



Health and Environment Integrated Methodology
and Toolbox for Scenario Assessment

Newsletter No. 1

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Overview

Fintan Hurley, *Institute of Occupational Medicine (IOM, Scotland)*



Welcome to the first HEIMTSA Newsletter!

HEIMTSA is a 4-year project that started on 1 Feb 2007; so we are now just over half-way. And this first newsletter comes at an interesting time, when the project is pushing forward on many fronts, is at the point of producing some interesting results, and is actively building links and planning with our sister projects, [INTARESE](#) and [2-FUN](#).

So what is HEIMTSA, what are we trying to do, and how are we getting on? The acronym is simple – it stands for **Health and Environment Integrated Methods and Toolbox for Scenario Assessment**. **So, it's about developing methods and tools, to help in analysing the environment and health implications of scenarios, and doing this in a way that is integrated across disciplines, across pollutants and across sectors.**

Ultimately, our aim is to inform the development of policies at the European level, i.e. in the EU-30, by enabling policy makers and other stakeholders to understand the public health effects of policies or measures (and how these are distributed across sub-populations), before the policies are put in place. Though of course we hope that the methods and tools being developed will prove useful in informing the development of policies at national or regional level also in Europe.

HEIMTSA builds on work in many previous projects and uses the full chain approach. This involves tracking the fate of pollutants from how policies affect emissions, through to changes in concentrations, exposures and risks to health. These exposures and risks are combined with demographic data and background rates of mortality and morbidity to give estimated annual health impacts attributable to the (changes in) emissions. Finally, these health impacts are aggregated, in HEIMTSA principally via monetary valuation

(which also allows comparison with costs of policies) but also via DALYs.

HEIMTSA was developed with knowledge of the INTARESE project, which started 15 months earlier. There has been close co-operation since then, on core methodology (see e.g. a recent article by David Briggs at www.ehjournal.net/content/7/1/61) and on a wide number of specific areas of activity. We are also in ongoing contact with another FP6 project, 2-FUN, which in its present form was designed to complement HEIMTSA. Now that all three projects are up-and-running, we are actively looking at how methods and tools can best be integrated, to provide an analysis framework as coherent as possible.

We welcome contacts with other relevant stakeholders and researchers. This first newsletter introduces some of the HEIMTSA activities and the people who bring them about. We intend to give you a flavour of the project and, hopefully, to spark your interest in it. We hope it will encourage you to contact us, with your ideas and questions; or at least, to look forward to our next newsletter, in about 4 months time – this will have more detail on results from the HEIMTSA case studies, which are introduced in this first issue. Thanks for your interest, and happy reading!

Fintan Hurley
Project co-ordinator



Introduction to the HEIMTSA Case Studies

Fintan Hurley, Institute of Occupational Medicine (IOM, Scotland)

HEIMTSA's aim is to develop methods and tools for assessing the health impacts of policies. To showcase the full chain approach for a wide range of pollutants HEIMTSA chose four categories of different multi-disciplinary Case Studies.



The first year HEIMTSA was concerned with reviewing the state-of-the-art, and developing general methods on integrated environmental health impact assessment (IEHIA), on uncertainty issues, on exposure scenarios, and on spatial issues in integrated assessment. While this was important and useful, we found that there were limitations to what we could do and develop in the abstract; that the development of specific methods progressed best when it was hand-in-hand with solving specific problems. For that reason, we brought forward to Month 13 the work on Case Studies, originally planned to begin in Month 19.

Objectives

HEIMTSA was designed to develop methods and tools for assessing the health impacts (mediated via the environment) of policies in a range of sectors, using the full chain approach (see below). In order to do this, we needed to have in place the elements of the full chain for a wide range of pollutants. Consequently, this first set of Case Studies was focused on pollutants rather than policies.

Our aims have been and are threefold:

- to make concrete the full chain approach through the pathway from precursor emissions, through concentrations, exposures and health risks, to health impacts and monetary valuation;
- to help in developing a more general methodology by testing initial views on methods via specific applications; and
- to help develop the experience of the HEIMTSA team, in full chain analysis and in multi-disciplinary working.

All three objectives are necessary preparation for the full, cross-sectoral evaluations of policies to be carried out later in the project.

Case Studies

The initial Case Studies and associated pollutants were chosen to include issues that have a substantial public health impact in Europe, and that give rise to an interestingly diverse range of methodological challenges. We chose pollutants from four main groups:

- i. Outdoor air (focus on particulate matter, ozone, NO₂, SO₂ and CO)
- ii. Indoor air (focus on benzene, naphthalene, formaldehyde, NO₂, CO, environmental tobacco smoke (ETS), radon, fine particulate matter and microorganisms, PBDEs, PCBs)
- iii. Noise (focus on road traffic)
- iv. Pollutants which act via Complex Pathways (focus on arsenic, lead and PCBs)

Each Case Study team is multi-disciplinary, with membership from all of the relevant methodological Work Packages of HEIMTSA. Both are designed to address substantive stages of the full chain (e.g. modelling from emissions to concentrations, or health risk and assessment, or monetary valuation) and cross-cutting issues (e.g. assessment of uncertainty, spatial and geographical analysis, tools). This gives, simultaneously, for each Case Study the range of expertise needed; and for each methodology Work Package an opportunity to see relevant methodological issues in four different contexts.

