

Technical Report No. 5

COPERT II

Computer Programme to calculate Emissions from Road Transport

Users Manual

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1. INTRODUCTION

COPERT II is an MS Windows^{*} software programme which is developed in order to enable the user to calculate emissions from road traffic. Furthermore, emissions from internal combustion engines used in off-road applications are also covered. The emissions calculated include all major pollutants (CO, NO_x, VOC, PM) and several more (N₂O, NH₃, SO₂, ...). In addition, fuel consumption results are computed. A detailed methodology can be found behind the software application. For more information regarding the methodology itself, the user should consult *Volume I: Methodology and Emission Factors*. COPERT II is an updated version of Copert I both in terms of methodology used and software supplied.

This manual is designed in order to help the users of COPERT II V1.1 to produce in a short time a complete annual emission data set from road transport (and off-road machinery) for a specific country. In order to do so the manual is divided in several chapters. The different chapters include all information needed to build a complete data set, assuming that the user has no former experience in using COPERT II. In contrast, it is necessary that the user is quite familiar with the methodology and the terminology used. A background knowledge in using MS Windows (3.1 or more recent) is also expected, although no special skills are required.

COPERT II is a self driven application. This means that once you have entered it, the software will lead you through the necessary steps until you have concluded the use of the programme. Another special feature is that the programme checks constantly the data entry and informs the user about incorrect or illegal actions. This can certify that the results will be reasonable. It cannot guarantee though the accuracy of the results if the input data do not represent the reality.

In order to be compatible with the application, this manual is designed in the same way that the software is developed. The contents in the manual are structured in the same order as the respective forms appear while using the software. Hence, it would be efficient to work with the programme in parallel, as you read the manual. This is a rather tutorial use of this book. In any case, you can always refer to it for specific problems when you are quite acquainted with the use of the programme.

The following coding is used throughout the manual:

- **Bold** characters refer to a button which you can click
- ***Bold Inclined*** characters are used for fields in which you can click, enter, read or select values. Alternatively they can symbolise a file
- *Inclined* characters are used for text you have to type or they refer to chapter names
- Underlined characters are used only to emphasise the context.

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2. REQUIREMENTS

2.1. Software Installed

MS Windows 3.1, 3.11, 95, NT

2.2. Minimum Hardware Requirements

1. IBM* - compatible computer 80486/66
2. 4Mb on board memory
3. Colour monitor 14'
4. Graphic card supporting 800 x 640 pixels screen resolution
5. Hard disk or network file server with 10 Mb free space
6. 3½' high density floppy disk
7. Microsoft mouse or other compatible pointing device

It has to be noted that a faster processor based computer and/or more on board memory are recommended if frequent use of the programme is to be expected. A resolution of 1024 x 768 pixels and a 15' monitor would also produce better visual results.

* IBM is a registered trademark of International Business Machines Corporation

3. INSTALLING COPERT II

3.1. Installation Procedure

COPERT II is provided in Windows set up disks. Those set up disks will install the application in your computer. The installation procedure is described through the following steps:

1. Enter MS Windows. If you are already using Windows please make sure that all of your MS Office applications have been terminated
2. Insert in the 3½' floppy disk the diskette labelled Disk 1. Let *a:* be the symbol of your floppy disk
3. If you are using Windows 3.x or NT 3.x, choose **File** and then **Run...** at the menu bar. In case you use Win95 or NT 4.0 then click the **Start** button and select **Run...**
4. In the field that appears type *a:\setup.exe*. An alternative way is by using the **Browse...** button. Browsing at the contents of disk *a:*, double click the *setup.exe* file
5. Click the **OK** button

By doing so, you have entered a typical Windows application set up environment. You can proceed with the installation as usual.

After the installation procedure has been completed you are ready to start the application.

If you are using Windows 3.x or NT 3.x three new icons will have been added in the programme manager. Double clicking **Copert II** icon will start the application. You can view the help file if you double click the Question Mark icon. Refer to the *Starting Up* chapter on how to use the **Compact Copert II** icon. In case you are under Win95 or NT 4.0 environment, the three new icons will have been added in the task bar.

3.2. De-installation Procedure

To completely de-install the programme from your computer:

1. Delete the directory in which you have installed COPERT II (by default this directory is *c:\copert*)
2. Delete the icons from the programme manager (Win 3.x, NT 3.x) or from your task bar (Win95, NT 4.0)
3. Delete the *copert.ini* file which is found in your Windows directory (e.g. 'Windows', or 'Win95', etc.)

After doing so, COPERT II will be completely removed from your computer.

4. STRUCTURE OF THE PROGRAMME

In order to have a better understanding of the use of the programme, it could be helpful to be also familiar with the structure of the application itself. After you have read this chapter you will be able to use the software more efficiently and take advantage of its special features.

The core of COPERT II is a file named ***copii.mdb***. This file provides mainly the user interface (UI). You execute this file every time you double click the COPERT II icon. Except of the UI, this file also includes all the necessary modules to calculate emission factors and emission results. Importing and exporting are also possible through that file. Finally it retrieves and saves the data. ***Copii.mdb*** is a secured file. That means that the whole or parts of it cannot be modified by third parties. The user has no access on the modules or the routines of the programme. For any problems you may encounter with this file you should contact the developers.

As has already been mentioned, different emission data sets can be created with COPERT II. Those data sets are called runs in the software terminology. A run can only refer to a specific country. For example, you can have a run including data for France but the same run cannot include data for France and Italy. A run usually includes fleet data for a specific year. It is up to you to decide what your runs should include. You could have for example runs for the same year but including different fleet data or a run regarding road transport and another one including off-road machinery.

To assist the main file there are several secondary databases named after the country they refer to (or an abbreviation of that country's name). These files have the .mdb extension. They include the available runs for each country. As will be demonstrated later, you can manipulate data of an existing run or create a new run. In any case the data associated with each of these runs will be stored in those files. In contrast to the main programme, they are unlocked and you can manipulate the data they include with simple Microsoft Access skills. More information about those files can be found in chapter 14. Because there is a constant need of interaction between the ***copii.mdb*** and those secondary files, they all should be kept in the same directory. If you move any of those in a different directory then the programme will not be able to communicate with them and your data will be temporarily lost. By moving them back to their original directory the communication will be re-established.

In order to secure the programme, a special file - named ***copert.mda*** - has been created. In this file all the necessary information is included in a coded form. If you accidentally delete it you will not be able to use COPERT II and you will have to re-install the application. You can also contact the developers for a copy of ***copert.mda***.

A list of the files in your COPERT II directory follows. If you would like to save some space on your hard disk you can remove the databases ('country.mdb') for those countries that you are not interested in. You should however not delete any of the system files.

After you have used COPERT II several times you will note that the size of the main database increases and the calculations slow down. Those side effects occur because the structure of the database is modified after multiple uses. To restore the original size and performance of the database is a good habit to use the assisting programme

Compact COPERT II often between uses. This programme is presented as an icon after you have installed the application.

File	Description
'country'.mdb ¹	Database including data for 'country'
'country'.ldb ¹	Database escorting file for 'country'
cop.ico	Icon
copexp.wk1	Lotus macro to export data from COPERT I runs
copii.hlp	Copert II help file
copii.mdb	Main database
copii.ldb	Main database escorting file
msafin.dll	Microsoft Access financial functions dynamic-link library
msain200.dll	Microsoft Access international dynamic-link library
msaju200.dll	Microsoft Jet database engine utilities dynamic-link library
msaole20.dll	Microsoft Access OLE 2.0 dynamic-link library
msarn200.exe	Microsoft Access run-time executable file
soa200.dll	Microsoft Access utilities dynamic-link library
copert.ldb	Escorting file to system.mda
copert.mda	File containing security data
utility.ldb	Escorting file to utility.mda
utility.mda	Microsoft Access utility database
copert.ini ²	COPERT II initialisation file
compact.mdb	Application which restores the original size of the main database

¹ If country's name exceeds 8 characters, an abbreviation is used instead

² Included in your main Windows directory

5. STARTING UP

This chapter will lead you through the basics of COPERT II. It includes information on how to start the programme, select a country and choose between different run options.

5.1. Before You Start for the Very First Time

To make sure that the programme is properly installed in your computer, you should use the application **Compact COPERT II** before you run the programme for the very first time. This will check the installation and will make any necessary modifications. To run it, just double click the respective icon after the installation has been concluded.

The same application is also used to restore the original size of COPERT II which might increase after several uses. You should use this application at least once a month if often use of the programme has to be expected.

5.2. Starting COPERT II

You can start using the software by double clicking the application icon (Win3.x, NT 3.x) or selecting **Copert II** from the task bar (Win95, NT 4.0). After doing so you will be encountered with a dialogue box which is used for security reasons (Fig.1).

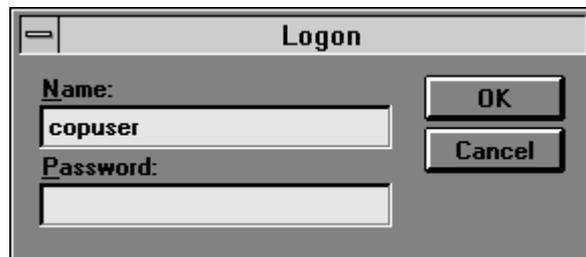


Figure 1

In the dialogue box enter *copuser* in the **Name:** field and leave the **Password:** field blank. Click **OK** to proceed or **Cancel** to abort. The name used is common for all COPERT II users.

An introductory form is presented after the **OK** button has been clicked, in which all countries taking part in the CORINAIR inventory are present with a green colour (Fig.2).

