

(Lead) and cadmium: Need for international action?

JUST FACTS

IFCS - Forum VI – Dakar

15-19 September 2008

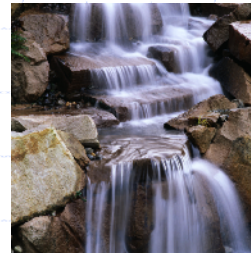
Where does cadmium come from?

Three main sources:



Zinc extraction

- ❑ Extracted in the course of zinc mining and purification



Erosion

- ❑ Naturally released through erosion, volcanic activity

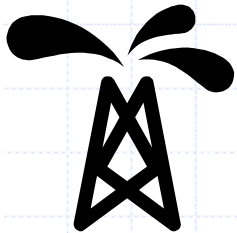


Volcanoes

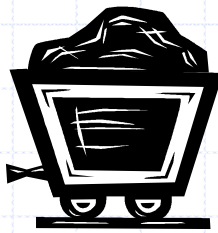


Phosphate fertilizers...

- ❑ As an impurity, present in several commodities



Oil



Coal



Tobacco

1 – Extracted in the course of zinc mining and purification

- ❑ Cadmium is naturally present in the earth's crust, with a high density in zinc ores
- ❑ Cd content is on average 0.3% of Zn content
- ❑ Zinc:
 - Production: 10 Million tons
 - Growth: 4% per annum
 - Africa is not a large source: 3% of world total zinc extraction, 1% of world total zinc refining
- ❑ Cadmium:
 - Production: 0.02 Million tons, flat for over 10 years
 - 1/3 (and growing) of extracted cadmium is not refined
 - No cadmium refining takes place in Africa

2 – Naturally released

- ❑ Cadmium is eroded through natural events:
 - ❑ Erosion
 - River erosion: WHO reports 15,000 t per annum are transported by rivers into the oceans
 - Wind erosion: no estimates available
 - ❑ Volcanic activity
 - Estimated at 1,000 t per annum
 - High year on year variability

3 – Present as an impurity in traded commodities

- Cadmium is a naturally occurring impurity present in many internationally traded commodities:
 - Phosphate fertilizers
 - Tobacco (and cigarettes, cigars...)
 - Non renewable energy sources (coal, oil, natural gas, peat)
 - Iron and steel, copper, lead ores and related processes
 - Cement

Where is cadmium used?

- Cadmium is intentionally added to the following products:
 - 70%: rechargeable consumer batteries
 - 10%: industrial batteries
 - 20%: other specialty uses
 - ✓ Specialty pigments (safety red)
 - ✓ Plastic stabilizers
 - ✓ Anticorrosion coatings of airplane parts
 - ✓ Coating of specialty electrical connectors
 - ✓ Photovoltaic panels
 - ✓ Complex metal alloys for specialty uses (nuclear power stations...)

Findings and Consequences

- When contemplating release minimization programmes, a clear distinction must be made between:
 - Cadmium intentionally added to products
 - Cadmium as an impurity within commodities (and related processes)
 - Naturally released cadmium
- This has been analysed, studied and quantified thoroughly in the EU

EU Cadmium Risk Assessment

- ❑ Under EU law: over 100 substances have been placed on a priority list
 - To be analyzed for their intrinsic properties
 - Evaluated in their uses and impacts across Europe
 - By an official governmental organization

- ❑ In the case of cadmium
 - Responsible entity: Belgium Federal Ministry of Health, Family and Environment (not industry)
 - Reviewed by numerous national expert committees
 - Results and conclusions submitted to EU Commission in late 2007
 - Formally approved by 27 EU Member States and European Parliament in May 2008
 - Recent, comprehensive, independent and up to date (duration: 9 years)

- ❑ Report and conclusions publically available on web site of the European Chemical Bureau:
 - http://ecb.jrc.it/DOCUMENTS/Existing-Chemicals/RISK_ASSESSMENT/REPORT/cdmetalreport303.pdf
 - Over 2000 pages long!

