WHO Human Health Risk Assessment Toolkit: Chemical Hazards

Training on Risk Assessment of Chemicals at National Level in a Global Context

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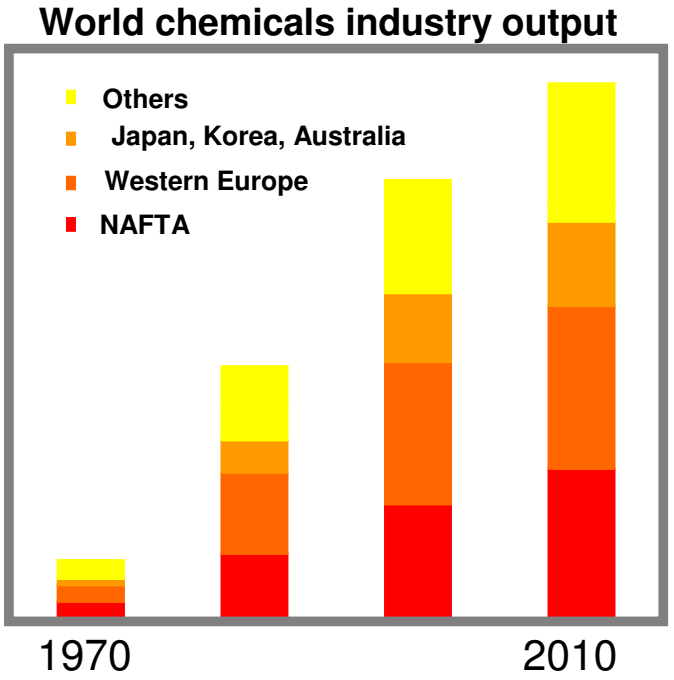
World Health Organization

Outline

- Chemicals production and use
- Environmental health paradigm
- Risk assessment framework
- WHO Toolkit: Chemical Hazards

Chemical production

- Production and use of chemicals continue to grow worldwide.
- Increase in global production was ten-fold during last decades.
- Chemical production is quickly expanding in non-OECD countries:
  - 17% in 1970; and
  - 31% of larger world production in 2020.



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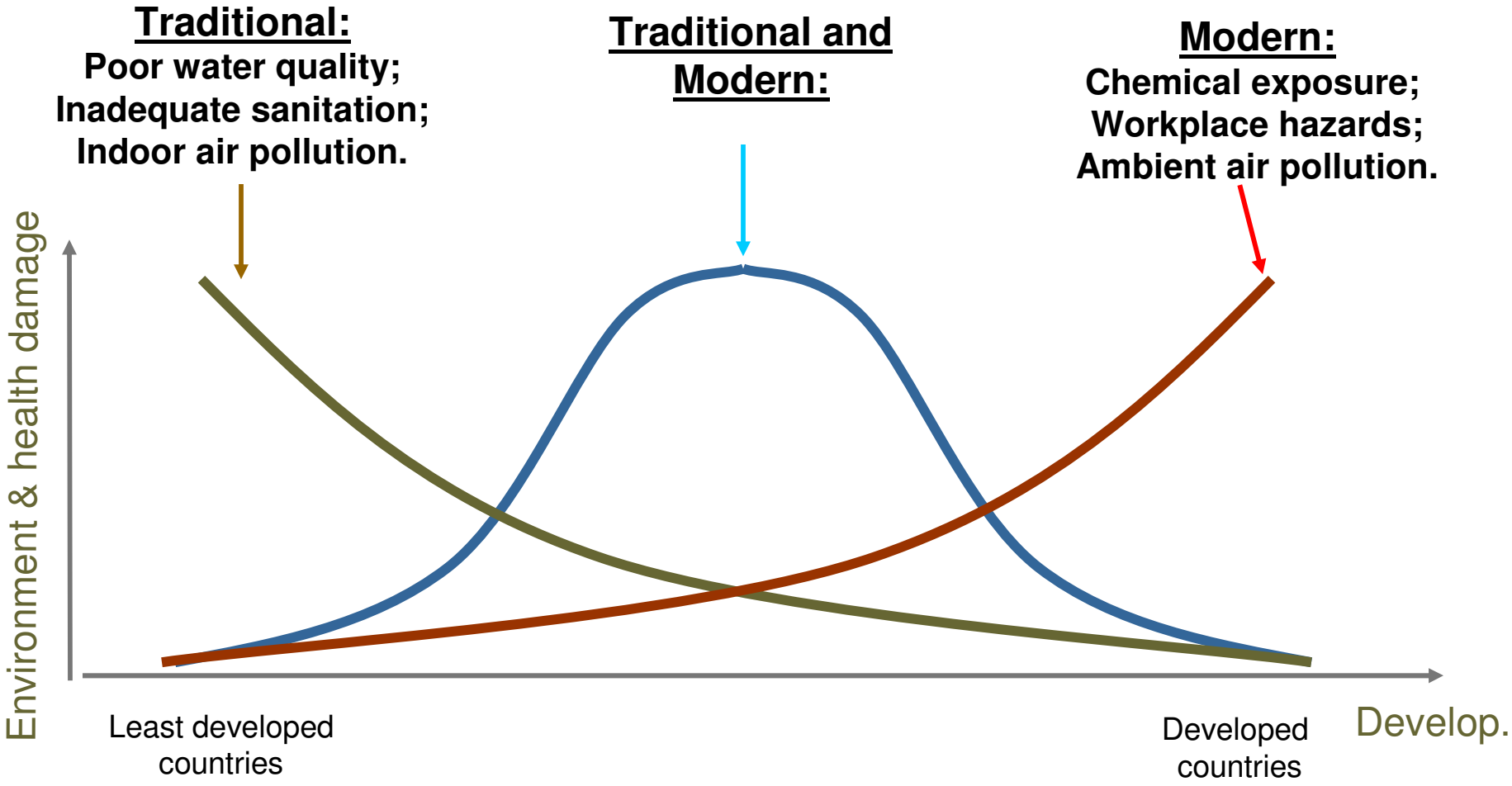
Environmental health risks



