

# **FOCUS** SURFACE WATER AND GROUNDWATER MODELS: Surface Water Models and Scenarios

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**presented and adapted by Paulien Adriaanse**

**FOCUS WG on Surface Water Scenarios,  
(1997-2003 !)**



# Acknowledgement

The **FOCUS** team members are:

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**Former members:**

**José-Luis Teixeira, Spyros Vizantinopoulos**



# Introduction

- **FOCUS**
- **Approach**
- **Scenarios**
- **Models and Results**
- **Conclusions**
- **Recommendations**
- **Finalisation**



# FOCUS

## ***FOrum for the Co-ordination of pesticides fate models and their Use***

- **EU initiative (DG SANCO)**
  - Directive 91/414/EEC
  - PECs based on community level validated models
- **Support: Commission and ECPA**
- **Participation:**
  - Registration Authorities
  - Academia & Research
  - Industry
- **Limited to exposure analysis**

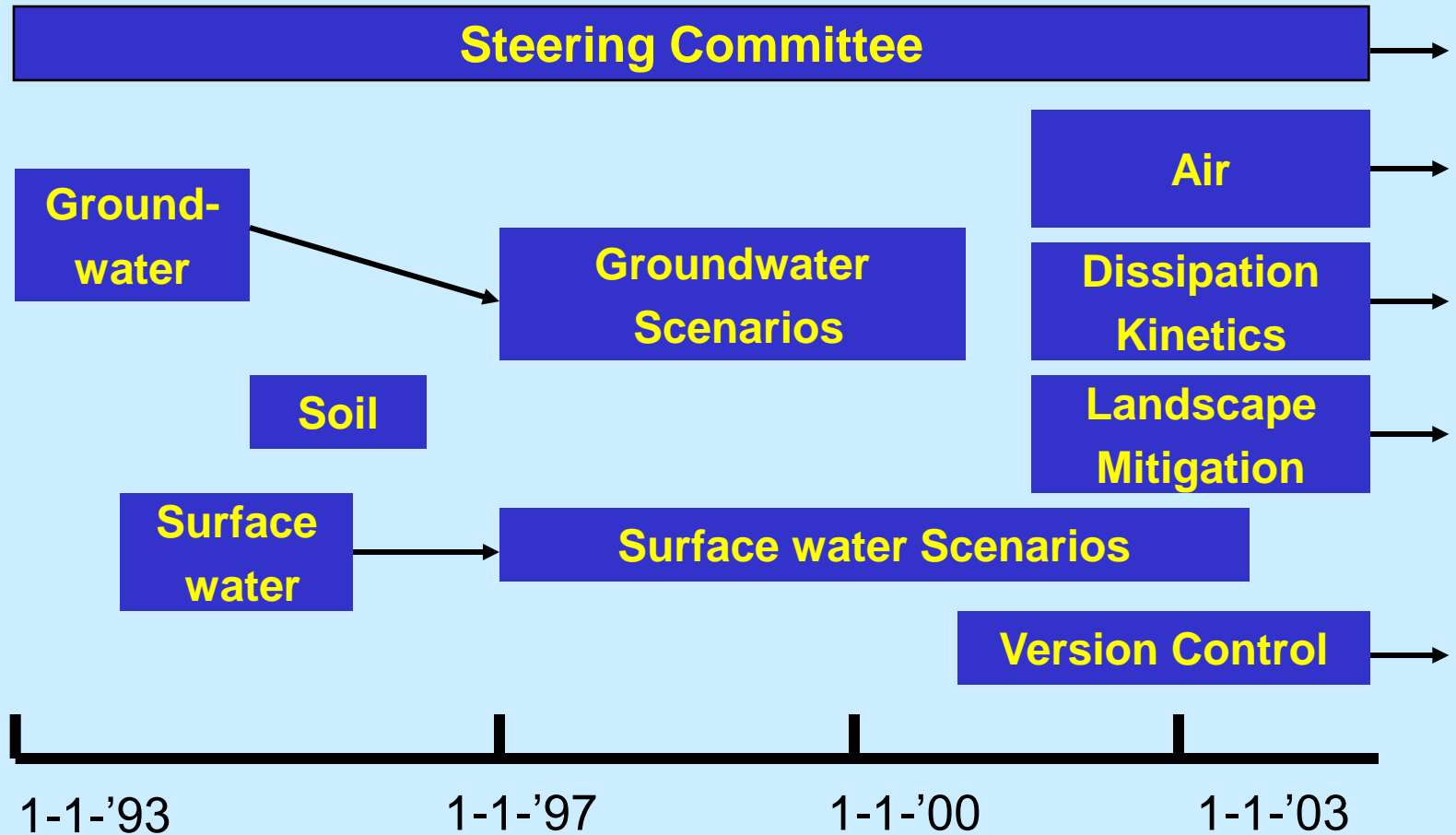


# FOCUS Principles

- **Remit to the group by Steering Committee**
- **Regular meetings in and outside Brussels**
- **Funding:**
  - **Travel and subsistence for governmental representatives**
  - **ECPA invitations only**
  - **No funding for work in-between meetings**
- **Co-operative attitude**
- **Consensus building**



# FOCUS in Time



# Models in FOCUS SWS

Choices of the Working group based on previous work by WG on SW Modelling

- Drift: German or Dutch tables
- Drainage: MACRO or PESTLA
- Run-off: PRZM or PELMO
- Fate: TOXSWA or EXAMS



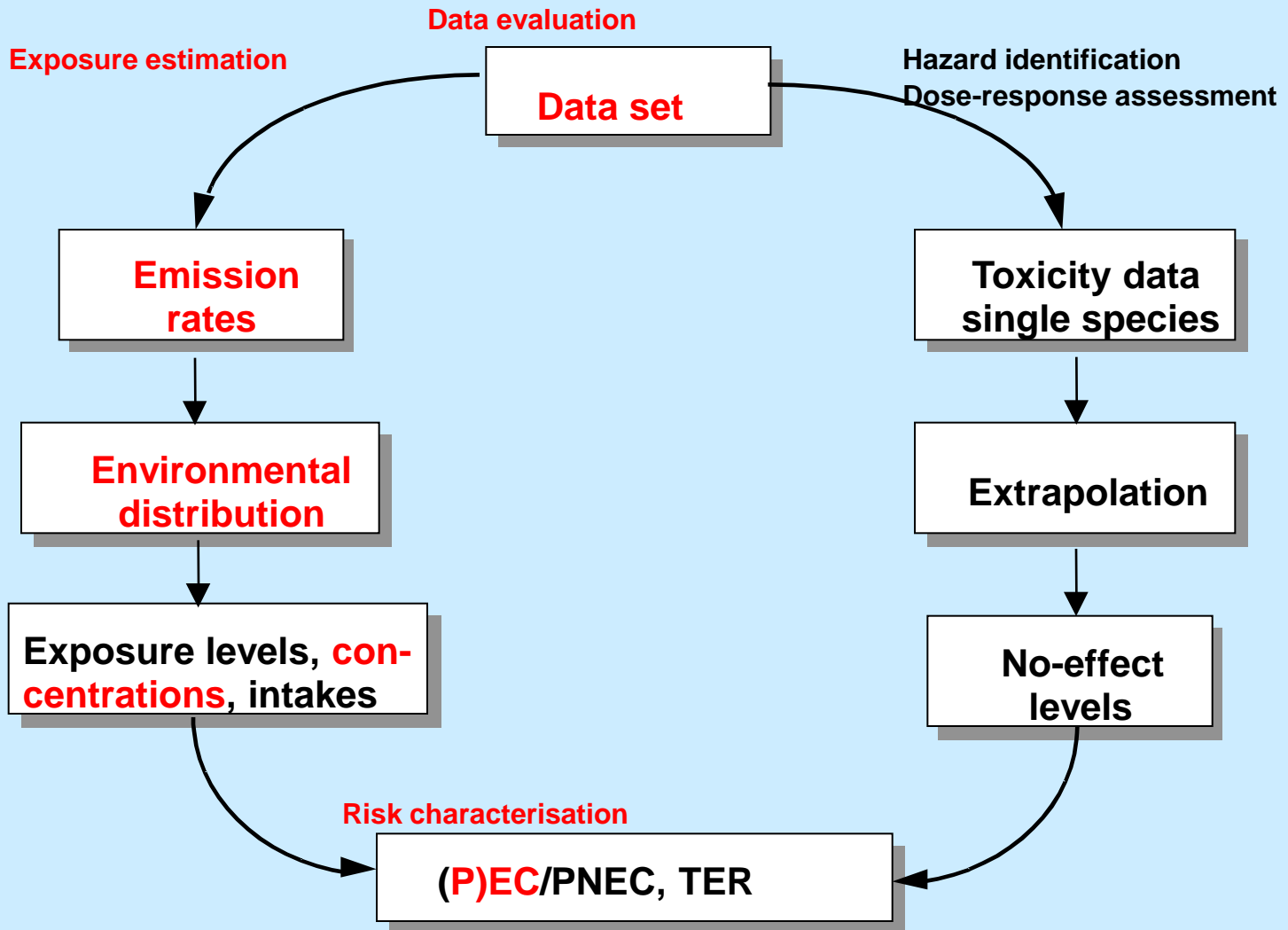
# Objectives of **FOCUS** SWS

- **Produce a limited number of ‘realistic worst-case’ scenarios (maximum of 10).**
- **Take into account all relevant entry routes, target crops, surface water bodies, topography, soil and climate.**
- **Scenarios should reflect realistic combinations of run-off and drainage (different processes dominate in different areas).**
- **Wherever possible, scenarios should be represented by a specific field site with monitoring data (allows validation).**