Looking forward

Work on all four Case Studies is now well advanced. Reports are being drafted and finalised in May 2009. They will be supplemented by preliminary reports from the Methodology Work Packages, outlining initial ideas, lessons learnt and methodological plans for the next set of HEIMTSA Case Studies, this coming year.



Indoor Air Quality

Miranda Loh, National Institute for Health and Welfare (THL, Finland)

People nowadays spend most of their time indoors – this fact makes indoor air quality an important topic. Assessing the health impact of indoor air quality is quite complex which requires different approaches within HEIMTSA’s Case Study.



People spend about 90% of their time indoors, mostly at home. The quality of air indoors is thus a critical determinant of people’s health. Consequently, several initiatives have arisen in the EU to deal with indoor air, such as INDEX, EnVIE, CAIR4HEALTH

and the WHO’s development of indoor air quality guidelines. HEIMTSA’s case study will both draw from and complement these projects, because despite these efforts, there are still many challenges around indoor air. Assessing the health impact of indoor air quality is complex, as the range of potential effects runs from the relatively clear (e.g. lung cancer from radon) to the vague (e.g. sick building syndrome from uncertain sources). Assigning exposures is also not a simple task. In addition to indoor sources, indoor air quality can be influenced by outdoor air, via infiltration of pollutants. For the first set of case studies, the case study group is examining agents of risk from indoor sources only. These agents were identified as priority concerns from previous assessments, and include

- formaldehyde,
- naphthalene,
- radon, and
- environmental tobacco smoke (ETS).

Pollutant based approaches

HEIMTSA develops policy-related assessment methodologies. During the course of the last year, it became clear that a single approach for all stressors is not feasible. Due to data limitations, we need several versions of the full chain approach, which are represented by the different indoor pollutants in our case study. In some cases, information on more

than one dimension is available and hybrid approaches work well. The first approach refers to situations where information on the source (e.g. from usage and production reports) such as for naphthalene from moth balls or smoking, is the primary information required or available. The second approach is applicable where media concentration or exposure data are available, but source information is not easily discerned, e.g. the case of formaldehyde. The final approach is for situations where we already have an estimate for the attributable fraction of disease to the risk agent (e.g. lung cancer from radon). The latter approach was used in the EnVIE project, which focussed on indoor air quality policies but from a health-based rather than pollutant-based approach. In HEIMTSA we use the first two approaches to complement and provide a point of comparison with the EnVIE approach.

Health based approaches

We are also developing and testing several health impact assessment methods, including using physiology based pharmacokinetic (PBPK) models and epidemiological methods. PBPK models are being used for cancer endpoints from ETS and formaldehyde. Non-cancer endpoints are being assessed using exposure-response functions derived from the epidemiological literature. Naphthalene poses an interesting example where exposure to a particular source for a susceptible population can have serious effects, but there is no quantitative dose-response.

Further issues to consider

Indoor air policies pose a unique challenge, as enforcement can be difficult and in some cases risk intrusion on personal liberties. For example, policies to ban smoking indoors can be implemented for public buildings, but within a person’s own home it is difficult to stop them from doing as they please. Their actions, however, impact others, such as children, who do not have a choice when it comes to exposure at home. The indoor air case study shows how assessments both inform and are influenced by potential policies.

Noise

Dick van den Hout, Netherlands Organisation for Applied Scientific Research (TNO, the Netherlands)

Noise is a health impact which is ranking very high among other environmental health problems in Europe. HEIMTSA is developing a methodology to calculate today's and future noise levels and the associated health impact to estimate the effect of policies on European level.



Noise is one of the few environmental stressors to health that we can observe directly with our senses. This ability is the very cause of the health effects of noise. When asked in polls, about one out of four Europeans says to be annoyed or highly annoyed by noise from traffic and other outdoor sources. As a result of this large part of the population, noise is ranking very high among other environmental health problems, even though noise annoyance is less severe than many other problems such as permanent lung damage or death. Besides annoyance as such, noise can also increase the likelihood of physical effects such as sleep disturbance, hypertension and heart infarction.