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Disease burden related to chemicals

- Chemical exposures cause loss of 7.4 million years of healthy life per year.
- Unintentional poisoning causes >350,000 deaths
  - >94% occur in low- and middle-income countries

Incident reporting

In 2005: 8603 chemical events in 15 US States

- 2034 victims, 69 deaths, 481 evacuations

In 2005: 1040 chemical incidents in England and Wales

- 27000 people exposed, 3000 people showed symptoms, approx. 150 evacuations

➢ **0.5-1 million events worldwide?!**

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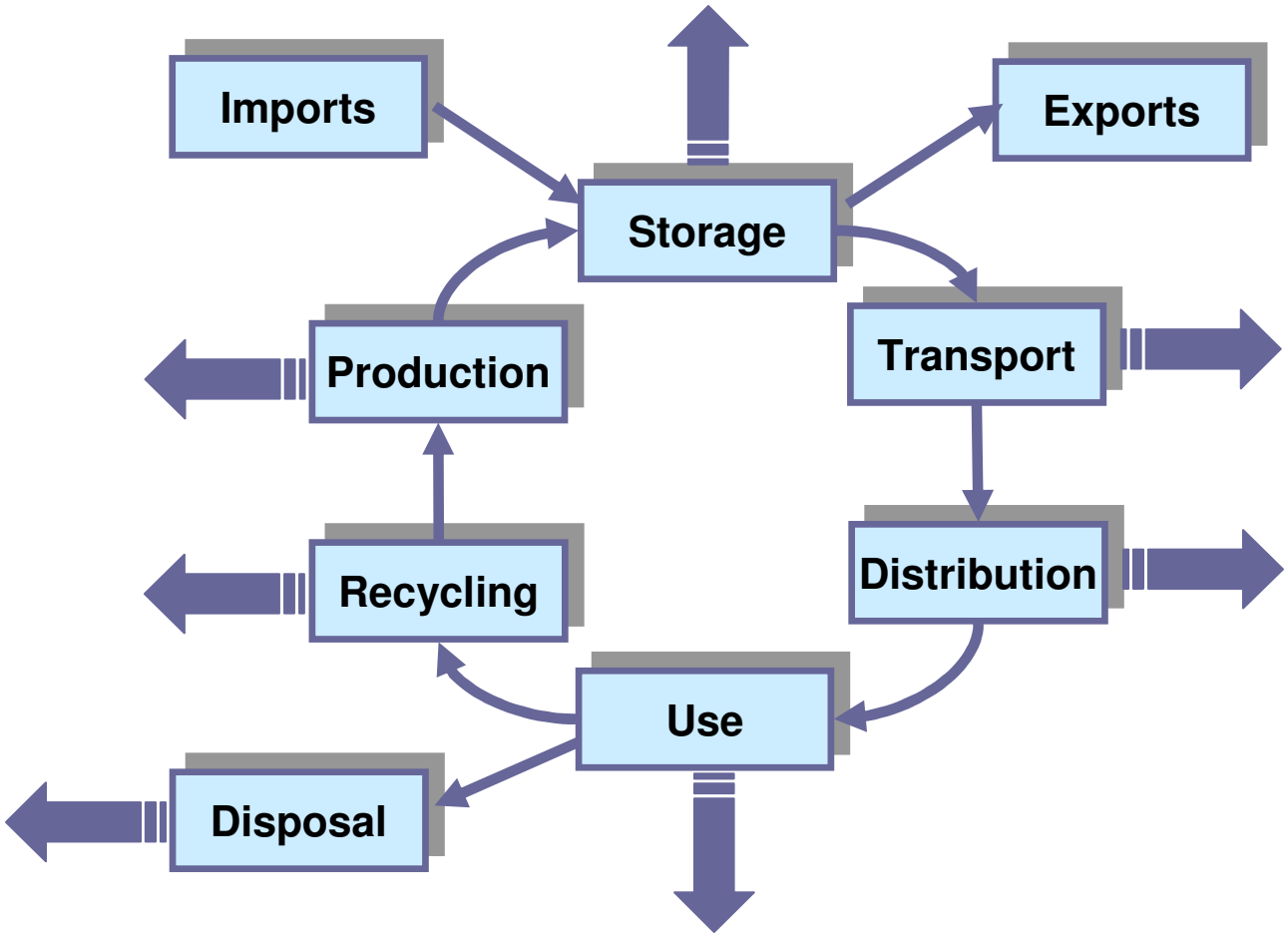
Stages of the chemical life cycle



