Why do we need chemicals control - benefits and cost of inaction

Eva Sandberg

International Unit

An integral part of daily life, chemicals are central to all economies

Why do we need chemicals control?
Benefits of Chemicals

- **Chemicals are part of every day's life**
  - In a modern society we can not live without functions such as cleaning agents, pesticides and fertilizers, plastics or petrol
  - For these functions we rely on chemicals
  - Chemicals are used in virtually every sector of modern society as such or as components of articles

Why do we need chemicals control?
How many are there?

- Chemicals are part of every day's life
- **There are tens of thousands of chemical substances on the market**
  - No one really knows how many!
  - EU 2003 estimation of substances on the market in quantities over 1 tonne: **30 000**
  - Pre-registrations in EU/REACH about
    143 000 substances (not a true figure for what is used)
  - Swedish product register, substances ≥ 0,1 tonne: **~14 700**

Why do we need chemicals control?
Production volumes are increasing!

- Chemicals are a part of every day's life
- There are many chemical substances on the market
- **The production volumes are high and they are increasing**
  - World production of chemical substances
    - 1950: About 7 000 000 tonnes
    - 2000: About 400 000 000 tonnes
  - Annual global sales doubled 2000-2009,
  - OECD countries part decreased 77% ☞ 63%
  - BRIICS part increased 13% ☞ 28%

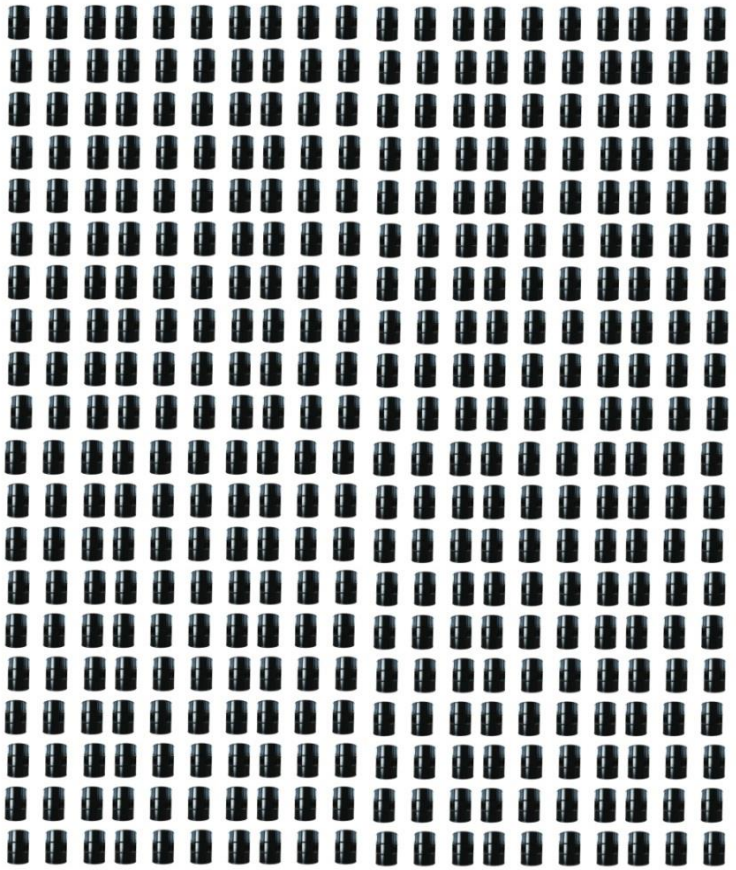
Global chemicals production

Global chemical output:

- **1970: US$171 billion**
- **2010: US$4.12 trillion**

2000
400 million tonnes/yr

1950
7 million tonnes/yr



Källa: European Commission, 2001.

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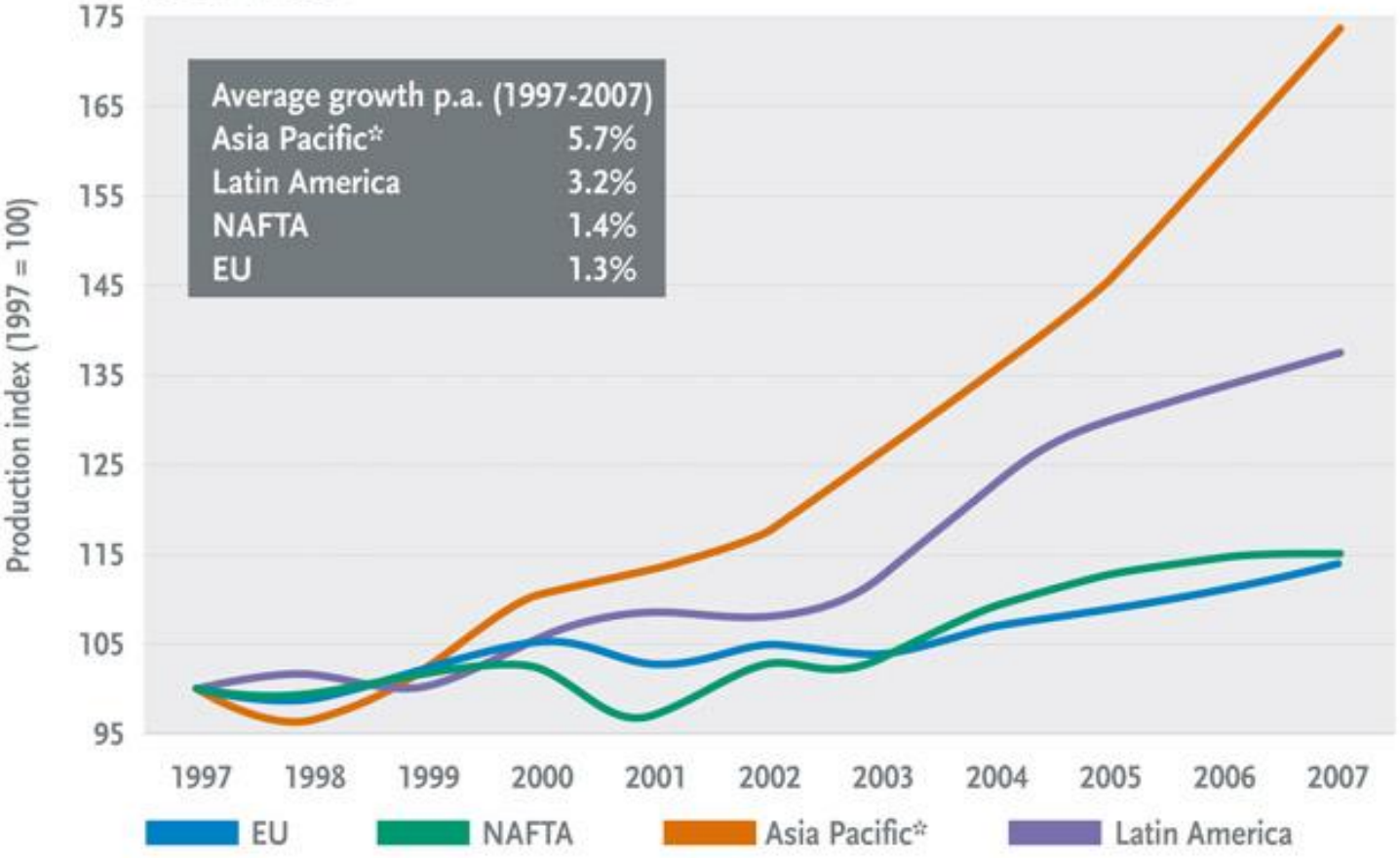
Chart 3.5: International comparison of production growth of the chemicals industry

