CORINAIR WORKING GROUP ON EMISSION FACTORS FOR CALCULATING 1990 EMISSIONS FROM ROAD TRAFFIC

Volume 2: Copert — Computer program to calculate emissions from road traffic

User's manual

CORINAIR Working Group on Emission Factors for Calculating 1990 Emissions from Road Traffic

Volume 2 : C O P E R T
COmputer Programme to calculate Emissions from Road Traffic

- USER'S MANUAL -

prepared by:

A. Andrias, D. Zafiris, Z.Samaras
Lab of Applied Thermodynamics
University of Thessaloniki, Greece

K.-H. Zierock
EnviCon, Germany

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CORINAIR Working Group on Emission Factors for Calculating 1990 Emissions from Road Traffic

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I. Introduction

COPERT is a programme which helps to calculate emissions of Nitrogen Oxides (NOx), Carbon Monoxide (CO), Non-Methane Volatile Organic Compounds (NM-VOC), Methane (CH_4), Total Particulate Matter (TPM - Diesel engines), Nitrous Oxide (N_2O), Ammonia (NH_3), Lead (Pb - Gasoline engines), Carbon Dioxide (CO_2) and Sulfur Dioxide (SO_2) from road and off-road traffic. It applies a methodology that was developed by EGGLESTON et al.[*], in the frame of the CORINAIR project of the Commission of the European Communities, DG XI. This manual is designed to guide the user of COPERT while applying the programme. However, the guidance given assumes that the user has background knowledge in the application of MS-DOS, system control and LOTUS 1-2-3 software.

The following hardware is required for the installation and operation of the programme:

1.   AT/XT IBM or compatible PC, with 640 K RAM at least, a hard disk and a graphics card for display of the LOTUS graphs produced during the execution of the programme (optional).

2.   Line Printer for hard copies of the results and input data (optional)

3.   MS-DOS 3.2 (at least)

4.   LOTUS 1-2-3 (or at least the 123 files of the LOTUS Version 2.2)

II. General Remarks Concerning the Structure of the Programme

The programme consists of a starting file and a number of spreadsheets which can be operated in conjunction with LOTUS 1-2-3.

The programme is to a large extent menu-driven and thus helps the user to find his way through the different spreadsheets. From the time the user turns the programme on, all he has to do is follow the instructions given in the programme. These instructions are given in the form of different menus, which appear at the top of the screen. Using the arrows (-> <RIGHT>, <- <LEFT>) the user is able to highlight each part of the menu individually. On the second line of the screen the user is able to read an explanation of the function that the highlighted part of the menu executes. When the user decides to follow one specific part of the menu, all he has to do is to highlight (using the arrows) that part of the menu, read the comments underneath and press <ENTER>. The programme automatically executes the user's command and on completion, a new menu appears at the top of the screen.

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[*] Eggleston H.S./ Gaudioso D./ Gorissen N./ Joumard R./ Rijkeboer R.C./ Samaras Z./ Zierock K.-H. (1991) CORINAIR Working Group on Emission Factors for Calculating 1990 Emissions from Road Traffic - Volume 1: Methodology and Emission Factors. Final Report to CEC

This is the way in which the user works through the programme (e.g. following the menus). Each spreadsheet has different menus(according to its aim).

When the user has completed the execution of one spreadsheet, he then has to continue to the next or to abandon the programme. In order to leave the programme the user has two choices:

A - Complete the execution of the entire programme,

B - Return step by step (e.g. from spreadsheet to spreadsheet).

The major intermediate and final results during the execution of the programme are either displayed on the screen or printed (or both). Nevertheless, there is in several cases a multitude of intermediate results with very detailed information, which are contained in the spreadsheet files of the programme and which - for reasons of economy - are not displayed nor printed. For the user interested in taking a closer look to the procedures and their results, the following GENERAL RULE may be of help:

GENERAL RULE : The user can interrupt the execution of the programme at any time by pressing <CTRL> <BREAK> simultaneously and then <ESCAPE>. This way he is within the spreadsheet and able to navigate around or make use of the standard possibilities of LOTUS 123. To restart the execution of the programme he only has to press <ALT> <A> simultaneously.

It is self-evident that the same rule applies in any case that - for any reason - the programme stops unexpectedly, and an error message is displayed at the bottom left of the screen: Press first <ESC> and then <ALT> <A> simultaneously.

III. Procedures to Carry Out Calculations

III.1. Installation and Starting Procedure

It is assumed that you have installed in your PC, which has to meet the requirements outlined above, MS-DOS 3.2 and LOTUS 1-2-3 Version 2.2. It is then advised to proceed as follows:

A -   Make back-up copies of the original attached diskettes(*)

B -   Make a new directory to your hard disk, under the name

<div align="center">C:\COP></div>

C -   Copy the contents of all the COPERT disks to the C:\COP

D -   Copy to C:\COP the following LOTUS files: 123.*

E -   Make sure that you have available the input data required by the programme

After having completed the above mentioned steps, you can start COPERT by typing

<div align="center">COPERT and then <ENTER></div>

Your screen should look as follows:

COMISSION OF THE EUROPEAN COMMUNITIES - DIRECTORATE GENERAL XI

COmputer Programme to calculate Emissions from Road Traffic

VERSION 2.1   - SEPTEMBER 1992
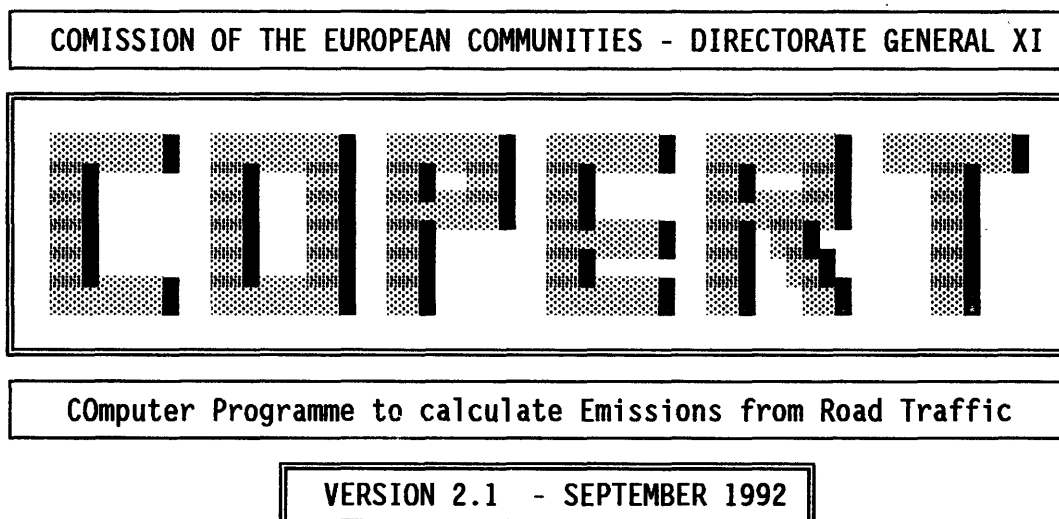
By: A.ANDRIAS, D.ZAFIRIS, Z.SAMARAS, University of Thessaloniki GREECE
     K.-H.ZIEROCK, EnviCon, F. R. of GERMANY

Then follow the instructions of the programme.

(*) either one 3.5" 1.44 Mb or two 3.5" 720 Kb

III.2. Data Collection Spreadsheets

The DATA COLLECTION SPREADSHEETS (DCS) is the first compulsory step, which the user is obligated to follow <u>at least once</u>.

