Disposal

Definition

Final placement or riddance of wastes, under proper process and authority, by landfill or incineration.

Minimizing Impact

Adoption of waste minimization practices and more sustainable waste management technologies will decrease the historical necessity for disposal of wastes. However, given the current status of waste generation and waste management policies, practices and technologies, there remains a need to dispose of residual waste materials. The goal is to minimize the amount of waste that goes to landfills, and the impact that landfills have on the environment.

Municipalities can reduce the amount of waste going to landfills and promote adoption of the 3Rs through creating disincentives for waste deposal. Common examples include:

- Pay-As-You-Throw (PAYT) programs require residents to pay on a volume basis for the disposal of their waste. The program may employ a tag or bag system or a cart system.
- Tipping fee are charged at landfills on all loads based on weight.
- Fines on contaminated loads where waste has not been separated.

Municipalities can also reduce the impact that landfills have on the environment through employing new technologies to improve the four critical elements in a landfill: the bottom liner, the leachate collection system, the cover, and the natural hydrogeologic setting. Bioreactor landfills are evolving from contemporary landfill designs in response to public demand for innovation to achieve more sustainable approaches to waste disposal. Bioreactor treatment of solid wastes involves design, construction and operation of a landfill cell that is specifically engineered to enhance the decomposition of wastes through careful manipulation of conditions within the site.

The primary benefits of bioreactor treatment include:

- Rapid stabilization of wastes resulting in the shortening of a site's contaminating lifespan during the period of time when engineered controls are most effective;
- Faster landfill settlement allowing for optimal use of existing approved waste disposal capacity and forestalling the need for new sites;
- In-situ treatment of leachate to reduce the contaminant loading; and
- Enhanced landfill gas recovery potential, thereby improving the feasibility of energy generation and engaging market forces to motivate even greater levels of emission reductions.

Municipal Examples

Municipality	Initiative
Provincial	
City of Airdrie	**Pay-as-you-throw** Airdrie was the first community in Alberta to introduce a user-pay garbage collection system. The City avoided public backlash by starting with a high bag

	limit of 5 bags. Then, as residents adjusted, the limit was reduced annually, until it reached its current limit of two bags. Click here for more information.
City of Calgary	**Landfill Gas Recovery and Utilization** In 2006, Calgary began to collect landfill gas, composed mainly of methane and carbon dioxide, to control greenhouse gas emissions. Some of the gas is used to generate electricity. Since 2007, the city has generated over 5 million kilowatt hours of power from landfill gas, which is enough to power over 700 Calgary homes for a year. Click here for more information. (See pages 20-21)
City of Edmonton	**Mining Waste** Since 1992, the Clover Bar Landfill has been mined to produce electricity from landfill gas. Enough gas is captured each year to satisfy the electricity demands of approximately 4,600 homes. To date, over 101 gas wells have been drilled into the landfill's decomposing waste. The Clover Bar Landfill site was the first landfill in Alberta that recovered gas for use to generate electricity. Click here for more information.
City of Red Deer	**Tipping Fees** Red Deer's Waste Management Facility (WMF) has increased tipping fees for disposal materials. These differential tipping fees offer a financial incentive to divert from the landfill materials that can be recycled or composted. Customers are encouraged to separate materials eligible for recycling or composting and bring them to the appropriate location at the WMF to qualify. Click here for more information.
Town of Devon	**Keeping a lid on Waste** Devon has a 3 stream waste management system with waste carts provided for garbage, blue bags for recycling and brown bags for yard waste. If recyclable items are left in a waste cart, the cart may not be emptied. Waste is limited to what will fit into the cart with the lid closed. Click here for more information.
Town of Olds	**Reduced garbage collection** The Town collects garbage on a biweekly basis. Each household receives a 240-litre black cart that holds the equivalent to three bags of garbage. The town has an informal bag limit policy since it does not permit curbside collection of additional garbage. Additional waste may be hauled to the town's eco-centre. **Waste management fees** Residents pay $20.04 on their monthly utilities bill and can rent a second black garbage bin for $19.30 per month or a second green organics bin or blue recycle bin for $3 per month.

	Rejection of mixed-waste garbage The town's waste management bylaw enables collection crews to reject garbage that contains recyclable and organic material and leave a tag explaining the problem. **Controlled disposal of waste** The town's waste management bylaw prohibits any burning of waste and permits an enforcement officer to issue tickets for offences. Click here for more information.
National	
Columbia Shuswap Regional District, British Columbia	**Landfill Gas Capture** The Columbia Shuswap Regional District (CSRD) in British Columbia has transformed the capped Salmon Arm landfill into an asset that will produce long-term economic and environmental benefits for the municipality and won a 2012 FCM Sustainable Communities Award. The project involved capping the completed portion of the landfill, capturing gas and upgrading it to provide natural gas heating for hundreds of local homes. The initiative is expected to reduce CO2-equivalent greenhouse gases by about 10,000 tonnes of emissions annually. A hybrid poplar plantation growing on top of the capped landfill further reduces carbon and reuses the reclaimed leachate. It is expected that the sale of carbon credits will offset the project cost over 15 years. Click here for more information.
City of Hamilton, Ontario	**Landfill to Energy** The Glanbrook Landfill Gas to Energy (LFGTE) project is a partnership between the City of Hamilton and Hamilton Renewable Power Inc. to collect landfill gas, generate electricity and sell to the Ontario grid. The power plant will generate 26 million kilowatts-hours of electricity per year, which is equivalent of powering up to 2,100 homes. The LFGTE project will reduce approximately 100,000 tonnes of carbon dioxide equivalent of emissions every year, which would otherwise be released to the atmosphere (in the absence of the project). This greenhouse reduction is equal to removing 18,000 vehicles from the road. Click here for more information.
City of Regina, Saskatchewan	**Landfill Gas into Power** In March 2017, the City of Regina unveiled a Landfill Gas to Energy Facility; the facility will use waste gas from the landfill to generate electricity. Methane gas is collected from decomposing organic landfill waste and used to fuel and engine which generates one megawatt to electricity – enough to power 1000 homes.