1997-2007



Source: Cefic Chemdata International
*Asia Pacific includes Japan, China, India, Korea, Malaysia, Philippines, Singapore, Taiwan, Thailand, Pakistan, Bangladesh and Australia

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Chemicals intensification of the economy

Table 1: Chemical Production:
Predicted Annual Growth Rates, 2012-2020

	Percent change, 2012-2020	
North America	**25%**	
United States		25%
Canada		27%
Mexico		28%
Latin America	**33%**	
Brazil		35%
Other		31%
Western Europe	**24%**	
Emerging Europe	**35%**	
Russia		34%
Other		36%
Africa & Middle East	**40%**	
Asia-Pacific	**46%**	
Japan		22%
China		66%
India		59%
Australia		23%
Korea		35%
Singapore		35%
Taiwan		39%
Other		44%

Source: Percentages calculated based on projections in Thomas Kevin Swift et al., "Mid-Year 2011 Situation & Outlook." American Chemistry Council, June 2011.

- **Change in production and use of chemicals towards developing countries**
- **Only 10% of National Development Plans surveyed in 2009 prioritized sound chemicals management**

Why do we need chemicals control?
Global Trade Influence

- Chemicals are a part of every day's life
- There are many chemical substances on the market
- The production volumes are high and they are increasing
- **Chemical substances are spread globally with trade – as such or in articles**

Increasing trade of chemicals

Huge article flows in the society

huge material flows

large flows of chemicals

chemical risks to H&E

Why do we need chemicals control?
Exposure

- Chemicals are a part of every day's life
- There are many chemical substances on the market
- The production volumes are high and they are increasing
- Chemical substances are spread globally with trade – as such or in articles
- **People are exposed to chemicals at work, at home and through the environment**

Ways of exposure

	Direct exposure	Exposure via the environment
• Workplace during production	X	X
• Use at home	X	X
• Recycling and Waste handling	X	X

Consumption of chemicals during production
(kg chemicals/kg clothes)

	Average	Best case	Worst case
T-shirt	3,0	2,0	4,1
Jeans	2,4	1,5	3,6
Trousers	1,9	1,6	2,5
Sweater (viscose)	5,5	3,6	4,2
Sweater (fleece/Polyester))	2,8	2,4	3,2

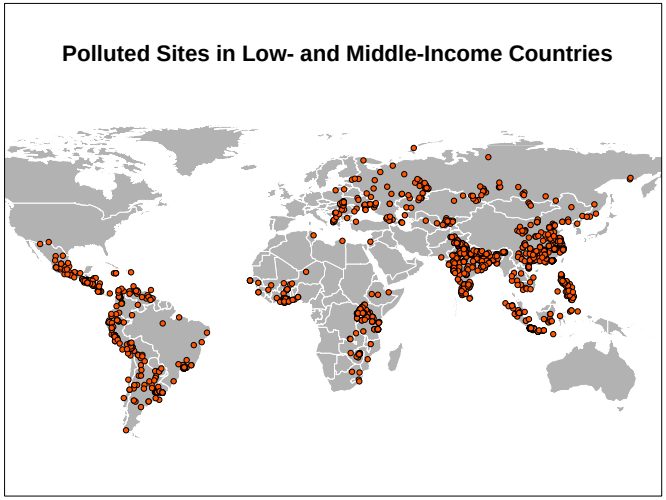
18 % lead in a children's chalk

0,5 % or more = poison!

Kemikalieinspektionen, Kemikalier i leksaker, Tillsyn 1/2006

A New Under-Recognized Global Epidemic

- As many as 200 million people exposed
  - at **dangerous** levels
  - in the low- and middle-income countries.
- Wealthy countries
  - shifted manufacturing and mining overseas
  - poorer countries have inadequate pollution controls.
- Poorest bear the burden
- Smaller local companies, abandoned sites, or artisanal sites are the main source of exposure – <u>not multinationals.</u>



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Chemicals and Waste

- Is best understood by thinking about the places where people (especially children) are harmed
- Solutions can then be designed appropriately
  - Regulation, enforcement, controls
  - Education
  - Remediation
- **Focus on prevention before remediation**
- Polluter pays (where possible)

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Waste

- Locally
- Globally
- In Nigeria alone an estimated 500 containers of computers and other electronic equipment come every month - all of which ends up in computer markets.

(UNEP: STUDY ON THE POSSIBLE EFFECTS ON HUMAN HEALTH AND THE ENVIRONMENT IN AFRICA OF THE TRADE OF PRODUCTS CONTAINING CADMIUM, LEAD AND MERCURY. 2008)

Impacts on Poverty & Economic Growth

- Poor disproportionately impacted, especially women, fetuses and children
- Exposures can cause long-term developmental and health problems
- Toxic chemicals can bioaccumulate up the food chain, impacting agricultural production
- Urban contamination can drive down property value and economic investment potential

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Poisoning Events: Recent Examples in Developing and Transition Countries - Africa

- *Angola* In 2007, an outbreak of acute neurologic disease among 467 individuals was attributed to poisoning with sodium bromide (commonly used in the oil drilling industry there).
- *Ivory Coast* In 2006, 8 deaths and about 85,000 health-related consultations resulted from the dumping of petrochemical toxic waste in a suburb of Abidjan
- *Senega*l Between November 2007 and March 2008, **18 children died** from lead poisoning in the suburbs of Dakar that was engaged in the recycling of used lead-acid batteries.
- *Tanzania* An NGO survey of 120 farmers showed that during the farming season from December 2006 to March 2007, 69 per cent had experienced pesticide poisoning; 22 per cent had experienced poisoning symptoms more than three times during the season. Poisonings most commonly occurred after using profenofos, mancozeb and endosulfan.

Poisoning Events: Recent Examples in Developing and Transition Countries ctd - Asia

- *Bangladesh* In 2010, an annual government survey revealed that pesticide-related poisoning is a leading cause of death in Bangladesh.
- *China* In 2011, tests revealed that 26 adults and 103 children had severe lead poisoning, while 494 others had moderate poisoning as a result of exposure to lead materials from tinfoil processing
- *China* In 2007, blood serum levels of deca-PBDE, among workers at a e-waste recycling operations exceeded levels previously reported for those occupationally exposed by a factor of 50-200; one worker had the highest levels ever reported.
- *India* In 2005, there were 323 separate incidents of ill health reported among 97 cotton farmers living in one state over a five month growing season. 83.6 per cent of these incidents were associated with signs of mild to severe pesticide poisoning.
- *Vietnam* In 2007, blood tests of 190 rice farmers revealed that over 35 per cent experienced acute pesticide poisoning, and 21 per cent were chronically poisoned.