By clicking the **About...** button found at the bottom of the screen you can obtain information on how to receive solutions to any of the problems that might arise while using the application. At the right hand side of the screen the following button options are available:

- **Start** button: to continue with the programme
- **Help** button: to request help on any subject associated with the use of the programme
- **End** button: to exit the application

Click **Start** to continue

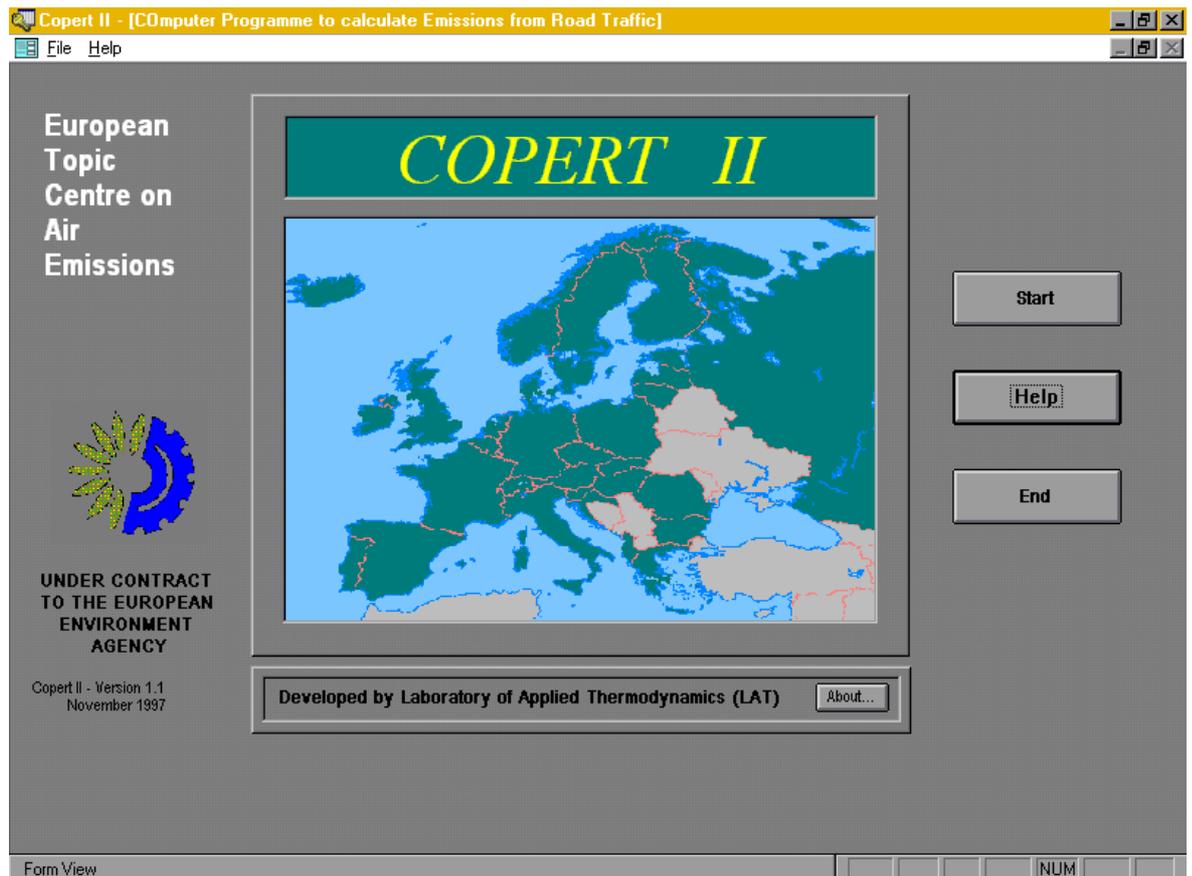


Figure 2

Remark

At the top of the screen a menu bar with the submenus **File** and **Help** is available. The **File** submenu includes typical print commands which let you configure your printer and print whatever is active at the moment of use. A command to exit the programme is also available. The **Help** submenu provides a customary Windows Help file and information about the application. You can use all of those commands at any point throughout the programme. You should be aware though that use of the **Exit** command would terminate the application immediately and any unsaved data will be lost.

5.3. Selecting a Country

The next form (Fig.3) provides a list of the available countries. You can scroll the list and choose the country in which you are interested. Selecting a specific country gives you the advantages of:

1. Retrieve and save data in a well structured order which is preserved by each '**country**'.**mdb** database
2. Have the option of country dependant operational parameters (e.g. temperatures, trip lengths,...)
3. Get descriptive outprints of your results
4. Be constantly informed about the country you have selected

To select a country, just point at the country's name and click the **OK** button.

5.4. Creating a Run

The next step after having selected a country is to begin working with a run. There are three choices in order to build a run in COPERT II (Fig.4):



Figure 3

1. Create New Run

In order to create a new run, select the respective field and provide a name for it. A description for the run is optional and is only used for your information.

2. Open Existing Run

If you have previously created a run you can always view or update the data included in that. To do so just select the name of the run in the relevant list.

3. Import Copert 90 run

Data sets which have been created with the previous Copert I version can be imported and used as usual COPERT II runs. The necessary steps to transform a Copert I data set are described in the chapter *Import/Export Capabilities*.

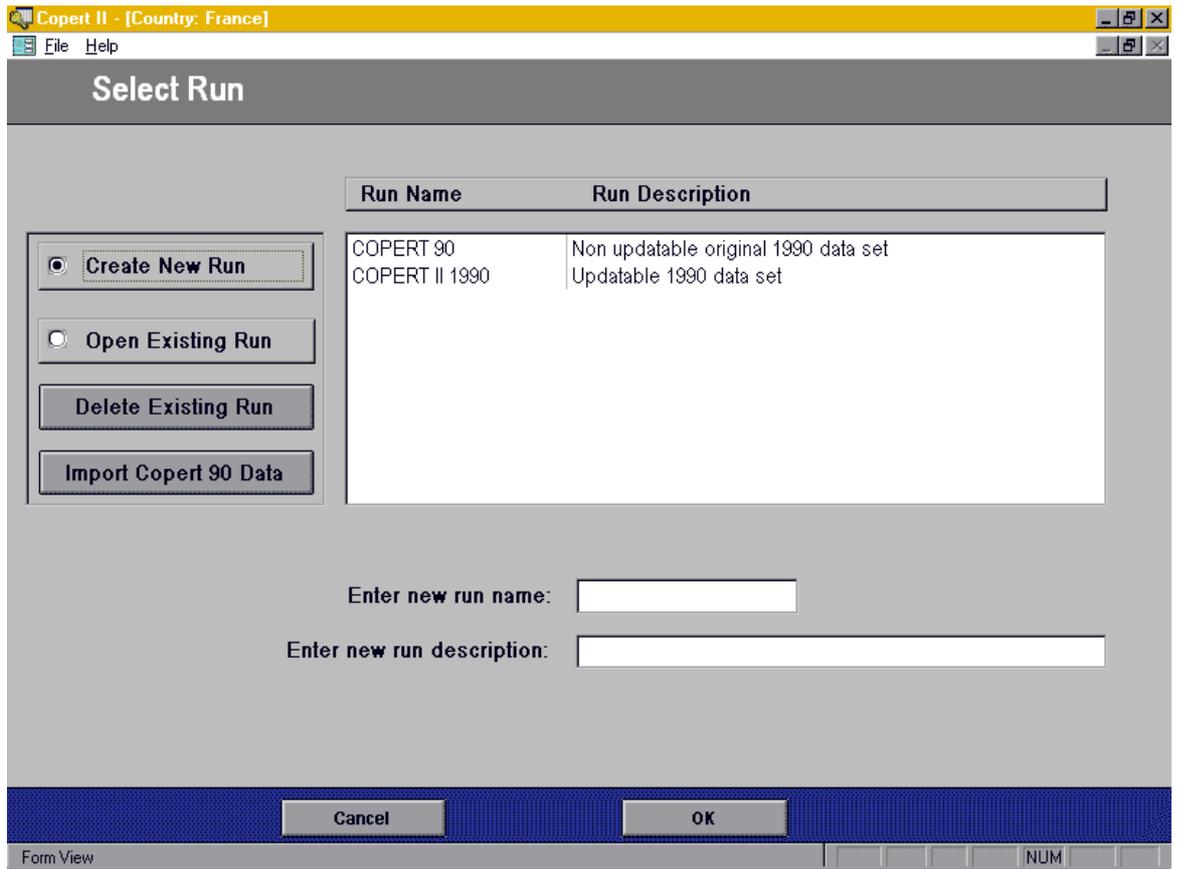


Figure 4

Remarks

1. There is always the possibility of opening an existing run, make any necessary modifications and then saving the updated run with a different name. To do so you need to open an existing run in the normal way. After you have finished with the modifications you will be prompted to save that run with a different name
2. If no existing run is available, the corresponding option will be disabled
3. There is no user interface available for deleting a run

6. CREATING A NEW RUN

The first thing you might do to get acquainted with the use of Copert II is to create a new run. This chapter covers all you need to know on data entering for a new run. For practical reasons, concerning the structure of this manual, it is assumed that a new run begins with data entry for road transport. However, this is not a limitation of the software. You may begin by selecting off-road machinery. This subject is covered in chapter *Off-road Machinery*.

6.1. Starting a New Run

In the form in figure 4 make sure that the *Create New Run* option is selected. Next, give a descriptive name for the new run in the *Enter new run name:* field. If a more detailed description of the run is needed, you can provide it in the relevant field. This description will be visible later in the list at the top of the screen. Click **OK** to start the new run.

6.2. Selecting Source Sector

In order to help you create a run efficiently, COPERT II offers the option to select a part of the total fleet each time (source sector) and supply data only for that specific sector. This is also a necessity because different elements are associated with each sector. You can select the particular fleet part for which you would like to enter data in the form represented in figure 5.

The screenshot shows a software window titled "Copert II - [Country: Greece , Run: Example]". The window contains a "Select Snap" dialog box. The dialog has three main sections: "1. Snap" with a dropdown menu showing "Snap 07: Road Transport"; "2. Source Sector" with a dropdown menu showing "Passenger Cars"; and "3. Subsector" with a dropdown menu showing "All Subsectors". There is a "New Technologies" button to the right of the "1. Snap" section. At the bottom, there are "Cancel" and "OK" buttons. The status bar at the bottom left says "Form View" and the bottom right has a "NUM" field.

Figure 5

The top field lets you choose between road transport (SNAP 07) and off-road machinery (SNAP 08). It is assumed that SNAP 07 is selected.

After SNAP has been selected, you can continue by choosing source sector and sub-sector. Different sub-sectors depend on each source sector. Unless there is a specific reason, you should select 'All Sub-sectors'. This would speed up the process of data entering which is described later on. For information on how to use the **New Technologies** option please refer to chapter *Introduction of New Technologies*.

Clicking the **OK** button will bring up an intermediate form (Fig.6).

Country: Greece , Run: Example	
Data Selection	
Fleet / Mileage	Ambient Temperatures
Usage Data (Speeds, Share,...)	Beta Factor and Itrip Value
Evaporation	Fuel Data
Go Back	OK

Figure 6

This form gives access to six data fields. Based on the original source sector selection some of the buttons can be disabled. This means that no data should be entered in the respective fields*. The first time you encounter this form, you have to go through all the enabled fields. If a field is enabled but not selected then the programme will refuse to proceed unless you first select it. The buttons in the left column become disabled after you have selected them. If in any case you want to change some of those figures you can do so later.

6.3. Providing Data for the Fleet and Mileage

Selecting the **Fleet/Mileage** button, shown among others in figure 6, will lead you to the form presented in figure 7. Based on the source sector selected, some of the fields visible in the picture may be missing. You have to provide data for all the available fields. You can go through all of the technologies of the specific sector by using the navigation buttons at the bottom of the form. You can enter data for any

* This applies to source sector Heavy Duty Vehicles, where no cold-start and evaporation methodologies are available.

technology, but one at a time. The SNAP, the sector and sub-sector fields to which each technology refers can be found at the top left corner. If you have selected 'All sub-sectors' as described in the subchapter *Select source sector*, then the sub-sector field will be constantly updated on the basis of the current record's sub-sector.

