

**ANNEX I**  
**DESCRIPTION OF THE ACTION**

**1. OVERVIEW**

**1.1. Title**

**A EUROPEAN HEALTH AND ENVIRONMENT INFORMATION SYSTEM FOR RISK ASSESSMENT AND DISEASE MAPPING (EUROHEIS 2)**

**1.2. Priority area and action**

**1. Health Information: Developing mechanisms for reporting and analysis of health issues and producing public health reports.**

The EUROHEIS2 project is aimed at improving analysis, reporting and dissemination of environmental health information, in particular in relation to health hazards potentially associated with local or regional environmental pollutants, using small-area spatial epidemiology and statistical analyses and geographical information systems (GIS) techniques. EUROHEIS2 is ideally suited to assist in the implementation of the European Environment and Health Action Plan and will be able to create synergies with the Environment and Health Working Party of the Public Health Programme and the European Environment Agency;

The EUROHEIS2 project is also well placed to the area:

**2. Responding to health threats rapidly and in a co-ordinated manner**

The EUROHEIS2 project uses innovative IT tools for health threat analysis (the Rapid Inquiry Facility (RIF)), which incorporates advanced GIS techniques and spatio-temporal analysis of routinely collected health and environment data. The RIF is able to produce long-term risk assessment in relation to specified environmental pollutants within a short period of time.

**1.3. Summary (objectives, methods, expected results)**

The project will further develop the health and environment information system (the Rapid Inquiry Facility (RIF)) initiated in the previously funded EUROHEIS project and further developed within the US CDC Environmental Public Health Tracking Program. The system will be made available to additional EU countries. The project will focus on tools and mechanisms for rapid assessment of environmental health risks and on geographical disease patterns related to the environment and socio-economic factors, taking into account the diversity of EU member states, thus contributing to the aims of the EU Environmental Health Action Plans. A network of environmental health experts will be created to exchange experiences. Network members will meet bi-annually to

discuss development of methods, which will be implemented in the RIF by the UK partner. A web-based support tool (web-forum) will be set up to facilitate implementation. The results will be widely disseminated, including an end-of-project conference.

## **2. OBJECTIVES**

### **2.1. General objectives**

The general objectives of this proposal are to utilise the wide range of environmental health expertise in eight EU countries to develop further methods for integrating and analysing information on environmental exposure and human health. This will be achieved by methodological development proposed in several workshops in partner countries, each with a different focus as outlined in the Work Package descriptions. Relevant methods will be implemented in the RIF software.

The UK Small Area Health Statistics Unit (SAHSU) was established in 1987 to assess environmental health risks using routine health statistics. The Rapid Inquiry Facility (RIF) was created by SAHSU to be used for quick assessment of environmental health risks associated with point sources of exposure (e.g. industrial installations) using routinely collected data on morbidity, mortality and population at a small-area scale. During the previous EUROHEIS project (2000-2003), the RIF was modified and implemented in several EU countries. The project website ([www.euroheis.org](http://www.euroheis.org)) includes the full project report. Papers from the end of project conference was published in the leading environmental health journal Environmental Health Perspectives as a mini-monograph (can be downloaded from the EUROHEIS website). The US Centers for Disease Control and Prevention (CDC) subsequently (2004-6) funded further development of the RIF within their Environmental Public Health Tracking Program ([www.cdc.gov/nceh/tracking/sahsu.htm](http://www.cdc.gov/nceh/tracking/sahsu.htm)).

The strategic objectives relate to the EU Environmental Health Strategy (EHS), and Environmental Health Action Plan (EHAP), which specified the need to link data on environmental pollutants to health data and the need to follow-up intervention actions. The EUROHEIS RIF is designed to link environmental data to routinely collected health data, and will provide possibilities to map geographical disease patterns over time, thus enabling follow-up of changes in disease rates due to preventive actions. The RIF methodology used is particularly well suited to assess health threats to children (short latency times between exposure and disease and less influence of migration).

There are geographical discrepancies of environmental health problems in Europe, and the EUROHEIS project focuses on these differences by implementing the RIF in a variety of EU countries, including new member states, also taking into account socio-economic aspects of environmental health.

Another strategic objective in line with the EHS and EHAP is to use the RIF to facilitate integrated analysis of environment and health data over time. The value added at European level is to generate synergies and developing methods in order to increase the understanding of the environment and health relationship. The EUROHEIS approach is well suited to work with other EU initiatives (e.g. GMES and INSPIRE). Finally,

EUROHEIS methodology can be used to map environmental health indicators using RIF methods.

The RIF functionality provides an important tool for risk assessment and risk communication. The opportunity exists, therefore, to link RIF into the assessment toolbox being planned for development as part of the EU-funded INTARESE (Integrated Assessment of Health Risks of Environmental Stressors in Europe) project, and to use it in a number of the policy assessments that will be done as part of that project (notably, of health effects associated with transport, housing, water, waste, agricultural land use and climate). Similar opportunities exist to develop and apply RIF as a basis for analysing health effects of policy scenarios within the HEIMTSA project.

#### 2.1.1. *Synergies between EUROHEIS2 and other European projects*

There are a number of current, related European projects, funded through FP6 or elsewhere, which complement EUROHEIS2 aims. Prof David Briggs & Dr Clive Sabel, Imperial College London, are members of a high level inter-project network, named the 5 project consortium, which specifically was set up to share knowledge and experience amongst the projects. These five projects nicely complement EUROHEIS2 in the area of environmental health risk assessment as detailed below.

The five projects are: INTARESE, NoMiracle, HEIMTSA, 2FUN, ENVIRISK-HENVINET. They are all funded by DG Research under FP6.

- INTARESE (Integrated exposure assessment for multiple environmental stressors) is coordinated by Imperial College London. There are 33 partner institutions from 14 countries, consisting of universities, national ministries/government agencies, and industry. There are 7 sub-projects, and 24 work packages. The INTARESE project is intended to help meet the needs for better information on health risks. Specifically, it aims to deliver a coherent and well-validated methodology for integrated assessment of health risks from environmental stressors, in support of EU policy;
- NOMIRACLE (Novel Methods for Integrated Risk Assessment of Cumulative Stressors in Europe) is coordinated by NERI, Denmark. The project aims include developing new methods for assessing the cumulative risks from combined exposures to several stressors including mixtures of chemical and physical/biological agents. It is thus similar to INTARESE, but concentrates on chemical exposures;
- HEIMTSA (Health And Environment Integrated Methodology and Toolbox for Scenario Assessment) broadly aims to quantify as fully as practicable the environmental health effects of policies in various sectors. It is coordinated by the Institute of Occupational Medicine, Edinburgh;
- 2FUN (Full-chain and UNcertainty approaches for assessing health risks in FUture eNvironmental scenarios) is coordinated by INERIS, France.