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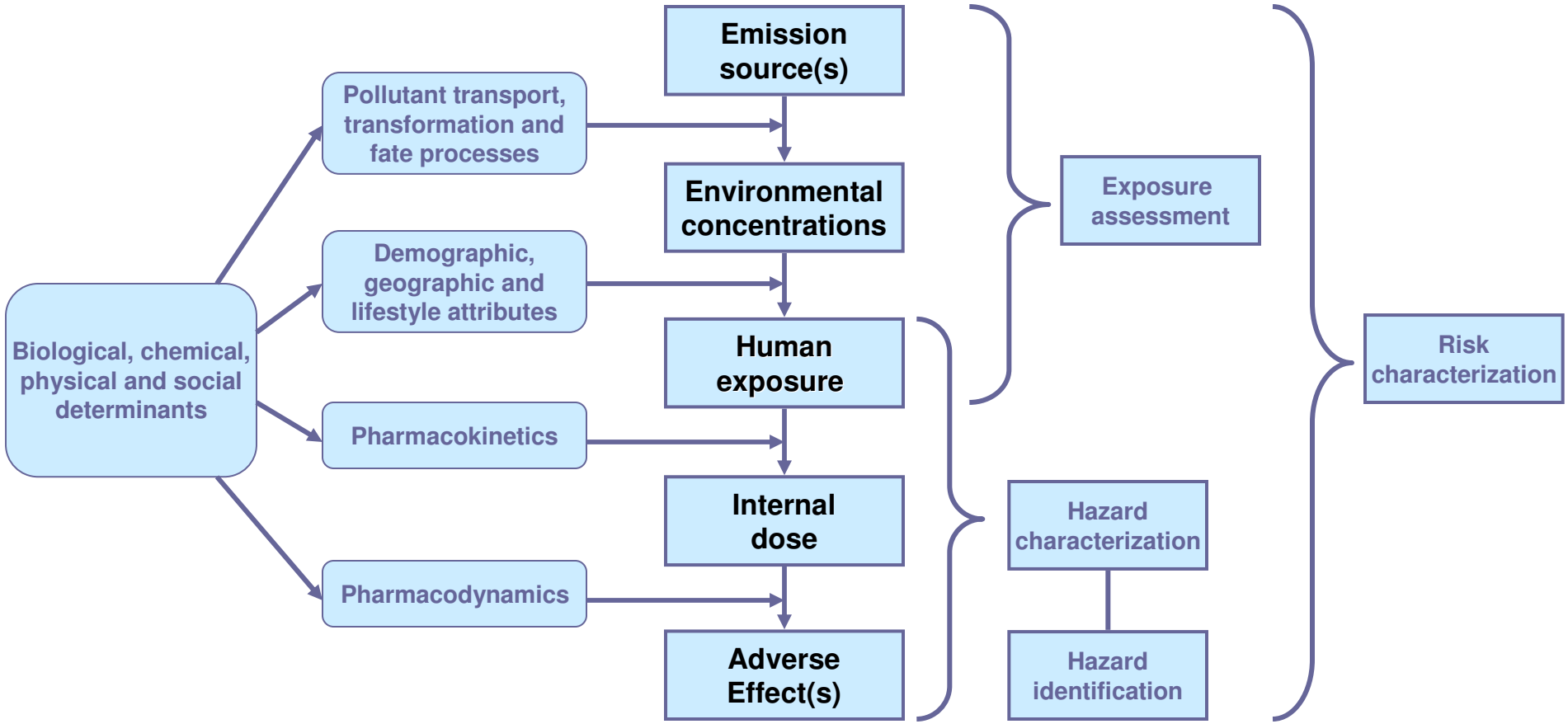
Mechanistic basis for sequence of events | Environmental health paradigm | Risk assessment framework



