

OECD PROCEEDINGS

Sources of Cadmium in the Environment

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ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

The Accelerated Reduction/Elimination of Toxics (ARET)

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Introduction

ARET, a Canadian volunteer initiative, was established as a consensus-oriented multi-stakeholder group to use science combined with common sense to take proactive measures to reduce emissions. It includes members from several industries, health, and academic institutions and government, both federal and provincial.

Thirteen mining companies representing 83% Canadian base metal production have voluntarily made commitments to reduce combined emissions of ARET listed substances by 71% from the base year 1988 to the year 2000. This includes a commitment to reduce cadmium emissions by 85% to the year 2000.

The ARET program represents an encouraging step toward a more co-operative, flexible approach to advancing environmental protection as an alternative to or supplement to conventional regulatory methods.

The ARET Program

ARET stands for the Accelerated Reduction/Elimination of Toxics. It's purpose is to reduce the potential adverse effects of toxic substances on health and the environment by accelerating the reduction of selected toxic substance emissions, on a voluntary basis.

The program grew out of an initiative by a group called New Directions, made up of Corporate executives and leading environmentalists. The group came together in November of 1990 to seek opportunities to improve how organizations make decisions about the environment.

In September, 1991, the federal Minister of Environment received a report from New Directions on a process to deal with toxics. The Minister responded by launching a group that became known as the ARET committee.

Members of the ARET committee included representatives from industry, health and professional associations and the Canadian government, both federal and provincial.

The list of stakeholders is as shown in Table 1.

TABLE 1**ARET Stakeholder List****Health and Professional Groups**

- ◆ Chemical Institute of Canada
- ◆ Comité de santé environnementale du Québec

Industry Associations

- ◆ Canadian Chemical Producers' Association
- ◆ Canadian Electrical Association
- ◆ Canadian Manufacturers' Association
- ◆ Canadian Manufacturers of Chemical Specialties
- ◆ Canadian Petroleum Products Institute
- ◆ Canadian Pulp and Paper Association
- ◆ Canadian Steel Environmental Association
- ◆ Mining Association of Canada

Government Groups: Provinces*For CCME:*

- ◆ B.C. Ministry of Environment
- ◆ Nova Scotia Department of Environment
- ◆ Ontario Ministry of Environment and Energy

Federal

- ◆ Environment Canada
- ◆ Health Canada
- ◆ Industry Canada

ARET relies heavily on the voluntary efforts of its members. Funding for provincial participation has been provided by the Canadian Council of Ministers of the Environment, which endorsed the process in May, 1993.

The ARET program is based on the premise that voluntary action on the part of users and emitters of toxic substances may work more quickly and effectively than the traditional regulatory approach. While governments recognize the growing importance of voluntary action, they will continue to use regulation as part of their environmental protection strategies. Through ARET, emitters have an opportunity to participate in an open and non-prescriptive decision making process to reduce toxics. The ARET approach has the potential of being less costly to both industry and governments.

ARET provides an opportunity to gain public trust and support and improve competitiveness while improving the environment. Voluntary action allows companies which use, generate or release toxics to plan to reduce or eliminate their emissions in a way that provides flexibility.

In encouraging voluntary action, ARET complements several activities already underway including industry, and sector specific programs and provincial recognition programs. The ARET program supports the principles of sustainable development and public participation. Its members view pollution prevention as the most effective way to reduce or eliminate

toxic emissions. Pollutants should not be shifted from one media - air, water, land or biota - to another. Naturally occurring metallic substances or compounds throughout their life cycle are to be managed in the most appropriate environmental manner.

Specific scientific criteria were developed to select substances for action. The final list of substances, as per appendix 1, was based on recommendations from representatives from government, industry, environmental and labour groups who had expertise in environmental toxicology and hazardous substances.

The criteria of toxicity, persistence and bioaccumulation were used to screen substances. Substances were selected on the basis of their intrinsic properties; no consideration was given to quantities released, the medium of release or quantities in the environment.

ARET and the Canadian Mining Industry

Mining provides important economic and social benefits to Canada, producing metals and non-metallic minerals. These products support Canadian manufacturing and construction industries. In 1993, mining contributed 4% of Canada's Gross Domestic Product.