The authors recommend the user to study the papers which show the form of the DATA COLLECTION SHEETS. The user should try to collect <u>all</u> the DATA referred to in these spreadsheets, write them down on a photocopy of each D.C.S. and then begin the operation of the programme. Otherwise it is pointless to attempt to begin the programme.

<u>Important Remark</u>: It is absolutely essential for the reliable execution of the programme that the entire data collection procedure is gone through <u>at least once.</u> (Obviously, this has to be done during the first execution of the programme).
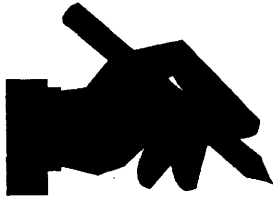
The aim of these spreadsheets is to collect nearly all required data for the calculations. The general principles that govern these spreadsheets are the following :

1. Every DCS is menu-driven. The user has to highlight the specific part of the menu that he wishes to follow (using the arrows) and press <ENTER>.

2. If the user's choice is INPUT or CHANGE DATA then the programme automatically leads inside the spreadsheet. The programme displays a message at the bottom of the screen, stating:

> **MANUAL INPUT OF DATA**
> **To Restart press <Alt-A>**

This means that the user has to use the arrows in order to move into the specific cells, then type the value for each cell and press <ENTER>. If the programme doesn't respond to the user's operation, the cursor is not in the correct position at the input data cell. In this case the user must press the <ESC> key and move (using the arrows) the cursor to the correct position in order to type the input data. At the end of this procedure, the user has to press <ALT> <A> <u>simultaneously</u> (or <ALT> <B> according to the message at the bottom of the screen).

3. If the user's choice is CHANGE DATA (which means that he has already introduced all the required data and wishes to change some of them), he has to move only to the specific cells in which new revised data are to be introduced.

4. If the user's choice is CONTINUE, then the programme automatically saves current spreadsheet and leads to the next DCS.

5.   If the user's choice is QUIT then the programme automatically saves current spreadsheet and leads to the beginning of the DATA COLLECTION subroutine.

The DATA COLLECTION subroutine is composed of one introductory spreadsheet and six individual ones. These are:

III.2.1. Data Spreadsheet (DATA)

This is the introductory spreadsheet to the data collection procedure. In this spreadsheet the user has to inform the programme of the country and year that the INPUT DATA refer to.

After having started the programme (see III.1), you are automatically in the DATA Spreadsheet input file. Then the following menu appears on the screen:

FIRST TIME CALCULATION: This choice is obligatory when the user operates the entire programme for the very first time.

CONTINUE: This option leads to a new menu which offers the possibility either to invoke each individual DCS, in case the user wishes to change data contained in one or several specific DCS, or to by-pass the DATA COLLECTION procedure and proceed to the calculations for quick recalculating, printing of results or viewing graphs that exist in the programme. This option is allowed to be chosen only if the user has already completed the entire DATA COLLECTION procedure.

QUIT: This option terminates the execution of COPERT and exits to DOS.

III.2.2. Data Collection Sheet I (DCSI)

This is the first INPUT sheet, in which the user has to introduce his own available data. The basic menu of this spreadsheet is the following one:

ITEM	EXPLANATION
Input or Change Data	Input or change the independent variables of the model
Print Data	Print the input data
Continue	Continue with data collection sheets referring to the applied emission factors
Quit	Return to the beginning

The required data are :

● The FIRST INPUT DATA that the user has to type in is the total number of vehicles for every vehicle category. After typing the number of vehicles of one vehicle category, the user has to check that the typed number is correct. In case of mistake, the user can simply overtype the correct number.

● The SECOND INPUT DATA that the user has to type in is the total annual mileage per vehicle (for each vehicle category), in kilometres.

● The THIRD INPUT DATA that has to be typed in is the mileage distribution per vehicle (percentage) for urban - rural - highway road class. That means that the user has to type the percentage of kilometres that one vehicle of each vehicle category, runs on urban roads, rural roads and highways(*).

● The FOURTH INPUT DATA that has to be typed in is the vehicle speed, in kilometres per hour, considered as representative for urban, rural and highway road class. That means that the user has to type the representative speed [km/h] in which one vehicle, of each vehicle category, runs on urban roads, rural roads and highways.

● The FIFTH INPUT DATA is the share of the cold start emissions that is emitted in urban, rural and highway road class [%]. This is not an obligatory input data, since it is calculated by the programme.

● The SIXTH INPUT DATA is the share of the evaporative emissions released in urban, rural and highway road class [%]. The user may by-pass this input data since there is a default distribution (80-10-10).

● The SEVENTH INPUT DATA is the portion of vehicles that are equipped with fuel injection [%].

● The EIGHTH INPUT DATA is the portion of the fuel injected vehicles that are equipped with evaporative control [%].

● The NINTH INPUT DATA is the portion of the carburettor equipped vehicles that are supplied with evaporative control [%].

● The TENTH INPUT DATA that has to be typed in is the total statistical fuel consumption, in kilotons. That means that the programme asks for:

        A. Gasoline consumption
        B. Diesel consumption
        C. LPG consumption

(*) The programme checks that in each case (row) the sum of the percentages equals 100%. In case it does not, an error message appears on the screen.

for each vehicle category separately and as totals as well. These data are not absolutely required for the calculations, but they can be used in order to balance calculated and statistical consumptions. Moreover, if they are input, they can be used by the programme for the calculation of Lead and SO_2 emissions.

● The ELEVENTH INPUT DATA is a set of individual fuel specifications. These are, both for gasoline and diesel, the following ones:

Market Share [%][*)
Lead Content (for gasoline) [g/l]
Sulphur Content (for diesel) [% by weight]
Ratio H/C [-]

III.2.3. Data Collection Sheet II (DCSII)

This spreadsheet asks for the introduction of emission factors for all the already mentioned pollutants as well as for fuel consumption, both for road and for off road traffic, in [g/km] per vehicle category, for urban, rural and highway driving.

In fact, this "spreadsheet" consists of nine different spreadsheets.

These spreadsheets have the same structure and give the user the same facilities. "Facilities" means that the user is allowed either to introduce his own data (if these are available) or to use the CORINAIR emission and consumption factors, which are directly calculated (based on the already introduced data in Data Collection Sheet I) and they are considered as default values. It is self-evident that a combination between national data and CORINAIR data is also possible.

The main menu of these spreadsheets is the following one:

ITEM	EXPLANATION
Input Own Data	Input own emission factors (OPTIONAL)
Print Data	Print either own or CORINAIR emission factors
Continue	Continue with the rest data collection sheets referring to the applied emission factors
Quit	Return to the beginning of COPERT

(*) The programme checks again that in each case (column) the sum of market shares per fuel (percentages) equals 100%. In case it does not, an error message appears on the screen.

III.2.4. Data Collection Sheet III (DCSIII)

The aim of this spreadsheet is to collect all the required data in order to calculate the cold start emissions. The main menu of this file is the following one:

ITEM	EXPLANATION
Input or Change Data	Input or change the average maximum and minimum monthly temperature, the e^{cold}/e^{hot} factors, trip length, factors beta and Reid Vapour Pressure (RVP)
Print Input Data	Print each one of the introduced input data of this specific file
Continue	Continue with data collection sheet referring to the evaporative emissions
Quit	Return to the beginning

The first obligatory step of this spreadsheet is the introduction of the average maximum and minimum temperature per month. On completion and following the instructions on the screen the user will have the chance to see the calculated (temperature dependent) e^{cold}/e^{hot} factors per month for NOx, CO, VOC, fuel consumption, valid for the passenger cars (gasoline diesel and LPG) and TPM (for diesel passenger cars). The programme offers the possibility of introducing own estimations for these factors (OPTIONAL). The third step of this spreadsheet is the introduction of the average trip length [km] (OBLIGATORY) and the definition of the introduced number either as estimated or as measured. The fourth and final step is the introduction of the estimated factor beta per month (OPTIONAL, since the user at the same time is able to navigate and see the proposed- default- factors by CORINAIR) and the introduction of the Reid Vapour Pressure (OBLIGATORY) in [kPa].

