation of the European Parliament and of the Council on type-approval of motor vehicles and of engines and of systems, components and separate technical units intended for such vehicles, with respect to their emissions and battery durability (Euro 7) and repealing Regulations (EC) No 715/2007 and (EC) No 595/2009 SWD/2022/359	GROW	Baseline and assessment of policy options	*EMISIA*	The model helped to assess the following impacts: - Cost/availability of essential inputs (raw materials, machinery, labour, energy, ..) - Information obligations placed on businesses - Budgetary consequences for public authorities - Costs on public authorities - Emission of greenhouse gases - Emission of ozone-depleting substances - Emissions of acidifying, eutrophying, photochemical or harmful air pollutants - Vehicle emissions - Energy and fuel consumption

Bibliographic references

None