Poisoning Events: Recent Examples in Developing and Transition Countries ctd – Latin America

- *Bolivia* In Cochabamba during 2007/2008 pesticide poisonings increased by 30 per cent (274 cases); 56 per cent of those poisoned were women from rural areas.
- *Peru* Hundreds of people fell ill from mercury poisoning when a mining company truck in 2000 dumped mercury along the road in the province of Cajamarca.

Pollution prevention

A sound chemicals management and control should be **preventive** and stop pollution at source in order to prevent emissions of hazardous chemicals and polluted waste hence eliminating i.a. costly cleaning-up actions “end-of-pipe!

Why do we need chemicals control?

- Chemicals are a part of every day's life
- There are many chemical substances on the market
- The production volumes are high and they are increasing
- Chemical substances are spread globally with trade – as such or in articles
- People are exposed to chemicals in their work, at home and through the environment.
- **Many chemicals are hazardous to human health or the environment** – but do we know enough about the properties?

Lack of data on health and environmental properties of substances

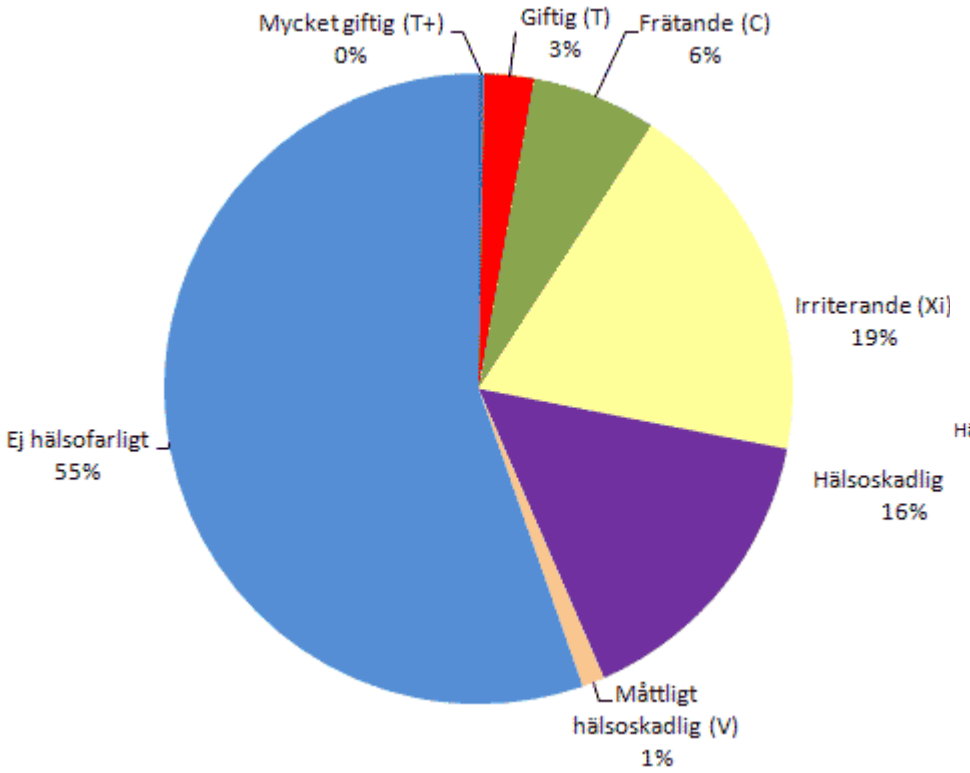
- A report from the prev. European Chemicals Bureau, ECB showed that only 14 % of the approximately 2 500 high-production-volume chemicals that were registered in the EU database EINECS had data complying with the basic requirements according to EU legislation in force at that time (10yrs ago)

- US-EPA found in 1998 that only 7 % of the appr. 3000 substances produced or imported to the USA in volumes over 454 tonnes per year (1000000 pounds) had minimum data considered to be necessary by the OECD

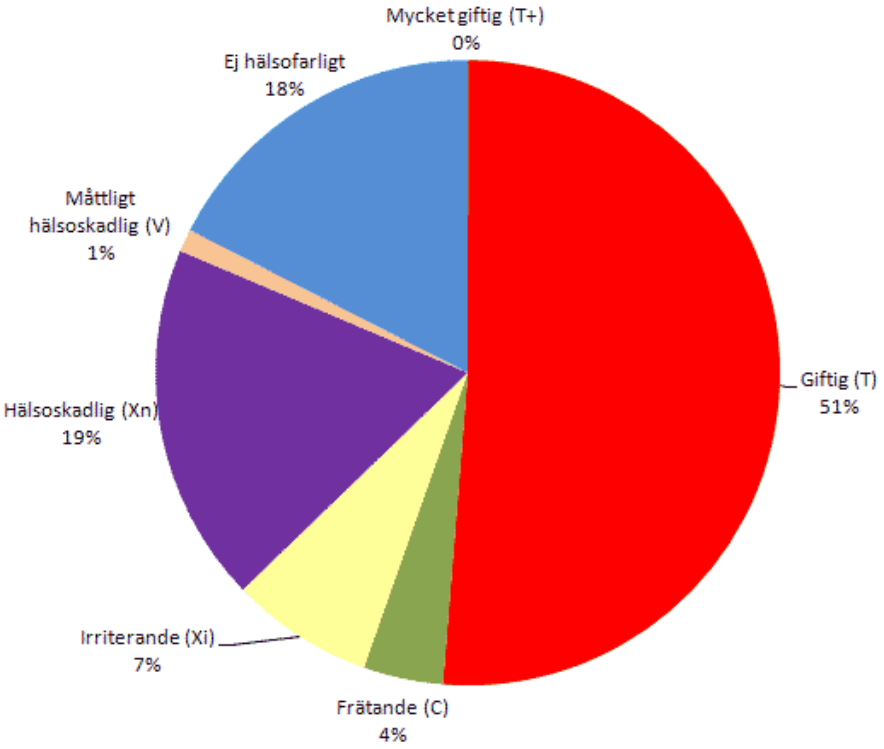
Toxic substances

- Exposure to harmful chemicals may lead to death or severe injuries on e.g.
  - the nervous system,
  - the immune system,
  - cancer,
  - Impaired fertility and
  - other injuries on specific organs
- Poor people are often hit the hardest by exposure to harmful chemicals