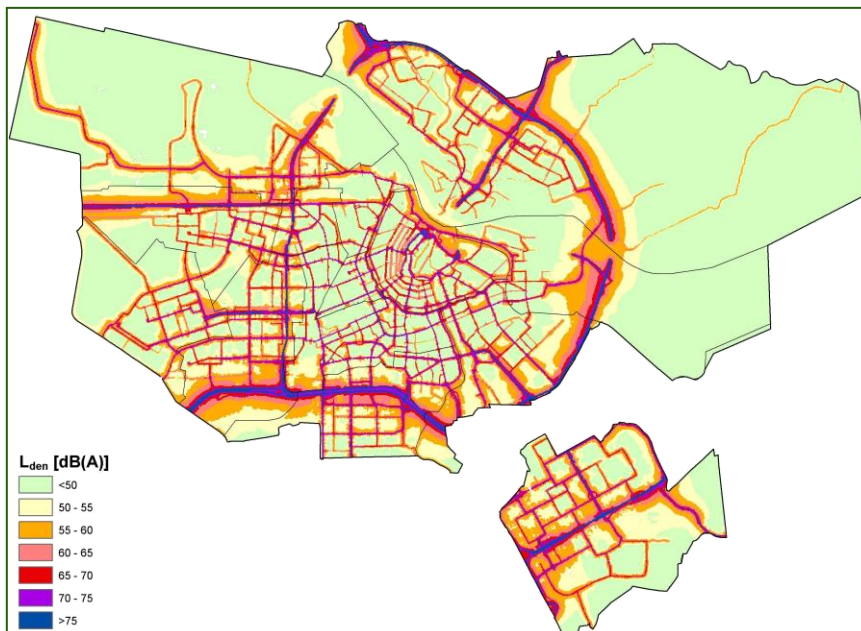
Regulations on EU level

Recently the new EU Environmental Noise Directive has been put in place, obliging member states to investigate and report exposure of their population to outdoor noise. These reports will clarify the size of the problem, but it will not show how the EU-wide noise problem will develop in the future, due to trends in society or due to possible EU noise policies.

HEIMTSA approach

A team in HEIMTSA is now developing a methodology to calculate, for Europe as a whole, today's and future noise levels and the associated health impact. With this methodology it should become possible to estimate the effect of policies. A major difficulty to overcome is that noise is often a small-scale problem, so existing EU-wide methods for e.g. air pollution, which calculate averages over big areas, cannot be applied. In addition, there are no EU-wide fine-scale data of noise sources.

The approach taken is to carry out detailed calculations for selected example areas and to scale the results up to the European Union as a whole. It is attempted to find suitable area characteristics that can make this up-scaling as reliable as possible.



The figure on the left shows a noise map for road traffic in Amsterdam, one of the example areas selected.

Exposure Scenarios for Impact Assessments

Miranda Loh and Matti Jantunen, National Institute for Health and Welfare (THL, Finland)

One of the main aspects of HEIMTSA is the development of scenarios. For environmental health hazards, exposure scenarios are particularly important because the assessment outcome is influenced by differences in exposure. The HEIMTSA exposure scenario concept is being put into practice in different case studies, which show that a scenario is truly an integrated object.



One of the main aspects of the HEIMTSA assessment framework is the development of scenarios,

or possible states of the world. For environmental health hazards, exposure represents the interface between a human being and an agent of risk; thus, exposure scenarios are particularly important because the assessment outcome is influenced by differences in exposure (see figure below). The IPCS Harmonization Project (<http://www.who.int/ipcs/methods/harmonization/en/>) has defined an exposure scenario as “a set of conditions or assumptions about sources, exposure pathways, amounts or concentrations of agent(s) involved, and the exposed organism, system, or (sub)population (i.e., numbers, characteristics, habits) used to aid in the evaluation and quantification of exposure(s) in a given situation.” For policy assessments, the scenario should allow for the comparison of alternative interventions and their consequences.

Situation of the exposure scenario in policy impact assessments.

Application

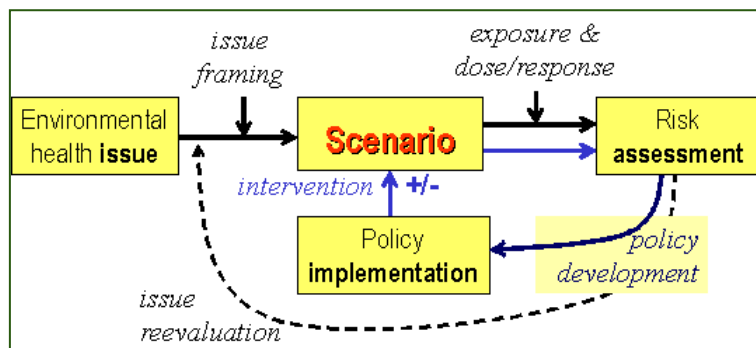
The guidance developed in Stream 2 centres around two main scenario components:

- media concentrations (Work Package 2.2) and
- exposure factors and modelling (Work Package 2.1), i.e. behaviour and characteristics that influence a person coming into contact with an agent of risk.