Specific projects aims are selection and construction of scenarios, mechanistic models for indirect exposure, mechanistic models for internal exposure and pathology endpoints and uncertainty in each tool;

- ENVIRISK (Assessing the risks of environmental stressors: contribution to development of integrating methodology) and HENVINET (Health and Environment network) are both coordinated by NILU, Norway. ENVIRISK aims to identify and assess available monitoring data, and then develop protocols for exposure assessment and for assessment of exposure-effect relationships. HENVINET aims to extract and summarise current scientific basis regarding the links between health and environment and best practices.

To summarise, there are a number of ongoing European projects which are aiming to better understand and quantify the relationship between environmental exposures and impacts on health, also considering policy implications. In EUROHEIS2, we are aiming to incorporate any relevant output from these projects into the RIF whenever feasible.

## **2.2. Specific objectives**

The specific objectives can be grouped into six categories:

### *2.2.1. Preparatory methodological discussions*

- To arrange workshops in partner countries to discuss methodology and suggest enhancements to the RIF within the EUROHEIS framework; comprehensive workshop reports will be provided;

### *2.2.2. Technical and statistical qualities of the RIF*

- To enhance the RIF user interface further to make it more user friendly and readily transferable to other EU countries;
- Enhance the import and export functions within the RIF. These should include additional ability to export selected data from the RIF. Import and export of a range of commonly used EU data types and sources will be ensured, including country specific denominator data and a range of local geographies;
- This work will extend compatibility with other approaches and methods;
- To enhance RIF input/output to incorporate any known exposure data, as well as data on potential confounders, such as smoking, obesity and life style factors, from other databases (e.g. modelled air pollution and noise levels, Local Authority housing survey data, life style survey data; country specific indices of SES);
- Include spatio-temporal methods for disease mapping in RIF;
- To add measures of uncertainty to disease mapping, and visualise this uncertainty in the maps;

2.2.3. *User interface and test cases in new countries*

- To incorporate the capability to include EU country specific indices of socio-economic status (SES) to enable the user to choose from a selection of indices to standardise for in analyses of environmental health risks;
- To use data on SES and environmental pollution to allow users to assess inequalities in health as well as environmental equity;
- Test the user interface and the expanded RIF software;
- To set up a web-based support tool (web-forum) assisting member countries in implementing and operating the system;

2.2.4. *Dissemination*

- To disseminate the RIF software as freeware via the internet;
- To supply training courses and material to interested EU countries;
- To organise an end of project conference showing the advances made during the project and summarise the overall project strategic developments;
- To identify dissemination mechanisms for reaching target audiences

2.2.5. *Involvement of policy makers*

- To interact with stakeholders at relevant workshops, ensuring the policy relevance of project work
- To raise awareness of the policy implications of the issues and trade-offs surrounding data governance, data protection, privacy and data quality issues;
- Raise awareness of accurate (health) data collection, across the EU as an input to RIF type analyses;

2.2.6. *Good practise recommendations and future work*

- To recommend data quality indicators to aid interpretation of the results;
- To identify issues in integrating the RIF into existing spatial data infrastructures, such as SMASH and the Health Atlas;

### **2.3. Indicators chosen**

The verifiable and quantifiable indicators are shown below:

We will deliver the RIF software as freeware, to be distributed to partners and other EU countries, initially for implementation in new partner countries. A beta-test version will

be delivered already at the end of year one and a web-based support tool (web-forum) assisting member countries in implementing and operating the system will be set up at the same time. Continuous improvement and enhancement to the RIF functionality will contribute to further releases of the software throughout the duration of the project

Training material will be provided at the time of the launch. Guidelines for interpretation of the results will be published at the same time. All documentation will undergo continuous improvement throughout the project period with a final release at the end of year three.

Health Impact Assessment tools will be developed within EUROHEIS and a report of how EUROHEIS may be used to assess inequalities in health as well as environmental equity will be produced as part of the final report.

The collaboration with CDC will further enhance the visibility of the project results.

We intend to use the following verifiable indicators to monitor the progress of the project:

#### Process indicators

- Workshop reports including details on the work process;
- Progress on implementation in new countries/regions will be continuously monitored via the EUROHEIS website ([www.euroheis.org](http://www.euroheis.org));
- Project progress will be reported annually in technical and financial interim reports;

#### Output indicators

- Releases of the software produced within the EUROHEIS project will be made available via the project web-site; initial release in year one and subsequent releases in years two and three;
- Training course will be announced, and the training material available via the project web-site from the end of year one onwards;
- The web-based support tool (web-forum) will be launched year one and will be accessible via a private area on the website, for use by partners to aid implementation;

#### Outcome indicators

- Increased knowledge in assessing environmental health risks, demonstrated by:
  - The project output will be continuously shared with other European bodies, such as the European Environment Agency (EEA) through workshop reports;

- The end-of-project conference will be arranged in the final (third) year of the project period;
- A final comprehensive technical and financial report will be published at the end of year three, including an evaluation by independent assessors.

#### **2.4. Rationale and relative merits of the project**

There is increasing awareness that combined exposures to environmental contaminants may cause ill health also at low levels of exposure. There is therefore a need for efficient surveillance systems, to map exposures as well as disease, in order to be able to detect changes in disease rates and risks at an early stage.

The EUROHEIS project is designed to improve information on environmental health risks, and may also be used to improve knowledge within other sectors of public health (e.g. inequalities in health). In particular, the Rapid Inquiry Facility (RIF) offers a capability of responding rapidly to environmental health threats. Furthermore, the EUROHEIS project aims to prevent disease related to environmental pollution through addressing determinants of pollution related diseases. EUROHEIS will explore the integration with existing or planned Environmental Impact Assessment tools, being directly relevant for the European Environmental Health Strategy.

Environmental Health Information Systems (EHIS or ENHIS) have been discussed for several years. In order to track and compare the environment and health situation as well as related actions across the European Region a set of indicators has been developed and tested. Data have been collected for several EU countries and results are available through the web. Currently, the EU Public Health Executive Agency (PHEA) and WHO are co-funding further development of a European system (ENHIS 2).

ENHIS is focused on collecting and analysing information at regional and national level. Identifying emerging issues by combining environment and health data is not one of the tasks of ENHIS. The implementation plan being prepared as a follow up of the EU EHAP states that before an Environment Public Health Tracking Programme could be implemented in the EU a bottom/-up approach is needed, starting with integration of data at local level and exchanging the experiences of pilot projects at local level before deciding about expansion. Thus, the EUROHEIS approach could form part of a European ENHIS (whether coordinated by WHO or other organisations). EC co-funding is necessary to allow arranging of workshops in partner countries, to be able to enhance the existing RIF and tailor the system to meet the specific requirements in a variety of European countries.

The current project will provide essential and efficient tools to rapidly respond to environmental health threats, in particular related to the impact of low level exposure on chronic diseases, such as cancer, heart disease, diabetes, and asthma. This will, for example, allow public health officers to quickly assess health risks potentially associated with a source of exposure, so that public concerns can be addressed in a timely manner.

