

Workshop on Case Studies in the Sound Management of Chemicals

➤ Chapter « Trends »

- ✗ Trends in Production and Consumption
- ✗ Impacts on health
- ✗ Data on Environmental effects

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1. Trends in the Production and Consumption of Synthetic Chemicals

- Trends in the global chemicals industry described in various sources
- Reports focus on the producers and formulators of chemicals and chemical products, and do not include the mining, petroleum and manufacturing sectors
- Most data available are from OECD countries
- There is little reliable data from developing countries, and even less of issues such as illegal trade

1. Trends in the Production and Consumption of Synthetic Chemicals (Cont'd)

- Data presented here has been extracted from:
 - The OECD *Environmental Outlook for the Chemicals Industry*, published in 2001
 - The *OECD Environmental Outlook to 2030*, published in 2008
 - The *ICCA Review 2007-2008*, published in 2008

1. Trends in the Production and Consumption of Synthetic Chemicals (Cont'd)

- Most data on the size of the chemical industry is based on sales
- Not a direct measure of quantities
- High-value chemicals are usually produced in smaller amounts but account for a larger proportion of the value of sales

Main features of the chemicals industry

- 1970-2001: 9x increase in global sales
- In 1998 the chemicals industry accounted for:
 - 7% of global income
 - 9% of international trade
 - Total sales estimated at US\$1,500 billion
- Total sales have increased significantly within a decade
 - in 2007, the turnover for the global chemical industry was US\$ 3,180 billion.
 - Pharmaceuticals accounted for around 1/3 of this total

Main features of the chemicals industry (Cont'd)

- The globalization in chemicals industry is also evident in the increase in trade
 - 1998-2007: world trade almost tripled to US\$ 1,380 billion (ICCA; 2008)
 - About 45% of the value of the global chemical industry
 - Over 35% of this world trade is intra-company in nature

Other features of the Chemicals industry

- The chemicals industry expected to grow over the next 20 years at a rate of 3-4 percent per year
- Most production and trade in chemicals occurs in and among OECD countries and will continue to do so for the foreseeable future
- Production and consumption will grow much faster in non-OECD countries than OECD ones, reducing the overall share of the OECD countries in this sector
- The main growth centers of chemical sales and production are in emerging economies of Asia
- Trade in chemicals is expected to continue to increase

Other features of the Chemicals industry (Cont'd)

- Almost 80% of global chemicals production is located in just 15 countries:
 - The US, Japan, Germany, China (including Taiwan), France, the UK, Italy, Korea, Brazil, Belgium/Luxembourg, Spain, the Netherlands, Switzerland and Russia
- Countries with important chemical manufacturing outside the OECD include the BRIICS countries:
 - Brazil, Russia, India, Indonesia, China, and South Africa
 - other countries with a rapidly growing chemical sector include Argentina, Malaysia, Saudi Arabia, Singapore, and the Philippines
- Chemical companies in OECD countries will concentrate more and more on life-science and speciality chemicals
- Chemical producers are likely to merge, which will result in larger and fewer multinational companies

2. Health and environmental effects of chemicals:

Impact of chemicals on health

- The overall burden of death and disease from chemicals is not well known
- The World Health Organization is currently preparing a publication on the burden of disease attributable to chemicals
- The chapter is based on information published to date
- The 2002 WHO World Health Report and the various Global Burden of Disease reports have examined the environmental contributions to mortality and burden in the world population
- The reports highlight the large and preventable exposures such as safe drinking water and sanitation, urban air pollution and indoor pollution from cooking stoves

Impact of chemicals on health (Cont'd)

- Due to data limitations, it has only been possible to quantify the total burden of disease due to exposure for a few agents (asbestos and lead)
- Data is more readily available and reliable for acute illnesses and deaths due to massive or extremely toxic exposures (i.e. chemical plant explosions, or pesticide ingestion leading to death)
 - 1 to 5 pesticide poisoning estimated each year
 - underreporting of both acute non-fatal pesticide poisoning and deaths due to accidental or intentional pesticide ingestion
 - children face higher risks from pesticides than adults and need greater protection against these chemicals, particularly in DCs

Impact of chemicals on health (Cont'd)

- WHO information provides an indication of the contribution of chemical exposures to the incidence of certain diseases
- Where better data are available, the contribution of chemical to exposure is important (poisonings and suicide)
- It is likely that current data underestimates the overall contribution of chemicals to adverse health impacts
- While not all occupational diseases are due to exposures to chemicals, the workplace is often an area where the highest exposures occur, and thus chemicals likely contribute to some of the health outcomes from this sector
- The burden of illness from outdoor air pollution is estimated from exposures to particles and some major pollutants such as ground-level ozone; it is also likely that some of the impacts seen are related to exposures to toxic chemicals

Impact of chemicals on health (Cont'd)

