

10

WORKING
PAPER
SERIES

COSEPRE

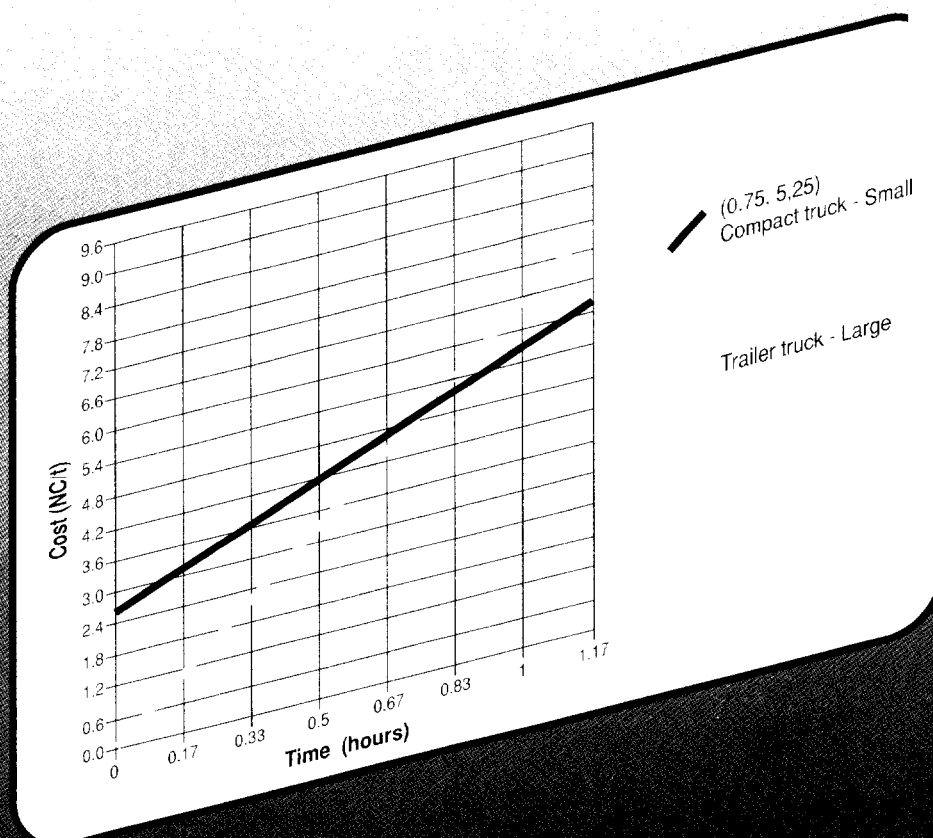
Costs of urban cleaning services

USER'S MANUAL

Version 1.0 - Windows 98

22022

February 2001



The World Bank
Urban Development
Infrastructure Group



Pan American Center for Sanitary Engineering
and Environmental Sciences
Division of Health and Environment
Pan American Health Organization
World Health Organization



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The World Bank



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COSEPRE AVAILABILITY

The COSEPRE manuals and software are available in printed version and diskettes at the following address:

The World Bank
Urban Development
MSN F4P-401
1818 H Street, N.W.
Washington, D.C., 20433
U.S.A.

The electronic version may be accessed on the following URL routes:

The World Bank: **<http://www.worldbank.org/urban/publicat/cosepre.html>**

CEPIS: **<ftp://ftp.cepis.org.pe/pub/cosepre>**

TABLE OF CONTENTS

PREFACE	v
1. INSTALLING THE COSEPRE SOFTWARE	1
1.1 Required hardware	1
1.2 Required software	1
1.3 Getting installed	1
2. STARTING COSEPRE	2
2.1 COSEPRE buttons	3
2.2 Getting help in COSEPRE	4
3. FILE	4
3.1 New	4
3.2 Open	5
3.3 Export to	6
3.4 Currency	6
3.5 Volume unit	7
3.6 Costing method	7
3.7 Services	8
3.8 Exit	8
3.9 Calculator	9
4. DATA	9
4.1 General data	9
5. TABLES	10
5.1 Uniform and safety equipment	11
5.2 Personnel	12
5.3 Equipment	13
5.4 Tools	14
5.5 Facilities	14
5.6 Fuel	15
5.7 Lubricant	16
6. SELECTED SERVICES	17
6.1 Personnel	18
6.2 Equipment	19
6.3 Tools	21

6.4	Facilities	21
6.5	Other expenses	22
7.	ADMINISTRATIVE AND FINANCIAL COSTS	23
8.	RESULTS	23
8.1	Annual cost per service	24
8.2	Overall annual cost	24
8.3	Unit cost per service	25
9.	ADDITIONAL TOOLS	25
9.1	Modification of terminology	25
9.2	Waste prediction	26
9.3	Cash flow	28
9.4	Graphs	29
9.4.1	Data entry	29
9.4.1.1	Large vehicles	30
	General data	30
	Operation costs of the transfer equipment	31
	Investment costs of the transfer station	31
	Operation costs of the transfer station	32
	Small vehicles	32
9.4.2	Graph generation	32
10.	HELP - F1	33

PREFACE

Managing the ever increasing volume of domestic, industrial, and commercial wastes is one of the greatest challenges that modern society has to face. In developing countries, the situation is even worse due to lack of grants for research targeted at solutions according to local realities. Moreover, models from countries with different conditions are brought into play by public cleaning designers and cleaning utilities often manage their limited financial means inadequately, without control, or insufficient knowledge of the resources that are being handled. All the above negatively affect the provision of urban cleaning services.

To help overcome these deficiencies, it is necessary to know the costs of each public cleaning service to identify those that are demanding more resources. In that way, a corrective policy to reduce costs while improving the quality of the services may be set up.

The COSEPRE program (costs of urban cleaning services, for its acronym in Spanish) allows the simulation of scenarios and facilitates the easy calculation of the annual and unit costs per service, based on information provided by the user. Besides the traditional services of manual and mechanical sweeping, collection, transfer and transportation, and final disposal, this new version analyzes the following services:

- cleaning of beaches, streets, and plazas
- maintenance of parks and gardens
- collection of containers and green waste
- treatment system: incineration, composting, and recycling
- any additional service defined by the user.

In addition to determine the costs of each service, the program examines the need for implementing a transfer station based on unit cost analyses and presents a cash flow for the installation of a sanitary landfill, estimating its useful life.

To complement this *User's manual*, the *COSEPRE Technical documentation* explains the technical issues that support the development of the software.