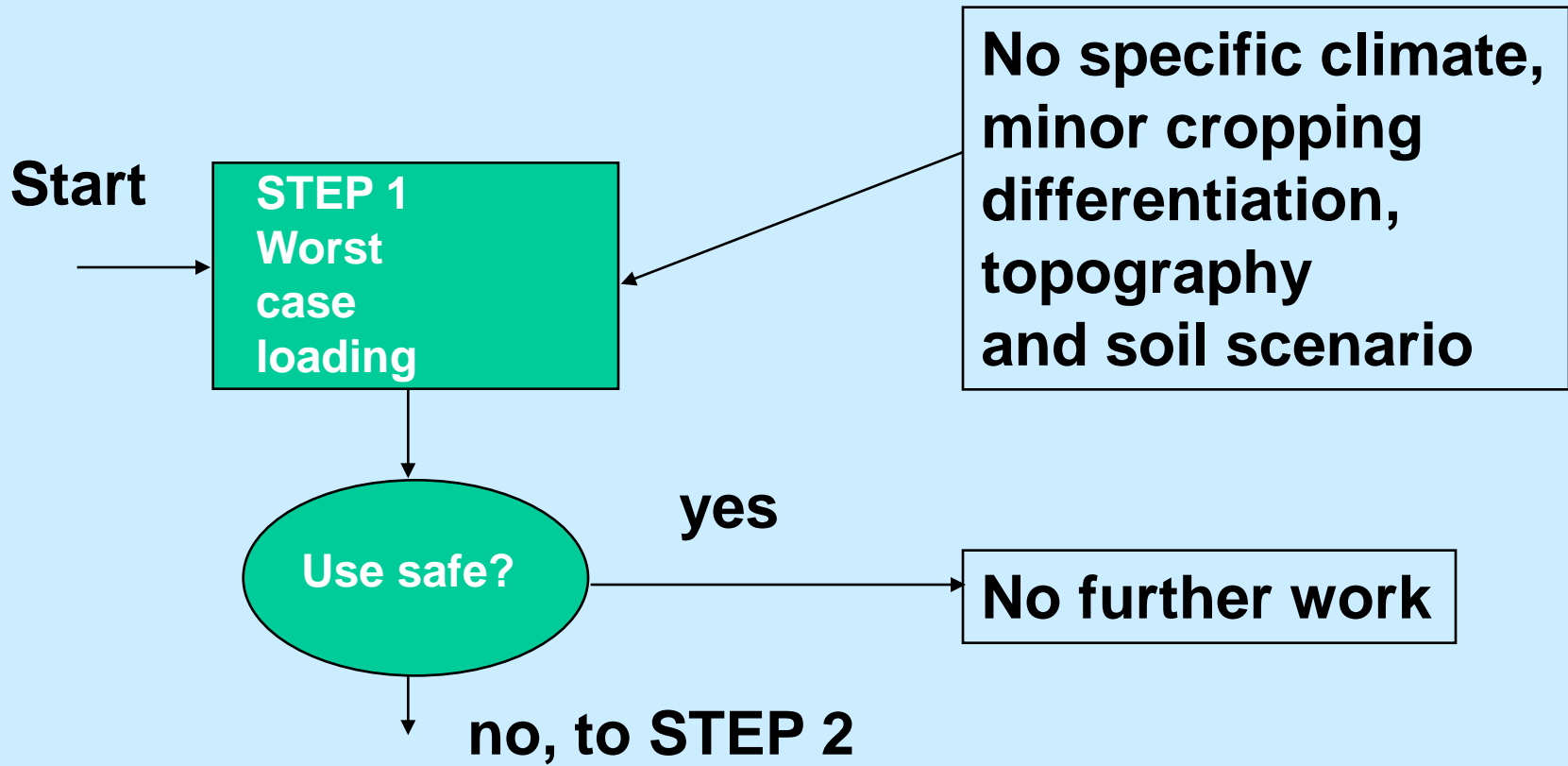




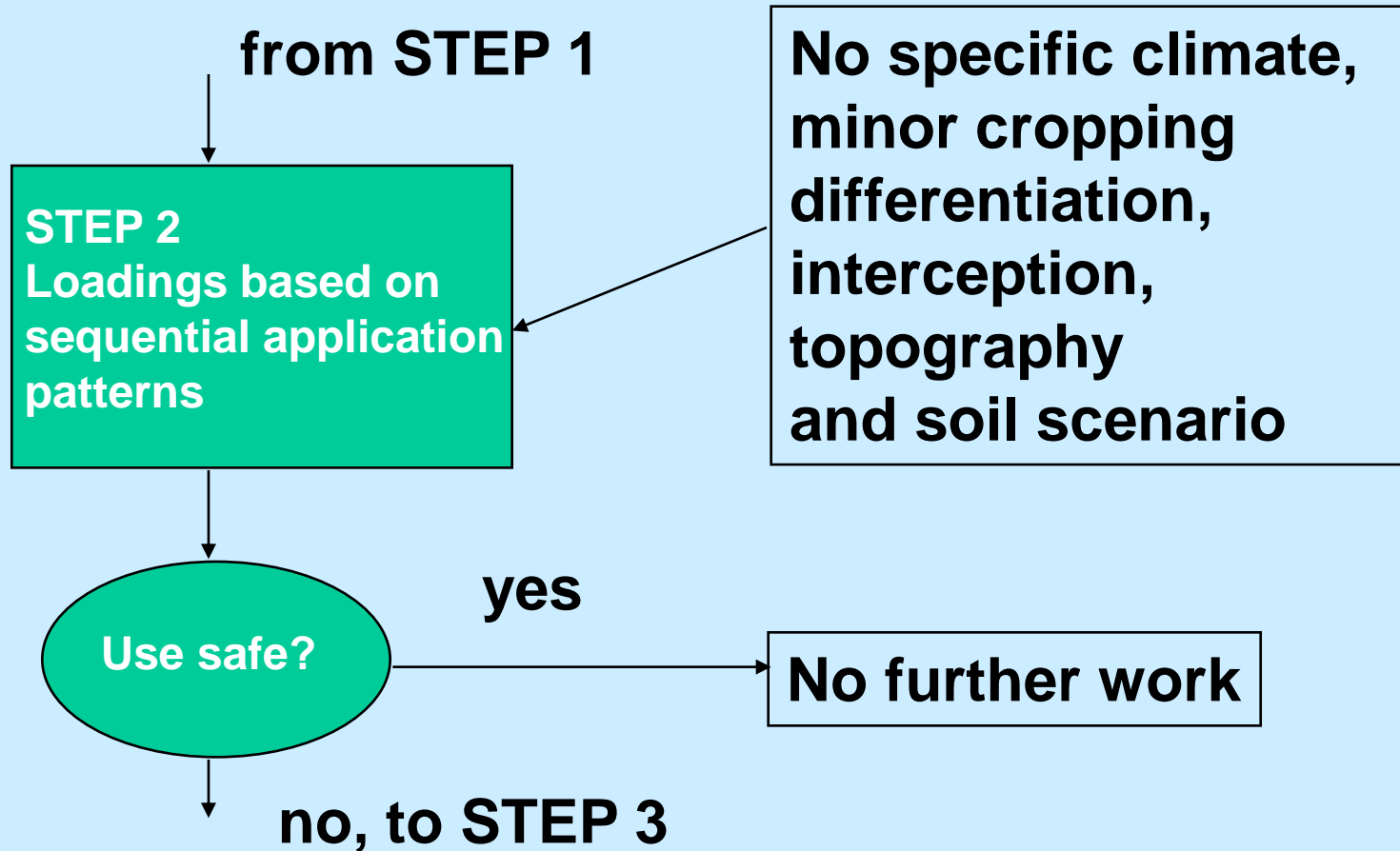
# Approach



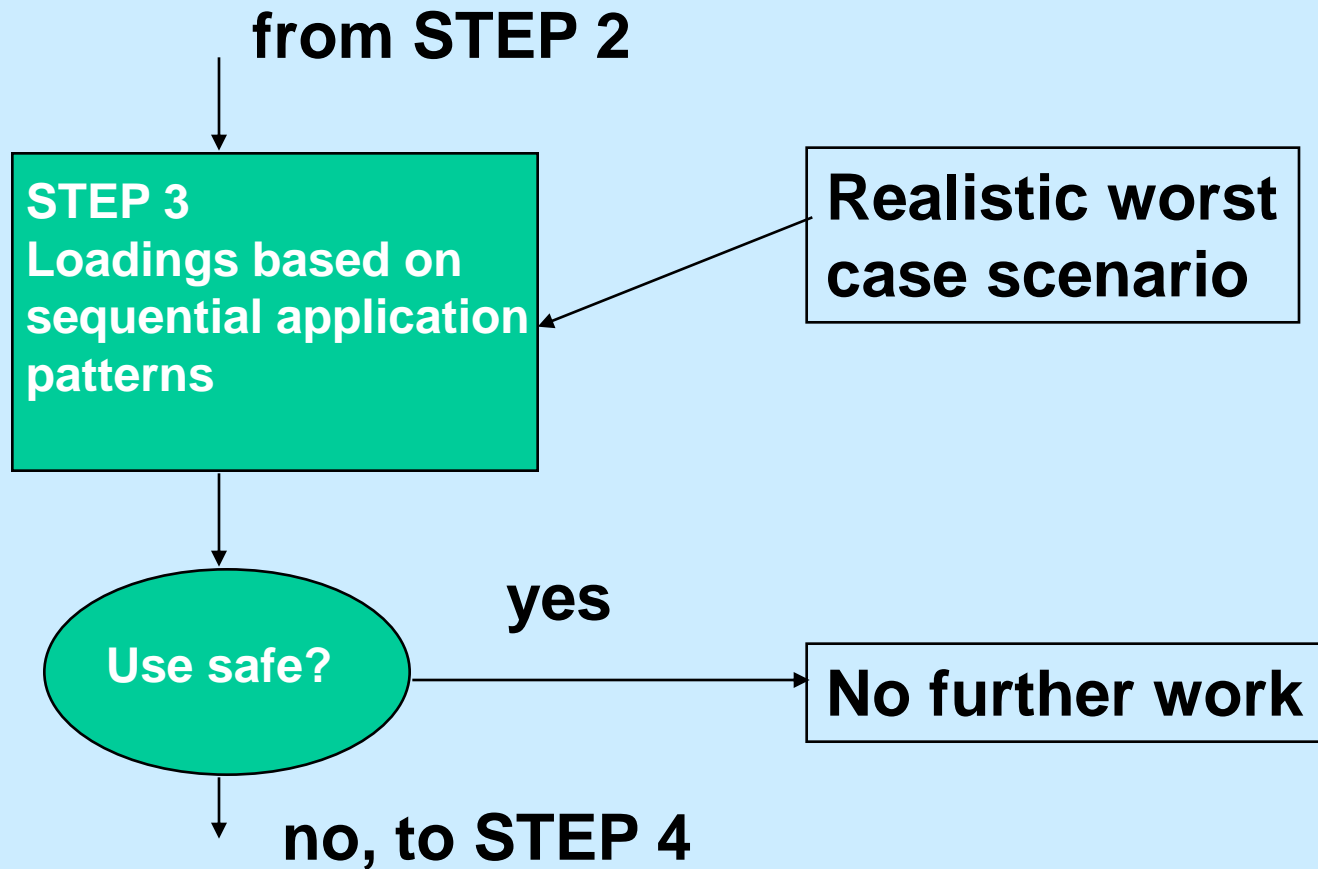
# Approach, Step 1



# Approach, Step 2



# Approach, Step 3



# Approach, Step 4

from STEP 3

**STEP 4**  
Loadings as in step 3  
considering the range  
of potential uses

**Specific and realistic combinations of cropping, soil, weather, fields, topography aquatic bodies**



# Approach, Logic

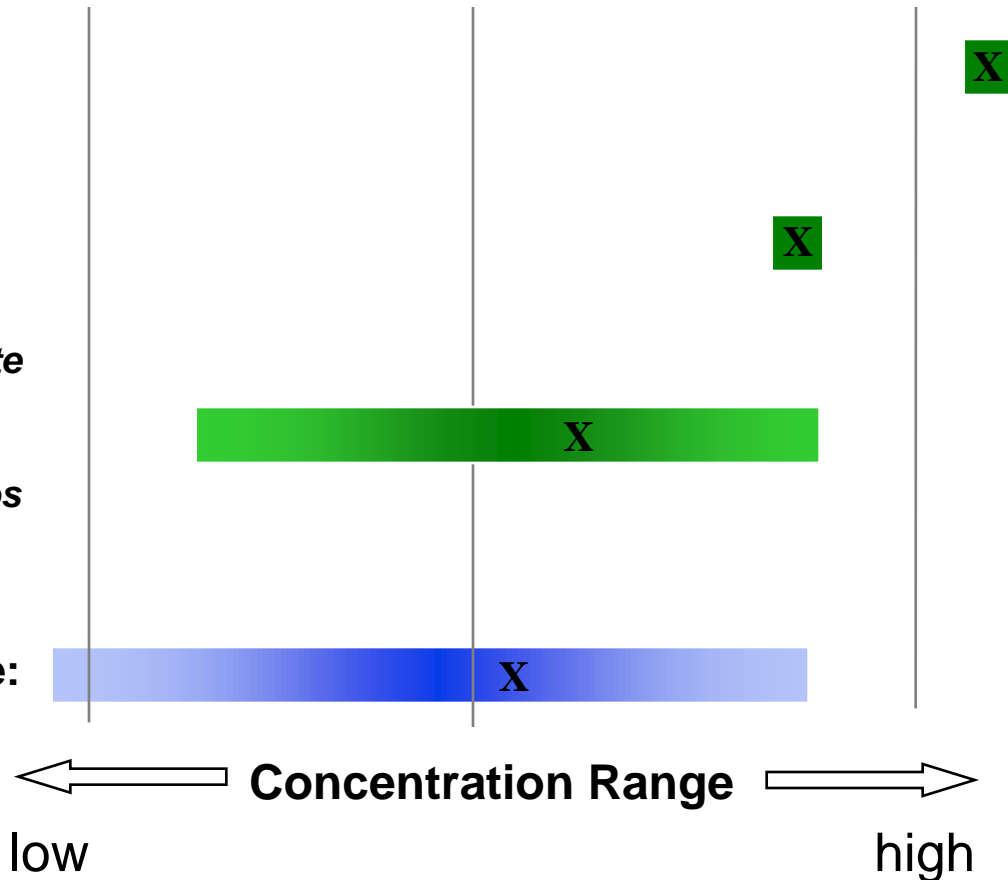
## Exposure Estimate

**Step 1:** *Initial estimate of aquatic exposure*

**Step 2:** *Refined