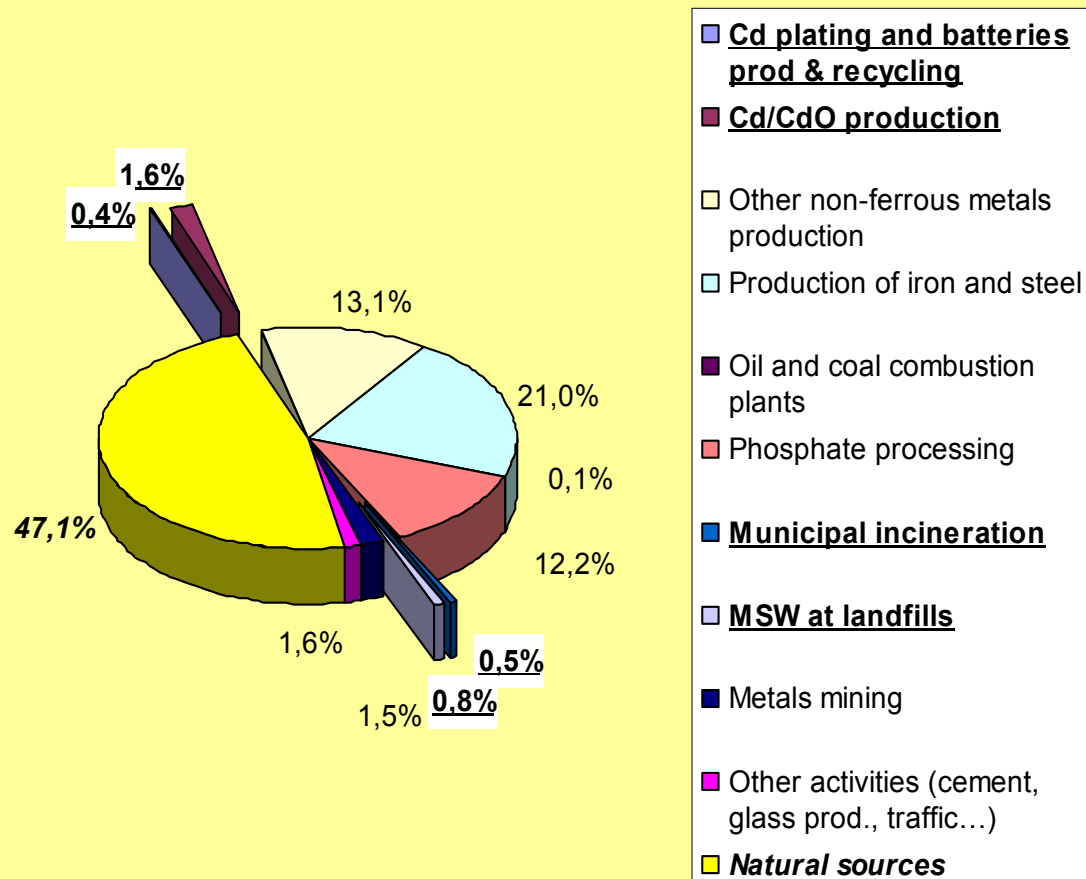
EU Cd Risk Assessment (RA)

- ❑ Releases to the environment:
- ❑ WATER
- ❑ AIR
- ❑ SOIL

Releases to the Environment

- WATER - (source: 2007 EU Cd RA)

Releases to Water by Source (EU Risk Assessment Cd 2007)

