**Norsk institutt for luftforskning**
Norwegian Institute for Air Research

# NOTE

To :
From : Frederick Gram
Date : Kjeller, 15 January 1998

## KILDER Air Pollution Modelling System - Version 2.0, NILU TR 12/96

## Revision 1/98: January 1998

Enclosed you will find a set with corrections to the manual for the KILDER Air Pollution Modelling System, Version 2.0, NILU TR 12/96. The corrections can be new programs, errors in the program description, new examples or other changes in the text. Please change the pages with corresponding pages in your copy of the manual. The most important changes are listed in the Revision List below.

The license code for your programs is:____________

☐ You will find an up-dated diskette with .EXE-versions of **all** the programs.

☐ You will find a diskette with new .EXE-versions of the programs that are changed.

☐ You will find the .EXE-versions of all the programs in the directory ____________.

**KILDER Model System, Version 2.0, Revisions list.**

| Revision | Date | Major changes |
|---|---|---|
| Revision 1/96 | October 1996 | Manual released |
| Revision 1/97 | February 1997 | Changes in some license codes. |
| | | Correction in CONS-EMI |
| | New | CODE-FIE, adjusts fields according to area code fields |
| | | Great changes in INP-FIE |
| | | Errors in program description for METFREC |
| | | New example for POI-EMIS |
| | | POI-KILD, format for stack data is not read |
| | New | RATI-FIE, calculates the ratio between two fields |
| | | TRA-WORK, reading from a ROADAIR-file |

Vennligst adresser post til NILU, ikke til enkeltpersoner/Please reply to the institute.

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| Revision | Date | Major changes |
| --- | --- | --- |
| Revision 2/97 | October 1997 | Stability, page 4/5, corrections to Table 1 |
| | New | Errors, some error codes from the computer |
| | New | DIST-POP, another program to distribute population |
| | | INP-FIE, major changes |
| | | POI-EMIS, changes to be more flexible |
| | | POI-KILD, corrections to the manual |
| | New | POPULATION, survey for population distribution |
| | | TRA-WORK and TRA-EMIS, extended to 6 vehicle classes |
| Revision 1/98 | January 1998 | CONS-EMI, corrections to the manual |
| | New | FUEL-FIE, makes fields with fuel consumption |
| | | METFREC, corrections to the manual |
| | | POI-EMIS, corrections to the manual |
| | | POP-FIE, gives population distribution in districts |
| | | PRIN-FIE, more examples |
| | New | ZOOM-FIE, changes the grid size for fields. Necessary when we operate with fields with different grid size |
| | | CONV-FIE will be removed from the KILDER package in the next revision |

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You have now got the fourth revision of **KILDER Air Pollution Modelling System, Version 2.0.** If you want to be on a mailing list for later revisions, please return the note below to:

Frederick Gram, NILU, P.O.Box 100, N-2007 Kjeller, Norway, telefax +47 63 89 80 50,
E-mail: frederick.gram@nilu.no

☐ Yes, I want to recieve later revisions to the manual for KILDER, Version 2.0.

☐ Yes, I want to recieve up-dated diskettes with .EXE-versions of later revisions of the programs in the KILDER System, Version 2.0.

☐ We are using the KILDER System for ________________________________

☐ We are not using the KILDER System at the moment.

Name: ________________________________________

Institution: ________________________________________

Adress: ________________________________________

City: ____________________ Country: ______________

Telephone: ____________ Telefax: ____________ E-mail: ____________

# Contents

# Summary

***The KILDER Air Pollution Modelling System is a system of small PC-programs for calculation of long-term emission, dispersion, concentration and exposure from different source categories. It has been developed from active use at NILU for more than 20 years to an integrated set of about 30 different programs.***

***The KILDER system may be divided into three parts:***

- ***The dispersion models POI-KILD and ARE-KILD,***
- ***Meteorological programs WINDFREC, STABFREC and METFREC,***
- ***Supporting programs for calculating emissions and exposure and for operating with binary data fields.***

This report is made as a loose leaf system with a detailed introduction to the KILDER data files, and a separate description for each program with examples. The data in some examples are collected from actual studies, other are only test examples and should not be used in other connections. In addition some chapters with more theoretical background, or practical information are included.

The programs **POI-KILD** and **ARE-KILD** are multiple source Gaussian type dispersion models calculating sector-averaged long-term averaged ground level concentrations in a regular grid of receptor points. They are using average emission data and a frequency matrix of wind direction, wind speed and stability classes.
POI-KILD is using emissions from several point sources, taking into account data on dispersion, topography, buildings and penetration through an upper stable layer.
ARE-KILD is using a field with area source emissions. Each area source is divided into 100 point sources, and the impact from the area source within its own square is calculated separately.

The meteorological programs **WINDFREC**, **STABFREC** and **METFREC** are analysing wind, stability and a joint frequency distribution of wind direction, wind speed and stability.

The **supporting programs** may be divided into several groups:

- programs for input/output etc. of fields, presentation and for field handling;
- programs for preparing area code fields and distribution of data;
- programs for calculating emissions from traffic, industry and combustion;
- programs for plotting;
- programs for exposure calculations.

As the PC operating system DOS only accepts 8-character file names, the program names has to be abbreviated in order to remind about what they are doing. The programs are normally creating a file with binary fields, called xxx.FLD, and a corresponding file with print-out, called xxx.PRN.

The programs are, the program packages will not always include all of them:

| | |
|---|---|
| READ-FIE | **reads a field** with values, |
| INP-FIE | reads **input** values to specified squares of a **field**, |
| PRIN-FIE | makes a **print**-out map of a **field**, |
| LIST-FIE | makes a **list** of values for several **fields**, |
| READ-PRN | **reads** a **.PRN**-file, |
| LOOK-FIE | **looks** at a binary file and displays values around a specified point, |
| CONT-FIE | gives the **content** of a .FLD file (sum, min., max. for each field), |
| PRES-FIE | **presents** a **field** map to the screen, |
| ZOOM-FIE | changes the grid size up or down, |
| | |
| SUM-FIE | makes the **sum** of several **fields,** |
| PROD-FIE | makes a **product** of two **fields**, |
| GRP-FIE | generates **group-**codes from for instance population distribution, |
| CODE-FIE | adjusts fields according to area **code fields,** |
| | |
| POP-DIST | calculates **population distribution** within regions, |
| POP-FIE | distributes **data** to **fields**, f.ex. population, |
| DIST-POP | **dist**ributes **pop**ulation to fields, |
| | |
| FUEL-FIE | calculates **fields** with **cons**umption of **fuels** as oil, coal or wood from a point source file, |
| CONS-FIE | calculates **fields** with **cons**umption of fuels as oil, coal or wood, |
| CONS-EMI | calculates **emiss**ion fields from **cons**umption fields and emission factors, |
| POI-EMIS | calculates **point** source **emissions** from consumption data and emission factors, |
| | |
| TRA-WORK | calculates fields with **traffic work** from road net data, |
| TRA-EMIS | calculates **emiss**ion fields from fields with **traffic** work and emission factors, |
| | |
| ISO-PLO | makes **plot** with **iso**-lines, |
| ROAD-PLO | makes a **plot** of a **road** network, |
| | |
| EXPO-FIE | calculates **exposure** from concentration fields, population fields and road data. |
| | |
| CONV-FIE | **converts** old .FLD files to a new structure. Will be removed in the next revision. |

# Program CONS-EMI

From the **consumption** fields that was created by CONS-FIE, **emission** fields are created by CONS-EMI. The program is run interactive.

There are some questions by the program which may seem senseless, but they have their use and their history. Consumption fields will very often tell about the annual consumption of fuels. It is useful to calculate annual emissions, by the use of emission factors. But as an input for model calculations hourly emissions are needed, in kg/h. In Norway most of the fuel is used during winter, and the major pollution problems are due to winter situations with bad dispersion conditions. Therefore we need winter emissions. In hourly model calculations the emissions from heating is adjusted by the hourly temperature and degree-days.

Other places there may also be great seasonal variations in the consumption, and it is necessary to take this into account when preparing hourly emissions.

### Input data to CONS-EMI

KX, KY,NCOMP — Grid dimensions, number of points eastward and northward and number of compounds (max 6)

INFILE — File with consumption figures (with apostrophes and .FLD)

INFAK — File with emission factors (with apostrophes and .DAT)

OUTFI — Name of the output files (with apostrophes).
The data fields will be written binary to the file OUTFI.FLD, the output is written to the file OUTFI.PRN

NFU, (IFU(I), I=1, NFU)
- NFU — Number of fuel types/consumption fields (max. 8)
- IFU — Fuel type code from emission factor file

IUV
- IUV=0 — Yearly emissions
- IUV=1 — Average hourly emissions shall be calculated

(PALL(J), J=1,NFU)
% of the total consumption allocated. This should be 100 % from CONS-FIE, but we have the opportunity to adjust this by multiplying the data with 100./PALL(J).

If IUV = 1, then:

(PPER(J), J=1,NFU) — % of the total consumption used during the period

NDAY — Number of days in the period (365, 182 or other)

PERIOD — New period (with apostrophes)
The period for the emission data may be different from the consumption data

PLACE and SOURCE will be taken from INFILE, PERIOD from INFILE if IUV = 0, and DATE is the current date.

**Emission factors** are read from the file INFAK.DAT (with apostrophes and .DAT). See the separate description of the emission factor file. Be careful to control that the compounds and the fuel types/codes at the emission factor file is according to the other data.

**Examples:**

**1.** Calculation of quarterly emissions in Pécs from fields with gas consumption at GAZFELH.FLD.

| | |
|---|---|
| **** | License code |
| 42,28,4 | Grid size, 4 components |
| 'GAZFELH.FLD' | Consumption file |
| 'EMISFACT.DAT' | Emission factor file |
| 'GAZEMIS1' | Output-file, fields at GAZEMIS1.FLD, output at GAZEMIS1.PRN. |
| 1,41 | Fuel type 41, Earth gas |
| 1 | Hourly emissions |
| 100 | All is allocated |
| 100 | All is used |
| 90 | Number of days January-February-March |
| 'JAN-MAR' | Period name |

**Output, with comments in *italics*:**

*PRINT-OUT OF THE CONSUMPTION FIELD:*

```
Fuel type % allocated % used
   41        100.0   100.0


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                 Pecs, Hungary
             VERSION 2.2, 15-1-1998
             - - - - O O O - - - -

MAP OF : GAS 1Q            UNIT: M3              SOURCE: GAZFELH
PERIOD : 1Q,1995          PLACE: PECS          GRID SIZE:  500 METER
CREATED: 1997/12/08 14.59

    MAXIMUM VALUE IS  1.2194E+06, IN (22,16)
             SUM= 2.81537E+07    SCALE FACTOR:     1000.
```

```
EMISSIONS:

 Season emis  Unit: kg/hour

                 SO2        NOx       CO         Part
  Earth gas      1.69       23.46     18.25       .00
  SUM            1.69       23.46     18.25       .00

  Emission fields are written to GAZEMIS1.FLD

EMISSION FIELDS, ONLY THE TOP IS SHOWN FOR THE FIRST:

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               - - - - O O O - - - -

 MAP OF :     SO2          UNIT: KG/HOUR          SOURCE: GAZFELH
 PERIOD : 1Q,1995         PLACE: PECS          GRID SIZE:  500 METER
 CREATED: 1997/12/08 14.59

     MAXIMUM VALUE IS  7.3387E-02, IN (22,16)
                  SUM= 1.69443E+00    SCALE FACTOR:  1.0E-05
..........
               - - - - O O O - - - -

 MAP OF :     NOx          UNIT: KG/HOUR          SOURCE: GAZFELH
 PERIOD : 1Q,1995         PLACE: PECS          GRID SIZE:  500 METER
 CREATED: 1997/12/08 14.59

     MAXIMUM VALUE IS  1.0161E+00, IN (22,16)
                  SUM= 2.34614E+01    SCALE FACTOR:  1.0E-03
..........
               - - - - O O O - - - -

 MAP OF :     CO           UNIT: KG/HOUR          SOURCE: GAZFELH
 PERIOD : 1Q,1995         PLACE: PECS          GRID SIZE:  500 METER
 CREATED: 1997/12/08 14.59

     MAXIMUM VALUE IS  7.9032E-01, IN (22,16)
                  SUM= 1.82477E+01    SCALE FACTOR:  1.0E-04
..........
               - - - - O O O - - - -

 MAP OF :     Part         UNIT: KG/HOUR          SOURCE: GAZFELH
 PERIOD : 1995            PLACE: PECS          GRID SIZE:  500 METER
 CREATED: 1997/12/08 14.59
 EMPTY FIELD
```

The emission factor for particles from gas use is 0.0.

