National legislation, international conventions and exposure to harmful chemicals

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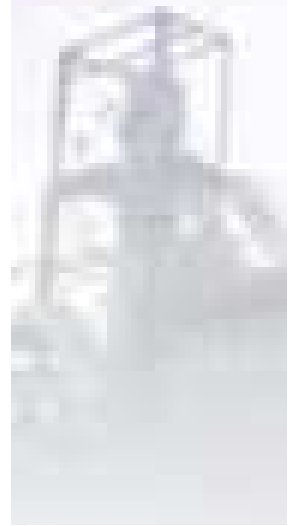
Introduction

- Without legislation pollution is regarded as an “externality” High levels of air and water pollution in Europe resulted increasing industrialisation.
- Desasters happened e.g. London smog in the 1950
- First Clean Air legislation was introduced
- The example was followed and improved upon around the world
- But improvement is still required e.g. in South Africa

National Environmental Management Act

- Air pollution in South Africa
  Industrial processes
  Transport
  Household
  Agriculture
  Biotic sources
- Highest pollution levels in urban area's
- Influence of weather is large



New Air Quality Act

- Backbone: Establishment of National Ambient Air Quality standards.
- The identification of priority pollutants
- Current: Ozone, Nitrogen oxides, Sulphur dioxide, Lead, Particulate matter (PM10).
- Ambient maximum concentration for each priority pollutant.

Ambient legislative limits

Pollutant	Peak/10 minutes (ppm)	1 hour (ppm)	24 hr (ppm)	Month (ppm)	Annual (ppm)
Ozone	1.25	0.12			
NOx	1.4	0.8	0.4	0.3	0.2
NO2	0.5	0.2	0.1	0.08	0.05
SO2	0.191	0.048	0.048		0.019
Pb				2.5 microgr/Nm3	
PM10			180 microgr/Nm3		60 microgr/Nm3
Suspended solids			300 microgr/Nm3		100 microgr/Nm3

Listed activities

- Listed activities are defined in Section 21. (1) National Environmental Management Air Quality Bill as follows “The Minister or MEC may, by notice in the Gazette, publish a list of activities which result in atmospheric emissions which have or are likely to have a significant detrimental effect on the environment, including health, social conditions, economic conditions, ecological conditions or cultural heritage.”[2]
- Listed activities are large activities that can cause the above as individual sources.
- New listed activities require a full EIA under the revised legislation.
- There must be a method to measure the emissions of the activity.

Controlled emitters

- “The Minister or MEC may, by notice in the Gazette, declare any appliance or activity, or any appliance or activity within a specified category, as a controlled emitter if such appliance or activity, or appliances or activities falling within such category, result in atmospheric emissions, which through ambient concentrations, bioaccumulation, deposition or in any other way, present or are likely to present a threat to health or the environment”
- Controlled emitters can be appliances or activities for which the total number can cause the above.
- New controlled emitters require a screening EIA under the revised legislation.
- There must be a method to measure the emissions of the appliance.

Notice on listed activities (HCRW)

- Size of HCRW incinerators.
- RSA activities not large compared with international systems.
- Differentiation from small (<10 kg/hr) to relatively large (about 400 kg/hr).
- Technical experts propose two categories:

- <10 kg/hr (controlled emitter)
- >10 kg/hr (listed activity)

Identified pollutants and emission limits (mg/Nm3)

- PM10/dust 25
- CO 100
- HCl 30
- SO_2 50
- Pb, Cr, Be, As, Sb, Ba, Ag, Co, Cu, Mn, Sn, V, Ni 0.5 (each)
- Cd, Tl 0.1 (each)
- Hg 0.5

Monitoring

- PM10/dust continuous
- CO continuous
- HCl continuous
- SO2 continuous
- Pb, Cr, Be, As, Sb, Ba, Ag, Co, Cu, Mn, Sn, V, Ni
  4 (1)*
- Cd, Tl 4 (1)*
- Hg 4 (1)*

* Four times per year, may be reduced to one time per year after period of documented compliance.

Controlled emitters (<10 kg/hr)

- Total emissions are small
- The manufacturer needs to specify maximal emissions under normal working conditions. SABS or another organisation needs to test the equipment and on compliance certifies that the specified emissions are justified. A general inspection of the equipment is required at e.g. annual intervals and emission testing is required at e.g. biannual intervals.

PM10/dust	500 mg/Nm3
CO	1000 mg/Nm3
HCl	300 mg/Nm3

The Dioxin example

- Toxicity From IRIS database

II.A. Evidence for Human Carcinogenicity__II.A.1. Weight-of-Evidence Characterization

Classification -- B2; probable human carcinogen

Basis -- Hepatic tumors in mice and rats by gavage

II.A.2. Human Carcinogenicity Data

None. There are no published epidemiologic evaluations of hexachlorodibenzo-p-dioxin, a contaminant in chlorinated phenols.

Dioxin exposure (in TEQ units)

- Centre of Decease Control
  0.1 pg (10Exp-12)TEQ/kg/day
  Intake in food <1 ppb.
- Pathway
  From emission point to atmosphere
  From atmosphere to soil/plants and water
  Uptake by plants and animals and enrichment over food chain.
- Intake by humans over food chain e.g. vegetables, milk, meat, fish.
- Exposure from atmosphere is not a major pathway

Dioxin emissions

- USA EPA data

  Emissions from a non-controlled HCRW incinerator with a short residence time (0.25 sec) are about 4 ng (4 x10Exp-9 gr TEQ)/kg of waste. (worst assumptions)
- South African HCRW throughput is typically <100 kg/hr and are operated about 2000 hr/y, therefore generate 0.8 mgr TEQ/y.
- Risk of cancer about 1 per 10 million people over a lifetime
- South African conditions of climate and vegetation are different from Europe and therefore pathway analysis model needs to be adapted.