The screenshot shows a software window titled "Copert II - [Country: Greece , Run: Example]". The window contains a "Modify Activity Data" dialog box. The dialog has a menu bar with "File" and "Help". The main area is divided into several sections. On the left, there are three labeled input fields: "Snap:" with the value "Road Transport", "Sector:" with "Passenger Cars", and "Subsector:" with "Gasoline <1,4 l". To the right of these fields are two buttons: "Surrogate Modifications on Mileage" and "Multiply Mileage". Below these is a "Technology:" field containing the text "PRE ECE". Underneath the technology field are four rows of data entry, each with a label and a text box: "Number of vehicles:" (empty), "Mileage:" (0) with units "[km/a]", "Fuel Injection:" (1) with units "(", and "Evaporation Control:" (0) with units "()". At the bottom of the dialog are "Cancel" and "OK" buttons. Below the dialog is a status bar showing "Record: 1 of 41" and a description "Enter the number of vehicles under specific technology".

Figure 7

Several fields are included in that form:

- **Technology:** Specifies the legislation under which the specific group of vehicles falls
- **Number of vehicles:** Enter the number of vehicles under specific technology
- **Mileage:** Provide the mean annual mileage by each of those vehicles
- **Fuel Injection:** Requires the percentage of vehicles of specific technology equipped with fuel injection systems
- **Evaporation control:** Requires the percentage of vehicles of specific technology equipped with evaporation control devices

There are also two special tools to help you accelerate the data entry:

- Button **Surrogate Modifications on Mileage**: In case that no more detailed figures are available you can use this option to provide the same annual mileage for each of the vehicles of the current selection. Click the button and enter the annual mileage in the field that appears.
- Button **Multiply Mileage**: You might want to modify the annual mileage by a constant percentage value. You may do so by clicking this button. A new field appears in which you have to enter a number by which mileage will be multiplied (e.g. if the annual mileage of a vehicle is 10.000 km and you enter the number 1,2, the new annual mileage will be 12.000 km, that is an increase of 20%).

The utilisation of those buttons is more obviously demonstrated in *Checking the fuel balance* chapter. Click **OK** to accept the figures and proceed or **Cancel** to abort without saving the figures.

6.4. Providing Usage Data

The form to collect usage data is presented in figure 8. Please refer to subchapter *Providing data for the fleet and mileage*, on how to navigate through the different records. The different fields in that form are described next.

- **Select Mode** list: Click on the list to select between the different modes of driving. The data entered will only apply to the specific mode, which is also mentioned at the top left corner of the list
- **Technology**: Specifies the legislation under which the specific group of vehicles falls
- **Share of total mileage on specific mode**: The percentage of the annual mileage driven under specific mode
- **Average Speed**: The average speed in which the vehicles are driven under specific mode
- **Load Factor**: (Heavy Duty vehicles) The mean percentage of load of the vehicles on specific mode (If no other figures are available a mean value of 50% is recommended)
- **Road Gradient**: (Heavy Duty vehicles) Select one of the available check boxes which correspond to different road slopes (0% accounts for even road and it is suggested, unless more accurate data are available)

Special features are also associated with the use of that form, to help you speed up the process of data input and enhance their reliability. Those features are:

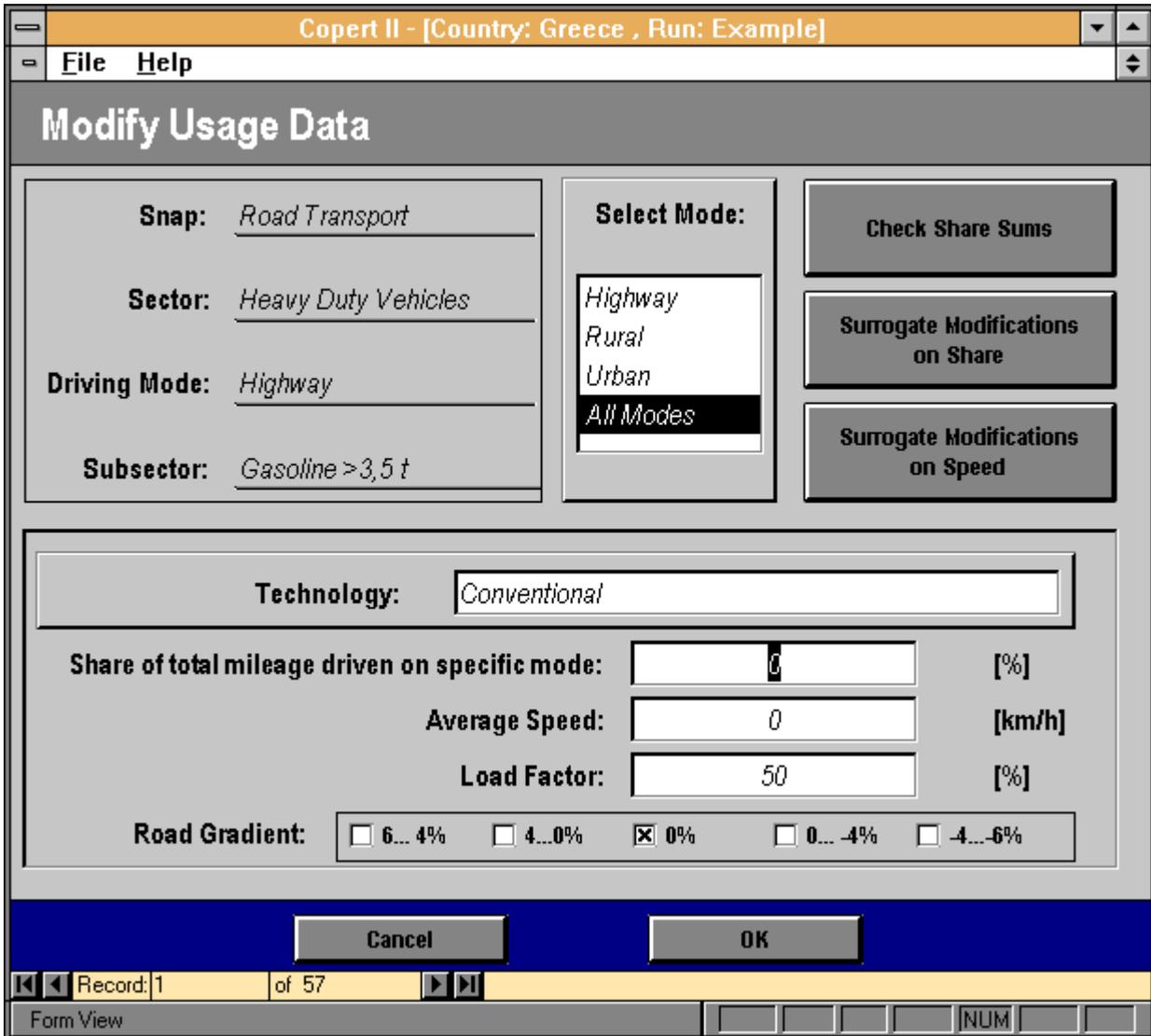


Figure 8

- Check Share Sums:** This feature is enabled only when 'All Modes' is selected on the list. It is obvious that after you have entered the shares for the different modes, they should result in a sum of 100% for each vehicle technology. You can check it by clicking this button. This operation seeks for share sums different than 100. If you have provided no data for some technologies you are not interested in (and thus a share sum of 0% results for them) you will be asked to exclude them (fig. 9).



Figure 9

- **Surrogate Modifications on Share:** If a single driving mode is selected on the list, you may apply a common driving mode share value in the field which appears after clicking that button. This value will be applied in all vehicles selected.
- **Surrogate Modifications on Speed:** Use this feature to apply surrogate modifications, as described above, but this time on speed instead of share.

6.5. Providing Evaporation Distribution Data

In order to provide figures concerning evaporation distribution data, you have to select the **Evaporation** button represented in figure 6. This will bring up the form of figure 10. By default the following values are considered as representative of the evaporation distribution:

Highway : 10%, Rural: 10%, Urban: 80%

You can accept those values or use your own. To do so, you have to use the fields available in the form:

Figure 10

- **Select Mode:** Refer to the respective field in chapter *Providing usage data*.
- **Driving Mode Share on Evaporation %:** Enter the percentage of evaporation for specific driving mode and vehicle technology
- **Surrogate Modifications:** Use this option to provide the same evaporation distribution share on a single driving mode for all vehicles selected. This option is disabled when 'All Modes' is selected on the list.
- **Check Share Sums:** Refer to the respective field in chapter *Providing usage data*.
- **Reid Vapor Pressure:** Clicking the button will display the form portrayed in figure 11. In this form you have to enter the monthly average gasoline reid vapor pressure. For most countries reid vapor pressure values are proposed. Those values have been collected through the Copert I use and are valid for the 1990 year. If more updated figures are available, you can enter them in the right column and mark the respective field at the bottom of the screen. Otherwise, you can accept the proposed values by marking the *Use Copert 90 Values* field.

The screenshot shows a software window titled "Copert II - [Country: Greece , Run: Example]". The main title of the form is "Input of Monthly Average Gasoline Reid Vapor Pressure". There are two buttons at the top: "Copert 90 Values" and "Own Values". Below these is a table with the following data:

Month	[kPa]	[kPa]
January	80	0
February	80	0
March	80	0
April	64	0
May	64	0
June	64	0
July	64	0
August	64	0
September	64	0
October	80	0
November	80	0
December	80	0

At the bottom of the form, there are two checkboxes: "Use Copert 90 Values" (checked) and "Use Own Values" (unchecked). An "OK" button is located to the right of these checkboxes. The status bar at the bottom shows "Record: 1 of 12" and "Form View".

Figure 11

You can only exit the evaporation distribution form after you have provided data for the reid vapor pressure of the gasoline fuel.

6.6. Providing Monthly Ambient Temperatures

The next step in building a new run is to provide the application with the monthly maximum and minimum temperatures. Click the **Ambient Temperatures** button demonstrated in the form of figure 6 to make the form next appear.

Month	Copert 90 Values		Own Values	
	Min Temperature	Max Temperature	Min Temperature	Max Temperature
January	6,4	12,9	0,0	0,0
February	6,7	13,9	0,0	0,0
March	7,8	15,5	0,0	0,0
April	11,3	20,2	0,0	0,0
May	15,9	25,0	0,0	0,0
June	20,0	29,9	0,0	0,0
July	22,8	33,2	0,0	0,0
August	22,8	33,1	0,0	0,0
September	19,3	29,0	0,0	0,0
October	15,4	23,8	0,0	0,0
November	11,7	18,6	0,0	0,0
December	8,2	14,6	0,0	0,0

Use Copert 90 Values
 Use Own Values

Form View

Figure 12

Monthly maximum and minimum temperature figures are proposed for most countries. Those values were collected through the 1990 data sets. You can provide your own values at the two rightmost columns and mark the **Use Own Values** field at the bottom of the screen. Selection of the default values is done by marking the **Use Copert 90 Values** field.

6.7. Providing Values for Cold-Start and Evaporation Parameters

If the source sector you have originally selected is covered under the evaporation and/or cold-start methodology* then the next step is to provide values for those parameters associated with the methodologies. The corresponding data collection form appears (Fig.13) by clicking the **Beta Factor and Itrip Value** button in the form shown in figure 6.