**2.** Calculation of emissions from fuel consumption in Oslo in 1985, both annual emissions and hourly winter mean emissions.

| | |
|---|---|
| **** | License code |
| 14,16,4 | Grid size, 4 components |
| 'TESTCONS.FLD' | Consumption file |
| 'FUEL-FAK.DAT' | Emission factor file |
| 'EM-D-WIN' | Emission file, emissions from "domestic", winter |

| | |
|---|---|
| 3, 11, 12, 13 | 3 fuel types from the emission factor file FUEL-FAK.DAT, code 11, 12 and 13. |
| 1 | IUV = 1, hourly emissions to be calculated |
| 70.,95.,100. | 70 % of the wood consumption is allocated, 95 % of dist. oil, and 100 % of heavy oil |
| 82.0, 75.0, 55.0 | 82 % of the wood is used during the winter season, 75% of the dist. oil, and 55 % of the heavy oil |
| 182 | Winter season (october-march) |
| 'WINTER 85' | Data for "Winter 85" will actually be used for calculations for the winter 1984/85 |

The emission factor file FUEL-FAK.DAT will be:

```
Emission factors for Oslo 1985.
Based upon A. Rosland: "Emission Coefficients", SFT 1985 and other sources
START
 4 Fuel type     UNIT      DENS        SO2      NOx        CO        PART
11 Wood          ton       1.00        0.20     0.7       100.0      10.0
12 Dist. oil     m3        0.83        3.65     2.5         6.5       0.3
13 Heavy oil     m3        0.95       18.4      4.2         0.4       1.3
14 Dom. coal     m3        1.00       19.0      1.5        45.0      10.0
```

The emission factors will vary from place to place, depending on access to "clean" fuels the burner type and many other factors. The $SO_2$-factor will be 20 * %S * ρ, where %S is the sulphur content and ρ is the density of the fuel.

To calculate annual emission fields to file EMIS-DOM, IUV is set to 0, but PPER, NDAY and PERIOD is not read.

# Program FUEL-FIE

In the program POI-EMIS the emissions from a file with point sources are calculated. All informations about a large number of small and large consumers (name, position, stack parameters, fuel type and consumption) are collected in a stack-file, INSTA, see the description for POI-KILD. In some cases we want to get more information of the distribution of this fuel use. The program FUEL-FIE is prepared for this, it reads the stack-file and makes fields with the consumption of different fuel groups.

The program can be run interactive, or as a batch job. When run **interactive** from terminal the program checks whether there exists a file called OUTFI.RUN. If not, the file OUTFI.RUN is created, and the answers to the program (input) is written to this file. In a later run this can be used as input in a batch job.

### Input data to FUEL-FIE

| | |
|---|---|
| KX, KY, NFG | Grid dimensions, number of points eastward and northward and number of fuel groups (max. 8) |
| RUNFILE | Name of the RUN-file (with apostrophes), or 'TERM' (terminal). If a name of a .RUN-file is given, the rest of the input is read from this. |
| OUTFI | Name of the output files (with apostrophes)<br>The consumption fields is written binary to the file OUTFI.FLD, the output is written to the file OUTFI.PRN |
| INSTA | Input file with stack and consumption data (with apostrophes and .DAT) |
| PERIOD, PLACE | Both with apostrophes |
| ICON | We may have different sets with consumption data at the file (max. 5), we want to use no. ICON |

For each of the NFG fuel groups is read:

FUELGRP(I), UNIT(I), NFU(I), (JFU(I,J), J=1,NFU(I))

where

| | |
|---|---|
| FUELGRP(I) | Name of the fuel group (with apostrophes) |
| UNIT(I) | Unit of consumption (tons, $m^3$ etc.) (with apostrophes) |
| NFU(I) | The fuel group includes NFU fuel types |
| JFU(I,J), J=1,NFU(I) | Fuel type codes |

In many cases the fuel consumption in an area will be dominated by a few large sources as power plants or similar. To avoid that these shall dominate the print-out upper limits for the fuel consumption is read:

| | |
|---|---|
| FULIM(I), I=1,NFG | Consumption of fuel group I above FULIM(I) is not included. If FULIM(I) = 0, no such test. |

**Consumption data**

The preliminary stack-file INSTA contains both data about the stack and the consumption or other activity. Instead of the line with
STACK, (SKOR(I), I=1,8), ICOD, (EM(I), I=1 NCOMP),

the program reads:
STACK, (SKOR(I), I=1, 2), SKORTE, ICOD, IFU, (CON(I), I=1, ICON).

| | |
|---|---|
| STACK | Stack (factory) name A10 (without apostroph) |
| SKOR (1), (SKOR(2) | UTMX (km), co-ordinates of the stack<br>UTMY (km) |
| SKORTE | Text, corresponding to STACK (3) -- STACK (9), within apostrophes. |
| ICOD | Source group code 1-9 |
| IFU | Fuel type code, according to the emission factor file. |
| CON | Consumption data sets, with units corresponding to the emission factor file. |

**Example:**

From Pécs we have a file with point source data and 5 sets with consumption data: for every 3 months and for a year. We want to make fields for the consumption of coal, oil, gas and wood, and use the fuel codes from 'EMISSZIO.DAT'. The power plant dominates the consumption, so we want maps with and without this. This gives the following input:

| | |
|---|---|
| 42,28,6 | Grid size, 6 fuel groups |
| 'TERM' | Reads from terminal, output at FUEL-1Q.RUN |
| 'FUEL-1Q' | Fuel consumption for 1. quarter, name of output-files |
| 'FELMER9.DAT' | Point source file with source data and consumption data |
| 'JAN-MAR','PECS' | Period, place |
| 1 | ICONS=1, consumption from column 1, January-February-March |
| 'COAL','tons',4,50,51,57,59 | 4 coal types, only consumption < 100.000 tons |
| 'COAL','tons',4,50,51,57,59 | 4 coal types, all consumption |
| 'OIL','tons',4,21,23,24,29 | 4 oil types, only consumption < 5.000 tons |
| 'OIL','tons',4,21,23,24,29 | 4 oil types, all consumption |
| 'GAS','m3',3,41,42,43 | 3 gas types, all consumption |
| 'WOOD','tons',2,11,12 | 2 wood types, all consumption |
| 100000,0,5000,0,0,0 | Limits for field 1 and 3 |

The stack file also contains the consumption of some hemp (fuel type 91), and we will get an error message for this. The fuel consumption is written binary to the file FUEL-1Q.FLD, the output is written to the file FUEL-1Q.PRN.

The output batch-file FUEL-1Q.RUN will be

```
'FUEL-1Q'
'FELMER9.DAT '
'JAN-MAR          ','PECS              '
          1
'COAL     ','tons     '   4  50  51  57  59
'COAL     ','tons     '   4  50  51  57  59
'OIL      ','tons     '   4  21  23  24  29
'OIL      ','tons     '   4  21  23  24  29
'GAS      ','m3       '   3  41  42  43
'WOOD     ','tons     '   2  11  12
 100000.00         .00   5000.00        .00        .00        .00
```

and this file can be used for preparing .RUN-files for the other quarters of the year.

**Output from the program:**

The maps with consumption figures are not shown, only the heading for the map.

```
COAL                4          50          51          57          59
OIL                 4          21          23          24          29
GAS                 3          41          42          43
WOOD                2          11          12

 Stack Pécsi Hőer has consumption of    7211. of fuel type 24 in grid (27,13)
 Stack Pécsi Hőer has consumption of    8492. of fuel type 24 in grid (27,13)
 Stack Pécsi Hőer has consumption of  120658. of fuel type 51 in grid (27,13)
 Stack Pécsi Hőer has consumption of  160831. of fuel type 51 in grid (27,13)
Unknown fuel type        91
 Hirdi Fonó     595.490000      86.340000    7     .096      .06
Unknown fuel type        91
 Hirdi Fonó     595.490000      86.340000    7     .096      .06
Unknown fuel type        91
 Hirdi Fonó     595.490000      86.340000    5     .096      .06
Unknown fuel type        91
 Hirdi Fonó     595.490000      86.340000   22      .36      .23


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                     Kjeller, Norge
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                 - - - - O O O - - - -

 MAP OF : COAL              UNIT: tons             SOURCE: FELMER9.DAT
 PERIOD : JAN-MAR 95       PLACE: PECS          GRID SIZE:  500 METER
 CREATED: 1997/12/23 10.28

     MAXIMUM VALUE IS  3.5190E+03, IN (27,13)
                 SUM= 5.55532E+03    SCALE FACTOR:       1.
```

Map for the consumption of coal from the **small** point sources

.............

```
MAP OF : COAL              UNIT: tons              SOURCE: FELMER9.DAT
PERIOD : JAN-MAR 95       PLACE: PECS            GRID SIZE:  500 METER
CREATED: 1997/12/23 10.28

    MAXIMUM VALUE IS  2.8501E+05, IN (27,13)
                SUM= 2.87044E+05    SCALE FACTOR:     100.
```

Map for the consumption of coal from **all** point sources.

.............

```
MAP OF : OIL               UNIT: tons              SOURCE: FELMER9.DAT
PERIOD : JAN-MAR 95       PLACE: PECS            GRID SIZE:  500 METER
CREATED: 1997/12/23 10.28

    MAXIMUM VALUE IS  4.2640E+02, IN (13,13)
                SUM= 1.29951E+03    SCALE FACTOR:  .1
```

Map for the consumption of oil from the **small** point sources.

.............

```
MAP OF : OIL               UNIT: tons              SOURCE: FELMER9.DAT
PERIOD : JAN-MAR 95       PLACE: PECS            GRID SIZE:  500 METER
CREATED: 1997/12/23 10.28

    MAXIMUM VALUE IS  1.5861E+04, IN (27,13)
                SUM= 1.70025E+04    SCALE FACTOR:   10.
```

Map for the consumption of oil from **all** point sources.

.............

```
MAP OF : GAS               UNIT: m3                SOURCE: FELMER9.DAT
PERIOD : JAN-MAR 95       PLACE: PECS            GRID SIZE:  500 METER
CREATED: 1997/12/23 10.28

    MAXIMUM VALUE IS  1.3395E+06, IN (19,16)
                SUM= 7.05778E+06    SCALE FACTOR:    1000.
```

Map for the consumption of gas from **all** point sources.

.............

```
MAP OF : WOOD              UNIT: tons              SOURCE: FELMER9.DAT
PERIOD : JAN-MAR 95       PLACE: PECS            GRID SIZE:  500 METER
CREATED: 1997/12/23 10.28

    MAXIMUM VALUE IS  4.2000E+01, IN (10, 8)
                SUM= 5.50000E+01    SCALE FACTOR:       1.
```

Map for the consumption of wood from **all** point sources.