Canada is one of the world's leading producers of metals, ranking first in mine production of zinc, uranium, potash, second in nickel, asbestos, sulphur and cadmium and third in production of primary aluminum, platinum group metals, titanium concentrates and lead. In 1993, exports of minerals and metals were \$26.13 billion, representing 14.8% of total Canadian exports.

Mining provides some 100,000 jobs directly and 300,000 jobs indirectly.

Some 64 per cent of the tonnage loaded at Canadian ports in international shipping trade in 1993 was minerals related. The national organization of the Canadian mining industry is the Mining Association of Canada.

In the past decade, Canadian mining companies have shown leadership in addressing the challenge to reduce or eliminate emissions while maintaining the economic health of the industry itself.

Many activities of the mineral industry can result in the release of contaminants. Canada is the site of many large metallurgical plants. New metals production processes and improved emission control technology have

greatly reduced the amount of airborne emissions from smelters. Some of the metallurgical processes that formerly used pyrometallurgy now use hydrometallurgy; where this technology can be applied, it significantly reduces airborne emissions. Other advances include effluent treatment and control technology such as the development of new methods to increase the recovery of metals from effluent.

The mining industry in Canada believes that environmental goals are best achieved by working in co-operation with government, local communities and public interest groups.

Thirteen¹ mining companies, representing 83% of the value of Canadian base metal production in Canada, have voluntarily made commitments to reduce emissions of 12 ARET listed substances² dramatically by the end of the decade. From production figures provided by the Statistics Division of the Mining Sector of Natural Resources Canada, these 13 companies represent most of Canada's base metal and silver mine production.

Combined, they produce 89% of Canada's cadmium production, 100% of

¹ 13 Mining companies: Billiton metals Canada Inc., Brunswick Mining and Smelting Corp. Ltd., Cominco Ltd., Echo Bay Mines Ltd., Falconbridge Ltd., Gibraltar Mines Ltd., Highland Valley Copper, Hudson Bay Mining and Smelting Co. Ltd., Inco Ltd., Noranda, Placer Dome Canada Ltd., Syncrude Canada Ltd. and Westmin Resources Ltd.

² The 12 substances defined by ARET identified by the mining industry are: arsenic (inorganic), cadmium compounds (respirable and soluble inorganic forms), chromium (Cr⁶⁺), cobalt (inorganic, soluble), copper (inorganic salts), cyanides, hydrogen sulphide, leads, mercury (elemental, inorganic), nickel (inorganic, respirable, soluble), silver (soluble, inorganic salts), zinc (inorganic, respirable, soluble).

cobalt, 75% of copper, 86% of lead, 98% of nickel, 70% of silver and 79% of zinc. They also produce a proportion of the country's gold and crude oil.

Part of the ARET program is the compilation of emissions data provided by all participants. The data consists of annual emissions at three different times: the base year (1988 or later), 1993 and commitments for the year 2000.

As illustrated in graph 1, the mining industry's commitment projects a reduction of 71% of the annual emissions of these 12 substances combined from 7927 tonnes in the base year to 2307 tonnes in the year 2000. This means 5620 fewer tonnes of ARET listed substances being released each year into the water, land and air. This is all the more encouraging because similar results are being achieved in the other sector participation in the ARET program.

Graph 2 specifically looks at cadmium compounds released to the environment and projections for the year 2000. In the base year, the combined annual emission of cadmium to the environment from the 13 previously listed mining companies was reported as 123 tonnes. The projection for the year 2000 is 19 tonnes, representing an 85% reduction from the base year.

To date, ARET has provided the opportunity not only for the Canadian Mining Industry but many Canadian industries to get together with health and academic associations and levels of government to take pro-active measure to protect the environment. Voluntary programs can be more effective than regulatory programs because they allow companies to plan more effectively and comprehensively for the reduction or elimination of emissions. The success of programs such as ARET may reduce the need for or provide supplement to regulation.

