

SIXTH FRAMEWORK PROGRAMME

FOOTPRINT

Functional Tools for Pesticide Risk Assessment and Management

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Igor G. Dubus, FOOTPRINT co-ordinator
FOOTPRINT annual meeting 2008, Wroclaw, Poland

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A warm welcome to Wroclaw

- > Our 4th major FOOTPRINT event
 - FOOTPRINT kick-off meeting in Orléans (F) in Feb. 06
 - FOOTPRINT annual meeting 2006 in Copenhagen (DK) in Nov. 06
 - FOOTPRINT annual meeting 2007 in Ispra (IT) in Nov. 07



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The FOOTPRINT final conference


- > On 18 & 19 March 2009
- > To take place at the University of Giessen in Germany



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Sincere thanks to

- > Wroclaw University of Environmental and Life Sciences for hosting the FOOTPRINT annual meeting(s)
- > Wieslaw Fialkiewicz, Irek Kajewski and Sylwester Krasnicki for the practical organisation of the event



- > All of the participants for attending the meeting

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Why Poland, why Wroclaw?

- > Meeting of European projects are all too often organised in Western-European cities
- > Selecting a meeting location in Eastern Europe
 - gives a chance of people from Eastern-European countries to attend FOOTPRINT meetings
 - makes people from the West side of Europe realise how much travelling is needed to attend EU research meetings when coming from the East
- > There is no doubt that the potential usefulness of the FOOTPRINT tools is greater in European countries where tools are not available yet
 - e.g. nationwide, regional and farm-level tools
 - e.g. registration context

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Where are we coming from?



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What are we going to talk about and do over the next 2 days?

> Today

- Overview of the project and update on recent developments
- Some of the FOOTPRINT science
- Demonstration of the first two FOOT tools
- Presentation of evaluation activities
- *Social dinner at Piwnica Świdnicka*

> Tomorrow

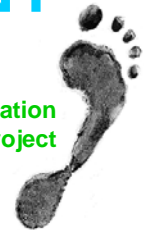
- Break-out groups with FOOT-FS and FOOT-NES
- FOOTPRINT beyond the EU funding
 - FOOTPRINT and other tools
 - FOOTPRINT for what?
 - FOOTPRINT+

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FOOTPRINT

Overall presentation of the project



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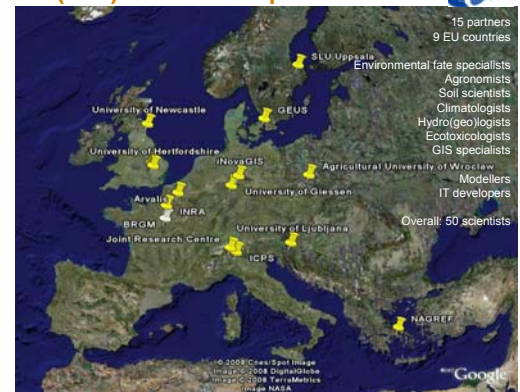
What is FOOTPRINT?

- > An innovative project funded by DG Research as part of FP6 (Box 8: Scientific Support for Policies)
- > 3(.5)-year project which started on 1 January 2006
- > A research project with VERY applied outcomes
- > Key focus is on the results (the FOOTPRINT tools)



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The (new) FOOTPRINT partners



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Project overall objective

- > To develop a set of 3 computer tools
 - Which provide an assessment of the risk of transfer of pesticides to water resources for any location in Europe
 - Which are based on state-of-the-art research models
 - Which can be deployed anywhere in Europe
 - Which can be used by all stakeholders, from farmers in the field to policy- and decision-makers
- > Each of the 3 tools should allow to
 - i) identify the dominant pathways and sources of pesticide contamination in the agricultural landscape.
 - ii) estimate levels of pesticide concentrations entering surface water and groundwater systems.
 - iii) make recommendations on how to reduce the pesticide contamination in water resources.

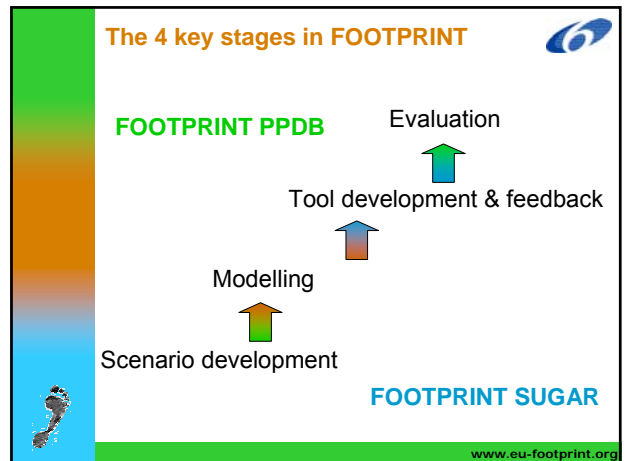
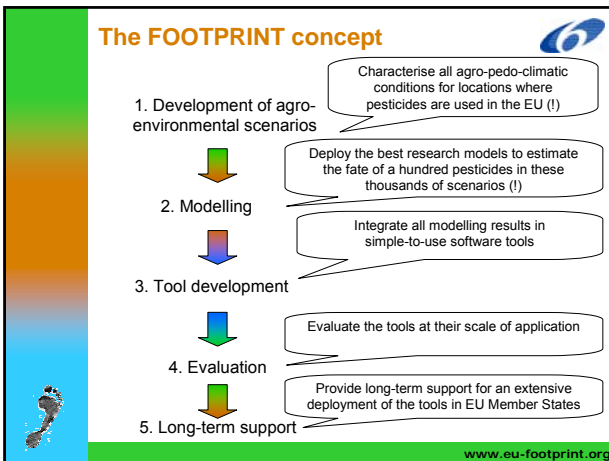
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3 tools, 3 scales, 3 user communities