.............

Maps for the consumption of fuel are written to the files FUEL-1Q.PRN and .FLD. If the input was from TERM, the file FUEL-1Q.RUN is created, for later use.

# Program METFREC

## General description of the program.

This program presents joint frequency distribution of wind speed, wind direction, stability and air quality for four wind classes, 12 or 16 wind sectors and four stability classes for a given period. The output from METFREC is used as input to the dispersion models POI-KILD and ARE-KILD. The program also calculates average values for a concentration variable in the same groups. The following data are input for the program:

- Stability parameter (variable 1 (and 2))
- Wind direction (variable 3)
- Wind speed (variable 4)
- Concentration parameter (optionally variable 5, see later).

The stability parameter and its limits should be the same as in STABFREC.

The results from METFREC are given in two parts:

The first part presents a joint frequency distribution matrix with the occurrence in percent within four classes of wind speed and stability and 12, 16 or 36 wind direction sectors. The values of the line "Total" gives the occurrence in percent of each stability class in each wind class for all wind directions. The values in the column "Rose" gives the occurrence in percent of winds blowing from this sector for all classes of wind speed and stability. If the program is run with 12 or 16 sectors, the frequency distribution matrix may be written to a special file which may be prepared as a meteorological input file to the dispersion models POI-KILD and ARE-KILD.

The second part of the program presents in the same way average and maximum values of concentrations or other variables, sorted into boxes of different meteorological conditions related to the wind/stability classification given in the first part. The fifth variable may be a $SO_2$-concentration, but can also be other variables as turbulence or mixing height.

## The program dialogue and results.

The program METFREC is an interactive program with a dialogue with the terminal, but the input may also be read from a batch file. The questions are written in `Courier`, the answers written in **bold.**The results are written to a user specified result-file. The example below is a typical input sequence for the program. The number of variables will vary with the data. Instead of using the temperature difference as a stability parameter you may use another variable, with other limits for the stability classes.

## C:\KILDER\PROGRAM METFREC

The program will always begin to ask where it will find the input data:

```
Enter the name of input file or 'TERM'.............: 'TERM'
```

If the answer is 'TERM', the rest of the data is read from the terminal (interactive), otherwise the data are read from the input file, which ought be a .RUN-file.

```
Enter the name of the result-file (with apostrophes
 and .PRN)                                        : 'MET-4-6.PRN'
Do you want a separate output-file for frequency
 distribution? (Y/N)..............................: Y
```

If the answer is Y, then:

```
Enter the name of the output-file for frequency
 distribution (with apostrophes and .MET)..........: 'MET-4-6.MET'
```

If this is a different file family than the result-file, you get a warning.

Further:

```
Enter number of months.............................: 3
```

If the number of months are more than 1, the following question is given:

```
Do you want a separate output for each month? (Y/N): Y

Stability can be represented in five ways:
```

- 1: Temperature difference directly from the file
- 2: Temperature difference: ($T_{upper}$-$T_{lower}$)
- 3: Bits
- 4: σ in wind data
- 5: Stability class 1-6

```
Select option......................................: 3

Enter 3 limits for the stability classes...........: 491,512,533

A wind direction = 0 may be interpreted in three ways:

1. Wind direction = 360 (north)
2. Calm
3. Data not available

Enter 1, 2 or 3....................................: 1

Enter number of wind sectors (12, 16, 32)..........: 12

Enter 3 limits for windspeed classes...............: 2,4,6

Enter lower wind-speed for not-calm................: 0.3
```

```
Enter number of hours per day.......................: 24
Enter number of observations per hour (1 or 2).....: 2
```

If we want separate daytime and nighttime matrices, the number will be different from 24, and the following question is given:

```
Enter hours to be included:.......................:
                  7,8,9,10,11,12,13,14,15,16,16,17
```

Further:

```
Enter code for missing data (-99.0 or other).......: -99.0
```

Further:

```
Reading of concentration data (variable 5)? (Y/N)..: Y
```

If the answer is Y, then:

```
Enter compound and unit (with apostrophes), number
of decimals (0, 1 or 2), and the column on the data
file.......................................: 'SO2','ug/m3',1,11
```

For **each** month is read:

```
Enter number of days in the month................ .: 30
Enter name of input file.(with apostrophes
and .SYN)...................................... ..:'METK0495.SYN'
```

Figure 1 shows a batch-file 'MET-4-6.RUN', and Figures 2 and 3 shows the corresponding output from 'MET-4-6.PRN' and 'MET-4-6.MET'.

```
'MET-4-6.PRN'            , Output-file
Y                        , Met-file
'MET-4-6.MET'            , Met-file
3                        , Months
N                        , Not monthly output
3                        , Stability from bits
491,512,533              , Bit limits
1                        , 0 is north
12                       , Sectors
2,4,6                    , Wind groups
.3                       , Calm limit
24                       , Hours per day
2                        , Obs. per hour
-99.0                    , Missing code
Y                        , Concentration variable
'SO2','ug/m3',1,11       , Compound, unit, decimals, place
30                       , Days in April
'METK0495.SYN'           , Data file
31                       , Days in May
'METK0595.SYN'           , Data file
30                       , Days in June
'METK0695.SYN'           , Data file
```

*Figure 1: Batch-file MET-4-6.RUN.*

```
**************************************************************
*              P R O G R A M   M E T F R E C                 *
* The program calculates a frequency distribution in percent *
* as a function of wind direction, 4 stability classes and 4 *
* wind speed classes.                                        *
*                  ** RUN 1996/01/29 14.47 **                *
**************************************************************

    Stability : MAV        - BITS
    Wind      : MAV
    Period    : 95.04.01. - 95.06.30.
    Unit      : Percent

JOINT FREQUENCY DISTRIBUTION OF STABILITY, WIND SPEED AND WIND DIRECTION
                                  Class   I: Unstable            DT <491.0 Bits
                                  Class  II: Neutral      491.0 < DT <512.0 Bits
                                  Class III: Light stable 512.0 < DT <533.0 Bits
                                  Class  IV: Stable       533.0 < DT        Bits

                                  Calm: U less or equal  .3 m/s

                .0-  2.0 m/s        2.0-  4.0 m/s        4.0-  6.0 m/s        over 6.0 m/s
     Wind-
    direction    I   II  III   IV     I   II  III   IV     I   II  III   IV     I   II  III   IV   Rose
    ----------------------------------------------------------------------------------------------------
           30  .00  .39  .02  .10   .27  .90  .02  .00   .15  .83  .07  .00   .02  .32  .02  .00   3.12
           60  .05  .68  .34  .68   .29 1.64  .15  .34   .07  .83  .07  .00   .02  .27  .02  .00   5.47
           90  .05 2.49 3.71  .81   .39 3.27  .71  .85   .22  .81  .02  .00   .02  .20  .05  .00  13.60
          120  .24 3.54 1.68  .17   .81 2.05  .12  .02   .29  .56  .02  .00   .00  .24  .10  .00   9.86
          150  .66 2.59  .51  .02  1.32 1.51  .15  .00   .22  .10  .00  .00   .00  .02  .02  .00   7.13
          180  .22 2.07  .37  .10  1.03 1.46  .07  .00   .20  .46  .02  .00   .00  .39  .00  .00   6.39
          210  .10 1.68  .61  .05   .68 1.49  .07  .00   .24  .32  .00  .00   .22  .10  .00  .00   5.57
          240  .32 2.95 1.12  .37  1.12 3.47  .66  .27   .44 1.39  .12  .05   .20  .71  .00  .02  13.20
          270  .12 2.83  .85  .34  1.10 5.96 1.15  .29  1.24 2.81  .32  .12   .12 1.90  .12  .00  19.28
          300  .05 1.15  .46  .12   .07 2.93  .12  .02   .10  .66  .05  .00   .02  .27  .00  .00   6.03
          330  .00  .34  .12  .02   .17 1.64  .05  .00   .12 1.07  .00  .00   .02  .39  .00  .00   3.95
          360  .00  .02  .00  .00   .00  .05  .00  .00   .00  .00  .00  .00   .00  .07  .02  .00    .17
         Calm  .02 1.34 3.71 1.15                                                                   6.22
    ----------------------------------------------------------------------------------------------------
        Total 1.8322.0913.52 3.93  7.2526.36 3.27 1.81  3.30 9.84  .71  .17   .66 4.88  .37  .02 100.00

    Occurrence       41.4 %              38.7 %              14.0 %               5.9 %       100.0 %
    Wind speed      1.28 m/s*             3.0 m/s             4.9 m/s             7.8 m/s      2.93 m/s*
    *: Calm not included

                                Frequency of occurrence of the stability classes
Class   I            Class  II            Class III            Class  IV
Occurrence        13.0 %               63.2 %               17.9 %               5.9 %        100.0 %
```

*Figure 2: Output-file. MET-4-6.PRN.*

MEAN CONCENTRATION OF SO2 FOR STABILITY, WIND SPEED, WIND DIRECTION

Variable : SO2
Unit : ug/m3
Period : 95.04.01. - 95.06.30.

| Wind-direction | .0- 2.0 m/s | | | | 2.0- 4.0 m/s | | | | 4.0- 6.0 m/s | | | | over 6.0 m/s | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | I | II | III | IV | I | II | III | IV | I | II | III | IV | I | II | III | IV | Rose |
| 30 | - | 12.8 | 21.2 | 34.5 | 21.1 | 13.9 | 6.6 | - | 33.6 | 14.1 | 10.6 | - | 19.9 | 14.1 | 13.3 | - | 16.0 |
| 60 | 31.1 | 27.8 | 17.5 | 36.3 | 21.8 | 16.8 | 7.1 | 10.8 | 22.5 | 16.6 | 18.1 | - | 11.9 | 15.5 | 15.9 | - | 20.4 |
| 90 | 33.1 | 24.4 | 18.6 | 27.5 | 18.6 | 27.1 | 22.1 | 15.4 | 17.7 | 14.1 | 4.0 | - | 15.9 | 12.3 | 18.6 | - | 21.9 |
| 120 | 44.7 | 28.8 | 23.1 | 9.8 | 83.8 | 48.8 | 23.1 | 33.1 | 30.8 | 40.6 | 5.3 | - | - | 13.6 | 20.5 | - | 36.7 |
| 150 | 66.2 | 32.2 | 26.9 | 27.8 | 63.8 | 27.3 | 15.2 | - | 188.2 | 18.2 | - | - | - | .0 | 15.9 | - | 43.9 |
| 180 | 37.8 | 32.0 | 19.3 | 29.8 | 23.6 | 22.7 | 27.4 | - | 21.2 | 23.2 | 21.2 | - | - | 11.3 | - | - | 25.6 |
| 210 | 33.1 | 27.1 | 22.5 | 13.9 | 21.3 | 19.4 | 6.2 | - | 19.9 | 19.3 | - | - | 13.8 | 25.5 | - | - | 22.2 |
| 240 | 42.3 | 22.1 | 18.4 | 8.2 | 25.6 | 15.9 | 11.5 | 14.1 | 15.4 | 17.1 | 21.2 | 37.1 | 2.2 | 6.4 | - | 4.0 | 18.0 |
| 270 | 24.1 | 22.4 | 17.3 | 14.0 | 30.2 | 19.8 | 9.6 | 16.3 | 22.7 | 12.2 | 8.3 | 8.8 | 21.2 | 6.8 | 4.2 | - | 17.4 |
| 300 | 24.5 | 18.6 | 17.4 | 13.3 | 35.8 | 18.1 | 15.6 | 5.3 | 25.2 | 17.4 | 19.9 | - | 19.9 | 9.6 | - | - | 17.9 |
| 330 | - | 19.4 | 15.1 | 25.2 | 25.2 | 19.3 | 10.6 | - | 23.9 | 7.7 | - | - | 1.3 | 4.6 | - | - | 14.8 |
| 360 | - | 5.3 | - | - | - | 11.9 | - | - | - | - | - | - | - | 19.4 | 15.9 | - | 14.8 |
| Calm | 21.2 | 15.6 | 20.3 | 12.4 | | | | | | | | | | | | | 17.8 |
| Average | 47.7 | 25.3 | 19.9 | 20.5 | 38.4 | 22.4 | 13.9 | 14.6 | 33.5 | 15.9 | 12.8 | 16.9 | 11.7 | 9.1 | 13.4 | 4.0 | 22.7 |
| Concentr. | 24.1 | | | | 24.3 | | | | 19.9 | | | | 9.6 | | | | |