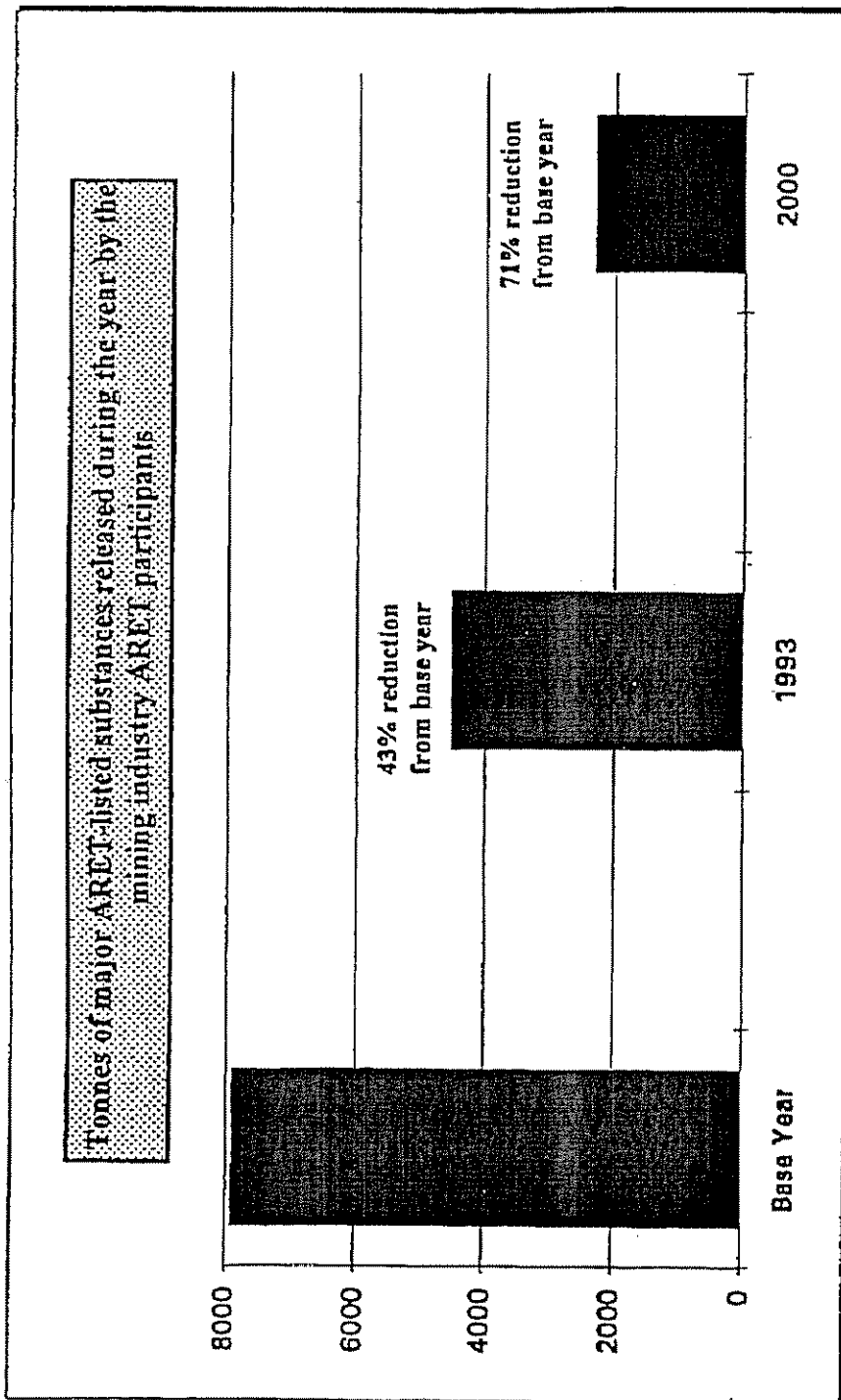
References

The Mining Association of Canada, Suite 1105, 350 Sparks Street, Ottawa, Ontario K1R 7S8.