Month	Beta Factor (estimated Itrip)	Beta Factor (measured Itrip)	Own Value for Beta Factor
January	0,293	0,075	0,000
February	0,289	0,074	0,000
March	0,282	0,073	0,000
April	0,261	0,067	0,000
May	0,237	0,062	0,000
June	0,214	0,056	0,000
July	0,199	0,052	0,000
August	0,199	0,052	0,000
September	0,218	0,057	0,000
October	0,242	0,063	0,000
November	0,264	0,068	0,000
December	0,284	0,073	0,000

Figure 13

You have the option to select between using the value proposed for Itrip (which originates from the 1990 data sets for each country) or entering your own value at the top right corner. You have to define which value should be used by marking the appropriate tick mark field next to the Itrip values.

The next step is to select Beta Factors for each month. The proposed value of Itrip is an estimated one, so if you want to use this value, the estimated value for beta factors should be selected too. If you enter a measured Itrip value then you should mark the appropriate field in the middle of the form's header. In any case you can provide your own values for beta factors, at the rightmost column. You can exit the form only after both Itrip and beta factor values have been selected.

* The only source sector not covered by any of those two methodologies is Heavy Duty Vehicles

6.8. Providing Fuel Data

The last step in data entry is the input of fuel specification and consumption figures. This option is available by clicking the sixth button of the form of figure 6, **Fuel Data**. Clicking this button reveals the form pictured in figure 14.

The screenshot shows a software interface for entering fuel data. At the top, a header bar displays "Country: Greece , Run: Example". Below this is a section titled "Fuel Data". Inside this section, a box contains "Gasoline" and "Type: 1 Leaded". Below this are four input fields: "Annual Consumption:" with a value of 0 [t], "Lead Content:" with a value of 0 [g/l], "Sulphur Content:" with a value of 0 [% wt], and "H:C ratio:" with a value of 1,8. A horizontal line separates this from a section titled "Heavy Metals [mg/kg]". Below this line are six input fields for heavy metals: Cadmium (0,01), Nickel (0,07), Copper (1,7), Selenium (0,01), Chromium (0,05), and Zinc (1). At the bottom of the form is an "OK" button. Below the "OK" button is a status bar showing "Record: 1 of 4" with navigation arrows.

Figure 14

You can provide data for four types of fuels, i.e. leaded and unleaded gasoline, diesel and LPG. Selection of the fuels is done with use of the navigation buttons at the bottom of the screen.

The top part of the form includes fields which refer to the consumption of the specific fuel as well as fuel specification. The bottom part refers to the fuel content in heavy metals. Typical values are proposed for the content of each fuel in several heavy metals. You can change those figures in any value if more accurate data are available.

6.9. Continue with Data Processing

After you have finished with all six data entry areas, you might want to insert data for another source sector. First, exit the form shown in figure 6 by clicking the **OK** button. Another intermediate form will appear (Fig.15).

The screenshot shows a software window titled "Country: Greece , Run: Example". The main content area is titled "Select: Emission Factors". It contains four buttons arranged in a 2x2 grid: "Hot Emission Factors", "Evaporation Emission Factors", "Modify / Add Category", and "Cold Start Extra Emission Ratio". At the bottom of the window, there is a printer icon and an "OK" button.

Figure 15

To continue with another source sector click the **Modify/Add Category** button. This will bring up the selection form of figure 16.

The screenshot shows a software window titled "Country: Greece , Run: Example". The main content area is titled "Choose Next Step". It contains four buttons arranged in a 2x2 grid: "Edit Existing Data", "Add New Data", "Road Traffic EF/Results", and "Off Road Results".

Figure 16

Only the two top buttons are of interest at that point.

Selecting the **Add New Data** button will lead you to the form of figure 5. You are once again at the start of this chapter and you should follow exactly the same procedure to add a new source sector. There are two points though that you should be aware of:

1. You need to be sure that the new source sector you are about to add in the run is not already included in your run. Otherwise, a warning message will appear (figure 17) and you will have to select a new source sector

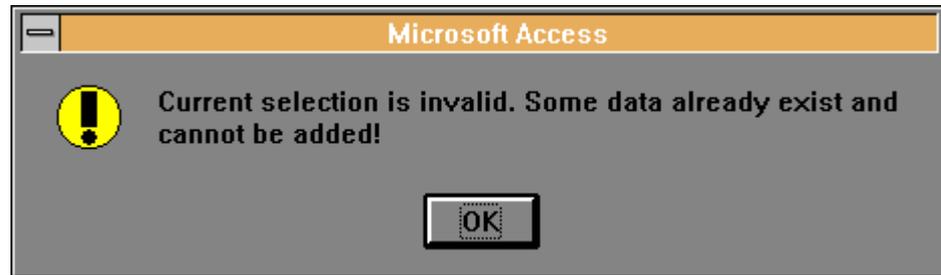


Figure 17

2. Using the form in picture 6 you do not need to click the buttons in the right column once again. Figures for those fields have already been provided for the specific run. You can do so though, if you would like to edit some of the data or just review the figures

If you select the **Edit Existing Data** button you will once again be led in the form presented in figure 5. Because you have selected to edit existing data, you have to choose among those sectors for which you have already provided data. You cannot edit data you have not yet entered. In such a case that you select a sector for which no data are available, you will be confronted with the message of figure 18.



Figure 18

If your selection is acceptable the programme will continue with presenting the form of figure 6. The procedure you have to follow in order to edit some of the data entered is almost similar with that described in the previous paragraphs of this chapter. However some details may differ. Because you are about to edit some data, the procedure is identical to that described in chapter *Working with an Existing Run*. Please refer to this chapter for more information.

This chapter has provided instructions on how to enter data for a new road transport run. It has shown how to add a source sector in your run and provide data associated with the vehicles included in this sector. It has also shown how to input data on country level, as for example monthly ambient temperatures and annual fuel consumption. The next chapter will guide you through the process of editing data that you have already entered. It is repeated that only road transportation (SNAP 07) has been taken into account so far.

7. WORKING WITH AN EXISTING RUN

This chapter covers the issues of editing data already provided while creating a run. In principle it is not much different from adding new data since the same interface is used in both cases. This chapter demonstrates the differences between the two procedures rather than repeating the steps presented in the previous chapter.

7.1. Opening an Existing Run

To open an existing run you can select it from the list shown in figure 4. **OK** will open the existing run and will bring up the form in figure 16. The use of button **Add New Data** has been examined in the paragraph *Continue with data processing* in the previous chapter. Once again you have to add sub-sectors not already included in the current run. The application of **Edit Existing Data** button is demonstrated below.

Clicking this button will once again bring up the form of figure 5. This time you have to select a sector/sub-sector which is part of the selection of the current run. Otherwise the warning message of figure 18 will inform you of the invalid selection. If the selection is valid you will be led in the well-known form in figure 6.

The buttons in the left corner are used in exactly the same way as has already been described in the previous chapter. Clicking one of them will cause a form of the type shown in figure 19 to appear. Those forms are not editable. They are mere lists of data that have already been added.

If you would like to edit those figures you have to select the button **Modify ... Data** (different title in each case) which is placed at the top right corner of the forms. In the form that will appear next you can edit the data as has already been shown in the previous chapter. The only difference is that now you don't have to add new values but rather to modify the existing ones.

Looking at figures 8 and 19 it is obvious that in case of data editing the *Select Mode* list has been transferred in the first of the two forms. This affects the operation of the buttons available in figure 8. In case that the 'All Modes' is selected in the list then the **Surrogate...** buttons will be disabled and the **Check Share Sums** button will be enabled. In contrast, when a single driving mode is activated in the list then the condition of the buttons will be exactly the opposite. It is repeated that those effects are present when using all three of the buttons at the first column of figure 6. The use of the button **Usage Data** has only been used as an example to illustrate the different environment while editing data comparing with adding new data.

A third difference between adding and editing is that the buttons in the first column in figure 6 do not become disabled once you have selected them. This was done in case of adding new data to help you keep track of the figures already added but it has no meaning while editing data. After you have finished with data editing you can click **OK** (Fig.6). You can decide then once again if data editing or adding will be the next step.

Copert II - [Country: Greece , Run: Copert II 1990]

File Help

Snap: Road Transport

Sector: Passenger Cars

Driving Mode: Highway

Subsector: Gasoline <1,4 l

Selectmode:

Highway
Rural
Urban
AllModes

Modify Usage Data

Technology	Mileage Distribution (%)	Average Speed [km/h]
PRE ECE	30	100
ECE 15/00-01	30	100
ECE 15/02	30	100
ECE 15/03	30	100
ECE 15/04	30	100
Improved Conventional	30	100
Open Loop	30	100
91/441/EEC	30	100
94/12/EEC	30	100

Cancel OK

Record: 1 of 123

Form View

Figure 19

7.2. Printing Input Data

A printer button can be found at the footer of the form in figure 15. This button provides a list of printing options regarding input data (Fig.20). You can double click on any of the list options. This will cause a printable report to appear. You can browse the contents of the report or print it. To make printing easier, a menu bar appears any time a report is active. The buttons of this menu bar are shown in figure 21.

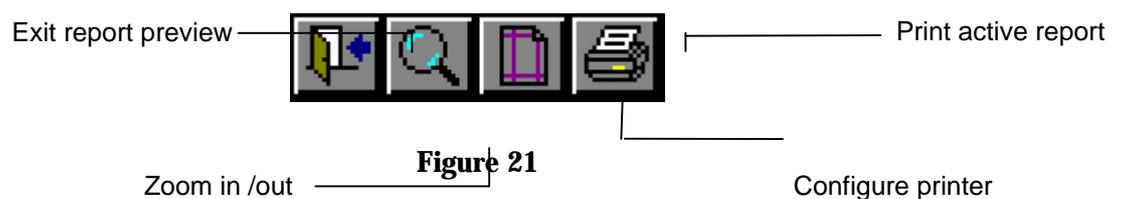


Figure 21

The two last chapters have shown how you can create a new or open an existing run. They have also given all the information necessary to the user to add and edit data. The next step is the calculation of the emission factors that will be part of the data set. This is the subject of the next chapter.

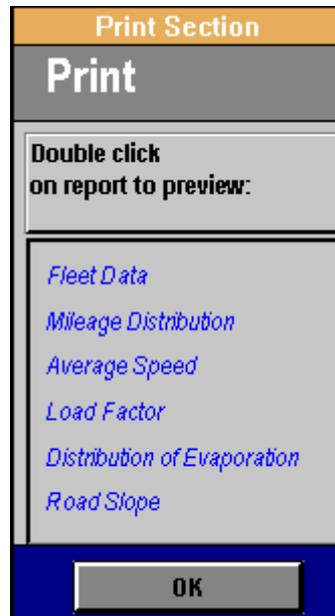


Figure 20

Remarks

For most of the countries two runs have been provided. A non updatable 1990 original data set and an updatable 1990 run. The difference between the two is that the first one is provided with the emission factors calculated with Copert I. For this reason you have no admission to change the velocities in this run. In advance, it is impossible to recalculate the emission factors. The second run is provided with the actual input data from Copert I but the emission factors from COPERT II are used. This run is fully updatable.