Average concentration in selected stability classes

| | Class I | Class II | Class III | Class IV |
|---|---|---|---|---|
| Concentr. | 37.1 | 21.4 | 18.4 | 18.5 |

MAX. CONCENTRATION OF SO2 FOR STABILITY, WIND SPEED, WIND DIRECTION

Variable : SO2
Unit : ug/m3
Period : 95.04.01. - 95.06.30.

| Wind-direction | .0- 2.0 m/s | | | | 2.0- 4.0 m/s | | | | 4.0- 6.0 m/s | | | | over 6.0 m/s | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | I | II | III | IV | I | II | III | IV | I | II | III | IV | I | II | III | IV | Rose |
| 30 | - | 29. | 21. | 99. | 32. | 54. | 7. | - | 111. | 30. | 20. | - | 20. | 24. | 13. | - | |
| 60 | 32. | 225. | 36. | 156. | 50. | 233. | 28. | 70. | 34. | 30. | 25. | - | 12. | 29. | 16. | - | |
| 90 | 33. | 122. | 62. | 178. | 56. | 243. | 56. | 129. | 24. | 32. | 4. | - | 16. | 24. | 20. | - | |
| 120 | 237. | 196. | 74. | 20. | 618. | 310. | 38. | 33. | 64. | 217. | 5. | - | - | 32. | 30. | - | |
| 150 | 319. | 341. | 97. | 28. | 727. | 174. | 24. | - | 311. | 29. | - | - | - | 0. | 16. | - | |
| 180 | 93. | 343. | 25. | 69. | 72. | 119. | 37. | - | 27. | 194. | 21. | - | - | 29. | - | - | |
| 210 | 46. | 213. | 76. | 20. | 29. | 42. | 8. | - | 37. | 41. | - | - | 23. | 69. | - | - | |
| 240 | 111. | 115. | 50. | 27. | 80. | 212. | 28. | 49. | 38. | 93. | 33. | 40. | 4. | 28. | - | 4. | |
| 270 | 28. | 106. | 29. | 29. | 118. | 272. | 28. | 25. | 38. | 41. | 24. | 17. | 32. | 61. | 20. | - | |
| 300 | 29. | 64. | 27. | 21. | 53. | 93. | 23. | 5. | 38. | 32. | 20. | - | 20. | 37. | - | - | |
| 330 | - | 30. | 29. | 25. | 29. | 311. | 20. | - | 29. | 29. | - | - | 1. | 23. | - | - | |
| 360 | - | 5. | - | - | - | 24. | - | - | - | - | - | - | - | 20. | 16. | - | |
| Calm | 21. | 42. | 101. | 60. | | | | | | | | | | | | | |

Number of obs.: 4097
Missing obs. : 271

*Figure 2: cont.*

```
Period     : 95.04.01. - 95.06.30.
12,
 1.3, 3.0, 4.9, 7.8,



  30  .00  .39  .02  .10  .27  .90  .02  .00  .15  .83  .07  .00  .02  .32  .02  .00
  60  .05  .68  .34  .68  .29 1.64  .15  .34  .07  .83  .07  .00  .02  .27  .02  .00
  90  .05 2.49 3.71  .81  .39 3.27  .71  .85  .22  .81  .02  .00  .02  .20  .05  .00
 120  .24 3.54 1.68  .17  .81 2.05  .12  .02  .29  .56  .02  .00  .00  .24  .10  .00
 150  .66 2.59  .51  .02 1.32 1.51  .15  .00  .22  .10  .00  .00  .00  .02  .02  .00
 180  .22 2.07  .37  .10 1.03 1.46  .07  .00  .20  .46  .02  .00  .00  .39  .00  .00
 210  .10 1.68  .61  .05  .68 1.49  .07  .00  .24  .32  .00  .00  .22  .10  .00  .00
 240  .32 2.95 1.12  .37 1.12 3.47  .66  .27  .44 1.39  .12  .05  .20  .71  .00  .02
 270  .12 2.83  .85  .34 1.10 5.96 1.15  .29 1.24 2.81  .32  .12  .12 1.90  .12  .00
 300  .05 1.15  .46  .12  .07 2.93  .12  .02  .10  .66  .05  .00  .02  .27  .00  .00
 330  .00  .34  .12  .02  .17 1.64  .05  .00  .12 1.07  .00  .00  .02  .39  .00  .00
 360  .00  .02  .00  .00  .00  .05  .00  .00  .00  .00  .00  .00  .00  .07  .02  .00
      .02 1.34 3.71 1.15                Calm
```

*Figure 3: Output-file MET-4-6.MET.*

In the examples above the input and output files were given the same "family name" XXX-4-6.RUN and XXX-4-6.PRN, where XXX was WIND, STAB and MET, respectively, and -4-6 was to tell that the period was April-June. When we shall use the file MET-4-6.MET as input to the dispersion models POI-KILD and ARE-KILD, it is renamed to MAV-4-6.MET, to tell that the data was from the station MAV. Some other data should also be added to the file, as shown in Figure 4.

The frequency matrix of the .MET-file is read unformatted, with one or more spaces delimiting the numbers. If one of the frequencies is greater than 10.0, a space has to be inserted.

```
APR-JUN-95              , Period
MAV PECS                , Place
20.                     , Tmid
12                      , Sectors
1.3, 3.0, 4.9, 7.8      , Wind speed
10.                     , Height of wind measurements
0.3                     , Starting velocity for wind sensor
Y                       , Standard wind profiles
Y                       , Standard mixing height
  30  .00  .39  .02  .10  .27  .90  .02  .00  .15  .83  .07  .00  .02  .32  .02  .00
  60  .05  .68  .34  .68  .29 1.64  .15  .34  .07  .83  .07  .00  .02  .27  .02  .00
  90  .05 2.49 3.71  .81  .39 3.27  .71  .85  .22  .81  .02  .00  .02  .20  .05  .00
 120  .24 3.54 1.68  .17  .81 2.05  .12  .02  .29  .56  .02  .00  .00  .24  .10  .00
 150  .66 2.59  .51  .02 1.32 1.51  .15  .00  .22  .10  .00  .00  .00  .02  .02  .00
 180  .22 2.07  .37  .10 1.03 1.46  .07  .00  .20  .46  .02  .00  .00  .39  .00  .00
 210  .10 1.68  .61  .05  .68 1.49  .07  .00  .24  .32  .00  .00  .22  .10  .00  .00
 240  .32 2.95 1.12  .37 1.12 3.47  .66  .27  .44 1.39  .12  .05  .20  .71  .00  .02
 270  .12 2.83  .85  .34 1.10 5.96 1.15  .29 1.24 2.81  .32  .12  .12 1.90  .12  .00
 300  .05 1.15  .46  .12  .07 2.93  .12  .02  .10  .66  .05  .00  .02  .27  .00  .00
 330  .00  .34  .12  .02  .17 1.64  .05  .00  .12 1.07  .00  .00  .02  .39  .00  .00
 360  .00  .02  .00  .00  .00  .05  .00  .00  .00  .00  .00  .00  .00  .07  .02  .00
      .02 1.34 3.71 1.15               , Calm
```

*Figure 4: Input-file MAV-4-6.MET.*

# Program POI-EMIS

In the program POI-KILD we calculate concentrations from point sources. All informations about the point sources (name, position, stack parameters and emissions) are collected in a **stack-file** INSTA, see the description for POI-KILD.

In some cases we start with informations about activity data as **fuel consumption** or **production** instead of emission data. The program POI-EMIS is prepared as a tool for calculating average hourly emissions from such consumption data, especially when we have a series of different consumption data sets. For this you have to prepare a stack-file INSTA as described for POI-KILD, see also the example to this.

In POI-EMIS the stack-file INSTA is read and copied to a new stack-file OUTFI.DAT until two dummy lines preceding the source data. Some of the information on the file is used by POI-EMIS, but most of it is only for POI-KILD. For each source the emissions are calculated, using consumption data, period length and emission factors. The program uses the same emission factor file as in CONS-EMI, see the separate description of this. If the emissions of all the compounds are less than given limits, the emissions are collected in an **area source** file OUTFI.FLD and OUTFI.PRN. Otherwise they are written together with the other source data to OUTFI.DAT, according to the POI-KILD format.

The fuel consumption data may be for a year or a shorter period, and the program calculates the average emission rate kg/h.

### Input data to POI-EMIS

| | |
|---|---|
| KX, KY, NCOMP | Grid dimensions, number of points eastward and northward and number of compounds (max 6) |
| INSTA | Input file with stack and consumption data (with apostrophes and .DAT) |
| OUTFI | Name of the output files (with apostrophes) Stack data and point source emissions are written to OUTFI.DAT<br>The area emission fields (if any) will be written binary to the file OUTFI.FLD, the output is written to the file OUTFI.PRN |
| PERIOD, PLACE | Both with apostrophes |
| ICON | We may have different sets with consumption data at the file (max. 5), we want to use no. ICON |
| NDAY | Number of days in the data period |
| INFAK | Emission factors are read from INFAK (with apostrophes and .DAT). |
| (QLIM(I), I=1,NCOMP) | Limits for point source emissions (kg/h) |

**Consumption data**

The preliminary stack-file INSTA contains both data about the stack and the consumption or other activity. If the calculated emissions from a source are small, the source will be included as an area source and the detailed stack information is not necessary. Instead of the line with

STACK, (SKOR(I), I=1,8), ICOD, (EM(I), I=1 NCOMP),
the program reads **unformatted**:
STACK, (SKOR(I), I=1, 2), SKORTE, ICOD, IFU, (CON(I), I=1, ICON).

| | |
|---|---|
| STACK | Stack (factory) name A10 (without apostrophes) |
| SKOR(1), (SKOR(2) | X- and Y-coordinates of the stack (unit km) |
| SKORTE | Text, corresponding to SKOR(3) -- SKOR(9), **within apostrophes**. The text contains the detailed stack information. It can also include a numbering of the sources, to find which source that has bad data |
| ICOD | Source group code 1-9 (default=1) |
| IFU | Fuel type code, according to the emission factor file. |
| CON | Consumption data sets, with units corresponding to the emission factor file. In the calculations we decide **which** data set we want to use. |

**Emission factors** are read from the file INFAK (with apostrophes and .DAT), see the separate description of the emission factor file.

