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# Best Waste Management Practices for Small and Remote Arctic Communities

A study of best waste management practices used in remote  
Arctic communities in Alaska, Canada, and Finland

Interim Project Report  
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Sustainable Development  
Working Group



ARCTIC COUNCIL

# Best Waste Management Practices for Small and Remote Arctic Communities

A desk study of best waste management practices used by rural and remote communities in Alaska, Canada, and Finland was undertaken in July – November 2018. This report details results of that work.

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## BACKGROUND

The basic purpose of a sound solid waste management program is to protect the health of local residents and the environment upon which they depend. Modern technologies and economies-of-scale can allow urban Arctic communities to achieve this end, and aspire to meet regional, national or global stewardship responsibilities. Proactive waste management programs remain challenging for small Arctic communities despite the above considerations.

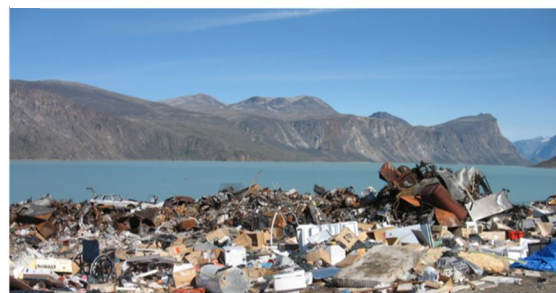


Figure 1. Small off-road community landfills in Alaska and Arctic Canada depicting the following common issues: a) Open burning, b) Proximity to town, c) Sprawl, d) Hazardous waste, e) Marine debris and litter. (Photo Credit: Govt. of NWT).

High transportation costs and poor economies-of-scale, together with related issues of expensive infrastructure, difficulties with operation and maintenance of waste management sites, and complex socioeconomic issues mean conventional solutions are often not successful. Waste infrastructure is less-developed and fewer financial and human resources are available. Unlined, unsegregated, sprawling landfills with open burning are common in rural Alaskan and Canadian communities without road access. Figure 1 depicts these issues. Additionally, due to cost and convenience, some rural households in Finnish Lapland resort to home barrel-burning and illegal dumping.

With all of these practices, leachate migration, surface runoff, and windblown and eroding waste contaminates and litters nearby water and land, and residents can be exposed to disease vectors when discarding wastes or can inhale toxic smoke coming from disposal sites that are often in close proximity to homes and schools.

However, some communities have managed to devise and employ a set of workable practices that substantially reduces the risks posed to their residents and environment. Rather than focus on challenges faced, the intent of this desk study is was to conduct a preliminary scoping of these best practice communities, provide useful information to Arctic small communities interested in improving their practices, and identify trans-Arctic work that may elucidate and facilitate best long-term solutions.

## PROJECT APPROACH

A relevant literature review conducted in the first three weeks helped to inform interviews with multiple individuals in each country possessing personal familiarity of community-level solid waste management circumstances. These individuals hailed from a variety of indigenous and nation-state governmental and private entities operating at the local, regional, or national level. Box 1 lists some of the entities contacted. The organizations best able to

identify and differentiate between various community waste circumstances depended on the backdrop of provincial- and national-level solid waste policies and programs. In general, one contact would lead to one or more further contacts until an individual with sufficiently specific local knowledge was found. Each of these end-individuals was asked to identify best local community practices addressing their region's waste challenges and to list which communities they believed best exemplified one or more of these best practices.

### Best Practices

Best practices were defined as purposefully performed operations which mitigate or prevent human, flora, and fauna exposure to harmful contaminants and disease vectors. So, for example, while important to a well-run program, recordkeeping practices were not examined. Operations that reduce financial burden and the negative aesthetics of trash within a community were considered as secondary best practices due to positive impact on community mental and economic wellness. The best practice operations that consistently surfaced in interviews are listed in Box 2.

A goal of the study is to enable any northern or Arctic community to identify and replicate one or more best practices in a straightforward manner. Criteria used to select two remote and small population communities from the full country list for further scoping included:

- *Relevancy*: Best practice exhibited is impactful to significant health, environment, or economic concerns.
- *Replicability*: Absence of unique factors playing a substantial role in best practice feasibility such as lack of a tourism base, nearby regional waste facility, specialized equipment.
- *Applicability*: Population size < 1,500 pp, remoteness of community, Arctic.

## RESULTS

Prior to final selection of the top two best practice case studies from each country, various recommended waste situations were parsed into whether communities had intentionally applied the practice or had simply benefitted from the waste situation being there already. Practices that were intentionally applied were examined as to whether various human capital

### **Box 2 Best Practices for Remote and Small Arctic Communities**

**Safer Waste Burning** Policy and Procedures to minimize smoke inhalation and direct and indirect particulate matter and other aerosol ingestion or absorption.

**Landfill Access Control** Infrastructure to reduce resident contact with waste and to facilitate fee payment if needed.

**Mandatory Collection Program** Minimizes cross-transmission of disease and resident contact with waste. Minimizes landfill maintenance duties which reduces cost, allowing better use of resources.

**Landfill & Equipment Maintenance** Operations to minimize disease transmission, surface runoff, leachate migration, marine debris & litter, and extend life of high capital items such as landfill and heavy equipment

**Hazardous and Other Harmful Wastes Appropriate Handling** Safe disposal, storage or backhaul of wastes that due to volume or toxicity can be anticipated to cause significant harm.

**Regional Special Waste Programs** Taking advantage of any available regional facilities and programs that handle special wastes when they result in program savings, or needed landfill capacity.

**Specific Program Design** Molding program operations to fit community needs, spending resources on specific problematic practices or infrastructure needs that most impact health and environment, using sociology to change people's behavior.

circumstances were present. These important circumstance attributes are described below, followed by the full list of identified best practice communities and top community case studies.

### **Formative Factors**

Infrastructural and financial factors exist that are wholly or partly out-of-the community's control. These factors are constraints that formulate where a community begins on the spectrum of worst to best waste circumstances, and to some degree the level of health and environmental protection that is achievable.

For example, preventing water contamination may be impossible for a community without an unlined landfill. Engineered liners are typically able to collect and treat the leachate, or divert its release into an intended outfall. The availability and accessibility of regional facilities provides another example. A community with road access can simply transport their waste materials on a truck and drive to a regional facility. Isolated communities must wait for a summer barge, arrange freight logistics, pack according to stringent regulations, and pay substantially higher costs. Thus, an isolated community dealt a dismal waste management start with poor hydrology, no liner, inadequate capital equipment, and little support from regional or national entities may engage in the best waste practices possible for that community. But its infrastructure and protective level may still fall short of other communities with better solid waste management formative starts.