	The power produced by this facility will generate approximately $1 million in revenue for the City each year. The cost to build the facility was just under the estimated budget of $5 million. Click here for more information.

Additional Resources

Other Organizations	Resource
Provincial	
Alberta Environment	**Standards** Landfills in Alberta are classified by the waste streams they can accept. There are three classes of landfills: • Class I, or hazardous waste landfill, • Class II, or non-hazardous waste landfill, and • Class III, or inert waste landfill. Alberta Environment's Standards for Landfills outline the minimum requirements for development, operation, monitoring, closure and post-closure of Class I, Class II, and Class III landfills. The Standards are intended to provide public assurance regarding the protection of groundwater and surface water, and the appropriate management of nuisances associated with landfill development. A *Guide to the Standards for Landfills In Alberta* is currently being developed to assist landfill owners, operators, engineers, and others with the siting, design, operation, monitoring, closure, and post-closure of landfills in Alberta. **Landfill Gas** Alberta is the only province in Canada that regulates landfills based on the quantity of greenhouse gases emitted. The Alberta Landfill Gas Working Group was established in May 2007 to develop a guidance document that will assist landfills in Alberta to quantify gas emissions through modelling, as well as fulfill the requirements of both the Specified Gas Reporting Regulation and Specified Gas Emitters Regulation under the *Climate Change and Emissions Management Act*. The Technical Guidance For The Quantification of Specified Gas Emissions from Landfills and associated excel worksheets can be found on the Information for Industry webpage. Click here for more information.
Alberta Innovates – Energy and	**Landfill Free Alberta** AI-EES is focused on helping the government deliver on its landfill-free strategy for eliminating most landfills in Alberta. Over a 10-year period, AI-EES worked

Environment Solutions (AI-EES)	alongside the City of Edmonton and Enerkem to open the world's first full-scale waste to fuels facility. AI-EES is now collaborating with rural municipalities, such as Parkland County, Spruce Grove and Stony Plain on developing a Waste-to-Value-Added demonstration project. To further accelerate its landfill-free strategy, AI-EES is working with Alberta Municipal Affairs, the Ministry of Environment and Parks, and the University of Alberta. Next steps will include: • Identifying the right location and size of regional waste-to-energy facilities • Launching waste-to-value-added projects that would demonstrate and set an example of how municipalities can participate and achieve environmental, economic and GHG benefits over the long-term • Identifying best available accounting standards for GHG benefits and supporting the offset system in developing the scientific validation for specific waste-to-biofuels application • Developing an international business strategy for assisting other countries in becoming landfill-free. This strategy fits international sustainability requirements Click here for more information.
National	
Canadian Biogas Association	**Biogas Industry** The Canadian Biogas Association is the collective voice of the biogas industry. Since 2008, their membership has grown to over 100, including farmers, municipalities, technology developers, consultants, finance and insurance firms, and other affiliate representatives – all with a focus on building the biogas sector in Canada. The Canadian Biogas Association serves its members by way of promoting biogas opportunities, shaping policy that impacts biogas, providing resources, and offering technical expertise to address challenges in development. Click here for more information.
Federation of Canadian Municipalities (FCM)	**Funding for landfill gas capture!** FCM's Green Municipal Fund accepts applications for landfill gas capture that demonstrate the potential capacity to transmit and use thermal energy, and reduce energy consumption by at least 20% for one or more existing municipal facilities within one year of implementation compared to baseline data. Click here for more information. **Technology Review** FCM's report, Solid Waste Resource: Review of Waste Technologies provides a helpful overview of the options to improve landfill management. Click here for more information.
International	
Aquatera Inc.	**Bioreactor**

	Aquatera uses bioreactor technology that is typically only practiced by larger, leading-edge landfills in North America. Unlike traditional landfills, which aim to keep the landfill dry, Aquatera's bioreactor does the opposite. By adding moisture to the landfill, it enhances conversion of waste into methane. This extends the life of the landfill by reducing the volume of landfill waste. An extensive system of over six kilometers of leachate (landfill liquid) collection and injection lines and landfill gas collection lines ensure the proper treatment of waste by-produce. Aquatera's landfill gas collection system works to capture the gas, and uses current technology of flaring to safely eliminate it. Click here for more information