- The WHO 2006 report estimates that:
 - 42 % of chronic obstructive pulmonary disease (COPD) is attributable to environmental risk factors such as occupational exposures to dust and chemicals, as well as indoor air pollution from household solid fuel use
 - 5 % (2-10%) of all congenital anomalies are attributable to environmental causes
 - About 9% of the disease burden of lung cancer has been attributed to occupation
 - 2 % of the leukaemia disease burden was attributed to occupational exposures to chemicals
 - 19 % (12-29 %) of all cancers were estimated to be attributable to the environment
 - 2 % of the ischaemic heart disease burden and 3% of the cerebrovascular disease burden could be related to lead exposure
 - 68 % (46-84 %) of poisonings in adults were attributable to occupation or the environment
 - 85 % (60-98 %) of poisonings in children were related to exposures to chemicals, including pharmaceuticals, often because they were not stored properly

Impact of chemicals on health (Cont'd)

- Many other effects could be related to environmental exposure to pesticides or other chemicals
 - risks to infant health, increasing the mortality rate for low-birth-weight and preterm infants, and congenital anomalies due to parental exposures to chemicals
- Many health conditions have a small-to-moderate link to the environment or occupation
- But uncertainty surrounding these estimates
 - due to the incompleteness of evidence linking specific environmental and occupational exposures to various cancers
 - In addition, available data only allow for a limited number of cancers to be addressed

Data on environmental effects of chemicals

- Chemicals can also have an adverse impact on the environment
- A few areas of potential impacts are highlighted in the chapter: the atmosphere, water, soil, and biodiversity
- Effects on these components of the environment can have a negative impact on ecosystem services valuable to people and society

Data on environmental effects of chemicals (Cont'd)

➤ *Atmosphere*

- Chemicals affect all important aspects of atmospheric resources: they can act as air pollutants; contribute to acid rain formation; and can act as greenhouse gases and ozone depleters
 - Additional chemicals continue to be identified as ozone depleters. (for example, the significant ozone depleting potential of nitrous oxide was not understood until recently)
 - Hazardous air pollutants enter the atmosphere from industrial emissions, the use and disposal of products and at other points in the chemical life cycle
 - Information on the atmospheric impacts of chemicals is available from a variety of sources. Air pollution data are available for many regions.

Data on environmental effects of chemicals (Cont'd)

➤ *Water resources*

- Chemical contamination of water resources is a world-wide problem that has been documented extensively
 - Impacts include cancers and endocrine disruption in aquatic animals; loss of invertebrate biodiversity; and other, related effects.
 - Small amounts of some individual chemicals have the potential to contaminate vast amounts of water (lindane, now listed in the Stockholm Convention).
 - Plastic waste has become a major contaminant in oceans.
 - These and other impacts could be enumerated in detail, and extensive documentation is available on each.

Data on environmental effects of chemicals (Cont'd)

➤ *Soil resources*

- Industrial chemicals contaminate soil in urban as well as industrial settings
 - Metals, solvents and other toxic substances contaminate many operating and abandoned industrial sites
 - “Soils contaminated with cadmium are a serious problem in many Asian countries, where cadmium enters the food supply, especially rice; more than ten percent of China’s arable land is contaminated with cadmium.” (CIEL; 2008)
 - Agricultural chemicals deplete soil resources
 - For example, use of insecticides and fungicides kills beneficial microorganisms, decreasing ecosystem resilience and reducing soil fertility

Data on environmental effects of chemicals (Cont'd)

➤ *Biodiversity*

- Persistent and bioaccumulative chemicals are found as widespread contaminants in wildlife, especially those that are high on the food chain
 - Cause cancers, immune dysfunction, and reproductive disorders in wildlife
 - These effects can contribute to species extinction

Data on environmental effects of chemicals (Cont'd)

➤ *Agriculture*

- The use of chemical fertilizers and pesticides can boost agricultural productivity under some circumstances, but are also associated with losses in agriculture:
 - Can lead to severe pest outbreaks by damaging natural predator populations
 - Studies have documented a pattern in which pesticide use can lead to an initial burst of productivity followed by a long period of diminished productivity
 - Farmers frequently become trapped in a “vicious cycle”.
 - Can also deplete soil fertility by reducing populations of beneficial soil micro-organisms
 - In addition, studies have found that farming populations in developing countries sometimes experience diminished productivity due to illnesses resulting from pesticide exposures
- Other impacts of pesticides include
 - erosion of biodiversity, reduced populations of pollinators and other beneficial insects, and contaminated fish, birds, and wildlife.

Data on environmental effects of chemicals (Cont'd)

➤ *Fisheries*

- Fisheries, an important source of protein and of economic value for populations around the world, can be severely affected by chemicals:
 - Persistent organic pollutants can accumulate in fish, especially those high in the food chain
 - Chemicals can also destroy fish populations (industrial and agricultural run-off, lower-level chemical contamination of water bodies decimating fish populations over time)
 - Chemical contamination is also associated with disease in fish populations, including cancers and increased vulnerability to infectious agents
- Given the economic value of fisheries worldwide, significant economic losses may result

➤ **Chapter « Trends »**

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Thank you for your attention!