In evaluating communities across the three countries, we identified what are termed here as "Formative Factors", listed in Box 3. These Formative Factors determine essentially where a community begins their waste management journey to full health and environmental protection.

### **Human Drivers**

The impact severity of solid waste circumstances on a community can fall anywhere along a

### **Box 3 Formative Factors**

*Communities are placed in a better or worse waste situation depending on these circumstances outside of their direct control:*

- **Accessibility:** Remote road communities have lower costs than non-road communities.
- **Population:** More people expand program potential, although increase waste issues if non-paying.
- **Tax base:** Locally sited regional institutions, philanthropy, or higher incomes increase revenue
- **Appropriate High Capital Infrastructure:** Sound landfill design, siting, and performance, and/or efficient and effective heavy equipment and other facilities reduce health risks and time needed to perform tasks.
- **Landfill “Clean-Start”:** Enables good landfill management again, instills community pride, and changes disposal behaviors. While human driven, requires significant funding to carry out.
- **Regional and National government support:** Programs that provide disposal options for hazardous and difficult to manage special wastes, and financial support for needed infrastructure can:
  - o Address community’s limitations in handling hazardous wastes by providing a means to either stage and store, or safely dispose in place, hazardous wastes.
  - o Address landfill infrastructural or operational limitations for difficult-to-manage wastes (e.g. tires, appliances, mattresses).
  - o Address landfill capacity and equipment challenges through financing needed and appropriate infrastructure.
  - o Provide technical expertise.

spectrum. The good news is that where a community begins along this spectrum is not where they need to stay. Their circumstances can be improved (or worsened) by human-driven dynamics. Best practice communities not only prioritize their operations to achieve best health and environmental protection, they partly determine the circumstances under which these best practice operations are designed.

Human Drivers (*see Box 4*) can influence the cost and financial feasibility of implementing best practices. For example, the level and type of access control needed, the lifespan of both small and large infrastructure, the amount of labor required, and the fee revenue are all partly under local community control. A motivated and trained operator will ensure strict burning policies are in place that limits resident exposure. Their care in pulling down windblown litter from the fence ensures the fence will not blow down prematurely and cost the community excess fees. A community champion motivates, and in some cases forces, the community and council to better their practices and program. They place waste management on the council agenda and ensure the topic is addressed. An engaged community is supportive of more and better improvements for themselves and for their neighbors. They are willing to put up with some inconvenience if it means better health protection and stewardship of their local, and even global resources. A caring council or other local government structure understands the importance of retaining and training a good operator, building and enforcing fines for the issues that need it. All of these actions move the community towards a higher health and environmental protection level.

### **Identified Communities**

Candidate best practice communities for all three countries are listed in the qualitative selection matrix shown in Figure 2. For each applicable practice for which data was available, communities were assigned one of

three performance levels - standard, very good, or excellent. Human Drivers in the community

#### **Box 4 Human Drivers**

*These community-driven forces broaden the best practice options available to communities and can also loosen certain infrastructural and financial constraints.*

- **Landfill Operator:** An appropriately trained, self-motivated, efficient operator that understands what tasks are most important for community health and does them can override facility inadequacies.
- **Local Champion:** A persistent community member that influences other residents and/or the local government to improve their financial contributions, disposal habits, or purchase and lifestyle decisions, engendering better circumstances from which to design a waste program.
- **Community Involvement:** A community that understands and meets their financial and behavioral responsibilities delimited by their community's operational and infrastructural challenges, and in the best case scenario, collectively reduce their waste challenges via modifying their own purchasing and lifestyle decisions.
- **Local Government Support:** Leadership and organization that prioritizes, implements and *supports* in practice the legal, infrastructural, or financial obligations of the designed program.

are included in the matrix, to provide further context for other communities seeking to potentially use one or more practice.

As explained in Box 5, Finnish communities cooperate in semi-regional waste management programs, and these districts are listed instead of community names.

#### **Community Case Studies**

Case studies for the top two communities from each country, shaded green in Figure 2, are presented in Appendix A. The final selection process was performed within the limitations of the desk study scope and depended largely on qualitative data. All communities listed in Figure 2 have demonstrated a suite of best practices in consideration of their waste circumstances.

#### **Box 5 The Finnish Difference**

Waste management is organized at the district level in Finland. Districts for which the Finns use the English word "municipalities", are groups of communities and villages at a sub-regional level that co-own a for-profit waste management company. This company manages all waste throughout the District. It works in conjunction with the Producer organizations that help to fund the larger special waste collection depots, trucks the non-EPR wastes to the regional landfill or incinerator, and provides education. There are 3 Waste Companies operating in Lapland with no geographical overlap. Two offer household collection services in addition to District self-haul depots. Private companies also offer house collection in some areas. Businesses are responsible for contracting their own waste disposal.

Community	Pop	Freight Access	Best Practices									Human Drivers	
			Waste Burning Policies	Landfill Access Control	Collection Program	Landfill & Equipment Maintenance	Hazardous Wastes	Use of Special Waste Opportunities	Program Design	Landfill Operator	Local Champion	Community Engagement	Local Government
<b>ALASKA</b>													
Golovin	172	Fly-in, summer barge	v	v	v	v	v	v	v	v	v	v	v
White Mountain	212	Fly-in, summer barge	v	v	v	v	v	v	v	v	v	v	v
Igiugig	57	Fly-in, summer barge	v	v	v	v	v	v	v	v	v	v	v
Ekwok	98	Fly-in, summer barge	v	v	v	v	v	v	v	v	v	v	v
Gustavus	544	Fly-in, summer barge	v	v	v	v	v	v	v	v	v	v	v
Tanana	225	Fly-in, summer barge	v	v	v	v	v	v	v	v	v	v	v
Beaver	63	Fly-in, summer barge	v	v	v	v	v	v	v	v	v	v	v
Iliamna	100	Fly-in, summer barge	v	v	v	v	v	v	v	v	v	v	v
Chignik Lake	68	Fly-in, summer barge	v	v	v	v	v	v	v	v	v	v	v
Nulato	239	Fly-in, summer barge	v	v	v	v	v	v	v	v	v	v	v
Rampart	54	Fly-in, summer barge	v	v	v	v	v	v	v	v	v	v	v
Manokotak	487	Fly-in, summer barge	v	v	v	v	v	v	v	v	v	v	v
<b>CANADA</b>													
<b>Nunavut</b>													
Arviat	2657	Fly-in, summer barge		v	v			v	v	v	v	v	v
Cape Dorset	1441	Fly-in, summer barge						v					v
<b>Northwest Territories</b>													
Paulatuk	265	Fly-in, summer barge	v	v	v	v	v	v	v	v	v	v	v
Ulukhaktok	396	Fly-in, summer barge	v	v	v	v	v	v	v	v	v	v	v
Trout Lake	120	Fly-in, winter road	v	v	v	v	v	v	v	v	v	v	v
<b>Yukon</b>													
Carcross	301	Klondike Highway	N/A	N/A	v	N/A	v	v		v	v	v	v
Mt Lorne	437	Klondike Highway	N/A	N/A	v	N/A	v	v	v		v	v	v
Marsh Lake	696	Alaska Highway	N/A	N/A	v	N/A	v	v	v	v	v	v	v
<b>British Columbia</b>													
Kwadacha	610	Float planes or barge, poor logging road	v	N/A	v	N/A	v	v	v	v	v	v	v
Kitkatla	490	Fly-in, barge	v	N/A	v	N/A	v	v	v	v	v	v	v
Bella Bella	1450	Fly-in, barge	v	N/A	v	N/A	v	v	v	v	v	v	v
<b>Saskatchewan</b>													
Black Lake	1614	Fly-in, winter ice road	v	v	v	v	v				v		
Fond Du Lac	1100	Fly-in, winter ice road	v	v	v	v	v	v					
<b>Manitoba</b>													
St Teresa Point	3262	Fly-in, winter ice road	v	v	v	v	v	v	v	v	v	v	v
Lac Brochet	629	Fly-in, winter ice road	v		v		v	v		v	v	v	v
Tadoule Lake	360	Fly-in, winter ice road		v	v						v	v	v
<b>FINLAND</b>													
Ylitornio		Year round road	N/A	N/A	v	N/A	v	v	v	v	v	v	v
Kittilä		Year round road	N/A	N/A	v	N/A	v	v	v	v	v	v	v

