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Canada

R-NET

Canadian Association of Recycling Industries

RECYCLING TECHNOLOGY NEWSLETTER

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Just one day after running an article "Global Warming Approaching Point of No Return," *The Independent* warned its readers on January 24, 2005 of the "Countdown to Global Catastrophe." A few days later (February 6, 2005) the same news source warned "Apocalypse Now: How Mankind is Sleepwalking to the End of the Earth." What events have prompted these headlines?

In January two major events prompted worries about the environment. The UN Conference on Small Islands in Mauritius was the background for a presentation by Dr. Rajendra Pachauri, the chairman of the Intergovernmental Panel on Climate Change (IPCC). Dr. Pachauri said that in his personal view we might have already reached a dangerous level of carbon dioxide in the atmosphere. In the same month, a report titled "Meeting the Climate Challenge" was published in London by the International Climate Change Task Force. This report warned that the point of no return might be reached in 10 years, leading to droughts, agricultural failure, and water shortages.

"Avoiding Dangerous Climate Change" was the theme of a symposium held in Exeter, UK (February 1-3, 2005). As the meeting materials state, "the aim of the symposium was to advance scientific understanding of and encourage an international scientific debate on the long-term implications of climate change, the relevance of stabilisation goals, and options to reach such goals, and to encourage research on these issues." The symposium consisted of the following sessions:

- For different levels of climate change what are the key impacts for various regions and sectors, and for the world as a whole?
- What would such levels of climate change imply in terms of greenhouse gas stabilisation concentrations and emission pathways required to achieve such levels?
- What options are there for achieving stabilisation of greenhouse gases at different stabilisation concentrations in the atmosphere, taking into account costs and uncertainties?
- Research requirements

At the time of writing, the symposium's web page at *www.stabilisation2005.com* contained the entire programme featuring most of the presentations and posters as downloadable files. One could also download the draft report of the Steering Committee, tables of impacts, and news releases.

Elizabeth Giziewicz
Editor-in-Chief
CANMET - Mineral Technology Branch

VISIT R-NET's HOME in cyberspace at **http://RNET.NRCan.gc.ca/** This bilingual web site contains current and previous issues. Bookmark this site and visit it often for interesting links and current event listings.

Please keep writing to us with your ideas and suggestions. Share your success stories with us, do not forget to tell us about meetings and conferences that you are organizing, and be sure to let us know if you mention us in any of your publications.

Support for this publication is provided by "Enhanced Recycling" a component of the *Government of Canada Action Plan 2000 on Climate Change.*

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Closed Ecological Systems

Earth is a system that is closed to matter, but open to energy. And just as the glass in a greenhouse holds the sun's warmth inside, so the atmosphere traps the sun's heat near the Earth's surface. In this era when there is a realization that human activities are changing the composition of the atmosphere, some solutions to greenhouse gas management could come from existing studies of closed sustainable systems.

As people were preparing for and then undertaking the exploration of space, extensive studies were performed that attempted to create environments incorporating nearly closed (with respect to matter), bioregenerative life-support systems. The two most widely known facilities are the Russian Bios-3 (located in the Syberian city of Krasnoyarsk) and the American Biosphere 2. Bios-3 was designed specifically as part of the Soviet space program. Although it was not initially concerned with understanding Earth's ecology, the outcome of the project, especially the experience gained in air and water purification and recycling, should not be overlooked.

Biosphere 2 was an ecological experiment built as a laboratory for global ecology. It was a tightly sealed glass and steel structure on approximately 1.3 ha near Oracle, Arizona where scientists created seven complete ecosystems (biomes), which mirrored those of Earth (ocean, freshwater and saltwater marshes, tropical rain forest, savannah, desert, intensive agriculture, and human habitat). For two years (September 26, 1991 - September 26, 1993) eight scientists and approximately 3,800 catalogued species of plants and animals lived inside Biosphere 2 sealed from the outside world.

An automated system continuously monitored atmospheric gases: carbon dioxide (CO_2), oxygen (O_2), nitrous oxide (NO_2), other nitrous gases (NO_x), sulphur dioxide (SO_2), methane (CH_4), ozone (O_3), and hydrogen sulphide (H_2S). Carbon dioxide concentrations fluctuated between 1,200 and 4,000 parts per million depending on the time of year. When days were continuously sunny, Biosphere 2's CO_2 would stabilize at around 1,800-2,000 parts per million. To deal with the rising CO_2 concentration in the winter solstice period, the crew built a recycling system, which mimics Earth's natural geological processes. The system would pull CO_2 out of the air and through a series of simple chemical reactions change it into limestone (calcium carbonate). Other techniques used to lower CO_2 concentrations were: maximizing plant production, reducing respiration, and not composting in the agriculture ecosystem during winter.

Biosphere 2's ocean was under constant observation. It was important to see whether the ocean in its complexity would survive the dramatic fluxing of carbon dioxide diffusing into the ocean water, lowering the pH of the water and thus affecting coral reefs. Coral reefs are found in waters where pH ranges from 8.0 to 8.4. With the high levels of carbon dioxide that were present in Biosphere 2, the ocean had to be buffered to keep the CO_2 from

lowering its pH. Carbonates and bicarbonates were used throughout the two years to counteract the rise of carbon dioxide concentration in the ocean water.

