Project no.	SSPE-CT-2003-501997
Project acronym	HAIR
Project title	Harmonised environmental indicators for pesticide risk
Instrument	STREP
Thematic priority	FP6

Publishable final activity report of HAIR project

Period covered: from 01-01-2004 to 31-03-2007
Date of preparation: 17-09-2007
Start date of project: 01-01-2004
Duration: 3 years and 3 months
Project coordinator name: Robert Luttik
Project coordinator organization name: RIVM

Revision [version 1]

1. Project execution

Executive summary of the sixth framework programme HAIR

harmonised environmental indicators for pesticide risk

Project full title:	Harmonised environmental indicators for pesticide risk
Project acronym:	HAIR
Project contract number:	SSPE-CT-2003-501997
Project type:	Specific targeted research or innovation project
Project coordinator name:	Robert Luttik
Project coordinator organization:	RIVM
E-mail address coordinator:	Robert.Luttik@RIVM.NL
Public website for HAIR:	http://www.rivm.nl/stoffen-risico/NL/hair.htm

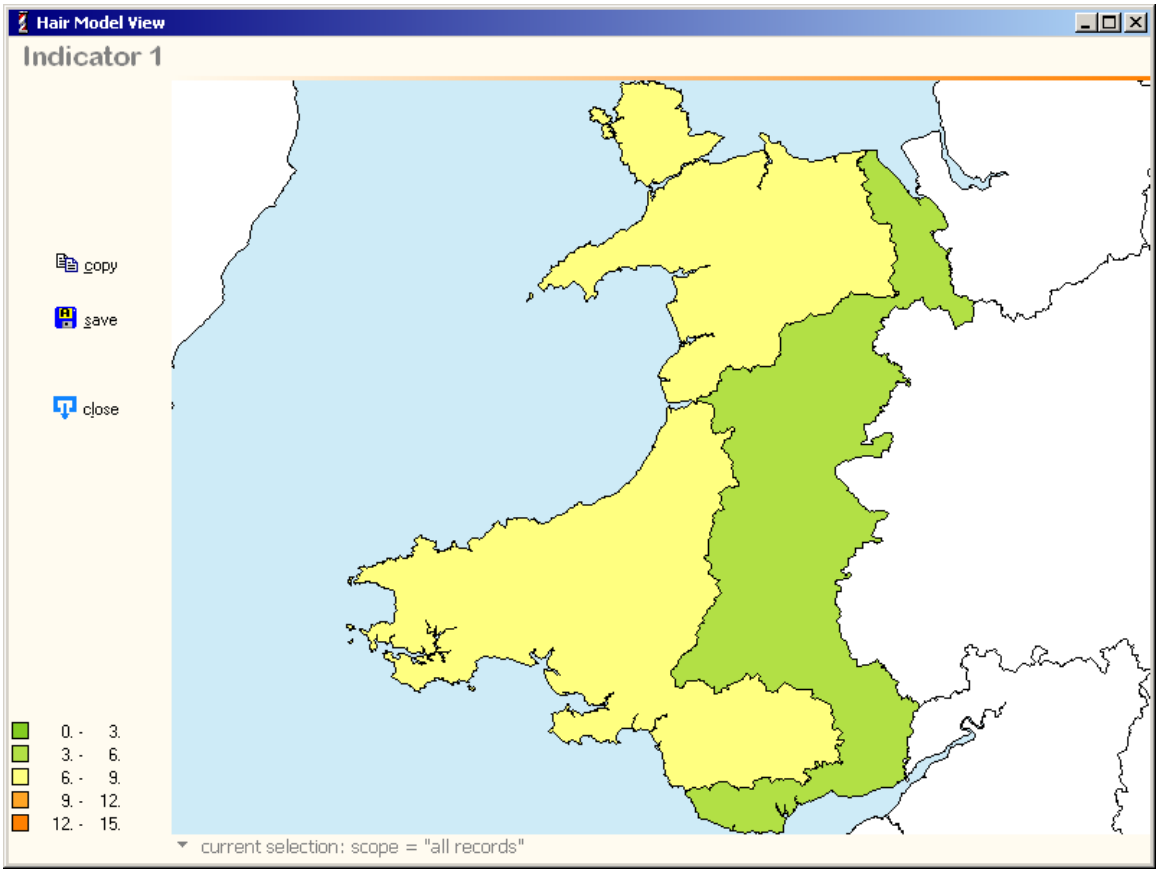
This project supports Community policies for sustainable agriculture by providing a harmonised European approach for indicators of the overall risk of pesticides. It has integrated European scientific expertise on the use, emissions and environmental fate of pesticides and their impact on agro-ecosystems and human health, in order to learn and understand the limitations of existing approaches and to develop improved indicators.