8. EMISSION FACTORS

The main part of the COPERT II methodology lies on the calculation of the emission factors. The emission factors are calculated as a function of the vehicle's mean speed. Regarding the software, the emission factors are calculated with integrated procedures and are presented in the user as constant values. Once values for average speed have been entered, the emission factors are a simple task to perform. In any case if the user would like to provide own emission factors this is acceptable from the programme, too.

8.1. Calculating Emission Factors

When the form of figure 15 was previously presented, only the button **Modify/Add Category** was of interest. Now it is time to examine the utilisation of the other buttons too. If you create a new run then you can bring up this form after you have entered at least one source sector. If you have opened an existing run this form can immediately become visible if you click the **Road Traffic EF/Results** button in figure 16.

Button **Hot Emission Factors** is the one which activates the procedure of calculating the emission factors. After it has been clicked the message of figure 22 appears. The emission factors are initially zero values. If you want to calculate them you have to answer yes in the question. This can be quite a time-consuming procedure especially in slow machines. If you have already calculated the emission factors and you just want to review them, then you should select **No**. However, You have to recalculate emission factors when you have modified some speed figures. Recalculation is the only way to keep the emission factors values constantly updated. If for some heavy duty vehicles a load factor other than 50% has been entered, the effect of the different load on emission factors is computed automatically. The same also applies for the effect of the road slope.

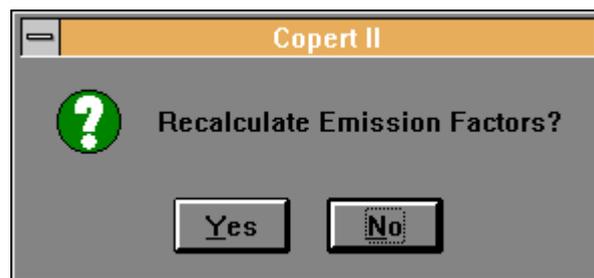


Figure 22

In any case, the menu bar of figure 23 will be the result of clicking the emission factors button.

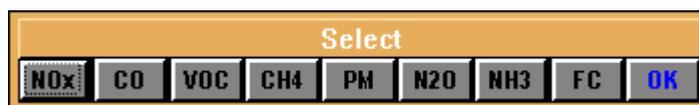


Figure 23

You can select which emission factors you want to view by clicking one of the buttons of the form. The **FC** button present consumption factors than emission ones. The emission factors are presented in the form of figure 24 (CO as an example).

Copert II - [Country: Greece , Run: Copert II 1990]

File Help

CO Emission Factors [g/km]

Select

NOx CO VOC CH4 PM N2O NH3 FC OK

Sector	Subsector	Technology	Urban	Rural	Highway
Passenger Cars	Gasoline <1,4 l	PRE ECE	42,565	21,304	15,520
Passenger Cars	Gasoline <1,4 l	ECE 15/00-01	32,119	14,380	18,620
Passenger Cars	Gasoline <1,4 l	ECE 15/02	27,555	9,220	8,260
Passenger Cars	Gasoline <1,4 l	ECE 15/03	24,695	10,692	7,620
Passenger Cars	Gasoline <1,4 l	ECE 15/04	17,075	6,283	4,292
Passenger Cars	Gasoline <1,4 l	Improved Conventional	9,688	5,858	9,957
Passenger Cars	Gasoline <1,4 l	Open Loop	11,472	5,432	8,432
Passenger Cars	Gasoline <1,4 l	91/441/EEC	3,271	1,907	3,743
Passenger Cars	Gasoline <1,4 l	94/12/EEC	2,289	1,333	2,617

Modify Emission Factors

Record: 24 of 77

Form View

Figure 24

You cannot update the figures in that form. Click the **Modify Emission Factors** button to activate the form of figure 25. In this form you can enter your own values to use as emission factors. Note the **Constant** check boxes next to the values. When a check box is marked then the value of that record will remain constant even if you change the speed that corresponds to this value. This means that if you change one or more emission factors and you have the corresponding check boxes marked, those values will remain unchanged even if you change the mean speeds and recalculate the emission factors.

You can view the emission factors in a tabular format by clicking the second button at the tool bar. The first button restores the form. When you are finished with the emission factors modifications click the **OK** button of the form in figure 23 to proceed.

Remarks for the emission factors

1. They are not visible for vehicles with zero population
2. They are zero, if zero mean speed has been entered for some vehicles
3. Are not calculated for any New Technologies (look also the *Introduction of New Technologies* chapter)
4. When the **Constant** field is checked the load and slope effects (heavy duty vehicles) are no longer applied.

Copert II - [Country: Greece , Run: Copert II 1990]

File Help

Modify CO Emission Factors [g/km]

Select: NOx CO VOC CH4 PM N2O NH3 FC OK

Sector	Mode	Subsector	Technology	CO	Constant
Passenger Cars	Highway	Gasoline <1,4 l	PRE ECE	15,520	<input type="checkbox"/>
Passenger Cars	Highway	Gasoline <1,4 l	ECE 15/00-01	18,620	<input type="checkbox"/>
Passenger Cars	Highway	Gasoline <1,4 l	ECE 15/02	8,260	<input type="checkbox"/>
Passenger Cars	Highway	Gasoline <1,4 l	ECE 15/03	7,620	<input type="checkbox"/>
Passenger Cars	Highway	Gasoline <1,4 l	ECE 15/04	4,292	<input type="checkbox"/>
Passenger Cars	Highway	Gasoline <1,4 l	Improved Conventional	9,957	<input type="checkbox"/>
Passenger Cars	Highway	Gasoline <1,4 l	Open Loop	8,432	<input type="checkbox"/>
Passenger Cars	Highway	Gasoline <1,4 l	91/441/EEC	3,743	<input type="checkbox"/>
Passenger Cars	Highway	Gasoline <1,4 l	94/12/EEC	2,617	<input type="checkbox"/>
Passenger Cars	Highway	Gasoline <1,4 l	EC Proposal I (post-2000)	0,562	<input type="checkbox"/>

OK

Record: 16 of 231

Form View

Figure 25

Copert II - [Country: Greece , Run: Copert II 1990]

File Help

Emission Factors for Evaporative Emissions

Vehicle Category	Diurnal Uncontrolled e(d) [g/day]		Diurnal Controlled e(d) [g/day]		Hot Soak Uncontrolled Fuel Injection e(fi) [g/procedure]		Hot Soak Controlled e(c) [g/procedure]
	Cop 90	Own Value	Cop 90	Own Value	Cop 90	Own Value	
PASSENGER CARS Conventional	5,734	0,000	1,147	0,000	0,700	0,000	0,000
Pass. Cars 91/441/EEC & on	5,734	0,000	1,147	0,000	0,700	0,000	0,000
Gasoline LIGHT DUTY VEHICLES	5,734	0,000	1,147	0,000	0,700	0,000	0,000
Mopeds & Motorcycles < 50 cm ³	1,147	0,000	0,000	0,000	0,000	0,000	0,000
Motorcycles > 50 cm ³ , 2-stroke	2,294	0,000	0,000	0,000	0,000	0,000	0,000
Motorcycles > 50 cm ³ , 4-stroke	2,294	0,000	0,000	0,000	0,000	0,000	0,000

Use Copert 90 Values Use Own Values

OK

Record: 1 of 6

Form View

Figure 26

If one or more of the source sectors entered is covered by the evaporation methodology then the evaporation emission factors should also be calculated. This is done by clicking the button **Evaporation Emission Factors** in the form of figure 15. This brings up the form of figure 26.

Choose between the values proposed and your own values (if any) by mentioning it at the two respective fields at the bottom of the screen. Make sure you have scrolled the form all the way to the right, to uncover all of the evaporation resulting procedures.

In case you have entered new technologies, the values for the emission factors will be also visible in this form.

8.2. Calculating the Cold-Start Extra Emission Ratio

The excess of emission due to cold first stages of an engine's operation are calculated with the help of special extra emission ratio for each month. You can calculate and view those ratios by clicking the button **Cold-start Extra Emission Ratio** shown in the form of figure 15. This will cause the form of figure 27 to appear.

You can change those figures to any values, if more updated data can be found. But your values will not be preserved in case you recalculate the extra emission ratios. More fields can be uncovered in this form if it is scrolled to the right.

This chapter has demonstrated the application of the emission factors and cold-start extra emission ratio in the software. Refer to the methodology documentation to find more information concerning the emission factors themselves.

Cold Start Extra Emission Ratio	Conventional Vehicles				Closed Loop Vehicles			
	NOx	CO	VOC	FC	NOx	CO	VOC	FC
Month								
January	1,082	2,832	2,221	1,383	3,602	8,172	12,011	1,383
February	1,078	2,773	2,182	1,377	3,598	8,113	11,972	1,377
March	1,070	2,651	2,101	1,365	3,590	7,991	11,891	1,365
April	1,046	2,283	1,855	1,328	3,566	7,622	11,645	1,328
May	1,017	1,859	1,573	1,286	3,537	7,200	11,363	1,286
June	0,990	1,454	1,303	1,245	3,510	6,794	11,093	1,245
July	0,972	1,180	1,120	1,218	3,492	6,520	10,910	1,218
August	0,972	1,185	1,123	1,218	3,492	6,524	10,913	1,218
September	0,995	1,526	1,351	1,253	3,515	6,866	11,141	1,253

OK

Figure 27

9. EMISSION RESULTS

After emission factors have been produced, the emission results are the last part of a complete run. For saving up some hard disk space though, the emission results are not saved anywhere. They are only calculated when the user asks for it. This also verifies that the emission results are constantly updated. To reach the emission results section of COPERT II click **OK** at the form of figure 15. This computes the cold-start results (if any) and allocates the unleaded fuel on the basis of the statistical to calculated gasoline consumption. The intermediate form of figure 28 is then presented.

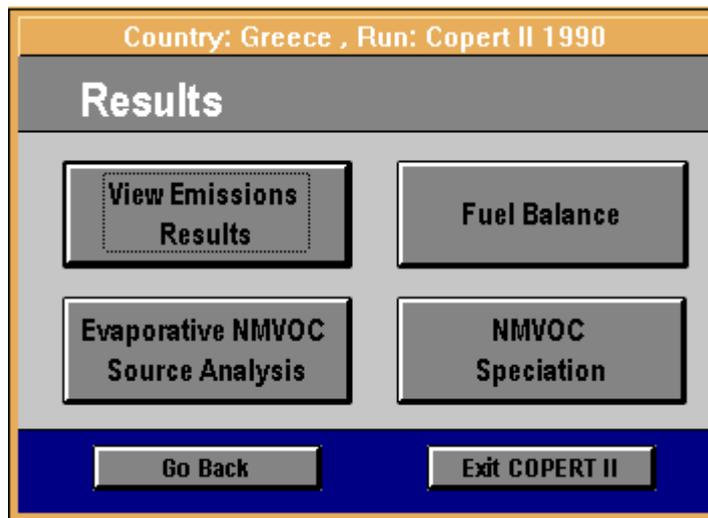


Figure 28

9.1. Checking the Fuel Balance

Before the emission results are viewed, it is a good habit to check the **Fuel Balance**. This button reveals the form of figure 29.