Toxic substances



numbers



volume

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Lead in blood

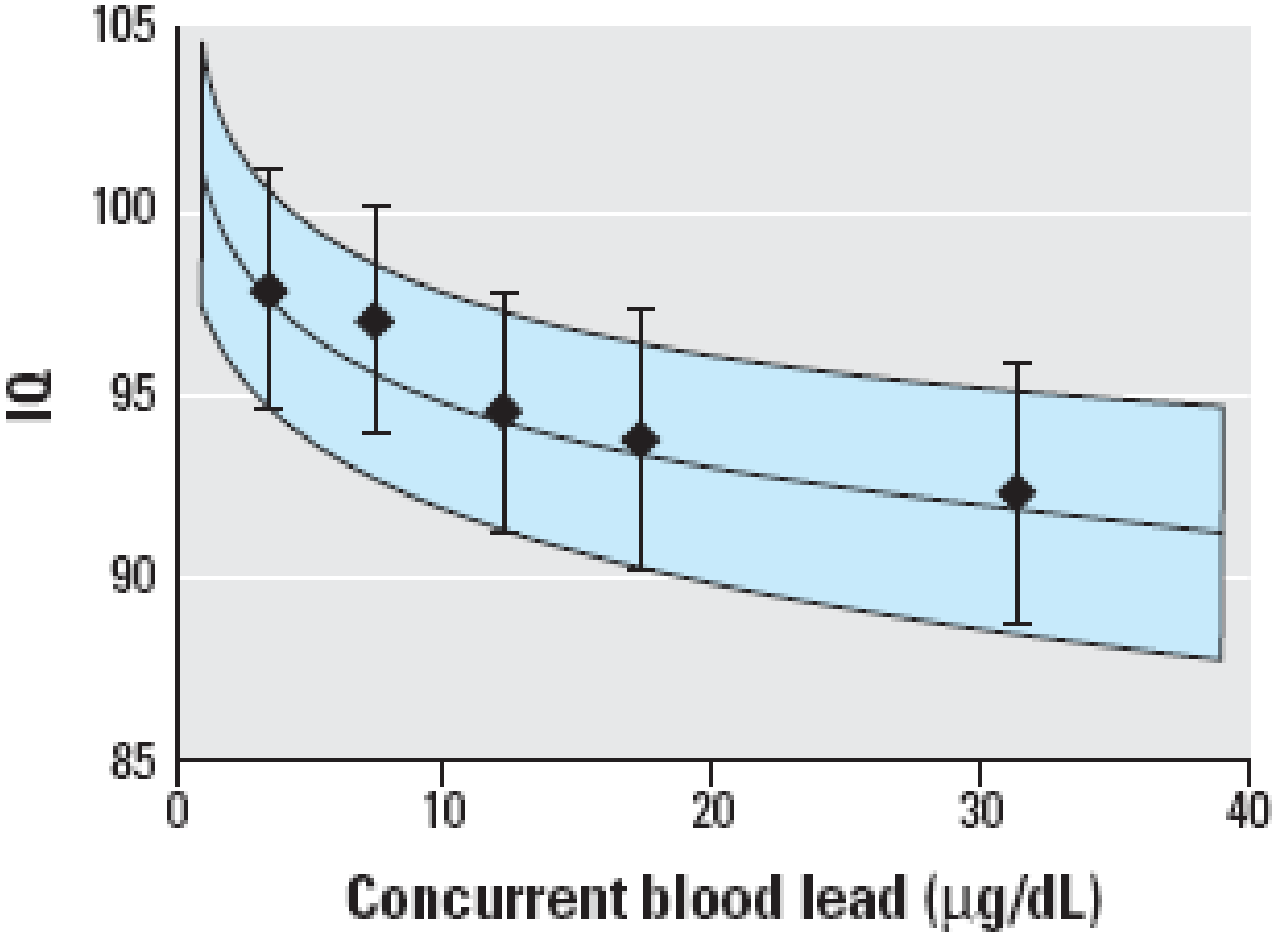
- A UNEP study in Kenya in 2007 found 328 children aged 2-18 living around the Dandora waste dump site in Nairobi to have concentrations of lead in their blood exceeding internationally accepted levels.

- In 42 % of analysed soil samples from the dump site lead levels were almost 10 times higher than what is considered unpolluted soil (over 400 parts per million (ppm) compared to 50 ppm). High levels of mercury and cadmium were also found.

Lead and children

- Poor children have higher lead levels, even in the US, 4 times more than middle class children
- Lead affects the nervous system, inhibits the fetus and lowers the IQ
- Children are particularly sensitive to the impact of lead

Lead in blood and IQ



From EFSA, Scientific Opinion on Lead in Food 2010

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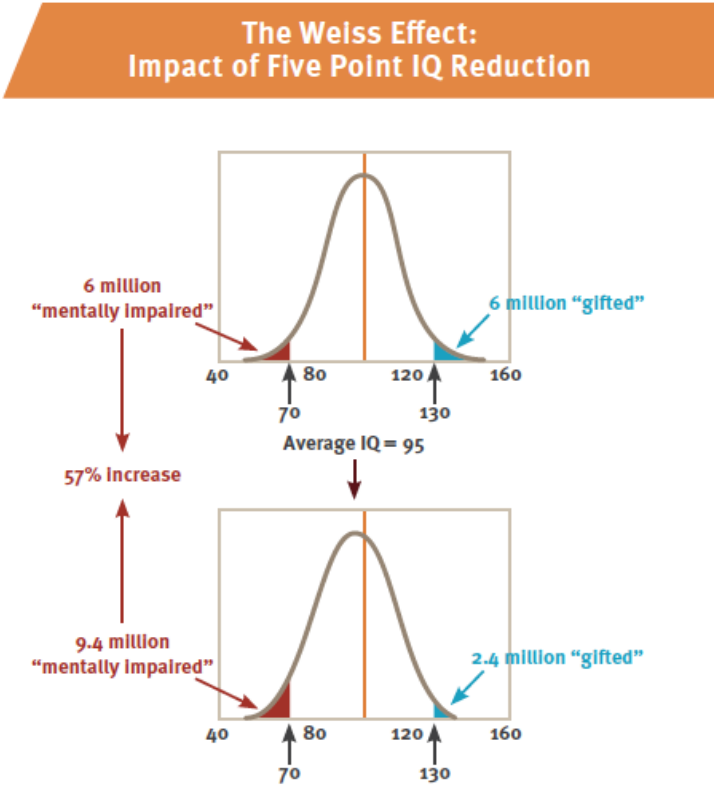
Effects of One Well-Studied Toxicant - Lead

- Lead (Pb) can significantly decrease intelligence quotient (IQ) of communities and contribute to societal violence

- Caravanos et al. (2013) showed lead exposures at 82 sites in 7 Asian countries were associated with significant loss in IQ.



