The Public Health Management of Chemical Incidents

Hazard and Risk

Professor David Russell,
The WHO Collaborating Centre for Chemical Incidents,
Cardiff, Wales, UK

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Hazard and Risk

Hazard

- "*A property or situation that in particular circumstances could lead to harm*."

Risk

- " *A combination of the probability, or frequency, of occurrence of a defined hazard and the magnitude of the consequences of the occurrence*."

Labelling

- Built on 16 physical, 10 health and 3 environmental hazard classes:
- Explosives
- Flammable
- Oxidants
- Gaseous
- Corrosive
- Toxic (dermal, respiratory, oral)
- Health hazard (carcinogen, mutagen, reprotoxic)
- Environment

Meaning and Expression of Risk-the probability of an adverse outcome

- A Risk analysis consists of answers to the following questions:
  - *What can happen?*
  - *How likely is it that will happen?*
  - *If it does happen, what are the consequences?*
  - *How do we prevent these consequences?*

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Context of risk

- Chemicals produced, stored and transported in vast quantities.
- Many are hazardous.
- Public health impact potentially significant.Therefore a risk is involved.
- Need to emergency plan and prepare in a risk-prioritised fashion.
- Requires prior risk assessment.

Chemicals are not without risk…

"Fears over impact of chemical plant"

"Tanker accident starts chemical alert"

"Five in hospital after chemical spill"

"Hospitals 'unready' for chemical alert"

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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.**

Capabilities: Considerations

- 24/7/365 access to expertise
- Multi-disciplinary:
  - ✓ Environmental chemistry
  - ✓ Environmental toxicology
  - ✓ Risk assessment
  - ✓ Public health
  - ✓ Clinical medicine
  - ✓ Laboratory medicine
  - ✓ Risk/crisis communication

TRANSPORT OF CHEMICALS

Each year > 4 billion tonnes hazardous chemicals moved around world by road, rail, pipeline, sea and air

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Risk and Impact

- Risk of exposure from chemicals

- Accidents at installations, during transportation, conduit through pipelines.

- Deliberate release and chemical terrorism a possibility

- All environmental media may be contaminated

- Number of scenarios is almost infinite

- Health effects may be acute and chronic.

- Essential to risk assess, prioritise, mitigate and plan/prepare

High Production Volume Chemicals (HPVs)

- Manufactured or imported in large quantities.
- >1 million pounds per annum by weight (USA).
- Produced or imported in volumes greater than 1000 tonnes per year (Europe)