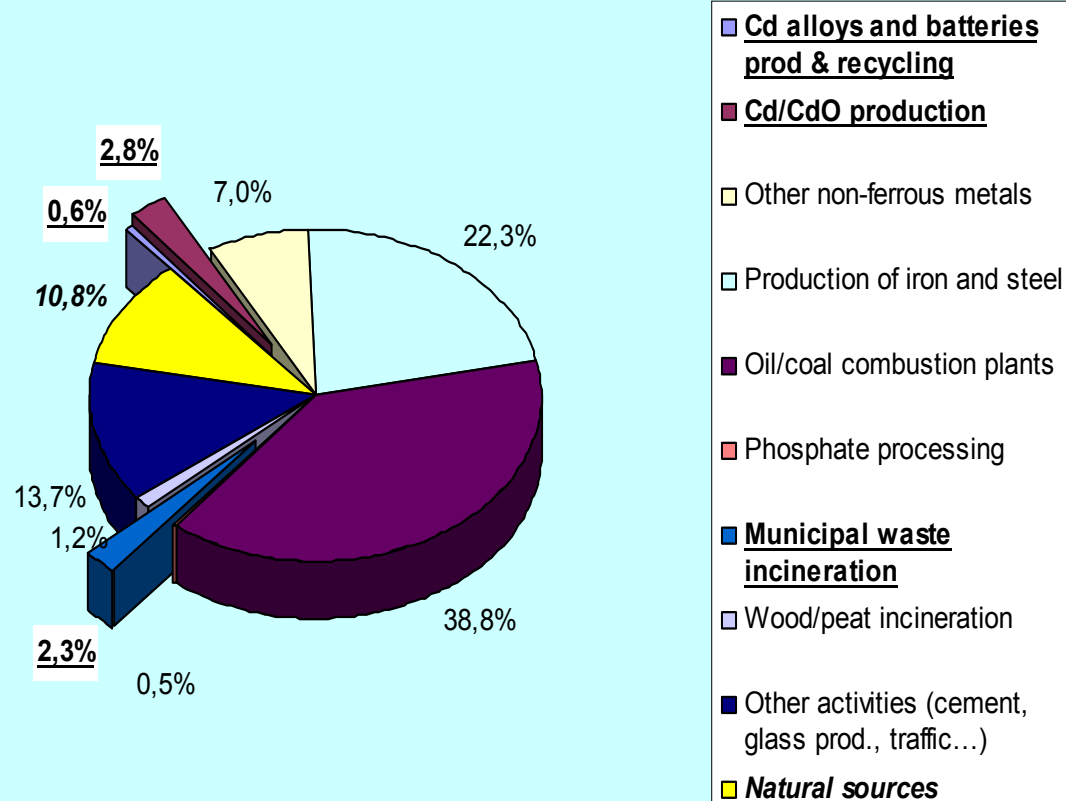


- Cadmium present as an impurity: 50%
- Natural sources (*italics*): 47%
- Cadmium intentionally added into products (underlined): 3.4%

Releases to the Environment

- AIR - (source: 2007 EU Cd RA)

Releases to Air by Source (EU Risk Assessment Cd 2007)

