



## **PAN-EUROPEAN SOIL EROSION RISK ASSESSMENT**

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### **DELIVERABLE 16: DATABASE ON LONG-TERM SOIL EROSION MEASUREMENTS**

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## CHAPTER 1 INTRODUCTION

The task of gathering plot data that contain the necessary information to evaluate the PESERA model has started at the beginning of the project. A special attention has been paid to collect databases that met two initial conditions: (i) the different datasets need to cover a wide range of different representative agro-ecological zones; and (ii) the measurements that compose the different datasets need to show a certain continuity in time to be able to deduce reliable monthly and yearly erosion budgets. However only few good quality long-term erosion datasets exist in Europe, without mentioning the problem of data copyrights which seriously restrain their availability. Considering these objectives and their limitations, it has been decided to carry out the evaluation at high resolution on the ten following datasets:

- ✓ Database from Clarinda, Iowa, USA (1). It has already been used to evaluate the first version of the model. The results are presented in the first and second Interim reports.
- ✓ Databases from Greece (2) and Spain (3) will be processed locally by the Greek and Spanish teams.
- ✓ Databases from (4) England, (5) Germany, (6) Netherlands, (7) France, (8) Austria (9), Portugal and (10) Italy are presented in this report (Table 1).

The quality of the different datasets is not homogeneous. Even if the database covers a long period of time, it is often not continuous, and they do not always provide all the necessary input data with the required precision. However these ten datasets represent a considerable amount of runoff and erosion measurements over a wide range of different conditions.

## CHAPTER 2 DESCRIPTION OF THE DATABASE ON LONG-TERM SOIL EROSION MEASUREMENTS

All the digital material contained in these databases is available on the CDROM “High resolution erosion databases” with three different levels of description:

1. **Raw data** (which contains all the raw digital material that has been gathered)
2. **Processed/extended** (which contains the inputs and outputs needed to evaluate the PESERA model and the data that have been used to generate them)
3. **Processed/simplified** (which only contains the inputs and outputs needed to evaluate the PESERA model)

To run and evaluate the PESERA model, the level 3 (Processed/simplified), which only contains the inputs and outputs is sufficient. However the levels 1 & 2 were kept for two main reasons: (i) to check if errors in the model predictions can be explained by parameter values that are not taken into account by the model (e.g. rainfall intensity), (ii) to have access to the original data, in case of inconsistency in the processed input or output values.

The input parameters for the PESERA model are the following:

Rainfall: mean monthly rainfall.

- $r_0$ : mean monthly rainfall per rain days.
- CV0 of  $r_0$  (CV0): coefficient of variation for rainfall, calculated for all rain days in the month.
- Trange: mean monthly daily temperature range.
- Tmean: mean monthly temperature.
- ET0: mean monthly potential evapotranspiration.
- Soil texture, plot length and slope, and land use.

The evaluation of the model will be carried out on the following outputs:

- Runoff: amount of runoff (in l) predicted by the model
- Erosion: amount of monthly and yearly (in T/ha) soil loss predicted by the model.
- When climatic data are missing, or when the erosion measurements do not cover a whole cultural year, the missing climatic inputs are to be replaced by the monthly normals for the studied area extracted from the MARS database. The monthly normals for the seven sites are situated in the file **Monthly\_Normals.xls**. The results corresponding to these inputs will obviously not be taken into consideration for the evaluation of the precision of prediction of the model. Example of the monthly normals for the Haute Normandie Region extracted from the Mars database are presented in Table 5.