In addition the project team will examine three other EHIS in partner countries – SMASH used in Finland, the Health Atlas used in the Republic of Ireland and the systems currently used in the Netherlands. This will greatly enhance our understanding of the issues involved in implementing RIF and/or RIF like functionality in other systems.

A large number of chemicals are used on a regular basis in modern society, and many new compounds with potential toxic properties are added annually. Rapid assessment of the health risks associated with the use of these chemicals and other environmental stressors (e.g noise) is therefore essential. Exposures to chemicals (and physical agents) are typically unevenly distributed geographically as well as temporally (Jarup 2004).

Disease occurrence also shows geographically varying patterns. Geographic Information Systems (GIS) may be used to produce maps of exposure and/or disease to reveal spatial patterns and to explore changes in disease patterns potentially associated with changes in environmental exposures. Spatial variations in risk and exposure related trends may be studied using software tools such as the RIF for an initial quick evaluation of any potential health hazards (Jarup 2004).

Small-area health risk analyses are essential for evaluation of differences in environmental health between geographical areas. Advances in GIS, statistical methodology, and availability of high-resolution, geographically referenced health and environmental quality data have created new opportunities to investigate environmental and other factors in explaining local geographic variations in disease (Elliott and Wartenberg 2004).

However, a large random component may predominate disease rates across small areas. Though this can be dealt with appropriately using Bayesian statistics to provide smooth estimates of disease risks, sensitivity to detect areas at high risk is limited when expected numbers of cases are small. A detailed understanding of potential biases and confounding and data quality is important. Disease cluster reports often arise non-systematically because of media interest and/or public concern. Current developments in exposure modelling and mapping, including new methods of surveillance of large health databases, promise to improve our ability to understand the complex relationships of environment to health (Elliott and Wartenberg 2004).

The current proposal aims to enhance the RIF and make it available throughout the EU. Refined exposure assessment methods will be available for input to the RIF and RIF results will be able to be used for further statistical analyses (using e.g WINBUGS, SaTScan). Implementation of RIF methods in several EU countries will facilitate the development of a pan-European Environmental Health Risk Assessment System.

In May 2006, the second Spatial Epidemiology Conference was arranged by SAHSU and CDC in London, as a follow-up of the EUROHEIS conference in Sweden in 2003. The conference was very successful, attracting 150 participants from 25 countries all over the world.

The current state-of-the art in the area of small area variations in environmental health will be highlighted at the end-of project conference – the third Spatial Epidemiology Conference in May 2010.

*References:*

Elliott P, Wartenberg D. Spatial Epidemiology: Current Approaches and Future Challenges. *Environ Health Perspect* 2004;112:998-1006.

Jarup L. Health And Environment Information Systems for Exposure and Disease Mapping, and Risk Assessment. *Environ Health Perspect* 2004;112:995-7.

### 3. EXPECTED RESULTS

#### 3.1. Outcome

The results related to the specific objectives and the relevant dissemination activities are:

- The project will be disseminated throughout the project period, using the already existing EUROHEIS web-site ([www.euroheis.org](http://www.euroheis.org)); this will include comprehensive workshop reports;
- Continuous updates of the RIF freeware will be announced on the website
- Case studies on environmental health risks will be reported in the workshops and reported in the peer-reviewed literature as well as on the website
- Case studies on inequalities in health as well as environmental equity will be reported in the peer-reviewed literature as well as on the project website;
- A set of data quality indicators will be suggested and published;
- The RIF software will be disseminated as freeware via the Internet, to be distributed to partners and other EU countries; further software development will continue throughout the project;
- Report on the feasibility of either embedding RIF itself, or some of the RIF functionality in existing spatial data systems (e.g. SMASH and the Irish Health Atlas);
- Training courses and material will be delivered to interested EU countries; in particular for the implementation of the RIF in EUROHEIS partner countries (Hungary, the Netherlands, Poland);
- Set up a web-based support tool (web-forum) assisting member countries in implementing and operating the system;
- Guidelines for interpretation of the results will be prepared where applicable;
- A dedicated end-of-project conference (the third EUROHEIS conference in Spatial Epidemiology 2010) will show the advances made during the project and summarise the overall project strategic developments; results will also be presented at the international ISEE conferences, in particular at the ISEE 2009 conference in Dublin, hosted by one of the EUROHEIS2 partners;
- Written reports will be produced in accordance with the contract with the Commission. It is anticipated that several papers will be submitted to peer-reviewed journals during the project period;
- A report of how EUROHEIS may be used to assess inequalities in health as well as environmental equity will be included the final report;
- The ongoing collaboration with the United States Centers for Disease Control and Prevention (CDC) will make it possible to further test EUROHEIS methods on US data. Further dissemination of the EUROHEIS results will also be made within the US in collaboration with CDC;
- The project will facilitate collaboration between the US and the EU in the development of Environmental Public Health Tracking Networks;
- Information will mainly be directed to the scientific community and health authorities/professionals, but lay information will also be included also by adding short briefings to the website and inviting NGOs to some of the workshops;

- Further dissemination will be arranged in collaboration with other European bodies (EEA, GMES) and the WHO. These bodies will be invited to some of the workshops and final conference.

### 3.2. Deliverables

<i>Deliverable No</i>	<i>Deliverable title</i>	<i>Delivery date</i>	<i>Nature</i>	<i>Confidentiality level</i>	<i>Dissemination</i>
D1	Kick-off meeting report	M3	Report	Public	Report on project design and time-tables
D2	Work-shop report (WP9)	M11	Report	Public	Report on work-shop recommendations
D3	First Technical and Financial interim report	M12 + 2	Report	PHEA	Report on project progress
D4	Launching of RIF freeware	M14	Demonstrator/Prototype	Public	Beta-testing of software
D5	Web-based support tool (web-forum) set-up	M14	Other	Limited to the scientific community	Support RIF implementation
D6	Work-shop report (WP8)	M17	Report	Public	Report on work-shop recommendations
D10	Work-shop report (WP5)	M20	Report	Public	Report on work-shop recommendations
D8	Work-shop report (WP6)	M24	Report	Public	Report on work-shop recommendations
D11	Second Technical and Financial interim report	M24 + 2	Report	PHEA	Report on project progress
D9	Work-shop report (WP7)	M27	Report	Public	Report on work-shop recommendations
D7	Work-shop report (WP10)	M33	Report	Public	Report on work-shop recommendations
D12	End of project conference	M35	Conference	Public	Main dissemination event to communicate project results to a wider audience
D13	Technical and Financial final report	M36 + 2	Report	PHEA	Final project report on findings and recommendations
D14	Evaluation report	M36 + 2	Report	PHEA	Critical appraisal of project

#### **4. METHODOLOGY**

Building on the experience from the previous EUROHEIS project (2000-3), and the current collaboration with the US CDC, we propose to amend the Rapid Inquiry Facility (RIF) user interface to make it easy to install in other EU and candidate countries. We will arrange biannual workshops to discuss and develop methodology for implementation of the RIF. Each workshop will be led by one of the partners, reflecting the specific expertise in the partner organisation. Dissemination strategies will be discussed at the workshops to ensure that the project results are distributed to all EU countries. We will investigate a comparison of the functionality of the RIF and some related systems, and explore the feasibility of integrating RIF into these systems.