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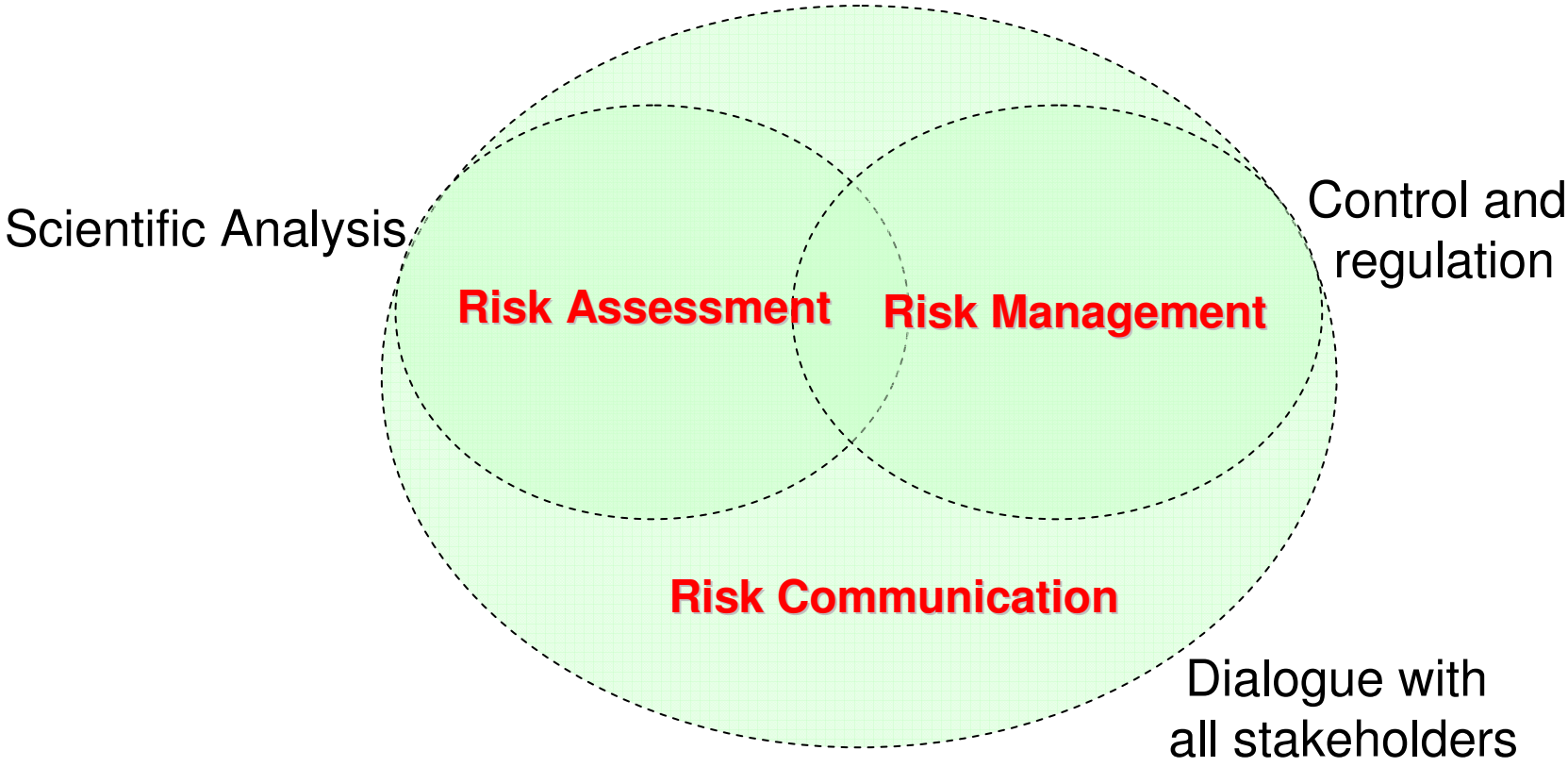
Human health risks from chemicals

In general terms, risk depend on:

- The **amount of a chemical** present in an environmental media (e.g., soil, water, air, food) or a product (e.g. commercial, industrial);
- The **amount of contact** (exposure) a person has with the pollutant in the environmental media or product; and
- The **toxicity** (hazardous properties) of the chemical.

➢ Obtaining information to describe these three factors is the cornerstone or foundation of most human health risk assessments related to chemicals.

Risk Analysis Paradigm



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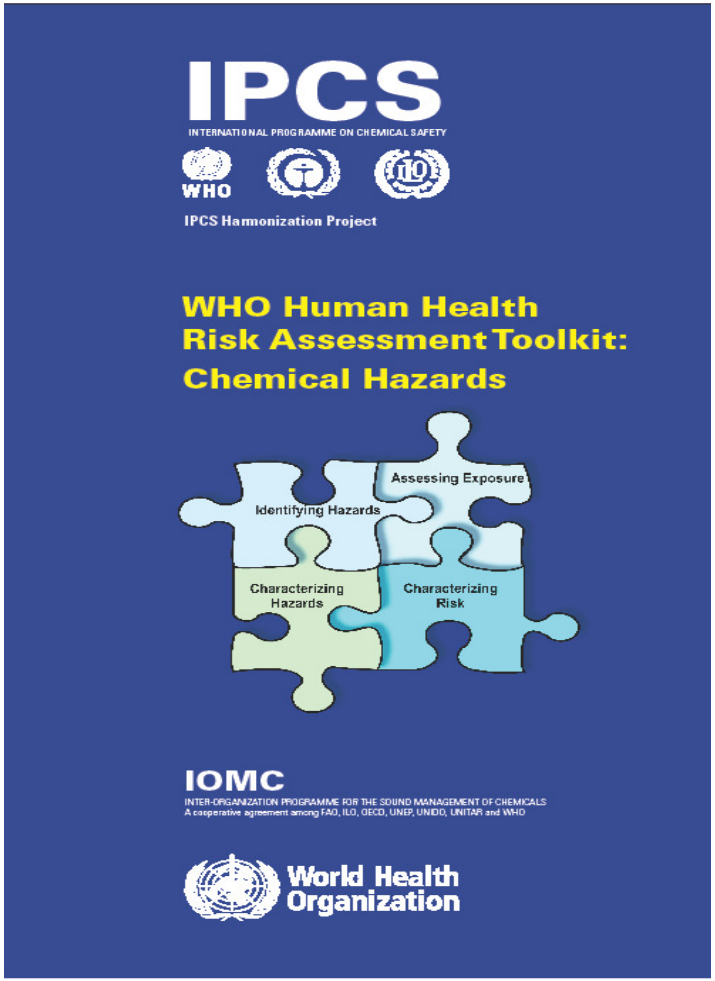