**Example:**

From Pécs we have a file with point source data and 5 sets with consumption data: for every 3 months and for a year. The point source data will be copied to a new file together with calculated emission data.
In addition to these emissions there will be emissions from industrial processes that has to be included in the point source dispersion calculations.

| | |
|---|---|
| 21,14,4 | Grid size, 4 components |
| 'FELMER5.DAT' | Point source file with source data and consumption data |
| 'EM-P-WIN' | Point source emission file, emissions from "point sources", winter |
| 'WINTER','PECS' | Period, place |
| 1 | ICONS=1, consumption for January-February-March |
| 90 | 90 days |
| 'EMISFACT.DAT' | Emission-factor file |

0.5,0.5,0.5,0.5 Limits for the emissions of SO2, NOx, CO and PART

The beginning of the stack file FELMER5.DAT is:

```
L:\USER\PECS\FELMER5.DAT
Start
Point sources in Pecs
1000,                Grid size
576.0,74.0,          UTMx,UTMy
0,                   North is north
4,0,                 4 normal compounds
0.0,                 Background
N,                   No correction for topography
Y,                   Alpha=1.0
3,                   McElroy-Pooler for low, Brookhaven for high sources
Y,                   50 m separates high and low sources
2,1,                 Emissions in kg/h, temp in oC
STACK      UTMX    UTMY    SKORTE                             ICO IFU CON(1)  CON(2)  CON(3)  CON(4)  CON(5)
AAAAAAAAAAxxxxxxxxXXXXXXX AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA  I   I xxxxxx  xxxxxx  xxxxxx  xxxxxx  xxxxxx
Initato KF 587.240 75.090 ' 107  1  1 15  1.000 gazolaj   ' 1 29  1.000   1.000   1.000   1.000   4.000
PLASTEX My 584.910 75.840 ' 144  1  1 14  1.440 tyzelool  ' 1 21 39.546   2.600   0.000  13.375  55.521
PLASTEX My 584.910 75.840 ' 144  1  2 14  0.300 tyzelool  ' 1 21  5.100   5.100   7.843   3.625  21.668
Aroma BT s 580.536 77.800 ' 304  1  1  8  0.090 kemenyfa  ' 1 12 21.000   0.000   8.000  26.000  55.000
Aroma BT s 580.536 77.800 ' 304  1  2  8  0.090 kemenyfa  ' 1 12 21.000   0.000   8.000  26.000  55.000
INTERGLOB  585.420 79.050 ' 439  2  4  9 12.000 higito    ' 1  0  0.025   0.025   0.025   0.025   0.100
INTERGLOB  585.420 79.050 ' 439  2  4  9 12.000 festek    ' 1  0  0.028   0.028   0.028   0.027   0.111
Közterylet 586.920 79.210 ' 442  5  4  7  0.160 festek,h  ' 1  0  0.067   0.060   0.083   0.053   0.263
Közterylet 586.920 79.210 ' 442  5  5  7  0.160 festek,h  ' 1  0  0.067   0.060   0.083   0.053   0.263
Gomba Komp 590.620 79.550 ' 492  2  1 18  0.800 tyzelool  ' 1 21  2.250   1.500   1.500   2.250   7.500
EPGEP Pann 586.560 79.580 ' 484 12  1 12  1.400 festek    ' 1  0  3.100   3.100   3.100   3.100  12.400
EPGEP Pann 586.560 79.580 ' 484 12  3 14  0.137 tyzelool  ' 1 21  2.450   2.450   2.450   2.450   9.800
EPGEP Pann 586.560 79.580 ' 484 12  5 11  0.126 higito    ' 1  0  0.750   0.750   0.750   0.750   3.000
B.M Zölder 585.220 79.760 ' 481  7  1 21  1.200 szen      ' 1 50 35.000  10.000   0.000  25.000  70.000
Gepjavito  590.940 79.800 ' 492  4  1 18  0.260 szen      ' 1 50 16.000   0.000   0.000  14.000  30.000
Gepjavito  590.940 79.800 ' 492  4  2  6  0.120 kovacssz  ' 1 51  0.050   0.050   0.050   0.050   0.200
Agraria Ke 586.720 79.800 ' 484 10  5 10  0.283 kovacssz  ' 1 51  0.030   0.030   0.030   0.030   0.120
Pecsi  mez 590.340 79.820 ' 491  1  5 18  0.560 szen      ' 1 50 20.500   0.000   0.000  18.500  39.000
Pecsi  mez 590.340 79.820 ' 491  1  5 18        fa        ' 1 11 13.000   0.000   0.000  11.000  24.000
........................
```

and so on. The actual file has 235 point sources, many with small emissions. The fuel types are written in Hungarian, and the fuel code is missing for many of the sources. The text within the apostrophes is not used by the program, but more detailed stack data should be included here before you are using the file as input to POI-KILD.

The output of the program is found at three files: Stack data and point source emissions are written to the file OUTFI.DAT, the area emission fields (if any) will be written binary to the file OUTFI.FLD, the output is written to the file OUTFI.PRN. Messages from the emission calculations are also written to the file OUTFI.PRN, as shown below. The file OUTFI.DAT has to be arranged a little, in order to be useful as input to POI-KILD.

The emission factor file must be adjusted for each place, due to differences in vehicle types, fuel types etc.

From the example the beginning of the output-file EM-P-WIN.PRN is:

```
Emission factors are read from file EMISFACT.DAT
Emiss
IFU
IIIIx
   4 Fuel type             UNIT      DENS     SO2     NOx      CO     Part
   1 Gasoline cars <3.5t g/km      1.000    .050   2.120   9.100     .240
   2 Diesel 3.5-16t      g/km      1.000    .110   7.400   7.300     .820
   3 Heavy diesel truck  g/km      1.000   1.470  14.800   7.300    1.400
   4 Bus                 g/km      1.000   1.350  18.200   6.200    1.200
   5 Motor cycle         g/km      1.000    .080    .080  22.000     .170
  11 Sawdust             ton       1.000    .040   3.000  15.000   10.000
  12 Wood (kemenyfa)     ton       1.000    .050   3.000  15.000    2.100
  21 Dom. fuel,  .3%S    ton       1.000   5.500   2.500   1.300     .200
  23 Med. fuel, 1.2%S    ton       1.000  23.000   4.500   1.200    5.000
  24 Med. fuel, 3.0%S    ton       1.000  57.000   4.500   1.200    5.000
  28 Diesel oil          ton       1.000   3.800   2.500   1.300     .200
  29 Gas oil, .05%S      ton       1.000    .900   2.500   1.300     .200
  41 Earth gas(foldgaz)  m3         .001    .130   1.800   1.400     .100
  42 Biogas              m3         .001    .030    .060   1.800     .020
  50 Coal (szen)         t         1.000  48.500   3.000  31.800   46.300
  51 Pecs coal(aknaszen) ton       1.000  34.000   2.400  31.900   65.400
  53 Coal dust(porszen)  ton        .001  26.600   3.000  31.900    1.800
  57 Coal nuts(dio szen) ton       1.000  42.000   3.000  32.400   48.600
  59 Coke (koksz)        ton       1.000  38.000   6.000  32.700   20.600
  65 Komloi dara         ton       1.000  41.800   3.000  30.000   74.200
  91 Kender              ton       1.000    .001    .490  12.190   18.290

 Stack data are read from file FELMER5.DAT  and written to EM-P-WIN.DAT
```

```
 Source Initato KF has emissions from use of      1.0 ton   of fuel type 29 in (12, 2):   .000    .001    .001    .000
 Source PLASTEX My has emissions from use of     39.5 ton   of fuel type 21 in ( 9, 2):   .101    .046    .024    .004
 Source PLASTEX My has emissions from use of      5.1 ton   of fuel type 21 in ( 9, 2):   .013    .006    .003    .000
 Source Aroma BT s has emissions from use of     21.0 ton   of fuel type 12 in ( 5, 4):   .000    .029    .146    .020
 Source Aroma BT s has emissions from use of     21.0 ton   of fuel type 12 in ( 5, 4):   .000    .029    .146    .020
 Fuel type missing:
INTERGLOB  585.420 79.050 ' 439  2  4  9 12.000 higito  ' 1  0    .025     .025     .025     .025     .100
 Fuel type missing:
INTERGLOB  585.420 79.050 ' 439  2  4  9 12.000 festek  ' 1  0    .028     .028     .028     .027     .111
 Fuel type missing:
Közterylet 586.920 79.210 ' 442  5  4  7   .160 festek,h' 1  0    .067     .060     .083     .053     .263
 Fuel type missing:
Közterylet 586.920 79.210 ' 442  5  5  7   .160 festek,h' 1  0    .067     .060     .083     .053     .263
 Source Gomba Komp has emissions from use of      2.3 ton   of fuel type 21 in (15, 6):   .006    .003    .001    .000
 Fuel type missing:
EPGEP Pann 586.560 79.580 ' 484 12  1 12  1.400 festek  ' 1  0   3.100    3.100    3.100    3.100   12.400
 Source EPGEP Pann has emissions from use of      2.5 ton   of fuel type 21 in (11, 6):   .006    .003    .001    .000
 Fuel type missing:
EPGEP Pann 586.560 79.580 ' 484 12  5 11   .126 higito  ' 1  0    .750     .750     .750     .750    3.000
 Source Gepjavito  has emissions from use of     16.0 t     of fuel type 50 in (15, 6):   .359    .022    .236    .343
 Source Gepjavito  has emissions from use of       .1 ton   of fuel type 51 in (15, 6):   .001    .000    .001    .002
 Source Agraria Ke has emissions from use of       .0 ton   of fuel type 51 in (11, 6):   .000    .000    .000    .001
 Source Pecsi  mez has emissions from use of     20.5 t     of fuel type 50 in (15, 6):   .460    .028    .302    .439
 Source Pecsi  mez has emissions from use of     13.0 ton   of fuel type 11 in (15, 6):   .000    .018    .090    .060
 Source Bader Bt   has emissions from use of       .3 ton   of fuel type 21 in ( 6, 7):   .001    .000    .000    .000
 Source MOL Rt Ig. has emissions from use of     21.6 ton   of fuel type 21 in ( 6, 7):   .055    .025    .013    .002
 Source Bader Bt   has emissions from use of       .6 ton   of fuel type 21 in ( 6, 7):   .002    .001    .000    .000
 Source Bader Bt   has emissions from use of      1.2 ton   of fuel type 21 in ( 6, 7):   .003    .001    .001    .000
```

and so on. The point sources are written to EM-P-WIN.DAT.

```
Norwegian institute for air research (NILU)
       "KILDER" program package license for
    South Trans-Danubian Environmental Inspectorate,
                      Pecs, Hungary
                 VERSION 2.0, 15-2-1997
                 - - - - O O O - - - -

 MAP OF : SO2              UNIT:  kg/h              SOURCE: FELMER5.DAT
 PERIOD : WINTER 95

   PLACE: PECS            GRID SIZE: 1000 METER
 CREATED: 1997/10/23 16.55


     MAXIMUM VALUE IS  8.2632E-01, IN (15, 6)
                 SUM= 4.04065E+00    SCALE FACTOR:  1.0E-04
```

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| J=14 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 209. | . | . | . | 980. | . | . |
| J=13 | . | . | . | . | . | . | . | . | . | . | . | . | . | 1749. | . | . | . | . | . | 145. | . |
| J=12 | . | . | . | . | . | . | . | . | . | . | . | . | 1332. | . | . | . | . | . | . | . | . |
| J=11 | . | . | . | . | . | . | . | . | . | . | . | . | . | 395. | . | . | . | . | . | . | . |
| J=10 | . | . | . | . | . | . | . | . | . | . | 27. | . | . | 175. | 172. | . | . | . | . | . | . |
| J= 9 | . | . | . | . | . | . | . | . | . | 323. | 1100. | . | 842. | 351. | 349. | . | . | . | . | . | . |
| J= 8 | . | . | . | . | . | . | . | . | 1068. | . | 511. | 371. | 216. | 3840. | . | . | . | . | . | . | . |
| J= 7 | . | . | . | 805. | 866. | 649. | 2925. | 634. | 26. | 2898. | 345. | 285. | 52. | 6768. | . | . | . | . | . | . | . |
| J= 6 | . | . | . | . | . | . | . | . | . | 321. | 211. | . | . | . | 8263. | . | . | . | . | . | . |
| J= 5 | . | . | . | . | . | . | . | . | . | 45. | . | . | . | . | . | . | . | . | . | . | . |
| J= 4 | . | . | . | . | 10. | . | . | . | . | 5. | . | . | . | . | . | . | . | . | . | . | . |
| J= 3 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| J= 2 | . | . | . | . | . | . | . | . | 1137. | . | . | 4. | . | . | . | . | . | . | . | . | . |
| J= 1 | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 |