This version for Windows 98 has incorporated useful feedback comments. We encourage and welcome any suggestion that may help improve the COSEPRE software (webmaster@cepis.ops-oms.org).

Engineer Leandro Sandoval, PAHO/CEPIS Urban Solid Waste Adviser, was responsible for the development of the program and had the valuable contribution of Eng. Alvaro Cantanhede, PAHO/CEPIS Solid Waste Adviser and Eng. Francisco Zepeda, ex-coordinator of the HES/PAHO Program. CEPIS computer support was provided by engineers Luis Cobo and Carmen Alvino who collaborated in the programming. The validation of the program was in charge of Eng. Martha Gutiérrez.

1. INSTALLING THE COSEPRE SOFTWARE

The following requirements are necessary to install the version 1.0 for Windows 98 of the COSEPRE software.

1.1 Required hardware

- Compatible IBM PC, 486 DX4 or higher processor
- 16 MB of available RAM memory
- 15 MB of free space minimum (besides the space required for Windows 95 at least)
- Floppy disk drive
- VGA, 800x600 resolution monitor
- Mouse.

1.2 Required software

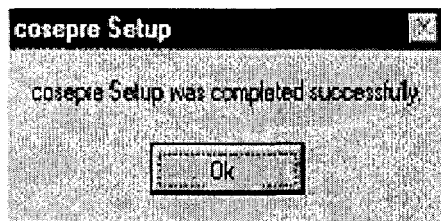
- Windows 95 or a higher version
- Five diskettes containing the COSEPRE software.

The user should enter the data required by the software to make the cost analyses, otherwise incoherent results may be obtained.

1.3 Getting installed

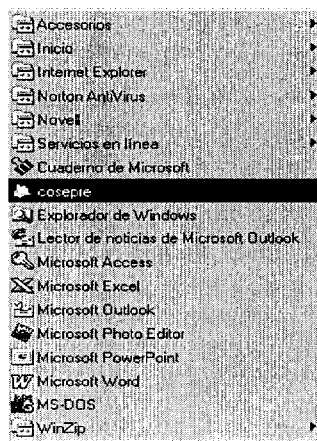
Follow these instructions:

- Insert diskette 1 in drive A
- Click *Start* from the taskbar and select *Execute*
- If *A:\Setup.exe* appears, click *Accept* to start the installation
- If *A:\Setup.exe* does not appear, click *Examine*, search drive A and select *Setup.exe* to start the installation
- Insert diskette 2 in drive A and follow the installation message
- Insert diskettes 3, 4 and 5 until the message *COSEPRE setup was completed successfully* appears.



2. STARTING COSEPRE

When COSEPRE is installed, an icon in *Programs* is created automatically. Every time you want to start the COSEPRE software, click the *Start* button in the taskbar at the bottom of your screen, point to *Programs*, and then double-click the COSEPRE icon. The following screen will appear:



Then, the presentation screen appears with the options *File* and *Help F1*.

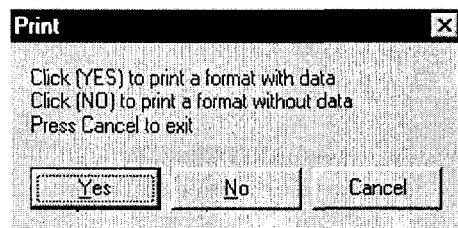


2.1 COSEPRE buttons

The different screens of COSEPRE have the following buttons:

- Add: click *Add* to save data entered into a table.
- Save: click the button *Save* to record new information typed in any text box.
- Edit: click the text box to be modified, type the correction, and then click the button *Edit*.
- Delete: click the text box to be deleted, then click the button *Delete*.
- Clear: click the text box to be cleared, then click the button *Clear*. All text boxes will be cleared, except the *Code* box. Once data have been cleared, enter the modifications and then click the button *Edit*.
- Print: click any of the two options:
 - Yes: to print a format with data
 - No: to print a format without data.

The following screen appears:



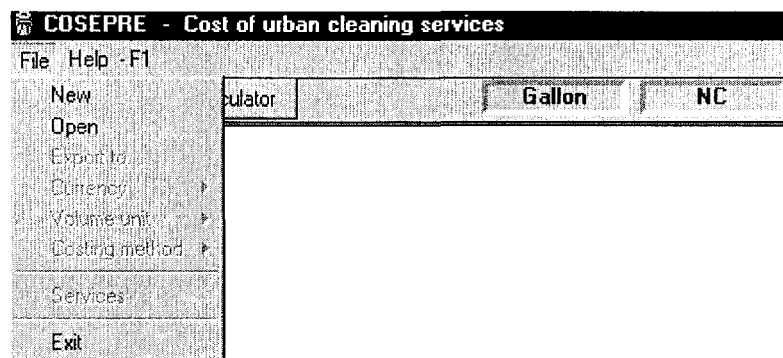
- Once you have selected *Yes* or *No*, a screen to select the printer appears. Select the printer, the number of copies to be printed, and then click *Accept*.
- Exit: click *Exit* to quit from the screen you have been working on.

2.2 Getting help in COSEPRE

To get help on how to input specific data, point with the mouse to the box you want further explanation and then press F1.

3. FILE

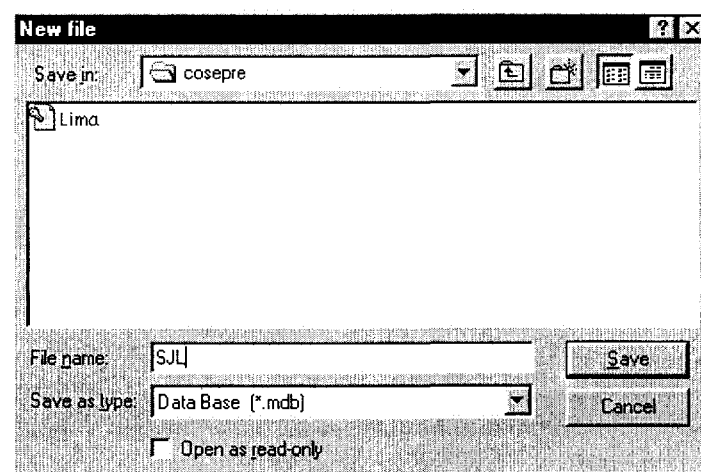
The option *File* enables you to create new files, to open existing files, and to close the COSEPRE software.



3.1 New

Point and double-click *New* with the mouse to create a new file.

When the option *New* is activated, the following screen appears.



In the box *File name* type the name of the new file and click the button *Save as type*:. Be advised not to modify the box *Save as type*; it should remain as shown in the screen.