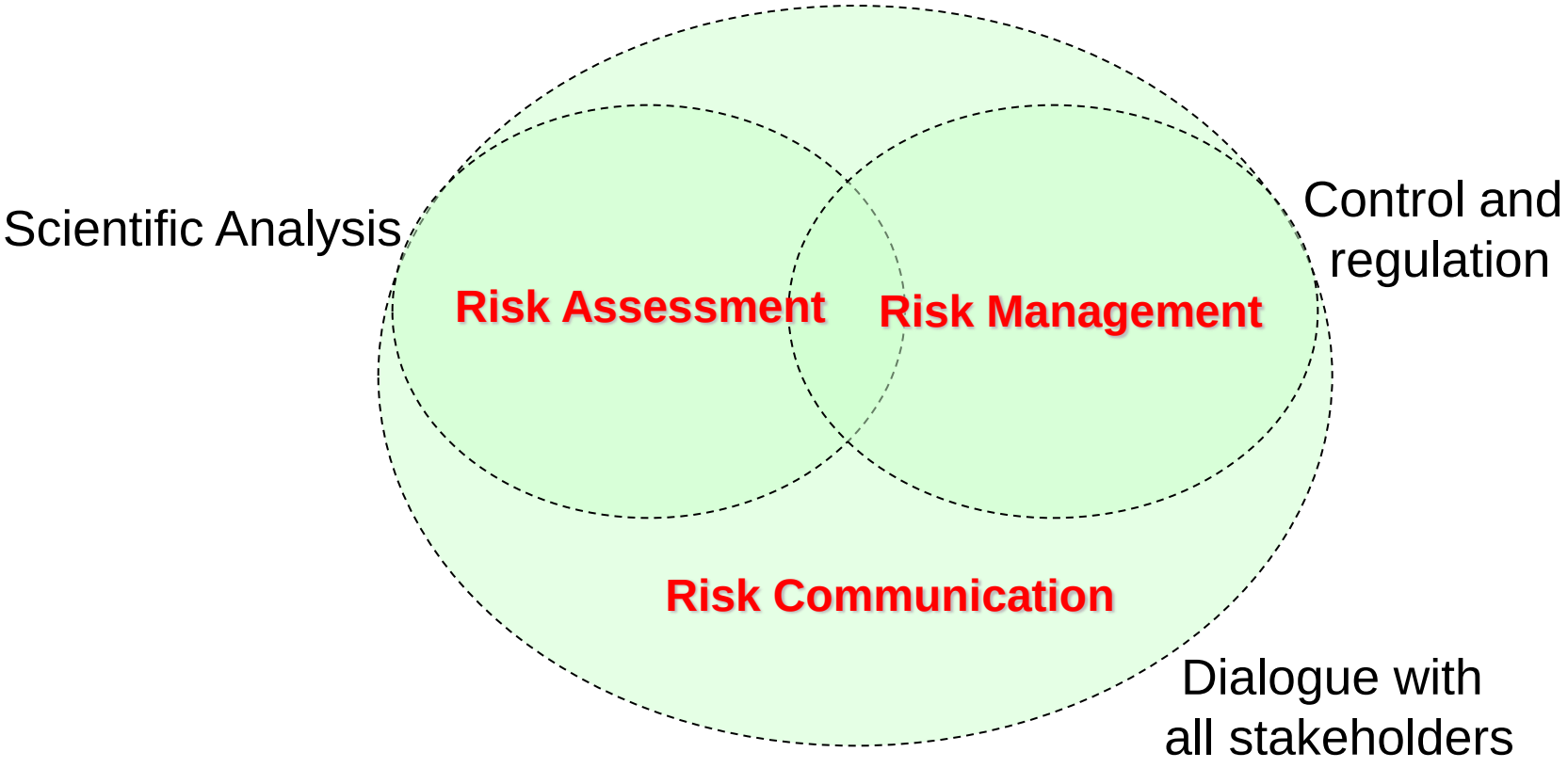
TOXIC INDUSTRIAL CHEMICALS

- Manufactured, stored and utilised throughout world
- Gas, liquid or solid
- Highly toxic
- Large quantities
- Chemical hazards
- Physical hazards

TICs: Examples

Ammonia	**Carbonyl sulphide**	**Methyl isocyanate**	**Cyanogen chloride**
Chlorine	**Arsenic trichloride**	**Parathion**	**Sulphuric acid**
Hydrogen chloride	**Nitric acid**	**Phosphine**	**Ethylene dibromide**
Hydrogen fluoride	**Phosgene**	**Hydrogen sulphide**	**Phosphorous trichloride**
Hydrogen cyanide	**Sulphur dioxide**	**acrolein**	**Fluorine**

Risk Analysis Paradigm



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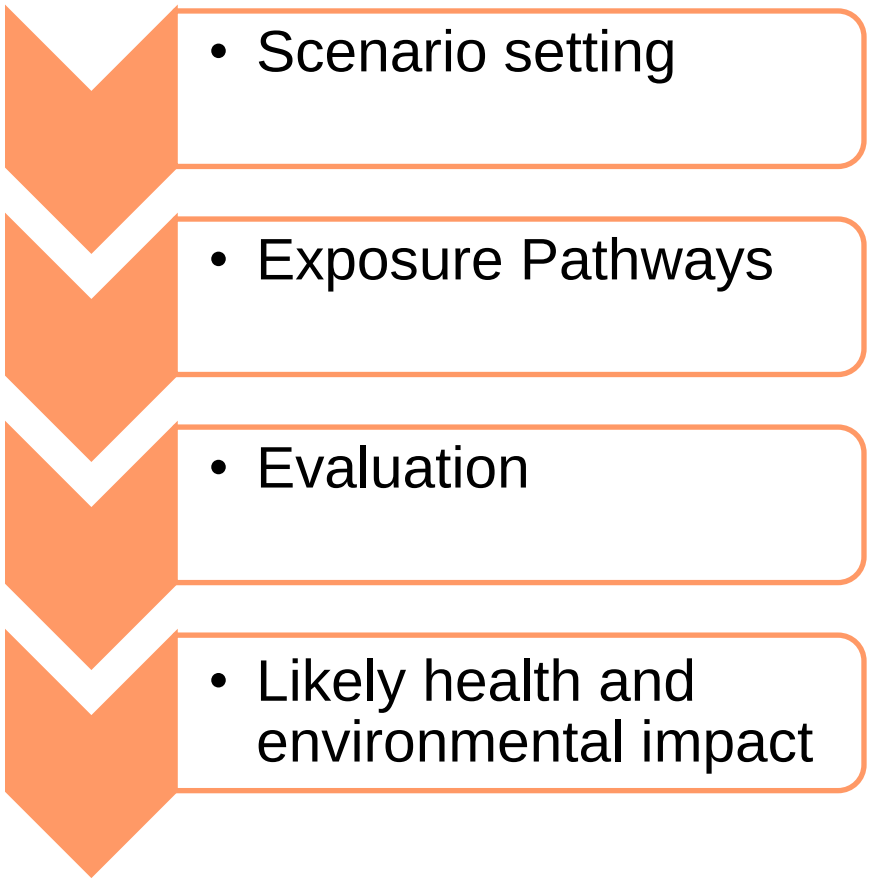
RISK MANAGEMENT