To aid implementation in new EU countries, we will design a web-base technical support tool (web-forum) assisting member countries in the implementation and initial operation of the system; we will supply training material and courses to partner countries, in order to facilitate implementation and operation of the system, and we will assist partners in understanding the analysis and interpretation of the results.

The original EUROHEIS RIF was designed primarily to assess disease risk related to point sources of environmental pollution. Subsequent enhancements within the current SAHSU CDC collaborative project have made it possible to incorporate exposure modelling data in the RIF. It is currently possible to include one potential confounder (usually an index of SES); we will enhance the possibilities of including data on several potential confounders, such as further SES variables, smoking, obesity and life style factors, which may be used to assess inequalities in health as well as environmental equity.

We will disseminate project findings widely within the European Community and world wide, using the Internet (the RIF will be made available as freeware), written reports and papers in peer-reviewed journals. We will also organise a dedicated end-of-project conference (the third Spatial Epidemiology conference in 2010) aimed at participants from both the research and practitioner communities.

##### **4.1. Methods used, references, significances**

Building on the experience from the previous EUROHEIS project, and in the ongoing collaborative project with the US CDC, we propose to use the following methodology, described in the tasks below, in the next phase (EUROHEIS2):

1. We will modify the Rapid Inquiry Facility (RIF) user interface to make it easy to implement in other EU and candidate countries, and we will enhance the RIF further to be able to respond more flexibly to increasingly complex requests; relating to point and area sources of environmental pollution, and small-area disease-mapping, including methodological development to facilitate interpretation of small area health and environment data analysis;
2. In the initial EUROHEIS project, the previous version of the RIF was implemented in Spain, Sweden, Finland and the Netherlands. In addition, we will implement the enhanced RIF system in new partner countries (Hungary and Poland). It is also likely that the enhanced RIF will be implemented in several

other collaborating countries (US, Italy, Switzerland and Slovenia; see Collaborating partners p.38). To aid implementation we will set up a web-based support tool (web-forum) assisting member countries in implementing and operating the system;

3. We will evaluate national environment and/or health information systems – SMASH and the Health Atlas, and see how they can be linked with RIF or RIF functionality;
4. We will develop and supply training material and courses to partner countries, in order to facilitate implementation and operation of the system, and to assist partners in understanding the analysis and interpretation of the results. The training package will include a general module of environmental health risk assessment, to put the EUROHEIS analysis into a broader context;
5. We will develop guidelines for interpretation of the results. This will include the possibility of incorporating data quality indicators;
6. We will make it possible to incorporate exposure modelling data, as well as data on potential confounders, such as SES, smoking, obesity and life style factors. Such data may be derived from other databases (e.g. modelled air pollution and noise levels, Local Authority housing survey data, Life style survey data), and will be used to assess inequalities in health as well as environmental equity;
7. We will disseminate widely within the European Community and world wide, using EUROHEIS website ([www.euroheis.org](http://www.euroheis.org)), written reports and papers in peer-reviewed journals. We will also present results from the project at international conferences, in particular the ISEE (International Society for Environmental Epidemiology) and we will organise a dedicated end-of –project conference (the third Spatial Epidemiology conference in 2010), aimed at participants from both the research and practitioner communities.
8. We will continue to collaborate with the United States Centers for Disease Control and Prevention (CDC), who are funding the current ongoing RIF development.
9. We will arrange a series of workshops to discuss and develop the methods used in the RIF and a wider EUROHEIS context, as described in detail in the work packages. For some of the workshops representatives of international organisations (EEA, WHO, Eurostat, DG-E and S, JRC) will be invited.

The methods described above details how EUROHEIS2 will add value to the previous EUROHEIS work. Innovations in methods related to the RIF will allow policy makers to make more informed decisions based on refined environmental health risk assessment

#### **4.2. Analysis of the risks and contingency planning**

The main obstacles for further implementation are related to availability of data. In particular, geographical data needed for small-area analyses can be expensive, which can be remedied by negotiations within partner countries. Alternatively, aggregated data may be used. Although the latter may not permit optimal use of the system, valid and valuable output may still be produced. Mechanisms should be implemented at a European level to ensure free use of publicly financed data in systems like EUROHEIS.

The EU Environmental Health Strategy (EHS) notes that “Gaining *access* to health data is a particular problem. The necessary information on morbidity and mortality is not always accessible, for instance for reasons of confidentiality.” We note that data protection issues are indeed an increasing problem in many EU countries (see also Ethics section below). These issues need to be approached at an EU level; the EUROHEIS partners have substantial expertise and experience in this field and would be happy to collaborate with other initiatives to ensure that accurate and reliable data on health and environment can be used in this and similar projects.

The EHS further notes “Another problem is that in some important areas there is no standardised medical nomenclature. Apart from data availability and accessibility problems, there are often problems with the *comparability* of information because of data being scattered in time, inappropriate geographic or temporal resolution, application of different standards, etc...”. Again EUROHEIS partners have considerable expertise in this area, and we would be happy to share our expertise with other relevant EU projects. It should be noted that comparability problems also exist in environmental datasets, most likely to an even higher degree than for health data.

#### 4.2.1. *Ethics*

Not applicable to the project as such, but the project may raise awareness of increasing difficulties in performing Environmental Health investigations in many EU countries, due to Ethical and Data Protection concerns. We will consider making recommendations in this area to facilitate future work. In particular, we will formulate recommendations to ease the high resolution health data availability for the RIF. In many countries record linkage is not possible due to Laws of Privacy. This is a major obstacle in many EU countries prohibiting or limiting data analyses at a small area level.

### 4.3. Work package overview

<i>Work-package (WP) No</i>	<i>Work package title</i>	<i>Lead partner</i>	<i>Number of person days</i>	<i>Global cost (€)</i>	<i>Starting date</i>	<i>Ending date</i>	<i>Deliverable No</i>
WP 1	Coordination of the project	UK	44	17958	M1	M36	D1,D3, D11, D13
WP 2	Dissemination of the results	UK	137	50236	M3	M36	D4, D12
WP 3	Evaluation of the project	UK	64	23101	M30	M36	D14
WP 4	Adaptation and enhancements of the current RIF to EU conditions	UK	714	275883	M1	M36	D4, D5
WP 5	Evaluation of RIF for integrated assessment of environment and health risks	The Netherlands	226	83754	M15	M20	D10
WP 6	Spatio-temporal methods for disease mapping	Spain	132	52750	M17	M24	D8
WP 7	Exposure databases and GIS methods	Sweden	180	68663	M20	M27	D9
WP 8	Health and Environment Information System in Poland in the context of the RIF application	Poland	224	83309	M10	M17	D6
WP 9	Health and Environment Information System in Hungary	Hungary	406	95601	M4	M11	D2
WP 10	Integration of RIF into Existing Spatial Data Infrastructures	Finland	237	86268	M28	M33	D7