The screenshot shows a software interface titled "Country: Denmark , Run: COPERT 90". Below the title is a section labeled "Fuel Balance". It contains a table with the following data:

Fuel	Consumption [t]		Deviation [%]
	Calculated	Statistical	
Diesel	1 263 424	1 258 780	0,37
Gasoline	1 632 143	1 650 000	-1,08
LPG	9 959	10 000	-0,41

At the bottom of the interface is an "OK" button.

Figure 29

In the case of Denmark 1990, the fuel balance shows a very good match between the statistical and calculated consumption figures. This can verify to some extent that the input data represent the reality and the emission results are valid. If a large deviation between the two values would be observed, then some of the input figures might be incorrect or some assumption was falsely selected. The easiest way to bring the figures closely is to modify the mileage figure which is directly proportional to the calculated fuel consumption. It is in this case the two buttons in figure 7 can prove very helpful.

9.2. Emission and Consumption Results

The choice of emission results (or fuel consumption) to be calculated is done on the toolbar of figure 30. This toolbar becomes visible after the **View Emission Results** button has been clicked. You can select between the different pollutants or consumption (**FC**). This will bring up a form of the type shown in figure 31 (CO as an example).

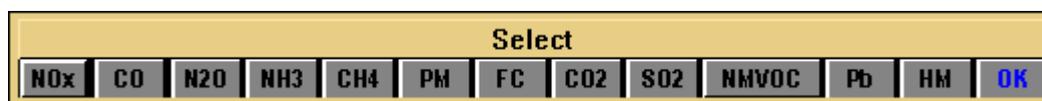


Figure 30

Sector	Subsector	Technology	Mode	Hot	Cold	Total
Passenger Cars	LPG	Conventional	Rural	191	0	191
Passenger Cars	LPG	91/441/EEC	Rural	0	0	0
Passenger Cars	LPG	94/12/EEC	Rural	0	0	0
Passenger Cars	LPG	EC Proposal I (post-2000)	Rural	0	0	0
Passenger Cars	2-stroke	Conventional	Rural	197		197
Passenger Cars	Gasoline <1,4 l	PRE ECE	Urban	1459	2041	3500
Passenger Cars	Gasoline <1,4 l	ECE 15/00-01	Urban	15179	21231	36409
Passenger Cars	Gasoline <1,4 l	ECE 15/02	Urban	6363	8901	15264
Passenger Cars	Gasoline <1,4 l	ECE 15/03	Urban	37253	52106	89359
Passenger Cars	Gasoline <1,4 l	ECE 15/04	Urban	23118	32336	55454
Passenger Cars	Gasoline <1,4 l	Improved Conventional	Urban	0	0	0
Passenger Cars	Gasoline <1,4 l	Open Loop	Urban	0	0	0

Figure 31

This form is very detailed and thus not very helpful. To produce more descriptive, aggregated results click one of the two report buttons at the footer of the form. Each of those buttons will produce a report. The leftmost button will create a printable

report with aggregated results on the basis of the different driving modes (Urban, Rural, Highway). The centre button will produce a report summing up the emissions originating from different sources (Hot, Cold-start, Evaporation emissions). Each of those reports includes a pie chart to better visualise the results. Click **OK** (Fig.30) to exit the emission results section.

9.3. Evaporation Emissions

The evaporation emissions are included in the general **NMVOC** emissions you can view by clicking the respective button in figure 30. A more detailed presentation of the evaporation emissions is presented with use of each of the buttons **Evaporative NMVOC Source Analysis** and **NMVOC Speciation** in figure 28. The first of the buttons classifies the evaporation emissions on the basis of their origin (Soak, Hot running, etc.). The second button produces a list of the total mass of the different NMVOC species included in the evaporation emissions.

This chapter has presented the results section of COPERT II. It has provided information on how to produce emission results and obtain more detailed evaporation emission results. The exporting procedure of those results is described in the special chapter *Import/Export Capabilities*.

10. SAVING A RUN AND FINISHING UP

Until now you have learned how to add and edit data, how to manipulate the emission factors and how to produce emission results. Those three parts constitute a complete run. You should be aware though that all of your modifications and updates are not saved until you get to the final section of COPERT II. This section gives you the option to safely store all of your data or cancel all modifications you have made.

10.1. Closing COPERT II

Clicking **Exit Copert II** in the form of figure 28 will bring you in front of the form shown in figure 32. This is the last form you encounter in the programme and it is the last step before exiting the application or starting a new run.

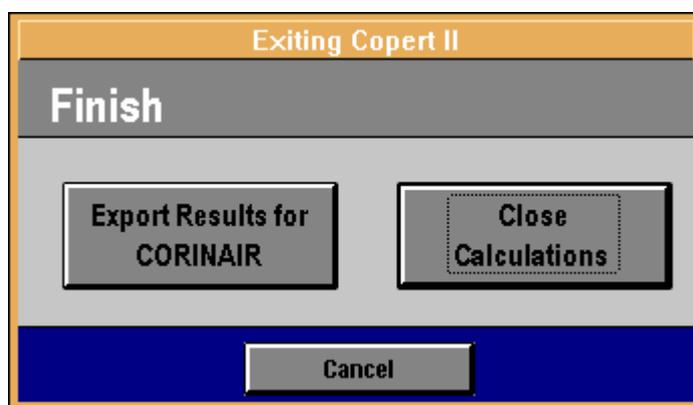


Figure 32

The use of the exporting button is described in the special chapter *Import/Export Capabilities*. The **Close Calculations** button is of interest at that point. After this button has been selected, the question presented in figure 33 will appear (where *d:\COPERT\denmark.mdb* is an example of a destination file to save the run). You are warned that if **No** is selected then all of the data you have entered or modified will be lost.

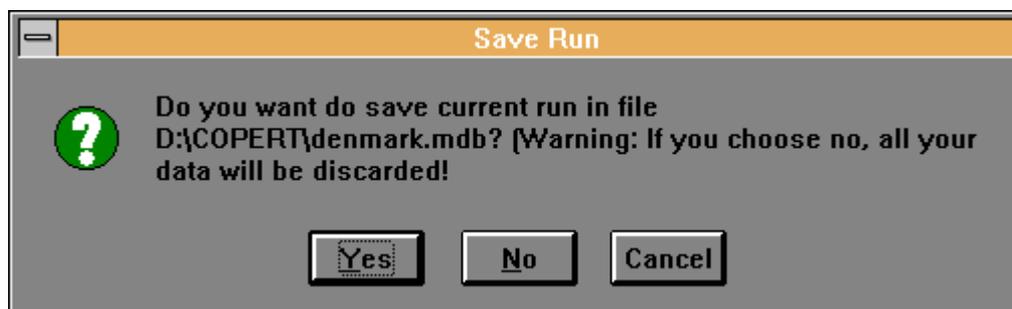


Figure 33

If you choose yes, different options are available depending on the way the current run has been created.

- New run or imported from Copert I
In case of a new or an imported run all of your data will be saved in the destination file without any further notification

- Existing run
If you have opened an existing run you will be asked if you would like to save it as a new one with a different name (Fig.34). If your answer in the question is **Yes**, then the form of figure 35 will appear. Enter the new name and a new description for the run, and it will be stored with a different name. This is convenient when you have modified an existing run and you would like to save it as a different one

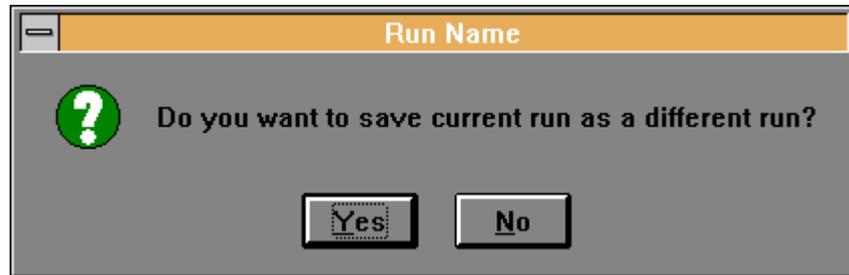


Figure 34

A form with a grey background and an orange title bar that says "Exiting Copert II". Below the title bar, the text "New Run Name" is displayed in a large font. Underneath, there are two labels: "Run Name:" followed by a white rectangular input field, and "Description:" followed by a longer white rectangular input field. At the bottom center of the form, there is a grey button with the text "OK".

Figure 35

10.2. Back to the Beginning

After you have saved or abandoned the last run, you will be asked to begin a new run for the same country you were working with (Fig.36 - Denmark as an example)



Figure 36

If you choose **Yes**, you will be led to the form of figure 4 and a new cycle may begin for the same country. If you choose **No**, you will be prompted to begin all over again for a different country (Fig.37).

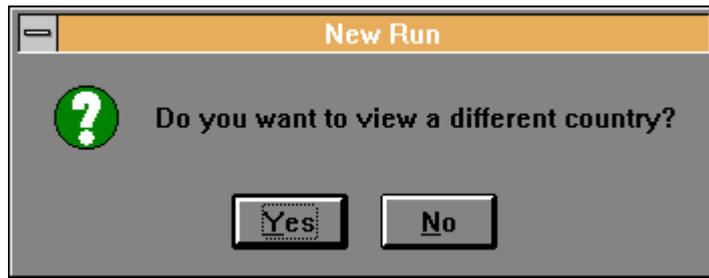


Figure 37

In that case, a positive answer will lead you to the form of figure 3. In contrast, choosing **N**o will terminate the application.

10.3. Deleting a Run

In case you want to delete a run included in any country's database, you may do so by selecting the **Delete Existing Run** button in the form of figure 3. This will bring up a list with the available runs for the country you have selected, where you can choose the run to be deleted. You have to be careful when using this option, because there is no way to restore a run after it has been deleted and all data will be lost.

This chapter has shown how to save a run and finalise the use of COPERT II. The next chapters discuss some special issues concerning the application, which are not part of the main structure of the programme.

11. IMPORT/EXPORT CAPABILITIES

COPERT II can communicate with two more applications through integrated import/export procedures. A constructed Copert I data set can be imported and used as a typical COPERT II run. Likewise, this or any other run can be exported to the CORINAIR format.

11.1. Import a Run from Copert I

An automated procedure has been developed for those users who have already used the previous version of Copert - Copert I - and would like to use the old data in the new environment. It is very easy to import those data in COPERT II. This procedure is started with use of the button **Import Copert 90 Data** which is found in the form pictured in figure 4. The next list describes the steps you have to take in order to import the old version run:

- Copy the *copexp.wk1* file which is provided with the COPERT II installation disks in the directory of the existing Copert I data set
- Load Lotus
- Retrieve the file *copexp.wk1*
- Files *copimp1.wk1* and *copimp2.wk1* must have been created in the directory of the existing Copert I data set. Move those two files in the directory where COPERT II is installed.
- Enter a name (optn. and a description) for this run at the respective fields (Fig.4)
- Click the button **Import Copert 90 Run**
- Delete the files *copimp1.wk1* and *copimp2.wk1*

All data will now have been transformed into the new format and you will be able to manipulate them in the usual way.