III.2.5. Data Collection Sheet IV (DCSIV)

This spreadsheet deals with the data referring to the calculation of the evaporative emissions. The main menu of this file is the following one:

ITEM	EXPLANATION
Input or Change Data	Input or change the emission factors for evaporative emissions (OPTIONAL)
Continue	Continue with the calculations
Quit	Return to the beginning of COPERT

This file introduces the calculated emissions factors for the evaporative emissions according to the recommended methodology. The user is, once more, able to introduce his own estimations for these emission factors.

III.3. Calculations

III.3.1. Choice Spreadsheet (CHOICE)

This spreadsheet is the introductory for the calculation of total fuel consumption and further of total emissions. At the beginning, the user is informed that there are two major available options, according to the different sets of data:

1. Calculation based on CORINAIR data (default values)

2. Calculation based on OWN (national) data that were introduced by the user in the relevant Data Collection Sheets.

and unquestionably the combinations between the individual parameters which give, in total a considerable number of different sets of independent variables.

ATTENTION   There is no point in choosing YOUR OWN DATA, in case that no national data were introduced, because the results will be totally unreliable.

SUGGESTION   If the user has introduced his OWN DATA for fuel consumption and emission factors, then he is urged to run the programme twice, with both CORINAIR and OWN DATA for comparison reasons.

If the user wishes to proceed to the calculations he has to choose CONTINUE from the main ·menu of this file. This will lead him to either the calculation of the Total Fuel Consumption or to the calculation of the Total Emissions, according to his choice. If his choice is Fuel Consumption then the programme will continue with the calculation and the presentation of the Total Fuel Consumption. If he chooses Total Emissions he will have to go through the following menu:

```
NOx
CO
NM-VOC
CH4
TPM
N2O
NH3
LEAD
CO2
SO2
OFF ROAD VEHICLES
SUMMARY
```

If the user wishes to return to the beginning of COPERT, he has to choose QUIT from the main menu of this spreadsheet.

III.3.2. Calculation of Total Fuel Consumption

At this point all the calculations concerning the total calculated fuel consumption have been completed. It is now up to the user to decide in order to either to continue with the calculation of the emissions or return to the input data again to change the "soft" input parameters, in order to better match calculated and input fuel consumptions for some or all categories. The following message on the screen reminds the user this possibility :

```
SUGGESTION:  FOR IMPROVEMENT OF THE
DIFFERENCE BETWEEN STATISTICAL INPUT
AND CALCULATIONS, RETURN TO THE
BEGINNING (CHOOSE QUIT)
```

III.3.3. Calculation of Total Emissions

There are separate files for each pollutant (but as they all have the same structure there will not be an individual description for each one of them) which have the following main menu:

ITEM	EXPLANATION
Continue	Continue with the calculations
View at	View at the results in various forms (Hot - Cold Start, Urban - Rural - Highway)
Print	Print the total emissions, the hot start and the cold start emissions
Graph	View at pie graphs describing the emissions per kind of fuel, per driving mode, per vehicle type, and per hot - cold start
Quit	Return to the beginning of the calculations

III.3.4. Summary Spreadsheet (SUMMARY)

At the beginning of this spreadsheet the programme displays the following menu, at the top of the screen:

ITEM	EXPLANATION
End	Terminate the execution of the entire programme and return to DOS
View at	View at the summary results per pollutant as required by CORINAIR, in [g/kg fuel] and in [g/km] per pollutant and per kind of fuel
Print	Print the summary results per pollutant as required by CORINAIR, in [g/kg fuel] and in [g/km] per pollutant and per kind of fuel
Quit	Return to the beginning of the calculations

This spreadsheet summarizes all the calculated emissions and presents the results in [g/kg fuel], according to CORINAIR nomenclature. Additionally, COPERT offers the user the possibility to have the same results expressed in [g/km]. These two options are offered for the three different fuels, gasoline, diesel and LPG.

Finally, the programme produces two ASCII output files per pollutant and per kind of fuel (containing the emission factors in [g/kg fuel] and in [g/km]). These files, together with the output files for total fuel consumption and mileage driven, are to be further used as a direct input to the main CORINAIR software. They are produced

either when selecting QUIT or END in the SUMMARY spreadsheet and they are entitled as follows (with the extension **PRN**):

ITEM	GASOLINE		DIESEL		LPG	
	g/kg fuel	g/km	g/kg fuel	g/km	g/kg fuel	g/km
NOx	NOXGAS	NOXKMG	NOXDSL	NOXKMD	NOXLPG	NOXKML
CO	COGAS	COKMG	CODSL	COKMD	COLPG	COKML
NM-VOC	NMVOCGAS	NMVOCKMG	NMVOCDSL	NMVOCKMD	NMVOCLPG	NMVOCKML
CH4	CH4GAS	CH4KMG	CH4DSL	CH4KMD	CH4LPG	CH4KML
TPM			TPMDSL	TMPKMD		
N2O	N2OGAS	N2OKMG	N2ODSL	N2OKMD	N2OLPG	NO2KML
NH3	NH3GAS	NH3KMG	NH3DSL	NH3KMD	NH3LPG	NH3KML
LEAD	LEADGAS	LEADKMG				
CO2	CO2GAS	CO2KMG	CO2DSL	CO2KMD	CO2LPG	CO2KML
SO2	SO2GAS	SO2KMG	SO2DSL	SO2KMD		
EVAP.	EVAGAS	EVAKMG				
Fuel Cons	FCG		FCD		FCL	
Mileage	KMG		KMD		KML	

An example on the content of the above mentioned files is given below. It has to be noted that each file contains only the numbers in bold:

NOx Emissions [g/kg fuel]	GERMANY		1990
File NOXGAS.PRN	URBAN	RURAL	HIGHWAY
Passenger Cars	**22.516**	**46.546**	**50.594**
Light Duty Vehicles	**20.566**	**40.000**	**50.196**
Heavy Duty Vehicles	**20.000**	**75.000**	**45.455**
Motorcycles < 50cc	**2.778**	**2.778**	
Motorcycles > 50cc	**7.849**	**7.849**	**7.849**

NOx Emissions [g/kg fuel]	GERMANY		1990
File NOXDSL.PRN	URBAN	RURAL	HIGHWAY
Passenger Cars	**11.412**	**15.239**	**14.801**
Light Duty Vehicles	**14.144**	**17.647**	**19.608**
Heavy Duty Vehicles	**39.649**	**40.586**	**40.668**

NOx Emissions [g/kg fuel]	GERMANY		1990
File NOXLPG.PRN	URBAN	RURAL	HIGHWAY
Passenger Cars	**26.500**	**58.474**	**52.884**

IV. Useful Hints

IV.1. First execution of the programme

The authors recommend the user to study the papers which show the form of the DATA COLLECTION SHEETS. The user should try to collect all the data referred to in these spreadsheets, write them down on a photocopy of each D.C.S. and then begin the operation of the programme.

IV.2. Repeated execution of the programme.

In case that the user wishes to recalculate one specific emission because, either the results are not satisfactory or he wishes to examine the influence of one (or more) specific data to the results, he has to proceed as follows :

A.   Return to the DATA.WK1.

B.   Choose CONTINUE from the main menu.

C.   Select the suitable DCS (which contains the input data that are going to be changed) from the submenu which is displayed at the top of the screen.