Table 1: Description of the plot databases

Location	Date	Plots	Length (m)	Area (m <sup>2</sup> )	Slope (%)	Land use
England: Woburn Loamy sand or sandy loam	07/89-10/93	1	35	765	9.9	Potatoes, winter wheat, sugar beat, fallow, winter barley
		2		827	9.2	
		3		822	11.4	
		4		844	10.1	
		5		782	12.8	
		6		820	12.1	
		7		897	7.6	
		8		955	9.5	
Germany: Hollmuth. Soil texture (%) Sa: 8, Cl: 10, Si: 82 Sa: 11, Cl: 14, Si: 75	11/79-08/80	ZI 1	165	330	11.4	Winter wheat
	05/80-09/80	EH 1	40	80 (Pe)	17.6	Maize (silo)
	04/81-10/81		60	120 (Pe) 120		Sugar beat
	10/79-7/80	BE 2	60	120	21.3	Winter barley
	05/79-04/82	P4	1	2	26.8	Grass
		P6	4	8	25.7	
		P1	5	10	24.9	
		P3	8	16	24.7	
		P12	4	8	31.1	Conifers
		P5	5	10	24	Bare
		P7	2	4	23.3	
		P8	2	4	23.3	
		P9	5	10	25.5	
		P10	10	20	22.2	
P11	20	40	22.2			
Netherlands : Wijnandsrade Sa: 6, Cl: 13, Si: 81	03/89-03/90	1	22	39.6	6	Maze, winter rye
	05/87-03/90	2				Maze, summer barley
	05/87-09/89	3				Maze, winter barley
	06/87-09/89	4				Fallow
	11/86-09/89	5				Maze, winter barley
	06/86-09/89	6				Fallow
	11/86-03/90	7				Maze, winter rye
	11/86-03/90	8				Maze, WB, SB
	06/87-03/90	9				Maze, WB, SB
	06/87-03/90	10				Maze, winter barley
	06/87-03/90	11				Fallow
	06/87-03/90	12				Maze, winter rye
Austria: Mistelbach (silt loam), Pyhra (loam)	05/94-06/98	MI 1, 5 & 6	15	45	13.2	Maze, WW, SB, SprB, Sun
	05/94-08/98	PY 1, 5 & 6	15	60	15.2	Maze, Winter Wheat
	06/97-09/00	PI 1, 5 & 6	15	60	5	Maze, Winter Wheat
Poortugal: Vale Formoso Sa: 60, Cl: 20, Si: 20	09/61-05/94	1	20	167	11	Wheat-Fallow
	09/61-05/94	2			10	Wheat-Fallow
	01/89-05/94	7			15	Wheat-Fallow
	10/61-05/94	10			15	Wheat-Fallow
	09/61-05/94	11			16	Wheat-Fallow
	10/88-05/94	13a			18	“Abandoned”
	11/89-05/94	15			18	wheat/natural pasture together (3 years) subter-ranean clover (4 years)
	11/89-05/93	16			16	?
	10/88-05/94	7X			80	15?
Italy	03/92-02/98	1-6	10	20	12-18	Cistus and grasses
		7-12			34-47	Burnt macchia
		13-18			12-31	Eucalyptus

Table 2: Monthly normals for the Haute-Normandie area. (extracted from the interpolated values of the MARS database)

	France Normandie											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Rainfall (mm)	70.4	51.7	65.6	52.5	67.8	59.6	63.4	51.4	68.1	75.6	72	90.2
r0= Mean Rain/Rain-Day	4	3.5	3.6	4.2	3.4	4.1	4.7	4.1	4.6	4.5	4.3	5.1
CV of r0 (SD/Mean)	1.14	1.28	1.12	1.24	1.16	1.36	1.49	1.66	1.28	1.32	1.15	1.10
Mean Temp C	4.1	4.4	6.9	12.2	8.6	14.9	17.3	17.4	14.9	11.5	7.2	4.9
Mean Daily range C	4.7	5.6	6.6	8.4	7.9	8.2	8.9	9.2	8.3	6.8	5.6	4.5
Pot E-T	16.1	22.8	44.6	68.6	95.3	105.4	115.5	100.9	62.0	34.4	15.8	13.0

The origin and the quality of the inputs present in the level **-3- Processed/simplified** are explained in the files contained in the level **-2- Processed/extended**, which are described below.

## 2.1. England

All data are contained in the file **England.xls**

The rainfall amounts per month need to be checked before running the model for one year.

Explanation of the different *worksheets* (this file contains no macros, the formulas to calculate the different parameters can be seen when clicking in the corresponding cells).

The file contains 10 worksheets:

*Codes and sizes* = contains crop rotations, soil texture, the size and slope of the plots and the codes referred to in *Runoff Soil Loss*.

*Runoff Soil Loss* = contains the runoff and soil loss data in a raw format.

*Input\_month* = (pivot table) contains the climatic inputs per month (except for CV0).

*Input\_sampling\_date* = (pivot table) contains the climatic inputs per sampling date (except for CV0).

*Data* = contains all the data in a detailed form.

*Output\_month* = (pivot table) contains the runoff and soil loss data per month.

*Data\_SL\_R* = *Data* with only one reference per sampling date to calculate the amount of runoff and soil loss in the pivot table of *Output\_Month*.

*CV0per\_month* = (pivot table) contains the input CV0.

*DataRD* = *Data* with only the dates for which rainfall was recorded to calculate the number of rain days per month and its coefficient of variation in the pivot table of *CV0per\_month*.

*ComparisonRain* = shows the differences with the rainfall data given by John Quinton and Tim Hess.

