

# Proposal for the Reduction of Electronic Waste in Yellowknife

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## **Introduction**

As technology becomes increasingly integrated into our daily lives with new products regularly entering the market consumers are at a greater incline to dispose of their current models in favour of the latest make. This cycle of consumption had led to an enormous amount of electronics in need of disposal with globally 50 million tons of electronic waste ( e-waste) created in 2018 of which approximately 20% recycled (UNEP, 2018). Subsequently, the lifespan of devices has increasingly shortened with, for instance, computers reduced from 4-6 years in 1992 to 2-3 years in 2015 (Kidde et all, ).

With the advent of technological advances and lesser emphasis on a circular economy a large amount of electronics find themselves at the end of their life cycle and in need of disposal. The process of recycling electronics must be done within specified parameters as the contents contain toxic materials such as lead, mercury, cadmium and chromium that are used as conductors as well as polychlorinated biphenyl which can be found within lithium-ion batteries. These substances are documented to be highly toxic to life and able to dissolve in water creating a risk of contaminating surrounding soil and water systems. Leaving e-waste in landfills is thus undesirable, however, there are also economic incentives to recycle as electronic devices also contain trace amounts of valuable metals such as gold, silver and palladium. E-waste is both a means of concern in relation to environmental contamination as well as a source of income through the extraction of these metals.

## **Northern Perspective**

Of the 725 tons of e-waste created in Canada in 2015 ( representing 20.4 kg per person) roughly 20% was recycled (Amit Kumar, 2016) leaving a majority of e-waste either unprocessed or shipped out. For smaller and more remote across Canada shipping unwanted electronics is not feasible due to infrastructure limitations and cost of shipping large installments of waste. This poses a particular challenge to northern communities that may not be accessible all season. Often the use of winter or ice roads during freezing periods and summer roads after the spring melt provide the best opportunities to access shipments to and from smaller communities. In the Northwest Territories these roads are instrumental in providing recycling options to divert waste from landfills or incinerators. Yellowknife being the central hub of the Northwest Territories and access point for many remote communities with facilities that many communities depend on such as healthcare and education, is also central to processing waste from communities who lack appropriate facilities.

In addition to the logistical challenges northern communities face over larger cities, on average residents of the Northwest Territories purchase more electronics per capita than the national average. Table A displays the data from a report documented in 2012 in preparation of the Government of the Northwest territories indicating that NWT residents purchased 1.55 kg more than the national average. This may be due to the higher annual income ( \$82,966) which is 16.7% higher than the rest of Canada (Canton, 7).

Table A. Estimated number and weight of electronic units sold in NWT

	CANADA	NORTHWEST TERRITORIES		
		BASED ON POPULATION RATIO	BASED ON HOUSEHOLDS RATIO	BASED ON AVERAGE TOTAL EE HOUSEHOLD EXPENDITURES RATIO
EE units sold 2011	33,252,984	41,185	36,696	50,980
Weight equivalent	214,245,394 kg	265,350 kg	236,431 kg	328,459 kg
Weight per capita	6.40 kg	6.40 kg	5.70 kg	7.92 kg

(Canton et al., 2012)

### **Yellowknife recycling options**

As of 2019 the current population of the Northwest Territories is 44,826 with the majority residing within Yellowknife. Historically, the city of Yellowknife has had unique challenges to waste storage. With the advent of a gold mine in 1933 a surplus of empty aluminum cans and mining equipment needed disposing subsequently finding storage on a rocky forested lot outside city limits emphatically called Tin Can Hill today by locals. Since 2005 the city has implemented a modernized compost and recycling program that focuses on residents disposing of their recycling into distributed large blue cargo containers with additional pick-up service for garbage on alternating weeks. The receptacles themselves are well distributed amongst downtown core and surrounding neighbourhoods, however, they are not convenient access points for residents without cars nor do they offer an option for recycling more complex material such as e-waste. This provides a barrier to residents who may have material that is not easily carried or transported by bus. In order for residents to dispose of end of use electronic material they must visit a designated drop off location as mentioned on GNWT website under electronic waste,

currently the city of Yellowknife does not have a webpage dedicated towards recycling electronics as it is forwarded to the services directory provided by the GNWT.