D.   The already described steps will lead to the selected DCS, where the user has to choose INPUT OR CHANGE DATA from the main menu. Then he is able to change the data that he wishes to change.

E.   On completion of the CHANGE DATA procedure, the user has to choose QUIT from the main menu of the specific DCS. This will lead to the DATA.WK1 file again.

F.   Choose CONTINUE and CALCULATIONS from the main menu of the DATA.WK1. This will lead to the CHOICE spreadsheet, where there is access to the calculation procedures.

G.   Choose the procedure whose results are supposed to be changed because of the revised data.

IMPORTANT REMARK: The authors would like to remind the user that the displayed results on the Total Emissions files, are the results from the LATEST execution of the programme.

IV.3. QUIT and EXIT

These are the most often used commands in the files of COPERT and it is considered that they need a further explanation.

A. EXIT: This command is used only in submenus and leads to the previous menu of the specific file.

B. QUIT: This command helps to find the reverse route through the programme.

IV.4. Quick Start

It is assumed that the user has installed in his PC, which has to meet the requirements outlined in the manual (Chapter I), the entire programme.

He may by pass all the introductory messages of COPERT if he proceed as follows (it is supposed that the screen has the prompt **C:\\>**):

A. Type **cd\cop** and press <ENTER>

B. Type **123** and press <ENTER>

After the above simple steps COPERT will start automatically.

IV.5. Troubleshooting

(1)

There is a possibility for some users to fail entering the LOTUS 123 spreadsheets of COPERT (after the introductory screen) and to arrive in a blank spreadsheet. At this point the authors would like to mention that this problem has nothing to do with the programme. It is caused from the different installation of LOTUS 123.

In this case the following procedure will solve the problem:

● Press <slash> (/). The Main LOTUS Menu appears at the top of the screen.

● Select **Fife**, press <ENTER>

● Select **Directory**, press <ENTER>

● Type **c:\cop**, press <ENTER>

● Press <slash>

● Select **File**, press <ENTER>

● Select **Retrieve**, press<ENTER>

● Select **AUTO123.WK1**, press <ENTER>

And COPERT will start automatically.

(2)

In order to avoid memory problems, it is generally recommeded routines to disable the UNDO function of LOTUS 123 and store it into the 123.SET file, before running the COPERT. To this aim:

● In the main LOTUS 123 Menu choose **Worksheet**

● Then choose the following in sequence:

Global - Default - Other - Undo - Disable - Update - Quit

ANNEX I
COPERT Flow-Chart
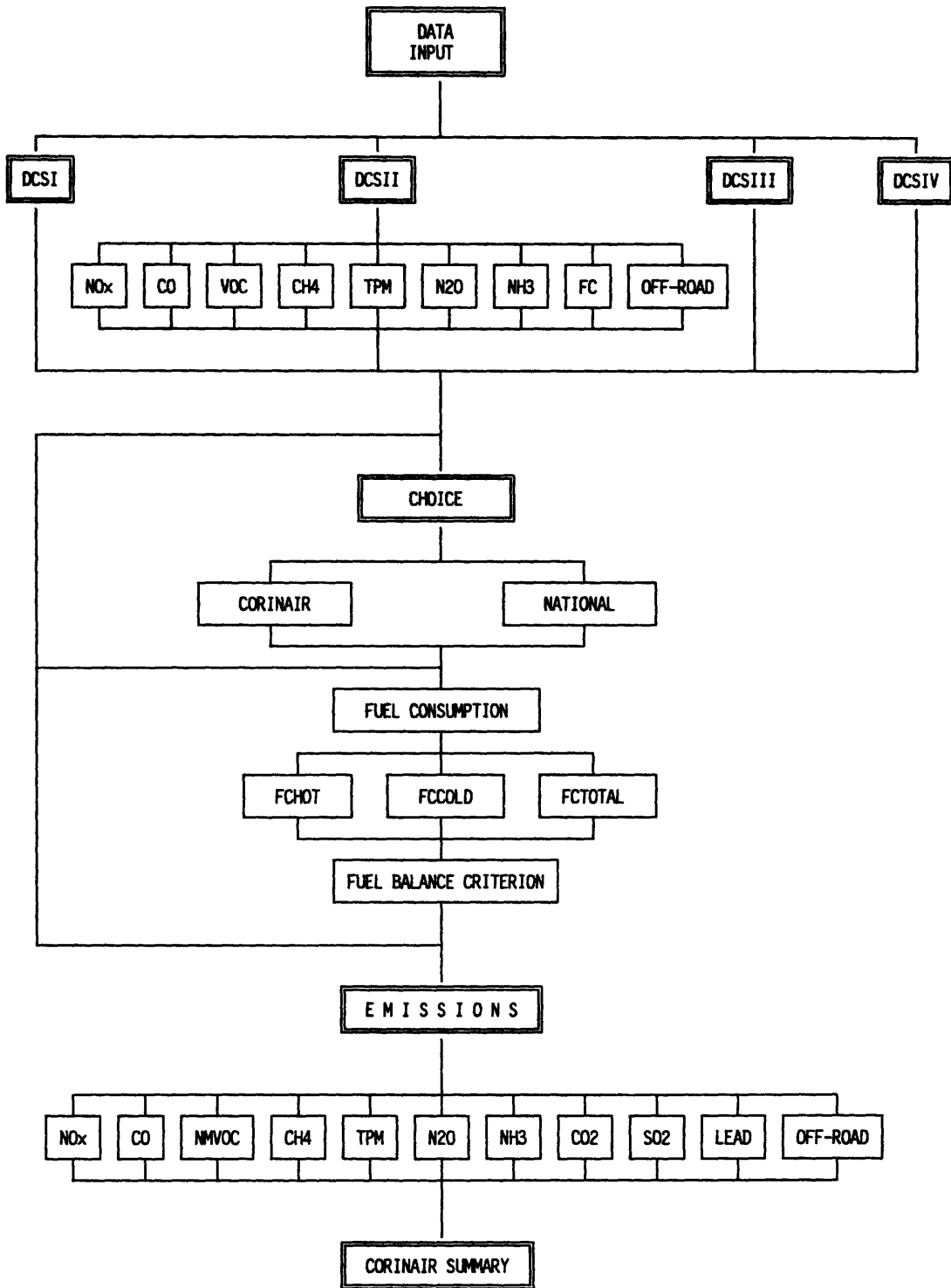
ANNEX II

Data Collection Sheets

Note:

In the following, the cells marked with an asterisk (*)
designate the minimum required data.