Similar maps are given for the other compounds:

```
MAP OF : NOx               UNIT:  kg/h              SOURCE: FELMER5.DAT
PERIOD : WINTER 95        PLACE:  PECS           GRID SIZE: 1000 METER
CREATED: 1997/10/23 16.55

    MAXIMUM VALUE IS  7.0738E-01, IN (11, 8)
                SUM= 4.56445E+00    SCALE FACTOR:  1.0E-04


MAP OF : CO                UNIT:  kg/h              SOURCE: FELMER5.DAT
PERIOD : WINTER 95        PLACE:  PECS           GRID SIZE: 1000 METER
CREATED: 1997/10/23 16.55

    MAXIMUM VALUE IS  6.2973E-01, IN (15, 6)
                SUM= 5.45041E+00    SCALE FACTOR:  1.0E-04


MAP OF : Particle          UNIT:  kg/h              SOURCE: FELMER5.DAT
PERIOD : WINTER 95        PLACE:  PECS           GRID SIZE: 1000 METER
CREATED: 1997/10/23 16.55

    MAXIMUM VALUE IS  8.4429E-01, IN (15, 6)
                SUM= 2.52600E+00    SCALE FACTOR:  1.0E-04
```

The point source file EM-P-WIN.DAT will look like:

```
L:\USER\FG\PECS\FELMER5.DAT
Name          x       y     grid                  fuel        if     1            2            3
AAAAAAAAAAxxxxxxxxxxxxx
Start
Point sources in Pecs
1000
  576.00   74.00
     .00
           4           0
     .00
N,
Y,
           3
Y
   2   1
```

```
Name          x       y    grid               fuel         if      1      SO2     NOx     CO    Particle
AAAAAAAAAAxxxxxxxxXXXXXXX AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA  I  xxxxxx  xxxxxx  xxxxxx  xxxxxx
B.M Zölder 585.22  79.76 ' 481  7  1 21  1.200 szen              ' 1     .79     .05     .52     .75
BAZIS DEV  582.26  80.13 ' 517  1 12 21  1.130 tyzelool          ' 1     .92     .42     .22     .03
Pecsi Hoer 589.34  80.28 ' 531  1              pakura            ' 1    4.17     .33     .09     .37
DRAVA PIER 579.33  80.34 ' 511  1  1 11  0.104 szen              ' 1     .76     .05     .50     .73
DRAVA PIER 579.33  80.34 ' 511  1  2 11  0.104 szen              ' 1     .76     .05     .50     .73
MAV vontat 586.08  80.96 ' 567 42  1 30  0.690 szen              ' 1    2.33     .14    1.53    2.22
MAV vontat 586.08  80.96 ' 567 42  2 30  0.690 szen              ' 1    2.33     .14    1.53    2.22
P & Tsai F 587.02  81.20 ' 611 23  1 23  0.283 koksz,fa          ' 1     .86     .14     .74     .47
M Design V 584.56  81.38 ' 606 11  2  3  0.110 levalasz          ' 1     .62     .04     .41     .59
Tydoszanat 585.94  83.16 ' 776  7  1     0.177 futoolaj          ' 1     .86     .07     .02     .08
Tydoszanat 585.94  83.16 ' 776  7  2     0.177 futoolaj          ' 1    3.10     .24     .07     .27
Hirdi Fono 595.49  86.34 '1047  2  1 22  0.360 kender h          ' 1     .10   49.98 1243.38 1865.58
Hirdi Fono 595.49  86.34 '1047  2  1  8  0.181 pakura            ' 1    1.06     .08     .02     .09
Hirdi Fono 595.49  86.34 '1047  2  1  7  0.096 kender h          ' 1     .00    1.47   36.57   54.87
Hirdi Fono 595.49  86.34 '1047  2  1  7  0.096 kender h          ' 1     .00    1.47   36.57   54.87
```

and so on.
The point source file EM-P-WIN.DAT has to be arranged a little before it can be used as input to POI-KILD: In the area between the apostrophes shall the following data be included:

| | |
|---|---|
| SKOR(3) | Stack base (m.a.s.l.) |
| SKOR(4) | Stack height (m) |
| SKOR(5) | Stack diameter (m) |
| SKOR(6) | Gas temperature, °C or K, according to index ITT |
| SKOR(7) | Gas velovity (m/s) |
| SKOR(8) | Building height (default 10 m) |
| SKOR(9) | Building width (default 30 m) |

In the example the source group code is 1 for all sources, but this can be adjusted now.

# Program POP-FIE

This program is written as a tool for distributing characteristics when total figures for several districts are given. This will mainly be population, but it has also been used to distribute working places and wood consumption.

From official statistics the population within districts/zones is given, and the problem is to distribute this to the grid. The more detailed the information is, the better will the result be. The work starts with a map with the grid, and with the borders of each zone. For each zone it is estimated how many % of the zone that is covered by each square. When it is a homogeneous zone the area distribution may be used, otherwise dense populated parts must be given more weight than the rest of the zone. In some cases we have data for sub-districts and we may calculate by the use of POP-DIST how many % of the population within a district that lives within each sub-district. In this way we prepare a distribution file DISTFILE.DAT, as shown in the example below. We may have several different sets for the population data on POPFILE.DAT (ex. POP1990, POP2000 and POP2010), and we select which we want. We may also have different distribution files according to different area use plans, but such plans will normally only affect the distribution in special districts.

**Example**:

Calculation of the population distribution in Jakarta, Indonesia is only interesting for Jakarta, but serves as an examle for how POP-FIE works. Jakarta is divided into 5 regions, Jakarta Pusat (Central), J. Timur (East), J. Barat (West), J. Selatan (South) and J. Utara (West). Figure 1 shows a part of the map for Central Jakarta, with a km-grid. The districts (kecamatans) Pusat1, Tanah Abang and Pusat2, Menteng are indicated with their borders, together with the sub-districts (kelurahans). From POP-DIST we have calculated the percentage of the population within the kecamatans that are living within each kelurahan. These percentages are distributed to the corresponding grids. Kelurahan Bendungan Hilir has 14.96% of the population of area P 1, and this is distributed with 5.0% in (700,312), 4.0% in (699,313), 4.0% in (700,313), 0.5% in (699,314) and 1.5 % in (700,314). Kelurahan Kebon Melati has 25.92 % of the population, distributed to 12. % in (700,314), 10.0% in (701,314) and 3.9% in (700,315).

For each square we are making the sum of the individual contributions. This procedure has to be done by hand, with a good map and good local knowledge. Following the procedure, we find that the population within the kecamatan P 1, Tanah Abang should be distributed according to the following 18 squares:

(698,311) 0.2%, (699,311) 1.0%, (698,312) 0.2%, (699,312) 0.1%, (700,312) 6.0%, (701,312) 1.0%, (698,313) 0.3%, (699,313) 4.2%, (700,313) 10.0%, (701,313) 5.0%, (699,314) 10.5%, (700,314) 18.0%, (701,314) 11.0%, (699,315) 3.0%, (700,315) 15.2%, (701,315) 9.6%, (700,316) 2.2% and (701,316) 2.5%,

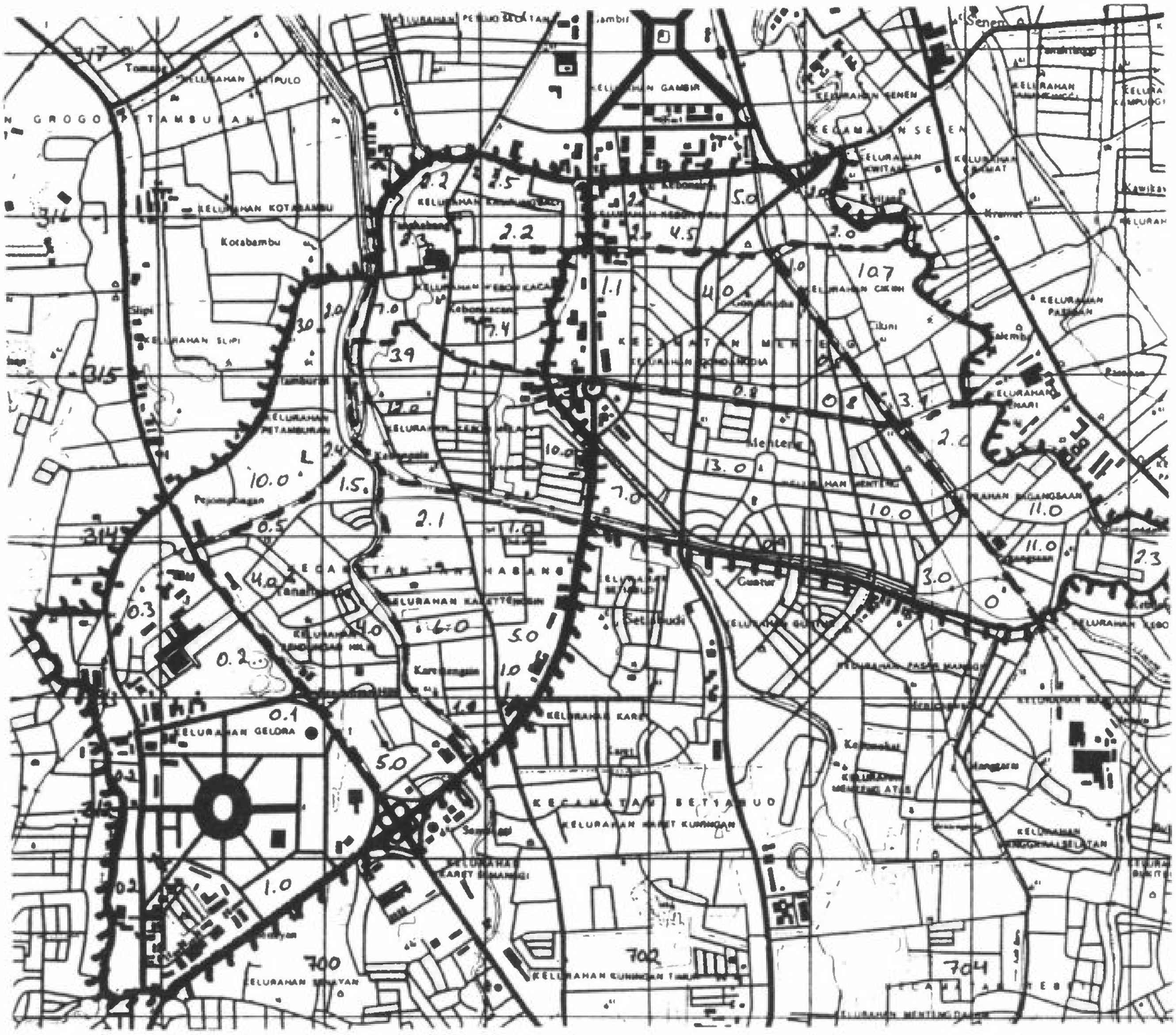



*Figure 1: Map of central Jakarta districts and sub-districts.*

and P 2, Menteng to the 14 squares:

(702,313) 0.9%, (703,313) 3.0%, (704,313) 11.0%, (705.313) 2.3%, (701,314) 7.0%, (702,314) 13.8% (703,314) 15.9%, (704,314) 11.0%, (701.315) 3.1%, (702,315) 9.5% (703,315) 13.5%, (701,316) 2.0%, (702,316) 5.0% and (703,316) 2.0%.