Figure 2. Best practice communities in Alaska, Canada, and Finland identified through expert interviews and desk study research, July – November 2018. See Box 2 and Box 4 for Best Practice and Human Driver details. **KEY:** v - Very good performance for this category, v - Excellent performance for this category, N/A - Not applicable. A blank space denotes standard performance for this category.

## DISCUSSION

Several broad preliminary observations at the Country level are included below.

### The Challenge of Global Stewardship

The limited seasonal access and scheduling complexity for off-road village transportation, as well as a limited construction season and Arctic engineering issues, mean that every construction activity and each piece of equipment is significantly more expensive in small Arctic communities. Indeed, without subsidization, for most of the Arctic's smallest and remote communities, especially for those without commercial or tourism bases, a state-of-the-art-landfill or regulatory compliant incinerator requires a fixed operation and maintenance cost that exceeds affordability. Communities must best manage their waste with what they have, and the case studies included here are examples of what can be achieved.

As small and remote Arctic communities face much greater challenges in implementing waste management and health protective measures, the Canadian and Alaskan best practice communities featured here do not do well when evaluated from a global stewardship perspective. For example, burning without emissions treatment is practiced in at least two of the case study communities. Black carbon and persistent, bioaccumulative and toxic substances are emitted into the atmosphere and directly add to Arctic contaminant levels. Disposal sites are typically proximate to water bodies that serve as transportation corridors and the community's food harvesting sites. With limited cover and compaction, poor or absent fencing, and often strong maritime winds, marine litter is inevitable.

A typical choice for these communities is to open burn-- or allow the expanding landfill footprint to encroach on, and ultimately fall into, the river or ocean. The landfill can't be maintained otherwise, and an incinerator is financially out of the question. The best practices then include separating out as much hazardous waste as



Figure 3. *Conceptual Model for Best Waste Practices in Small and Remote Arctic Communities.*

possible, and then burning only when the wind is away from town.

Larger and more urban Arctic communities have the economy of scale to not only meet minimum health and environmental goals, but to begin to meet global stewardship goals as well. Figure 3 depicts a conceptual model of community best waste practices. Due to Formative Factors that emplace financial and infrastructural constraints, best practice communities will prioritize health & local food resource protection over global stewardship goals of reduced volume, toxicity, and material waste. But human drivers can push out these constraints so that communities can design for expanded health and environmental outcomes, and possibly advance environmental stewardship goals as well.

### Overall Country Differences

There are macroscopic considerations when viewing small Arctic community waste management programs at the country level.

### Road Access

Of foremost consideration is road access. The great bulk of Alaska's and Canada's remote and small communities examined for the purpose of

this study are not on a reliable road system. In contrast, all of Finland's communities are on a well-maintained road system.

It is not within the scope of this desk study to provide a cost comparison. However, lack of road access substantially increases the cost of operating a solid waste program for off-road system Alaskan or Canadian communities. And it increases the cost of capital equipment and infrastructure development. For example, a 400-person Yup'ik village in Alaska pays approximately \$6,000 to ship out a one-year accumulation of spent lead-acid batteries and electronics. Freight for heavy equipment can be an additional ten to thirty percent of the cost. The ballpark cost to build just the road for a new landfill is about \$1.5 million per mile. The capital and operational cost per household served in small villages typically numbering several hundred people is extraordinary.

### Extended Producer Responsibility (EPR)

Extended Producer Responsibility (EPR) policies and laws impact the efficiency and effectiveness of waste management programs for hazardous and special wastes. Finland nationally mandates EPR for a large number of waste categories and all communities have access to services that safely accept hazardous and other special waste.

Canada has national goals that support and promote EPR but adoption and implementation is the responsibility of the provinces and territories. Canada's smaller and more remote communities are variously served, depending on the regional design and implementation progress. It is notable that the Northwest Territories and Nunavut, comprised of many of the smallest and most remote communities-- that fare worst from a Formative Factor perspective, are precisely those regions that have the least developed EPR Programs. But remote and small communities even in those provinces/territories with excellent EPR programs are not very well served. EPR is easier and less expensive to operate in more densely populated areas.

The U.S. has no national EPR policy, and it is the states that determine autonomously whether to adopt a program. Alaska has none, and its communities struggle with safely handling any of the waste covered by Canada or Finnish EPR legislation, including electronics, lights, and batteries. The bulk of hazardous wastes end up in Alaskan communities and are unsafely landfilled, stored outside, or burned.

### Regulatory Differences and Local Community Program Management

National laws can impact community accountability and waste program structure. For example, as with other EU Countries, Finland mandates waste management education in every community, and children typically receive waste management lessons in school. Canada and Alaska have no such directive, leaving it to community decision, albeit with technical support from regional and national environmental programs.

Finland also requires districts to provide self-haul or collection waste services for every household. Districts are required to fully recoup the cost of service in the solid waste fees they charge. Subsidization is not allowed. Communities understand that it is their own disposal practices and program infrastructure that are responsible for the level of fee they are charged. On the other hand, the districts are powerless to alleviate cost burden to poor households, and they must weigh expanding service convenience for some-- with increasing the fee for all.