11.2. Export a Run to CORINAIR Format

Any run in COPERT II can be exported automatically to the CORINAIR format. In order that a run can be exported, two are the only concerns:

1. At least one of the source sectors included in that run is covered by the cold-start methodology
2. At least one of the source sectors included in that run is covered by the evaporation methodology and the evaporation results have been calculated. The evaporation results can be calculated with use of at least one of the buttons associated with evaporation emissions (figure 28 and figure 30)

If both the above points are valid, then the exporting procedure is initiated by clicking the **Export Results for CORINAIR** button found in the last form (Fig. 32). In case that any of those points are not valid then the exporting button will not be enabled and it will be impossible to begin the exporting procedure.

The exporting will create two files in the COPERT II directory:

COP_ACT.dbf Including activity data

COP_EF.dbf Including emission data

You can use those two files (tables) for the CORINAIR inventory.

12. INTRODUCING NEW TECHNOLOGIES

A special feature of COPERT II software is the unlimited list of technologies under each sub-sector. The user can import as many technologies necessary to better describe a country's fleet. No new sub-sectors can be introduced though. This is not a disadvantage, since any sub-sector can be described as a new technology attached to a sub-sector. As it is next demonstrated, any new technology has its own complete set of features. A new technology depends on the sub-sector it is attached only in fields of the fuel used. Some secondary features will be further discussed next.

12.1. Adding a New Technology

To add a new technology you have to click the relevant button in the form of figure 5 (**New Technologies**). In order that this button gets enabled, it is necessary that:

- You have entered the form of figure 5, either while creating a new run or having clicked the **Add New Data** button at the form of figure 16. This is necessary to verify that you want to add data and not to edit
- SNAP 07 has been selected in the relevant field (Fig.5)
- A single sub-sector and not 'All Sub-sectors' has been selected (Fig.5)

From the last bullet it is obvious that you can enter a new technology for any single sector or sub-sector. After clicking the button mentioned above, the form of figure 38 will appear. Depending on the sector and sub-sector, some of the fields included in the form of figure 38 may not be enabled or even visible.

The most general condition will be discussed next by describing each of the fields in figure 38.

- **Technology Name:** Provide a name for the new technology
- **This technology is:** Specify if the new technology is closed loop or conventional. This information is needed for the CORINAIR exporting procedure
- **Gasoline Used:** Specify if leaded or unleaded gasoline is used. This information is necessary for the allocation of the unleaded fuel
- **Evaporation calculations should:**
 1. **not performed at all:** Do not calculate emissions from evaporation for that technology even if the sector and the sub-sector to which the technology is attached, are covered by the evaporation methodology
 2. **performed with the existing methodology:** use the same evaporation factors as for the rest vehicles of that sub-sector (closed loop or conventional)
 3. **performed with own emission factors:** provide your own emission factors (at the fields rightmost in the form) to calculate evaporation results
- **Add Technology:** Add the new technology in the run and proceed with another one
- **OK:** Add the technologies and exit

Copert II - [Country: Greece , Run: Copert II 1990]

File Help

Technology Name:

This technology is: Conventional Closed Loop

Gasoline Used: Leaded Unleaded

Evaporation calculations should

not performed at all

performed with the existing methodology

performed with own emission factors

Evaporation emission factors

Diurnal Uncontrolled [g/day]:	<input type="text" value="0,1"/>
Diurnal Controlled [g/day]:	<input type="text" value="0,15"/>
Hot Soak Fuel Injected Uncont. [g/proc]:	<input type="text" value="0,2"/>
Hot Soak Fuel Injected Cont. [g/proc]:	<input type="text" value="0,18"/>
Warm Soak Uncontrolled [g/proc]:	<input type="text" value="0,25"/>
Warm Soak Controlled [g/proc]:	<input type="text" value="0,12"/>
Hot Soak Carb Uncontrolled [g/proc]:	<input type="text" value="0,8"/>
Hot Soak Carb Controlled [g/proc]:	<input type="text" value="0,4"/>
Warm Running Uncontrolled [g/km]:	<input type="text" value="0,6"/>
Warm Running Controlled [g/km]:	<input type="text" value="0,2"/>
Hot Running Uncontrolled [g/km]:	<input type="text" value="0,9"/>
Hot Running Controlled [g/km]:	<input type="text" value="0,2"/>

Cancel Add Technology OK

Form View NUM

Figure 38

Regarding the new technologies, the following should be made clear:

1. If the sub-sector to which the new technology belongs is covered by the cold-start methodology, the same methodology will also be applied to the new technology
2. No emission factors are calculated for any new technology
3. You can introduce as many new technologies as you want for any sub-sector

After one or more technologies have been added you can manipulate them in exactly the same way as you do with the default ones.

13. OFF-ROAD MACHINERY

This chapter assumes that you are already familiar with the use of the software. This means that you can open and manipulate a run, add and edit data and produce results. This chapter only demonstrates the necessary steps you have to take in order to include off-road machinery data and emissions in your run. To enter the off-road module you have to select SNAP 08 in the respective field of figure 5. Then once again you have to select a source sector and preferably a sub-sector. Next you will encounter the form of figure 39. The concept of this form is exactly similar compared to the one presented in figure 6. The buttons in the first column become disabled (when adding data) once you have selected them.

The image shows a software dialog box titled "Data Selection". At the top, a status bar indicates "Country: Greece , Run: Off Road Example". The main content area contains six buttons in a 3x2 grid:

- Top-left: Data
- Top-right: Emission/Degradation Factors
- Middle-left: Diesel Type Mix
- Middle-right: Weighting Factors
- Bottom-left: Evaporation Losses Factors
- Bottom-right: Fuel Data

At the bottom of the dialog, there are two buttons: "Go Back" on the left and "OK" on the right.

Figure 39

13.1. Providing Data for Off-Road Machinery

Clicking the button **Data** will lead you in the form shown in figure 40. The different fields are described next:

- **Vehicle population:** Enter the number of vehicles (engines) of the specific category
- **Annual Working Hours:** Enter the annual working hours for this machinery
- **Load Factor (%):** An estimation of the average load factor of the vehicles
- **Power Distribution (kW):** Enter the percentage distribution of those vehicles into several power output categories. The emissions from the different machinery differs for different power classes. Note that the programme will not let you provide a distribution that does not result in a sum of 100%
- **Age Distribution:** Provide the distribution of the vehicles into different age classes. The application of special degradation factors will be possible if the age of the vehicles is known. The sum of the age distribution figures should also equal 100% in this case.

Click **OK** to finish with the general data entry.

Power Distribution [kW]	
0-20 :	10
20-37 :	20
37-75 :	0
75-130 :	0
130-300 :	40
300-560 :	0
560-1000 :	0
>1000 :	30

Age Distribution	
0-2 years :	30
2-10 years:	60
10-30 years:	10

Figure 40

13.2. Providing Diesel Type Mix

Concerning diesel fuelled engines, the emissions vary according to the engine's combustion layout. This means for example that a turbocharged direct injection engine probably has a different emission level than a natural aspirated prechambered one. To compensate for those irregularities different emission factors have to be applied (see also the *Providing weighting factors* paragraph). As a result, the number of diesel engines for each layout has to be entered.

This is done with the help of the form in figure 41. You have to enter the engine percentage distribution at the different concepts in the fields provided for that reason. Note that the sum must be 100%. With the navigation buttons you can go through all of the vehicles of the current collection equipped with diesel engines. For each category, the diesel type distribution has to be entered for all power classes. To select a power class for vehicles of a specific category use the buttons at the right hand side of the form.

Copert II - [Country: Greece , Run: Off Road Example]

File Help

Diesel Type Mix

Sector:	Agriculture	
Vehicle/Machinery:	2-wheel tractors	
Fuel:	Diesel	

Natural Aspirated Direct Injection [NADI]		50	
Turbo Charged Direct Injection [TCDI]		10	
Intercooled Turbo Charged Direct Injection [ITCDI]		0	
Natural Aspirated Prechamber Injection [NAPC]		40	
Turbo Charged Prechamber Injection [TCPC]		0	
Intercooled Turbo Charged Prechamber Injection [ITCPC]		0	

0-20 kW
20-37 kW
37-75 kW
75-130 kW
130-300 kW
300-560 kW
560-1000 kW
>1000 kW

Record: 1 of 12

The Sum must be 100 and the value between 0 and 100

Figure 41

13.3. Providing Evaporation Factors

Vehicles equipped with gasoline engines contribute to the total emissions also due to evaporation effects. You have to provide emission factors for evaporation from gasoline engines. The form of figure 42 is used for that reason. Provide the emission factors at the respective field. For vehicles in the same sub-sector, select between two-stroke and four-stroke engines by using the respective buttons **G2S** and **G4S** at the top of the form.

Evaporation emission factors are proposed for both engine types. You can either keep the values proposed or enter your own.

13.4. Providing Emission and Degradation Factors

Engines of different power output produce different amount of pollutants for each hour of use. This leads to the necessity of the introduction of different emission factors for each pollutant, type of fuel and power class. Those emission factors can be entered in the form presented after the button **Emission/Degradation Factors** has been clicked (Fig.43).

Country: Greece , Run: Off Road Example

Evaporation Factors

Fuel: G2S G4S

Sector :

Vehicle/Machinery:

Evaporation Factor : [g/h]

Cancel
OK

Record: 1 of 4

Figure 42

Again, emission factors (g/kWh) are proposed for each fuel. You can change those values if more updated data are available. You can select different fuels using of the navigation buttons at the bottom of the form.

Copert II - [Country: Greece , Run: Off Road Example]

File Help

Emission Factors in [g/kWh] and Degradation Factor [% per year]

Fuel: Diesel

Emission Factors as a function of Power [kW] in g/kWh									
POLLUTANT	0-20	20-37	37-75	75-130	130-300	300-560	560-1000	>1000	DF
NOx	14,360	14,360	14,360	14,360	14,360	14,360	14,360	14,360	0,00
CO	8,375	6,429	5,061	3,757	3,000	3,000	3,000	3,000	1,50
CH4	0,050	0,050	0,050	0,050	0,050	0,050	0,050	0,050	1,50
NM VOC	3,817	2,913	2,279	1,673	1,300	1,300	1,300	1,300	1,50
FC	270,800	268,580	265,280	259,700	254,000	254,000	254,000	254,000	1,00
N2O	0,350	0,350	0,350	0,350	0,350	0,350	0,350	0,350	0,00
NH3	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,002	0,00
PM	2,223	1,806	1,510	1,230	1,100	1,100	1,100	1,100	3,00

OK

Record: 1 of 6

FLTR NUM

Figure 43

The degradation factors can be found next to the emission factors under the abbreviated title DF. Those degradation factors depend on the pollutant and the fuel used. They express the expected degradation percentage of the engine per year.