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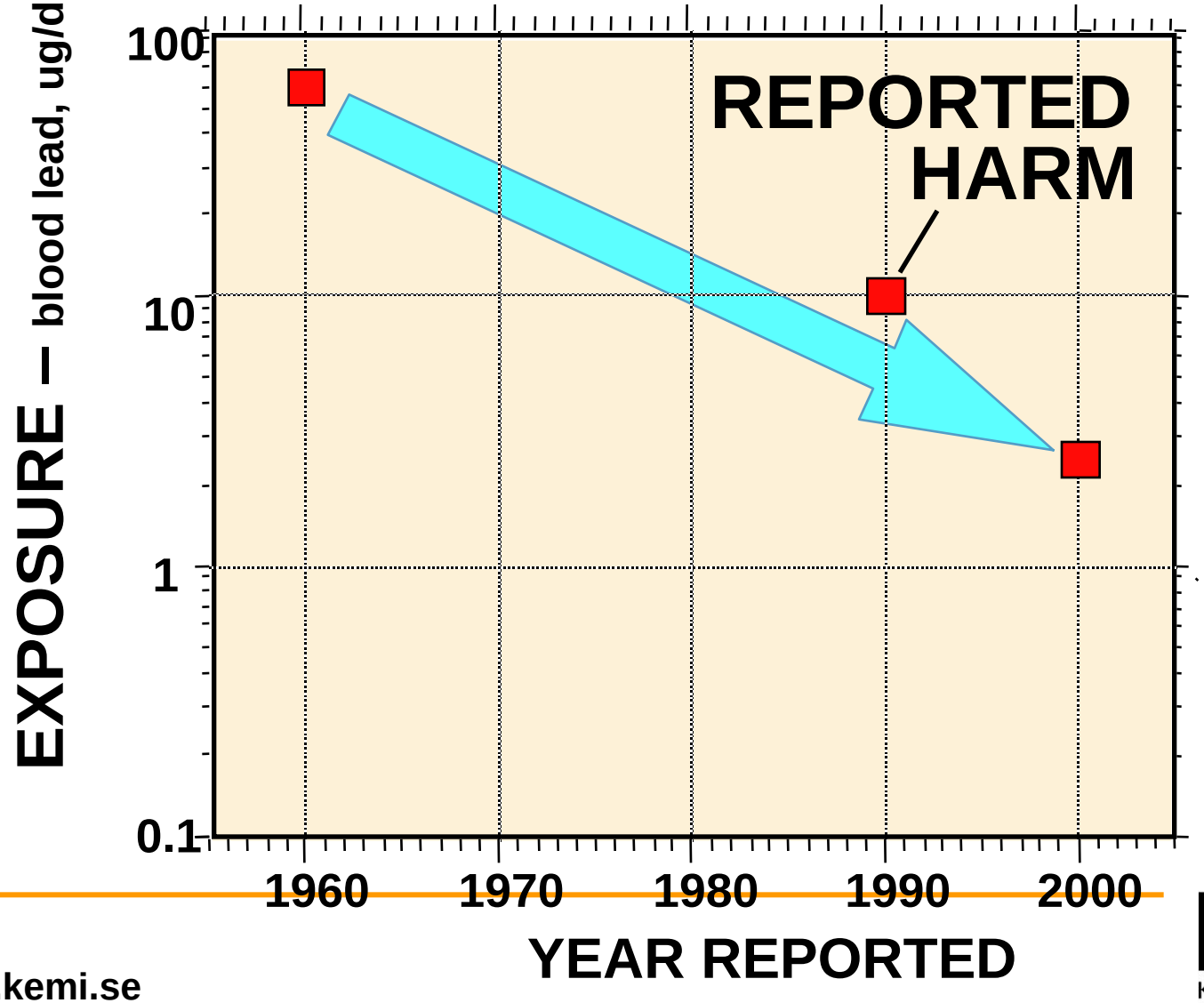
DECLINING THRESHOLD OF HARM - LEAD



www.kemi.se

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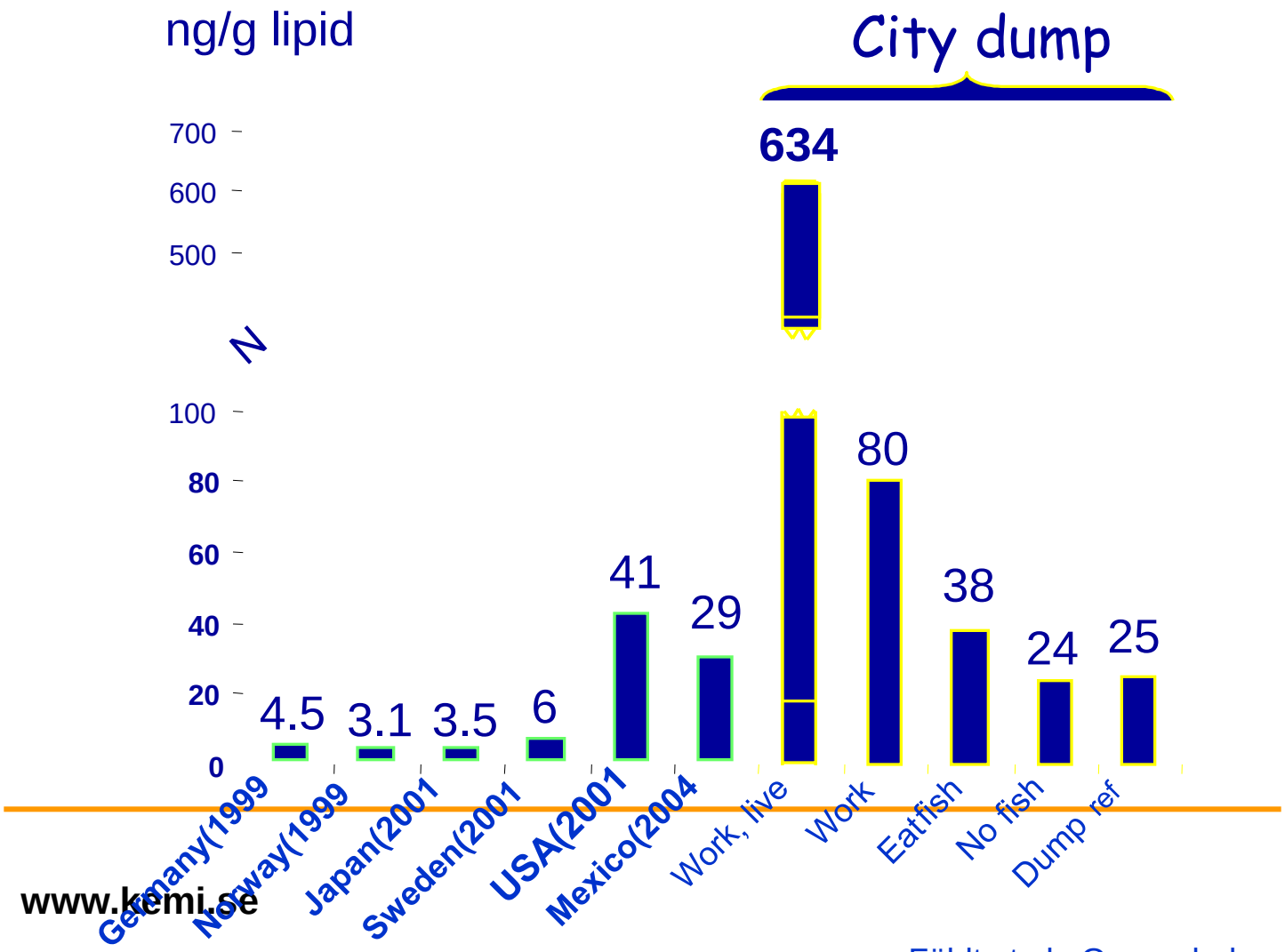
Note: Exposures expressed in micrograms/deciliter (blood lead)