estimate of aquatic exposure*

**Step 3:** *Deterministic estimate of aquatic exposure across a maximum range of ten scenarios*

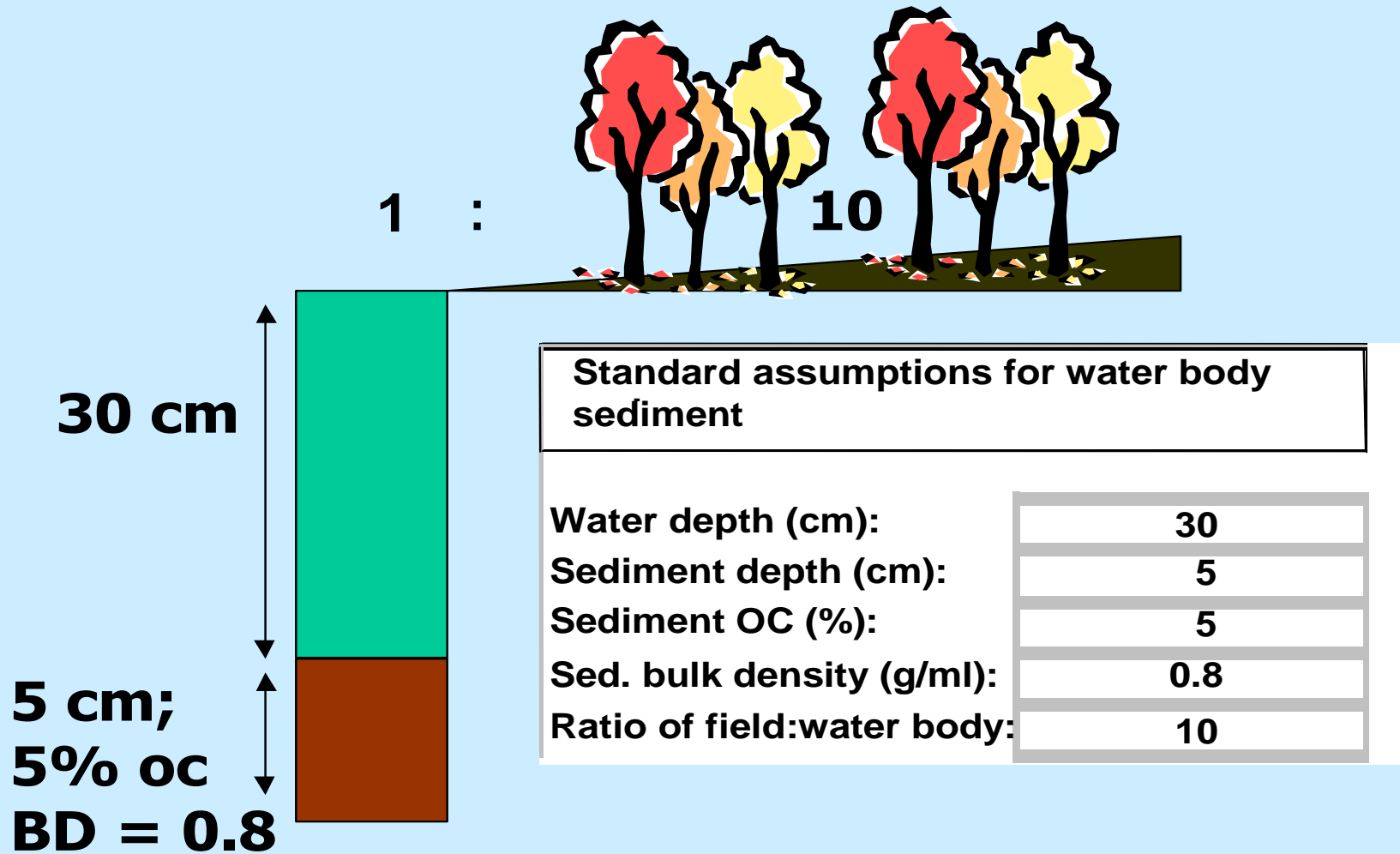
**Actual Range of Aquatic Exposure:**



# **STEPS1\_2** **in FOCUS**



# Soil & Water Body Scenario at Steps 1 and 2





## Steps 1-2

- **Steps 1: all loadings (sd, ro/dr) evaluated as single appln**
- Drift =  $f(\text{crop})$ : 2.8-33%
- Runoff/drainage entries: 10 %
- Pesticide mass distributed between water and sediment with aid Koc value
- Degradation based upon DT50 in water-sediment system