Alaska and Canadian communities have more leeway in how they structure and finance their programs to fit their communities, but do not have the legal motivation that may at times help convince a community to pay for an improved waste program.

### National Funding

National funding streams impact a community's infrastructure and operational abilities. A list of funding mechanisms is beyond this study's scope, but examples include a critical U.S.

capacity-building grant to federally recognized tribes that the bulk

of Alaska small communities use for at least part of their waste program. Canada funds local community-hire cleanup of landfills, as well as needed operator training. Termed “Clean-Starts”, these often very successful projects are funded opportunistically through various funding mechanisms. Finland relies largely on community-formed waste districts and producers to fund solid waste management programmes. Landfills, incinerators, and other waste treatment facilities are regional to serve an appropriate economy-of-scale population. These facilities are funded variously by local government consortiums, EPR entities, private enterprise waste management companies, and/or for-profit companies owned by local and/or regional governments for the purpose of complying with national directives.

### Public Health

The dominant health risk exposures relating to waste programs primarily occur at the community-level in Alaska and Canada, and at the household-level in Finland. In Alaskan and Canadian communities, smoke inhalation, direct contact with waste, surface water contamination, and environmental degradation primarily emanate from the landfill and/or other community-level facilities and practices. For Finnish Arctic small communities, there are no landfills. Organized and maintained waste transfer stations and collection depots exist instead. However, some households appear to burn, or possibly bury, their trash at home or other illegal locations. When located near the home, what is often termed “backyard burning” is associated with a number of health risks. Additionally, burying hazardous wastes can contaminate water and a sufficient volume of waste may impact nearby flora and fauna. Box 6 provides additional detail.

### Waste Management and Human Behavior

The generation and disposal of waste inherently depends on human behavior, for better or worse. 17. Best practices addressing sociological

#### **Box 6: A Finnish Mass Balance Question.**

While Finnish communities enjoy possibly unparalleled rural community waste management services, EPR and district programs provide drop-off points that may be considered inconvenient by some rural Finns, and they may not use them.

Study data indicate that these rural and possibly most relatively isolated households may opt to accumulate waste, or burn or discard it illegally. For example, one district program saw use of their collection center double when they made the payment for its use more convenient for customers. An interviewed district waste company had a per capita trash collection rate that was one-third higher for households receiving curbside service than that for households self-hauling. If households perceive waste disposal to be inconvenient or costly, some waste reduction often ensues but typically only to a limited point. Beyond possible waste reduction, both cases indicate that a potentially significant portion of the small and rural community wastestream is accumulating at homes or being discarded illegally.

Household health, public nuisance, and (likely localized) environmental impact may ensue. Communities have no easy way to determine the extent of these practices for EPR products, which are handled externally to their programs. For other wastes, significant resources are required to carry out a wastestream characterization and mass balance, and the lack of transparency and trans-border operations of private companies exacerbates the difficulty.

factors appear to have universal application. The Finland case study best practices are primarily based on incentivizing customers to use their service and use it correctly, while providing disincentives to use it improperly. Small Finnish communities face quite different waste management situations that those in Alaska and

Canada. Program designs that are consistent with community beliefs and goals are more likely to be adopted and result in better fee payment and improved waste disposal practices.

## FINDINGS & WAYS FORWARD

Issues observed in conducting this study are italicized below, followed by possible action items.

1. *The network of rural Arctic waste management entities is limited. Ten of the contacted individuals requested contact information for one or more study contacts.*

### **Possible Action Items:**

- ◆ Develop a website that stores relevant literature, outreach materials, and ordinance and planning templates. Design for practical use by community audience.
- ◆ Host a workshop for addressing common challenges and identifying cross-collaboration efforts, including trans-Arctic shipping, best adaptation and mitigation practices and policies, best remote community EPR practices, marine debris, and more. Target audience: regional & national waste management personnel and community practitioners that influence and implement waste management practices on the ground.

2. *Whether, and to what extent, best practice communities experienced measurable health and environment outcomes could not be established within the project scope. For example, blight and potential harm are often conflated. A well-consolidated unlined landfill with no waste segregation may present more risk than a sprawling blighted site without hazardous waste.*

### **Possible Action Items:**

- ◆ Support studies that elucidate environmental health outcomes associated with rural Arctic waste practices and circumstances, with a focus on results that provide useful information or guidance in waste management decisions.

3. *The universe of best practice communities was not examined. The study scope was not sufficient to identify remote best practice communities in all Canadian provinces, and a strong potential exists for other best practice communities in other Arctic nations.*

### **Possible Action Items:**

- ◆ Develop a full trans-Arctic list of best practice communities and best practices to which communities can refer.
  - ◆ Develop an understanding of issues cross-Arctic so that policy approaches and community decisions can be best directed.
4. The set of practices resulting in greatest environmental and health improvement for a particular community is situation-dependent. For example, in communities with barrel burning, a focus on landfill maintenance does not directly address what may be the most pressing health risk.

### **Possible Action Items:**

- ◆ Characterize the circumstances necessary for a set of best practices to achieve program improvements, to better enable communities to make decisions specific to their own situation.
5. *The factors and drivers that allow each identified community to implement their best practices could not be examined in*

*detail. For example, what circumstances are necessary for a community champion or dedicated operator to emerge? How does a community become better informed and why do some local councils prioritize waste? What do the timeline and milestones look like for a community implementing a sound protective program, and what factors stymied or propelled it?*

**Possible Action Items:**

- ◆ Conduct in-depth community interviews and employ sociological tools to deconstruct the genesis of best practice drivers, so that communities can more dependably replicate each other's successes.
  
- 6. *Community engagement is a powerful driver for improved programs, but it is unclear whether and to what extent outreach materials play a role in developing that engagement. If effective outreach materials exist, their replication could be a low-cost improvement effort for struggling communities.*

**Possible Action Items:**

- ◆ Identify effective waste messaging and guidance within best practice communities and share successfully tested templates via an online website and print distribution where appropriate.
- ◆ Develop targeted waste outreach and education materials
  
- 7. *Training programs and curricula exist which could benefit communities across the Arctic. For example, a landfill operator course specific to rural & small communities exists in Alaska, and a program that trains in operations and life skills simultaneously exists in Canada.*

**Possible Action Items:**

- ◆ Develop and support an Arctic Small and Remote Community Train-the-Trainer program to facilitate the sharing of tested, results-oriented curricula among Arctic nations and communities.
  