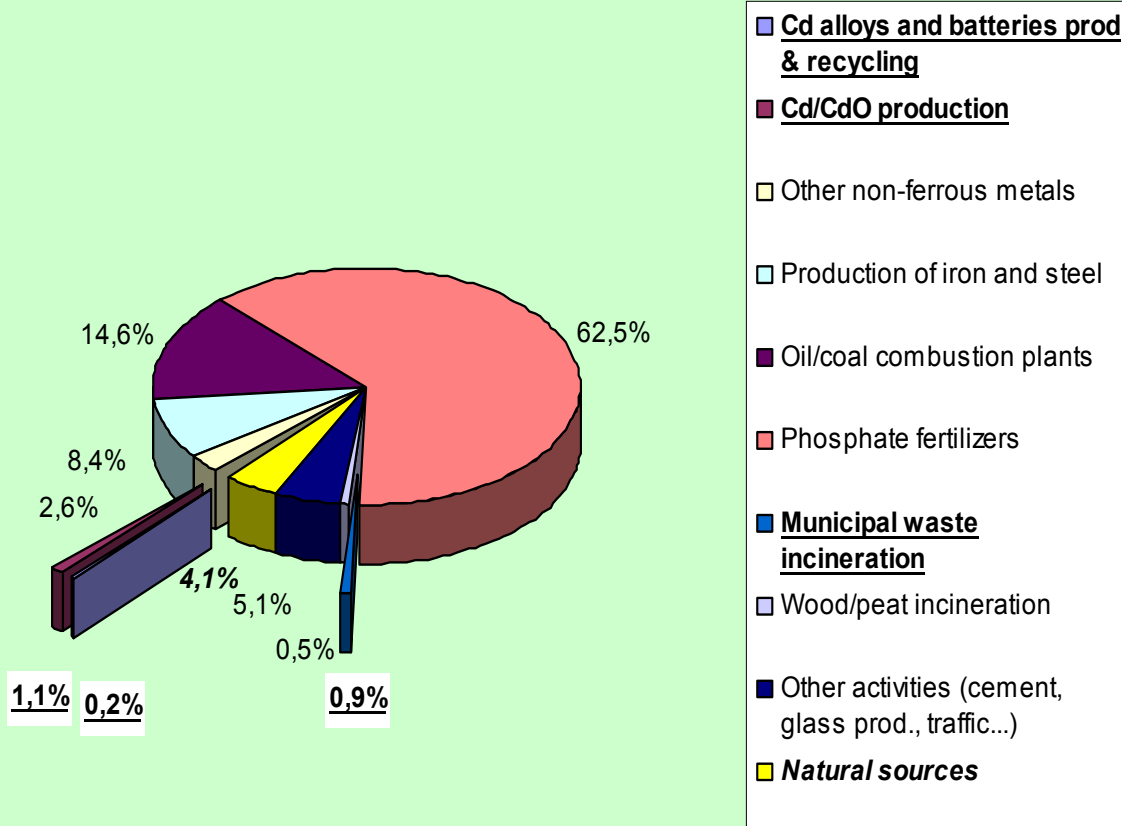


- Cadmium present as an impurity: 83%
- Natural sources (*italics*): 11%
- Cadmium intentionally added into products (underlined): 5.8%

Releases to the Environment

- SOIL - (source: 2007 EU Cd RA)

Releases to Soil by Source (EU Risk Assessment Cd 2007)



- Cadmium present as an impurity: 94%
- Natural sources (*italics*): 4%
- Cadmium intentionally added into products (underlined): 2.2%

Findings

- ❑ In all releases, AIR, WATER, SOIL, ranking is identical:
 - Rank 1: Impurity in commodities and relevant processes (range: 95 - 50%)
 - Rank 2: Natural emissions (range: 47 - 4%)
 - Rank 3: Intentionally added into products (range: 5 - 2%)
- ❑ Action could primarily be aimed at commodities such as:
 - Phosphate fertilizers
 - Fossil fuels
 - Tobacco
 - Metallic Ores
- ❑ Action towards products with intentionally added cadmium would have no impact on overall environmental releases

Eu Cd Risk Assessment (RA)

- ❑ Human uptake:
- ❑ WORKERS
- ❑ GENERAL POPULATION: non-smokers
- ❑ GENERAL POPULATION: smokers

Human uptake

- WORKERS - (source: 2007 EU Cd RA)

- In EUROPE: workers exposed to cadmium work mainly in:
 - Battery manufacturing
 - Metal coating
 - Zinc (and other non-ferrous metals) smelting
 - Population is small: below 1,500

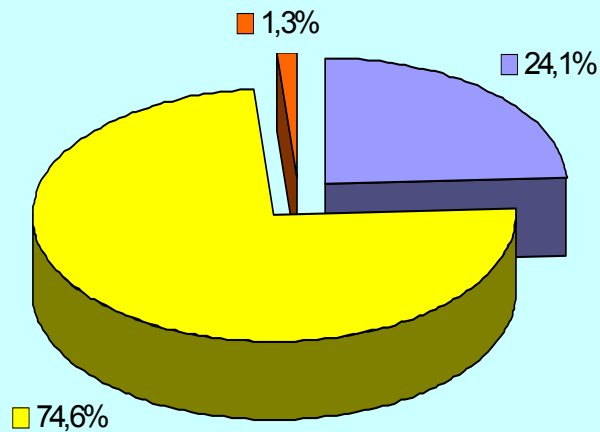
- In AFRICA: workers exposed to cadmium work mainly in:
 - Phosphate rock mining and fertilizer operations
 - Zinc (and other non ferrous metals) smelting
 - Population not evaluated, expected to be small