# Steps 1-2

- **Steps 2: series of individual loadings (sd and ro/dr)**
- Drift = f(crop, # applns): 1.5-33%
- Crop interception taken into account (0.2-0.75)
- Runoff/drainage entries: 2-5 % (N or S Europe, spring, summer, autumn appln)
- Pesticide mass distributed between water and sediment with aid Koc value
- Degradation based upon DT50 in water-sediment system



# *Steps 1-2 in FOCUS*

*Surface Water Tool for Exposure Predictions - Step 1 and 2*

*developed by FOCUS*

Continue

*programmed by M. Klein, Fraunhofer-Institut, Schmallenberg, 2001*



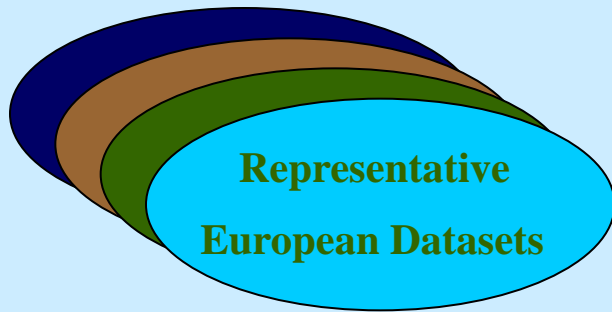
# **FOCUS**

## **STEP 3**

# **Scenarios**



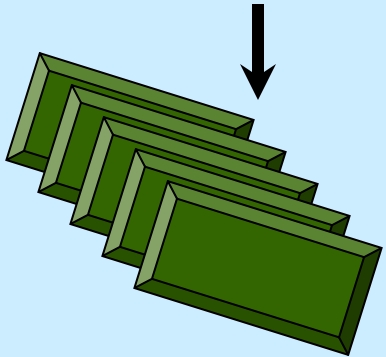
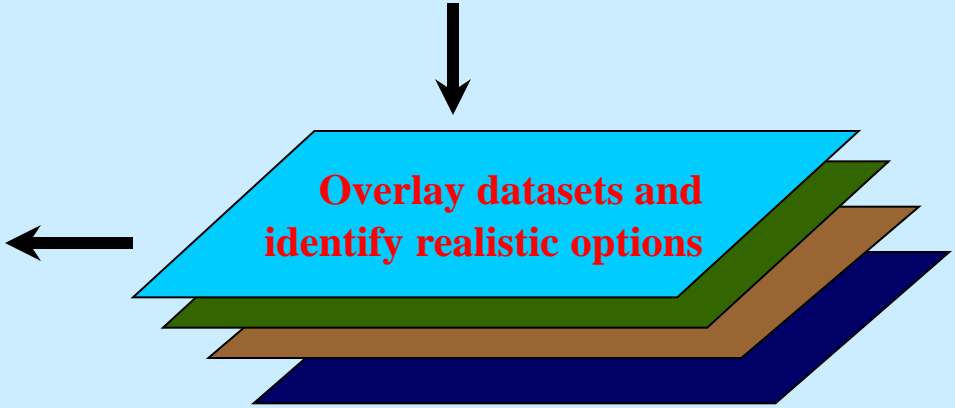
# A Pragmatic Methodology



**Classify agro-environmental characteristics according to their relative worst-case nature**

**10 scenarios identified according to the worst-case nature of their inherent agro-environmental characteristics:**

**Climate    Slope    Soil**

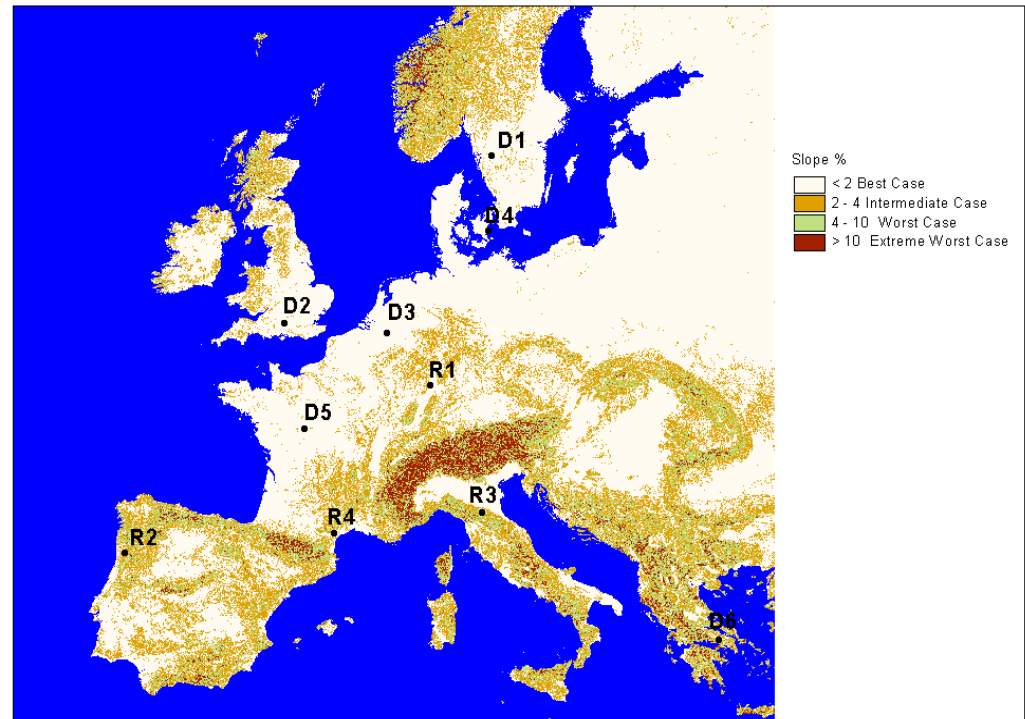
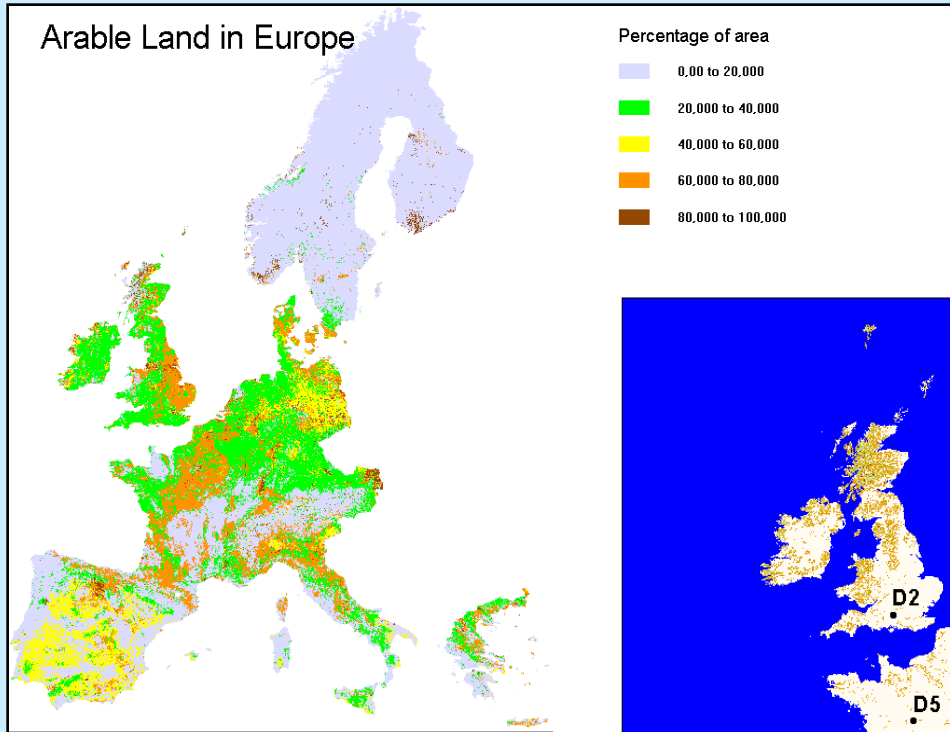