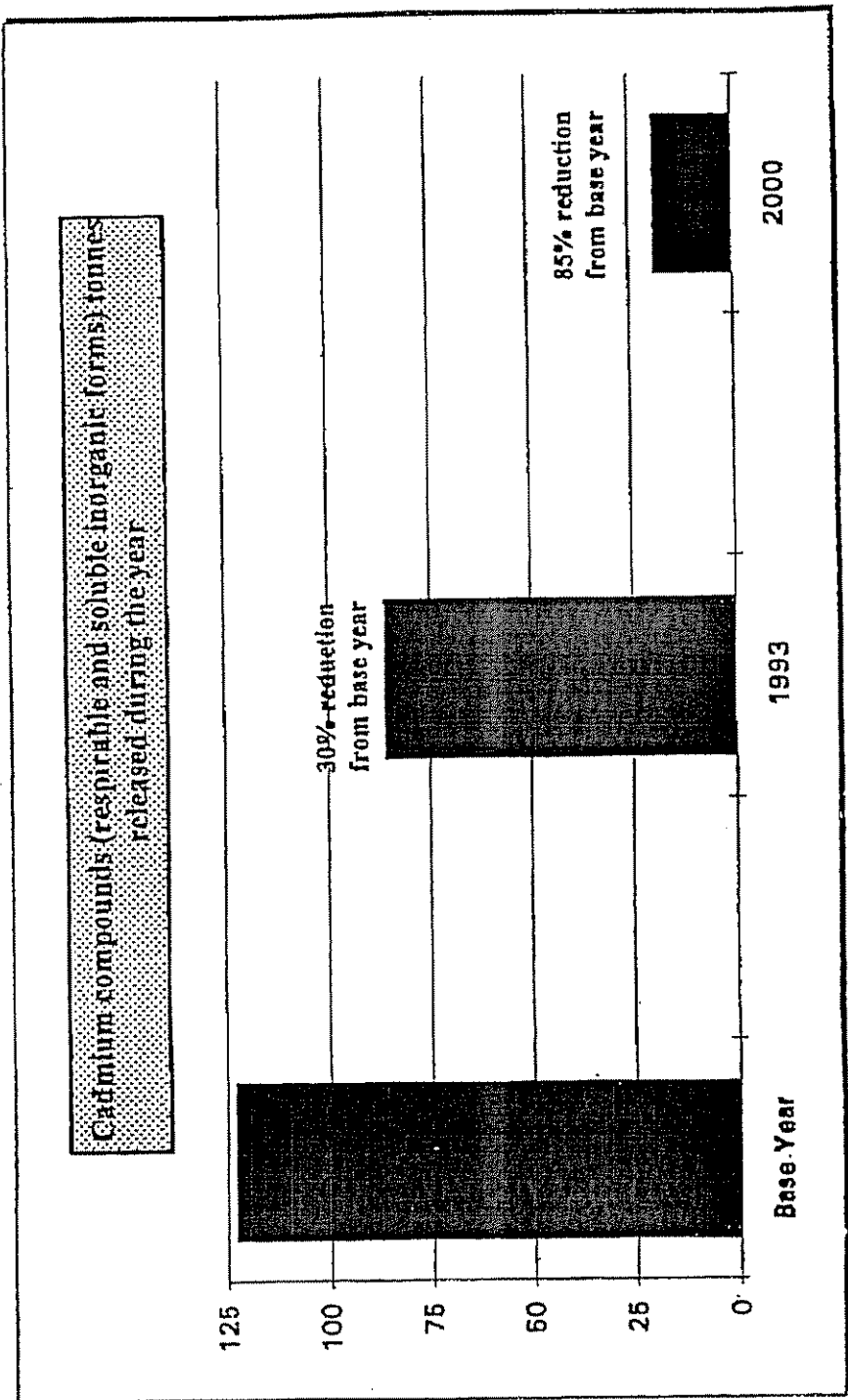
Publication "Voluntary Emissions Reduction-- The Mining Industry and the ARET Program"

ARET Secretariat, c/o Environment Canada 11th Floor, 351 Joseph Boulevard, Hull, Quebec K1A 0H3.