## 2.2. Portugal

The measurements are not always continuous and rainfall events of one month can be grouped with rainfall events of the following or previous months, therefore it should be tested on a line-by-line basis.

All the data are in the file **Portugal.xls** (*All plots*).

The climatic inputs CV0, Trange, Tmean and PET should be taken from the file **Monthly\_Normals.xls**.

## 2.3. Italy

The data are in the file **Italy.xls** and **Italy\_plots.doc**

### **Italy.xls:**

Some months are missing, (01/1992, 06/1992, 09/1992, 11/1994, 12/1992, 01/1993, 02/1993, 03/1993, 04/1993, 08/1993, 07/1994, 08/1994, 09/1994, 04/1995, 03/1996, 04/1996, 08/1996, 09/1996, 01/1997, 12/1997) and for temperature: from 10/08/97 to 12/08/97 temperature values are constant at 70°C, therefore it should be tested on a line-by-line basis. The file contains 21 worksheets:

*Plot01* to *Plot18*: contains the parameter Rainfall, Mean rainfall per rain days for the sampled events, Runoff, Erosion and the plot sizes for the 18 plots.

*Clima\_monthly\_ET0*: contains the mean monthly climatic characteristics needed to calculate ET0.

*TCD\_Clima\_monthly*: (pivot table) aggregation of *Clima\_Daily* per month, contains the parameters, Tmean, Trange, mean rainfall per rain days.

*Clima\_Daily*: Daily climatic records.

**Italy\_plots.doc**: contains the soil types, soil texture, slope length, slope intensity and land use.

The parameter CV0 should be taken from the file **Monthly\_Normals.XLS**.

## 2.4. Austria

The data are in the files **Austria.xls** and **Austria\_Soil.doc**.

### **Austria.xls:**

The climatic data have been generated with the CLIGEN software.

*Pix9799*, *Pyhr9499*, *Mist9499*: Contain the daily climatic record of the corresponding site.

*xxxxCV0* : Contain the daily climatic record for the rain days of the corresponding site.

*TCD\_Clima\_xxxx*: aggregation of the climatic data per month, contains the parameter Rainfall, Tmean, Trange, mean rainfall per rain days (rain day = when daily rainfall exceeds 1 mm) and the runoff and erosion values of the corresponding site.

*TCD\_CV0\_xxxx*: aggregation of the climatic data per month, contains the parameter CV0 of the corresponding site.

The parameter ET0 should be taken from the file **Monthly\_Normals.XLS**.

**Austria\_Soil.doc**: contains the soil texture, the slope length and gradient, the crop rotation and the tillage operations.

## 2.5. The Netherlands

All the data are in the file **Netherlands.xls**

*Plot 1* to *Plot 12*: contain the rainfall, the runoff, the erosion, the slope length and gradient, the land use and the Average particle size distribution. The cells are filled with red when inconsistencies (erosion without runoff, runoff coefficient > 100 % ...) were noticed.

The parameters Tmean, Trange, mean rainfall per rain days, CV0 and ET0 should be taken from the file **Monthly\_Normals.XLS**.

## 2.6. Germany

All the data are in the file **Germany.xls**. There are four sites and a worksheet per site: *Hollmuth*: contains soil texture, land use, runoff, erosion, slope length and gradient, rainfall, ET0, r0 and CV0. Trange and Tmean should be taken from the file

**Monthly\_Normals.XLS**.

*EH 1*: contains soil texture, land use, runoff, erosion, slope length and gradient, and rainfall. Trange, Tmean, ET0, r0 and CV0 should be taken from the file

**Monthly\_Normals.XLS** or from the worksheet *Hollmuth* (the two sites are in the same 50km grid cell).

*ZE 1*: contains soil texture, land use, runoff, erosion, slope length and gradient, and rainfall. Trange, Tmean, ET0, r0 and CV0 should be taken from the file

**Monthly\_Normals.XLS** or from the worksheet *Hollmuth* (the two sites are in the same 50km grid cell).

*BE 2*: contains soil texture, land use, runoff, erosion, slope length and gradient, and rainfall. Trange, Tmean, ET0, r0 and CV0 should be taken from the file

**Monthly\_Normals.XLS** or from the worksheet *Hollmuth* (the two sites are in the same 50km grid cell).

The cells are filled with red when problems are indicated by the person who collected the data (certainly overflowing problems, which means that the values are underestimated).

## 2.7. France

All the data are in the file **France.xls**.

*Data*: contains soil texture, land use, runoff, erosion, slope length and gradient, rainfall.

The parameters ET0, r0, CV0, Trange and Tmean should be taken from the file

**Monthly\_Normals.XLS**.