**Characterization of model-specific scenario parameters based on 'representative' field sites**

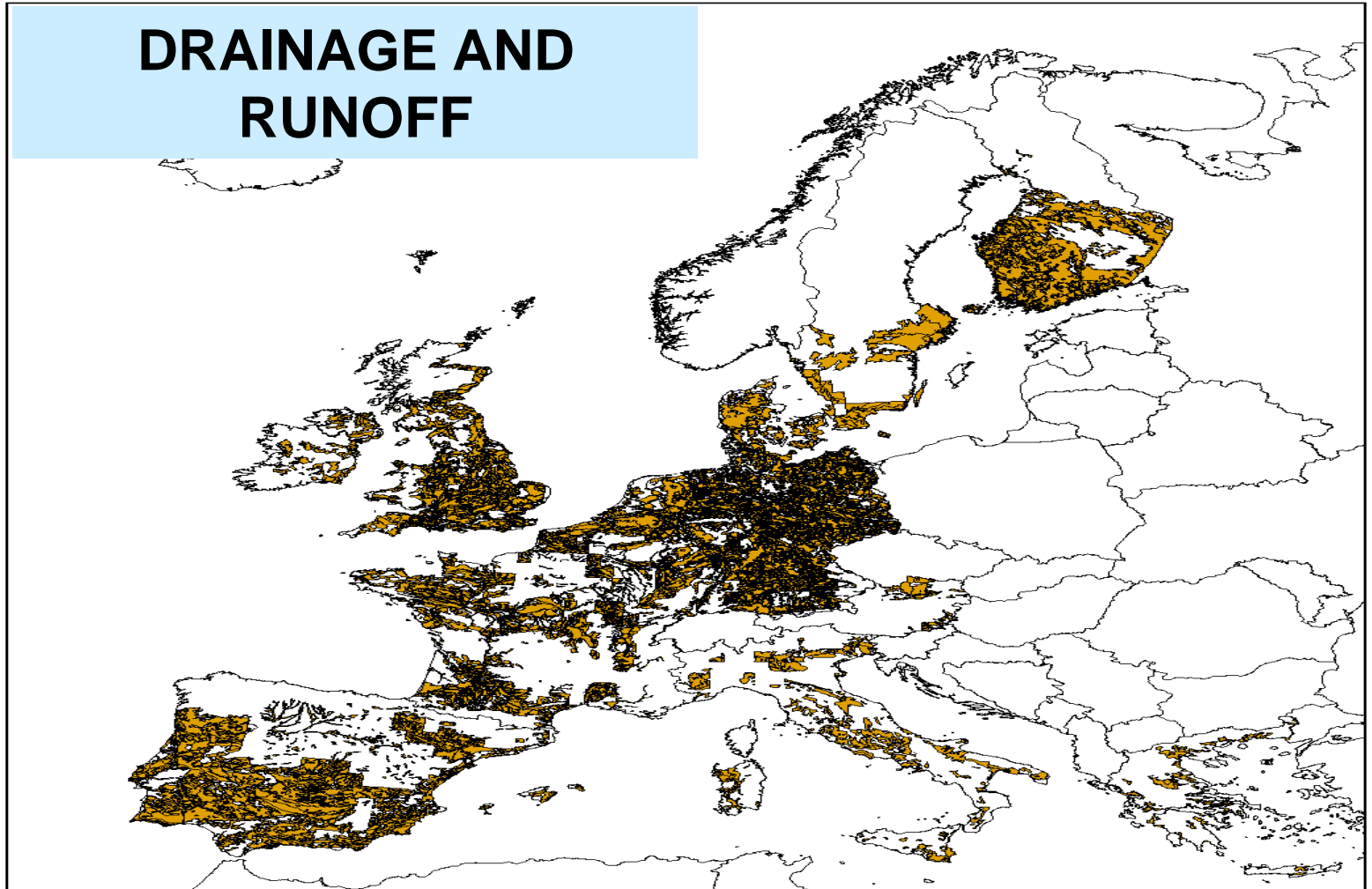




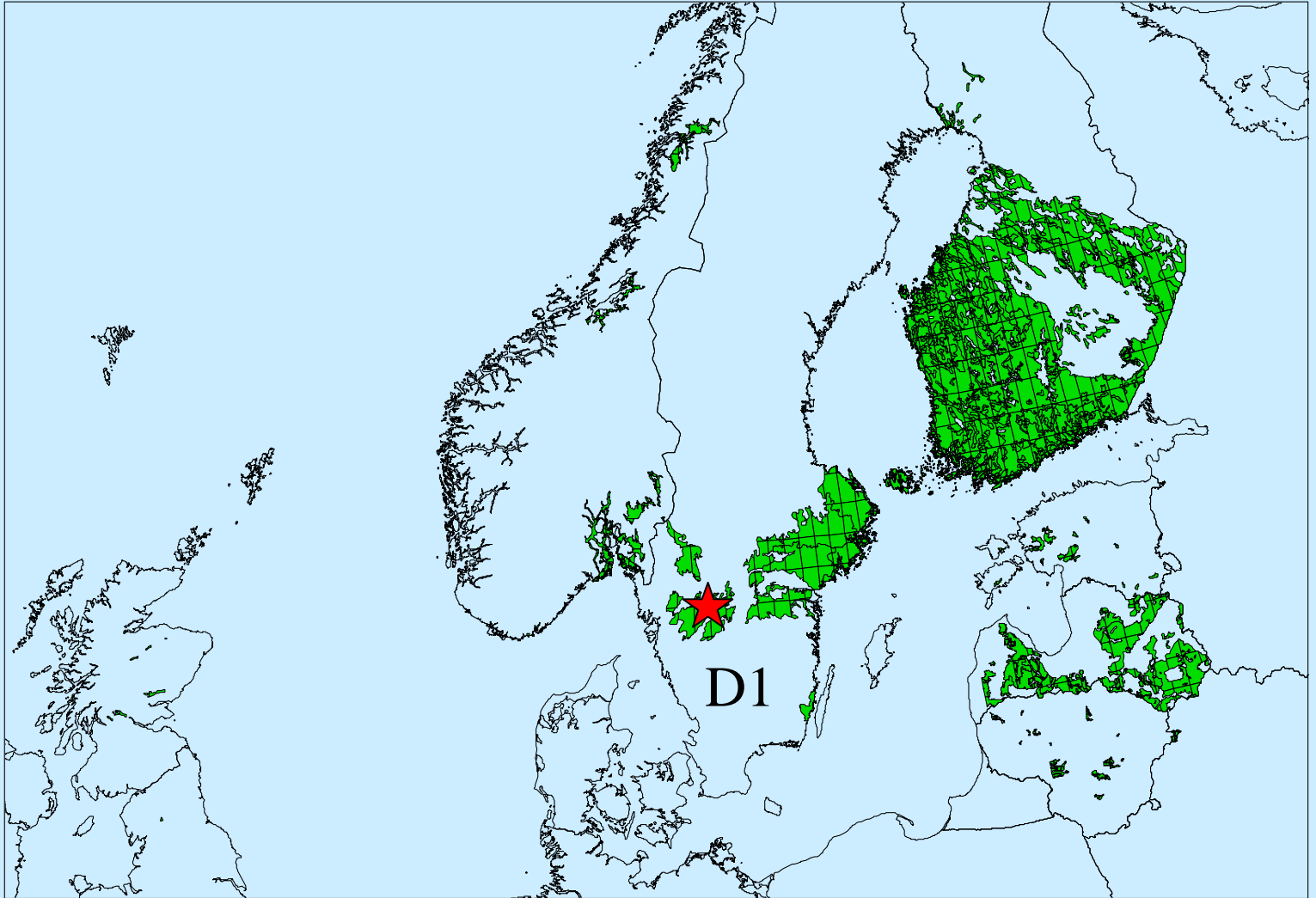
# Cropped land and slopes in Europe



## DRAINAGE AND RUNOFF

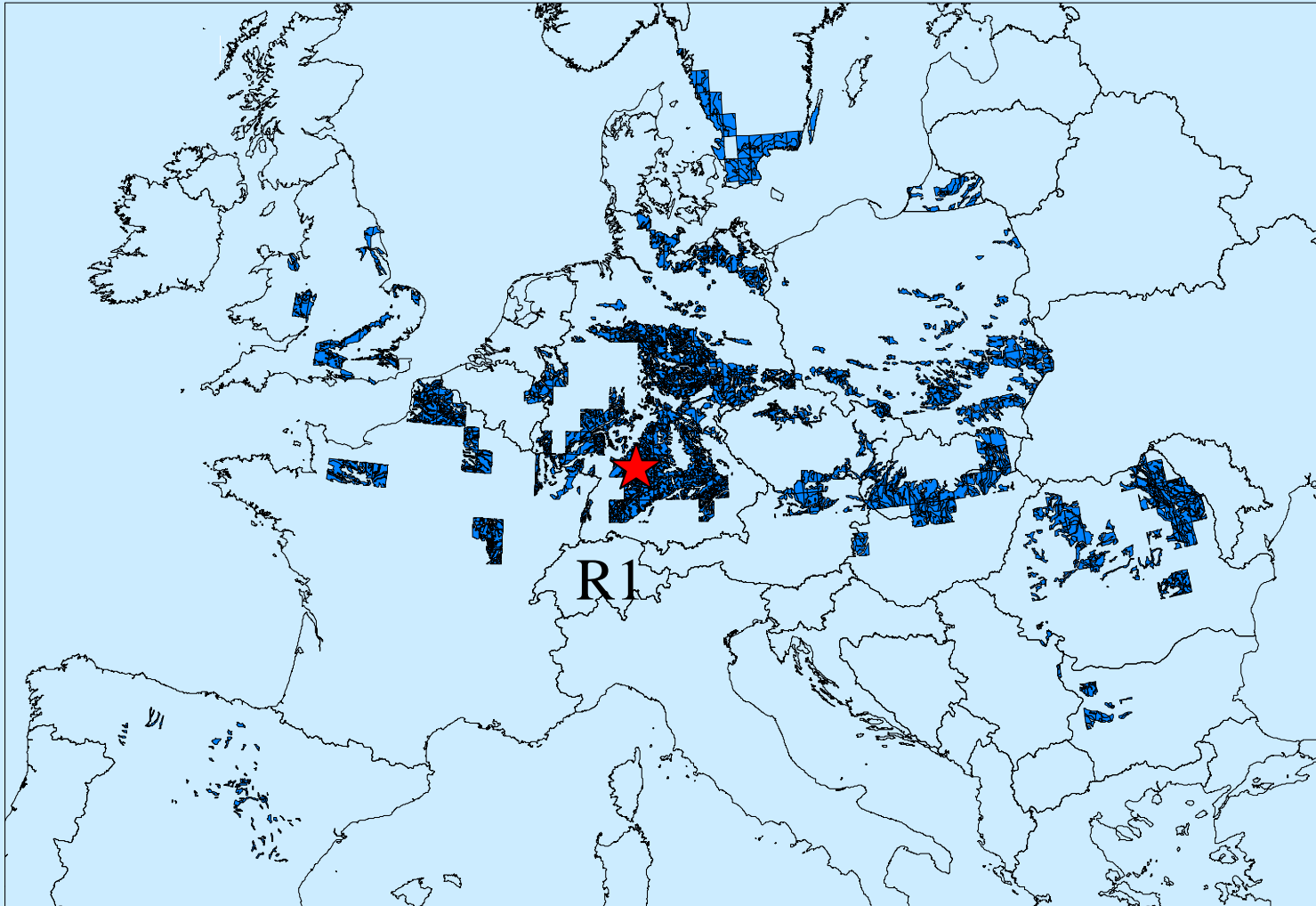