The main deliverable of the project is a set of harmonised environmental and human health risk indicators, implemented in a software package. The proposed tool includes methods to predict environmental fate and exposure, and the resulting acute and chronic risks for aquatic and terrestrial organisms, for groundwater, for public health (including pregnant women) and for applicators of the pesticides. Consistent database structures have been developed for soil, climate, land use, agricultural practice, pesticide use and ecotoxicological data, to enable the harmonised use of the indicators at the distinguished scales. State-of-the-art methods have been used to extrapolate from test animals to humans and wildlife, and the indicators include chronic risks based on sub-lethal effects as well as acute risks. The project has used existing data sets to systematically evaluate the validation status of the indicators.
All definitive reports (PDF as well as Word files of the HAIR project and the computer program can be found at the HAIR website:
(http://www.rivm.nl/rvs/overige/risbeoor/Modellen/Results_of_HAIR_project.jsp).

The indicator outputs are available for different scales, providing results at the catchment or regional level, taking account of local conditions of soil, climate etc; and also aggregating or integrating results at the European level.

The indicators provide new and powerful assessment tools for monitoring and managing the overall risks of pesticides. They contribute directly to Agenda 2000 aims for sustainable agriculture, and to the 6th Environment Action Programme's Thematic Strategy on the Sustainable Use of Plant Protection Products.

The outcomes of the program can be viewed as tables, as cumulative distributions and as maps (hypothetical example outcome for Wales is shown below) or as trends in time.



At the start of the project a "Workshop on pesticide risk indicators for man and the environment" was organised in the Netherlands. The aims and goals of the Workshop were: to present HAIR to the stakeholders outside the research consortium, to make acquaintance with all the players in this field, to find out what kind of sales data are available in Europe, to find out what kind of usage data are available in the Europe, to find out what kind of indicators are already used in Europe, to find out what kind of questions should be answered by the indicators, and to set the noses of all HAIR researchers in the same direction.
General conclusions of workshop:

- Although it is difficult to have one harmonised indicator, it was concluded that there is a general approach,
- The indicator is a function of risk and a measure of use,
- The general form of risk is the predicted environmental concentration (or dose) divided by toxicity (risk as defined by Directive 91/414),
- There will be a grid cell approach so that 'territory can be defined by the user', and
- Aggregation of indicators is necessary.

A full report of the workshop and of all presentations are available on the HAIR website: (http://www.rivm.nl/rvs/overige/risbeoor/Modellen/HAIR.jsp).

In November 2006 a special Seminar was organised with the Risk Reduction Steering group of the OECD and the HAIR consortium to inform many of the policy makers that are dealing with the use of plant protection products in the world. The presentations given at that Seminar and the report of the Seminar are available at the HAIR website:
(http://www.rivm.nl/rvs/overige/risbeoor/Modellen/HAIR_pdfs_ppts.jsp).

