Human Health and climate changes in EIA

ECRAN National workshop on SEA and EIA
Osijek, Croatia, May 11-12, 2015
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HIA in SEA EIA diferences

- **SEA**
  - More about broad „evidence based knowledge!“
  - More about international and national „health strategies, programs
  - More about phantasy policy, strategy
- **EIA**
  - More about HRA
  - More about toxicology, sociology, hygiene
  - More about modelling of physical environment determinants
  - More about indicators
  - More about math, statistic, technic….

RISK

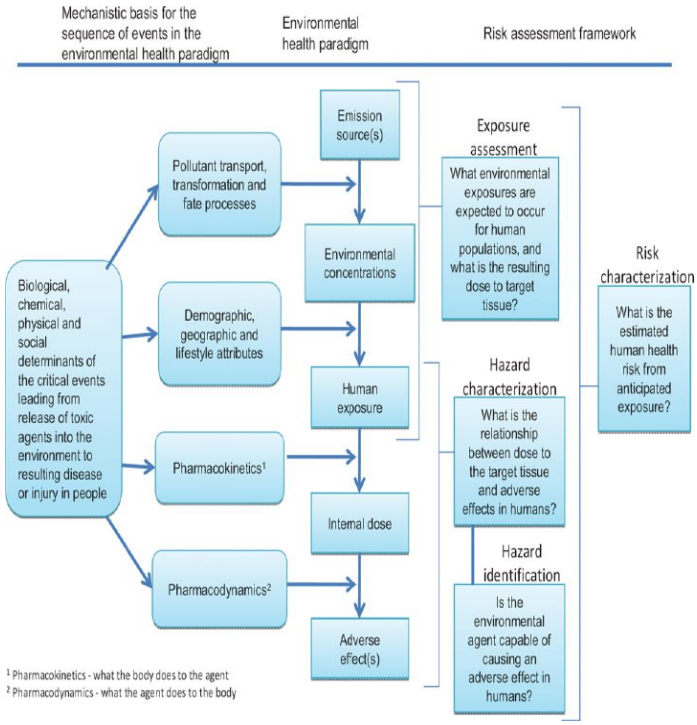
$$R = f(h;e)$$

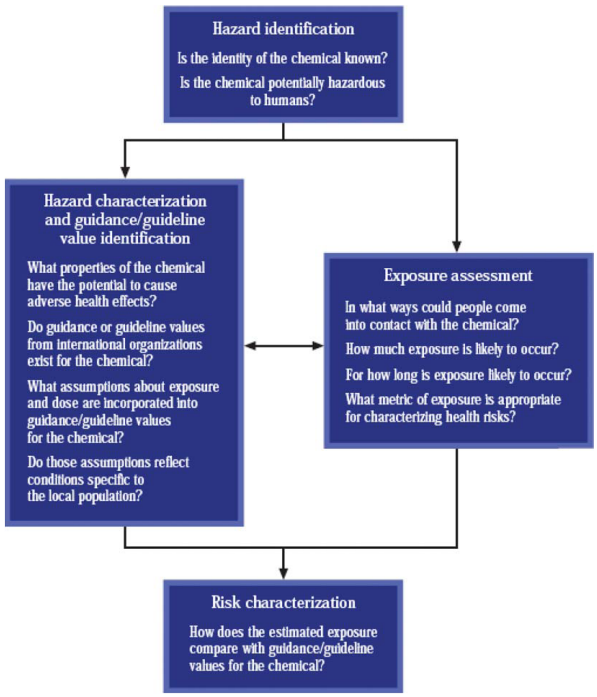
h- hazard

e- exposure

Risk assessment

- Human Health Risk Assessment - The characterization of the probability of potentially adverse health effects from human exposures to environmental hazards.
- Ecological Risk Assessment – A process that estimates the likelihood of undesirable ecological effects occurring as a result of human activities.


Mechanistic basis for the sequence of events in the environmental health paradigm
Environmental health paradigm
Risk assessment framework
Biological, chemical, physical and social determinants of the critical events leading from release of toxic agents into the environment to resulting disease or injury in people
Pollutant transport, transformation and fate processes
Demographic, geographic and lifestyle attributes
Pharmacokinetics[1]
Pharmacodynamics[2]
Emission source(s)
Environmental concentrations
Human exposure
Internal dose
Adverse effect(s)
Exposure assessment
What environmental exposures are expected to occur for human populations, and what is the resulting dose to target tissue?
Hazard characterization
What is the relationship between dose to the target tissue and adverse effects in humans?
Hazard identification
Is the environmental agent capable of causing an adverse effect in humans?
Risk characterization
What is the estimated human health risk from anticipated exposure?
[1] Pharmacokinetics - what the body does to the agent
[2] Pharmacodynamics - what the agent does to the body