Car emissions

- Controlled emitters

  Transport vehicles are the first group of controlled emitters that are following the new legislation
- Tables 1 – 4 provide the emission limits for new motor vehicles sold in South Africa after 1 January 2006. The standards are provided for the full range of the vehicle fleet ranging from passenger cars to heavy duty vehicles.
- The use of Pb in petrol is also prohibited starting 1 january 2006.

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Car exhaust emissions

Table 1
Euro 2 Emission Standards for Passenger Cars
(Category M_1*), g/km

Fuel	CO	HC	NOx	HC + NOx	PM
Diesel	1.0	-	-	0.7	0.08
Petrol	2.2	-	-	0.5	-

Category M_1 – Passenger vehicles
Excluding cars over 2,500 kg, which meet N_1 category standards

Dynamic Air Pollution Prevention System

- Developed in South Africa by a consortium supported by IF.
- Input in the model:

  Time dependent emissions of point sources, non-point sources, biogenic sources

  Meteorological data
- Output of the model:

  Expected pollution levels over a certain area within the next 24 hours (or another time)
- System tested for Cape Town
- Reasonable correlation between model and actual measured pollution levels

Rotterdam convention

- Dramatic growth in chemical production and international trade
- Potential risks posed by hazardous chemicals and pesticides
- Vulnerability of countries lacking infrastructure to monitor import and use of chemicals.

- Therefore UNEP started developing an information exchange program in the 1980's.
- In 1989 the Prior Informed Consent (PIC) was jointly implemented by FAO and UNEP.
- After Rio (1992) the Rotterdam Convention was established and entered into force in 2004.

Functioning of the Rotterdam Convention

- More then 100 countries are signatories to the convention.
- There is a secretariat to give support to all meetings and other activities of the convention.
- There is an annual Conference of the Parties meeting were decisions on the addition or removal of chemicals to the Annex III (banned or severely restricted chemicals) list are made.
- There is an annual Chemical Review Committee meeting that makes recommendations to the CoP regarding the inclusion of chemicals to the Annex III list based on notifications by the member countries.

Obligations (a selection)

- Each country to establish a Designated National Authority (DEAT in South Africa).
- Final regulatory actions to be forwarded to the secretariat.
- The exporting country to provide an export notification to the importing country before an Annex III chemical is exported.
- The importing country to acknowledge receipt of the export notification.

ANNEX III list

- 2.4.5.T and its salts and esters
- Aldrin
- Binapacryl
- Captafol
- Chlordane
- Chlordimeform
- Chlorobenzilate
- DDT
- Dieldrin
- DNOC and its salts
- Dinoseb

ANNEX III list

- 1,2 dibromoethane (EDB)
- Ethylene dichloride
- Ethylene oxide
- Fluoro acetamide
- HCH (mixed isomers)
- Heptachlor
- Hexachlorobenzene
- Lindane
- Mercury compounds
- Monocrotophos, also as soluble liquid formulations exceeding 600 g active/l

ANNEX III list

- Parathion
- Pentachlorophenol and its salts and esters
- Toxaphene
- Benomyl, Carbofuran, Thiram (dustable powder formulations
- Methamidophos
- Phosphamidon
- Asbestos in most forms
- PBB
- PCT
- Tetraethyllead
- Tetramethyllead
- Tris (2,3 –dibromopropyl) phosphate

Chemicals under review

- Asbestos in all its forms including Crysotile
- Endosulfan
- Tributyltin in all its forms
- Cyhexatin
- Dicofol
- Methyl-parathion
- Myrex
- 4-nitro-biphenyl
- DBCP

Tributyltin in all its forms

- Antifouling paint for ship hulls
- Potential for bioaccumulation, as the log *Kow* values range from 3.2 to 4.1. The bioconcentration factor (BCF) values range up to 10 000 in periwinkles, 50 000 in fish, and 500 000 in clams.
- Mollusc: LC50 (48h, adult *Mytilus edulis)* = 300 µg
  LC50 (48h, juvenile *Mytilus edulis)* = 0.97 µg
  LC50 (48h, larvae *Mytilus edulis)* = 2.3 µg
- Fish: LC50 (96h, *Salmo gairdneri)* = 3.44 µg
- Bacteria: EC10 (18h, *Pseudomonas putida)* = 24 µg
  Daphnia magna NOEC (21 d) = 0.078 µg TBT/L
- Using the effect of imposex on molluscs to monitor recovery from TBT contamination in Canadian waters, it was found that whelks before 1989 had high frequencies of imposex in the Juan de Fuca Strait and the Strait of Georgia, and lower frequencies on the west coast of Vancouver Island.

Cyhexatin

- Cyhexatin was found to be teratogenic in rats and rabbits at low doses according to the information available to Canada at the time. It is used in orchards and greenhouses to control mites on apples, pears, peaches, nectarines, strawberries, hops, non-bearing raspberries, and ornamentals. Exposure occurs to workers in treated orchards or fields.
- Because subsequently new internationally peer-reviewed information became available showing that teratogenicity is not of concern, the Committee considered that this fact should be taken into account before any recommendation for inclusion of the substance into Annex III of the Convention would be made in the future