

Educational Programs

Options	Diversion Potential	Cost	Benefits	Comments
<p>Consumers - Education programs aimed at consumers in order to promote waste minimization and reuse and recycling.</p>	<p>Low</p>	<p>\$500,000 per Annum. (Cost of running waste reduction office, ICI and DLC education programs)</p>	<p>Good PR. Key to participation in other programs.</p>	<p>The RDCO already have extensive education programs in place e.g. at schools, Living Greener Calendar and an informative website.</p>
<p>Businesses - Educational programs aimed at ICI sector promoting best practices in waste management.</p>	<p>Low</p>	<p>Included above</p>	<p>Key to participation in other programs.</p>	<p>The RDCO have a number of programs in place to encourage 5 Rs in the ICI sector. These include the wastewise@work program, a recycling directory, an informative website and a newsletter.</p>

Materials Reuse

Option	Diversion Potential	Cost	Benefits	Comments
<p>Share shed - A permanent facility at the region's landfills whereby members of the public can drop off and collect reusable goods that would have been otherwise destined for the landfill. After a certain length of time, goods that have not been collected will be disposed of.</p>	<p>Minimal - Only applies to certain components of the waste stream e.g. furniture, electronic goods, household items.</p>	<p>Relatively high for amount of diversion that can be achieved. Capital costs include design and construction of the facility shed. Operating costs include the possibility of extra landfill staff if additional workload can not be handled by existing staff.</p>	<p>High on waste management hierarchy. Shows public that the Regional District is making an effort follow the waste management hierarchy.</p>	<p>Needs to be a well designed and manned area to function properly and not look like a "dump". Risk of public dropping off material that will end up being landfilled, thus requiring additional handling. Constant supervision required for safety and liability reasons. Additional service level compared with existing ReCycle It! centres</p>
<p>Waste exchange days - Regular events (biannual or quarterly) where the public brings reusable items to the landfill(s) for exchange.</p>	<p>Low - Only applies to certain components of the waste stream e.g. furniture, electronic goods, household items.</p>	<p>Costs to RDCO would be lower than a share shed if this were a regular event rather than a permanent fixture of the landfill.</p>	<p>High on waste management hierarchy. Shows public that the Regional District is prepared to follow the waste management hierarchy. Would attract more usable goods than a share shed, less leftovers for the landfill. Residual goods are handled on a one off basis rather than on a daily basis as is the case with share sheds.</p>	<p>Might not trap all of reusable goods; people might not be prepared to wait a few months for the waste exchange day and some reusable items could end up in the landfill. May compete with the garage sale culture. Variation of this theme currently exists in Peachland.</p>
<p>Formalize re-use of ICI/DLC waste - This would involve having a separate cell at the landfill where reusable DLC waste can be collected for free or at a cost depending on the material. This option would work in conjunction with variable tipping fees.</p>	<p>High - DLC waste currently comprises 26% (35,000 tonnes) of waste disposed at the RDCO Landfills, much of this is reusable.</p>	<p>Additional handling costs including landfill staff. Design and construction of DLC recycling area. Relatively low for the amount of diversion that can be achieved.</p>	<p>High on waste management hierarchy. Variable tipping fees will encourage participation. Considerable diversion potential at relatively low costs.</p>	<p>RDCO is currently carrying out a pilot project of this nature. Results of this study will give a good indication of diversion potential. Quality control and constant supervision will be required.</p>

Stewardship

Option	Diversion Potential	Cost	Benefits	Comments
<p>Roundup Events - RDCO sponsored events such as annual hazardous waste round up, round up for E waste and other materials.</p>	<p>Low</p>	<p>Moderate</p>	<p>Good way of dealing with hazardous and problem wastes. High on waste management hierarchy especially if materials are reused. Hazardous materials are disposed of in designated facilities minimizing environmental impact.</p>	<p>Important environmentally but diverts relatively small volumes.</p>
<p>Industry Stewardship- Lobbying of provincial government for expanded stewardship programs. Based on the producer pays principle, the consumer returns the material to the retailer/producer who is then responsible for recycling the material or disposing of it in an environmentally sound manner.</p>	<p>Low</p>	<p>No cost to Regional District</p>	<p>Cost is borne by the businesses and not the Regional District.</p>	<p>Regulations already require the recovery of beverage containers, pesticide products, pharmaceuticals, lubricating oils, containers and filters, paints, solvents and flammable liquids. It is expected that E Waste will be added shortly. Usually applied to materials with high environmental impact but low volumes.</p>