Once the first COSEPRE file has been created, under *File* appears an icon to open new files and four boxes with the following information:

- the first box refers to the selected volume unit (gallon or liter);
- the second box indicates if the national currency (NC) or the American dollar (US\$) is being used;
- the third box indicates the selected costing method, i.e., the linear method;
- the fourth box indicates the name of the file you are working on.



3.2 Open

Enables you to open a file, to review it, or modify it.

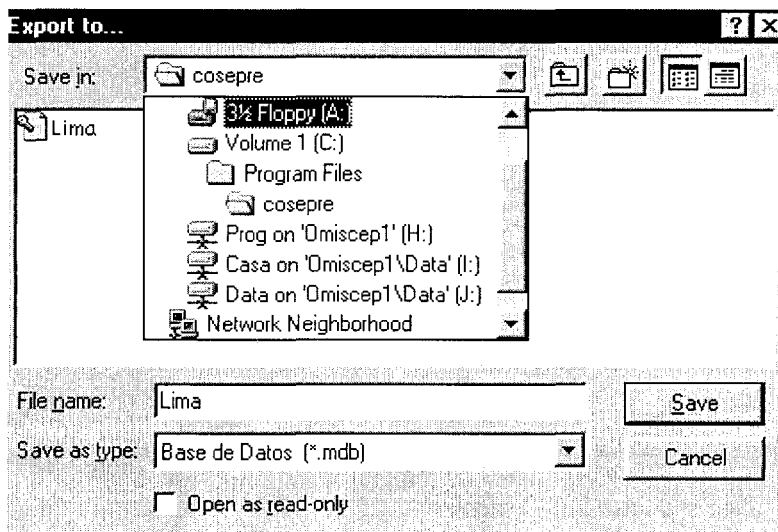
Double-click *Look in*, select the directory, and then the file you want to open.

The creation of the first COSEPRE file prompts the following options under *File*:

- Export to
- Currency
- Volume unit
- Costing method
- Services
- Exit.

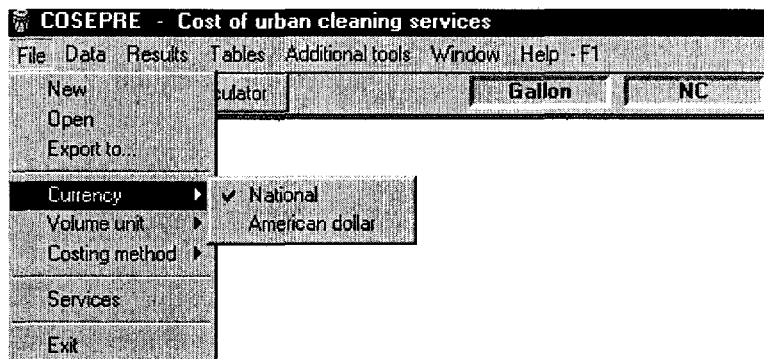
3.3 Export to

Enables you to copy an active file in other directory or diskette. Through this option, other users can use the same data. This option is similar to the *Save as* option in Windows.



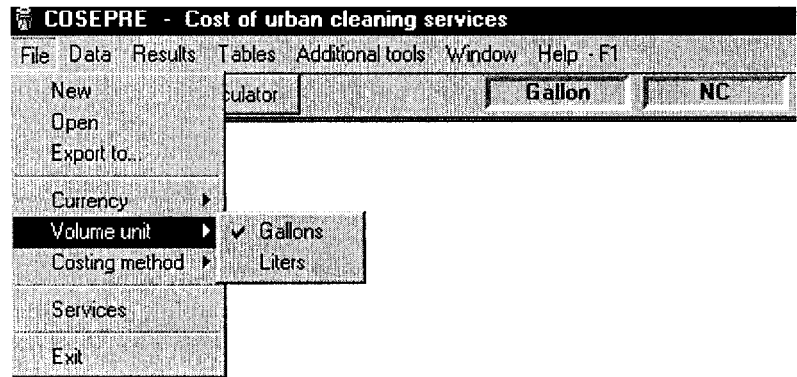
3.4 Currency

Point to *File*, click *Currency*, and select between the national currency or the American dollar.



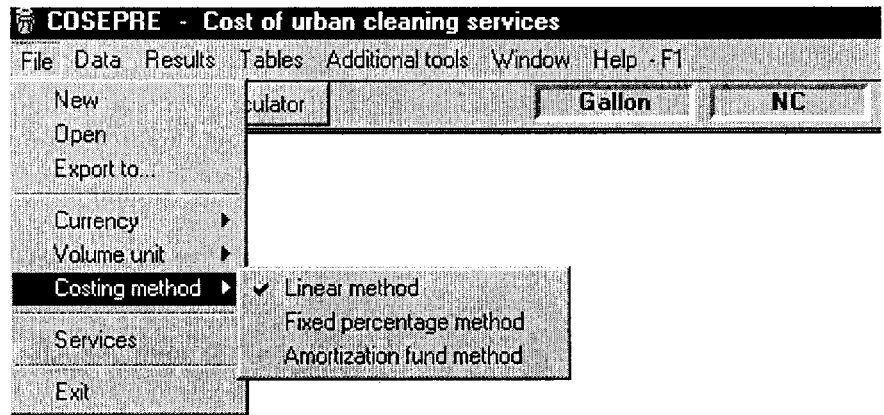
3.5 Volume unit

Point to *File*, click *Volume unit* and select between liters o gallons.



3.6 Costing method

Point to *File*, click *Costing method* and select among the linear method, fixed percentage method, and the amortization fund method. The lineal method is given by default.



3.7 Services

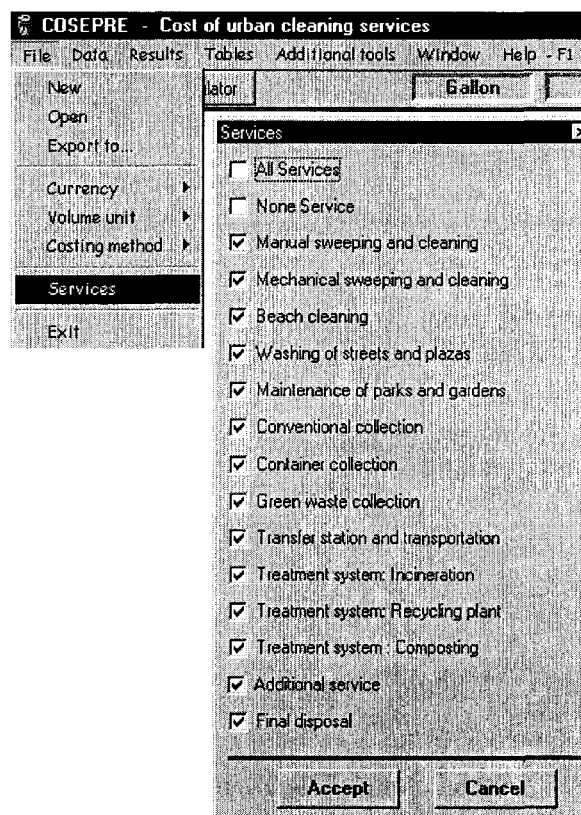
Enables you to select the service to be analyzed.