Hazard identification
Is the identity of the chemical known?
Is the chemical potentially hazardous to humans?
Hazard characterization and guidance/guideline value identification
What properties of the chemical have the potential to cause adverse health effects?
Do guidance or guideline values from international organizations exist for the chemical?
What assumptions about exposure and dose are incorporated into guidance/guideline values for the chemical?
Do those assumptions reflect conditions specific to the local population?
Exposure assessment
In what ways could people come into contact with the chemical?
How much exposure is likely to occur?
For how long is exposure likely to occur?
What metric of exposure is appropriate for characterizing health risks?
Risk characterization
How does the estimated exposure compare with guidance/guideline values for the chemical?

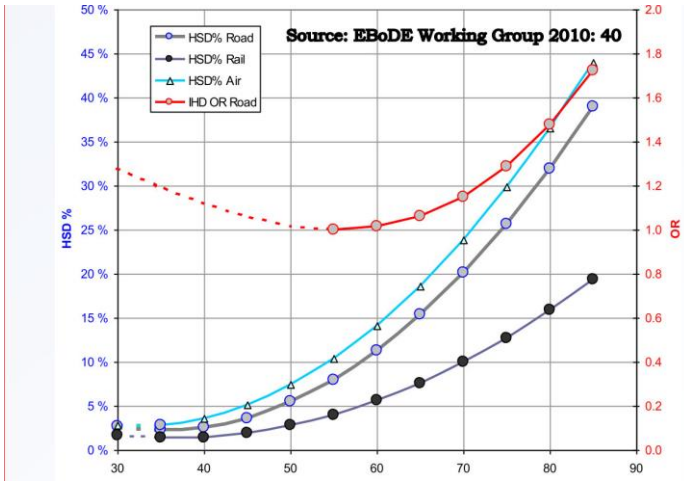
Screening HI, HR in EIA
Hazard identification

- Mostly **done obligatory by** ENVI authorities
- Mostly covered by **hazard identification** by HRA process
- Sometimes **very reduced** by „modelling possibilities or methodology (air, noise).
- Only in some cases is social or economical risk screened.
- Very rare is screening focused for „Health positives“

- Increase in noise above the norm or above the today's level (feeling as new situation?)
  - **Decrease in sleep quality** of residents
  - **Decrease in physical health** and mental Scoping:
  - **Impact on learning** achievements by school children

DOSE – RESPONSE ASSESSMENT, DATA…..

Noise Ischemic Heart Diseases Risk
High Sleep Disturbance



Environmental Burden of Disease in Europe: Assessing Nine Risk Factors in Six Countries