In this way the file DISTFILE is prepared. You can put any comments at the beginning of the file, until a line with START or Start.

```
                      1                 2                 3                 4                 5                 6
AAAAiiiXfff.FFF.ff.fFFF.fff.FF.Ffff.FFF.ff.fFFF.fff.FF.Ffff.FFF.ff.fFFF.fff.FF.F
START
P 1   18 698.311. 0.2699.311. 1.0698.312. 0.2699.312. 0.1700.312. 6.0701.312. 1.0
         698.313. 0.3699.313. 4.2700.313.10.0701.313. 5.0699.314.10.5700.314.18.0
         701.314.11.0699.315. 3.0700.315.15.2701.315. 9.6700.316. 2.2701.316. 2.5
P 2   14 702.313. 0.9703.313. 3.0704.313.11.0705.313. 2.3701.314. 7.0702.314.13.8
         703.314.15.9704.314.11.0701.315. 3.1702.315. 9.5703.315.13.5701.316. 2.0
         702.316. 5.0703.316. 2.0
```

and so on.

POPFILE will normally consist of different sets with population data (for different years, different area strategies etc.), but it may also be other types of data which are given for each district. If it is working places, the distribution codes will be different.

This procedure is based upon a steady population distribution or an even population growth. If there are plans for development within one sub-district the population distribution key for that area must be revised, but for the rest of the area the keys may be unchanged.

As an example of a POPFILE different data sets for the population of Jakarta may be used:

```
Start       1987    1990    1994    2000
Pusat
P 1     1  229896  192152  186727  226000
P 2     1  116581   90774  115479  121000
P 3     1  134547  112589  126465  109000
P 4     1   84400   92497   88901   97000
P 5     1  112850  122866  108863  124000
P 6     1  206107  226528  232221  245000
P 7     1  152040  124482  141627  152000
P 8     1  129493  112864  119610  132000
Timur
T 1     2   80366  119517  119328  140000
T 2     2   55939  100860   92721  113000
T 3     2   94709  157674  142296  164000
T 4     2  159711  211757  190714  204000
```

and so on. These data are collected from different sources, and the variations in the population from year to year, particularly for the kecamatans are so large that it will be necessary to examine the background for the data in detail. Are the borders changed?

**Input data to POP-FIE**

| | |
|---|---|
| KX, KY | Grid dimensions, number of points eastward and northward |
| LDI | Number of districts (see below) |
| DISTFILE, POPFILE | Distribution code file, population file (both with apostrophes and .DAT) |
| OUTFILE | Name of the output files (with apostrophes) |
| ISIZE | Grid size in meters |
| COMPOUND, UNIT, PERIOD, PLACE, SOURCE | all with apostrophes |
| UTMX, UTMY | Co-ordinates for lower left corner if the grid coordinates are given in the UTM grid.<br>With a local coordinate system, UTMX = UTMY = 0 |
| NT, JT | NT data sets at INFILE, we want no. JT. (Max. 4 data sets.) |
| NREG | Separate maps for NREG different regions (max. 12) |

The program is dimensioned to LDI * NSQ ≤ 3000. We can have up to 200 districts and up to 50 squares for a district, but not at the same time. The maximum number of squares for a district, NSQ will be 3000/LDI. If this is not sufficient, you have to divide the area or the districts in smaller parts.

The file DISTFILE is read until START or Start, and then distribution data are read until end, for a maximum of 200 districts. Each district may be covered by max. 50 squares.

If NSQ is 6 or less:

DIS, NSQ, (XR(I), YR(I), VAL(I), I=1,NSQ)
(A4, I3,1X,6(2F4.0,F4.2))

| | |
|---|---|
| DIS | Name of the district, an abbreviated name or a number (A4). Must be the same as in POPFILE.<br>The district covers NSQ squares, each with coordinates (XR,YR) and with VAL % of the value for the district, VALUE. |

If NSQ is 7 or more:

DIS, NSQ, (XR(I), YR(I), VAL(I), I=1,6)
(A4, I3,1X,6(2F4.0,F4.2))
Distribution for the first 6 squares

(XR(I),YR(I),VAL(I), I=7,NSQ)
(8X,6(2F4.0,F4.2))
Distribution for the rest, 6 squares per line.

The file POPFILE with population data are read until a line beginning with Start.

REGION (A5) Region name, followed by:

DIS,IREG,(VALUE(I), I=1,JT) (A4,1X,I3,4F8.0)

DIS is the name of the district, which should be the same as in DISTFILE.
IREG, the district belongs to region IREG
Data set no. JT is used, with the value VALUE(JT)

When all data are read the program asks if we want to re-scale the data, Y / N.

If the answer is Y or y, then:

SCALE Scale factor

Finally the program asks whether we want a listing of the data for each square, Y/N.

If we have asked for separate maps for each region these will now follow.

**Example:**

For calculating the distribution for Jakarta in 1990 the input will be:

```
20,20                          , Grid dimensions
150                            , Number of districts
'DISTFILE.DAT', 'POPFILE.DAT   , Input files
'JAK-POP'                      , Output file
1500                           , Grid size
'INHABITANT', 'PERSON', '1990', 'JAKARTA', 'POPULATION'
686.0, 295.0,                  , Lower left corner
3,2                            , 3 data sets at POPFILE, we want no. 2.
5                              , Separate maps for 5 different regions.
```

Then the distribution codes will be read from DISTFILE.DAT, and the population from POPFILE.DAT.

The output of the program will be a population distribution map at the file JAK-POP.PRN, as shown in Figure 2. This covers 7,108,354 persons, with a maximum of 120,388 persons living in grid (11,15).

In this example the distribution was evaluated for a 1500 m grid, but the procedure will be the same. Lower left corner has the co-ordinates (686.0, 295.0).

```
MAP OF : INHABITANT          UNIT: PERSON              SOURCE: POPULATION
PERIOD : 1990               PLACE: JAKARTA          GRID SIZE: 1500 METER
CREATED: 1995/07/28 17.41

    MAXIMUM VALUE IS  1.2039E+05, IN (11,15)
                SUM= 7.10835E+06    SCALE FACTOR:  100
```

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| J=20 | . | . | 1. | . | . | . | . | . | . | . | . | . | . | . | . | . | . | . | 3. | 6. |
| J=19 | 39. | 47. | 23. | 5. | 2. | 4. | . | . | . | . | . | . | . | 76. | 162. | 63. | 173. | 63. | 41. | 9. |
| J=18 | 64. | 107. | 104. | 32. | 7. | 39. | 157. | 255. | 255. | . | . | 195. | 139. | 426. | 822. | 673. | 398. | 217. | 28. | 10. |
| J=17 | 51. | 72. | 117. | 130. | 94. | 22. | 123. | 558. | 528. | 540. | 390. | 100. | 392. | 493. | 772. | 278. | 351. | 306. | 42. | 24. |
| J=16 | 78. | 97. | 87. | 106. | 145. | 202. | 469. | 459. | 790. | 898. | 1045. | 397. | 147. | 147. | 131. | 137. | 39. | 39. | 39. | 29. |
| J=15 | 72. | 110. | 116. | 92. | 92. | 356. | 635. | 722. | 565. | 395. | 1204. | 855. | 635. | 316. | 122. | 132. | 65. | 43. | 37. | 26. |
| J=14 | 43. | 105. | 84. | 69. | 111. | 193. | 370. | 828. | 651. | 228. | 813. | 895. | 638. | 356. | 199. | 151. | 96. | 45. | 35. | 90. |
| J=13 | . | . | 35. | 49. | 49. | 189. | 370. | 778. | 730. | 1098. | 489. | 486. | 499. | 636. | 392. | 231. | 252. | 127. | 104. | 97. |
| J=12 | . | . | 40. | 190. | 112. | 225. | 227. | 974. | 758. | 763. | 585. | 945. | 865. | 708. | 520. | 194. | 155. | 81. | 81. | 37. |
| J=11 | . | . | 59. | 97. | 116. | 250. | 260. | 348. | 565. | 729. | 682. | 768. | 933. | 682. | 384. | 341. | 341. | 325. | 169. | . |
| J=10 | . | . | . | . | 129. | 263. | 291. | 313. | 407. | 399. | 888. | 863. | 840. | 711. | 357. | 268. | 211. | 209. | . | . |
| J= 9 | . | . | . | . | 79. | 240. | 298. | 445. | 402. | 139. | 557. | 452. | 527. | 513. | 66. | 175. | 153. | 112. | . | . |
| J= 8 | . | . | . | . | 29. | 303. | 159. | 380. | 396. | 118. | 672. | 319. | 425. | 369. | 66. | 31. | . | . | . | . |
| J= 7 | . | . | . | . | 47. | 199. | 129. | 204. | 257. | 253. | 313. | 208. | 228. | 268. | 62. | 52. | . | . | . | . |
| J= 6 | . | . | . | . | . | 82. | 123. | 258. | 213. | 200. | 228. | 304. | 255. | 272. | 177. | 63. | 16. | . | . | . |
| J= 5 | . | . | . | . | . | . | 73. | 105. | 112. | 144. | 188. | 207. | 287. | 181. | 164. | 76. | 32. | . | . | . |
| J= 4 | . | . | . | . | . | . | . | 23. | 25. | 67. | 155. | 237. | 252. | 49. | 82. | 60. | 32. | . | . | . |
| J= 3 | . | . | . | . | . | . | . | . | 44. | 91. | 78. | 137. | 132. | 94. | 55. | 32. | 12. | . | . | . |
| J= 2 | . | . | . | . | . | . | . | 10. | 55. | 64. | 56. | . | 88. | 89. | 58. | 33. | 11. | . | . | . |
| J= 1 | . | . | . | . | . | . | . | 6. | 41. | 25. | . | . | . | 30. | 66. | 20. | 7. | . | . | . |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |

*Figure 2: Map for population distribution in Jakarta.*

# Program PRIN-FIE

Normally the results from a programme will be as corresponding .FLD and .PRN files. Sometimes the .PRN file may have been deleted, or you want it presented in another way. PRIN-FIE makes a print-out of a .FLD-file.