**5. WORK PACKAGES DESCRIPTION**

**5.1. Work package n° 1: Coordination of the project**

*5.1.1. List of partners involved*

Imperial College London, UK

*5.1.2. Description of the work*

A kick-off meeting will be arranged to organise the project work in detail; a technical report will result from the meeting, describing how project work will be performed. Partner workshops will be discussed and priorities will be set to facilitate the coordinated use of workshop output, in particular making sure the most important and EU relevant methods are being implemented in the RIF (when feasible). The enhancement of the RIF will be closely supervised and monitored and reported regularly to partners and the EC. The final RIF software will be disseminated as freeware via the Internet in collaboration with the US CDC. It is anticipated that the close collaboration with CDC will further aid the dissemination activities. In conjunction with new releases of the RIF software, appropriate training course will be arranged to facilitate the implementation of the RIF in new EU countries; this activity will be closely supervised by the Coordinator, who will also set up a web-based technical support tool (web-forum) to further assist in the implementation. Finally the Coordinator will organise an end of project conference (the third EUROHEIS conference in Spatial Epidemiology).

*5.1.3. Milestones*

<i>Date</i>	<i>Milestone</i>
M1	Kick-off meeting
M14	RIF freeware (first release)
M14	Web-based support tool (web-forum)
M35	End-of-project conference

*5.1.4. Deliverables*

A kick-off meeting report (D1) will be produced after the initial meeting in the first month of the project to plan the detailed activities within the project. Technical and financial interim reports (D3, D11) will be delivered at the end of the first and second years, highlighting project progress and preliminary findings. A comprehensive technical and financial final report (D13) will be delivered to partners and the EC, including project findings and recommendations. Clearly these deliverables link to all other work packages, forming the basis for the project work. The delivery of the RIF as freeware (D4) links primarily to WP4 and is one of the major overall outcomes of the project. A web-based Technical Support Tool (web-forum) (D5) will be set up, which links to WP4

and partner workshops, in particular to the implementation in new partner countries (WP8 and WP9). The end of project conference (D12) links to all other WPs.

## **5.2. Work package n° 2: Dissemination of the results**

### *5.2.1. Overall strategy and methods*

The project will be widely disseminated throughout the project duration. All meetings and workshops will be comprehensively reported and disseminated via the project website ([www.euroheis.org](http://www.euroheis.org)).

### *5.2.2. Objectives*

Dissemination activities will include:

- Reporting workshop results on the project website;
- Publishing a paper on data quality issues essential for interpretation of results from spatial epidemiology;
- Publishing a paper on measures of uncertainty to disease mapping;
- Launching the RIF software as freeware via the Internet;
- Organisation of an end of project conference.

### *5.2.3. Description of the dissemination work*

We will aim to publish papers in peer-reviewed journals reflecting the outcomes of each workshop held in partner countries, whenever feasible. In particular, it is clear that a major issue in designing and implementing a health and environment information system is the availability of good quality data. The availability of such data in the EU will be reviewed and published; recommendations will be given to the EC on relevant steps to be taken in order to secure and improve the availability of good, comparable data in all EU countries.

Currently, maps of disease risk are frequently published with no indication of the underlying uncertainty in the risk estimates. We will explore methods to overcome this major problem and recommend a best practice for mapping of environmentally related health outcomes.

The launch of the RIF as freeware will be a major task, which will be carried out in several steps, starting with a beta-test version, followed by updated versions throughout the project period. We will ensure that adequate training and support are available during the duration of the project.

The end of project conference is the major dissemination activity and will follow a similar structure as the EUROHEIS conference in 2003 and the follow-up conference in Spatial Epidemiology in 2006 ([www.spatepiconf.org](http://www.spatepiconf.org)).

*5.2.4. Milestones and deliverables*

Comprehensive reports from all WPs (see respective WP) will be delivered to partners and the EC. Clearly these deliverables links to other work packages. The delivery of the RIF as freeware (D4) links primarily to WP1 and WP4 and is one of the major overall outcomes of the project. The end of project conference (D12) links to all other WPs. The conference will disseminate the results of all activities in the work packages and will also be a forum for further discussion with partners, the EC and other professional and lay organisations. We will also endeavour to present findings at meetings of the EU Working Party on Environment and Health.

*5.2.5. List of stakeholders*

***EU wide:***

- European Commission
  - Working Party on Environment and Health
- European Environment Agency
- WHO
- NGOs (e.g. European Public Health Alliance, Women in Europe for a Common Future)

***Partner countries***

- National and regional public health organisations
- Environmental Protection Agencies

### **5.3. Work package n° 3: Evaluation of the project**

#### *5.3.1. List of parties involved*

All partners as well as external evaluators (proposed by the EUROHEIS2 coordinator, to be approved and appointed by the PHEA and selected stakeholders)

#### *5.3.2. Description of the work and methodologies*

The project work will be assessed in several different ways. Firstly, workshop reports will be reviewed by partners and the EC, and relevant results submitted for publication in peer-reviewed journals, which will permit further evaluation of the reports.

Secondly, the usefulness of the RIF will be assessed by interviewing users and by applying the RIF methods to case studies in partner countries. Assessment of the performance of the RIF compared to other EHIS is a key outcome of this work package. The quality of the technical support will again be assessed by interviewing users and by its ability to solve upcoming problems related to RIF implementation in partner countries.

We will aim to publish proceedings from the end of project conference in a peer-reviewed journal, further adding to total project evaluation. Finally, we will submit the end of project technical and financial report to two external assessors, to be appointed in collaboration with the EC, to get an objective assessment of the project, in a similar fashion as for the previous EUROHEIS project.

An essential part of the evaluation is the monitoring of project progress via the chosen indicators (see section 2.3).

The main deliverable will be the assessors' report (D14) after the end of the project. This report obviously links to all work packages in the project.

#### **5.4. Work package n° 4: Adaptation and enhancements of the current RIF to EU conditions**

##### *5.4.1. List of partners involved*

All (Imperial College London, UK, lead partner)

##### *5.4.2. Objectives*

The RIF development work will:

- enhance the user interface;
- enhance the import and export functions;
- enhance output to incorporate any known exposure data, and data on potential confounders;
- incorporate the capability to include EU country specific indices of SES;
- include measures of uncertainty to disease mapping, and visualise this uncertainty in the maps.

##### *5.4.3. Description of the work*

This work will be based on the work carried out within SAHSU where the RIF was initially designed and programmed. The work will benefit from further development within the previous EUROHEIS project (2000-2003) and from current enhancement being done to adapt the RIF to US conditions in collaboration with the US CDC, for their Environmental Public Health Tracking Program.

We will enhance the user interface to be as user friendly as possible, taking into account different needs in EU countries, in particular in Hungary and Poland, who intend to implement the RIF in their countries as a major part of the EUROHEIS2 project.