PBDE in Nicaraguan city dump subjects compared to other world data



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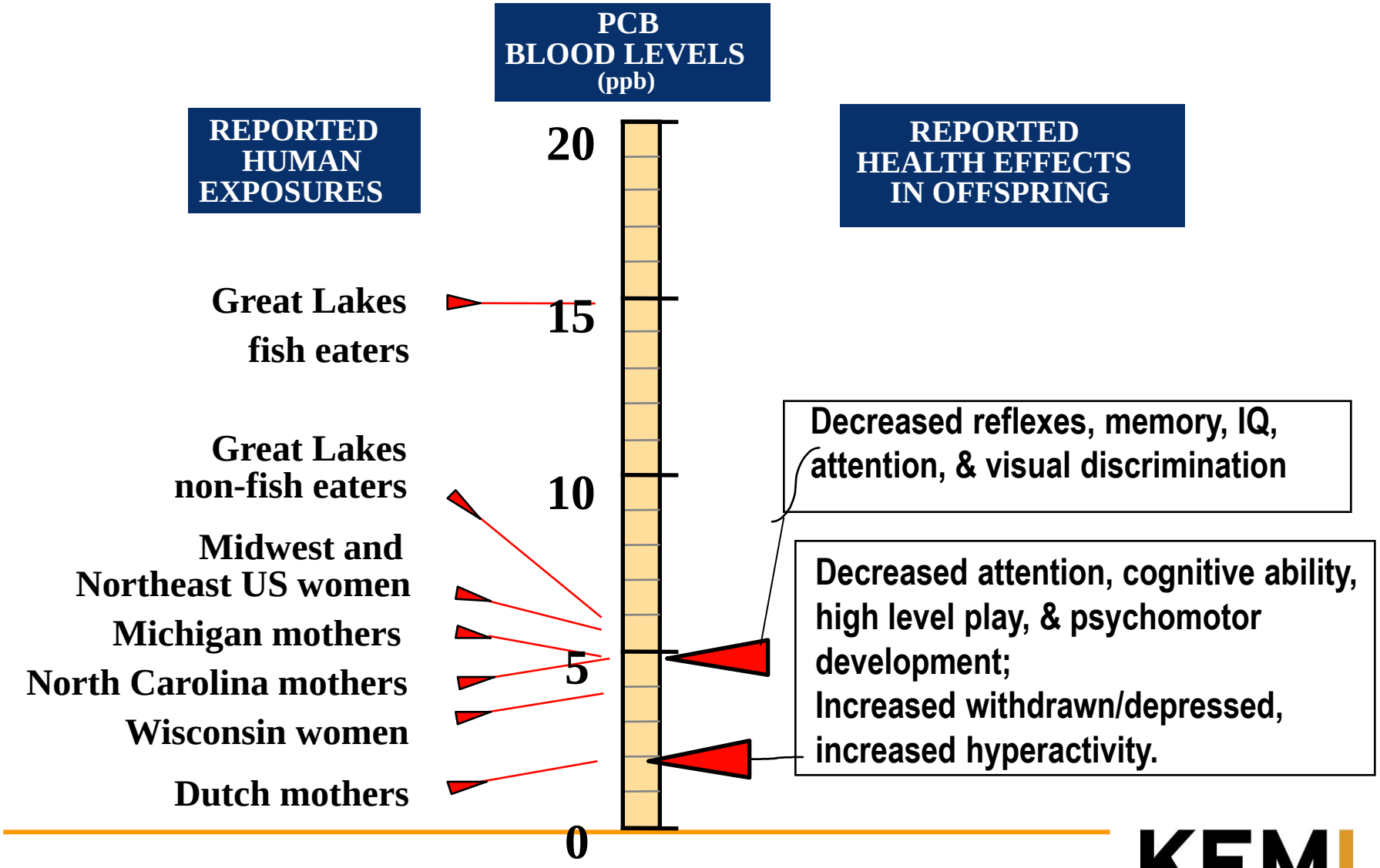
Fäldt et al., Organohalogen Comp. 2005, pp 502

PCBs: Inadequate Margin of Safety



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Highly hazardous pesticides

- WHO estimates
  - 3 million intentional and unintentional pesticide poisoning episodes globally very year
  - 300 000 die
  - 99% of the cases being from low- and middle-income countries

  Accident in India summer 2013
  - 23 school children died from eating monocrotophos contaminated food (oil stored in pesticide containers)
  - FAO/WHO says that highly hazardous pesticides should be withdrawn
  - Destroy old pesticide containers

Why do we need chemicals control?

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- There are many chemical substances on the market
- The production volumes are high and they are increasing
- Chemical substances are spread globally with trade – as such or in articles
- People are exposed to chemicals at work, at home and through the environment.
- Many chemicals are hazardous to human health or the environment
- **Chemicals control can save human lives, a good environment and money**

We need chemicals control to:

- Gain knowledge on the properties of chemical substances
- Gain knowledge on the occurrence of chemical substances
- Substitute substances of very high concern with less harmful alternatives
- Minimize the risks posed by chemicals

- Both industry and authorities play an important role

Benefits of sound management of chemicals

- Health (learning and working abilities, avoidance of health care costs)
- Environment (preserved biodiversity, ecosystem services, usable land and water, avoidance of remediation costs etc)
- Trade facilitated

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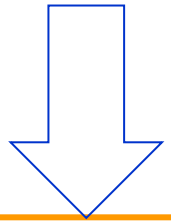
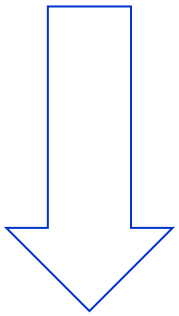
Summary

- All people on the globe are exposed to chemicals
- Exposure occurs during production, use and waste handling
- Both industrial chemicals and pesticides give rise to exposure
- Both urban populations and rural populations are exposed
- Ignorance causes careless or erroneous handling
- Poverty gives high risk for chemicals exposure
- Poor areas are more polluted, closer to the sources of release
- Vulnerable groups are hit the hardest; the unborn fetus, children, the sick and the elderly





- The overall results:
  - decreased life span,
  - increased sickness and disease,
  - lack in work capacity,
  - retarded economic growth and development,

  are **external costs** of using chemicals that are not often taken into cost-benefit equations

Towards a non-toxic environment: a concerted effort by all

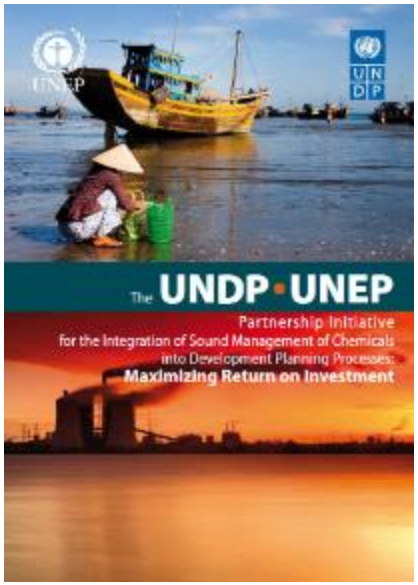
UNEP

- **Chemical Manufacturers** – front line of sound chemicals management, Green Chemistry
- **Corporate and Individual Chemicals Users** – demand information, low and non-toxic alternatives and use best practice
- **Governments** -- laws and policies and more effectively implement them
- **International organizations** -- promote synergies among existing instruments, foster public-private partnerships, and facilitate SMC into development planning

Sound chemicals management must become a national and international environmental and public health priority and part of a sustainable development paradigm.