The following partners were involved in the HAIR consortium/project:

- National Institute of Public Health and the Environment (RIVM), The Netherlands,
- Joint Research Centre (JRC), Italy,

- Central Science Laboratory (CSL), United Kingdom,
- Cranfield University, United Kingdom,
- University of York, United Kingdom,
- Biologische Bundesanstalt (BBA), Germany,
- Alterra Green World Research (Alterra), The Netherlands,
- Universita Cattolica del Sacro Cuore (UCSC), Italy,
- Ghent University (RUG), Belgium,
- National Environmental research Institute (NERI), Denmark,
- Centre for Environmental Research (UFZ), Germany,
- Luigi Sacco Hospital and University (ICPS), Italy,
- Norwegian Crop Research Institute (NCRI), Norway
- Catholic University of Louvain (UCL), Belgium,
- Mario Negri Research Institute for Farmacology (NEGRI), Italy,
- Veterinary and Agrochemical Research centre (VAR), Belgium,
- Research Institute of Organic Agriculture (FiBL), Switzerland, and
- Central Service for Plant Protection and Soil Conservation (CSPPSC), Hungary.

2. Dissemination and use

Section 1 - Exploitable knowledge and its Use

Not applicable for the HAIR project.

Section 2 – Dissemination of knowledge

Overview table

Planned/actual Dates	Type	Type of audience	Countries addressed	Size of audience	Partner responsible /involved
3-4 Feb 2004	Presentation	OECD members of Working Group on Pesticide	OECD countries	60	Partner 1 (RIVM)
24-26 May 2004	Workshop	Stakeholders	EU and some OECD countries	50	All
Summer 2004	Project communication platform	Stakeholders	EU and some OECD countries	70	Partner 1 (RIVM)
September 2004	Project web-site	General interested people	All	?	Partner 1 (RIVM)
3 Nov 2004	Presentation	Agriculture/ pesticide minded researchers, industry and policy makers	Mainly Europe	60	Partner 1 (RIVM)
7 Dec 2004	Presentation	Farmers, industry and policy Makers	Sweden, Denmark, Norway and Finland	80	Partner 1 (RIVM)
7&8 March 2005	Presentation	Expert Group On Pesticide Statistics of EUROSTAT	EU	30	Partner 1 (RIVM)
May 2005	Presentation	SETAC Europe	Mainly EU	70	Partner 10 (UFZ)
2 June 2005	Presentation	Students, governmental and industrial persons	EU countries (Italy)	35	Partner 1 (RIVM)

Planned/actual Dates	Type	Type of audience	Countries addressed	Size of audience	Partner responsible /involved
8 June 2005	Presentation	OECD members of Working Group on Pesticides	OECD countries	60	Partner 1 (RIVM)
September 2005	Presentation	SETAC Basel	Mainly EU	35	Partner 10 (UFZ)
29 Nov. 2005	Presentation and discussion	OECD members of the Risk Reduction Steering Group of the OECD	OECD countries	45	Partner 1 (RIVM)
May 2006	Presentations at SETAC meeting; Platform session 5 platform pre-sentations and 5 posters	Researchers and policy makers and industry	EU	150	All partners (see reference list below)
November 2006 Bonn	Presentation	OECD members of the Risk Reduction Steering Group of the OECD	OECD countries	45	Partner 1 (RIVM)
6 November Bonn	Seminar	OECD members of the Risk Reduction Steering Group and the Working Group on Pesticides of the OECD	OECD countries	60	All partners (see HAIR website for presentations and report of meeting)[1]
April 2007 Brussels	Presentation and discussion	Policy makers of the Council of the EU	EU member states	50	Partner 1 (RIVM)
2004 - 2007	Papers & presentations on symposia and congresses	Scientists and policy makers	Mainly EU	40 -300	All (see for detailed references below)
May 2007	Publication of program and end reports on HAIR web site[2]	Anyone who is interested	Mainly EU	?	Partner 1

1 = http://www.rivm.nl/rvs/overige/risbeoor/Modellen/HAIR_pdfs_ppts.jsp

2 = http://www.rivm.nl/rvs/overige/risbeoor/Modellen/Results_of_HAIR_project.jsp

Papers

Ashauer R, Boxall ABA, Brown CD: Modelling combined effects of pulsed exposure to carbaryl and chlorpyrifos on *Gammarus pulex*. (submitted to *Environmental Science and Technology*).

Ashauer R, Boxall ABA, Brown CD: Simulating toxicity of carbaryl to *Gammarus pulex* after sequential pulsed exposure. (submitted to *Environmental Science and Technology*).