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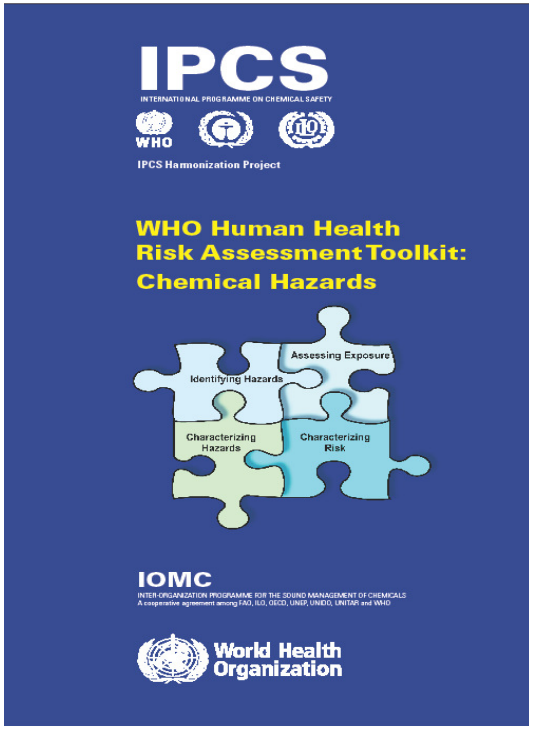
Purpose and intended audience of the Toolkit

- Assist its users with the performance of human health risk assessments.
- Promotes the use of information developed by international organizations.
- Designed for addressing different risk assessment scenarios.
- Aimed at those conducting and using risk assessments (scientific and lay professionals).
- Targeted at developing countries and countries with economies in transition.
- However, it is of use for everyone involved in RA.



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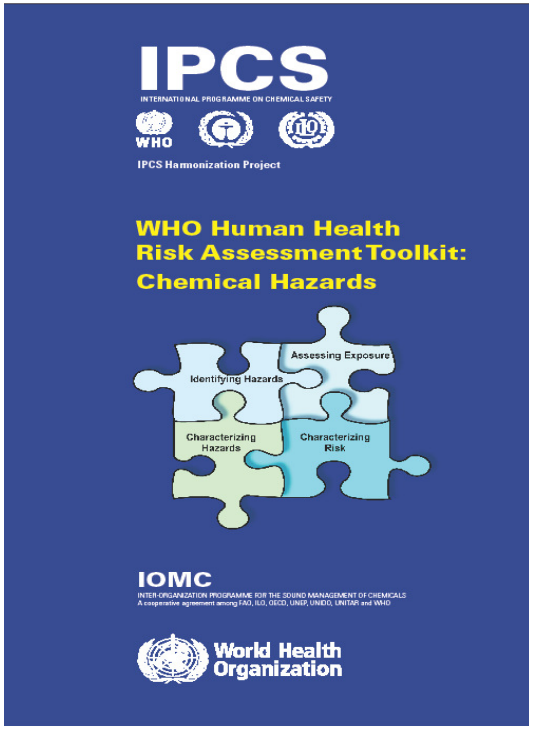
Content of the Toolkit

- Provides **road maps** for conducting human health risk assessments;
- Identifies **information** that should be gathered to complete an assessment;
- Lists **references** and provides links to **websites** for international resources from which an assessor can obtain information and methods essential to a risk assessment; and
- Provides **case studies** that illustrate how the Toolkit can be used to address a health risk assessment question.