- The deliberate alteration of risk to increase or decrease the probability of occurrence.

Planning: Community Impact assessment

- Local public health responsibility
- Relies on model projections of releases
- Qualitative/quantitative



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Community Impact assessment

- Scenario

-scenario development for installations and transport

Exposure Pathways

-Likely transport media elucidated. Vulnerable zone elucidation.

Population vulnerability

-Numbers and sensitive sub-populations

Health Impact

-Based on above to estimate total number of casualties. Forms basis of requirements

Evaluation

-Probability of occurrence

Immediate Health Impact assessment

- Symptoms may occur with short latency, therefore dynamic risk assessment vital.

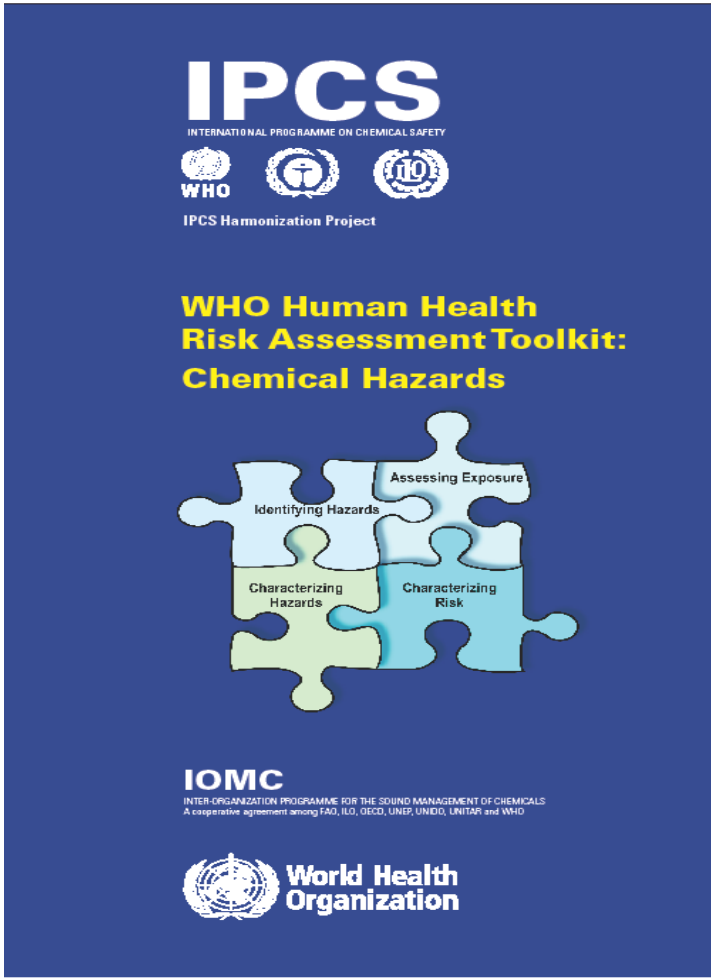
- May be difficult to identify chemicals initially, exposure and thus health impact.

- Exposure assessment based on knowledge of chemicals released, environmental interactions, modelling, monitoring and exposure guidelines.

- Base management on risk assessment-fire management, evacuation or shelter etc.

Risk and Health Outcome assessment

- Production of exposure index, product of numbers exposed and degree of exposure.
- May involve questionnaires, environmental and biological measurements.
- Health impact should be assessed immediately after a chemical incident.
- May lead to subsequent epidemiological studies



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