- 8. *A common thread for all three countries is the significantly higher cost of providing collection to remote and small communities, whether via EPR programs or coordinated waste backhaul. Regions often address this issue by limiting service to these communities and, anecdotally, illegal dumping, waste burning, and other undesirable practices are partial advents. Yet, there are Arctic EPR programs and emerging regional coordinated backhaul programs that include successes.*

**Possible Action Items:**

- ◆ Identify best practice EPR programs for regional, national, or cross-Arctic governments to replicate or adapt them.
- ◆ Evaluate potential for coordinated cross-Arctic waste backhaul transportation to reduce costs for local communities.
  
- 9. *The extent, and health and environmental risk significance, of unauthorized waste disposal in rural Arctic Finland is unclear.*

**Possible Action Items:**

- ◆ Conduct a waste mass balance to determine whether and where household waste burning and waste burial is a significant issue.
- ◆ If burning is conducted by a significant number of households, conduct a health risk study to determine impacts and develop results that may be used in an education campaign.

## CASE STUDIES



## GOLOVIN

**Population:** 172 **Access:** Small plane and barge. Ice roads to nearby communities but not connected to hub  
**Overview:** Golovin is located in Alaska on the Seward Peninsula, 70 miles east of Nome. It is an Inupiat village with a fishing, herding, and subsistence lifestyle. The City of Golovin operates a Class 3 Landfill, 2 miles north of the community.

**Human Drivers:** Local champion is also the landfill operator who has worked with purpose for 20 years to improve their self-haul landfill to the point of receiving the highest landfill inspection score in the state. The community pays a utility fee, and follows prescribed self-haul practices. The City of Golovin supports the program with regular training, ordinances, adequate supplies, and a backup staff. The City and the Chinik Eskimo Community partner on solid waste issues when needed.

**Formative Factors:** Golovin has access to a regional backhaul program for hazardous wastes, and has access to gravel for landfill cover.

**Highlight:** Their operator is a major force behind their success. They operate a successful self-haul program because the operator, community, and council chose to purposely adapt their waste program to the community needs, while prioritizing health and environment, exemplifying good ordinances and enforcement.

### Best Practice Detail:

#### Waste Burning

*Waste burning is not a best practice, but when used it is critical to employ best practice techniques.*

- No open burning
- To save money, an old fuel tank was converted to their burnbox
- Only burn when wind is blowing away from the community and away from nearby communities.
- Hazardous waste and non-burnables sorted out before burning
- A loader is used to lift the burnbox and push the ash out.

#### Landfill Access Control

- The landfill is fenced to minimize windblown litter, but not gated. The absence of gating is not a best practice, but works here because the engaged residents observe the landfill rules on where and what to discard, and the operator and city enforce these practices.
- Signage is displayed at the landfill for general wastes, hazardous wastes, and salvage wastes.

#### Collection Program

- Golovin exemplifies a best practice self-haul program because the disciplined residents comply with all signage indicating where and what to discard, ordinances are enforced by the city, and monitored by the operator. A separate well-organized salvage yard contributes keeps the public from wandering the landfill. Residents still pay fees for solid waste through their utility bills

#### Landfill & equipment maintenance

- Have heavy equipment and a good maintenance program
- Carry out regular landfill maintenance. Consolidation and compaction of non-



burnables. Operate a trench and fill landfill.

- Landfill trench cells are 10x10 or 15x20 feet. The operator digs trenches until permafrost is hit, extending life of the landfill by 20 yrs.
- Regularly pick up litter in and around landfill (especially plastic bags)
- They adjust landfill operations in the winter - moving the burnbox closer to the landfill entrance since the landfill area fills with snow, and using snow like dirt to cover wastes, helping to keep the birds away.
- Regular maintenance of their landfill and continual litter pick up has resulted in a clean landfill site which has encouraged the community to keep the landfill clean and well organized.
- Golovin has a solid waste operation plan and ISWMP. They reference their operation plan for monthly inspection forms and other regular landfill maintenance.
- Calcium chloride is used for dust control in community and on the landfill access road via a sprayer pulled by an ATV.
- City garage is used as the operator shop.

### Hazardous and other harmful wastes

- Backhaul program: Electronics, batteries, and lights, are regularly shipped out through a semi-regional backhaul program. Electronics, household batteries, and CFL's are collected and stored at the tribal office. Lead acid batteries, used oil, and used antifreeze are collected and stored at the operator shop.
- Much care has been taken to set up the program properly. All storage containers are labeled and the operator shop is kept clean.
- Over the past three years, the Tribe has contributed federal grant funds to backhaul legacy wastes that took up significant space in the landfill.

### Other special wastes

- Tires – good ones are salvaged and the rest are cut in half or quartered and nested to reduce space when buried
- Operate a recycling program for plastic bottles and cans that is administered free-of-charge throughout the state by the non-profit group ALPAR.
- Have a dedicated salvage area at the landfill with signage. The salvage area is used by residents of Golovin as well as residents in nearby villages for parts and equipment. The salvage area was moved closer to town so it is easier for public to use and also is closer to the barge dock (for shipping out scrap metal). Vehicles and white goods are depolluted.
- Have C&D ordinances – Contractors are only allowed to dump household trash in the landfill. They are required to backhaul everything else out.

### Other Details:

- Community champion is the operator, who has been working there for 20 years. He not only set up the program, but is directly active in maintaining it.
- Golovin has community ordinances. For households, the ordinance states which materials can and cannot go to the landfill. For the school, the ordinance states they must participate in the recycling program for cans and bottles and includes specifications on how these items should be prepared..

### Community Contact:

**Landfill Operator:** Dwight Amaktoolik 907-779-2005

**City of Golovin:** Carol Oliver 907-779-2005 [oxiedec49@yahoo.com](mailto:oxiedec49@yahoo.com)

**Photo Credit:** State of Alaska Solid Waste Program





## WHITE MOUNTAIN

Population: 212 Access: Small plane and barge.

**Overview:** White Mountain is an Inupiaq community located on a south-facing hillside on the west bank of the Fish River, on the Seward Peninsula. It is 63 miles east of Nome, is home to the mandatory last rest stop for the Iditarod Sled Dog Race, and has historical influences from the gold rush. Subsistence activities are primary and prevalent. A sprawling, unmanaged dumpsite used to be located just one-quarter of a mile from homes, but the community worked diligently over several years and has achieved the third highest rural landfill score in Alaska.

**Human Drivers:** White Mountain has not had a local champion, nor dedicated operator that spurred their solid waste improvements. They have had frequent staff turnover in their solid waste department. The human drivers are the community, who respect their improved landfill, and the local governments from the Tribe, City, and Tribal Corp who have banded together to pay for, and prioritize, a consistently strong solid waste program.

**Formative Factors:** White Mountain has access to a regional backhaul program for hazardous wastes and to cover material. A federal grant paid for a clean-start, as well as signage, a burn unit, fencing, and collection bins.