- > **FOOT-NES**
 - National and EU scale
 - EU and MS policy- and decision-makers, ministries, pesticide registration authorities
 - > **FOOT-CRS**
 - Catchment and regional scale
 - 'Water quality' managers, i.e. regional/local authorities, water agencies, water companies
 - > **FOOT-FS**
 - Farm scale
 - Agricultural advisers and farmers
- > All 3 tools are coherent across scales



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The FOOTPRINT PPDB

- > FOOTPRINT Pesticide Properties Database
- > Developed by the University of Hertfordshire for FOOTPRINT
- > Holds physico-chemical, environmental fate, ecotoxicological and toxicological data for 928 active substances and 414 metabolites
- > Quality assurance scheme (origin of the data + confidence)
- > Numerous internal and external quality checks
- > Free online access via the FOOTPRINT web site
- > Languages: English, French, Spanish, Italian and Polish

<http://www.eu-footprint.org/ppdb.html>

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Language selection

FOOTPRINT - creating tools for pesticide risk assessment and management in Europe

SELECT LANGUAGE

THE FOOTPRINT PPDB
Pesticide Properties Database

The FOOTPRINT Pesticide Properties Database (FOOTPRINT PPDB) is a comprehensive relational database of pesticide physicochemical and ecotoxicological data. The database has been developed by the Agriculture & Environmental Research Unit (AERU) at the University of Hertfordshire, with part funding from the EU-funded FOOTPRINT project.

The new database is a revised and greatly expanded version of the database that originally accompanied the SIM (Environmental Management for Agriculture) software, developed by AERU for the UK.

To access the database, select your required language from the options on the left.

For advice on purchasing the FOOTPRINT PPDB, click here.

133,127

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Alphabetical list of a.i. & search features

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SELECT OPTION

THE FOOTPRINT PPDB
A to Z List of Pesticide Active Ingredients

Home - Other product constituents

Please click here for information about the FOOTPRINT PPDB and its conditions of use.

For metabolite pages, please click on the appropriate active, and follow the links from there.

SEARCH

By active No. A B C D E F G H I J K L H B O P Q R S T U V W X Y Z

Numbers

SELECT LANGUAGE

1,2-Dichloro-4-(4-chlorophenyl)-5-methyl-4-pyridinol
1,2-Dichloropropane
1,3-Dichloropropane
1-Methyl-4-pyridinium
2-Methylphosphinic acid
2,3,7-Tri-
2,4,6-Trichlorophenol
2,4-D
2,4-DE
2-aminobutane
2-methylphosphinic acid

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General information (e.g. glyphosate)

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SELECT OPTION

glyphosate (Ref: MON 0573)
* OP 4753 ** sulfosate ** Translators

Environmental Fate - Ecotoxicology - Human Health - A to Z Index - Home

GENERAL INFORMATION

Description: A herbicide used in a wide range of cropping, utility and industrial situations to control annual and perennial grasses and broad-leaved weeds.

Introduction: 1974

Approved for use (-) or known to be used (+) in the following European countries:

AT	BE	BG	CH	CZ	DE	DK	EE	ES	FI	FR	GR	HU	IE	IT	LT	LU	LV	NL	PL	PT	RO	SE	SI	SK	UK	

Other: Australia, USA

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Physico-chemical properties

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SELECT OPTION

General status:

Pesticide Type	Herbicide
Chemical Group	Glycine derivative
Mode of Action	Broad-spectrum, systemic, CONTACT action translocated and non-residual. Inhibition of biosynthetic enzymes.
CAS No	1071-93-6
EC Number	213-997-4
CPAC Number	28x
US EPA Chemical code	417300
Chemical Formula	C ₉ H ₉ N ₃ O ₂
Chemical SMILES	CC(=O)O[C@H](N)C(=O)O
Structure diagram available?	Yes
Molecular Mass (g mol ⁻¹)	168.07
IPAC Name	n-(phosphonomethyl)glycine
CAS Name	n-(phosphonomethyl)glycine
EC Directive 91/414 Status	Annex I
Other status information	-
Herbicide Resistance (HRAC) Classification	6
Insecticide Resistance (IRAC) Classification	Not applicable
Fungicide Resistance (FRAC) Classification	Not applicable