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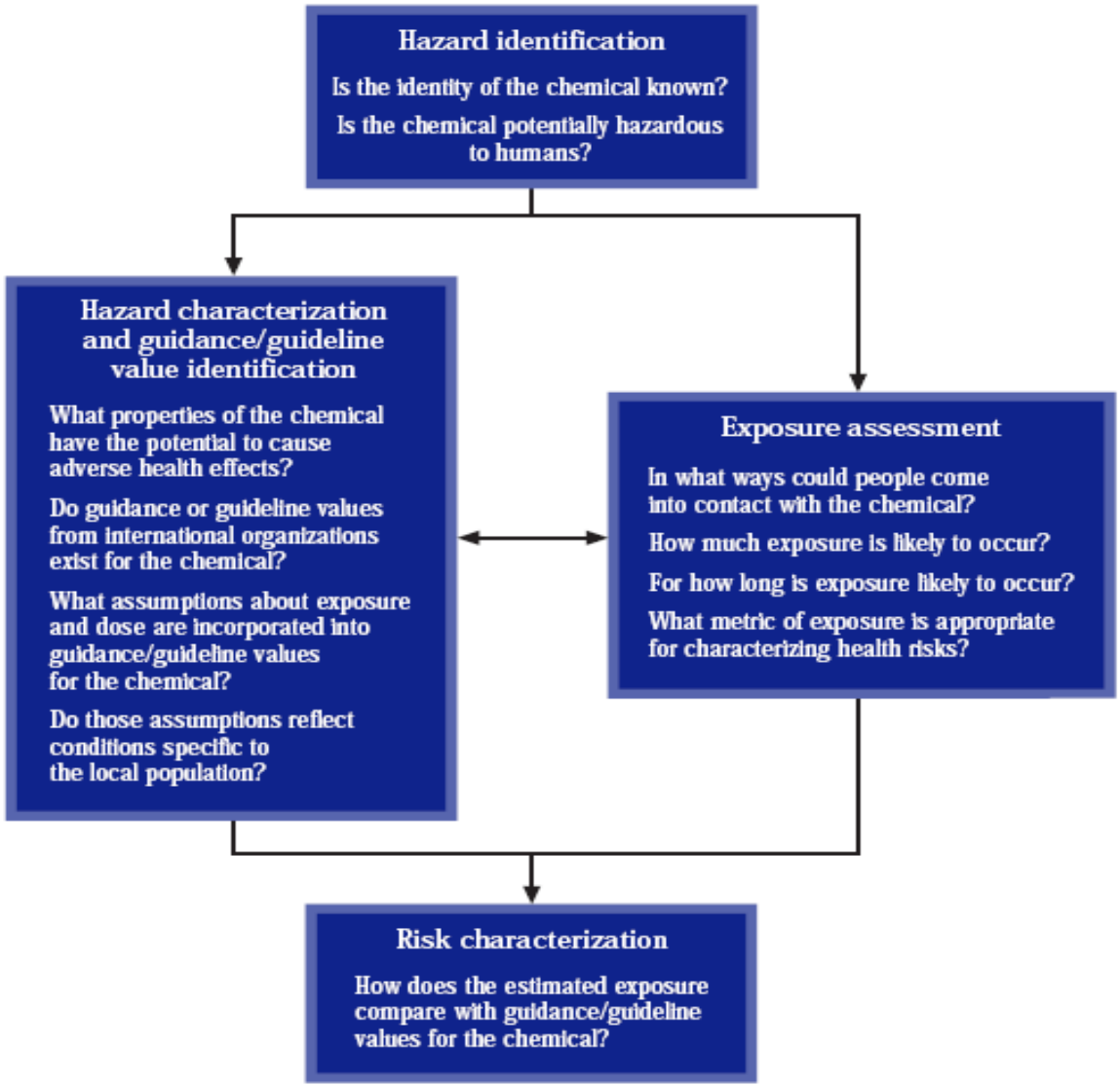
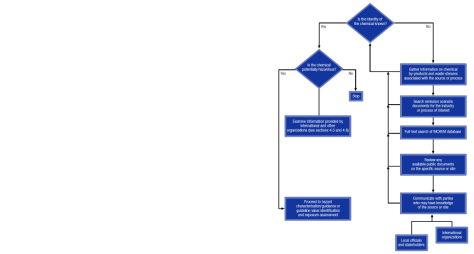
Tiers of Risk Assessment included in the Toolkit

Tier	*Description*
1: Screening	Existing hazard and exposure data from international sources
2: Adaptive	Existing hazard data from international sources reflecting local conditions; existing local exposure data
3: Modelling or field-based	Existing hazard data from international sources; new local exposure data
4: De novo	Locally conducted hazard and exposure assessments

Overall Generic Roadmap of the Toolkit

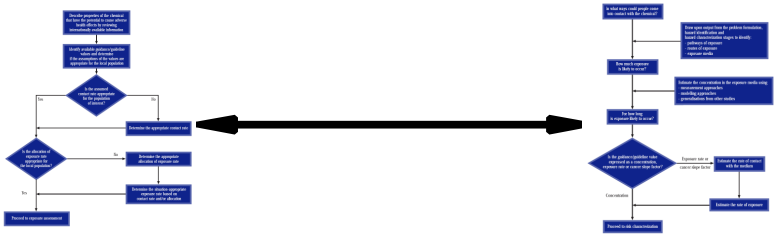


Roadmaps by stage of the risk assessment

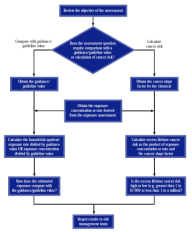


Road map for Hazard identification

Road map for Hazard characterization/ Guidance value identification



Road map for Exposure assessment



Road map for Risk characterization

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Resources – weblinks in theToolkit

- Directories of resources
- Generic resources on risk assessment
- Chemical-specific resources
  - *Hazard identification resources*
  - *Hazard characterization/ guidance or guideline value resources*
  - *Exposure assessment resources*
  - *Risk characterization resources.*