The most interesting atmospheric observation of the two-year closure was the unexpected continuous decrease in oxygen concentration, about 0.3% per month, from 20.9% (amount in Earth's atmosphere at sea level) to 14.2%. When the oxygen level in the atmosphere reached about 16%, the biospherians began to experience symptoms of high-altitude sickness. On January 13, 1993, after several members of the crew began experiencing physical difficulties, 31,000 pounds of liquid oxygen were injected into the air over a nineteen-day period boosting the level of oxygen to approximately 19%.

The unusual aspect of the aforementioned loss of oxygen was that it was not accompanied by an equivalent increase in carbon dioxide concentration in the atmosphere. An unforeseen process was removing oxygen, or something was capturing the excess carbon dioxide. It was definitely established that oxygen was used in respiration and decay of fresh compost and peat contained in soils. After an examination of core samples of concrete inside Biosphere 2, it was discovered that concrete taken from the inside walls contained ten times as much calcium carbonate as concrete from the outside walls. Nearly all of the excess carbon dioxide produced by soil microbes munching on organic matter, reacted with calcium hydroxide in the concrete to form calcium carbonate, as well as some caliche soils. Measurement of the carbon^{12}/carbon^{13} isotope ratio in several parts of the system was the key to confirming this evaluation.

This startling result should make us all think about the effect of increased carbon dioxide on Earth interacting with our expensive concrete infrastructures.

Because Biosphere 2's glass roof admitted no ultraviolet radiation, the closed facility gave an opportunity to isolate biological sources and sinks of gases such as nitrous oxide. Biosphere 2 experienced a continuous increase in nitrous oxide. On Earth photolysis eliminates the excess by reactions in the stratosphere. However, according to recent studies, since the Industrial Revolution the level of nitrous oxide in the Earth's atmosphere has increased by approximately 16%. The main contributor is believed to be the widespread use of nitrogen-base fertilisers followed by the burning of fossil fuels and wood. Nitrous oxide is 200 to 300 times more effective in trapping heat than carbon dioxide

One of the most striking accomplishments for Biosphere 2 was its massive recycling system. For two years the crewmembers used the same water and recycled all waste products (including human and animal waste). Each Biospherian's actions resulted in immediate reactions in their mini-world, which dramatically demonstrates the importance of individual accountability for our common closed system - Earth.

Biosphere 2 was designed to last a century, providing valuable data for research and education. Unfortunately what was supposed to be a 100-year long experiment was opened to exchange air in 1994, and the world record-setting agricultural system was destroyed. After being used first as a research facility and later as a tourist attraction, it is currently for sale. The sellers identified potential buyers as government entities, universities, private schools, church groups, resorts, and spas.

The Biosphere
Vladimir I. Vernadsky
New York: Springer-Verlag, ***1997***
First published in 1926 in the Soviet Union. Vladimir Ivanovich Vernadsky (1863-1945), a prominent Russian scientist, was an original pioneer in the field of biospherics, a science before its time. Under Vernadsky's definition, the Biosphere is the single greatest geological force on Earth, moving, processing, and recycling several billion tonnes of mass a year. The construction, science and research behind the Biosphere 2 were based on his theory.

Using the Recyclability Index of Materials as a Tool for Design for Disassembly
G. Villalba, M. Segarra, J.M. Chimenos, F. Espiell
Ecological Economics ***2004****, 50, 195-200 (Eng)*
The recyclability index (R) measures the ability of material to regain its valued properties through a recycling process. The recyclability index could be used to determine the economic feasibility of a disassembly of a product, as the value of the material must be greater than the cost of disassembling operations. A recyclability index of 1 means that there is no difference between the recycled and the virgin material: the recycled material is able to regain all the properties the material had in its first form, and this is reflected by similar market values placed on the recycled and the virgin material. For example, copper recovers its properties through recycling and therefore has a high recyclability index (R=0.94); on the other hand, paper has a low recyclability index (R=0.156) since recycled paper does not recover the purity of the virgin paper. The legislation, especially in Europe, dictates that materials should be recycled and new products are made from recycled materi-

als. Therefore, it becomes important to incorporate the recyclability index of materials in the evaluation and optimization of disassembly and design for disassembly.

Determining a Recyclability Index for Materials
G. Villalba, M. Segarra, J.M. Chimenos, I. Fernández, F. Espiell
http://gin.confex.com/gin/2003/techprogram/P36.HTM

Life Cycle Assessment, Part 1: Framework, Goal and Scope Definition, Inventory Analysis, and Applications
G. Rebitzer, T. Ekvall, R. Frischknecht, D. Hunkeler, G. Norris, T. Rydberg, W.-P. Schmidt, S. Suh, B.P. Weidema, D.W. Pennington
*Environment International **2004**, 30, 701-720 (Eng)*
The paper provides an overview of the objectives, characteristics, and components of an LCA and focuses on Life Cycle Inventory (LCI), a methodology for estimating the consumption of resources and the quantities of waste flows and emissions attributable to a product life cycle. The aim of the LCI is to calculate the quantities of different resources required and emissions and waste generated per functional unit. The authors define their audience as decision makers in industry and policy, product developers, environmental managers, students, and other non-Life Cycle Assessment (LCA) specialists working in environmental issues. This highly technical paper contains 119 references.