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Formulations

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Formulations:

Property	Value
Example manufacturers of products using the active	<ul style="list-style-type: none"> Bayer Environ Dow AgroSciences Madand Maittechem-agen Monsanto Nufarm UK Surgenta
Example products using the active	<ul style="list-style-type: none"> Asteroid Environ Touchdown Glyph Glypho Dater Chophorate 360 Zyphogan Yamot Manfact
Associated substances	<ul style="list-style-type: none"> Chlorogenic acid 4-Hydroxyphenyl acetic acid Hydroxyphenyl acetic acid Hydroxyphenyl sulfonic acid
UK LERAP Status	LERAP Category 9

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Environmental fate (1/2)

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SELECT OPTION

ENVIRONMENTAL FATE

Property	Value	Source/Quality Score/Other Information	Interpretation
Solubility - in water at 20°C (mg l ⁻¹)	10300	A3	High
Solubility - in organic solvents at 20°C (mg l ⁻¹)	76	A5 - Acetone	-
	291	A5 - Hexane	-
	12	A5 - Ethyl acetate	-
Melting Point (°C)	169.5	A5	-
Octanol-water partition coefficient (log P) at pH 7, 20°C	-3.2	A5	Low
Bulk density (g ml ⁻³)/specific gravity	1.71	A5	-
Dissociation constant (pKa) at 25°C	2.36	A5	-
Vapour pressure at 25°C (mPa)	0.0131	A5	Volatile
Henry's law constant at 25°C (Pa m ³ mol ⁻¹)	2.10 × 10 ⁻⁰⁷	A5	Non-volatile
Henry's law constant at 20°C (dimensionless)	6.60 × 10 ⁻¹³	Q2	Non-volatile

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Environmental fate (2/2)

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SELECT OPTION

Henry's law constant at 20°C (dimensionless)	6.60 × 10 ⁻¹³	Q2	Non-volatile
Soil degradation DT50 (Days)	Typical: 12 Lab at 20°C: 49 Field: 12	A5 A5 A5	Non-persistent Moderately persistent Non-persistent
Aquatic photolysis DT50 (Days) at pH 7	Value: 69 Note: EU Dossier Lab studies range = 100 days, field study 5-21 days (Germany & Switzerland)	A5 A5	Stable
Aquatic hydrolysis DT50 (Days) at 20°C and pH 7	Value: 95 days Note: Stable pH 5 to pH 9 at 28 degC	A5	Very persistent
Water-sediment DT50 (Days)	87	A5	Moderately fast
Water phase only DT50 (Days)	2.5	A5	Moderately fast
Q2 leaching potential index	-0.36	Calculated	Low leachability
SCI-GROW groundwater index (log l ⁻¹) for a 1 kg ha ⁻¹ or 1 ha ⁻¹ application rate	Value: 5.35 × 10 ⁻⁰³ Note: Estimated concentrations of chemicals with K _{oc} values greater than 1000 m ² g ⁻¹ are beyond the scope of the regression data used in SCI-GROW development. If there are concerns for such chemicals, a higher tier groundwater exposure assessment should be considered, regardless of the concentration returned by SCI-GROW.	Calculated	-
Potential for particle bound transport index	-	Calculated	Medium
K _{oc} - Organic-carbon sorption constant (ml g ⁻¹)	21899	A5	Non-mobile
Freundlich coefficient (n)	Note: EU dossier log range 884 (Sandy sands) - 80000 (Clay clay loam)	04	-

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Metabolites and ecotoxicology (1/3)

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SELECT OPTION

Metabolites:

Metabolite	Formulation Medium	Estimated Maximum Formation Fraction
Ammonomethylphosphonic acid	Soil	0.290

ECOTOXICOLOGY

Property	Value	Source/Quality Score/Other Information	Interpretation
Bio-concentration factor (BCF) [FWS (Days)]	8.5	F4 Whole fish	Low potential
Bioaccumulation potential	Not available	-	-
Mammals - Acute oral LD50 (mg kg ⁻¹)	1700	A5 Rat	Moderate
Mammals - Short term NOEL (mg kg ⁻¹ , 10 day diet)	150	A5 Rat	Moderate
Birds - Acute LD50 (mg kg ⁻¹)	2000	A4 Unknown species	Moderate
Fish - Acute LC50 (mg l ⁻¹)	8.2	E4 Oncorhynchus mykiss	Moderate
Fish - Chronic 21 day NOEC (mg l ⁻¹)	917	A4 Unknown species	-
Aquatic invertebrates - Acute EC50 (mg l ⁻¹)	13	E4 Daphnia magna	Moderate
Aquatic invertebrates - Chronic 21 day NOEC (mg l ⁻¹)	1.1	A5 Daphnia magna	-