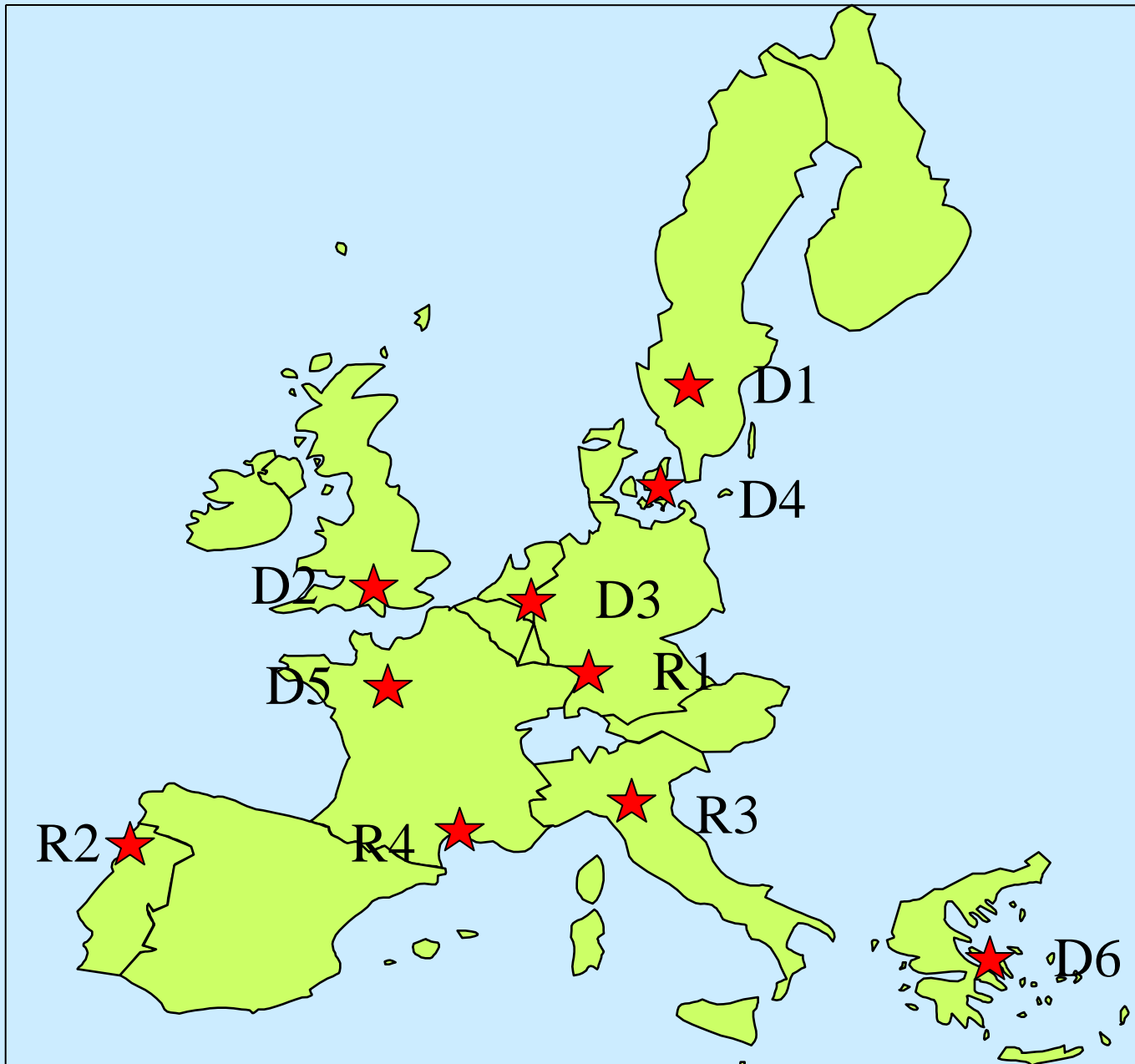
# Scenario D1





# Scenario R1

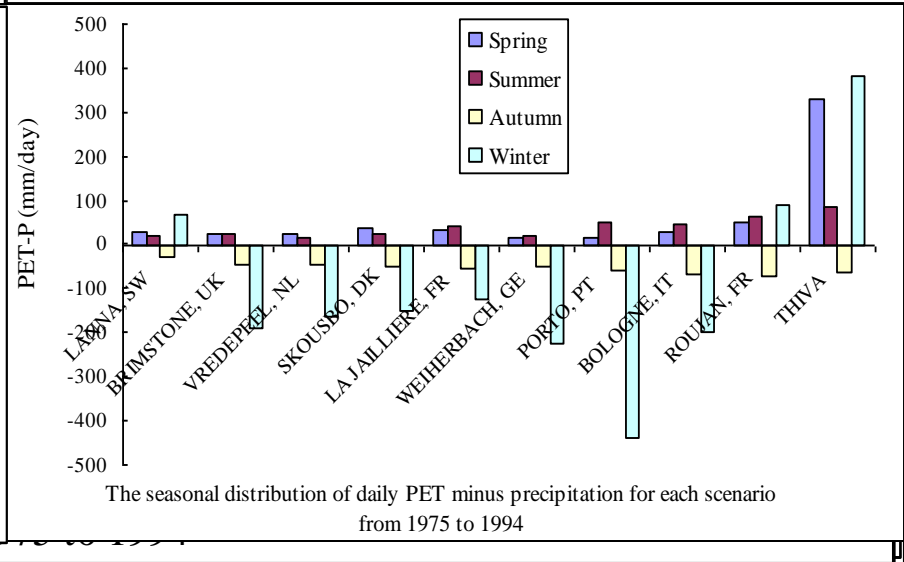
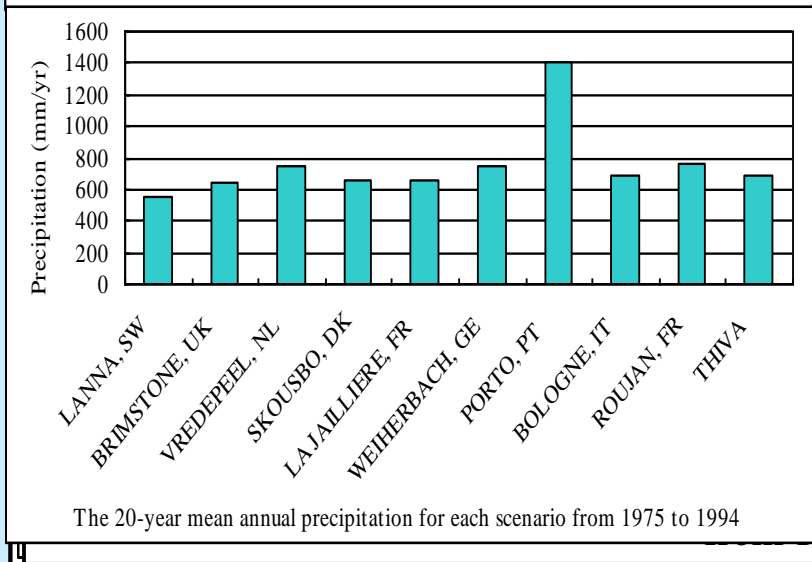
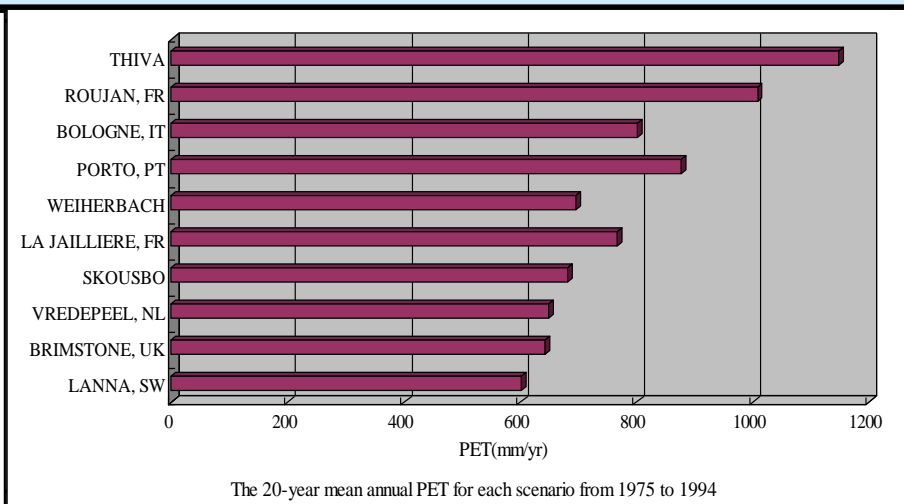
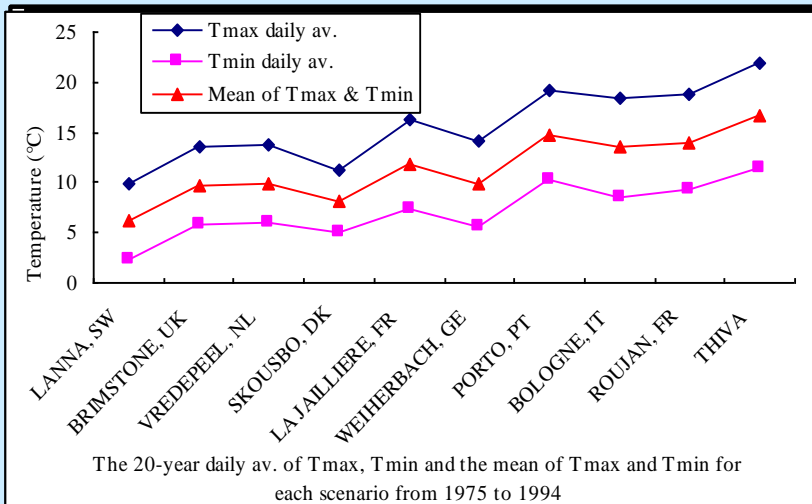