**Highlights:** The community is the champion. The Tribe, City, and Tribal Corporation work together on a Solid Waste Workgroup to make a good system for their community.

### Best Practice Detail:

#### Waste Burning

*Waste burning is not a best practice, but when used it is critical to employ best practice techniques.*

- No open burning
- Saved money and employed locally by building a burnbox from a used fuel tank.
- Only burn when wind is blowing away from the community
- Waste is sorted before burning (burnables go to the burnbox and non-burnable waste is stored in a cage until it is ready to be buried. Hazardous wastes are also separated).
- Only the solid waste operator and heavy equipment operator access and light the burn pit.

#### Landfill Access Control

- The landfill is fenced and gated, but not locked. They are working towards acceptable landfill business hours, and plan to lock it during closed hours. It also is intended to keep out brown bears, which are an issue at the landfill.
- Used 55-gallon drums are used to section off different areas of the landfill.
- Multiple signs at the landfill for what to do with wastes.

#### Collection Program

- Waste is collected from cans in front of households by two trash collectors.
- The City charges solid waste fees for households and businesses.
- Collectors are paid by the Tribe and the operator is paid by the City.



## Landfill & equipment maintenance

- Have a D6 dozer that is used by the operator.
- Carry out regular landfill maintenance -- consolidation, some compaction, and cover of non-burnables.

## Hazardous and other harmful wastes

- Backhaul program: Electronics, batteries, and lights, are regularly shipped out through a semi-regional backhaul program. Electronics and lights are collected in a secure connex at the landfill. Batteries are collected in labeled bins with lids at the generator house.
- They will be getting a used oil burner soon for their spent oil.
- They have a dedicated storage area for hazardous waste and recyclables at the landfill with signage.
- They have ordinances for improper disposal of batteries and improper incineration of refuse however they don't need to enforce them because the community fully complies with the rules. The community is very supportive of solid waste management and feel strongly about not contaminating their environment.

## Other special wastes

- Freon is removed from white goods. Vehicles are depolluted. Scrap metal is buried in a separate area of the landfill.

## Other Details

- When the Tribe began receiving the US Environmental Protection Agency's Indian General Assistance Program (IGAP) funding, the City and Tribe began to work together to improve their serious waste management issues.
- A Solid Waste Workgroup was formed by the City, Tribe, and Tribal Corporation with attending staff that represented a cross-section of community members. The Workgroup met regularly to plan out what they needed to do and how it would be done, and were rewarded by a federal grant large enough to implement their planned improvements.
- The Workgroup, which continues to meet, also developed a solid waste ordinance to govern solid waste issues in the community. The comprehensive code includes rules and guidance on waste separation, accepted materials, hazardous waste disposal, waste burning, and fees.



White Mountain Landfill before their "clean start"



White Mountain Landfill after their "clean start"

## Community Contact:

**City of White Mountain Landfill Operator:** Amos Brown

**Native Village of White Mountain Environmental Director:** Henry Titus Sr., [henryjack\\_4@hotmail.com](mailto:henryjack_4@hotmail.com), (907) 638 2111 Fax: (907)638-3652

**Photo Credit:** State of Alaska Solid Waste Program





## SAMBAA K'E

**Population:** 120 **Access:** Small plane, and winter ice road (for three months of the year).

**Overview:** Samba K'e, a traditional Dene settlement, is located in the Northwest Territories, on the southeast shore of Trout Lake, 430 km southwest of Yellowknife. In 2016, the settlement officially changed its name from

"Trout Lake" to "Samba K'e," its name in the Slavey language, meaning "place of trout." Samba K'e is famous for its fishing. The landfill in Samba K'e is located approximately 3.5 km south of the community and approximately 2.5 km from Trout Lake. The daily operation and maintenance of the landfill is the responsibility of the community government/municipal staff (Dene Band).

**Human Drivers:** Clean land and water are essential to Samba K'e way of life. Residents live a traditional life style of hunting, fishing, and trapping and drink and use water directly from the water bodies of the traditional territory. Households follow environmental rules diligently and are motivated to do the right thing to protect their environment. The Band government is also very supportive of solid waste management and is constantly looking for ways to improve their program. Their human drivers are the community at large and government which make them less reliant on consistent landfill operators or specific environmental staff.

**Formative Factors:** Samba K'e has access to an ice road for three months in the winter which they utilize to backhaul hazardous wastes. They also have access to soil for cover for their landfill.

**Highlight:** Samba K'e has an excellent multi-approach solid waste education program. Events are held with food served to teach the community how to properly separate and recycle various materials. Posters, explaining what to do with hazardous wastes such as batteries and paint, are put up and distributed around the community. The Band also carries out household visits to pick up hazardous wastes, and households that need collection sooner than a scheduled visit can call the Band office. Staff use the in-person opportunity to further educate and remind households of the system for all hazardous wastes and any changes.

### Best Practice Detail:

#### Waste Burning

- Eliminated all burning of waste

#### Landfill Access Control

- The landfill is fenced and gated, but not locked. One section of their fence is compromised because of bears trying to gain access to the landfill (they are working on a solution to the bear/fence issue).
- Signage is used at the landfill hazardous wastes, and salvage wastes.

#### Collection Program

- Waste is collected by two part-time collectors.
- Waste is placed in bags by households and put into locally-made plywood bins next to the road for collection. The waste collectors pick up waste two times per week in the winter and three times per week in the summer, using an enclosed truck.
- Hazardous wastes and recyclables are separated by households and collectors.



Photo Credit: Ecology North



Photo Credit: Ecology North



Photo Credit: Ecology North



Photo Credit: Caroline Lafontaine



Photo Credit: Golder Associates Ltd

## Landfill & equipment maintenance

- Carry out semi-regular landfill maintenance. Operate a trench, fill, and cover landfill. Remediated soil is used as landfill cover.
- Have heavy equipment (D-4 bulldozer). Short term laborers are used to consolidate, compact, and cover waste at the landfill. They are looking to fill a permanent operator position.



## Hazardous and other harmful wastes

- Hazardous wastes are collected and stored at the landfill. A trailer is currently being installed within the fenced area of the landfill for storage of hazardous wastes including batteries, lights, paint, and oil. Racks are also being built for easy winter loading.
- Hazardous wastes are shipped out with opportunistic pots of funding. Recently, stockpiles of drums of oil, fuel, glycol, and other liquids, as well as paint were shipped out and community members were trained on how to properly package and label the materials through an Ecology North project.
- The school is now being reennovated and the Band will work with the construction companies to backhaul additional stockpiled hazardous wastes and tires at the landfill along with the rennovation project wastes.
- Electronic wastes are managed by the Government of the Northwest Territories (GNWT), through their EPR/Product Stewardship program. E-wastes are stored inside and shipped out to Hay River. Household batteries and cell phones are also collected in boxes and shipped to GNWT when full.
- Contractors are encouraged to backhaul hazardous wastes generated in the community.