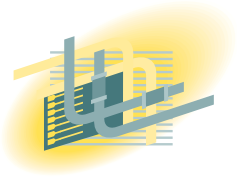
Life Cycle Assessment Part 2: Current Impact Assessment Practice
D.W. Pennington, J. Potting, G. Finnveden, E. Lindeijer, O. Jolliet, T. Rydberg, G. Rebitzer
*Environment International **2004**, 30, 721-739 (Eng)*
This paper focuses on Life Cycle Impact Assessment (LCIA), the subsequent phase of an LCA (Life Cycle

Other closed ecology experiments include the Soviet Bios -1 to Bios-3 research projects, and NASA's Closed Ecology Life Support Systems (CELSS). Bios-1 was built in 1965, and it regenerated the atmosphere for one human in a sealed 12 m^3 chamber connected through air ducts to an 18 litre algal cultivator containing *Chlorella vulgaris*. The Bios-3 facility was built in 1972 and has been used almost continuously since its construction. It housed ten manned closure experiments with a 1-3 man crew. Today, Bios-3 facilities are still operational and used for experimentation on various aspects of life support and stability of ecosystems.

In 1999 NASA developed a new facility to test advanced life support. The Bioregenerative Planetary Life Support Systems Test Complex (Bio-Plex) is a network of sealed chambers that house equipment to recycle air, water, and solid waste, and to produce food on a continuous basis. Bio-Plex is located at the Johnson Space Centre in Houston.

Additional reading:
- John Allen, "Biosphere 2: The Human Experiment", edited by Anthony Blake, *Penguin Books, New York, **1991***.
- Abigail Alling, Mark Nelson, "Life under Glass, The Inside Story of Biosphere 2", *Biosphere Press, Oracle, Arizona, **1993***.
- Sally Silverstone, "Eating in: From the Field to the Kitchen in Biosphere 2", *Biosphere Press, Oracle, Arizona, **1993***.
- Web: *www.biospherics.org*

Alberta's Electronics Recycling Program



Rapid advances in technology, consumer demand for new products and a growing provincial population have accelerated the amount of electronic waste being sent to Alberta landfills. It is estimated that 190,000 televisions and 90,000 desktop computers will be discarded from Alberta households over the next year. Management of this waste stream is a growing challenge for businesses, residents and communities. Electronic recycling is a key part of the Government of Alberta's strategy to reduce the annual amount of per capita waste going to landfills. The electronics recycling program is designed to ensure that Albertans in all areas of the province have reasonable access to drop-offs for their end-of-life electronics destined for recycling.

Alberta's electronics recycling program, a first of its kind in Canada, came into effect on October 1, 2004. The purpose of this program is to give Albertans access to collection sites and e-roundups to help them dispose of their old (or end-of-life) electronics - specifically computers and TVs, so they can be recycled. An environmental fee, ranging from $5 to $45, funds the program. Beginning February 1, 2005, all suppliers (companies that sell or supply electronics in Alberta including manufacturers, wholesalers, distributors and retailers) are required to collect this fee - the Advance Disposal Surcharge (ADS), from end-user customers on the sale of new television sets, desktop computers and related equipment. The federal government then adds the GST onto it. End-of-life electronics will be stored at designated collection sites until they can be transported to a processing/recycling facility where they will be broken down into metals, glass and plastic so that they can be more easily recycled. In some cases, these materials may turn into the next generation of electronics.

Electronics Recycling Alberta (ERA), a division of the Alberta Recycling Management Authority (ARMA), a non-profit organization, manages the program and oversees the actual recycling activity. The environmental fee is used for collection, transportation and recycling of the electronic material as well as program operations, including public awareness and research-related activities, such as improved technologies for recycling. The program will help to ensure that end-of-life televisions and computer equipment discarded by Albertans are diverted from landfill, ultimately resulting in a cleaner, healthier environment. Electronics cannot be brought from another province into Alberta for recycling. Alberta's electronics recycling program applies only to electronics products sold in or into Alberta. Visit *www.albertarecycling.ca* to view a comprehensive description of the program and/or to contact the Alberta Recycling Management Authority.

Statistics Canada Reports

Waste Management Industry Survey: Business and Government Sectors 2002, released in September 2004 (16F0023XIE), also available on-line at *www.statcan.ca*. From the *Our Products and Services* page under *Browse our Internet publications*, choose *Free*, then *Environment*.

In 2002, the waste management industry handled over 30 million tonnes of non-hazardous solid waste generated by Canadian households and businesses. Households alone produced 39% of these waste materials, on average 383 kilograms for each Canadian, about 18 kilograms more per person than in 2000.

In 2002, almost 24 million tonnes (760 kilograms per capita) of non-hazardous material was disposed, an increase of 7 kilograms per Canadian from 2000. This includes material that was disposed in Canadian landfills and incinerators as well as material that was exported to another country for disposal. The lowest per capita disposal rate was in Nova Scotia with 417 kilograms. The highest disposal rate for 2002 was 928 kilograms per capita in Alberta.

Percentages of the total non-hazardous wastes generated that was diverted from disposal in 2002 in Canada were: residential sources 21% (versus 19% in 2000), industrial, commercial and institutional sources 23% (versus 24% in 2000), and construction and demolition sources 16% (versus 12% in 2000). Nova Scotia had the highest diversion rate (30%) followed closely by British Columbia (29%) and Prince Edward Island (28%).

Over 6.6 million tonnes of non-hazardous materials were processed for recycling in 2002. Mixed paper and organic materials made up the bulk of the material recycled, accounting for 23% and 18% respectively of the total for 2002. Within material categories the largest increases from 2000 to 2002 were construction and demolition material (up 42%) and cardboard and boxboard material (up 27%).

There were 48 more businesses in the waste management industry in 2002 than in 2000 (1785 versus 1737). Small waste management businesses (under 20 employees) saw the largest increase in their numbers from 1502 in the year 2000 to 1545 in 2002.