UNEP initiatives to promote SMC

- **UNEP-WHO Health and Environment Strategic Alliance**
- **UNDP-UNEP Partnership Initiative for the Integration of Sound Management of Chemicals (SMC) into Development Planning Processes**
- **UNEP Guidance on the Development of Legal and Institutional Infrastructures for the Sound Management of Chemicals and Recovery of Costs of National Administration (LIRA)**



Global Chemicals Outlook

- Scientific arguments to prioritize sound chemicals management into development planning
- Making the economic case for investing in sound chemicals management
- A basis for setting future priorities and activities

Aim behind Costs of Inaction Report

1. Raise political awareness of the benefits stated in economic terms
2. Strengthen the rationale for inclusion of sound chemicals management priorities into national development plans and policies across key development sectors.

www.chem.unep.ch/unepsaicm/mainstreaming/CostsOfInaction/COISteerComm.htm

UNEP-studie om Cost of Inaction

- 70 sources from 28 countries: 57 on health and 24 on environment.
- Information is incomplete and several methods have been used.
- The results are underestimates.

UNEP and WHO:s estimates

Included:

- Industrial- and agricultural chemicals
- Acute health damages
- Deaths and reduced working capacity

Not included:

- Effects of e.g. dioxins, cadmium, mercury, long term effects of pesticides

UNEP and WHO´s estimates, **Health**

Globally per year, chemicals use:

0,96 M deaths (1,5 %)

21 M DALYs

(reduced working capacity, m.m., Prüss-Üstün et al, 2011)

All health impacts related to chemicals:

4,9 M deaths (8,3 %)

(indoor smoke 2, ambient air poll 1,2 o secondary smoking 0,6)

86 M DALYs

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Economic valuation, **Health**

Own calculation (WHO, low values):

~ 2000 Bln USD per year

Turnover of chemicals industry:

~ 4000 Bln USD per year

(Based on: USA 7,4 M USD/lost life (EU 3,6) Global GDP/capita (PPP) is ¼ of that of USA)

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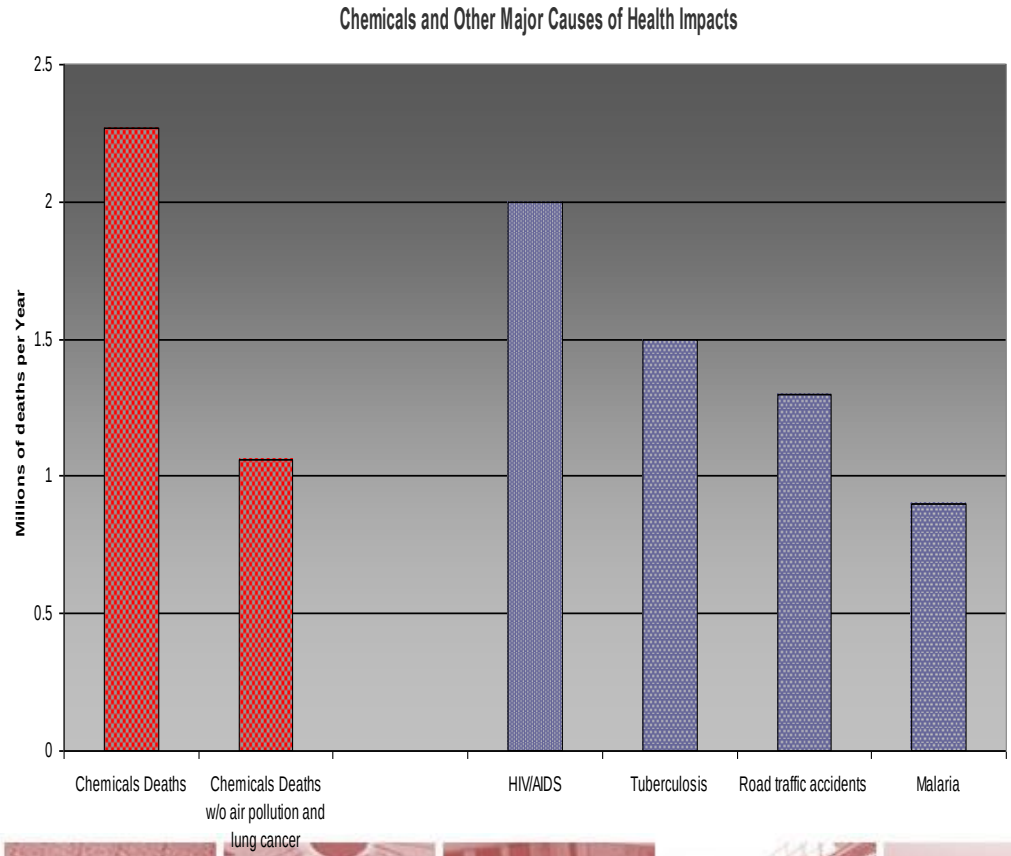
Effects of unsound chemicals management

Negative health effects: from acute poisoning to long term effects



Environmental effects: from sensitive species to large scale life-sustaining ecosystems

Pesticide and fertilizer contamination of rivers and lakes

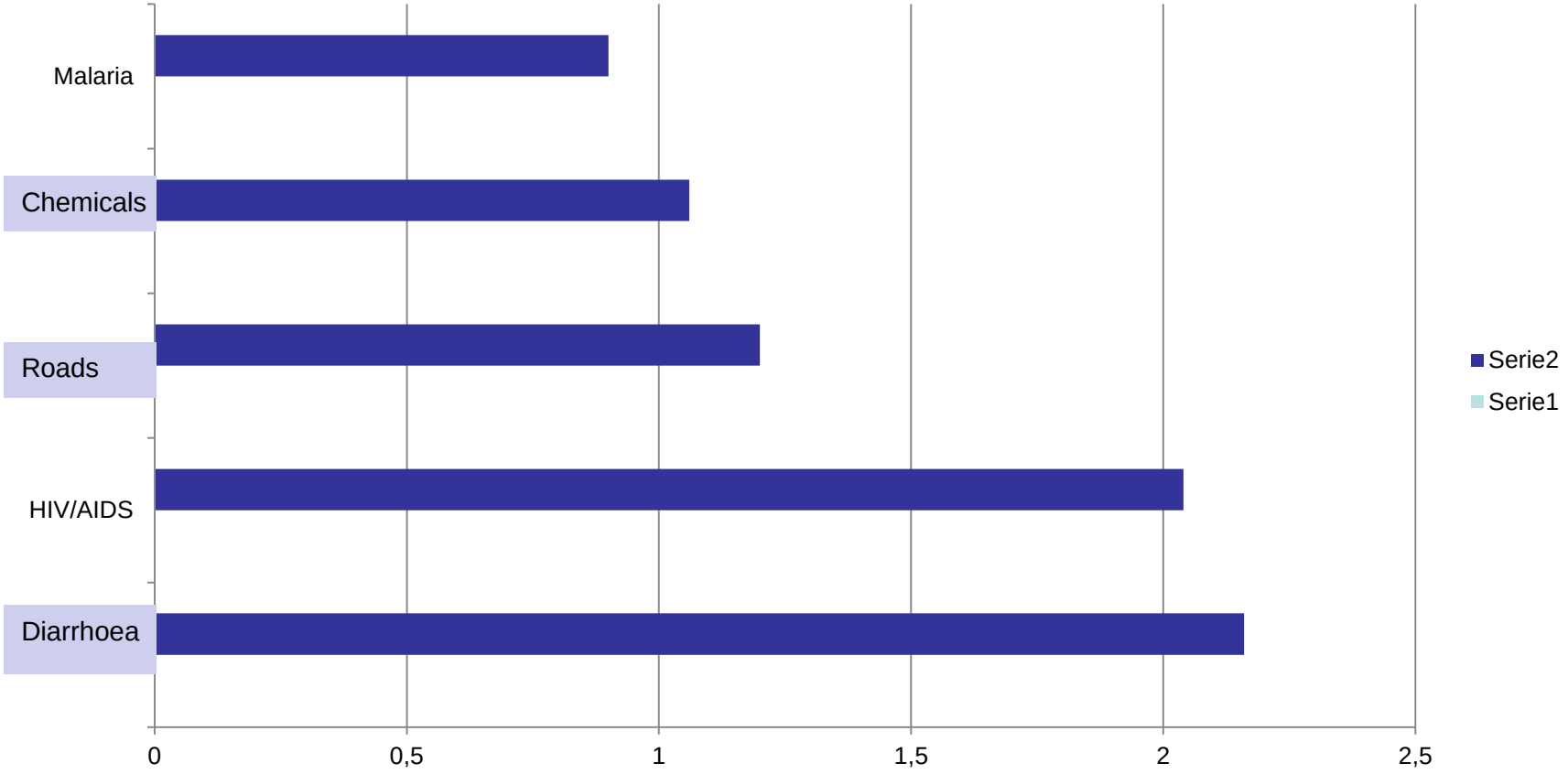
Heavy metals (e.g., mercury and lead)