Human uptake

- General Population - (source: 2007 EU Cd RA)

Non-Smoking Adult Population:
Cd uptake by source

- commodities with Cd impurities
- natural releases
- products with Cd intentionally added

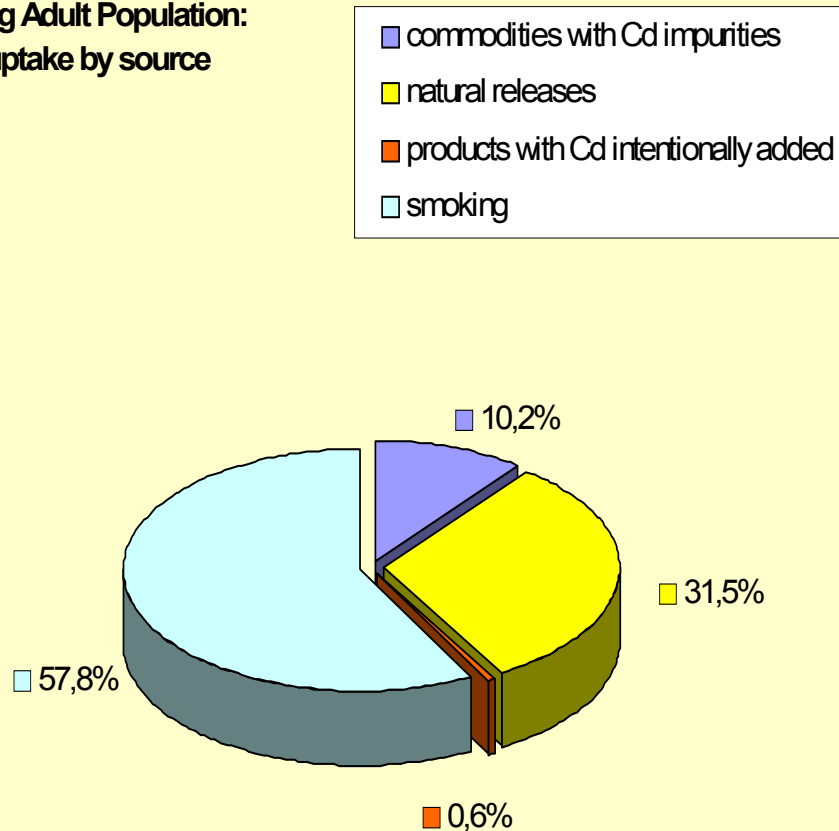


- Non-Smokers
- Natural sources: 75%
- Cadmium present as an impurity: 24%
- Cadmium intentionally added into products: 1.3%

Human uptake

- General Population - (source: 2007 EU Cd RA)

Smoking Adult Population:
Cd uptake by source



- ☐ Smokers
- ☐ Smoking: 58%
- ☐ Natural sources: 31%
- ☐ Cadmium present as an impurity: 10%
- ☐ Cadmium intentionally added into products: 0.6%

Findings

- ❑ Smokers: smoking contribution is 100 times greater than products with intentionally added cadmium
- ❑ Non smokers: natural sources are first source of uptake
- ❑ Action towards products with intentionally added cadmium would have no impact on overall human uptake

Impact of Trade in: - COMMODITIES -

- Trade in commodities with cadmium as an impurity:
 - Number one source of environmental releases in all cases,
 - Number two source of uptake for non-smokers
 - Tobacco dwarfs all other sources for smokers,
- Would impact trade in goods from Africa to Europe:
 - oil and gas,
 - phosphate fertilizers,
 - tobacco
 - metallic ores

Impact of Trade in:

- GOODS w. intentionally added Cd -

- Such goods represent a very minor share of environmental releases and human uptake in Europe
- All purpose consumer rechargeable Ni-Cd batteries:
 - Progressively being replaced by higher power density batteries (same power, less volume) to allow for smaller and lighter appliances
 - No need for robustness, wide temperature range in consumer uses
 - At times replaced by non-rechargeable batteries (over 100 times more waste)
- Batteries in cordless power tools (battery replaces external cord):
 - Largest market in consumer Ni-Cd rechargeable batteries
 - In most segments, other technologies do not have the proper performance and reliability characteristics of Ni-Cd
 - *Remark: Europe and Africa both 750 Million inh. Sales of Cordless Power Tools to Africa are 1/30th of those to Europe. Releases linked to this use are expected to be even smaller in Africa than in Europe.*
- Industrial Ni-Cd rechargeable batteries:
 - Used for back-up power when human or equipment safety is critical
 - Ex: all planes you flew with to Dakar use industrial Ni-Cd batteries
 - Other uses are passenger trains, telecom and other networks, power plants
 - Well collected in Europe, collection active and growing in Africa for recycling in Europe
 - *Remark: With same population, sales of industrial Ni-Cd to Africa are 1/10th of those to Europe. Releases linked to this use are expected to be even smaller in Africa than in Europe.*

Conclusion

- ❑ Data shows that focusing on goods with intentionally added cadmium will achieve no positive results for the environment or human health
- ❑ Such focus would actually harm population/development by:
 - Reducing options for efficient housing construction
 - Increasing workplace accidents (corded tools vs. non-corded tools)
 - Crippling industrial assets and networks (planes, power plants...)
 - Reducing access to renewable energy (1/3 of world population not connected to electricity network)
- ❑ **When reviewing hard scientific data, the case that « trade in products containing lead and cadmium presents an unacceptable risk to human health or the environment » cannot be sustained**

Additional conclusion (1)

- ❑ ICdA would like to remind the audience that several pages of remarks and comments were submitted to the document « Thought Starter » with a view to eliminate factual errors as well as subjective and possibly misleading statements.
- ❑ ICdA is deeply concerned that these comments have not been taken into consideration in the final CIEL document circulated.

Additional conclusion (2)

- **Example:** « section 18. ...maternal exposure to cadmium **is associated** with low birth weight and an increase in spontaneous abortions... »
- **Five Excerpts taken from the EU cadmium Risk Assessment - Human Health Report.**
- **Epidemiological studies – oral route – general population:** « Overall, **the epidemiological evidence** for a developmental effect (on birth weight, malformation, neurobehavioral performances) of Cd compounds in the general population mainly exposed by the oral route **appears weak** »
- **Epidemiological studies – inhalation route – occupational exposure:** « **No clear evidence indicates that cadmium has adverse effects** on the development of the offspring of women occupationally exposed to cadmium. Decreased birth weight and skeletal malformations were reported in a paper written in Russian and often cited by reviewers. However, this last study can hardly be used to draw definite conclusions on the developmental effects associated with cadmium exposure as information on exposure, offspring and maternal effect is fragmentary »
- **Epidemiological studies – population exposed to cadmium via tobacco smoking:** « It is well known that the babies of mothers who are cigarette smokers are smaller at birth than are those of non-smokers and that smoking increases the uptake of cadmium (...). **The weight of evidence** to specifically attribute these developmental effects to CdO or Cd metal from tobacco smoke **is insufficient** ».
- **Overall conclusions:** « **No clear evidence indicates that cadmium had adverse effects on the development of the offspring of women exposed indirectly via the environment or occupationally to cadmium** »
- **Classification:** Cd metal and CdO have been classified in Reprotoxic category 3 [lowest: 3 – highest: 1] (substances which cause concern for humans owing to **possible** developmental toxic effects) and labelled with R63 (**possible** harm to the unborn child) considering the effect of animal testing with water soluble Cd compounds and acknowledging (...) general toxicity **cannot be ruled out** »