Assessment) assessing the inventory data in terms of contributions to environmental impacts. This is a highly technical paper and suited to those who already have in-depth knowledge of the LCA process and would like to see a comprehensive review of various approaches and techniques. The authors present a comprehensive summary of LCIA category indicators (i.e., climate change, stratospheric ozone depletion, acidification, aquatic and terrestrial eutrophication), characterization factors and models. Each choice is supported by a reference to scientific literature. The paper contains 148 references.

An Overview of Recycling and Treatment of Scrap Computers
Ching-Hwa Lee, Chang-Tang Chang, Kuo-Shuh Fan, Tien-Chin Chang
Journal of Hazardous Materials ***2004****, B114, 93-100 (Eng)*
It is estimated that approximately 700,000 scrap personal computers are generated each year in Taiwan. On June 1, 1998, a producer responsibility recycling program for scrap computers was officially implemented in Taiwan. Under this program, several local recycling plants were established to treat and recycle scrap computers generated in the country. This study reviews the available recycling technologies. Actual recycling data from a scrap computer recycling plant are also introduced. On the basis of actual practice in Taiwan, a high recovery rate of 94.75 wt.% was achieved when recycling computers; however a recovery rate of 46 wt.% was obtained when Cathode Ray Tube (CRT) monitors are considered. A poor local recycling market for CRT glass is a reason for the low recycling rate for CRT monitors.

Copper Removal from Effluents by Various Separation Techniques
N.K. Lazridis, E.N. Peleka, Th.D. Karapantsiois, K.A. Matis
Hydrometallurgy ***2004****, 74, 149-156 (Eng)*
The researchers investigated the recovery of copper ions from wastewaters using three different flotation mechanisms: ion flotation using xanthates, precipitate flotation generating copper hydroxide and sorptive flotation using zeolites as a sorbent material. Under the studied conditions, ion and sorptive flotation were found very effective in removing copper (almost 100% Cu removal achieved), while the precipitation method failed. These flotation techniques deserve wider attention because of their potential successful industrial applications. They could aid in effluent treatment and recover the metal values that otherwise would be lost.

High Tide, the Truth About our Climate Crisis
Mark Lynas
New York: Picador, ***2004***
ISBN 0-312-30365-3
EAN 978-0312-30365-5
Mark Lynas reports on his travels into some of the places showing intense change caused by global warming. He experienced disappearing glaciers in the Peruvian Andes and melting permafrost in Alaska. He visited an island of Tuvalu in the Pacific Ocean that is awaiting the end of its existence and preparing for the evacuation of the entire population, as the water levels surrounding it increase every year. He gives his personal account of the dust storm season in parts of China, weather changes in Britain, hurricanes in the Unites States and the recent European heat waves. On his web site www.marklynas.org one can find many of pictures that Mark took during his travels. These pictures illustrate better than words, the extent of the damage resulting from climate change.

Governments and public waste management bodies generated over $875 million from waste management activities in 2002. The largest source of these revenues was tipping fees, making up 50% of the total. Expenditures made by governments and other public bodies targeted to waste management activities totalled $1.5 billion in 2002, an increase of 9% from 2000.

Employment for the entire waste management industry, including both private and government sectors, totalled 32 485 persons in 2002 for an increase of almost 3% from 2000.

Technological Innovation for Environment

Technological Innovation Data Sheets are a promotional tool for the new environmental technologies developed by SMEs in Quebec. Produced by Environment Canada, their purpose is to disseminate the results of technology development and demonstration projects carried out in the following sectors: wastewater, air emissions, contaminated soil, waste management, hazardous waste, agri-environment, and innovative tools and processes. These fact sheets are intended for all companies, industries, organizations and individuals with an interest in new technologies.

Each one summarizes the environmental issue, presents the characteristics of the new technology, and describes the results obtained during the validation phase, as well as the technology's application potential and limitations.

At this time, the following Data Sheets are available at http://www.qc.ec.gc.ca/dpe/. Click on *Technology Innovation and Industrial Sectors,* then on *Publications,* and choose *Environment - Technological Innovation (Data Sheets, 2004)*:
- Bionest™: An Advanced Secondary Treatment System for Domestic Wastewater
- Bio-Terre Systems: Low-temperature Anaerobic Treatment of Hog Manure and Transformation of Biogas into Green Energy
- Bio-Aqua: System for Treating and Recirculating Water from Fish Rearing Facilities

For more information please contact Jeane Ritchie at (514) 283-9274, or by email: innovation.technologique@ec.gc.ca

Waste Management Guide For Small and Medium Enterprises - Canadian Version
This guide is specifically designed to assist small and medium-sized enterprises (SME) managers in developing and implementing a customized waste management program that is tailored to their needs. Municipalities, who are playing an important role in waste management in Canada, will also find relevant information.

In order to meet each organization's specific needs, this guide includes four parts:
- **Part 1**: Ten real life experiences and accounts of situations observed inside various organizations (case studies).
- **Part 2**: A general portrait of the current waste management situation in Canada and an overview of provincial/territorial regulations.

- **Part 3**: An operational guide to the five-step process of the implementation of a waste management program.
- **Part 4**: A compendium of resources that will support the realization of the approach described in the Part 3.

The electronic version of the Guide is currently available on the Web site of Environment Canada (*http://www.qc.ec.gc.ca/dpe*), under the *Publications* section. A free printed or CD-ROM copy can also be obtained from the company NI Environnement (nicorp@netrover.com).