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Ecotoxicology (2/3)

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SELECT OPTION

HWAL (mg l ⁻¹)	Value	Source/Quality Score/Other Information	Interpretation
Sediment 96 hour acute LC50 (mg l ⁻¹)	40.0	F4 Americamyces baha	Moderate
Sediment dwelling organisms 96 hour acute LC50 (mg l ⁻¹)	-	-	-
Sediment dwelling organisms 28 day chronic NOEC, static, water (mg l ⁻¹)	-	-	-
Sediment dwelling organisms 28 day chronic NOEC, sediment (mg kg ⁻¹)	-	-	-
Aquatic plants - EC50 (mg l ⁻¹)	6	E3 Lemna gibba, 7 day	Moderate
Algae - acute EC50 (mg l ⁻¹)	4.4	F4 Scenedesmus quadricauda	Moderate
Algae - 96h NOEC (mg l ⁻¹)	2	Q2 Unknown species	Low
Invertebrates - LC50 (mg l ⁻¹)	100	A5 Daph	Moderate
Earthworms - Acute LC50 (mg kg ⁻¹)	480	A5 Eisenia fetida	Moderate
Earthworms - Reproduction NOEC (mg kg ⁻¹)	28.8	A5 Eisenia fetida	Moderate
Other soil macro-organisms (e.g. Collembola)	LD50 / EC50 / NOEC / % Effect	-	-
Other arthropod (1)	LD50 g ha ⁻¹	-	-
	% Effect: 25	-	Mortality
	9	-	Fertility
	Dose: 3.72 kg ha ⁻¹	-	A5: Aphidius rhopalosiphii (adult)
Other arthropod (2)	LD50 g ha ⁻¹	-	-
	% Effect: 100	-	Mortality
	Dose: 3.0 kg ha ⁻¹	-	-

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Ecotoxicology (3/3)

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SELECT OPTION	Value	Unit	Family	Source/Quality Score/Other Information	Interpretation
Other arthropod (C)	LD50 g ha ⁻¹	-	Family: 3-75 kg ha ⁻¹ AI: aphidius rhopalosiph (adult)	-	-
% Effect	100	-	Mortality: 3.8 kg ha ⁻¹ AI: Tychobothrus pyri (Microcycle)	-	negotial
Soil micro-organisms	Nitrogen mineralization: No significant effect Carbon mineralization: No significant effect	-	AI [Dose: 18 kg ha ⁻¹]	-	-
Neoclass study data	NOEAEC mg l ⁻¹	-	-	-	-
NOEAEC mg l ⁻¹	-	-	-	-	-

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Toxicology (1/2)

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HUMAN HEALTH

PROPERTY	Value	Source/Quality Score/Other Information	Interpretation
Frequency	1	-	Moderate
Humanity - Acute oral LD50 (mg kg ⁻¹)	1760	AI Rat	-
Humanity - Dermal LD50 (mg kg ⁻¹ body weight)	5000	AI Rat	-
Humanity - Inhalation LC50 (mg l ⁻¹)	1.0	AI Rat	-
WHO Classification	U	-	Unlikely to present acute hazard in normal use
US EPA Classification (Formulation)	III	-	Caution - Slightly toxic
EC Risk Classification	[D - Irritant: R41], [X - Dangerous for the environment: R11, R12]	-	-
EC Safety Classification	S2, S24, S36, S63	-	-
ADI - Acceptable Daily Intake (mg kg ⁻¹ bw day ⁻¹)	0.3	AI Rat, SF=100	-
ARF - acute Reference Dose (mg kg ⁻¹ bw day ⁻¹)	None allocated	AI	-
AOEL - Acceptable Operator Exposure Level - Systemic (mg kg ⁻¹ bw day ⁻¹)	0.2	AI Rat, SF=100	-
Dangerous Substances Directive 1994 Exposure Limits	-	-	-

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Toxicology (2/2) & known health issues

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SELECT OPTION	Value	Unit	Family	Source/Quality Score/Other Information	Interpretation
Exposure Limits	-	-	-	-	-
Exposure Routes	Public:	-	-	-	-
Occupational:	-	-	-	-	-
Examples of European risk (mg kg ⁻¹)	Value:	-	-	-	-
Notes:	-	-	-	-	-
Drinking Water MAC (µg l ⁻¹)	-	-	-	-	-

Health issues:

	Carcinogen	Endocrine disruptor	Reproduction / development effects	Acetyl cholinesterase inhibitor	Neurotoxicant	Respiratory tract irritant	Skin irritant	Eye irritant
X	-	-	X	X	X	X	X	X

General human health issues [No further information available]
Handling issues [No information available]

✓ = Yes, known to cause a problem
X = No, known not to cause a problem
? = Possibly, status not identified
- = No data