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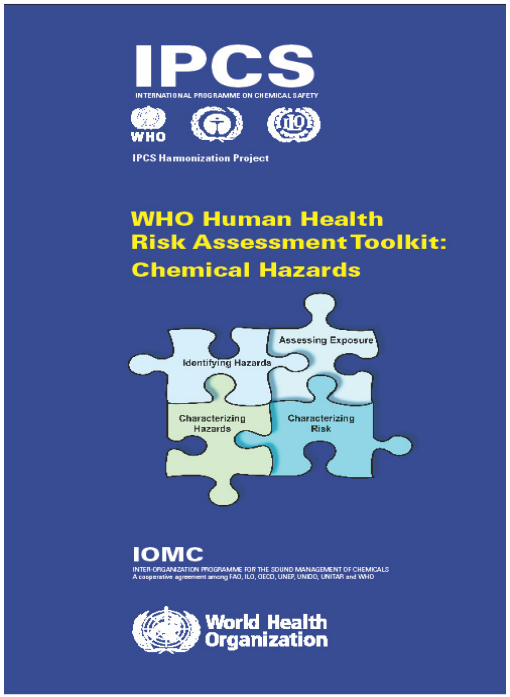
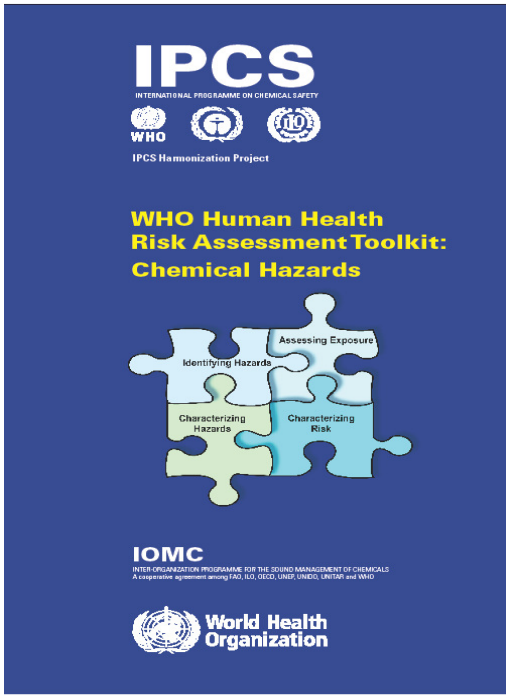
Hazard identification resources



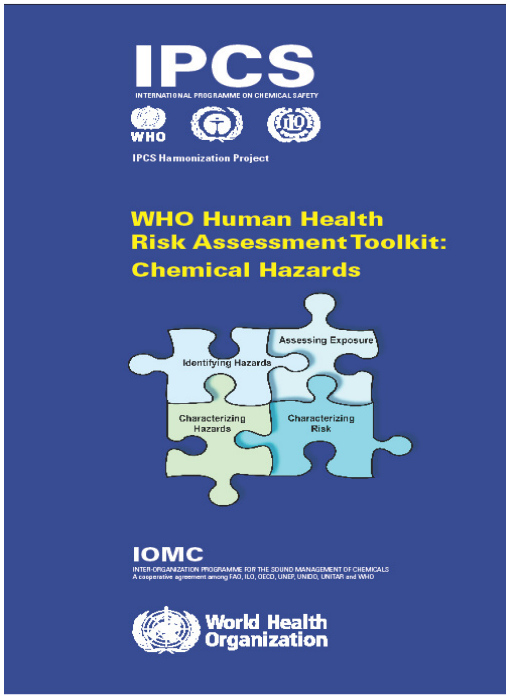
Resource
International Chemical Safety Cards
Screening Information Datasets for High Production Volume Chemicals
WHO Recommended Classification of Pesticides by Hazard
UN Recommendations for the Transport of Dangerous Goods
IARC monographs
Hazardous Substances Data Bank
European Chemical Substances Information System
EU Classification and Labelling System
International Chemical Control Toolkit

Guidance values developed by international organizations



Guidance value	*Organization*
Acceptable daily intake (ADI)	FAO/WHO
Acute reference dose (ARfD)	FAO/WHO
Tolerable daily intake (TDI)	FAO/WHO
Provisional tolerable weekly intake (PTWI)	FAO/WHO
Provisional tolerable monthly intake (PTMI)	FAO/WHO

Guideline values developed by international organizations



Guidelines	*Organization*
Drinking-water quality guideline values	WHO
Air quality guidelines	WHO
Maximum residue limits (MRLs) of pesticides in food	FAO/WHO
Maximum limits (MLs) of contaminants in food	FAO/WHO

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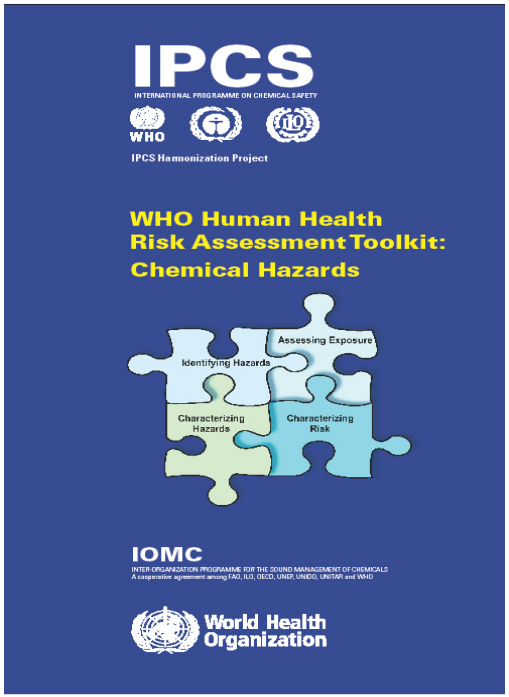
Resources – weblinks in theToolkit (cont'd)



Harmonization Project Document No. 8

FAO/WHO (2004) *Safety evaluation of certain food additives and contaminants*. Prepared by the sixty-first meeting of the Joint FAO/WHO Expert Committee on Food Additives (JECFA). Geneva, World Health Organization, International Programme on Chemical Safety (WHO Food Additives Series, No. 52; http://whqlibdoc.who.int/publications/2004/924166052X.pdf, accessed 19 August 2010).