Recycling Collection

Options	Diversion Potential	Cost	Benefits	Comments
Continue with existing system of separate collection of recyclables and mixed waste	Low	Low	Low costs System works quite well as is.	Relies on education for increased participation in the blue bag system.
Expand the types of materials collected through the blue bag program. Currently only Number 2 plastics are accepted, this could be expanded to include plastic containers and films	Low - Only applies to the collection of household recyclables. Existing program is almost maximized already.	Fairly high with low diversion yields- Additional costs will include extra staff at sorting facility. Materials with very little market value will require subsidy. Additional estimated cost to be \$160,000 - \$200,000.	Will help to maximize household recycling potential. Public satisfaction will increase when more recycling options are available.	Household recycling in the RDCO is currently at 239 Kg per household per year, with limited room for improvement. Household recycling in Nova Scotia was reported at 324 Kg per household per year in 2001.
Increase blue bag collection frequency	Low - Possibly slightly higher diversion levels could be achieved if collection frequency was increased.	Increase in collection costs.	Less storage time would encourage recycling.	Recyclables are currently collected every two weeks. Less regular collection may cause odour and storage problems with recyclables and increased likelihood of disposing recyclables along with garbage.

Recycling Depots

Options	Diversion Potential	Cost	Benefits	Comments
Expand materials collected through depot system to include bulky items such as furniture, white goods etc.	Moderate - Only applies to household recyclables.	Moderate - Depending on extent of additional materials collected. Collection of bulky items from all recycling depots would be costly. It would involve redesigning the depots. Includes cost of manning depots.	Would help to maximize household recycling potential. Increased public satisfaction with system when more recycling options are available.	Not required if waste exchange days or share sheds are put in place. Similar to the recently implemented ReCycle It! centers.
Increase the number of depots. Increase rural/urban locations.	Low Only affects residential waste stream. Marginally increases capture of MFU recyclables though convenience.	Moderate - Depending on number of new depots installed.	Increased urban locations - This could help capture recyclables from multi family units. Lots of small depots in urban areas would make it easy for those living in apartment blocks (possibly without cars) to access recycling depots. Increased rural locations - could capture recyclables from those rural areas not on regional collection routes.	A significant education program is required to mobilize additional recyclers and to make people aware of the new opportunities. There may be some opposition to the siting of new recyclable collection facilities due to traffic, noise and odours.

Change Recycling Collection System

Options	Diversion Potential	Cost	Benefits	Comments
<p>Replace current system with 2 stream collection of organics & mixed waste. Organics are composted and mixed waste is mechanically separated and recycled or landfilled.</p>	<p>High - Captures the entire waste stream including ICI.</p>	<p>High. Cost of changing collection system is low but associated costs of handling waste are high. Involves completely changing current waste management system and replacing with new and costly equipment.</p>	<p>This system has the advantage of not being dependent on participation levels of the public. It also has the advantage of being able to capture multi family and ICI waste, recycling of which is not currently under the control of the RDCO.</p>	<p>Radical change from existing practice. Being implemented in Europe as more cost effective than segregated collection of multiple materials.</p>
<p>Dirty Materials Recovery Facility (dirty MRF) Replace current systems with single stream commingled collection followed by mechanical separation of recyclables and biological treatment of organics</p>	<p>Moderate to High - Captures the entire waste stream including ICI. Due to contamination, there may still be a significant portion going to landfill</p>	<p>High. Cost of changing collection system is low but associated costs of handling waste are high. Involves the construction of a mechanical facility capable of funneling the entire waste stream.</p>	<p>This system has the advantage of not being dependent on participation levels of the public. It also has the advantage of being able to capture multi family and ICI waste, recycling of which is not currently under the control of the RDCO.</p>	<p>Quality of final product is low. Many of the recyclables are of a low value. If the organics are composted, they could contain significant contamination. This approach lacks an educational component for the general public and encourages wasteful practices</p>

Change Recycling Collection System cntd.