To be applicable across regions, key areas of variation across time, space, and population need to be identified and quantified. General guidance for scoping exposure scenarios can be found on the ExpoPlatform: http://www.ktl.fi/expoplatform/exposcen_ui/index.php?Option=purpose.

Further development

Exposure scenarios are created based on the needs or priorities of society and must be optimized within the constraints of limited resources and knowledge. Over time, as knowledge improves, and as policies are implemented, there should be a feedback mechanism to update the exposure scenario or re-frame the issues addressed, if necessary (see figure below). Ancillary effects (whether positive or negative) of the interventions may also need to be considered. The exposure scenario concept is being put into practice in our case studies, which show that a scenario is truly an integrated object. Development of these scenarios depends upon the upstream scenarios and variables (e.g. emissions) and downstream ones (e.g. available exposure or dose-response functions, outcomes that have been valued).



**Bridging the Gap: 2nd joint HEIMTSA-INTARESE workshop
Luxembourg, 27. January 2009**

The second joint HEIMTSA-INTARESE workshop was held with emphasis on 'Developments in Integrated Environmental Health Impact Assessment (IEHIA), with special reference to policies that affect Indoor Air'. The aim was to allow further discussion of IEHIA, a need that was earlier defined at the 'WHO International Public Health Symposium on environment and health research' in Madrid 2008.

45 participants from different European stakeholders discussed the state of the science for extending EHIA approaches to a wider range of environmental policies and pollutants with a specific focus on indoor environments. Presentations can be viewed at <http://www.intarese.org/event/bridging-gap-using-science-inform-development-policy-200901.htm>.

**2nd annual HEIMTSA meeting
Ispra, 09.-12. February 2009**

40-50 project participants came together to discuss the project activities during the last months and to set up a working plan for the months 25-42 (48). Progresses and difficulties within the different Streams were reported and discussed, especially in regard to the Case Studies. Additionally the present dissemination strategy was revised with focus on a more pro-active approach.



Upcoming HEIMTSA meetings

April 2009: Outdoor Case Study Meeting in Oslo, NO

08.-09. June 2009: PPG meeting in Stuttgart, DE (see below)

10.-12. June 2009: Summer School in Stuttgart, DE

Links to relevant Projects

INTARESE

INTegrated Assessment of Health Risks of Environmental Stressors in Europe
<http://www.intarese.org/>

2-FUN

Full-chain and UNcertainty Approaches for Assessing Health Risks in FUTURE Environmental Scenarios
<http://www.2-fun.org/>

HENVINET

Health and ENVIRONMENT NETWORK
<http://henvinet.nilu.no/>

NOMIRACLE

NOvel Methods for Integrated Risk Assessment of Cumulative stressors in Europe
<http://nomiracle.jrc.ec.europa.eu/default.aspx>

Announcement of HEIMTSA/INTARESE Summer School 2009 in Stuttgart, DE

Did you ever wonder what Integrated Environmental Health Impact Assessment is or how your specific contribution fits into the whole picture? Are you keen on meeting young fellow students and experienced old hands? Then join our HEIMTSA/INTARESE/2-FUN summer school in Stuttgart on **June 10-12**. Our key target groups are PhD students, new recruits of the three projects and any other interested project partner. We will focus on the methodology developed and applied, the case studies carried out and the toolbox developed in INTARESE, HEIMTSA and 2-FUN. Lectures will be accompanied by some hand-on exercises. As social program we will visit the Mercedes Museum. An agenda will be distributed in all three projects. The venue will be located at:

University of Stuttgart
 Institut für Energiewirtschaft
 und Rationelle Energieanwendung (IER)
 Hessbruehlstrasse 50
 70565 Stuttgart, DE

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Upcoming related events

24.-27. March 2009: 7th International Conference on Air Quality – Science and Application, Istanbul, TR

<http://www.airqualityconference.org/>

26.-27. March 2009: NoMiracle 5th Public Workshop Cumulative Risk Assessment: A Challenge for Science and Management, Ravenstein, NL

<http://nomiracle.jrc.ec.europa.eu/Lists/Announcements/AllItems.aspx>

01.-03. April 2009: WHO indoor air quality guideline meeting, Bonn, DE

07.-08. May 2009: Research Connection 2009, Prague, CZ

http://ec.europa.eu/research/conferences/2009/rtd-2009/index_en.cfm

23.-26. August 2009: INTER-NOISE 2009, Ottawa, CA

<http://www.internoise2009.com/>

25.-29. August 2009: 21st Conference of the International Society for Environmental Epidemiology (ISEE), Dublin, IRL

<http://www.isee2009.ie/home/>

17.-18. September 2009: Valuation of Environment-Related Health Effects, Prague, CZ

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