FAO/WHO (2006) *Evaluation of certain food contaminants*. Sixty-fourth report of the Joint FAO/WHO Expert Committee on Food Additives (JECFA). Geneva, World Health Organization, International Programme on Chemical Safety (WHO Technical Report Series, No. 930; http://whqlibdoc.who.int/trs/WHO_TRS_930_eng.pdf, accessed 19 August 2010).

FAO/WHO (2008) *Dietary exposure assessment of chemicals in food*. Report of a Joint FAO/WHO Consultation, Annapolis, MD, 2–6 May 2005. Geneva, World Health Organization (http://whqlibdoc.who.int/publications/2008/9789241597470_eng.pdf, accessed 19 August 2010).

FAO/WHO (2009) *Principles and methods for the risk assessment of chemicals in food*. Geneva, World Health Organization (Environmental Health Criteria 240; http://www.who.int/ipcs/food/principles/en/index1.html, accessed 21 September 2010).

FAO/WHO (2010a) *Evaluations of the Joint FAO/WHO Expert Committee on Food Additives (JECFA)*. Geneva, World Health Organization, International Programme on Chemical Safety (http://apps.who.int/ipsc/database/evaluations/search.aspx, accessed 19 August 2010).

FAO/WHO (2010b) *Pesticide residues in food: maximum residue limits, extraneous maximum residue limits*. Rome, Food and Agriculture Organization of the United Nations, FAO/WHO Food Standards Programme, Codex Alimentarius Commission (http://www.codexalimentarius.net/mrls/pestdes/jsp/pest_q-e.jsp, accessed 19 August 2010).

FAO/WHO (2010c) *Joint FAO/WHO Meeting on Pesticide Residues (JMPR) publications*. Geneva, World Health Organization, International Programme on Chemical Safety (http://www.who.int/ipcs/publications/jmpr/en/, accessed 19 August 2010).

Feng Y, Liu D, Zhang G, Li J, Sheng G, Fu J (2009) Measurements of black and organic carbon emission factors for household coal combustion in China: implication for emission reduction. *Environmental Science & Technology*, 43(24): 9495–9500.

HSDB (2010) *Hazardous Substances Data Bank*. Bethesda, MD, National Institutes of Health, National Library of Medicine, Toxicology Data Network (TOXNET) (http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?HSDB, accessed 19 August 2010).

HSE (2005) *EH40/2005 workplace exposure limits containing the list of workplace exposure limits for use with the Control of Substances Hazardous to Health Regulations 2002 (as amended)*. Surrey, United Kingdom Health and Safety Executive (http://www.hse.gov.uk/pubns/priced/eh40.pdf, accessed 19 August 2010).

IARC (1999) *Some industrial chemicals and dyestuffs*. Lyon, International Agency for Research on Cancer (IARC Monographs on the Evaluation of Carcinogenic Risks to Humans,

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INCHEM

Chemical Safety Information from Intergovernmental Organizations

Search options:

Full-text Search

Example: kidney <AND> DDT

Search

Chemical Identity Search

CAS Number

Example: 103-89-3

OR

Chemical Name or Synonym

Example: Toluene

Search

Advanced Search

- About IPCS INCHEM
- Help
- Disclaimer

Rapid access to internationally peer reviewed information on chemicals commonly used throughout the world, which may also occur as contaminants in the environment and food. It consolidates information from a number of intergovernmental organizations whose goal it is to assist in the sound management of chemicals.

Browse content using links below:

- Concise International Chemical Assessment Documents (CICADs)
- Environmental Health Criteria (EHC) Monographs
- Harmonization Project Publications
- Health and Safety Guides (HSGs)
- International Agency for Research on Cancer (IARC) - Summaries and Evaluations
- International Chemical Safety Cards (ICSCs)
- IPCS/CEC Evaluation of Antidotes Series
- Joint Expert Committee on Food Additives (JECFA) - Monographs and Evaluations
- Joint Meeting on Pesticide Residues (JMPR)
- Kemi-Riskline
- Pesticide Documents (PDs)
- Poisons Information Monographs (PIMs)
- Screening Information Data Set (SIDS) for High Production Volume Chemicals
- UK Poison Information Documents (UKPID)

Case studies in the Toolkit

Water pollution

Air pollution

Pesticide use

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Training projects that use the WHO Toolkit

- *SAICM QSP Project on risk assessment at national level in a global context, Armenia, Ghana, Chile*.
  Federal University of Zurich, Switzerland (project leader).
- *Annual training course on risk assessment and management of chemicals*.
  Chulabhorn Research Institute (CRI), Bangkok, Thailand.
- *SAICM QSP Project on distance learning tool for the assessment of risk from the use of chemicals*.
  Chulabhorn Research Institute (project leader).
- *Risk ASSETs: Development of European Training Programme on risk assessment*.
  Health Protection Agency, United Kingdom (project leader).
- Others, e.g. in the context of the International Health Regulations (2005).

Summary

- Chemical production and use is increasing world wide. New and more chemicals enter societies while they are developing.
- The use and production of chemicals require countries to address related health risks.
- Human health risk assessment is critical to describe health risks related to chemicals.
- The WHO Human Health Risk Assessment Toolkit helps its users to identify internationally produced technical information and provides guidance on how to use it in a local/national chemical risk assessment context.

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www.who.int/environmental_health_emergencies/en/index.html

www.who.int/ipcs/emergencies/chemical_incidents/en/index.html

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