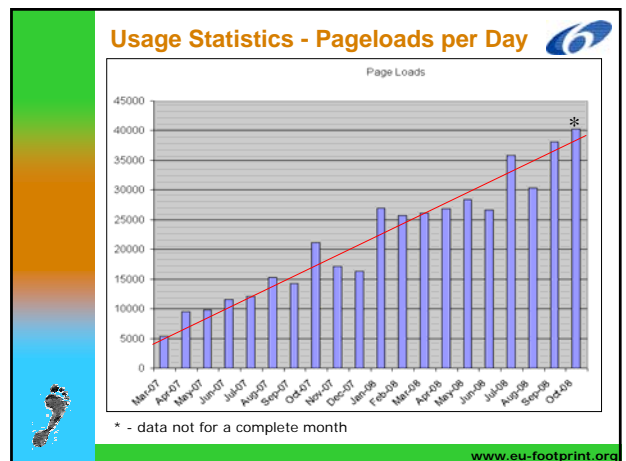
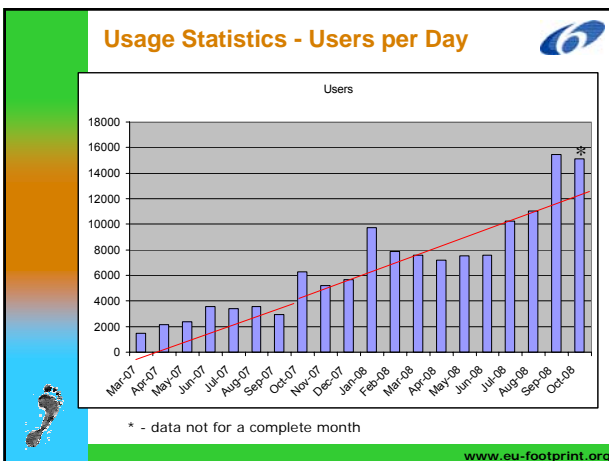
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Translations in 12 EU languages

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Language	Name
English	glyphosate
French	glyphosate
German	glyphosat
Danish	glyphosat
Italian	glifosato
Spanish	glifosato
Czech	glyphosat
Slovenian	glifosat
Polish	glifosat
Swedish	glifosan
Hungarian	glifosat
Dutch	glyfosaat

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The FOOTPRINT PPDB

- > The FOOTPRINT database is a success and clearly fills a gap
- > New developments coming soon
- > We are looking into means to maintain and upgrade it in the long term
- > A landmark in the FOOTPRINT world

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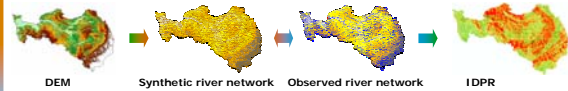
The FOOTPRINT SUGAR index

- > NOT specific to pesticides
- > SUGAR = Surface water / Groundwater contribution index
- > Tells whether water falling on a particular piece of land contributes to groundwater or surface water
- > Based on observed data only
 - Altitudes (DEM)
 - Surface water (river) network
 - (FOOTPRINT soil map)
- > Fits very well with preconceptions of national experts regarding infiltrating and non-infiltrating zones in the various MS

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SUGAR = f(IDPR, SPR)

- > IDPR
 - Based only on real, readily-available, data
 - Altitudes (DTM) and Surface Water network
 - Computes a hypothetical SW network and compares it to the observed one
 - The difference between the 2 networks provides an indication of water pathways

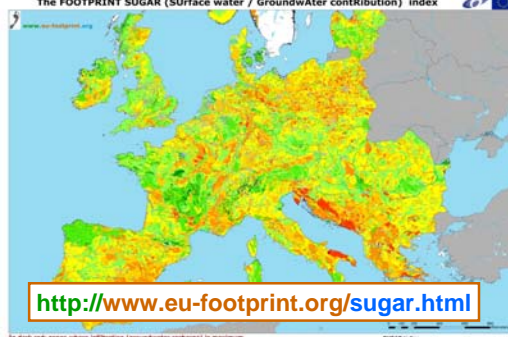


- > SPR
 - Standard Percentage Runoff used in catchment hydrology (responsiveness)
 - SPR attached to each FOOTPRINT soil type

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FOOTPRINT SUGAR

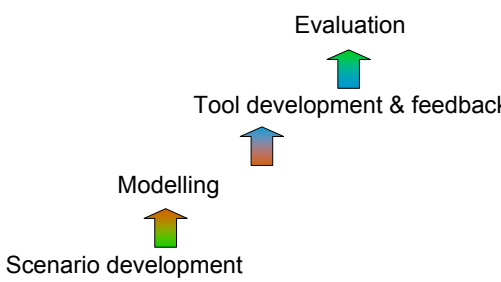
The FOOTPRINT SUGAR (Surface water / Groundwater contribution) index