Data Collection Sheet	Total statistical fuel consumption [kt]	Total number of vehicles	Total annual mileage per vehicle [Km]	Mileage distribution [%]			Vehicle speed [km/h] considered as representative for road class		
				Urban	Rural	Highway	Urban	Rural	Highway
PASSENGER CARS									
Gasoline < 1.4 l									
PRE ECE		* * * * *	* * * * *	* * * *	* * * * * *	* * * *	* * * * *	* * * * *	* * * * *
ECE 15/00-01		* * * * *	* * * * *	* * * *	* * * * * *	* * * *	* * * * *	* * * * *	* * * * *
ECE 15/02		* * * * *	* * * * *	* * * *	* * * * * *	* * * *	* * * * *	* * * * *	* * * * *
ECE 15/03		* * * * *	* * * * *	* * * *	* * * * * *	* * * *	* * * * *	* * * * *	* * * * *
ECE 15/04		* * * * *	* * * * *	* * * *	* * * * * *	* * * *	* * * * *	* * * * *	* * * * *
Improved Conventional		* * * * *	* * * * *	* * * *	* * * * * *	* * * *	* * * * *	* * * * *	* * * * *
Open Loop		* * * * *	* * * * *	* * * *	* * * * * *	* * * *	* * * * *	* * * * *	* * * * *
Closed Loop		* * * * *	* * * * *	* * * *	* * * * * *	* * * *	* * * * *	* * * * *	* * * * *
Gasoline 1.4 - 2.0 l									
PRE ECE		* * * * *	* * * * *	* * * *	* * * * * *	* * * *	* * * * *	* * * * *	* * * * *
ECE 15/00-01		* * * * *	* * * * *	* * * *	* * * * * *	* * * *	* * * * *	* * * * *	* * * * *
ECE 15/02		* * * * *	* * * * *	* * * *	* * * * * *	* * * *	* * * * *	* * * * *	* * * * *
ECE 15/03		* * * * *	* * * * *	* * * *	* * * * * *	* * * *	* * * * *	* * * * *	* * * * *
ECE 15/04		* * * * *	* * * * *	* * * *	* * * * * *	* * * *	* * * * *	* * * * *	* * * * *
Improved Conventional		* * * * *	* * * * *	* * * *	* * * * * *	* * * *	* * * * *	* * * * *	* * * * *
Open Loop		* * * * *	* * * * *	* * * *	* * * * * *	* * * *	* * * * *	* * * * *	* * * * *
Closed Loop		* * * * *	* * * * *	* * * *	* * * * * *	* * * *	* * * * *	* * * * *	* * * * *
Gasoline > 2.0 l									
PRE ECE		* * * * *	* * * * *	* * * *	* * * * * *	* * * *	* * * * *	* * * * *	* * * * *
ECE 15/00-01		* * * * *	* * * * *	* * * *	* * * * * *	* * * *	* * * * *	* * * * *	* * * * *
ECE 15/02		* * * * *	* * * * *	* * * *	* * * * * *	* * * *	* * * * *	* * * * *	* * * * *
ECE 15/03		* * * * *	* * * * *	* * * *	* * * * * *	* * * *	* * * * *	* * * * *	* * * * *
ECE 15/04		* * * * *	* * * * *	* * * *	* * * * * *	* * * *	* * * * *	* * * * *	* * * * *
Closed Loop		* * * * *	* * * * *	* * * *	* * * * * *	* * * *	* * * * *	* * * * *	* * * * *
Diesel									
CC < 2.0 l		* * * * *	* * * * *	* * * *	* * * * * *	* * * *	* * * * *	* * * * *	* * * * *
CC > 2.0 l		* * * * *	* * * * *	* * * *	* * * * * *	* * * *	* * * * *	* * * * *	* * * * *
L P G		* * * * *	* * * * *	* * * *	* * * * * *	* * * *	* * * * *	* * * * *	* * * * *
2-stroke		* * * * *	* * * * *	* * * *	* * * * * *	* * * *	-----------------------		
LIGHT DUTY VEHICLES									
Gasoline		* * * * *	* * * * *	* * * *	* * * * *	* * * *			
Diesel		* * * * *	* * * * *	* * * *	* * * * *	* * * *			
HEAVY DUTY VEHICLES									
Gasoline Veh. > 3.5 t		* * * * *	* * * * *	* * * *	* * * * *	* * * *			
Diesel Veh. 3.5 - 16 t		* * * * *	* * * * *	* * * *	* * * * *	* * * *			
Diesel Veh. > 16 t		* * * * *	* * * * *	* * * *	* * * * *	* * * *			
MOTORCYCLES									
< 50 cm^3		* * * * *	* * * * *	* * * *	* * * * *	* * * *			
> 50 cm^3 2 stroke		* * * * *	* * * * *	* * * *	* * * * *	* * * *			
> 50 cm^3 4 stroke		* * * * *	* * * * *	* * * *	* * * * *	* * * *			
TOTAL GASOLINE									
TOTAL DIESEL									
TOTAL LPG									

Data Collection Sheet I	Distribution of the cold start emissions [%] (OPTIONAL)			Distribution of evaporative emissions [%] (OPTIONAL)		
	Urban	Rural	Highway	Urban	Rural	Highway
PASSENGER CARS						
Gasoline < 1.4 l						
PRE ECE						
ECE 15/00-01						
ECE 15/02						
ECE 15/03						
ECE 15/04						
Improved Conventional						
Open Loop						
Closed Loop						
Gasoline 1.4 - 2.0 l						
PRE ECE						
ECE 15/00-01						
ECE 15/02						
ECE 15/03						
ECE 15/04						
Improved Conventional						
Open Loop						
Closed Loop						
Gasoline > 2.0 l						
PRE ECE						
ECE 15/00-01						
ECE 15/02						
ECE 15/03						
ECE 15/04						
Closed Loop						
Diesel						
CC < 2.0						
CC > 2.0						
L P G						
2-stroke						
LIGHT DUTY VEHICLES						
Gasoline						
Diesel						
HEAVY DUTY VEHICLES						
Gasoline Veh. > 3.5 t						
Diesel Veh. 3.5 - 16 t						
Diesel Veh. > 16 t						
MOTORCYCLES						
< 50 cm^3						
> 50 cm^3 2 stroke						
> 50 cm^3 4 stroke						

Data Collection Sheet I	Portion of vehicles equipped with fuel injection [%]	Portion of fuel injected vehicles equipped with evaporative control [%]	Portion of carburetor equipped vehicles with evaporative control [%]
PASSENGER CARS			
Gasoline < 1.4 l			
PRE ECE			
ECE 15/00-01			
ECE 15/02			
ECE 15/03			
ECE 15/04			
Improved Conventional.			
Open Loop			
Closed Loop			
Gasoline 1.4 - 2.0 l			
PRE ECE			
ECE 15/00-01			
ECE 15/02			
ECE 15/03			
ECE 15/04			
Improved Conventional			
Open Loop			
Closed Loop			
Gasoline > 2.0 l			
PRE ECE			
ECE 15/00-01			
ECE 15/02			
ECE 15/03			
ECE 15/04			
Closed Loop			
Diesel			
CC < 2.0 l			
CC > 2.0 l			
L P G			
2-stroke			
LIGHT DUTY VEHICLES			
Gasoline			
Diesel			
HEAVY DUTY VEHICLES			
Gasoline Veh. > 3.5 t			
Diesel Veh. 3.5 - 16 t			
Diesel Veh. > 16 t			
MOTORCYCLES			
< 50 cm^3			
> 50 cm^3 2 stroke			
> 50 cm^3 4 stroke			

FUEL SPECIFICATIONS	Market Share	Lead content	Sulphur content	Ratio H/C
GASOLINE	[%]	[g/l]	[w%]	[-]
Leaded 1	* * * *	* * * *	* * *	* * *
Leaded 2	* * * *	* * * *	* * *	* * *
Leaded 3	* * * *	* * * *	* * *	* * *
Unleaded 1	* * * *	* * * *	* * *	* * *
Unleaded 2	* * * *	* * * *	* * *	* * *
DIESEL				
Diesel 1	* * * *	------	* * *	* * *
Diesel 2	* * * *	------	* * *	* * *

