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INTERA: Integrated Exposure for Risk Assessment in Indoor Environments

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INTRODUCTION

The INTERA (Integrated Exposure for Risk Assessment in Indoor Environments) project, aims to develop a comprehensive indoor air exposure and risk assessment methodology. The main objective of the project is to define methodologies for predictive modelling of indoor exposures to chemical contaminants. The final product is a full chain mechanistic approach from source to exposure including internal dosimetry modelling. This full chain approach is implemented in a dynamic simulation environment dealing with all relevant steps of the assessment chain. The updates on the progress of the project will be available on the INTERA website[7].

The work has been divided into 6 linked work packages (Figure 1).

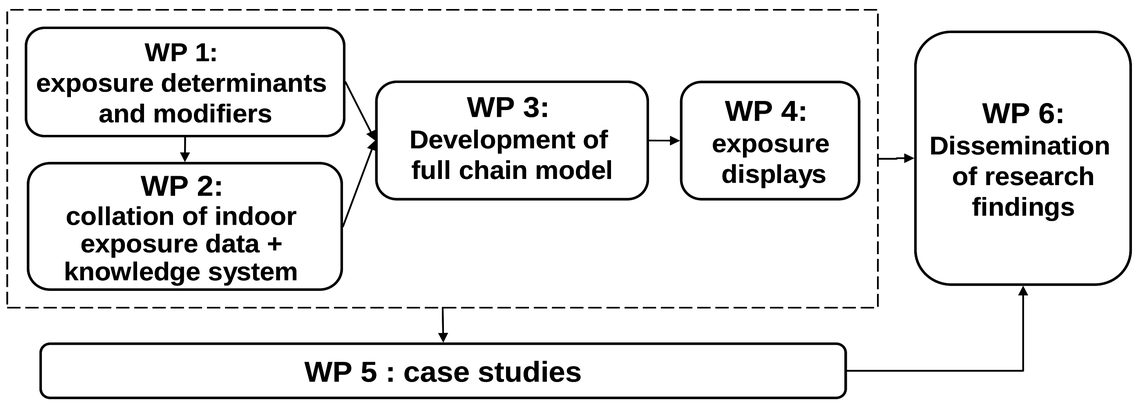

Figure 1 Links among the INTERA WPs

METHODS

There are four main steps to perform in the INTERA project:

1. Identify the main determinants of exposure for indoor air contaminants
2. Collect and organize the data for these parameters as a internet based knowledge management system (KMS).
3. Design a full chain modelling platform including advanced visualisation tools
4. Test the methodology with three case studies.

The case studies, which will involve the following steps, will help identify data gaps and possibilities for further methodological refinements:

a) Defining the scope of the case study
b) Preliminary data collection step (information to be fed into tools)
c) Identify the (main) household emission sources and the emission strengths of the substance of interest
d) Identify and collate data on patterns of use of these household sources,
e) Consider mitigating factors for exposure in home
f) Measurements (modelling) of indoor and personal exposure of European population
g) Estimation of internal doses to pollutants of interest
h) Combine the data using a probabilistic exposure approach and develop estimates of exposure across all sources and pathways

RESULTS

The main determinants of indoor air exposure

- Indoor air concentrations
- Population behaviour (time-activity, consumer habits etc.)
- Sources and source strengths
- Housing conditions (room volume, air exchange rate etc.)

A comprehensive report is available from the INTERA website[7].

The Indoor exposure knowledge management system (KMS)

- Data collected for the determinants listed above
- Created a Wiki based system[8]
- Majority of the data provided in a SQL-based database that can be used by other systems
- Data freely accessible, allowing interested people to contribute on the content

Full chain modelling platform

- A web-based user interface
- The modelling platform includes the following modules (more detailed presentation by D. Sarigiannis[9], abstract nr. 764):
  1. Emissions-concentrations module, linking emission sources to indoor air concentrations
  2. Exposure module, linking the temporal variation of indoor air contamination to human exposure
  3. Internal dosimetry module, linking the temporal variation of exposure to internal dose dynamics
  4. Health effects module, linking internal dose dynamics to possible health outcomes

Case studies

- Sources to consider: consumer products and building materials
- Selected chemicals and scope presented in Table 1.
- The results of the exposure assessment provided in the fall of 2011

Table 1. The scope of the case studies

Pollutant	Source	Exposure routes	Main health effects
Dimethylfumarate (DMF)	Shoes, furniture	Dermal	Skin sensitization Allergic contact dermatitis
Phthalates	Building materials, clothing, food packaging, toys, gloves, cosmetics, sealants, adhesives and tarps	Inhalation, ingestion, dermal	Developmental and reproductive effects, asthma, rhinitis and eczema (children)
BTEX (benzene, toluene, ethylbenzene, xylenes)	Rubbers, lubricants, dyes, detergents, pesticides, tobacco smoke, gasoline, kerosene, paints, and lacquers, nail polish or nail polish remover, carpet glues, varnishes rust preventives	Inhalation	Benzene: Cancer (AML) BTEX: neurological impairment

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[7] http://www.intera-home.eu
[8] http://en.opasnet.org/w/Intera
[9] Sarigiannis et al. 2011. A full chain mechanistic approach assessing health risks from multiple sources in indoor environments. Indoor Air 2011 Conference, Abstract Nr. 764.