<http://www.eu-footprint.org/sugar.html>

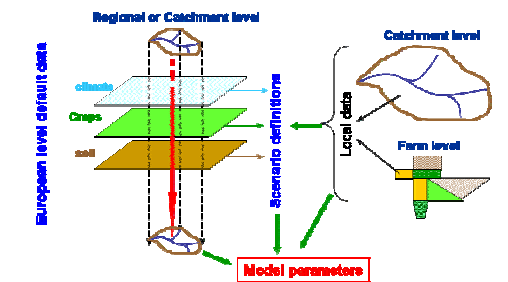
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The 4 key stages in FOOTPRINT



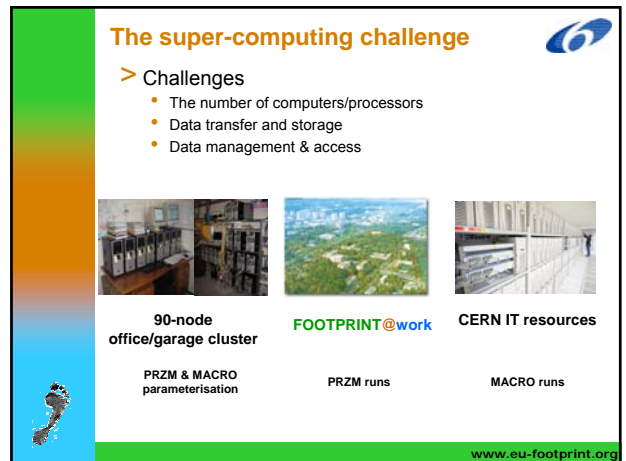
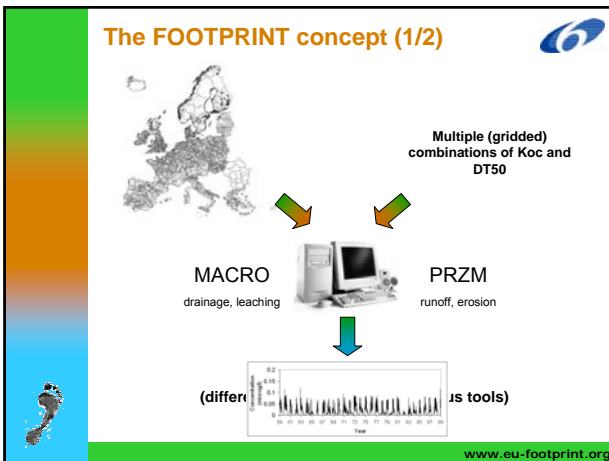
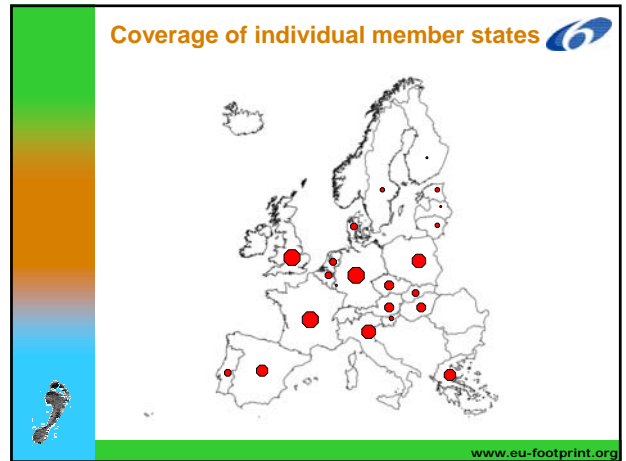
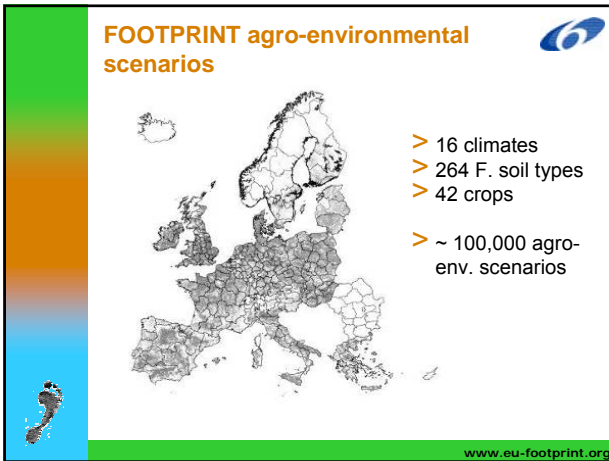
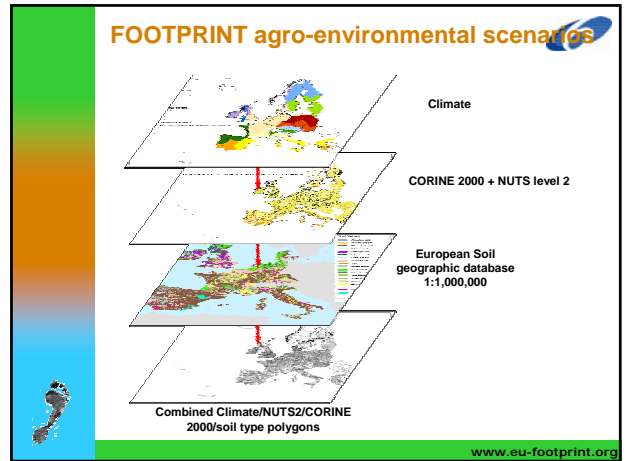
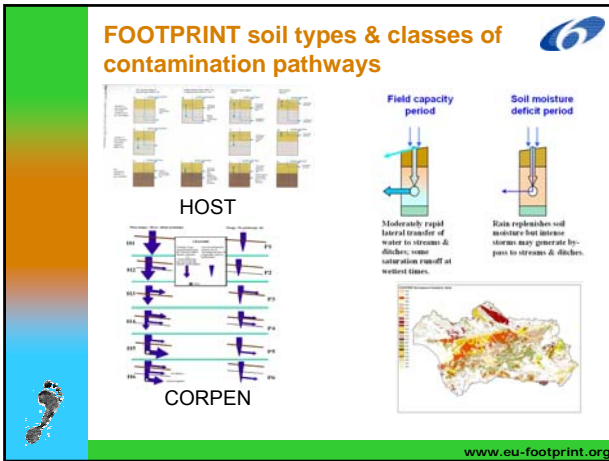
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Developing agro-environmental scenarios for the whole of the EU27