Enhanced Recycling

The Enhanced Recycling Program is a five-year (April 2001-March 2006), $3.4 million component of the Minerals and Metals Program of the *Government of Canada Action Plan 2000 on Climate Change*. It is designed to stimulate recycling activities within Canada by seeking like-minded partners to participate in projects that take current recycling activities to higher levels. The Enhanced Recycling Program has been critical in raising awareness of the efficiencies realized from reducing material and energy wastes throughout the product life cycle. Since the start of the program, over 30 projects have either been completed or are in progress. All projects are cost shared with multiple partners and the program is running at an average leverage of 60%. Some of the projects are:

Scan of metals and minerals recycling programs and associated climate change impacts
Identifies policies and programs within Canada, as well as internationally, that address the diversion of metals and minerals from disposal. Using a number of factors, the effectiveness of the various policies and programs aimed at metal and mineral recovery in each province and territory has been evaluated. Data from each region were compiled into a master database with the capability to correlate programs by criteria such as material type and program characteristics. This database was used to update contacts in the NRCan Industry Framework, as well as provide additional information on companies and programs currently involved in metals and minerals recycling in Canada.

A roadmap for implementation of a product responsibility program for selective Information and Communications Technologies (ICT) equipment in Canada
Defines the steps necessary to implement a national electronic waste recovery program including options for a national roll-out; costs; roles for industry, municipalities and consumers; regulatory barriers; and, greenhouse gas implications.

By-product synergy - Greenhouse gas reduction analysis project
Develops a life cycle analysis approach for estimating the greenhouse gas savings potential of by-product synergies or industrial eco-efficiency projects. The synergies investigated are in the Golden Horseshoe BPS project: (1) By-product carbon black fines from activated carbon process to be used as a substitute fuel in a cement kiln; and (2) By-product steel slag from the steel making process to be used as a raw material in producing asphalt.

Et cetera...

On February 16, 2005, the day the Kyoto Protocol entered into force Prime Minister Paul Martin announced that Canada would be hosting the Eleventh Conference of the Parties to the United Nations Framework Convention on Climate Change in Montreal (from November 28 to December 9, 2005).

One-Tonne Challenge, Take Action On Climate Change
Reduce your annual greenhouse gas emissions (GHGs) by one tonne. The average Canadian produces five tonnes of GHGs each year so one tonne is a reduction of about 20 per cent.

C'mon Canada. Lose a tonne. Feel great
The 30 and 60-second television advertisements with Rick Mercer were launched in December 2004. They ask Canadians to take the challenge. You can watch Rick Mercer as he delivers the message at http://www.climatechange.gc.ca/one-tonne/english/media_room/media.asp

Or you can watch Pierre Lebeau delivering the same message in French at http://www.climatechange.gc.ca/one-tonne/francais/media_room/media.asp

Recycle Used Rechargeable Batteries and Cell Phones
Through the North American program, *Call2Recycle*™, the Rechargeable Battery Recycling Corporation (RBRC) helps you recycle your old cell phones and used portable rechargeable batteries. In October 2004 a complete national infrastructure was launched, with all-in-one cell phone and battery collection boxes shipped to over 4,000 participating retailers, communities, public agencies and businesses, providing a convenient service to all Canadians who own a cell phone.

Visit *www.call2recycle.org* to learn more about the program and to locate participating retailers and locations in USA and Canada.

Waste Diversion Ontario
Visit *www.wdo.ca* to find interesting reports, such as the three mentioned below.

Ontario Blue Box Markets Overview, 2002/2003 Blue Box Materials Generated and Municipally Marketed, Mass Balance Report, January 2005
The Stewardship Ontario Mass Balance Report for residential recyclables generated, collected, processed and marketed in Ontario presents baseline information about the flows of recyclable materials from householders to end markets in 2002 and 2003 and establishes a format for future reports. The report deals with residential Blue Box materials collected through municipal curbside and depot collection programs.

Municipal Datacall, September 2004
Every year, the Municipal Datacall asks municipalities to provide statistical data for waste generation and diversion activities. The Financial Datacall is used to calculate the industry funding contribution to municipalities, to support programs and to manage residential Blue Box arrangement. The 2003 Financial Datacall Summary Report contains data as reported by the 194 recycling programs serving 317 of the 446 municipalities in the Province of Ontario.

- A total of approximately 780,000 tonnes of residential Blue Box post-consumer products were marketed in 2003. This represents a 7.3% increase over the 2002 recovery of about 727,000 tonnes. Household recovery rates for residential Blue Box increased to 174 kilograms per household per year from 164 kg in 2002 and 161 kg per household per year in 2001.
- 3.2 million households had access to a collection system for electronic waste. A total of 58 programs reported collecting

Status of metal recycling technologies in metal processing
Identifies the major recycling and refining technologies used in the ferrous and non-ferrous industries, such as steel, magnesium and aluminium.
The following issues are being reviewed and evaluated:
- Scrap management, sorting and classification in primary and secondary metal industries of steel, aluminum and magnesium
- Refining technologies used in primary and secondary metal processing, removal and reduction of impurities in steel, aluminum and magnesium, and detection of trace elements in liquid metals
- Design of recyclable products in transportation, construction and energy, particularly the re-use of by-product and the production of alloys easy to recycle
- Energy efficiency and energy saving related to recycling

Development of a guidance manual for the selection of policies for sustainable economic recovery of municipal waste
The broad range of waste management policies and infrastructure currently available make it difficult for community leaders to decide on the best course of action for their municipality. Federation of Canadian Municipalities (FCM) created a guidance document for municipal leaders and waste managers that will help communities identify and implement progressive and innovative approaches to minimizing inefficiencies in material and energy use.