You may select *All services*, only one, or several of them.

Point and click the service you want to work on. A check mark will appear on the service selected.

Once the service has been selected, click *Accept*.

The option *None service* is used only to clear in case of error.

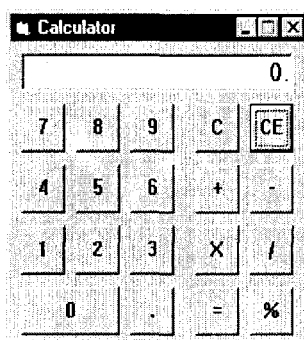


3.8 Exit

Enables you to close the COSEPRE software.

3.9 Calculator

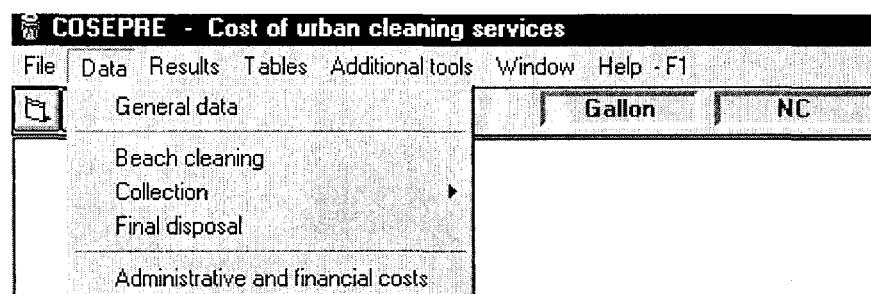
Once a service has been selected, the option *Calculator* appears below the main menu.



4. DATA

Once you have selected the services, click *Data* to input information.

The following options will appear:



- *General data*
- *The services selected*
- *Administrative and financial costs.*

4.1 General data

The following boxes appear in this option:

- Reference: type any comment regarding the file you are working on.

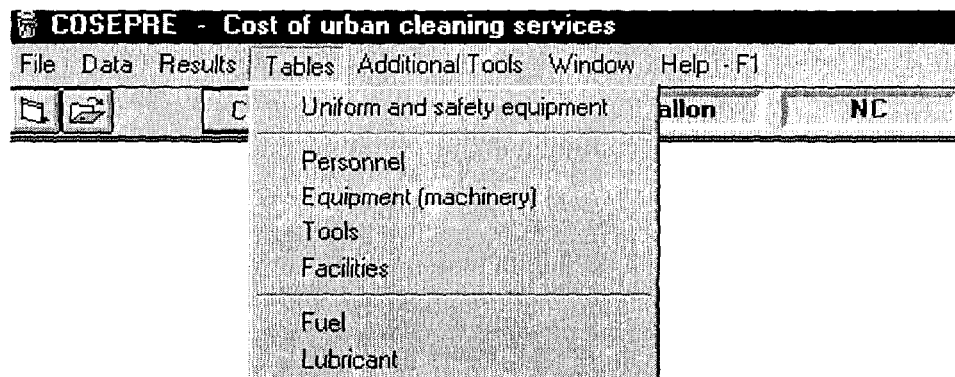
- Date: type the date your are creating the file (mm/dd/yy).
- Annual bank interest (%): type the percentage. In the Peruvian case, for example, the average annual interest is 12%.
- Exchange rate (US\$): type the American dollar exchange rate on the date the program is carried out. This data allows the automatic conversion of the dollar into the national currency or vice versa in the files.
- Insurance premium (annual percentage for equipment): type the annual amount the cleaning utility should pay for insurance against robbery, fire, vandalism, among others; it represents a percentage of the investment cost and should be entered as such.
- Population to be served: type the approximate number of persons to be served by the public cleaning utility or by one of its components.
- Average of persons per family: type the average number of persons per family in the area of study.

To save data, click *Save*. To quit to another screen, click *Exit*.

Once *General data* has been input, fill data in the option *Tables*.

5. TABLES

Point and click the option you want to input information.



The following options appear under *Tables*.

- Uniform and safety equipment
- Personnel
- Equipment
- Tools
- Facilities
- Fuel
- Lubricant.

5.1 Uniform and safety equipment

The list of uniform and safety equipment enables the user to select under the *Personnel* option what uses every worker.

Table: Uniform and safety equipment

CODE	DESCRIPTION	UNIT	USEFUL LIFE	COST
001	Trousers	unit	0.5	60.00
002	Boot	pair	1	80.00

Code: 001
 Description: Trousers
 Unit: unit
 Useful life (years): 0.5
 Cost (NC): 60.00
 Type: UNIFORM

Buttons: Add, Edit, Delete, Clear, Print, Exit

Fill the following boxes.

- Code: type a successive number to identify every garment.
- Description: type the name of the garment. For example, trousers.
- Unit: type if the garment is a unit or a pair. Example, a pair of shoes.
- Useful life (years): type how many years the garment could last. It indicates how frequently the employer provides the uniform (twice a year or 0.5 year, annually or 1.0 year, depending on the garment or place).
- Cost (NC): type the unit price of each garment in the currency specified by the user.

- Type: select the garment as part of the uniform (UNI) or as part of the personal safety equipment (SAF).

5.2 Personnel:

Fill the following boxes:

- Code: type a successive identification number.
- Description: type the denomination of the position.

Table: Personnel

Service: Container collection

Code:

Description:

COD.	DESCRIPTION
001	Collector
002	Driver

Buttons: Uniform, Add, Edit, Delete, Clear, Print, Exit

Click *Add* to record data.

In this screen, click *Uniform* to record the uniform and safety equipment used by every worker.

The following screen will appear with the name of the service, the code, and the job position.

Service: Beach cleaning 02

001 - Assistant

Uniform	Description	Unit
001	Trousers	unit
002	Boot	pair

New Edit Delete Exit

Click the option *New* to select from the table every relevant garment for each position. The data in the table has been input under the *Uniform and safety equipment* option.

Any additional garment should be input under *Uniform and safety equipment*.