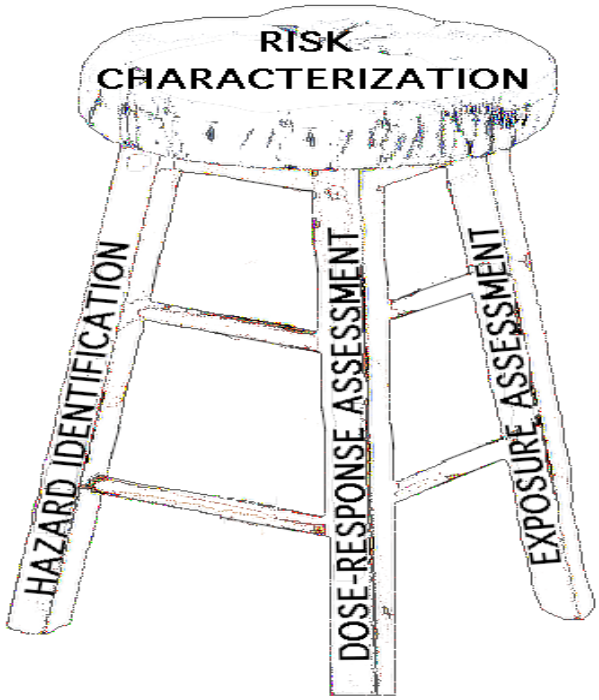
http://dx.doi.org/10.1289/ehp.1206154

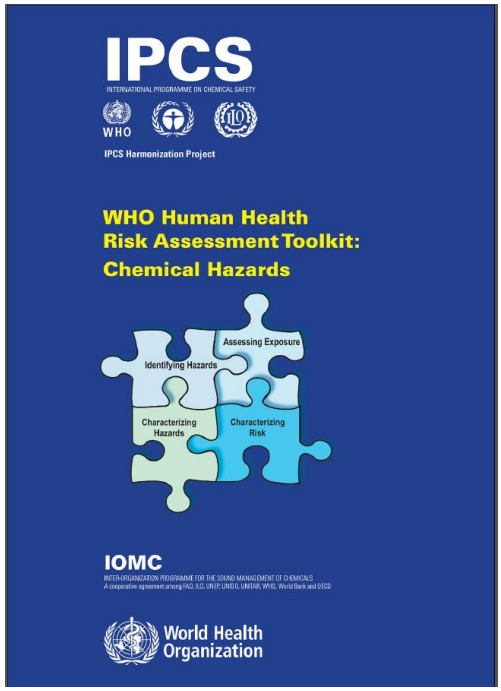
Table 1. Summary of health end points, exposure units, exposure–response relationships, and calculation methods.

Risk factor	Selected health end points	Population	Exposure estimate	Unit of exposure	Type of ERF	Point estimate of ERF (95% CI)[a]	References for ERF	Threshold[b]	Calculation method[c]
Benzene	Leukemia	All	Annual mean exposure	μg m^{-3}	UR	6.00×10^{-6} (2.20×10^{-6}, 7.80×10^{-6})	WHO 2000	0	2a
Dioxin	Total cancer incidence	All	Daily intake of adults	pg/kg/day	UR	1.00×10^{-3} (5.70×10^{-4}, 5.10×10^{-3})	Leino et al. 2008; National Academy of Sciences 2004	0	2a
SHS	Trachea, bronchus, and lung cancers[d]	Adult nonsmokers	Percent of exposed	Yes/no	RR	1.21 (1.13, 1.30)	U.S. Surgeon General 2006	0	1a
SHS	Ischemic heart disease	Adult nonsmokers	Percent of exposed	Yes/no	RR	1.27 (1.19, 1.36)	U.S. Surgeon General 2006	0	1a
SHS	Asthma induction	Adult nonsmokers	Percent of exposed	Yes/no	RR	1.97 (1.19, 3.25)	Jaakkola et al. 2003	0	1a
SHS	Asthma induction	Children (< 14 yr)	Percent of exposed	Parental yes/no	RR	1.32 (1.24, 1.41)	Cal-EPA 2005	0	1a
SHS	Lower respiratory infections	Infants (< 2 yr)	Percent of exposed	Parental yes/no	RR	1.55 (1.42, 1.69)	U.S. Surgeon General 2006	0	1a
SHS	Otitis media	Toddlers (< 3 yr)	Percent of exposed	Parental yes/no	RR	1.38 (1.21, 1.56)	Cal-EPA 2005; Etzel et al. 1992	0	1a
Formaldehyde	Asthma aggravation (children) (morbidity only)	Toddlers (< 3 yr)	Annual mean residential indoor concentration	μg/m^{-3}	RR	1.017 (1.004, 1.025)	Rumchev et al. 2002	100	1a