Improving recycling supply and demand data for minerals and metals
The objective is to produce accurate and consistent statistics over a five-year period regarding the generation and characterization of solid wastes in all provinces and territories. Primary project tasks include the identification and quantification of resource recovery opportunities (i.e., metals, plastics, glass, paper, etc.) and the projection of potential greenhouse gas emission savings that could be achieved if higher recovery rates were attained in each of the three sectors under review (residential; institutional, commercial & industrial; and construction, renovation and demolition).

Pilot program to recycle spent computers
The aim was to establish a pilot recycling initiative for computers and other electronic equipment arising from the post consumer sector within a regional area of Manitoba. Electronic Products Stewardship of Manitoba Inc. (EPSOM) was given a mandate to discover and implement effective means of collecting; reusing and recycling unwanted consumer electronics in the Province of Manitoba. The project assessed, in practice, the feasibility of collection, testing for re-usability, disassembly where warranted, recycling and recovery of computers and other electrical equipment. A "best practices" recycling manual was developed which has applicability to future recycling and recovery programs being initiated across Canada.

Assessment of advanced sensing and monitoring technologies for efficient metals recycling
The refining step in both primary and secondary metals processing requires the monitoring and control of metallic and non-metallic impurities in molten metal for improved product quality. The use of chemical sensors for in-situ/on-line detection of impurities during both primary and secondary metals processing can lead to a reduction in production time, improve product quality and lower energy consumption with commensurate reduction in greenhouse gas (GHG) emissions. Continued R&D efforts are needed to overcome certain

technological challenges in order to make the metal production/recycling process more efficient.

Increasing waste diversion by creating by-product synergy in an industrial park
A coordinator, working under the guidance of a local steering committee comprised of industry representatives, is fostering collaboration between the businesses in the Foothills Industrial Park of Calgary. Waste diversion and resource, energy, and greenhouse gas savings are being tracked and a final report and a guidance document to assist in project replication will be produced. At the completion of the project, businesses will be able to continue the activity through the web-based exchange developed for the project.

Baseline data and tracking system for the generation and diversion of obsolete white goods from residential sources in Canada
This project inventories white goods recovery and recycling initiatives already in place in Canada. Through interaction with representatives from various sectors, the proponents will estimate the flow of obsolete white goods and the corresponding flow of the constituent materials of these products. An increased understanding of the dynamics of this product stream will help to determine gaps in existing approaches to effective management as well as beneficial recovery and recycling opportunities. The environmental benefits (including greenhouse gas emission reductions) associated with current recovery statistics will be determined, and the benefits of future scenarios will be estimated.

Let's Climb Another Molehill - Analysing Construction, Renovation and Demolition (CR&D) Waste
The project provides insight into the magnitude, composition and fate of waste generated from the Construction, Renovation and Demolition (CR&D) sector through waste audits of various CR&D projects. This project involves an in-depth analysis of fifteen CR&D projects, specifically: low and high-rise residential renovation projects as well as CR&D activity on commercial, industrial and institutional sites. This study will engage owners, managers and staff, who work on these sites daily, for meaningful data and information input. Project outputs include: detailed financial and composition audits of CRD site waste; and development of a prototype design for "The Molehill Tool": a practical site-specific, handbook on job-site waste management, reduction and recycling.

Study to determine the economic, environmental and social benefits of an electronics extended producer responsibility program
The project's objectives are:
- To assess the recycling capacity and infrastructure that currently exists both nationally and regionally.
- To examine options and opportunities for the creation of new facilities.
- To develop a business case that identifies the costs and technologies required for establishing a regional recycling facility.
- To identify all options regarding the potential for re-manufacturing of discarded electronics into new products.
- To determine what measures may be developed to create a communication mechanism between recyclers and the manufacturers, such that Design for the Environment and Design for Recycling initiatives may be incorporated into the initial manufacturing and final recycling process.

electronic waste in 2003 (versus 49 programs reporting in 2002).
- There were 70 municipal residential organic waste collection programs operating in 2003 (versus 78 programs operating in 2002). A total of 435,000 tonnes of residential organic waste were collected in 2003. This represents a 21% increase over the 2002 recovery of 360,000 tonnes. A total of 4 million households have access to curbside collection and depot collection of residential organics. Household recovery rates for residential organic waste increased from 90 kilograms per household per year in 2002 to 109 kg in 2003.
- At 13,130 tonnes, household special waste (HSW), also commonly known as household hazardous waste (HHW) enjoyed a 7% increase in recovery over the 2002 recovery of 12,280 tonnes.

EPSC Tour of Electronic Waste Producer Responsibility Programs, June 2003
Electronics Product Stewardship Canada (EPSC) led a delegation of representatives from federal, provincial and recycling/waste diversion organizations interested in creating a national electronics stewardship program for Canada. The Mission participants visited Netherlands and Belgium and also met with representatives from Sweden. The report features a detailed description of attended presentations and industrial tours. A variety of photographs from visited facilities illustrate the know-how. The European Union is under obligation to develop and implement electronics stewardship programs by 2006 mandated by the Waste Electronic and Electronic Equipment (WEEE) Directive. According to a number of industry representatives, the current generation of WEEE per inhabitant in the Netherlands and Belgium is estimated to be 16 to 17 kg per year. One can find more information about the WEEE Directive and the related European legislation at http://europa.eu.int/comm/environment/waste/weee_index.htm