5.3 Equipment

Fill data in the following boxes:

Code: type a successive number for each equipment.

Description: type the denomination of every equipment used in the service.

Table: Equipment

Service: Mechanical sweeping and cleaning

Code: 001

Description: Sweeper

COD	DESCRIPTION
001	Sweeper
002	Truck

Add Edit Delete Clear Print Exit

5.4 Tools

Input information as mentioned above.

The 'Table Tools' window displays a form for data entry. At the top, the 'Service' dropdown menu is set to 'Conventional collection'. Below this, the 'Code' field contains '001' and the 'Description' field contains 'Brooms'. A table below these fields shows the entered data:

COD.	DESCRIPTION
001	Brooms

At the bottom of the window, there are buttons for 'Add', 'Edit', 'Delete', 'Clear', 'Print', and 'Exit'.

5.5 Facilities

Input information as mentioned above.

The 'Table Facilities' window displays a form for data entry. At the top, the 'Service' dropdown menu is set to 'Conventional collection'. Below this, the 'Code' field contains '001' and the 'Description' field contains 'Store'. A table below these fields shows the entered data:

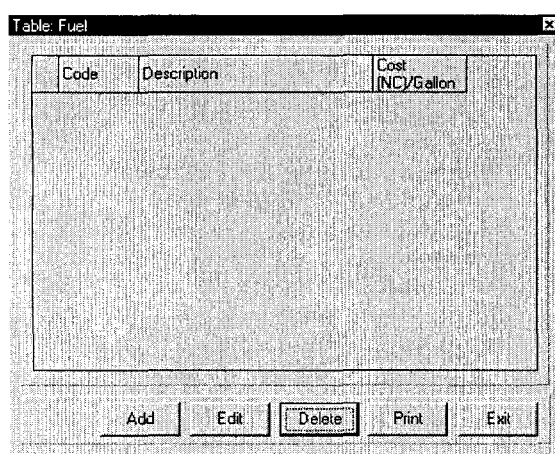
COD.	DESCRIPTION
001	Store

At the bottom of the window, there are buttons for 'Add', 'Edit', 'Delete', 'Clear', 'Print', and 'Exit'.

5.6 Fuel

Fill data in the following boxes:

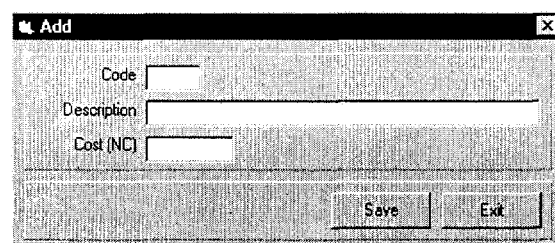
- Code: type a successive number to identify every fuel.
- Description: type the name and octane of the fuel.
- Cost: type the cost of the fuel per volume unit (liter or gallon).



Code	Description	Cost (NC/Gallon)
------	-------------	------------------

Add Edit Delete Print Exit

To enter data, click *Add* and the following screen will appear:



Add

Code

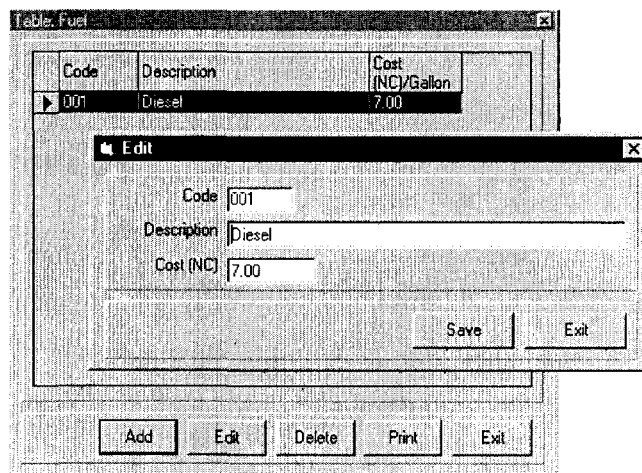
Description

Cost (NC)

Save Exit

Once data has been input, click *Save*.

To edit, point and double-click the line to be modified, make the correction, and then click *Save*.



Another way to make modifications is pointing to the line to be modified and then click *Edit*. To delete, follow the same procedure using the option *Delete*.

5.7 Lubricant

Follow the same procedure as in *Fuel*.

If one equipment does not use fuel nor lubricant, enter data in the following way:

- Code: enter a successive number
- Description: none
- Cost: 0.00

In this way, "none" will appear in the printed format. Otherwise, any data entered in the fuel table will appear.

Once you have entered all data required in the option *Tables* you should input information in the option *Data*.

6. SELECTED SERVICES

Point and click the service you want to work on. The following screen will appear:

Beach cleaning

Data input

Number of shifts per day: Average of working hours per shift:

Number of working days per week: Total service area (m2) to be covered:

Personnel | Equipment | Tools | Facilities | Other expenses

Position: Number of personnel:

Salary (monthly) (NC): Benefits (% of salary):

Food allowance (monthly): No. of bonus (annual):

Bonus (% of salary): Others (annual) (NC):

Position	Number	Salary (monthly)	Benefits	Food allowance (monthly)	Num
▶ Assistant	10	500.00	50	60.00	

In the upper part, the following common data required for all services appear:

- Number of shifts per day: type the number.
- Number of working days per week: type the number.
- Average of working hours per shift: type the number.

The fourth data varies according to the service as follows:

- Sweeping (manual or mechanic)
 - Total average length of sweeping per day: type the average number of kilometers, including all shifts.
- Beach cleaning, washing of streets and plazas, and maintenance of parks and gardens
 - Area to be covered by the service: type the area expressed in m².

- Collection (conventional, containers and weed)
 - Average of waste collected per day: type the quantity expressed in ton/day; include all shifts.
- Transfer and transportation
 - Average of waste received per day (ton/day): type the total volume of waste received at the transfer station in a working day for its later transfer to the sanitary landfill, expressed in ton/day.
 - Average of round trips from the transfer station to the landfill per shift: type the average of round trips made by every vehicle during a shift. In every shift there may be two, three, or four trips.
 - Distance from the transfer station to the sanitary landfill (km): type the number of kilometers.
- Treatment system (incineration, recycling plant, composting)
 - Average of waste treated at the plant (ton/day): type the average, expressed in ton/day.
- Final disposal
 - Average of waste received per day (ton/day) at the sanitary landfill in a working day: type the average expressed in ton/day.
- Additional service
 - Data mentioned above are required.