There is a need to incorporate methods to make use of different sources of exposure data and data on confounders (such as SES, smoking and other life-style data), which are often in different formats and different geographic resolutions. Methods will be developed to handle such issues as efficiently as possible.

The previous EUROHEIS project explored various measures of SES in partner countries. Building on this work, we will now make it possible to include not only one, but several different SES measures in the RIF to take socio-economic confounding more fully into account when analysing environmental health risks.

Finally, we will use existing GIS tools and the consortium expertise in spatial statistics to incorporate and visualise uncertainties in risk estimates produced by the RIF and shown in disease maps.

##### *5.4.4. Deliverables and links with other work packages*

The main deliverable of this major work package is the RIF software (D4) to be launched in the first year of the project with further releases throughout the project period as new features are incorporated as a result of discussions and recommendations in the workshop

reports. The web-based support-tool is the second major deliverable, which is linked to the RIF launch (D5). These deliverables obviously link to all other work packages.

## **5.5. Work package n° 5: Evaluation of RIF for integrated assessment of environment and health risks**

### *5.5.1. List of partners involved*

All (RIVM, The Netherlands, lead partner)

### *5.5.2. Objectives*

The aims are to evaluate RIF methods and identify issues regarding the integration of RIF functionalities in the Dutch environment and health information system (IMEG). IMEG is being expanded with a web based data-exchange platform, which should enable the exchange, comparison and analysis of national, regional and local environment and health data, and for which RIF may be a useful addition.

### *5.5.3. Description of the work*

#### **Step 1: Review use and integration of RIF in Dutch system**

In the framework of the Dutch Action programme on Environment and Health there is a need for the development of tools and methods to facilitate the assessment of local, regional and national environment-related health risks, whilst using routine monitoring data if possible. To achieve this, an improved access to the distributed information sources and enhanced linkage and analysis of environmental, socio-demographic and health data is crucial. End 2006, the results will become available of a pilot on the development of a web-based data-exchange and analysis platform taking into account experiences with the Dutch Health Atlas, Public Health Monitor and the Dutch INSPIRE projects. In this pilot study, the same issues will be evaluated as presented in WP10. Thus, the outcome of this pilot, including user experiences and technological descriptions, will be discussed with WP10.

#### **Step 2: Organise workshop to exchange experiences and findings**

A workshop will be organised with the purpose to evaluate data linkage and spatial analysis methods within the RIF, in the light of the assessment and information dissemination needs in the NL. Invitees of the workshop will be: experts participating in relevant Dutch pilot projects (eg. INSPIRE, Data-exchange platform), the Dutch Scientific Committee on identifying Emerging Risks, participants in the EUROHEIS project and some international experts on spatial analysis and environmental health tracking. The total numbers of participants will be 20 – 25. The results of Dutch pilot projects of which some are expected to use RIF and others other spatial analysis tools, will be presented. A major point for discussion will be the evaluation of the embedding of RIF or similar tools in the Dutch Environment and Health Information system, taking into account user needs and the findings of other working packages, especially WP 10.

Outcomes of the workshop will be:

- Suggestions for enhancement of RIF methodology (exposure assessment, use of SES indicators)

- Suggestions for improved integration of RIF-functionalities in existing systems, taking stock of findings in the Dutch pilot projects.

5.5.4. *Deliverables and links with other work packages*

Deliverable: Report of the workshop (D10).

*Links with other working packages:* WP2 and 3: For dissemination and evaluation of our work in relation to results of other work packages. Results of WP4, 6 and 7 will be used in Dutch pilot-project(s) as soon as they are available and will form the basis for the discussion at the WP5 workshop. Experiences gained in WP 8 and 9 will be fed into the Dutch testing and piloting process. Work of WP10 is an important basis for the review of the limitations and possibilities for using RIF in the Dutch Environmental Health Information System, taking into account its user needs.

## **5.6. Work package n° 6: Spatio-temporal methods for disease mapping**

### *5.6.1. List of partners involved*

All (University of Valencia, Spain lead partner)

### *5.6.2. Objectives*

Disease risks are variable in space and time, and supporting risk management should ideally incorporate spatio-temporal analysis tools. New methods provide spatio-temporal monitoring of environmental hazards and the potential effects on health. This work package will study and discuss different spatio-temporal disease mapping methods to be included in RIF.

### *5.6.3. Description of the work*

There is an increasing interest in spatio-temporal monitoring of disease and environmental health threats. The growing awareness of environmental issues has emphasised the need for rich, timely and flexible information systems capable of supporting decision making based on analysis of and reasoning on spatio-temporal data. A temporal GIS aims to process, manage, and analyse spatio-temporal data.

Statistical techniques for disease mapping have become very popular in public health analysis. These methods enable to smooth ecological health indicators accounting for the geographical structure of the units under study. As a consequence, more reliable risk estimates in less populated areas are obtained due to the sharing of information between neighbouring regions, which are intended to share common risk factors. This way it becomes possible to display the geographical distribution of risk even in small areas.

Currently, several spatio-temporal disease mapping techniques have been proposed recently. However, the implementation of these methods is not always easy or adequate for a quick response tool. A special effort is necessary to elucidate which methods are appropriate to be included in RIF. Focus of this work package is to evaluate these methods, to promote the scientific discussion about their properties and to recommend the inclusion of the most valuable spatio-temporal techniques in the health and environment information systems.

The work package plan involves the preparation of a working report explaining the main properties of different spatio-temporal methods for disease mapping, the organisation of a workshop on this issue and the writing of a final report with conclusions and recommendations.

During the first year, an extensive report will be prepared collecting all available spatio-temporal methods for disease mapping. Their properties, abilities and difficulties will have to be discussed in depth.

The workshop will be held in 2009, and several of the main experts in this field will be invited to present keynote lectures providing the discussion on their possible implementation in quick analysis tools.

The conclusions will be summarised in a final report presenting the main progress and establishing recommendations for consequent implementations. This report will be written and debated during 2010.

*5.6.4. Deliverables and links with other work packages*

A workshop on spatio-temporal methods for disease mapping will be organized and held in Spain in June 2009. This meeting will promote the discussion on the methods and their possible implementation in quick analysis tools, between all the partners and other international experts in this issue. A draft working report explaining the main properties of different spatio-temporal methods for disease mapping will be prepared including their properties, abilities and difficulties (D8). A final workshop report will be included in the final EUROHEIS2 project technical and financial report (D13).

This WP links to WP4 in particular, but will also link to all other workshops (WP5, WP7-10)

## **5.7. Work package n° 7: Exposure databases and GIS methods**

### *5.7.1. List of partners involved*

All (Lund University, Sweden, lead partner)

### *5.7.2. Objectives*

We will explore incorporation of exposure data (environmental pollutants and various confounders related to life-style and SES) from external databases into the RIF. Especially, the incorporation of indicators of data quality and measures of uncertainty for exposure assessment, and the methods for communication and visualizing of uncertainties will be explored.