Options	Diversion Potential	Cost	Benefits	Comments
<p>Recycling and Mechanical Biological Treatment (MBT). Continue to collect blue bag materials separately. Applies (MBT) to mixed waste collected. Remaining recyclables, household hazardous waste and residuals are separated by a mechanical process. Remaining organic materials are treated using a biological process (aerobic/anaerobic composting) to stabilize the organics and reduce moisture content before finally landfilling.</p>	<p>Moderate - Could capture ICI (including MFU) recyclables. Captures remaining SFU recyclables after blue bag collection. Biological treatment reduces volume/weight and stabilizes landfilled material.</p>	<p>High Requires mechanical system for all of the waste stream</p>	<p>Organics are treated and stabilized before being landfilled. Therefore, leachate and landfill gas production are suppressed/avoided.</p>	<p>This process is sometimes used in Europe to get around the costly energy from waste option. In Europe, legislation requires that all organic waste must be treated before disposal.</p>

Organics Collection

Options	Diversion Potential	Cost	Benefits	Comments
<p>Increase frequency of yard waste collection (currently only 4 times per annum)</p>	<p>Moderate - Yard waste that is currently still being landfilled along with residential mixed waste could be captured.</p>	<p>Moderate. Collection costs for the residential sector would increase.</p>	<p>Additional diversion could be achieved by capturing more yard waste and keeping it out of the landfill.</p>	<p>Precise estimates of diversion potential require a survey of the composition of residential waste disposed of at the landfill. Weekly or bi-weekly collection of yard waste during the growing season is a common practice in many Lower Mainland municipalities. There is some risk that more collection would discourage some backyard composting.</p>
<p>Implementation of separate and regular collection of all household organics including kitchen waste.</p>	<p>Moderate to High - This will apply initially only to the residential waste stream as the RDCO does not have responsibility for collection of ICI or DLC waste. It could be implemented in conjunction with an organics waste ban at the landfill. Organics typically account for 40% of residential waste generated.</p>	<p>High - Costs will include increased collection costs, new vehicles, and staff. Once kitchen wastes are added to the organics, composting systems will need to be enclosed, which means a complete new facility/technology will be required. Alternatively, anaerobic digestion or aerobic digestion could be employed. Costs for these processes range from \$50 per tonne for a basic in vessel composting system to well over \$100 per tonne for a mechanical digestion technology. Some of these costs could be offset through revenue generation.</p>	<p>Diversion of organic materials will reduce leachate and methane emissions at the landfill. Organic matter is transformed into a useful end product (compost or energy) rather than be landfilled.</p>	<p>Quality of feedstock is key to the quality of final product. Rigorous education programs are needed in order to prevent contamination in organics. If collection of organics is combined with variable disposal fees or landfill bans, then this increases the likelihood of contamination. E.g. if mixed waste is more expensive than organics, people will be tempted to throw garbage in the organics bin. If the program is implemented together with landfill bans for organics to attract ICI feedstock, then facilities must be in place to accept the organic waste from the ICI sector.</p>

Composting

Options	Diversion Potential	Cost	Benefits	Comments
<p>Centralized Composting- One large processing facility which will handle all of region's organic waste.</p>	<p>High, if all of the organics in the region are collected and processed. An estimated 40% of the waste disposed of in the landfill is organic.</p>	<p>Moderate - High If processing is to include food waste then an in-vessel facility will be required.</p>	<p>Economies of scale involved in having only one centralized facility compared to a number of decentralized ones. Only need to pay out once for design, construction costs and only one set of operators needed. Could be designed to also handle biosolids.</p>	<p>There is transportation costs associated with moving a low value product as well as odour problems. Siting difficulties could arise in terms of public acceptance of a large facility accepting organic waste.</p>
<p>Decentralized composting - A number of smaller organic waste processing facilities throughout the region.</p>	<p>Moderate - High Depending on whether organic materials include kitchen wastes or not. If so, facility will need to be in-vessel.</p>	<p>Moderate - High Depending on number of new facilities required, waste types accepted and upgrades to existing facilities.</p>	<p>Shorter transportation distances compared to centralized facility. Fewer difficulties involved in siting of smaller facilities than large ones. Could potentially upgrade existing facilities, thus reducing costs.</p>	<p>It may be more costly to build and run many small facilities to the same environmental/odour standards than one large one.</p>