Americana 2005
The Pan-American Environmental Technology Trade Show and Conference
April 6-8, 2005
Montréal, Quebec, Canada
Phone: 514-270-7110
Web: www.americana.org

2005 Convention and Exposition "Generation", Institute of Scrap Recycling Industries (ISRI)
April 12-16, 2005
New Orleans, Louisiana, USA
Phone: (202) 662-8510
Web: www.isriconvention.org

25th Annual Conference Recycling Council of Ontario
May 4-6, 2005
Etobicoke, Ontario, Canada
Phone: (416) 657-2797, ext. 4
Email: tracysak@rogers.com
Web: www.rco.on.ca/intro/upcoming.html

Waste - The Social Context Edmonton Waste Management Centre of Excellence
May 11-14, 2005
Edmonton, Alberta, Canada
Phone: (780) 496-6872
Web:
www.ualberta.ca/ERSC/Waste/index.htm

7th Annual Canadian Environmental Conference and Tradeshow (CANECT 2005)
May 11-12, 2005
Toronto, Ontario, Canada
Phone: (905) 727-4666
Email: steve@esemag.com
Web: www.esemag.com

EPA Science Forum 2005: Collaborative Science for Environmental Solutions
May 16-18, 2005
Washington, DC, USA
Email: tcs-events@saic.com
Web: www.epa.gov/ORD/scienceforum/

Canadian Association of Recycling Industries

Electronics Product Stewardship

by Leonard Shaw

Report after report is telling us what is obvious in every community in the developed world: used electrical and electronic equipment is creating major disposal problems. Apart from the problem of the very large quantities of this e-waste, as it is called, there is the fact that it may contain hazardous materials such as lead, cadmium, and mercury. In order to deal with these concerns, many jurisdictions are developing end-of-life electronics policies and programs. Many of these programs are using product stewardship approaches.

Recently, in a move to promote "harmonization of approaches to the greatest extent possible, and to prevent market distortions among jurisdictions," the Canadian Council of Minister's of the Environment (CCME) developed the following set of 12 principles for electronics product stewardship.

1. Responsibilities associated with management of e-waste are primarily borne by producers of the products, where "producer(s)" means the manufacturer, brand-owner, or first importer who sells or offers for sale the product in each jurisdiction.
2. Costs of program management are not borne by general taxpayers.
3. Environmental and human health impacts are minimized throughout the product life-cycle, from design to end-of-life management.
4. Management of e-waste is environmentally sound and consistent with the 4R waste management hierarchy:
   a. **R**educe, including reduction in toxicity and redesign of products for improved reusability or recyclability
   b. **R**euse
   c. **R**ecycle
   d. **R**ecovery, of materials and/or energy from the mixed e-waste stream
5. Consumers have reasonable access to collection systems without charge.
6. Education and awareness programs ensure that consumers, retailers, and other stakeholders have sufficient information on program design and knowledge of their roles.
7. Program design and implementation will strive for equity and consistency for consumers, particularly among those who live in adjacent jurisdictions and among those who live in large urban centres and rural and remote communities.
8. Adjacent jurisdictions will strive for consistency in e-waste products collected.
9. Programs will include residential, commercial, historic, and orphan products.
10. Programs will report on performance, specify objectives and targets, and be transparent in financial management.
11. E-waste is managed in the most economically and logistically feasible manner, while striving to maximize local economic and social benefits.
12. E-waste is exported from Canada for recycling only at facilities with a documented commitment to environmentally sound management and fair labour practices.

At first glance these principles seem logical and useful. Certainly the articles that specifically address harmonization and uniformity make a lot of sense. Different approaches in different jurisdictions can lead to market distortions and uneven competition in both the equipment and the recovery/recycling sectors.

Principle number 2 states that the costs of program management should not be borne by taxpayers. This is also very sound. Generally manufacturers incorporate all costs into the price of their products. They have to do so in order to stay in business. They will, therefore, do the same with any costs associated with a product stewardship program. Given that individual consumers decide what equipment to purchase, it is only right that these consumers accept the responsibility associated with their purchases. A taxpayer who does not buy this type of equipment or who does research to purchase a product that is much better designed and less environmentally harmful at the end of its life should not have to pay for the actions of others.

What about trying to make all purchasers more enlightened? This is where the CCME has missed a great opportunity: the opportunity to advance a stewardship program that encourages and pushes manufacturers into more effective actions for their products.

The CCME principles, like those followed for other products, are heavily weighted to the collection of old products. In fact, the preamble of these principles state that "producers of electrical and electronic products are responsible for their products at end-of-life" and the very first principle clearly focuses on the managing of e-waste. Only two principles, numbers 3 and 4, out the 12 do mention the front end of the product chain: the design aspect of product manufacturing.

Surely after all these years it is time to concentrate on this aspect. Why not focus on product design goals and not on a collection of redundant product goals? Manufacturers could be encouraged to develop products that are designed with no or minimal hazardous materials, that have a high content of recycled material, that have a high content of recyclable material, that minimize the number of different materials, and that are easy to disassemble.

The other most significant principle that needs expansion and refocusing is that of education. It is fine to develop programs that ensure that all participants know about the program and their roles. However, what consumers need is information that educates them about these products and information on the design aspects of the products. What are the environmental issues associated with the disposal of these products? Are there any hazardous materials in these products? What is the content of recycled materials or the amount of recyclable materials in these products? What are the particular design features that will maximize product reuse or material recovery? With this type of information an educated consumer can now make an informed purchase.