Photo Credit: Ecology North/GNWT

## Other special wastes

- Tires, and metal waste (e.g. vehicles, white goods) are stored along the fence at the landfill site (vehicles and appliances are depolluted).
- A dedicated bulky waste/salvage area is used by residents (for parts and equipment), away from the main landfill face.
- The disposal site contains separate pits for animal carcasses and diapers.



Photo Credit: Ecology North/GNWT

## Other Details:

- Samba K'e recently started a composting program and built a greenhouse. Two garden coordinators operate the program -- one looks after the greenhouse and the other operates a small bed program. Households can drop off food waste to the greenhouse or can call the Band office to have it collected. The Band carried out a workshop for the community on composting and provides educational materials for households that need further information and guidance.
- Samba K'e's landfill is quickly running out of room, so the community and government is motivated to look for other waste reduction possibilities. They are currently looking for funding to purchase a cardboard shredder to use for their composting program and they are also actively trying to recycle more materials.



Photo Credit: Ecology North/GNWT

## Community Contact:

**Band Manager:** Ruby Jumbo [manager@sambaakefn.com](mailto:manager@sambaakefn.com)

**Environmental and Lands Coordinator:** Jessica Jumbo (867) 206-2800



Photo Credit: Ecology North/GNWT



## ULUKHAKTOK

Population: 396 Access: Small plane and barge.

**Overview:** The Hamlet of Ulukhaktok, an Inuvialuit community, is located in the Northwest Territories, on the west coast of Victoria Island, 948 km north of Yellowknife and 676 km northeast of Inuvik. Hunting, trapping, and fishing are major sources of income, but printmaking has taken over as the primary source of income in recent years. The solid waste disposal site is located a little over a mile north of the community along a road leading towards the airport. The site contains both a municipal solid waste (general household waste) and bulky waste disposal area.

**Human Drivers:** A dedicated operator that is able to implement the various improvements the hamlet has instituted. A hamlet that has supported stricter access controls and burn policies, as well as partnered for a landfill “clean start”. A new community pride and involvement as a result of the clean start.

**Formative Factors:** EPR program for electronics.

**Highlights:** In 2018, Ulukhaktok partnered with the territorial government to perform a successful “clean start” – organizing the landfill and shipping out drums of used oil, batteries, and end-of-life vehicles. The hamlet has also eliminated open burning of unseparated trash and now only burns paper/cardboard in a dedicated pit, using strict burning policies and procedures.

### Best Practice Detail:

**Waste Burning** *Waste burning is not a best practice, but when used it is critical to employ best practice techniques.*

- Eliminated open burning of unseparated trash.
- Only burn cardboard, paper, and clean wood in a contained area in the landfill
- Only burn when wind is blowing away from the community, generally two-three times per week
- Only the solid waste operator and heavy equipment operator access and light the burn pit.

### Landfill Access Control

- The landfill is fenced and a gate has been ordered so that the landfill will be locked and closed to the public.
- There is signage at the landfill, including a map of where to place different materials.
- Only the landfill operator and heavy equipment operator access the active face.

### Collection Program

- Waste is collected by a full-time trash collector.
- Waste is placed in bags by households and put into bins with lids next to the road for collection. The waste collector picks up waste five days per week using an enclosed truck.
- Burnable wastes and hazardous wastes are separated by the collector.
- The bins with lids are relatively new and have really helped to keep the birds and other animals out of the trash.



Photo Credit: Golder Associates Ltd



Photo Credit: Hamlet of Ulukhaktok



Photo Credit: Golder Associates Ltd



Photo Credit: Govt. of NWT



Photo Credit: Golder Associates Ltd

## Landfill & equipment maintenance

- The disposal site is an area fill bermed landfill.
- Have heavy equipment (2 D-6 bulldozers)
- Regular landfill maintenance is carried out. Compaction on a bi-monthly basis in non-frozen months. Waste is covered sporadically with sand and gravel. Waste is dropped in the central part of the landfill and spread with heavy equipment on a weekly basis.
- Operator works regularly at the site to manage the landfill and separate wastes.



Photo Credit: Golder Associates Ltd

## Hazardous and other harmful wastes

- Dedicated storage area for hazardous waste at the community works yard (Hamlet property). Hazardous wastes are stored there vs at the landfill because it is more secure and covered.
- Hazardous wastes are not accepted at the landfill and if dropped off are sent to the community works yard for storage.
- Used oil is stored in leak free containers.
- Hazardous wastes are shipped out with opportunistic pots of funding.
- Electronic waste (as well as beverage containers) are managed by the Government of the Northwest Territories (GNWT), through their EPR/Product Stewardship program. The GNWT visits Ulukhaktok on a regular basis and carries out collection events and then packages and ships out the materials for recycling.



Photo Credit: Hamlet of Ulukhaktok

## Other special wastes

- Ulukhaktok has a dedicated and secure storage area away from the disposal site for hazardous wastes.
- Tires, and metal waste (e.g. vehicles, white goods) are stored at the landfill site (vehicles and appliances are depolluted).
- A dedicated bulky waste/salvage area is used by residents (for parts and equipment), away from the main landfill face.
- The disposal site contains a dedicated burn pit (large steel culvert) for animal carcasses.



Photo Credit: Govt. of Northwest Territory

## Other Details:

- According to the Senior Administrative Officer (SAO) the clean start instilled community pride and made residents more aware of waste, recycling, and potential risks. The solid waste program staff also developed a new perspective on how to manage the disposal site.
- Operator has completed training
- Ulukhaktok started a Single-use Retail Bag Ban Program in the stores (only reusable bags are allowed)

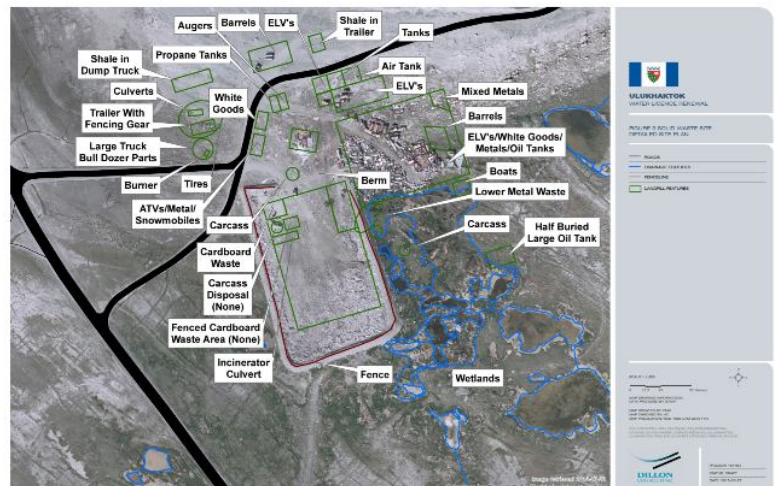


Photo Credit: Dillon Consulting

## Community Contact:

**Ulukhaktok Assistant SAO:** Susan Kaodloak,  
[asao\\_ulu@northwestel.net](mailto:asao_ulu@northwestel.net), 867-396-8023

**Foreman/Operator:** Doug Goose

Solid waste in northern Finland is managed at the regional district level. A for-profit company, owned cooperatively each district's municipalities, serves essentially as an areawide waste management program.