Objective: to provide an extensive characterisation of European agro-pedo-climatic conditions in which pesticides are applied

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Specify your soil...

www.eu-footprint.org

Specify your field margins...

www.eu-footprint.org

Specify your pesticides...

www.eu-footprint.org

...Launch the assessment...

www.eu-footprint.org

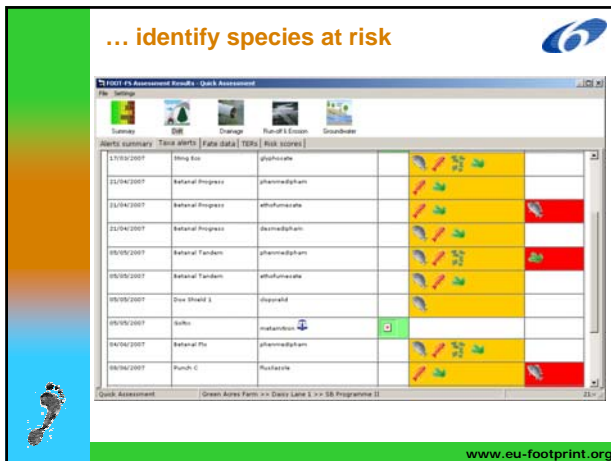
And get your risk assessment results... ... for all processes in <10 seconds

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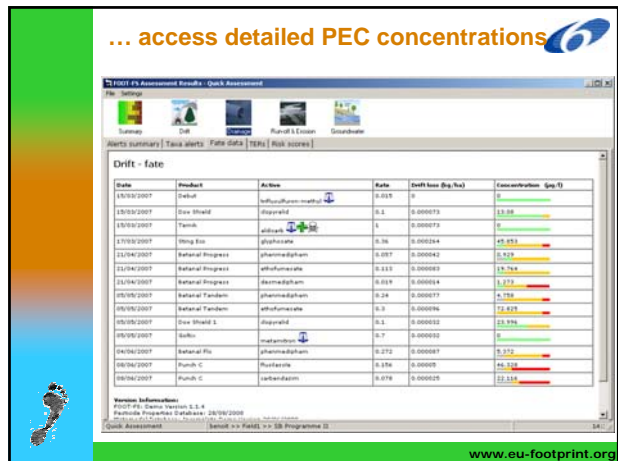
... or for a specific process

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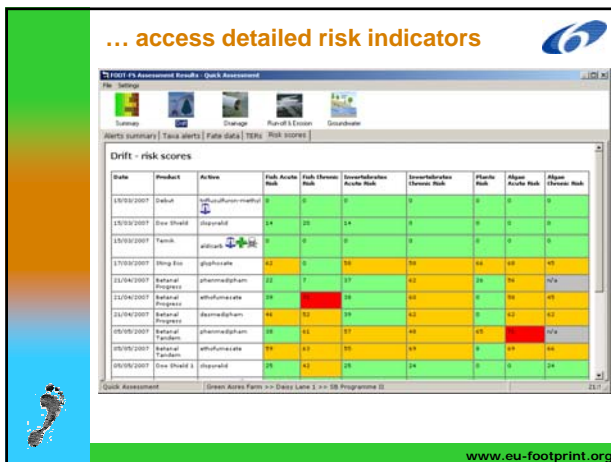
... identify species at risk



... access detailed PEC concentrations



... access detailed risk indicators



The FOOT tools for decision support

- > What-if testing / comparative assessment / hypothetical scenarios
- > What is the likely influence on pesticide transfers of:
 - A reduction in application rates ?
 - A change in application date?
 - A change in cropping? In crop protection strategies?
 - Product substitutions?
 - The implementation of mitigation strategies (grassed buffer strips, no-spray zones)

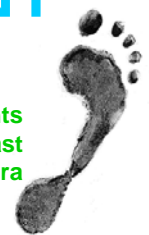
What is so special about FOOTPRINT ?