DATA COLLECTION SHEET FOR .... EMISSION FACTORS [g/km]			
		CORINAIR DATA	
	URBAN DRIVING	RURAL DRIVING	HIGHWAY DRIVING
PASSENGER CARS			
Gasoline < 1.4 l			
PRE ECE			
ECE 15/00-01			
ECE 15/02			
ECE 15/03			
ECE 15/04			
Improved Conventional			
Open Loop			
Closed Loop			
Gasoline 1.4 - 2.0 l			
PRE ECE			
ECE 15/00-01			
ECE 15/02			
ECE 15/03			
ECE 15/04			
Improved Conventional			
Open Loop			
Closed Loop			
Gasoline > 2.0 l			
PRE ECE			
ECE 15/00-01			
ECE 15/02			
ECE 15/03			
ECE 15/04			
Closed Loop			
Diesel			
CC < 2.0 l			
CC > 2.0 l			
L P G			
2-stroke			
LIGHT DUTY VEHICLES			
Gasoline			
Diesel			
HEAVY DUTY VEHICLES			
Gasoline Veh. > 3.5 t			
Diesel Veh. 3.5 - 16 t			
Diesel Veh. > 16 t			
MOTORCYCLES			
< 50 cm^3			
> 50 cm^3 2 stroke			
> 50 cm^3 4 stroke			

OFF ROAD	Total statistical fuel consumption [kt]	Total number of vehicles (OPTIONAL)
Agriculture Forestry Industry Military	* * * * * * * * * * * * * * * * * * * *	
CO EMISSION FACTORS [g/kg fuel]	CORINAIR	OWN
Agriculture Forestry Industry Military		
NOx EMISSION FACTORS [g/kg fuel]	CORINAIR	OWN
Agriculture Forestry Industry Military		
VOC EMISSION FACTORS [g/kg fuel]	CORINAIR	OWN
Agriculture Forestry Industry Military		
TPM EMISSION FACTORS [g/kg fuel]	CORINAIR	OWN
Agriculture Forestry Industry Military		
CH4 EMISSION FACTORS [g/kg fuel]	CORINAIR	OWN
Agriculture Forestry Industry Military		
N2O EMISSION FACTORS [g/kg fuel]	CORINAIR	OWN
Agriculture Forestry Industry Military		
NH3 EMISSION FACTORS [g/kg fuel]	CORINAIR	OWN
Agriculture Forestry Industry Military		

DATA COLLECTION SHEET III	Average Monthly Minimum Temperature	Average Monthly Maximum Temperature
	$Tmin(i)$	$Tmax(i)$
MONTH OF THE YEAR		
January	* * * * *	* * * * *
February	* * * * *	* * * * *
March	* * * * *	* * * * *
April	* * * * *	* * * * *
May	* * * * *	* * * * *
June	* * * * *	* * * * *
July	* * * * *	* * * * *
August	* * * * *	* * * * *
September	* * * * *	* * * * *
October	* * * * *	* * * * *
November	* * * * *	* * * * *
December	* * * * *	* * * * *

DATA COLLECTION SHEET III

MONTH OF THE YEAR	e(cold)/e(hot) per month NOx (GASOLINE closed loop) CORINAIR DATA (DEFAULT)	OWN DATA (OPTIONAL)	e(cold)/e(hot) per month CO (GASOLINE closed loop) CORINAIR DATA (DEFAULT)	OWN DATA (OPTIONAL)	e(cold)/e(hot) per month VOC (GASOLINE closed loop) CORINAIR DATA (DEFAULT)	OWN DATA (OPTIONAL)	e(cold)/e(hot) per month FC (GASOLINE closed loop) CORINAIR DATA (DEFAULT)	OWN DATA (OPTIONAL)
January								
February								
March								
April								
May								
June								
July								
August								
September								
October								
November								
December								

DATA COLLECTION SHEET III	e(cold)/e(hot) per month NOx (DIESEL vehicles) CORINAIR		e(cold)/e(hot) per month CO (DIESEL vehicles) CORINAIR		e(cold)/e(hot) per month VOC (DIESEL vehicles) CORINAIR		e(cold)/e(hot) per month PM (DIESEL vehicles) CORINAIR		e(cold)/e(hot) per month FC (DIESEL vehicles) CORINAIR	
MONTH OF THE YEAR	DATA (DEFAULT)	DATA (OPTIONAL)	DATA (DEFAULT)	DATA (OPTIONAL)	DATA (DEFAULT)	DATA (OPTIONAL)	DATA (DEFAULT)	DATA (OPTIONAL)	DATA (DEFAULT)	DATA (OPTIONAL)
January										
February										
March										
April										
May										
June										
July										
August										
September										
October										
November										
December										

DATA COLLECTION SHEET III

MONTH OF THE YEAR	e(cold)/e(hot) per month NOx (LPG vehicles)		e(cold)/e(hot) per month CO (LPG vehicles)		e(cold)/e(hot) per month VOC (LPG vehicles)		e(cold)/e(hot) per month FC (LPG vehicles)	
	CORINAIR DATA (DEFAULT)	OWN DATA (OPTIONAL)	CORINAIR DATA (DEFAULT)	OWN DATA (OPTIONAL)	CORINAIR DATA (DEFAULT)	OWN DATA (OPTIONAL)	CORINAIR DATA (DEFAULT)	OWN DATA (OPTIONAL)
January								
February								
March								
April								
May								
June								
July								
August								
September								
October								
November								
December								

DATA COLLECTION SHEET III	Cold Mileage Percentage (Factor Beta per month) CORINAIR OWN DATA DATA (DEFAULT) (OPTIONAL)		Reid Vapour Pressure (per month) [kPa]
MONTH OF THE YEAR			
January			* * * *
February			* * * *
March			* * * *
April			* * * *
May			* * * *
June			* * * *
July			* * * *
August			* * * *
September			* * * *
October			* * * *
November			* * * *
December			* * * *

Average Trip Length (ANNUAL) (you have to state if this is an estimated or measured value)
l(trip) [km]
Type l(trip) =   * * * *
Please state if the above typed value is: 1. Estimated 2. Measured
Type <1> or <2>...........   * * * *

DATA COLLECTION SHEET IV

Emission Factors for Evaporative Emissions

Emission Factors for Evaporative Emissions VEHICLE CATEGORY	Diurnal (Uncontrolled) CORINAIR (DEFAULT) e(d) [g/day]	Diurnal (Uncontrolled) OWN DATA (OPTIONAL) e(d) [g/day]	Diurnal (Controlled) CORINAIR (DEFAULT) e(d) [g/day]	Diurnal (Controlled) OWN DATA (OPTIONAL) e(d) [g/day]
PASSENGER CARS Conventional				
PASSENGER CARS Closed Loop				
Gasoline LIGHT DUTY VEHICLES				
Two Wheelers < 50 cm^3				
Two Wheelers > 50 cm^3 2-S				
Two Wheelers > 50 cm^3 4-S				

DATA COLLECTION SHEET IV

Emission Factors for Evaporative Emissions

Emission Factors for Evaporative Emissions VEHICLE CATEGORY	Hot Soak (Uncontrolled) (fuel injection) CORINAIR (DEFAULT) e(fi) [g/procedure]	Hot Soak (Uncontrolled) (fuel injection) OWN DATA (OPTIONAL) e(fi) [g/procedure]	Hot Soak (Controlled) (fuel injection) CORINAIR (DEFAULT) e(fi) [g/procedure]	Hot Soak (Controlled) (fuel injection) OWN DATA (OPTIONAL) e(fi) [g/procedure]
PASSENGER CARS Conventional				
PASSENGER CARS Closed Loop				
Gasoline LIGHT DUTY VEHICLES				
Two Wheelers < 50 cm^3				
Two Wheelers > 50 cm^3 2-S				
Two Wheelers > 50 cm^3 4-S				