Lead	IQ loss	Children (< 5 yr)	Blood lead levels	µg/L	UR	0.051 (0.032, 0.07)	Lanphear et al. 2005	24	NA
Lead	Mild mental retardation (morbidity only)	Children (< 5 yr)	Blood lead levels	µg/L	DS[e]	Function[f]	—	24	2b
Lead	Hypertensive diseases (morbidity only)	Adults/all	Blood lead levels	µg/L	DS[e]	Function[f]	—	50	2b
Lead	Increased blood pressure	Adults/all	Blood lead levels	µg/L	UR	2.50×10^{-2} (1.70×10^{-2}, 3.20×10^{-2})	Fewtrell et al. 2003; Schwartz 1995	50	NA
Road traffic noise	Severe sleep disturbance (morbidity only)	All	Exposure categories	L_{night} (dB)	UR	Function[f]	Miedema and Vos 2007; WHO 2009c	35	2b
Road traffic noise	Ischemic heart disease (mortality and morbidity)	All	Exposure categories	L_{day}16hr (dB)	OR	Function[f]	Babisch 2006, 2008	55	1a
Railway traffic noise	Severe sleep disturbance (morbidity only)	All	Exposure categories	L_{night} (dB)	UR	Function[f]	Miedema and Vos 2007; WHO 2009c	35	2b
Aircraft noise	Severe sleep disturbance (morbidity only)	All	Exposure categories	L_{night} (dB)	UR	Function[f]	Miedema and Vos 2007; WHO 2009c	35	2b
Ozone	Total mortality (non-violent)	Adults (> 30 yr)	Ambient SOMO35 level	µg/m^{-3}	RR	1.0003 (1.0001, 1.0004)	WHO 2006a	70	1a
Ozone	Minor restricted activity days (morbidity only)	Working age (18–64 yr)	Ambient SOMO35 level	µg/m^{-3}	UR	0.0115 (0.0044, 0.02)	Hurley et al. 2005; WHO 2006b	70	2b
Ozone	Cough days, children (morbidity only)	Schoolchildren (5–14 yr)	Ambient SOMO35 level	µg/m^{-3}	UR	0.093 (0.019, 0.22)	Hurley et al. 2005; WHO 2006b	70	2b
Ozone	LRS days in children (excluding cough) (morbidity only)	Schoolchildren (5–14 yr)	Ambient SOMO35 level	µg/m^{-3}	UR	0.016 (–0.043, 0.08)	Hurley et al. 2005; WHO 2006b	70	2b
$PM_{2.5}$	Cardiopulmonary disease (mortality and morbidity)	Adults (> 30 yr)	Population-weighted ambient level	µg/m^{-3}	RR	1.0077 (1.0020, 1.0132)	Pope et al. 2002; WHO 2006a	0	1a
$PM_{2.5}$	Lung cancer (mortality and morbidity)	Adults (> 30 yr)	Population-weighted ambient level	µg/m^{-3}	RR	1.012 (1.004, 1.020)	Pope et al. 2002; WHO 2006a	0	1a
$PM_{2.5}$	Chronic bronchitis (new cases) (mortality and morbidity)	Adults (> 27 yr)	Population-weighted ambient level	µg/m^{-3}	UR	5.33×10^{-5} (1.70×10^{-6}, 1.13×10^{-4})	Hurley et al. 2005; WHO 2006b	0	2b
$PM_{2.5}$	Restricted activity days (morbidity only)	15–64 yr	Population-weighted ambient level	µg/m^{-3}	UR	0.0902 (0.0792, 0.101)	Hurley et al. 2005; WHO 2006b	0	2b
Radon	Lung cancer (mortality and morbidity)	All	Residential mean level	Bq/m^{-3}	RR	1.0016 (1.0005, 1.0031)	Darby et al. 2005, 2006	0	1a

Abbreviations: Cal-EPA, California Environmental Protection Agency; DS, distribution shift; ERF, exposure–response function; L_{day}16hr, noise level for day and evening; LRS, lower respiratory symptoms; NA, not applicable; $PM_{2.5}$, particulate matter ≤ 2.5 µm; RR, relative risk; SOMO35, sum of maximum 8-hr ozone levels > 35 plead (70 µg/m^3); UR, unit risk; yr, years. [a]Exposure–response functions are all expressed per 1 unit of exposure. [b]Above the threshold the health impacts are included in the estimates. [c]Different types of calculation methods were applied, as described in "Methods." [d]The RR for spousal smoking is used as a proxy for any regular exposure (including at work). [e]For lead, a shift in exposure distributions is linked to a unit risk approach. [f]No point estimate can be given because the exposure–response function is given by a more complex function. This table is adapted from the full report (Hänninen and Knol 2011) with the permission of the copyright holder.


RISK
CHARACTERIZATION
HAZARD IDENTIFICATION
DOSE-RESPONSE ASSESSMENT
EXPOSURE ASSESSMENT


IPCS
INTERNATIONAL PROGRAMME ON CHEMICAL SAFETY
WHO
IPCS Harmonization Project
WHO Human Health
Risk Assessment Toolkit:
Chemical Hazards
Assessing Exposure
Identifying Hazards
Characterizing
Hazards
Characterizing
Risk
IOMC
INTER-ORGANIZATION PROGRAMME FOR THE SOUND MANAGEMENT OF CHEMICALS
World Health
Organization

WHO publication HIA in SEA

- http://www.who.int/hia/network/en/HIA_as_part_of_SEA.pdf

Determinats

- http://apps.who.int/iris/bitstream/10665/84213/1/9789241548625_eng.pdf?ua=1&ua=1

http://ec.europa.eu/clima/policies/g-gas/progress/docs/hr_2014_en.pdf

- **Assessment of climate change policies in the context of the European Semester**
- **Country Report: Croatia**
- Ecologic Institute
- Authors team: Andrew Eberle, Lena Donat, Eike Karola Velten
- Eclareon Author: Saša Rajković, Client: DG Climate Action
- Service Contract: 071201/2012/635684/SER/CLIMA.A.3
- These reports have been prepared by an external contractor and do not necessarily represent the Commission's view. They are based on the contractor's own research on information publicly available a
- **Any term Health in whole document**

Some exemples

- https://echa.europa.eu/documents/10162/13580/georgioiu_from_porbabilistic_risk_assessment_to_human_health_impact_assessment_and_monetisation_en.pdf

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