Once these data have been input, fill the boxes of the middle part of the screen referred to personnel, equipment, tools, facilities, and other expenses.

6.1 Personnel

Click the scroll arrow in the *Position* box to select the position you want to work on and enter the following data:

- Number of personnel: type how many persons are working in the position that is being analyzed.
- Salary: type the basic monthly income of the laborer. The payment may be daily, weekly, or twice a month. The quantity to be entered, however, should be the total received monthly.

- Benefits (% of the salary): type the percentage of the salary that the company or municipality should pay to the laborer for social security, housing fund, etc.
- Food allowance: type the monthly fixed sum the laborer receives for food per working day. This amount is given according to collective bargain or as a social benefit.
- Number of bonuses per year: type the number of bonuses per year the laborer receives on special occasions, such as national holidays or Christmas. It may be established by law or by collective bargain. If no bonus is granted, zero must be entered.
- Bonus (% of the salary): type the percentage of the worker's salary that represents the bonus.
- Others (annual): type the total amount received per year for any other payment, such as overtime, promotion, or other allocations.

6.2 Equipment

Click the scroll arrow in the *Equipment* box to select the equipment you want to work on and enter the following data:

- Number of equipment: type the quantity of equipment used in the specific service.
- Purchase cost: type the unit cost of every equipment.
- Salvage value (unit): type the value expected to be obtained from the equipment at the end of its useful life.
- Average of working hours per shift: type the average of effective working hours per shift, without considering idle hours.
- Useful life (years): type the estimated duration of the equipment expressed in years.
- Fuel (gal/hr or km/gal): type the number of gallons or liters used in an hour or kilometers per gallon or liter.
- Type of fuel: click the scroll arrow and select the type of fuel used by the equipment.

- Lubricant (gal/hr or km/gal): type the number of gallons or liters used in an hour or kilometers per gallon or liter.
- Type of lubricant: click the scroll arrow and select the type of lubricant used by the equipment.
- Tires (number of tires per vehicle, cost, and useful life): type the quantity of tires required by the specific equipment, the unit cost, and the estimated duration expressed in years.
- Battery (number of batteries per vehicle, cost, and useful life): type the quantity of batteries required by the specific equipment, the unit cost, and the estimated duration expressed in years.
- Large brooms (number of large brooms, cost, and useful life): type the quantity of large-brooms required; the unit cost; and the estimated duration expressed in years. Large brooms are only used for mechanical sweeping.
- Maintenance: type the depreciation percentage according to the machinery. Include both the preventive and corrective maintenance.

The following screen shows the data input for a collection truck.

Personnel	Equipment	Tools	Facilities	Other expenses
Type of equipment	Collection truck	No. of equipment	1	Purchase cost (unit) (NC)
Salvage value (unit) (NC)	10000.00	Average of working hours per shift	7.00	Useful life (year)
Fuel(Gal/Hour)	0.08	T.Fuel	Diesel	Lubricant(Gal/Hour)
T.Lubricant	Lubricant oil	Maintenance (%depreciation)	10.00	
Tire				
N° per vehicle	4	Cost unit (NC)	1500.00	Useful life (year)
Battery				
N° per vehicle	1	Cost unit (NC)	500.00	Useful life (year)

Type of equipment	No. of equipment	Purchase cost	Salvage value	Ave. of working hours per shift	
Collection truck	1	100000.00	10000.00	7	

6.3 Tools

Click the scroll arrow in the *Tool* box to select the tool you want to work on and enter the following data:

- Number of tools: type the quantity of tools used in the specific service.
- Purchase cost: type the unit cost of every tool.
- Useful life (years): type the estimated duration of the tool expressed in years.

Type of tool	Number of tools	Purchase cost	Useful life (years)
Brooms	10	15.00	0.4

6.4 Facilities

Click the scroll arrow in the *Type of facility* box to select the facility you want to work on and enter the following data:

- Investment cost: type the amount required to build the basic infrastructure for each service.
- Useful life (years): type the estimated duration of the infrastructure, expressed in years.
- Insurance premium (%): type the percentage of the investment cost representing the annual amount the cleaning utility should pay for insurance against robbery, fire, and vandalism, among others.

6.5. Other expenses

It should be noted that a service may have several facilities, in which case, the total sum of expenses made in the various facilities should be entered. Fill the following data:

Utilities

- Electricity: type the monthly amount paid for the electricity bill.
- Water: type the monthly amount paid for the water bill.
- Telephone: type the monthly amount paid for the telephone service.
- Facility rent: type the monthly amount paid for the rental of the facility.
- Watchman service: type the monthly salary of the personnel that guard the facility.
- Others: type the monthly amount paid for any service not considered above.

Various items

- Office furniture: type the purchase and maintenance cost of furniture such as shelves, desks, tables, etc.
- Office equipment: type the purchase and maintenance cost of computers, telephones, air conditioning, etc. used in administrative offices.
- Stationery: type the cost of materials such as envelopes, pens, folders, etc.
- Computer supplies: type the cost of computer items (paper, ink, toner, diskettes, etc.)
- Cleaning items: type the cost of cleaning items used in the facility (brooms, mops, detergent, disinfectant, wax, etc.)
- Others: enter any item not considered above.

UTILITIES (NC/monthly)		VARIOUS ITEMS (NC/monthly)	
Electricity	800.00	Office furniture	0.00
Water	0.00	Office equipment	0.00
Telephone	0.00	Stationery	0.00
Facility rent	0.00	Computer supplies	0.00
Watchman service	1000.00	Cleaning items	1000.00
Others	0.00	Others	0.00

Save

Print

Once you have saved the above data, enter information regarding the administrative and financial costs.

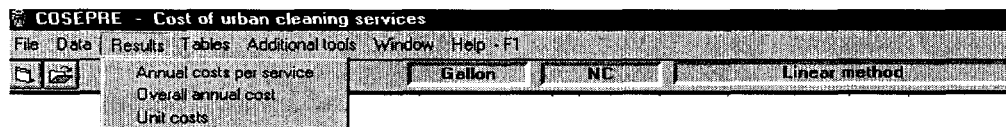
7. ADMINISTRATIVE AND FINANCIAL COSTS

The administrative and financial costs is a default option and it always appears with any service. Data to be input is similar for any service. Since personnel in this area work half a day on Saturdays, a fraction (5.5) is accepted in *number of working days per week*.

8. RESULTS

Once data has been input in each service, click *Results* to select among three options:

- Annual costs per service
- Overall annual cost
- Unit cost per service.



The calculation of the depreciation is made with the costing method selected in the *File* option.