### *5.7.3. Description of the work*

Because of the large size, often long duration, and diversity of outcomes and exposures of interest for rapid assessment as well as for follow-up of spatio-temporal patterns of disease, the environmental exposure assessment should rely on modelling to provide estimate for the entire population. New modelling strategies include proximity-based, geostatistical, land-use-regression, dispersion, integrated meteorological emissions, and hybrid approaches with personal sampling. Such modelling can be supported by subject-derived data from questionnaires, and other types of survey information. The quantification of exposure variation and exposure misclassification is crucial, but often not taken sufficiently into consideration.

Ambient air pollution exposure, and community noise exposure, which varies on urban, neighbourhood and household spatial scale are examples explored in recent European projects (among others EXPOLIS, APHEA, HYENA). The emerging databanks from human biomonitoring programs, having varying focuses (environmental exposure monitoring, food safety) may give emerging possibilities for exposure assessment for evaluation of exposures that have multiple routes of exposure. In Action 3 of the European Environment and Health Action Plan 2004-2010 the Commission announces to develop a coherent approach to Human Biomonitoring (HBM) in Europe based on existing expertise and experiences in the Member States. The issue of geocoding of such biomonitoring data needs thus to be taken into account.

During the workshop scheduled presentations on the experiences from exposure assessment on population level, both from the present consortium, and from other European projects in which large databases of exposures have been assembled or planned will be given. Discussions among all participants will focus on possibilities and limitations in available as well as emerging sources of information, and in the spatial information systems. A major component during the workshop will also be the demonstration of features for exposure and covariate assessment and quantification of measures of uncertainty within RIF and other spatial information systems. The mathematical/statistical considerations on requirements for probabilistic exposure analysis and possibilities to combine and compare different data sets will be considered. The follow-up procedure for the workshop will be carefully planned ahead of the meeting.

5.7.4. *Deliverables and links with other work packages*

Report from the workshop (D9).

**Links with other packages:** WP 4 and 10 (adaptation of RIF, comparison on different spatial information systems). The identification of limitations and possibilities that exist within RIF and other spatial information systems, and the experiences gained and needs defined to be discussed during the WP7 workshop are closely interrelated.

WP 6 (methods for disease mapping). The problems of how to handle the geographical distribution of outcomes mapping in small areas is equally important for handling of exposure estimates.

WP 8,9 (implementation in Hungary and Poland). WP7 is relevant for application and development.

WP 5. This is a very important link for WP7, giving examples of integrating exposure assessment in health impact assessment

## **5.8. Work package n° 8: Health and Environment Information System in Poland in the context of the RIF application**

### *5.8.1. List of partners involved*

All (NOFER, Poland, lead partner)

### *5.8.2. Objectives*

The objectives of this package are to implement a HEIS and the RIF in Poland, and to assist in enhancing the RIF to incorporate country specific exposure data, health outcomes data, and data on potential confounders, such as smoking, obesity and life style factors from different databases.

### *5.8.3. Description of the work*

The workshop will review and discuss needs and possibilities of implementation of RIF in Poland taking into account existing health and environment databases. The workshop will discuss methodology adaptable to Polish conditions and will outline implementation approaches.

Specific topics for the workshop discussions and recommendations will include:

- The assessment of the quality of the databases in Poland taking into account their implication to GIS/RIF (e.g. Mortality Registry, Cancer National Registry, Polish Birth Defects Registry, Occupational Diseases Registry, Air Monitoring Data, Hazardous Waste Landfills Data, Heavy Metals Soil Contamination Data).
- Mapping of risk factors and exposure data for studying patterns of disease occurrence.
- GIS and RIF methodology of exposure and health risk assessment in industrialised regions.
- Application of GIS/RIF for assessment of spatial distribution of birth and developmental defects and their associations with environmental pollution
- GIS/RIF and epidemiology in assessment of spatial distribution of health risk from environmental exposure to asbestos.

*“Step by step”*

#### 1. Workshop preparatory work

- Review and analysis of existing databases in Poland relevant for adaptation and application of GIS/RIF in environmental health programme in Poland.
- Identification and invitation of the EUROHEIS experts to contribute lectures on:  
(a) Mapping of risk factors and exposure data for studying patterns of disease occurrence; (b) GIS and RIF methodology of exposure and health risk assessment in industrialised regions.
- Identification and invitation of Polish experts to present selected databases relevant for the workshop
- Preparation of the final annotated programme of the workshop

#### 2. Organisation and holding of the workshop

- Administrative and technical arrangements for the workshop
  - Conducting two days workshop (presentations, discussions, recommendations)
3. Ending activities
- Preparation of the workshop report and dissemination.

Total numbers of the workshop participants is 20 – 25.

Polish experts will be invited from the following institutions: Polish Registry of Congenital Development Malformations, National Institute of Hygiene, Institute for Ecology of Industrial Areas (IETU), Central Statistical Office, participants in EUROHEIS project and 5-6 international experts on spatial analysis and environmental health.

#### *5.8.4. Deliverables and links with other work packages*

Report of workshop results (D6):

GIS and RIF methodology of exposure and health risk assessment for application in specific environmental health situations in Poland.

Outline protocols for specific applications GIS/RIF (assessment of spatial distribution of health risk for exposure to asbestos and environmental risk of birth defects in Poland)

This WP links to WP4, WP6, WP10 (adaptation of RIF, comparison on different spatial information system, methods for disease mapping) – close links with those packages in application and adaptation to Polish conditions GIS/RIF methodology.

WP7 – link in advising how to develop and modify Polish databases in the context of GIS application.

WP5 – this is an important link by presenting examples of integrating exposure assessment and health outcome

## **5.9. Work package n° 9: Health and Environment Information System in Hungary**

### *5.9.1. List of partners involved*

All (NIEH, Hungary, lead partner)

### *5.9.2. Objectives*

The primary objectives of this WP are to adapt methods and implement the RIF in Hungary. The WP will also seek to harmonise the EUROHEIS RIF methodology with the “point source impact assessment” developed by Hungary. The WP will assist in enhancing RIF functionality to incorporate country specific exposure data, and data on potential confounders from external databases.

### *5.9.3. Description of the work*

**Background and rationale.** The elaboration of a GIS in order to assess the impact of the environment on human health was launched by the National Environmental Health Action Plan (1998-2002) adopted by a Parliament Resolution [83/1997. (IX. 26.) OGY]. Regional and cluster analysis as well as multiple spatial regression methods were elaborated to assess the impact of several confounding or effect modifying factors on the spatial distribution of a health outcome. A methodology was developed to study the health impact of point source pollutants in the surrounding area within the framework of the National Environmental Programme 2003-2008 (Parliament Resolution No. 132/2003 XII.11.OGY). The Action Programme of Environmental Health and Food Safety identifies the development of an environmental health informatics system as a specific objective of the programme. The development of GIS as a tool of environmental information system is included in the National Public Health Programme under the sub-programme of “National Environmental Health Action Plan”. By applying GIS, the spatial distribution of mortality due to major causes of death as well as the impact of ambient air and drinking water quality was assessed considering the modifying effect of socio-economical state.