Pollution associated with cement and textile production

Dioxin contamination from mining

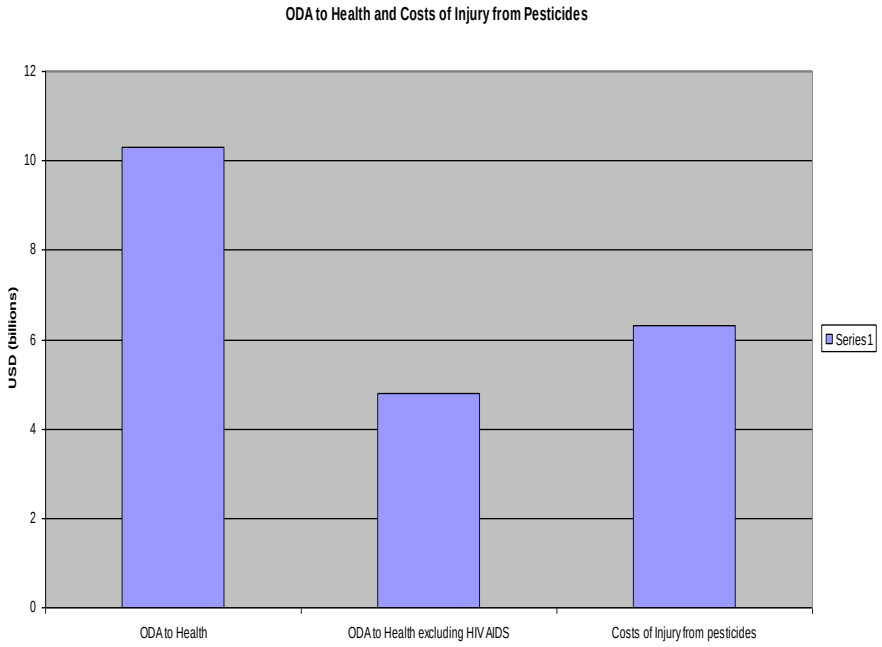
POPs (dioxins PCBs, DDTs) effects on wildlife and human food sources

Causes of death globally – a comparison,
million deaths per year



Costs to National Economy: unrecognized and substantial

Costs of inaction for human health and environment: ***large with heavy burden on individual and public budgets***



US$ 22 billion: global environmental external costs from mercury emissions

Financial costs to the chemicals and related industries*:*

- *higher insurance costs,*
- *loss of productivity, and*
- *reputation impacts.*

Costs incurred due to asbestos and contaminated drywall, for example, total over US$125 billion worldwide – and the figure is still rising.

The Benefits: above cost savings, SMC paves the way for a Green Economy

*Benefits from the removal of lead from gasoline on a global scale: USD **$2.45 trillion per year, or 4% of global Gross Domestic Product (GDP).***

In the United States alone, the benefits estimated to outweigh costs by more than ten times, driven by improved cognition resulting from reduced exposure to children.

45%: increase in revenue per unit from recycling desktop computers in Ghana.

US$100 billion: estimated value of the global green chemistry market in 2020

Example of economic costs for diseases

- **Costs for Asthma, Cancer, Lead exposure and Neurobehavioral disorders among children in the USA caused by environmental factors:**

  estim. US$ 76.4 Bln/year

  (Transande and Liu, 2010 $)

Economic valuation, **Health**

Phasing out lead in petrol globally:

- **2450 Bln USD per year**
- Benefit cost quota 10/1

(Tsai o Hatfield, 2010, UNEP, 2011)

Some more examples of costs

- Health and environmental costs of pesticides US$8-47 per hectare or US$ 4.28 per kg of active ingredient. In China it was 186% of the cost of the pesticides.

- Unintentional ingestion, inhalation or contact with chemicals caused 346 000 deaths from acute poisonings in 2004.

- Minamata disease: control costs 125 M yen and pollution damage 126,630 M yen.

Economic valuation, **Health**

USA, pesticides:

787 M USD per year

(acute poisonings, cancer and other chronic effects, deaths)

(Pimental et al, 1992)

Economic valuation, **Environment**

VOCs: **236 mdr USD per year**

Mercury: **22 mdr USD per year**

(UNEP, 2010)

Economic health costs of pesticides in Africa south of Sahara

- Actual costs for hospital care, medicine and time lost from work
- Not deaths, suffering nor environmental effects
- Data from Uganda, Zambia and Mali has been extrapolated to surrounding countries and adjusted to local conditions (agric. work force, unit costs, etc.)

- 4,4 Bln USD per year or 35 USD/capita for affected farm workers
- Development aid to health care excl. HIV/AIDS was 4,8 Bln USD per year

(UNEP, 2012)

Effects on economy and development

- Air pollution 1,8 % of GDP in Egypt
- IPM production +17 % (calcul.) in Bangladesh
- IPM pesticide use -56 %; production +10 % (realized) in Indonesia

Cd Flows to and from arable land, 2008/9

- Airborne (metal prod., energy sector, etc),
  ≈ 500 kg
- Mineral fertil., 47-71 kg (6 mg Cd/kg P)
- Manure, 204-380 kg (8-15 mg Cd /kg P)
- Sludge, 46 kg (30 mg Cd/kg P)
- Biogas sludge, 4,9 kg (10-20 mg Cd/kg P)

Costs for fractures caused by cadmium content in food, Sweden

- Total social costs for fractures:
  (hospital, care, reduced quality of life, deaths)
  39 Bln SEK per year
- Part that can be explained by cadmium in food:
  men 7 %, women 13 % (rough estimate)
- Social costs of fractures due to cadmium in food:
  4,2 Bln SEK per year

(KemI 2012, von Bahr, Åkesson och Drake)

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Thank you!

Questions?