8.1 Annual cost per service

Click the scroll arrow and select the service you want to analyze. The table shows the annual costs of personnel, operation and maintenance, capital, and the administrative and financial costs regarding the selected service.

Annual costs per service				
Type of service		Beach cleaning		
Currency = NC		Print		Exit
DESCRIPTION	COST	SUB-TOTAL	%	TOTAL
A) Personnel costs				
- Salary	60000.00			
- Benefits	18000.00			
- Food allowance	3000.00			
- Bonus	10000.00			
- Uniforms	0.00			
- Safety equipment	0.00			
- Others	0.00	91000.00	52.97	
B) Operation and maintenance costs				
- Fuel	1168.00			
- Lubricant	3128.57			
- Tools	0.00			
- Tire	4000.00			
- Battery	500.00			
- Maintenance (%depreciation)	1800.00	10496.57	6.17	
C) Capital costs: equipment and facilities				
- Investment	7200.00			
- Insurance	3000.00			
- Depreciation	16000.00	26200.00	16.41	
D) Administrative and financial costs (including other expenses)		62000.00	24.45	171796.57

8.2 Overall annual cost

This option shows a table with all services including the annual costs of personnel, operation and maintenance, capital, and administrative and financial costs.

8.3 Unit cost per service

This option shows a table with the unit cost of every service, according to the unit that has been selected.

SERVICE	UNIT	SUB-TOTALS
+ Beach cleaning	Cost/m2	330
+ Collection		
- Conventional	Cost/t	0
+ Final disposal	Cost/t	0
Service total cost	Cost/month	14316.38
Suggested flat tariff	Cost/fam-month	191

Currency = NC

Print Exit

9. ADDITIONAL TOOLS

There are four options:

- Modification of terminology
- Waste prediction
- Cash flow for a sanitary landfill
- Graphs.

9.1 Modification of terminology

This tool may be used to modify a term that is not common in the region or country where the program is being applied. You may modify the formats of data entry (services) and results (annual cost).

Modification of terminology

Format: Annual cost
 Term: Salary
 New term: Remuneration
 Observation: Modified on 13 September 2000

☒ Activated

Save Cancel

Edit Print Exit

Format	Term	New term	Observation	Active
Annual cost	Lubricant			No
Annual cost	Tools			No
Annual cost	Safety equipment			No
Annual cost	Tire			No
Annual cost	Salary	Remuneration	Modified on 13 September 2000	Si
Annual cost	Bonus			No
Annual cost	Uniforms			No
Annual cost	Fuel			No
Annual cost	Food allowance			No
Annual cost	Battery			No
Annual cost	Benefits			No
Service	T. Lubricant			No
Service	Fuel(Gal/h)			No
Service	T. Fuel			No

Click the line to be modified, then click the button *Edit* and enter the modification in the text boxes.

This tool has two boxes for data entry:

- New term: type the new term to replace the old one.
- Observation: type any relevant comment.

To confirm the acceptance of the new term, click the button *Activated* and *Save*.

9.2 Waste prediction

To predict the generation of waste, click this tool and fill the following data:

- Starting year: type the starting year to initiate the predictive analysis of waste generation.
- Growth index of population per year (%): type the percentage. You can get this data from population censuses.
- Average coverage (%): type the percentage of population served by the final disposal service (sanitary landfill) in the starting year of the prediction.

- Number of days per year: type 365.
- Number of prediction years: type the number of years considered in the waste generation prediction.
- Average of waste generation (kg/pop/day): type the average of daily waste generation per person in the area covered by the final disposal service, expressed in kg/pop/day.
- Growth index of coverage per year (%): type the percentage representing the estimated increase in waste collection and final disposal.
- Population: type the population of the area to be covered by the final disposal service.
- Growth index of waste generation per year (%): type the percentage. If this information is not available, the average growth index of 1% may be used for waste generation in Latin America.
- Waste density in the landfill (t/m³): type the waste compaction expressed in density units (t/m³). It should not surpass 1.2 t/m³.

To get a table with results, click *Update*.

Waste prediction

Waste prediction

Starting year: 2000 Number of prediction years: 15 Population: 30000

Growth index of population per year (%): 2.1 Average of waste generation (kg/person/day): 0.5 Growth index of waste generation per year (%): 2

Average coverage (%): 60 Growth index of coverage per year (%): 2 Waste density in the landfill (t/m³): 0.9

Number of days per year: 365

YEAR	Population	pgc (kg/person/day)	Coverage (%)	Prediction (ton/day)	Volume	Acc. Volume (m ³ /y)
2000	30000	0.500	60	9.00	3650	3650
2001	30630	0.510	62	9.685	3928	7578
2002	31273	0.520	64	10.408	4221	11799
2003	31930	0.531	66	11.19	4538	16337
2004	32600	0.541	68	11.993	4864	21201
2005	33285	0.552	70	12.861	5216	26417
2006	33984	0.563	72	13.776	5587	32004
2007	34698	0.574	74	14.738	5977	37981
2008	35426	0.586	76	15.777	6398	44379

Update
Print
Exit

9.3 Cash flow

To calculate the cash flow of a sanitary landfill for a given period, click *Cash flow* and fill the following data described above:

- Starting year
- Growth index of population per year
- Average coverage (%)
- Number of working days per year
- Average waste generation (kg/pop/day)
- Growth index of coverage per year (%)
- Population
- Growth index of waste generation per year (%).

Additional data to calculate the cash flow are:

- Number of projection years: type the number of years to establish the profitability of the project.
- Monthly tariff per family (NC/month): type the monthly tariff every family (household) must pay for the final disposal service.
- Unit cost of the service (without capital) per ton (NC/t): type the total annual cost of operation (without the investment in machinery and infrastructure) divided by the volume of waste received or expected in a year, expressed in tons.
- Investment in machinery after its useful life (NC): type the constant amount added to the investment after its useful life. It is the additional expenditure in machinery due to the increase of wastes.
- Annual average interest (%): type the annual banking interest per loan expressed in percentage.
- Total investment (NC): type the costs of investment and infrastructure.
- Useful life of the infrastructure (years): type the number of years the infrastructure is expected to last.

- **Persons per family (number):** type the average number of persons per family in the area of study.
- **Initial investment in machinery (NC):** type the cost of the machinery required for the sanitary landfill operation (front-end loader, tractor, motograder, roller compactor, dump truck, among others).
- **Average useful life of the machinery (years):** type the estimated useful life for all vehicles expressed in years. In many cases this information is provided by the manufacturer.

To get a table with results, click *Update*.