DATA COLLECTION SHEET IV

Emission Factors for Evaporative Emissions

VEHICLE CATEGORY	Warm Running (Uncontrolled) CORINAIR (DEFAULT) e(r,warm) [g/km]	Warm Running (Uncontrolled) OWN DATA (OPTIONAL) e(r,warm) [g/km]	Warm Running (Controlled) CORINAIR (DEFAULT) e(r,warm) [g/km]	Warm Running (Controlled) OWN DATA (OPTIONAL) e(r,warm) [g/km]
PASSENGER CARS Conventional				
PASSENGER CARS Closed Loop				
Gasoline LIGHT DUTY VEHICLES				
Two Wheelers < 50 cm^3				
Two Wheelers > 50 cm^3 2-S				
Two Wheelers > 50 cm^3 4-S				

DATA COLLECTION SHEET IV

Emission Factors for Evaporative Emissions

VEHICLE CATEGORY	Hot Running (Uncontrolled) CORINAIR (DEFAULT) e(r,hot) [g/km]	Hot Running (Uncontrolled) OWN DATA (OPTIONAL) e(r,hot) [g/km]	Hot Running (Controlled) CORINAIR (DEFAULT) e(r,hot) [g/km]	Hot Running (Controlled) OWN DATA (OPTIONAL) e(r,hot) [g/km]
PASSENGER CARS Conventional				
PASSENGER CARS Closed Loop				
Gasoline LIGHT DUTY VEHICLES				
Two Wheelers < 50 cm^3				
Two Wheelers > 50 cm^3 2-S				
Two Wheelers > 50 cm^3 4-S				

Eastern Europe and the USSR

THE CHALLENGE OF FREEDOM

GILES MERRITT

The sparks of unrest that leapt from Berlin in November 1989 to Moscow's Red Square in August 1991 are firing an explosion of political and economic change. Out of the ashes of Communism is emerging the shape of a vast new European market-place stretching from the Atlantic to the Pacific.

In his fascinating account of Europe's fast-changing East-West relationships, Giles Merritt argues that a massive rescue operation must be mounted to ensure the success of these changes. The upheaval of Communism's collapse is 'The challenge of freedom'.

Written with the cooperation and support of the European Commission, this book sets out to identify the key policy areas where a new partnership is being forged between the countries of Eastern and Western Europe. It offers a privileged insight into the current thinking of European Community officials, politicians and industrial leaders, and analyses the factors that will determine whether the emerging market economies of Eastern Europe can truly be absorbed into a single European economy.
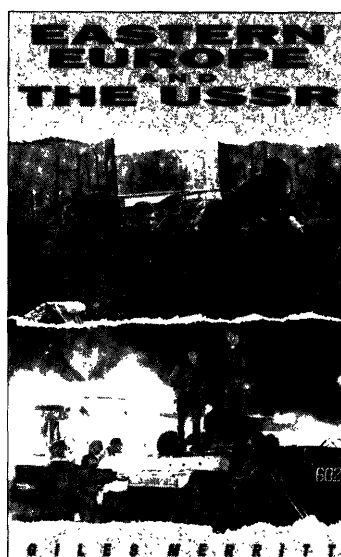
Immensely readable and often disturbing, this important book contains much up-to-date and hitherto unpublished information on such major East-West problem areas as energy, environmental control, immigration, trade relations, agriculture and investment. It also examines the arguments surrounding a 'Marshall Plan' for Eastern Europe that would emulate the famous US aid programme that helped relaunch the economies of Western Europe in the aftermath of World War II.

For anyone concerned about the future of Eastern Europe and the USSR, whether from a political, social or economic standpoint, this book is essential reading.

25/11/92

Bulletin
of the European
Communities

The *Bulletin of the European Communities*, which is issued 10 times a year (monthly, except for the January/February and July/August double issues), is an official reference publication covering all spheres of Community activity.

It is compact, easy to consult (with an index and copious references to the Official Journal and to previous issues), logically structured (to reflect the main fields of Community policy) and wholly reliable. The Bulletin is an essential reference tool, describing the passage of Community legislation through all its stages from presentation of a proposal by the Commission to final enactment by the Council.

Thanks to its topical commentaries on the month's major events, it provides the student of European integration and other interested readers with up-to-date and accurate information about the most recent developments in Community policy — the creation of a single market, economic and social integration, the Community's role in international affairs, etc.

Supplements to the Bulletin are published from time to time, containing important background material on significant issues of the day. Recent Supplements have covered German unification, the Commission's programme for 1992 and European industrial policy for the 1990s.

The Bulletin and its Supplements are produced by the Secretariat-General of the Commission, 200 rue de la Loi, B-1049 Brussels, in the nine official languages of the Community, and can be ordered from the Community sales agents.

COMMISSION OF THE EUROPEAN COMMUNITIES

National Implementing Measures

to give effect to the White Paper
of the Commission on the Completion
of the Internal Market

Situation at 30 April 1991
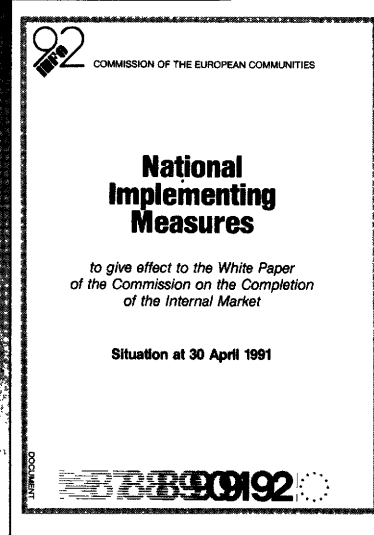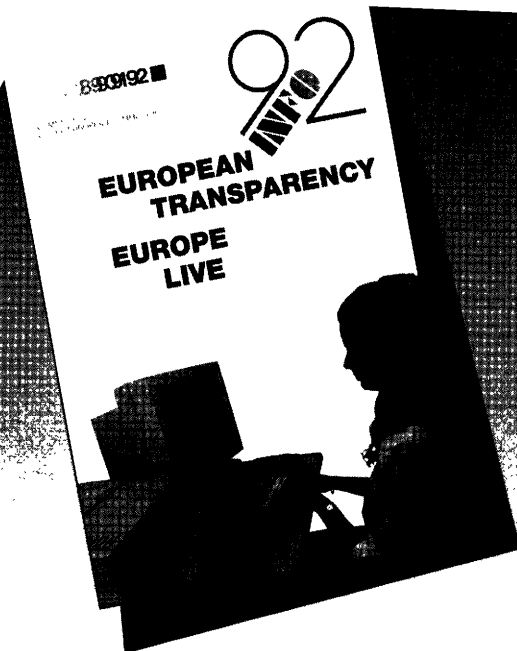
INFO92

The Community database focusing on the objectives and the social dimension of the single market

As a practical guide to the single market, INFO92 contains vital information for all those determined to be ready for 1992.

INFO92 is really a simple market scoreboard, recording the state of play on the stage-by-stage progress of Commission proposals up to their adoption by the Council, summarizing each notable development and placing it in context, and keeping track of the transposition of directives into Member States' national legislation.

Using INFO92 is simplicity itself. It can be consulted on-screen by means of a wide range of everyday equipment connected to specialized data-relay networks. Fast transmission, the virtually instant updating facility (several times a day, if necessary) and dialogue procedures requiring no prior training make INFO92 ideal for the general public as well as for business circles and the professions.

The system offers easy access to information thanks to the choice of menus available and to the logical presentation modelled on the structure of the *White Paper*, the *Social Charter* and the decision-making process within the institutions.

Enquiries may also be made to the Commission Offices in the Member States or – for small businesses – the Euro-Info Centres now open in all regions of the Community.

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DIRECTORY

OF COMMUNITY LEGISLATION IN FORCE
and other acts of the Community institutions

The Community's legal system is of direct concern to the individual citizen as much as to the Member States themselves.

Both lawyers and non-lawyers, then, need to be familiar not just with national law, but also with Community legislation, which is implemented, applied or interpreted by national law and in some cases takes precedence over it.