Figure B. Recycling receptacles

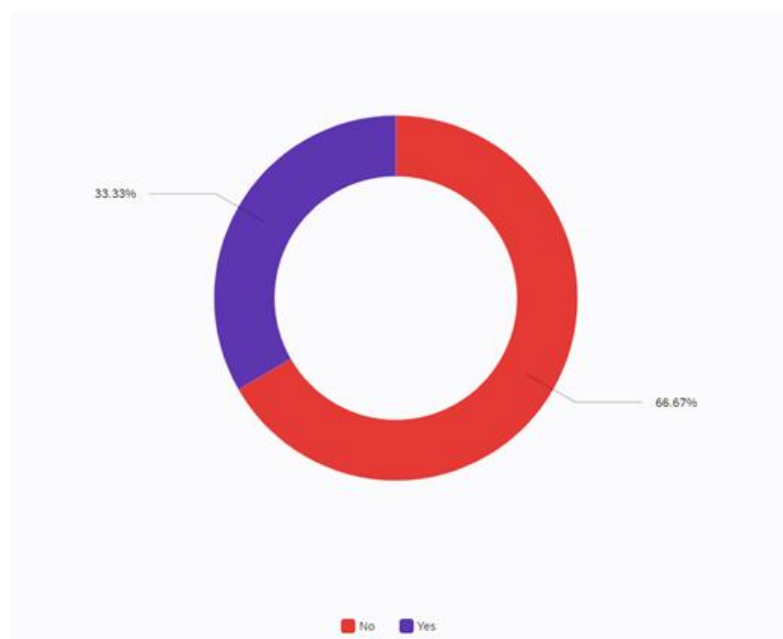


In order for residents to learn more information they must visit the GNWT page <https://www.enr.gov.nt.ca/en/services/waste-reduction-and-recycling>. This page provides an overview of electronics that can be recycled, lists appropriate fees as well as provides contact information in which residents may further inquire. The site is well laid out with appropriate information, however, it does not provide residents of specific communities more information on where they may drop off electronics other than the information to inquire on yearly satellite depots. Further, the site lacks additional warning to residents of the potential health concerns with improper disposal of electronic devices lacking a greater incentive for residents to hold onto waste until a mobile pick depot arrives.

## Resident Awareness

The city's webpage lacks additional information on specific disposal sites, however, a local bottle depot does accept electronic devices as well as local stores such Staples and The Source. This knowledge is not widely displayed on either the city's or the GNWT sites providing a point of confusion among residents. In a survey distributed among local social media pages of the 62 residents that completed the survey over half replied they were unsure of a drop-off location. With addition of more specific information on the municipal website the city may be able to increase residential awareness on location details as well as increase transparency in procedures taken towards e-waste management

Figure C. Percentage of surveys residents unsure of depot



## **Yellowknife Landfill**

The current system in place for residents to dispose of non-recyclable waste is either through alternating pick-up for residential locations or through drop-off to the landfill. The location of the landfill is approximately a 10 minute drive from the city center and situated on the northern side of Jackfish Lake. It is not strictly prohibited to dispose of electronics at the landfill, as currently the city is allowing for select items to be stored. Appliances with and without Freon are sorted and electronics such as televisions and computers have a designated slot within the landfill.

As the majority of Yellowknife consists of exposed Canadian shield bedrock, the site of the landfill is similarly situated. In a report conducted by third party Golder Associates in 2016 on landfill management systems in the NWT, the finding detailed lack of landfill liner and leachate (water that percolates through soil) collections systems were implemented only to new sections or cells of the landfill. As the site is host to a large swath of exposed rock there is a greater potential for water to percolate into cracks as the shield is often exposed to deep crevices. This increases the risk that material situated without a liner may contaminate precipitation such as snow fall when it begins to melt in the spring, drawing it under the surface. In addition, due to proximity of the lake as well as a creek that flows through this site is potentially at a high risk of further environmental contamination.



Figure D. Yellowknife Landfill



Figure E. Landfill water system proximity



**Recommendations**

Confusion surrounding e-waste disposal sites as well as a lack of information on the municipal website, in conjunction with GNWT's provided site, is an area in which the city may consider creating new content in order to better inform the public of both disposal locations as well as associated risks. The landfill is another area that may be improved by providing an adequate barrier to the entire site in order to better protect the adjacent bodies of water, especially with the consideration that Great Slave lake is used to provide residents with potable drinking water.

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