Type of Composting

Options	Diversion Potential	Cost	Benefits	Comments
Increase types of organics accepted at existing composting facilities to include food waste and other organics e.g. paper and sewage sludge.	Moderate Depending on participation levels. Higher if ICI food waste could be captured.	High A compost facility accepting food waste would be required to be in-vessel to control vectors; in this case new facilities would be needed.	Possibility of capturing ICI food waste if implemented along with an organics ban at the Landfill. Diversion of organic waste decreases leachate and methane generation at landfill. Composting produces a usable final product.	Not likely to work well for householders. Odours associated with organic waste storage in the household mean that it has to be disposed of regularly, at least once per week. Householders are not likely to make such regular trips to a depot and would need regular collection of organics.
Aerobic Digestion - This is an in-vessel mechanized process for converting organic feedstock into solid and liquid organic fertilizers	Moderate - The process deals only with a relatively uncontaminated organic waste stream.	High - Capital and operating costs are high (similar to anaerobic digestion) but the process manufacturer claims that value of compost can offset all costs and generate profits.	The process is very fast and can produce a batch of fertilizer from organic waste in a matter of days. Claims for the organic fertilizer include reduced pesticide and herbicide requirements. Advantages of organics removal from landfill apply (same as composting and anaerobic digestion)	Only a single process has been commercialized in Canada at this time. The manufacturer is based in N.Vancouver BC and has one full demonstration facility, which has been in operation for several years.

Energy from Waste - Combustion

Options	Diversion Potential	Cost	Benefits	Comments
Energy from Waste - Mass burn, fluidized bed, and two stage starved air combustion systems	High - the majority of waste that is currently landfilled could be treated through combustion.	High, generally in the \$100 to \$180 per tonne range. Higher than composting and much higher than landfilling.	Recovers energy that would otherwise be wasted in a landfill. Helps avoid methane generation (GHG) in the landfill. Recovered energy offsets the use of fossil fuels (GHG credits). A properly sized energy from waste system complements and can work well together with recycling and composting. Recycling will remove the higher value materials first, and composting takes out the wet organics that do not burn well.	Although combustion recovers energy, it is generally not considered a waste diversion technology or process (like recycling or composting). The public has a poor perception of modern incineration due to misinformation. Energy from waste systems require a constant guaranteed feedstock for an extended period, so proper sizing is critical. High initial investment costs.
Energy from Waste - Advanced Thermal Systems, such as pyrolysis, gasification, bio-oil	High - the majority of waste that is currently landfilled could be treated through thermal systems.	Generally higher than conventional energy from waste due to complexity and materials handling. Assume about a 20% premium.	Same benefits as conventional energy from waste. Depending on process, additional environmental benefits from reduced emissions, and potential to convert synthetic gas into other forms of energy such as methanol.	More expensive than and not as proven as conventional energy from waste. Very few commercial operating facilities. Some promising Canadian technologies exist. Generally easier to accept by the public than conventional energy from waste.

Energy from Waste – Digestion.

Options	Diversion Potential	Cost	Benefits	Comments
<p>Energy from Waste - Anaerobic Digestion (AD)</p>	<p>Moderate - AD can handle only pure organics. Operating costs are somewhat offset by energy sales. Similar economics to advanced thermal systems.</p>	<p>AD costs are higher than conventional energy from waste. There is a complex organics separation and preparation step required before the process can proceed. Organic residue needs to be treated (usually composted).</p>	<p>AD produces an environmentally desirable synthetic gas, which can be converted to green power. There are no stack emissions apart from engine or turbine exhaust. Waste used in the process is considered diverted from disposal.</p>	<p>Only 2 facilities in Canada (in Toronto) with spotty track record and questionable economics. In Europe, usually only economical with government subsidies. Process discards need to go to landfill disposal. Organic residue needs to be composted/treated and sold or disposed. AD requires a fairly clean feedstock.</p>
<p>Energy from Waste - Bioreactor Landfill. This is a fully lined landfill designed and operated to accelerate the generation of landfill gas and stabilize solid waste, usually under anaerobic conditions.</p>	<p>There is no waste diversion, but an additional 20 to 30% of airspace is created through rapid waste decomposition</p>	<p>Bioreactor costs are initially 50+% more expensive to build and operate than conventional landfills. However, significant revenues are generated within 5 years from landfill gas sales. Additional cost savings are from increased capacity and much shorter post closure care requirements.</p>	<p>Increased Landfill Capacity, reduced leachate management costs, much improved landfill gas capture. Gas to energy plant becomes viable within 5 years and for relatively small landfills. Much better GHG capture than conventional landfill. Power generated is considered Green Power. Active landfill degradation period is about 20 years, as opposed to 50 years for a conventional landfill. Reduced post closure care liability.</p>	<p>Technology is not yet fully developed. It works well, but specialized operators to achieve good process control are required. Better operations result in much higher gas generation and subsequently higher revenues. Good power sales agreements from BC Hydro for green power are required. The technology is best suited for new landfill cell development, not retrofits.</p>