To make Community legislation more accessible to the public, the Commission of the European Communities publishes a Directory, updated twice a year, covering:

- binding instruments of secondary legislation arising out of the Treaties establishing the three Communities (regulations, decisions, directives, etc.);
- other legislation (internal agreements, etc.);
- agreements between the Communities and non-member countries.

Each entry in the Directory gives the number and title of the instrument, together with a reference to the Official Journal in which it is to be found. Any amending instruments are also indicated, with the appropriate references in each case.

The legislation is classified by subject matter. Instruments classifiable in more than one subject area appear under each of the headings concerned.

The Directory proper (Vol. I) is accompanied by two indexes (Vol. II), one chronological by document number and the other alphabetical by keyword.

The Directory is available in the nine official languages of the Community.
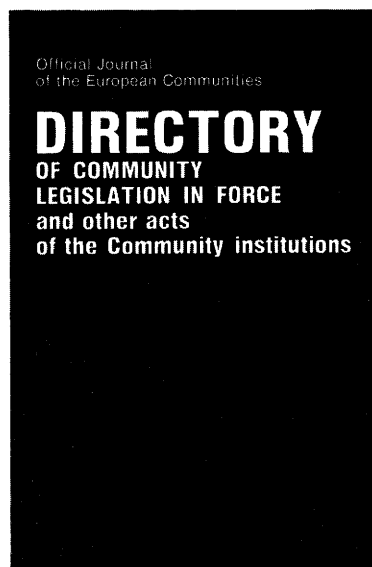
Official Journal
of the European Communities

DIRECTORY
OF COMMUNITY
LEGISLATION IN FORCE
and other acts
of the Community institutions

EUROPEAN
ECONOMY

European Economy appears four times a year, in March, May, July and November. It contains important reports and communications from the Commission to the Council and to Parliament on the economic situation and developments, as well as on the borrowing and lending activities of the Community. In addition, *European Economy* presents reports and studies on problems concerning economic policy.

Two supplements accompany the main periodical:

– Series A – 'Economic trends' appears monthly except in August and describes with the aid of tables and graphs the most recent trends of industrial production, consumer prices, unemployment, the balance of trade, exchange rates, and other indicators. This supplement also presents the Commission staff's macroeconomic forecasts and Commission communications to the Council on economic policy.

– Series B – 'Business and consumer survey results' gives the main results of opinion surveys of industrial chief executives (orders, stocks, production outlook, etc.) and of consumers (economic and financial situation and outlook, etc.) in the Community, and other business cycle indicators. It also appears monthly, with the exception of August.

Unless otherwise indicated, the texts are published under the responsibility of the Directorate-General for Economic and Financial Affairs of the Commission of the European Communities, 200 rue de la Loi, B-1049 Brussels, to which enquiries other than those related to sales and subscriptions should be addressed.

Subscription terms are shown on the back cover and the addresses of the sales offices are shown on the third page of the cover.
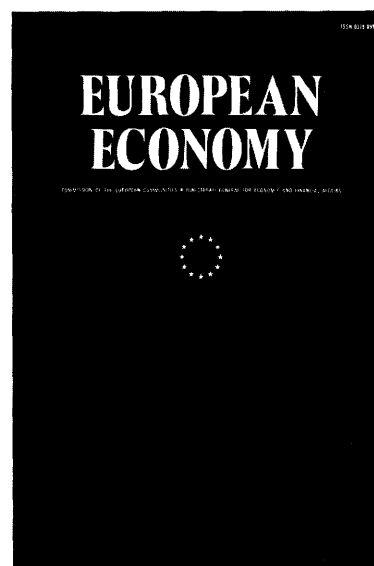
Success in business

depends on the decisions you make ...
which depend on the information you receive

Make sure that your decisions are based on information that is accurate and complete!

In a period of rapid adjustment, with national economies merging into a single European economy under the impetus of 1992, reliable information on the performance of specialized industry sectors is essential to suppliers, customers, bankers and policymakers.

Small and medium-sized enterprises, in particular, need easy access to information.

The market must be defined, measured and recorded. Information is needed on production capacities, bottlenecks, future developments, etc.
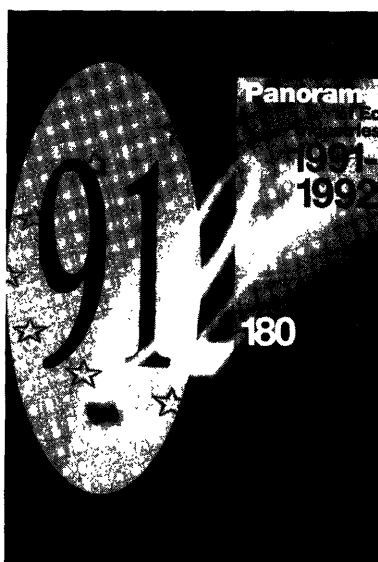
Panorama of EC industry 1991-1992
Current situation and outlook for 180 sectors
of manufacturing and service industries
in the European Community

SOCIAL
EUROPE

Social Europe, published by the Commission of the European Communities, Directorate-General for Employment, Industrial Relations and Social Affairs (DG V), Coordination and Information Policy Unit, deals with current social affairs in Europe.

The basic review appears three times a year. In addition, a number of supplements/files are published annually, each dealing in depth with a given subject.

ENERGY

A CHALLENGE FOR EUROPE AND THE WORLD

Since it first appeared in 1985 **Energy in Europe** has become recognized as an invaluable source of information on both the policy-making and the operational aspects of European Community energy policy. Subscribers include leaders of energy-consuming and energy-producing industries and other decision-makers in the private and public sectors, as well as major consultancies and research institutes in and outside the Community.

In the present situation within the Community, itself at the eve of the single market, and *vis-à-vis* the huge energy problems, as well as the potential, of our neighbours in Central and Eastern Europe and in the Commonwealth of Independent States, the energy sector is of the greatest strategic importance. An understanding of it is indispensable in many areas of economic activity. It also constitutes a crucial factor within a debate of truly global importance, namely the protection of the environment, including the global warming issue.

Energy in Europe continues to keep its readers abreast of the ongoing situation as regards overall policy, markets, energy planning, and the constant quest for cleaner and more efficient energy technology.

Market trends and perspectives are covered in **two regular issues** each year, and also in a **Short-term energy outlook** appearing in the first half of the year and an **Annual energy review** at the end of the year which includes the world energy situation by region including EC Member States, the short-term energy outlook for the Community, and a review of trends in main indicators over 10 years. Further **Special Issues** are also produced in connection with major developments or events, including international conferences on or relevant to the energy sector.

Energy in Europe appears in English but each issue also contains translations into French, German or Spanish of articles from the preceding issue.
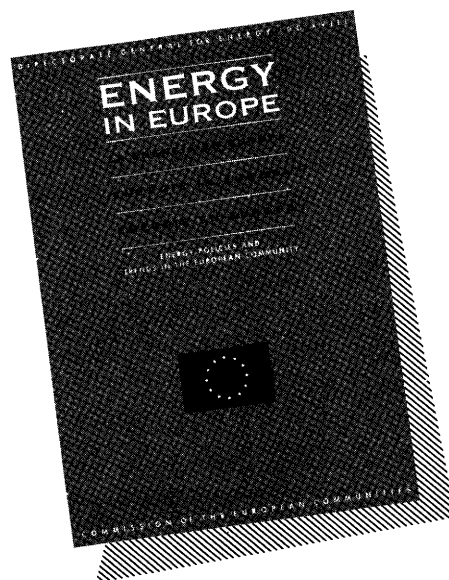
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