The CCME could further encourage governments, at all levels, to show leadership and introduce procurement policies that will favour products that have equivalent cost and quality but that are "environmentally designed". It is through the evolution of both private and public product purchasing that manufacturers will become effective stewards.

For further information regarding the above article, or for information on CARI's activities and membership, please contact Dr. Leonard Shaw. Tel.: (613) 256-8533, Fax: (613) 256-8534, Email: len.shaw-cari@on.aibn.com.

9th Canadian Pollution Prevention Roundtable
June 1-2, 2005
Victoria, British Columbia, Canada
Email: sue@c2p2online.com
Web: www.c2p2online.com/CPPR

YUCK! Organics, Recycling and other Diversions, 31st Annual Waste Reduction Conference
Recycling Council of British Columbia
June 1-3, 2005
Harrison Hot Springs, BC, Canada
Phone: (604) 683-6009, ext. 314
Email: rcbc@rcbc.bc.ca
Web: www.rcbc.bc.ca

CARI: Serving Our Industry, 64th Annual Convention, Exhibition and General Meeting
Canadian Association of Recycling Industries
June 11-13, 2005
Toronto, Ontario, Canada
Phone: (905) 426-9313
Email: donna.turner-cari@on.aibn.com

2nd International Symposium on Processing & Disposal of Mineral Industry Wastes
June 13-15, 2005
Falmouth, Cornwall, UK
Email: bwills@min-eng.com
Web:
www.min-eng.com/pdmiw05/index.html

Recycling Metals from Industrial Waste, a short course focusing on plant practice
Colorado School of Mines
June 20-23, 2005
Golden, Colorado, USA
Phone: (303) 273-3321
Email: space@mines.edu
Web: www.mines.edu/outreach/cont_ed/

2005 Paper Recycling Conference & Trade Show
June 26-28, 2005
Atlanta, Georgia, USA
Email: mfitzpatrick@giemedia.com
Web:
www.paperrecyclingconference.com

3rd International Symposium on Feedstock Recycling of Plastics & Other Innovative Plastics Recycling Techniques
September 25-29, 2005
Karlsruhe, Germany
Email: info@isfr2005.de
Web: www.isfr2005.de

The Recycling Council of Alberta's 2005 Annual Conference
October 12-14, 2005
Lake Louise, Alberta, Canada
Email: info@recycle.ab.ca
Web: www.recycle.ab.ca

The Composting Council of Canada's 2005 Annual Conference
October 12-14, 2005
Lake Louise, Alberta, Canada
Email: ccc@compost.org
Web: www.compost.org

Canadian Waste & Recycling Expo
October 26-27, 2005
Vancouver, British Columbia, Canada
Email: info@usa.messefrankfurt.com
Web: www.cwre.ca

E-Scrap 2005
The North American Electronics Recycling Conference
October 27-28, 2005
Orlando, Florida, USA
Web: www.e-scrapnews.com

Year in Review - 2005 Environment Conference
November 29-30, 2005
Toronto, Ontario, Canada
Phone: (416) 510-6864
Email: rshaikh@ecolog.com
Web: www.ecolog.com/yir

Pollutec 2005
November 29 - December 2, 2005
Paris, France
Email: ilse_dapper@reedexpo.fr
Web: www.pollutec.com

GLOBE 2006
March 29-31, 2006
Vancouver, British Columbia, Canada
Email: info@globe.ca
Web: www.globe2006.com

The media in North America have now virtually replaced schools, colleges, and universities as the main source of information for the general public. "Worlds Apart, How the distance Between Science and Journalism threatens America's Future" (***www.freedomforum.org/publications/first/worldsapart/worldsapart.pdf***) examines the relationship between scientists and journalists. Scientists control the flow of fundamental information on basic research, but journalists communicate their accomplishments and failures to the American public. The authors say that the scientist sees the journalist as imprecise, mercurial, and possibly dangerous. The journalist sees the scientist as narrowly focused, self-absorbed, cold-eyed, and arrogant. They add that science is slow, patient, precise, careful, conservative, and complicated. Journalism is hungry for headlines and drama, fast, short, and very imprecise at times. They conclude by saying that scientists and journalists have a lot in common in the search for knowledge and nothing in common when it comes to reporting results.

Universities, polytechniques, and colleges boast a strong presence on the Internet. Their web pages describe the conducted research, list research programs, and allow access to their scientists. Some universities, such as the Massachusetts Institute of Technology (MIT), feature Open Courseware (***ocw.mit.edu/index.html***), a free publication of MIT course materials. The American Association for the Advancement of Science (AAAS) maintains EurekAlert (***www.eurekalert.org/index.php***). The site provides searchable press releases from universities, companies, and laboratories either announcing the results or progress of research efforts. Some of the information available here is work in progress and is not peer-reviewed, but the site is a good place to begin researching up-to-the minute developments.

Internet based documents should be handled with care. One cannot just save links and forget about them. Unfortunately, links tend to disappear just at the moment when the information is needed. Links are not books that one can put on a shelf and return to when it is convenient. The best option is to make a note of each interesting document with the author, the name of the institution, and the address of the main page to which the document was originally connected. If available, the author's contact information should also be saved. This information will help to find the document when it suddenly disappears. Documents seldom disappear forever; they usually just change place on the server and receive a new link and a new address. However, there is also a tool to deal with these situations: The Wayback Machine - Internet Archive (***www.archive.org/web/web.php***) features a large number of archived Internet pages. The Internet Archive is working to prevent the Internet from disappearing into the past. The archiving was started in 1996. There is always a possibility that a broken link can be found there.