Publication "Voluntary Commitments to Action on Toxics Through ARET"



GRAPH 1



GRAPH 2

Appendix I

List A - 1

(meet or exceed criteria for toxicity, bioaccumulation and persistence)

Polychlorinated Biphenyls (PCBs)

Benz(a)anthracene
 Benzo(a)pyrene
 Benzo(e)pyrene
 Benzo(b)fluoranthene
 Benzo(j)fluoranthene
 Benzo(k)fluoroanthene
 Benzo(g,h,i)perylene
 Dibenz(a,j)acridine
 dibenzo(c,g)carbazole
 Fluoroanthene
 Indeno(1,2,3-c,d)pyrene
 Pyrene
 Phenanthrene
 Pyrene

Nitro-PAHs

1,6-dinitropyrene
 1,8-dinitropyrene

Chlorinated organics

Hexachlorobenzene
 alpha-hexachlorocyclohexane
 gamma-hexachlorocyclohexane
 4,4'-methylenebis(2-TH-chloroaniline)
 Octochlorostyrene
 Pentachlorophenol
 2,3,7,8-tetrachlorodibenzofuran
 2,3,7,8-tetrachlorodibenzo-p-dioxin

Metal Compounds

Methyl mercury
 Tributyltin

List A - 2

(ARET members unable to agree on the appropriate vision and resulting reduction targets for these substances)

1,4 dichlorobenzene
 Cadmium compounds (respirable & soluble inorganic forms)

List B - 1*(meet or exceed criteria for toxicity & bioaccumulation)***PAHs with data screened in this category:**

Anthracene
 7,12-dimethylbenz(a)anthracene
 Dimethylnaphthalene

Chlorinated organics

3,3'-dichlorobenzidine
 Hexachlorocyclopentadiene
 2,4,6-trichlorophenol

Other

bis(2-ethylhexyl)phthalate
 Tetraethyl lead

List B - 2*(meet or exceed persistence & toxicity criteria)***PAHs with data screened in this category:**

Benzo(a)fluorene
 Benzo(b)fluorene
 Dibenz(a,h)acridine

Chlorinated organics

alpha-chlorotoluene
 bis(2-chloroethyl)ether
 Bromodichloromethane
 Carbon tetrachloride
 Chloroform
 Chlorodibromomethane
 1,2 dichloroethane
 Methylene chloride
 1,1,2,2-tetrachloroethylene
 2,3,4,6-tetrachlorophenol

Other

o-anisidine
 Cyanides
 4,6 dinitro-o-cresol
 1,4 dioxane

Metal compounds

Arsenic(inorganic)
 Asbestos
 Beryllium
 Chromium (Cr6+)
 Cobalt(inorganic, soluble)
 Copper(inorganic salts)
 Lead (all forms except alkyl)
 Mercury (elemental & inorganic)
 Nickel (inorganic, respirable,
 soluble)
 Silver (soluble inorganic salts)
 Uranium (inorganic,
 respirable, soluble)
 Zinc (inorganic, respirable,
 soluble)

Ethylene oxide
 2-naphthylamine
 2-nitropropane
 Thiurea

List B - 3*(meet or exceed toxicity criteria)***Chlorinated organics**

bis(chloromethyl) ether
1-bromo-2-chloroethane
1-chloro-4-nitrobenzene
1,2-dibromo-3-chloropropane
1,2-dichlorobut-3-ene
2,4-dichlorophenol
1,3 dichloropropene
1,1,2-trichloroethylene

Aromatics

4-aminoazobenzene
4-aminobiphenyl
Aniline
Benzene
Benzidine
Dimethylphenol (mixed isomers)
2,6 dimethylphenol
2,4 dinitrotoluene
2,6 dinitrotoluene
1,2 diphenylhydrazine
2-methylpyridine
Phenol
Toluene diisocyanates

Nitrosamines

N-nitrosodimethylamine
N-nitrosodiphenylamine
N-nitroso-di-n-propylamine

Other

Acetaldehyde
Acetamide
Acrolein
Acrylamide
Acrylonitrile
1,3 butadiene
Chlorine dioxide
n-dodecane
Epichlorohydrin
Ethanol
Ethylene dibromide
Ethylene thiourea
Formaldehyde
Hydrazine
Hydrogen sulphide
Methyl isobutyl ketone
4-nitrosomorpholine
Quinoline
Tetramethylthiuram disulphide
Vinyl bromide