Ashauer R, Boxall ABA, Brown CD (2007): New ecotoxicological model to simulate survival of aquatic invertebrates after exposure to fluctuating and sequential pulses of pesticides. *Environmental Science and Technology* 41(4): 1480-1486.

Ashauer R, Boxall ABA, Brown CD (2006): Uptake and elimination of chlorpyrifos and pentachlorophenol into the freshwater amphipod *Gammarus pulex*. *Archives of Environmental Contamination and Toxicology*. 51: 542-548.

Ashauer R, Boxall ABA, Brown CD (2006): Predicting effects on aquatic organisms from fluctuating or pulsed exposure to pesticides. *Environmental Toxicology and Chemistry* 25(7): 1899-1912.

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Fließbach, A., Mäder, P. 2004. Short- and long-term effects on soil microorganisms of two potato pesticide spraying sequences with either glufosinate or dinoseb as defoliants. *Biology and Fertility of Soils* **40**, 268-276.

Pineros-Garcet JD, Linden AMA van der, Tiktak A, Vanclooster M. 2004. Development of a GeoPearl metamodel: NL-metamodel. (Het ontwikkelen van een metamodel voor GeoPearl.) Final report. Université catholique de Louvain. 89 pp.

Schäfer, R. B., Caquet, T., Siimes, K., Mueller, R., Lagadic, L. and Liess, M., 2007. Effects of pesticides on community structure and ecosystem functions in agricultural headwater streams of three biogeographical regions in Europe. Science of the Total Environment, accepted.

Schriever, C. A. and Liess, M., 2007. Mapping European Risk of Runoff. Science of the Total Environment, accepted.

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Tiktak A., J.J.T.I Boesten, A.M.A. Van der Linden and M. Vanclooster, 2006. Mapping the vulnerability of European groundwater to leaching of pesticides with a process based meta-model of EuroPEARL. Journal of Environmental Quality, 35: 1213-1226.

Presentations, Papers and or posters

Ashauer R, Boxall ABA, Brown CD: Sequential pulsed exposure to multiple compounds – the sequence matters: experimental results and their prediction by independent simulations. Platform Presentation. SETAC-Europe Congress May 2007, Porto.

Ashauer R, Boxall ABA, Brown CD: Semi-mechanistic modelling of recovery in aquatic ecotoxicity. Poster Presentation. SETAC-Europe Congress May 2007, Porto.

Ashauer R, Boxall ABA, Brown CD: A new ecotoxicological model to simulate survival of aquatic invertebrates after exposure to fluctuating and sequential pulses of pesticides. Seminar at EAWAG, Dübendorf, Switzerland. 26 January 2007. Mixed scientific audience; 50 in audience.

Ashauer R, Boxall ABA, Brown CD: Die Simulation der Effekte von realistischen Konzentrationsmustern auf aquatische Organismen. Presentation. SETAC-GLB Kongress 2006, Landau. Mixed scientific audience; 150-200 in audience.

Ashauer R, Boxall ABA, Brown CD: Predicting effects on aquatic organisms from realistic exposure to pesticides. Platform Presentation. SETAC-Europe Congress 2006, Den Haag. Mixed scientific audience; 200-250 in audience.

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Sulmon R., M. Vanclooster, P. Janssen, A. Buesen and A. Tiktak, 2006. A meta-model for run-off in the Netherlands. In: N. Laftouhi (ed.). Gestion intégrée des ressources en eau et défi au développement durable (GIRE3D). Marrakech, Morocco, May 2006

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Section 3 - Publishable results

All final reports and the final program have been made available for the public on the HAIR web site. Some of the results have already been published (see reference list above). Further publications are not foreseen within the project, but are up to the members of the consortium. Depending on the research proposals of EUROSTAT and the outcome of their research the HAIR indicators will be used in the EU for measuring the sustainable use of pesticides in the member states.

The coordinator of the HAIR project will participate in the Crop Protection Network (CPN) of the EU project ENDURE to present the HAIR outcome and to create links with the ENDURE project when appropriate.