### Input data to PRIN-FIE

| | |
|---|---|
| KX, KY | Grid dimensions, number of points eastwards and northward |
| INFILE | Name of the file that shall be printed (with apostrophes and .FLD) |
| OUTFILE | Name of the output file (with apostrophes and .PRN) |
| | Normally, INFILE and OUTFILE will be the same family. |
| NFIE, | Number of fields to be printed. If you do not know how many fields you have, say 0 and you get all. |
| If NFIE > 0, read: | IFIE (I), I=1,NFIE     Number of the fields to be printed |
| ISC | Scaling:<br>ISC=1 No scaling (small integers)<br>ISC=2 Automatic scaling<br>ISC=3 New unit for some fields<br>ISC=4 Separate scale factor for each field<br>ISC=5 Common scale factor for all fields |

If ISC=3 or higher, enter for each field:

| | |
|---|---|
| CSC | New scale factor |

If CSC is different from 1.0, then:

| | |
|---|---|
| UNIT | New unit (with apostrophes). If you want the same unit, put SAME. |

### Example and output from PRIN-FIE

```
C:\KILDER\PRIN-FIE
****             License
14,16            Grid dimensions
'TESTZONE.FLD'   Field to be printed
'TESTZONE.PRN'   Print-file
1                1 field
1                Field no. 1
1                ISC=1 (small integers)
```

```
Field for ZONE CODE        is put on file testzone.FLD

MAP OF: ZONE CODE      UNIT: CODE NUMBER   PERIOD: 1994          PLACE: TESTPLACE

     MAXIMUM VALUE IS  4.0000E+00, IN ( 8, 6)
                 SUM= 3.17000E+02       SCALE FACTOR:  1.0

     GRID SIZE:  1000 METER
```

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| J=16 | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| J=15 | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| J=14 | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 2. | 2. | 2. | 2. | 1. | 1. |
| J=13 | 1. | 1. | 1. | 1. | 1. | 2. | 1. | 2. | 3. | 3. | 2. | 2. | 1. | 1. |
| J=12 | 1. | 1. | 1. | 2. | 2. | 2. | 2. | 2. | 3. | 3. | 3. | 2. | 1. | 1. |
| J=11 | 1. | 1. | 2. | 2. | 2. | 3. | 3. | 3. | 4. | 4. | 1. | 1. | 1. | 1. |
| J=10 | 1. | 1. | 2. | 2. | 2. | 4. | 4. | 2. | 4. | 3. | 2. | 1. | 1. | 1. |
| J= 9 | 1. | 2. | 2. | 2. | 1. | 1. | 1. | 2. | 3. | 2. | 1. | 1. | 1. | 1. |
| J= 8 | 1. | 2. | 2. | 2. | 1. | 1. | 1. | 2. | 3. | 1. | 1. | 1. | 1. | 1. |
| J= 7 | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 3. | 3. | 2. | 1. | 1. | 1. | 1. |
| J= 6 | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 4. | 4. | 3. | 1. | 1. | 1. | 1. |
| J= 5 | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 3. | 3. | 2. | 1. | 1. | 1. | 1. |
| J= 4 | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 3. | 2. | 2. | 1. | 1. | 1. | 1. |
| J= 3 | 1. | 2. | 1. | 1. | 1. | 1. | 1. | 1. | 2. | 2. | 1. | 1. | 1. | 1. |
| J= 2 | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| J= 1 | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |

Another examples:

| | |
|---|---|
| C:\KILDER\PRIN-FIE | |
| **** | License |
| 22,18 | Grid dimensions |
| 'POP-OSLO.FLD' | Field to be printed |
| 'POP-OSLO.PRN' | Print-file |
| 1 | 1 field |
| 1 | Field no. 1 |
| 2 | ISC=2 (automatic scaling) |

In many cases it would be useful to take the .PRN-file into an editor and substitute 'blank-zero-period' by 'blank-blank-period'. In this way the zeros from all the grids with no activity or emissions are suppressed and the map is easier to read.

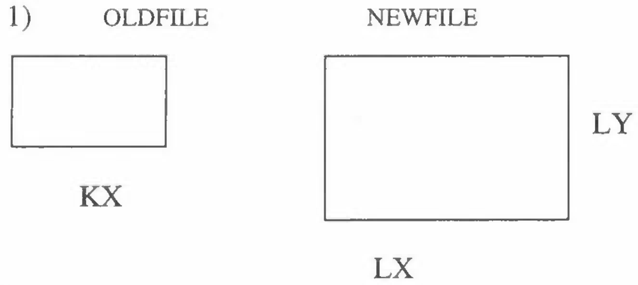
In Guangzhou maps for the fuel consumption are made in the program FUEL-FIE. The consumption is dominated by some large consumers, and the print-out is scaled according to this. But we can print the field with another scaling to see the other sources better:

| | |
|---|---|
| C:\KILDER\PRIN-FIE | |
| **** | License |
| 26,28 | Grid size |
| 'FUEL-95.FLD' | File name |
| '95-FUEL.PRN' | Output file, will not overwrite FUEL-95.PRN! |
| 0 | All fields |
| 0.01 | Scale factors |
| 1.0 | |
| 0.1 | |
| 0.01 | |
| 1.0 | |

# Program ZOOM-FIE

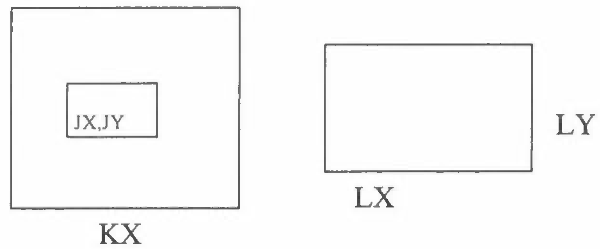
In many model calculations we are working with different grid size. For some purposes we use a 1 km-grid, while other calculations are made for a 2 km- or a 500 m-grid. The program ZOOM-FIE are transforming data fields with one grid size to another. We have five alternatives, as shown below:

1)



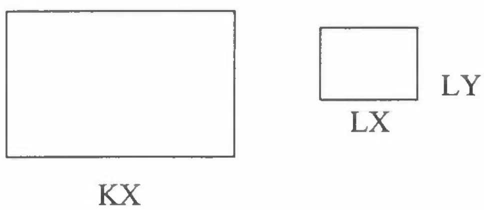

A file is expanded to a file with half the grid size

2)



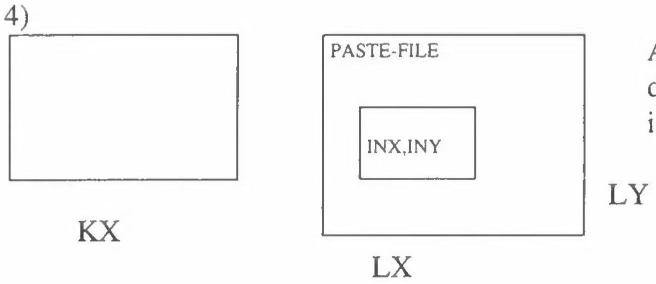

A **section** of a file is expanded to a file with half the grid size

3)



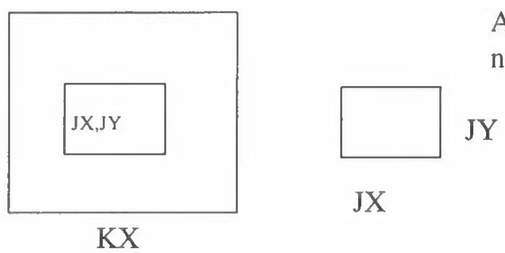

A file is compressed to the double grid size

4)




A file is compressed to the double grid size and pasted into another file

5)




A **section** of a file is stored in another, new file with the same grid size

## Input data to ZOOM-FIE

| | |
|---|---|
| IC | Alternative 1-5 |
| K, L | Grid size for the two grids (K=2*L for IC=1 or 2, K=L/2 for IC=3 or 4, K=L for IC=5) |
| KX, KY, LX, LY | Grid dimensions, for old and new field |
| OLDFILE, NEWFILE | Names of old and new file (with apostrophes, but not .FLD). The new fields are written binary to the file NEWFILE.FLD, the output is written to the file NEWFILE.PRN |
| NFIELD | Number of fields at OLDFILE |
| YMAP | Do you want maps of the initial fields (Y/N)? |

For alternatives IC=1 or 2 (one square splitted into 4) there is two possibilities:

| | |
|---|---|
| IK | 1: Same value in the new squares as before<br>2: New value = old value/4 |

For alternatives IC=3 or 4 (4 squares combined to one) there is three possibilities:

| | |
|---|---|
| IK | 1: New value is the sum of the four values<br>2: New value is the average of the four values<br>3: New value is the highest of the four values |

For alternative IC=5 the squares are not changed.

For IC=2:

| | |
|---|---|
| JX, JY | Lower left corner of the area that shall be expanded |

For IC=4:

| | |
|---|---|
| PASTEFILE | Name of the file that the section shall be pasted into (with apostrophes and .FLD) |
| ISU | 1: New section substitutes the values at PASTEFILE<br>2: New section is added to the values at PASTEFILE |
| INX, INY | The section is pasted to lower left corner (INX,INY) of PASTEFILE |

For IC=5:

| | |
|---|---|
| JX, JY | Lower left corner of the area that shall be expanded |

## Examples for ZOOM-FIE

In Pécs we have calculated the fuel consumption within a 500 m-grid with the program FUEL-FIE, and want a map of the fuel consumption in a 1km-grid. (This can obviously also be done in FUEL-FIE, using the 1km-grid directly.)

| | |
|---|---|
| **** | , License code |
| 3 | , Alternative 3, compression of the fields |
| 500,1000 | , Grid sizes |
| 42,28,21,14 | , Grid dimensions for old and new field |
| 'FUEL-1Q','FUEL-KM' | , Old and new file |
| 6 | , 6 fields at OLDFILE |
| N | , No map of initial fields |
| 1 | , IK=1, new value is the sum of the four values |

**Output from ZOOM-FIE:**

```
     Norwegian institute for air research (NILU)
        "KILDER" program package license for
   South Trans-Danubian Environmental Inspectorate,
                    Pecs, Hungary
                 VERSION 2.1, 5-11-1997
                 - - - - O O O - - - -

MAP OF : COAL            UNIT: tons              SOURCE: FELMER9.DAT
PERIOD : 1Q-1995        PLACE: PECS          GRID SIZE: 1000 METER
CREATED: 1998/01/24 14.11

     MAXIMUM VALUE IS  3.5342E+03, IN (14, 7)
                 SUM= 5.55532E+03    SCALE FACTOR:        1.
```

Map with the consumption of coal in small point sources

```
     Norwegian institute for air research (NILU)
        "KILDER" program package license for
   South Trans-Danubian Environmental Inspectorate,
                    Pecs, Hungary
                 VERSION 2.1, 5-11-1997
                 - - - - O O O - - - -

MAP OF : COAL            UNIT: tons              SOURCE: FELMER9.DAT
PERIOD : 1Q-1995        PLACE: PECS          GRID SIZE: 1000 METER
CREATED: 1998/01/24 14.11

     MAXIMUM VALUE IS  2.8502E+05, IN (14, 7)
                 SUM= 2.87044E+05    SCALE FACTOR:      100.
```

Map with the consumption of coal in all point sources

```
     Norwegian institute for air research (NILU)
        "KILDER" program package license for
   South Trans-Danubian Environmental Inspectorate,
                    Pecs, Hungary
                 VERSION 2.1, 5-11-1997
                 - - - - O O O - - - -

MAP OF : OIL             UNIT: tons              SOURCE: FELMER9.DAT
PERIOD : 1Q-1995        PLACE: PECS          GRID SIZE: 1000 METER
CREATED: 1998/01/24 14.11

     MAXIMUM VALUE IS  4.7599E+02, IN ( 7, 7)
                 SUM= 1.29951E+03    SCALE FACTOR:  .1
```

Map with the consumption of oil in small point sources

```
    Norwegian institute for air research (NILU)
       'KILDER' program package license for
   South Trans-Danubian Environmental Inspectorate,
                  Pecs, Hungary
             VERSION 2.1, 5-11-1997
             - - - - O O O - - - -

MAP OF  : OIL             UNIT: tons             SOURCE: FELMER9.DAT
PERIOD  : 1Q-1995         PLACE: PECS         GRID SIZE: 1000 METER
CREATED: 1998/01/24 14.11

    MAXIMUM VALUE IS  1.5861E+04, IN (14, 7)
             SUM= 1.70025E+04    SCALE FACTOR:      10.
```

Map with the consumption of oil in all point sources, and so on. The sum of the values will be the same as before, and the maximum values for the fields including all point sources are almost the same. For the small sources the maximun value of coal consumption was 3519 tons in (27,13), and together with 15.2 tons in (28,14) we get a maximum of 3534.2 tons in (14,7). Similarly the maximum of 475.99 tons of oil consumption in (7,7) consists of 426.40 tons in (13,13) and 49.59 tons in (14,14).