9.4 Graphs

In this option you can prepare a graph of unit costs as a tool to help decide the creation of a transfer station. To prepare it, the program requires data of vehicles from the collection service and the transfer and transportation service. General information common to two vehicles at least is requested for the analysis, as well as specific information on the large vehicle and the small one.

There are two options:

- Data entry
- Graph generation.

9.4.1 Data entry

Click *Add* to enter data. There are two options:

- Large vehicles
- Small vehicles.

Common data for both large and small vehicles are:

- **Description:** type the description of the vehicle used.
- **Working days per year (days):** type the number of working days per year.
- **Annual average interest (%):** type the percentage of the annual banking interest per loan.

- Fuel cost: type the cost per volumen unit (liter or gallon).
- Lubricant cost: type the cost per volumen unit (liter or gallon).
- Effective working hours per shift (hours): type the number of working hours of the vehicle per shift.

9.4.1.1 Large vehicles

Vehicle graph

Large vehicle | Small vehicle

General data

Description:

Working days per year (d):

Effective working hours per shift (hours):

Installed capacity TS (t/d):

Annual average interest (%):

Fuel price (NC/Gal):

Lubricant price (NC/Gal):

Operation costs of the transfer equipment

Vehicle cost (NC/Unit):

Insurance + vehicle tax (NC/year):

Driver cost (NC/d):

Vehicle maintenance (NC/year):

Worker benefits (%):

Fuel consumption (Gal/km):

Lubricant consumption (Gal/km):

Number of tires (tires/vehicle):

Tire cost (NC/Unit):

Useful life of tire (months):

Amortization time (years):

Vehicle capacity (t):

Average speed (km/hr):

Investment cost of the transfer station

Cost of the transfer station (NC):

Useful life of the station (years):

Insurance premium (%):

Operation cost of the transfer station

Operation cost TS (NC/month):

Maintenance cost TS (NC/month):

Buttons: Add | Edit | Delete | Save | Cancel | Exit | Graphic

Description	Slope	Origin point	Vehicle cost NC/Unit	Insurance + vehicle tax NC/year	Vehicle capacity (t)	Driver cost (NC/d)
▶ Trailer truck	23.677	2.316	350000	105000	10	50

Large vehicles are those of large capacity used in the transfer service.

The following data should be filled:

General data

Besides the common data described above, enter the following:

- Installed capacity TS (ton/day): type the average capacity of the transfer station, expressed in ton/day. There is a direct relation between infrastructure capacity and the number of available vehicles.

Operation costs of the transfer equipment

- Vehicle cost (NC/unit): type the purchase cost of the vehicle.
- Insurance + vehicle tax (NC/year): type the annual amount paid for the vehicle insurance and taxes.
- Driver cost (NC/day): type the daily salary of the driver.
- Vehicle maintenance (NC/year): type the preventive and corrective maintenance cost.
- Worker benefits (%): type the percentage of the daily salary paid to the worker for allowances, bonuses, benefits, and others.
- Fuel consumption (gal/km): type the number of fuel gallons per kilometer used by the equipment.
- Lubricant consumption (gal/km): type the number of lubricant gallons per kilometer used by the equipment.
- Number of tires (tires/unit): type the number of tires required for the equipment.
- Cost of tires (NC/U): type the unit cost of every tire.
- Useful life (months): type the number of months the tire is expected to last.
- Amortization time (years): type the number of years required to pay the investment.
- Vehicle capacity (ton): type the load capacity of the vehicle expressed in tons.
- Average speed (km/hr): type the relation between the distance traveled by the vehicle and the average time used to travel that distance, expressed in km/hr.

Investment costs of the transfer station

- Cost of the transfer station (NC): type the amount required to implement the facility or basic infrastructure of each service.
- Useful life of the station (years): type the estimated duration of the facility or infrastructure expressed in years.

- Insurance premium (%): type the annual percentage of the investment cost paid for insurance against robbery, fire, and natural disasters, among others.

Operation costs of the transfer station

- Operation cost TS (NC/month): type the monthly amount of the operation cost of all the machinery of the transfer station. For example: funnel, motograder, etc.
- Maintenance cost TS (NC/month): type the monthly cost for maintaining all the machinery used in the transfer station.

Small vehicles

Small vehicles are those used in the collection service. The information required for small vehicles is similar to the information entered for large vehicles.

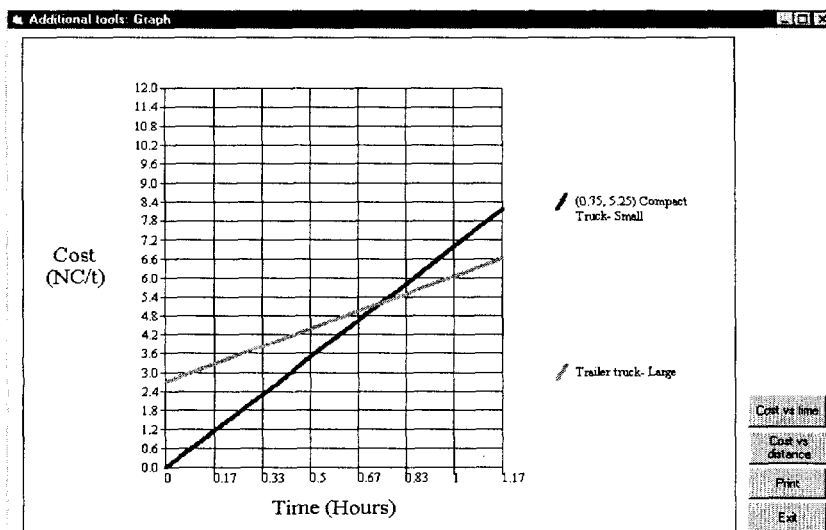
Specific data for small vehicles are:

- Helpers per vehicle (number): type the number of helpers working in the vehicle.
- Helper cost (NC/day): type the daily salary of every helper.

9.4.2 Graph generation

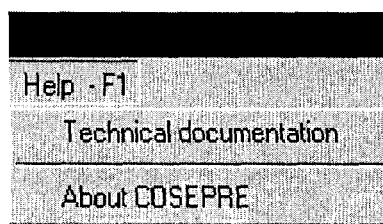
To get the comparative graph with data entered for each vehicle, click the button *Graph*.

The graph will compare hours versus NC/ton. To get the graph comparing kilometers versus NC/ton, click the button *Cost vs distance*.



10. HELP - F1

The *Help - F1* presents two options:



- Technical documentation: summary of the technical documentation manual.
- About COSEPRE: brief presentation of the staff responsible for the preparation of the COSEPRE software.

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