Disposal Bans

Options	Diversion Potential	Cost	Benefits	Comments
<p>Disposal bans for specific materials with alternative options provided by the RDCO</p>	<p>High Depending on materials banned and level of enforcement of ban.</p>	<p>Moderate - high Depending on costs involved in providing alternative handling infrastructure for the banned materials.</p>	<p>High diversion potential</p>	<p>RDCO already have a ban on paper fibres at the landfills but this has not been strictly enforced. It is planned to rewrite existing bylaws in April and to start strict enforcement of paper ban in May. Risk of illegal dumping or backyard burning. The ICI waste could leave the region and result in reduced landfill tipping fee revenue.</p>
<p>Disposal bans for DLC waste with alternative options provided by the private sector</p>	<p>High</p>	<p>Costs to the RDCO are low if private sector provides alternative options.</p>	<p>Forces private sector to come up with alternatives for handling of the banned materials increasing diversion from landfill.</p>	<p>RDCO are currently carrying out a pilot project of this nature. Results of this study will give a good indication of diversion potential. Quality control and constant supervision will be required. It would require a long phase in period.</p>

Variable Fees and Disposal Limits

Options	Diversion Potential	Cost	Benefits	Comments
<p>Variable tipping fees for expanded range of materials. E.g. low tipping fee for source separated organics compared with high tipping fees for mixed residuals.</p>	<p>Moderate</p>	<p>Moderate Cost of changing the tipping fees is not high however there are many costs associated with providing adequate infrastructure for alternative collection and treatment options.</p>	<p>Variable tipping fees will act as an incentive to segregate waste at the source and hence reduce residuals going to landfill. It provides an incentive for the private sector to divert waste.</p>	<p>High degree of monitoring and quality control will be required at the landfill, since there is a risk that low disposal cost materials will be contaminated with higher disposal cost materials.</p>
<p>Limits on number of bins- limit the amount of waste that can be disposed of per household</p>	<p>Low - Only effects residential waste stream, and bin limits are already in place</p>	<p>Low</p>	<p>Restrictions on amount of garbage collections will lead to higher participation on waste reduction reuse and recycling programs. Especially if the permitted amount is very low.</p>	<p>Risk of illegal dumping and littering. Current limit on garbage collection in the RDCO is 2 containers per week; additional containers cost \$2 Alternative avenues for waste recycling must be open to the general public.</p>
<p>True user pay programs - Pay by weight system for the collection of mixed waste</p>	<p>Moderate - Only effects residential waste stream. Could have significant impact on residential waste diversion.</p>	<p>Moderate to High - It involves putting weigh scales on each collection truck, this could be costly both in terms of capital costs and operating. Time taken at each household will increase. Collection service will be more expensive. Unproven technically in the winter.</p>	<p>Significant savings can be made to the householder by reducing waste disposed. This should have a direct impact on reduction, reuse and recycling levels.</p>	<p>Risk of illegal dumping and littering. Could be used for differential collection fees for individual materials. Alternative recycling avenues must be put in place.</p>

Residual Management

Options	Diversion Potential	Cost	Benefits	Comments
<p>Continue to provide environmentally compliant landfill capacity as per the current Solid Waste Management Plan.</p>	<p>None</p>	<p>Low</p>	<p>Infrastructure is in place. Minimal new capital investment required.</p>	<p>The City of Kelowna already plans to accept all of the region's waste at the Glenmore Landfill when the Westside Landfill closes. The current lifespan projection for the Glenmore landfill is until the year 2050. Landfills take up valuable space that could be used for other economic purposes. Landfill standards may change and require new investments or deem the current site unsuitable. There is considerable long term liability associated with waste storage (landfilling).</p>
<p>Close local landfills and send waste to regional southern BC Landfill.</p>	<p>None</p>	<p>Moderate. This will require the construction of a transfer station network and the contracting of a fleet of transfer vehicles</p>	<p>Waste leaves the region. Local landfill space can be used for other economic purposes. A larger remote site will create economies of scale and could result in higher environmental protection standards and landfill gas recovery and utilization.</p>	<p>There will be increased traffic on the regions highways with associated emissions. The RDCO will lose control over how the waste is disposed and at what cost. Liability for the existing sites remain with the RDCO.</p>