<b>Name</b>	<b>Mean annual Temp. (°C)</b>	<b>Annual Rainfall (mm)</b>	<b>Topsoil</b>	<b>Organic carbon (%)</b>	<b>Slope (%)</b>	<b>Water bodies</b>	<b>Weather station</b>
<b>D1</b>	<b>6.1</b>	<b>556</b>	<b>Silty clay</b>	<b>2.0</b>	<b>0 – 0.5</b>	<b>Ditch, stream</b>	<b>Lanna</b>
<b>D2</b>	<b>9.7</b>	<b>642</b>	<b>Clay</b>	<b>3.3</b>	<b>0.5 – 2</b>	<b>Ditch, stream</b>	<b>Brimstone</b>
<b>D3</b>	<b>9.9</b>	<b>747</b>	<b>Sand</b>	<b>2.3</b>	<b>0 – 0.5</b>	<b>Ditch</b>	<b>Vredepeel</b>
<b>D4</b>	<b>8.2</b>	<b>659</b>	<b>Loam</b>	<b>1.4</b>	<b>0.5 – 2</b>	<b>Pond, stream</b>	<b>Skousbo</b>
<b>D5</b>	<b>11.8</b>	<b>651</b>	<b>Loam</b>	<b>2.1</b>	<b>2 – 4</b>	<b>Pond, stream</b>	<b>La Jailliere</b>
<b>D6</b>	<b>16.7</b>	<b>683</b>	<b>Clay loam</b>	<b>1.2</b>	<b>0 – 0.5</b>	<b>Ditch</b>	<b>Thiva</b>
<b>R1</b>	<b>10.0</b>	<b>744</b>	<b>Silt loam</b>	<b>1.2</b>	<b>3</b>	<b>Pond, stream</b>	<b>Weiherbach</b>
<b>R2</b>	<b>14.8</b>	<b>1402</b>	<b>Sandy loam</b>	<b>4</b>	<b>20*</b>	<b>Stream</b>	<b>Porto</b>
<b>R3</b>	<b>13.6</b>	<b>682</b>	<b>Clay loam</b>	<b>1</b>	<b>10*</b>	<b>Stream</b>	<b>Bologna</b>
<b>R4</b>	<b>14.0</b>	<b>756</b>	<b>Sandy clay loam</b>	<b>0.6</b>	<b>5</b>	<b>Stream</b>	<b>Roujan</b>

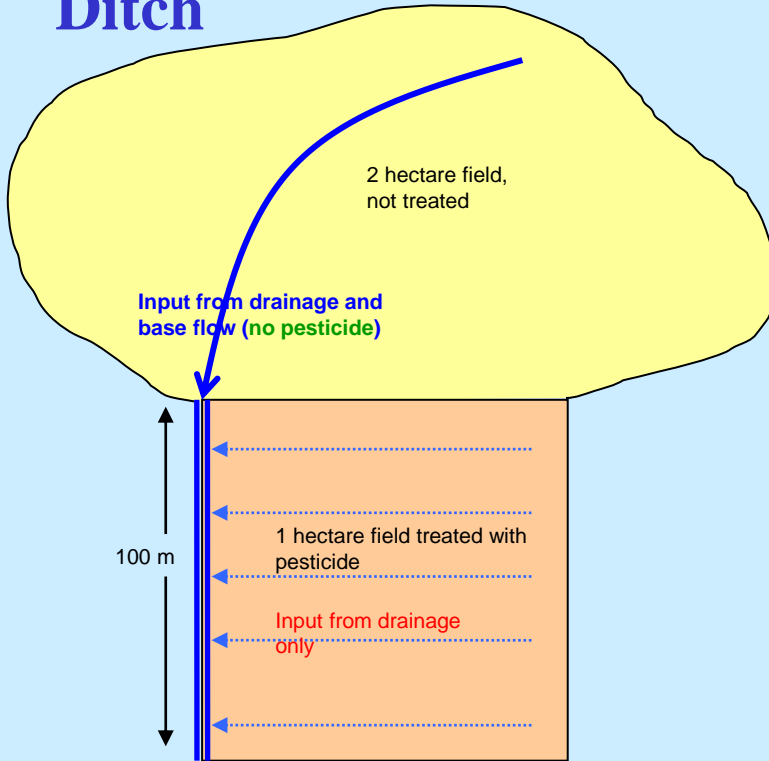


# Climatic characteristics

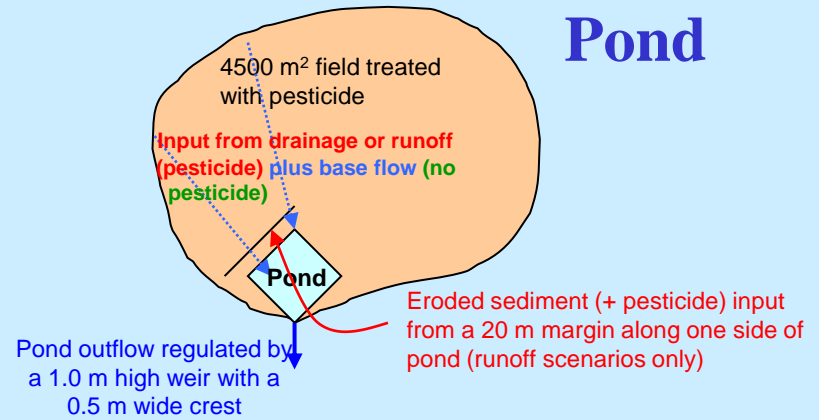


# The FOCUS Water Bodies

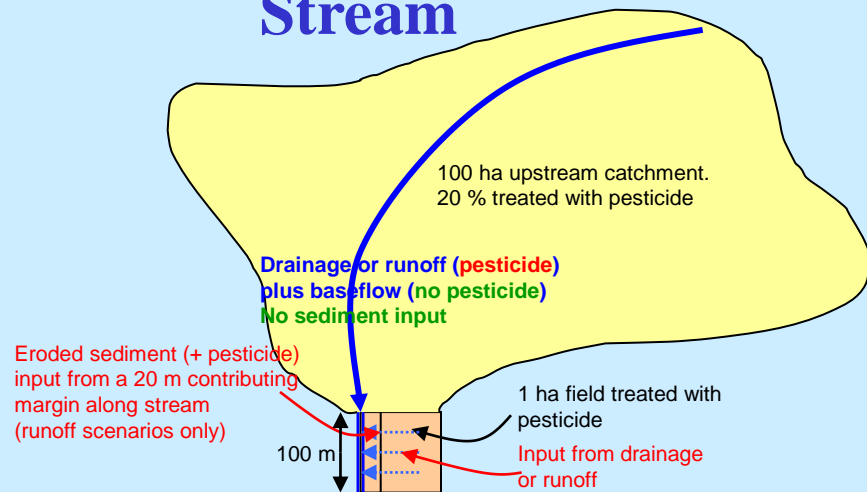
## Ditch



## Pond



## Stream



# Fixed characteristics

## Dimensions

Type of water body	Width (m)	Total length (m)	Distance from top of bank to water (m)
Ditch	1	100	0.5
Pond	30	30	3.0
Stream	1	100	1.0