**Tasks.** The workshop will discuss the possibilities of implementation of RIF in Hungary by different working groups taking into account existing health and environment and lifestyle databases as well as availability.

Specific topics for the workshop discussions and recommendations will include:

1. Mapping of risk factors related to SES as well as exposure data for studying patterns of disease occurrence.
2. GIS and RIF methodology of exposure and health risk assessment in regions with high level of environmental exposure.
3. Specify indices of SES to standardise for analyses of environmental health risks;
4. Use data on SES and environmental pollution to assess inequalities in health as well as environmental equity.

5.9.4. *Deliverables and links with other work packages*

The outcomes will be given in the workshop report (D2):

- Suggestions for application and development of EUROHEIS framework in the Hungarian situation, harmonising with the findings of previous Hungarian assessments.
- Disseminating the methodology for the different working groups in Hungary assessing the impact of SES indicators on health outcomes.

WP9 links to WP4, adapting the current RIF to Hungary. WP7 will contribute to WP5 work by integrating own data and assessment. WP9 will test the methods in WP6 using own data. A feasibility study will be carried out testing the data availability for disease mapping. A close cooperation will be built with WP7 to exchange experiences on maintainability of RIF. WP9 will have close cooperation with Poland and share experience in RIF implementation in both countries.

## **5.10. Work package n° 10: Integration of RIF into Existing Spatial Data Infrastructures**

### *5.10.1. List of partners involved*

All (KTL, Finland, lead partner)

### *5.10.2. Objectives*

WP10 builds on the experience using RIF and other EHIS, including the SMASH (in Finland), and the Health Atlas (in Ireland). We will identify issues in integrating RIF into existing spatial data infrastructures, and explore the different development models underlying these systems. This will enhance the technical properties, maintainability, flexibility and user-friendliness of RIF.

### *5.10.3. Description of the work*

RIF was developed in Imperial College London. The two other teams in Finland and the Republic of Ireland also developed national spatial data systems - SMASH and the Health Atlas, respectively. The three countries have different levels of spatially referenced health and environmental information available. The national systems are at very different stages of development, and have used different developed models.

We will systematically explore the functionality for these systems, and identify methods, functions and issues relating to development methods, maintainability extensibility, and usability which would benefit RIF. We will also examine the approaches for linking properties of these systems. The work will substantially deepen our understanding of how RIF fits into different health systems.

The specific topics for the workshop will cover

1. system background and documentation,
2. technologies – experience and implications for future development,
3. comparison of analysis and results obtained by different systems,
4. user needs and experiences of the selected systems,
5. system extensibility and maintainability,
6. suggestions for embedding other health information systems' functionality in RIF (or vice versa), and
7. other lessons for future development.

The preparation of workshop includes collection of information covering workshop topics (listed above), pre-workshop interviews with health information system users, developers, and potential users, partner homework, preparation of detailed agenda, preparation of workshop presentations, and practical arrangements. The 2-day workshop will take place in Finland. The post-workshop tasks derive from suggestions at workshop, and include further data collection, additional interviews, and preparation of the report.

*5.10.4. Deliverables and links with other work packages*

Report on the integration of RIF into Existing Spatial Data Infrastructures (D7).

The main links will be with WP5, WP6 and WP7 which will contribute ideas for development, functionality and needs into WP10, and with WP8 and WP9 into which our results will feed as they become available.

**6. MEASURES TO ENSURE VISIBILITY OF COMMUNITY CO-FUNDING**

The project will highlight the outcomes of each workshop in concise reports, which would be widely disseminated both on the project website and in papers submitted to peer-reviewed journals where applicable. These reports will make recommendations in various areas of environmental health risk assessment, applicable in all EU countries, drawing on the expertise of the participating partners.

EUROHEIS 2 results will also be presented at the annual US CDC Environmental Public Health Tracking conferences, which will provide excellent opportunities to share and the EU experience in this area.

The end of project conference (the 3<sup>rd</sup> EUROHEIS conference in Spatial Epidemiology) will summarise the findings in the workshops and focus on the most important implementations in the RIF with direct relevance to the environmental health system development within the EU. The conference will also be a forum for further discussions of methodological improvements in analysing spatially referenced data on environmental exposures and health. The conference is planned to be associated with the European Public Health Conference in Poland 2009.

It is also anticipated that the EUROHEIS2 project results will be presented at the next Ministerial WHO Environmental Health Conference to be held in Italy in 2009.

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## **8. PROJECT MANAGEMENT, PARTNER ROLES AND EXPERTISE**

The EUROHEIS project builds on the expertise established within the UK Small Area Health Statistics Unit (SAHSU), and in the previous EUROHEIS consortium, with long experience of small area health risk analysis and information systems.

The project will be coordinated by the UK partner, who has considerable expertise in coordinating similar projects, such as the previous EUROHEIS project (2000-3), which was successfully audited in 2005. The coordinator will take the main responsibility for the project, whereas the partners will be responsible for arranging the workshops as described in the Work Packages.

A project management group will be set up, consisting of the principal investigators in each partner organisation,. We also aim to form a Steering Committee including relevant stakeholders for continuing evaluation of the project.

The School of Public Health in University College Dublin was a partner in the previous EUROHEIS project. The Irish partner is now Dublin City University, which is developing the Irish Health Atlas in partnership with the Irish Health Service Executive, and also plays a leading role in the Irish burden of Environmental Disease project.

The Department of Occupational and Environmental Medicine, Lund University has a long experience in environmental epidemiology, and exposure assessment. Focus is on heavy metals and persistent organohalogen pollutants. Exposure to air pollutants and community noise for a large population has recently been modelled and linked to health data for use in epidemiological studies.

The Department of Environmental Health, the National Public Health Institute, Finland (KTL) was a partner in the previous EUROHEIS Project and has developed a Small Area Statistics of Health System (SMASH) to investigate health risks by geographical areas. Research is now increasingly targeted to integrated and environmental risk assessment and to the use of geoinformatics in studies of environmental health.

The Centre of Environmental Health Research of RIVM has developed an environment and health information system and is currently expanding this with a data-exchange platform. It reports regularly on the Dutch Environmental Disease burden and is coordinating a long term environment and health monitoring programme around Schiphol Airport.

The Department of Environmental Health Hazards, Nofer Institute of Occupational Medicine in Lodz-Poland focuses on environmental health risk assessment. The Department cooperates with Ministry of Health and Welfare, ATSDR, WHO and with other national organizations. Activities include spatial analysis of the incidence of congenital malformations and potential association with environmental health hazards in Poland.

The Department of Statistics and Operations Research, Universita de València was a partner in the first EUROHEIS project. The researchers involved are experts on Bayesian methods for disease mapping and environmental health impact assessment. Recently, the Spanish partner has developed a mortality atlas by small areas in partnership with the Valencian Health Authorities, and is involved in the development of spatio-temporal methods for disease mapping.