- > Coherence across scales
- > A full coverage of the EU
- > The potential to use default or your own data
- > Integrates validated approaches and methodologies
- > An exceptional engine (the best research models)
- > All the underlying complexity is hidden from the user
- > Provision of robust environmental indicators
- > Possibility to do what-if scenarios
- > Tools and results made available to all stakeholders in all MS
- > A genuine consensus around the tools (Member States in Europe, Environment AND Agriculture / public bodies and private sector)
- > An initiative which will be supported in the long term




FOOTPRINT

Update on the developments in FOOTPRINT since our last annual meeting in Ispra



A very busy year (as usual!)



- > Changes in the composition of the consortium
- > Amendment to the Contract with the European Commission
- > Development of the tools
- > Large-scale modelling activities
- > Dissemination activities
- > FOOTPRINT+



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Changes made the consortium...

- > Resignation of GEOSYS (SME, FR) from the FOOTPRINT consortium who could not / did not want to fulfill its duties (development of FOOT-CRS)
- > A very lengthy process which involved the signing of an agreement between FOOTPRINT and GEOSYS
- > Standby on development work for 6 months
- > Development work for FOOT-CRS is now underway and undertaken by iNovaGIS (SME, Kassel, DE) who already developed FOOT-NES

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... and changes made to the Contract



- > Amendment of the Contract with the European Commission
 - Replacement of GEOSYS by iNovaGIS
 - Shifting of the end of the project by 6 months
 - Rescheduling of deliverables
- > The project will now finish at the end of June 2009 which gives us more time to
 - develop or finalise the tools
 - undertake the modelling
 - evaluate the tools
 - prepare the end of the project



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Update on tool development (1/2)



- > FOOT-FS (farm scale)
 - Serious beta version available in January 2008
 - Debugging and optimisation
 - Organisation of piloting workshops
 - Feedback from external Beta testers now required
- > FOOT-NES (National and EU scale)
 - Beta version available in June 2008
 - Used by WP6 (validation people)
 - Still needs thorough testing and optimisation

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Update on tool development (2/2)


- > FOOT-CRS (catchment scale)
 - Development on standby for 6 months
 - Beta version expected at the end of December
 - Thorough testing will start in January
- > Will we make it?
 - Yes, thanks to the extension!
 - The most polished tool will undoubtedly be FOOT-FS

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Modelling activities

- > Modelling work is underway on 3 different IT systems
- > Still a lot to do because of the late start and the increase in the number of model runs to do
- > All PRZM runs expected to be finished by the end of December
- > Additional resources sought for MACRO
- > Delay had a knock-on effect on validation activities
- > The sheer volume of the data produced meant that the format of databases had to be changed in the FOOT tools



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Dissemination activities

- > 4 scientific papers published and 6 international conferences in 2008
- > Numerous presentations of FOOTPRINT in EC and national working groups
- > FOOT-FS piloting workshops in 6 EU countries
- > Major 2.5-day workshop in France in June 2008
 - Presentation of FOOTPRINT
 - Demonstration of FOOT-FS
 - Discussion groups
 - Feedback
 - Meeting expectations
 - Towards FOOTPRINT France

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The next 8 months

- > Development / finalisation of the FOOT tools
- > Provision of all remaining deliverables
- > Communication: web site, events, scientific papers, articles
- > Closure of the EU project
- > Setting up of a FOOTPRINT support group

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FOOTPRINT+

- > FOOTPRINT partners asked to think about how to support FOOTPRINT in the long term (beyond the EC funding)
- > Proposal for the creation of a FOOTPRINT support group ("FOOTPRINT+")
 - Support for the deployment of the FOOTPRINT tools
 - Maintenance and further improvement of the tools
 - New approaches based on FOOTPRINT
 - Development of new versions of the FOOTPRINT tools
 - For specific countries
 - For specific applications (registration, WFD, etc.)
- > Currently on schedule to be operational when FOOTPRINT finishes in June 2009
- > More information to be provided tomorrow afternoon

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Time for action!

- > FOOTPRINT is developing innovative tools which are adapted to their user needs
- > Wide consensus around the tools
- > The tools now only need to be deployed and used!
- > Time for users to benefit from the tools
 - Policy makers / decision makers / registration authorities at the national/EU scale.
 - Water managers, environment agencies, water companies, local authorities at the catchment scale
 - Agricultural advisers, farmers at the local scale

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Conclusions

- > A first in the transfer of knowledge and technology from innovative research to very applied tools for pesticides
- > Many potential applications and a genuine will to see the tools being used on a large scale across the EU
- > FOOTPRINT opens a very valuable opportunity to reduce the contamination of water resources across the EU and achieve the targets of the WFD

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