## Sediment Characteristics

Concentration of suspended solids in water column ( $\text{mg.L}^{-1}$ )	15
Sediment layer depth (cm)	5
Organic carbon content (%)	5
Dry Bulk density ( $\text{kg.m}^{-3}$ )	800
Porosity (%)	60

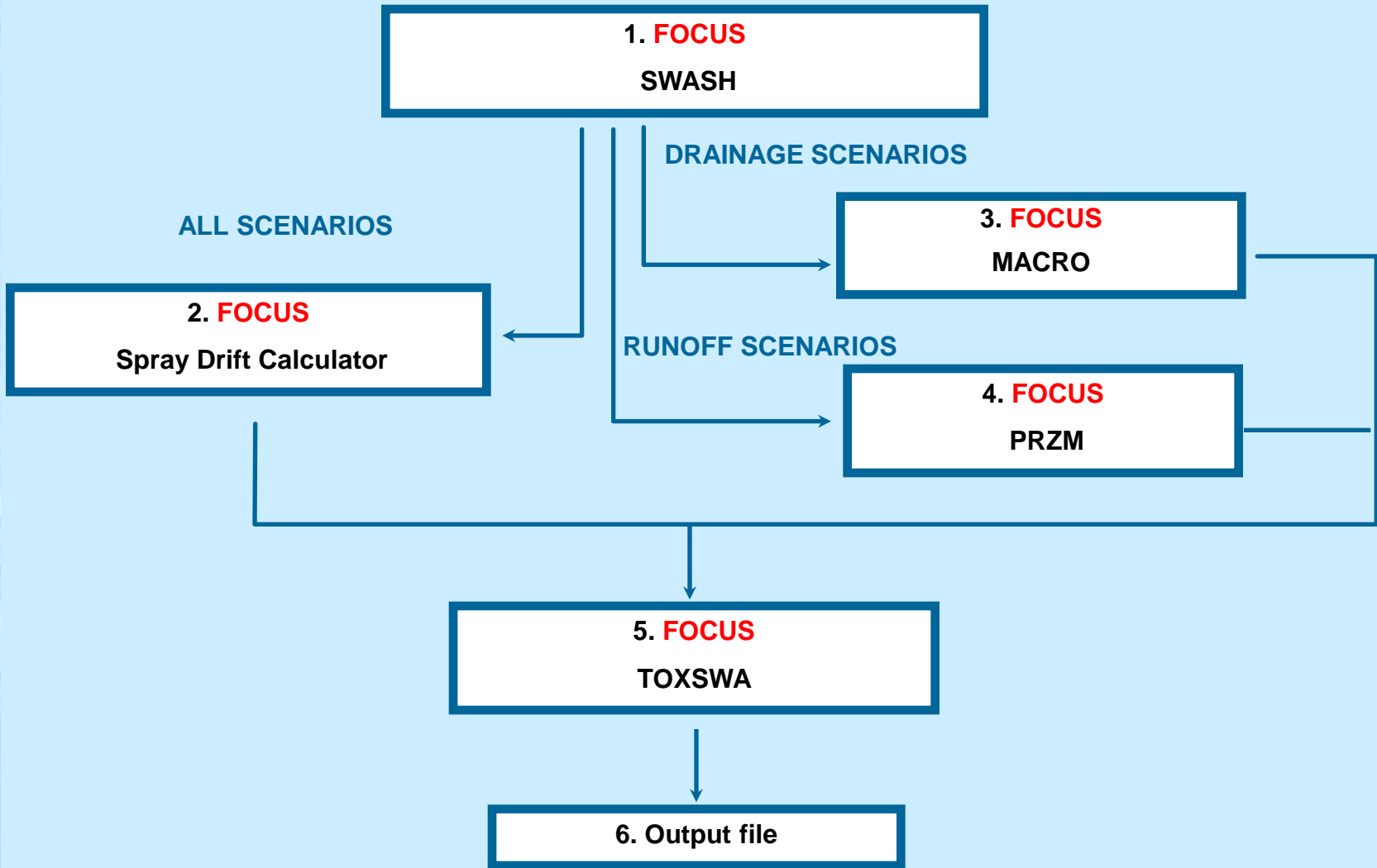


# Mode(u)l(e)s in **FOCUS**

- Drift Calculator
- MACRO in **FOCUS**
- PRZM in **FOCUS**
- TOXSWA in **FOCUS**
- PAT
- SWASH



# Interaction of Models





# SWASH

## Surface Water Scenarios Help

for  
input to MACRO, PRZM3 and TOXSWA  
to calculate  
exposure concentrations in water bodies



**DG Health and Consumer  
Protection**

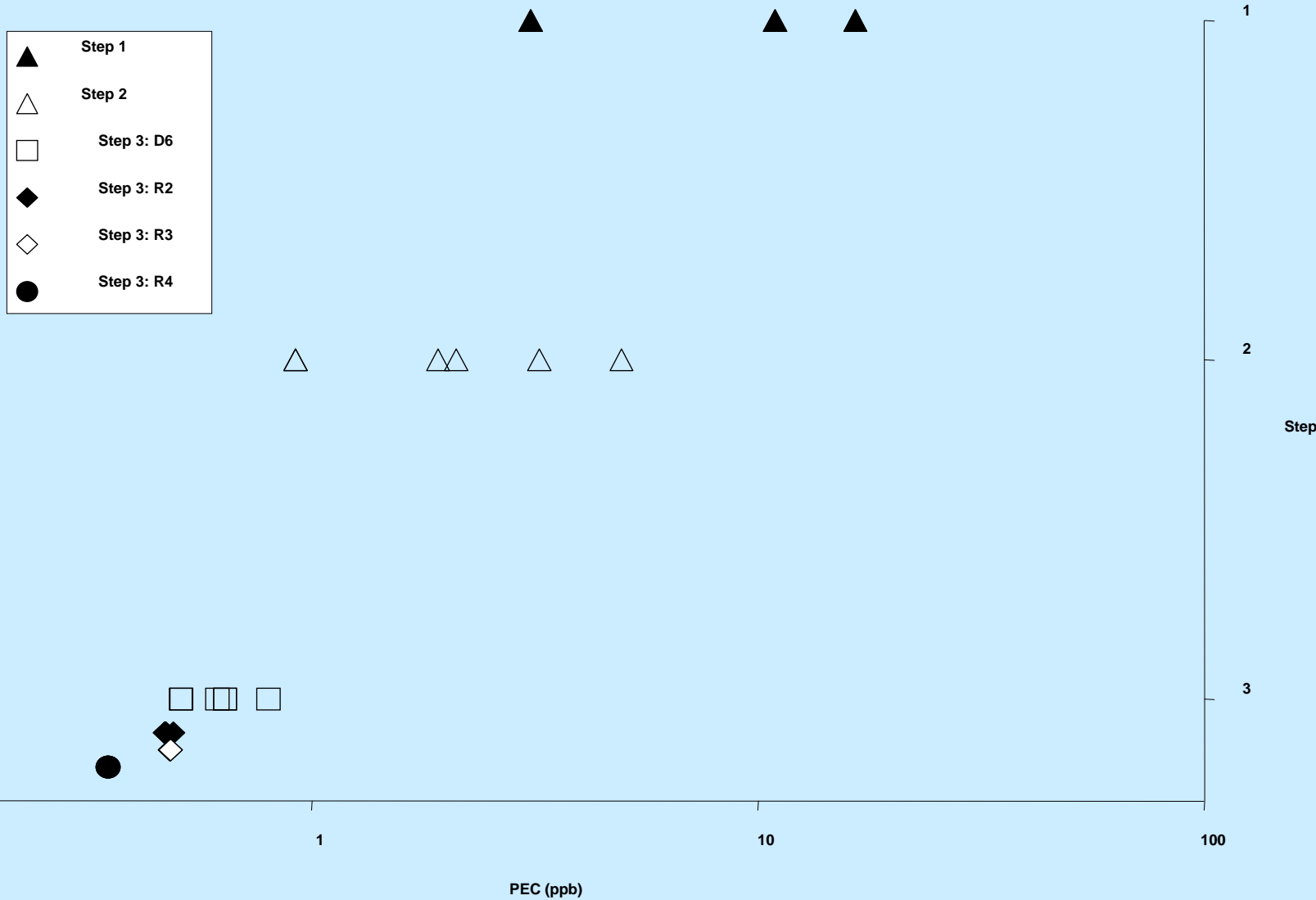
**Version: 1.1, July 2000**



**TESTING**  
**FOCUS**  
**SCENARIOS**



# a) Maximum PEC<sub>SW</sub>



# Profits

- **Incorporation of scientific knowledge**
- **Harmonisation of PEC calculations**
- **Registration authorities and industry**
- **Tools, manuals, GUI available**
- **Facilitation of communication**
- **Discussion on substance properties**
- **Credibility of Risk Assessments**
- **EU registration and evaluation process**



# Conclusions

- **FOCUS** objectives achieved
- **10 European surface water scenarios**
  - 6 drainage
  - 4 runoff
- **Useful tool for Annex I listing**
  - by authorities and industries
- **GUI available**
- **Web address:** <http://viso.ei.jrc.it/focus/>  
(models, documentation, version control)