13.5. Providing Weighting Factors

The emission factors already presented in the previous paragraph are baseline emission factors. This means that they are common figures for each pollutant, fuel used and power class. In the case of diesel engines, as has already been mentioned (look at paragraph *Providing diesel type mix*), a more detailed specification is necessary, according to the combustion layout of the engine. Different type diesel engines present different emission levels.

If the same emission factors have to be used for all diesel engines (baseline emission factors), they have to be corrected with special correction or weighting factors. Those special factors are function of the pollutant concerned and the combustion layout applied. To view or change those emission factors, click the **Weighting Factors** button (Fig.39) in order to show the form of figure 44.

POLLUTANT	NADI	TCDI	ITCDI	NAPC	TCPC	ITPC	Diesel		
							Diesel (Stage I)	Diesel (Stage II)	
CH4	0,80	0,80	0,80	1,00	0,95	0,90			
CO	0,80	0,80	0,80	1,00	0,95	0,90			
FC	0,95	0,95	0,95	1,10	1,05	1,05			
N2O	1,00	1,00	1,00	1,00	1,00	1,00			
NH3	1,00	1,00	1,00	1,00	1,00	1,00			
NMVOC	0,80	0,80	0,80	1,00	0,95	0,90			
NOx	1,00	0,80	0,80	0,80	0,75	0,70			
PM	0,90	0,80	0,80	1,20	1,10	1,00			

Figure 44

The titles in the first row of the forms header are the initial letters of the concept applied. You can move between the different stages of diesel emission legislation

using the three buttons placed at the form's header. You can also change the values at at your convenience.

13.6. Providing Fuel Data

As in the case of SNAP 07, the specification of the fuels used is necessary to compute the emissions produced by the fuels' content in several elements. To do so, click the button **Fuel Data** (Fig.39). This reveals the form of figure 45. No statistical consumption has to be provided in this case; only fuel content in Lead and Sulphur. The H:C ratio of the fuel is also necessary for the calculation of the CO₂ emissions.

Enter the necessary figures for the Diesel, Gasoline and LPG fuels and click **OK** to exit.

The screenshot shows a software window titled "Country: Greece , Run: Off Road Example". Inside, there is a section titled "Fuel Data" with a sub-section for "Diesel". Below this, there are three input fields: "Lead Content:" with a value of "0,15" and units "[g/l]"; "Sulphur Content:" with a value of "0,05" and units "[% wt]"; and "H:C ratio:" with a value of "1,86". At the bottom of the form is an "OK" button. A status bar at the very bottom indicates "Record: 1 of 3".

Figure 45

13.7. Emission Results

When you have finished adding new data, click the **OK** button in the form pictured in figure 39 to proceed. This will cause the form of figure 46 to appear. This is equivalent to the form shown in figure 15 for road traffic. In the case of off-road machinery though no emission factors section is available because emission factors checking has been done in the previous section.

You can click the **Modify/Add Category** button to move back to the form of figure 16. If you have calculated off-road results at least once, the button **Off-road Results** will be enabled.

Click the **Print Input Data** button and you will be encountered with a form similar to that of figure 20. You can produce several reports describing all the off-road machinery input data for the current run.

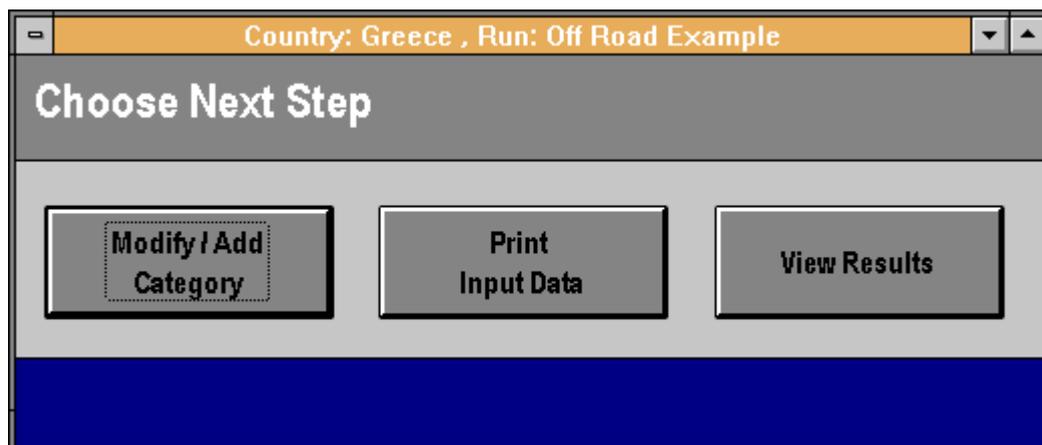


Figure 46

The **View Results** button will activate the procedure of calculating emission results. The emission results are presented with the form shown in figure 47 (CH₄ as an example). You can select the pollutant of interest with the buttons at the top of the form.

The screenshot shows a window titled 'Copert II - [Country: Greece , Run: Off Road Example]'. Below the title bar is a menu bar with 'File' and 'Help'. The main area is titled 'Off Road: Emission Results' and has a row of buttons for pollutants: CH₄ (selected), CO, CO₂, FC, N₂O, NH₃, NO_x, Pb, PM, SO₂, and NMVOC. Below this is a table with columns: Sector, Vehicle/Machinery, Fuel, and Emissions [kt]. The table lists 18 rows of data for the Agriculture sector, categorized by vehicle type (2-wheel tractors, Agricultural tractors, Harvesters/Combines, Others) and fuel type (Diesel, Diesel (Stage I), Diesel (Stage II), G2S, G4S). At the bottom, there are buttons for 'Report (Fuel Oriented)', 'Report (Sector Oriented)', 'End Off Road Session', and 'Exit COPERT II'. A status bar at the very bottom shows 'Record: 1 of 24' and 'CH4'.

Sector	Vehicle/Machinery	Fuel	Emissions [kt]
Agriculture	2-wheel tractors	Diesel	0,05
Agriculture	Agricultural tractors	Diesel	0,10
Agriculture	Harvesters/Combines	Diesel	0,02
Agriculture	Others	Diesel	0,00
Agriculture	2-wheel tractors	Diesel (Stage I)	0,00
Agriculture	Agricultural tractors	Diesel (Stage I)	0,00
Agriculture	Harvesters/Combines	Diesel (Stage I)	0,00
Agriculture	Others	Diesel (Stage I)	0,00
Agriculture	2-wheel tractors	Diesel (Stage II)	0,00
Agriculture	Agricultural tractors	Diesel (Stage II)	0,00
Agriculture	Harvesters/Combines	Diesel (Stage II)	0,00
Agriculture	Others	Diesel (Stage II)	0,00
Agriculture	2-wheel tractors	G2S	0,00
Agriculture	Agricultural tractors	G2S	0,00
Agriculture	Harvesters/Combines	G2S	0,00
Agriculture	Others	G2S	0,00
Agriculture	2-wheel tractors	G4S	0,00

Figure 47

At the bottom of the screen the following button options are available:

- **Report (Fuel Oriented):** Preview a printable report including fuel aggregated results for the current pollutant
- **Report (Sector Oriented):** Preview a printable report with results summed up on the basis of the different sectors entered
- **End Off-road Session:** This will once again lead you in the form pictured in figure 16
- **Exit COPERT II:** Will present the form of figure 32 to finalise the use of COPERT II

14. USING DATA IN YOUR OWN APPLICATIONS

As has formerly been mentioned, the data you enter in order to create a new run are stored in single files named after the country they refer to, with the extension **.mdb**. The files are kept in the same directory as Copert II. In contrast with the main programme, they are unprotected, meaning that you can view or modify their contents as well as export them to other applications. In order to gain access to those files, the following steps have to be carried out:

1. Microsoft Access 2 must be installed in your computer.
2. Locate and open the file **workgadm.exe** which is found in the Access 2 directory.
3. Click the button **Join...** in the Workgroup Administrator dialogue box which is appeared.
4. In the **Database:** prompt which appears, type the directory you have installed Copert II, followed by the file **copert.mda** (e.g. *c:\copert\copert.mda*). Click the **OK** button.
5. Exit the Workgroup Administrator dialogue box.

Next time you start Access 2, you will encounter the dialogue box of figure 1. As with Copert II, enter *copuser* in the **Name:** field and leave the **Password:** field blank. You may then open any of the .mdb files and review their contents. In order to remove the dialogue box which appears every time you start Access 2, you have to repeat the steps 1 to 5. The only difference is that in step 4 you have to enter the file **system.mda** which is found in your Access 2 directory (e.g. *c:\access\system.mda*).

All table names end to a number which refers to the run the table belongs to. You can find all relevant information for the runs in table tblDescription. A brief description of the data contained in the tables which form a run follows:

Table Name	Table Description
tblActivity	Number of vehicles, annual mileage, fuel injection percentage, evaporation control percentage, fuel used
tblColdStart	Cold-start parameters and emission increase
tblColdStartResults	Total cold-start emissions per vehicle technology
tblDCSI	Share of different roads on total mileage, average speed, slope of the road (for HDV), load percentage (for HDV)
tblEvapEF	Evaporation emission factors
tblEvaporation	Share of different roads on evaporation
tblFactorsRES	Hot emission factors
tblFuel	Fuel consumption and specifications
tblRVP	Fuel Reid vapour pressure per month
tblTemperatures	Ambient temperatures per month
tblTechImpl	System table
tblEvapEFNewTech	Evaporation emission factors for technologies introduced by the user
Table Name	Table Description
tblOffRoadResults	Emission results for off-road machinery
tblOffRoadData	Input data for off-road machinery
tblOffRoadFuel	Specifications of fuel used in off-road applications
tblEF	Emission factors of off-road applications

You can review or export the data in any other application by using the Access 2 built-in tools. You must not though change any of the tables' format and structure because this might turn the run to an non-recognisable structure for the main programme. For any other information concerning the contents of those databases you should contact the application developers directly.

15. TROUBLESHOOTING

A run time error occurs every time the Export to CORINAIR procedure is initiated

To correct:

Locate the file ***copert.ini*** which sites in your windows directory.

Open ***copert.ini*** by double-clicking it.

The following sentences can be found under the title [Installable ISAMs]:

Paradox 3.X=C:\WIN95\SYSTEM\pdx200.dll

Paradox 4.X=C:\WIN95\SYSTEM\pdx200.dll

FoxPro 2.5=C:\WIN95\SYSTEM\xbs200.dll

FoxPro 2.6=C:\WIN95\SYSTEM\xbs200.dll

FoxPro 2.0=C:\WIN95\SYSTEM\xbs200.dll

dBASE III=C:\WIN95\SYSTEM\xbs200.dll

dBASE IV=C:\WIN95\SYSTEM\xbs200.dll

Btrieve=C:\WIN95\SYSTEM\btrv200.dll

Change the directory "WIN95" into the windows directory found in your computer (for example "WINDOWS" or "WIN" etc.) for all of those sentences.

Hot Line in case you need help:

e-mail: leon@eng.auth.gr & zisis@eng.auth.gr

or fax: +30 31 286 009 & + 30 31 996019