## YLITORNIO

### Overview of Waste Management in Ylitornio

The public for-profit company Perämeren Jätehuolto O.Y. is in charge of managing the district's waste. As in the entirety of Finland, an ambitious national waste minimization and EPR policy translate to significant household-level responsibility.

Paper, metal, cardboard, glass, plastic, and textiles are separated at-home and brought to "collection centers". For convenience, collection centers are generally located in supermarket or gas station parking lots and households drop materials free of charge. Producers are responsible for collecting and managing collection center waste. Beverage containers are separated and are taken to automated machines, usually located in supermarkets that return a bottle deposit fee. Supermarkets also have bright red boxes available to drop off small household batteries for recycling.

For other hazardous wastes and bulky wastes, a fee-based sorting station is available for households to drop off materials. In Ylitornio, the sorting station is open one day a week. Waste management companies will also pick up these materials directly from communities one to two times per a year. Households can also drop off scrap vehicles, tires, batteries and energy storage devices, and electrical and electronic equipment at stores that sell these materials and producers will take them free-of-charge. A curbside collection service is offered for the remainder of the residential waste. This trash is termed "burnable waste", and is transported 190 kilometers to the nearest incineration facility. Households pay 240 Euros/yr for the curbside service.

**Formative Factors:** All households have road access, residents benefit from a national EPR program and a nationally funded waste education program.

**Best Practices:** Households used to be charged 15-25 Euros per visit to drop off drop off hazardous and bulky wastes at sorting stations. Three years ago, Perämeren Jätehuolto implemented the Jäkälä customer card, for which customers prepay 24.80 Euros per year and are allowed four station visits. The fee covers the district's management of hazardous waste, medical waste, recyclable waste collection, sorting stations, and environmental and recycling advisory, and more. The new card system doubled the amount of hazardous and bulky wastes coming into sorting stations. The sorting stations have also been easier to staff – use of the Jäkälä cards makes customer entry and recordkeeping easy and efficient. Implementation of the new system was smooth and residents have accepted the new annual fee without issues.

The regional incinerator is near-capacity, so that the volume of biowaste it accepts is now limited. As a result, Ylitornio charges extra for curbside biowaste collection, to encourage home composting. Ylitornio, with 4,850 people, requires household curbside collection services. This policy discourages unauthorized and potentially unsafe household trash disposal. Records indicate that the volume of burnable waste collected from households with curbside service compared to households that self-haul waste due to lack of curbside services are about one-third greater. Because these households have similar lifestyles, the volume difference is unlikely to be due to waste reduction alone.

**Community Contact:** Tuija Ahrikkala, Perämeren Jätehuolto Oy, 358 40 747 589  
[tuija.ahrikkala@pmjh.fi](mailto:tuija.ahrikkala@pmjh.fi)





## KITTILÄ

### Overview of Waste Management in Kittilä

The public for-profit waste company Lapeco manages solid waste for the Kittilä area that encompasses northern Lapland. They operate a transshipment facility and self-haul waste disposal station. Burnable waste is driven to an incineration

plant in Oulu.

Curbside waste collection is voluntary. Those receiving the service pay a range of fees, from 120-260 Euros/yr, depending on the waste container size they choose. Finland requires that municipalities charge fees that cover all waste management costs. So those not on curbside service are still billed an annual self-haul fee even though the collection centers are not fenced or staffed. All households sort out at home their paper, metal, cardboard, glass, plastic, and textiles and bring those wastes to collection centers. Collection centers are located in convenient areas such as supermarket/gas station parking lots, or tourist areas, and households drop materials free of charge. Producers are responsible for collecting and managing wastes at collection centers.

Households drop off hazardous wastes, bulky wastes, and some special wastes at a fee-based waste sorting station. Weighing scales are used, and residents pay 36-45 Euros annually for up to 500 kilos-- after 500 kilos, there is a 0.16 Euro/kilo charge. Electronics and electrical equipment, scrap metal, glass and porcelain, wood, oil waste, garden waste, construction waste, soil and stone materials, furniture, windows, and doors are all accepted. Lapeco also operates an annual mobile collection event in each smaller community. As elsewhere in Finland, pharmaceuticals and thermometers are accepted at pharmacies. Small batteries are accepted by all battery retailers.

**Formative Factors:** All households have road access, residents benefit from a national EPR program and a nationally funded waste education program.

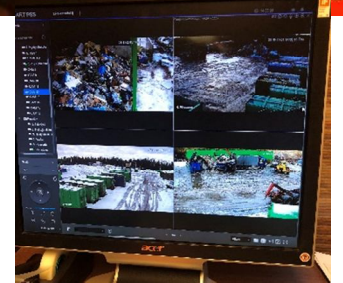
### Best Practices:

- Residents in Kittilä are fully informed of waste management regulations and the consequences for not following them. Regulations are sent out to all households along with other waste information. When violations occur, Lapeco staff follow-up with offenders to help ensure everyone remains educated.
- A small community in the municipality had a highly motivated population that cared about waste management and recycling. The community made a request to Lapeco for a local collection center to reduce residents' drive time and potentially help to address any illegal dumping or home waste storage. Lapeco appreciated the community's self-motivation, and built their collection center. This act motivated the community further to improve their waste management disposal behavior and recycling compliance.
- Lapeco offers a 10% discount on household waste fees for residents that compost their own biowaste, and submit an application form. Lapeco has a



dedicated webpage for home composting with step by step instructions on how to get started and carry it out.

- Producers do not provide textile collection in the north, but Lapeco recently began offering a clothing drop-off bin at their collection centers. They deliver the clothes to the humanitarian organization (UFF), which transfer clothes to those in need. The public appreciates this service, and Lapeco sees views the small cost as a good value. They believe if the community is satisfied with how Lapeco serves them, they are more likely to see residents complying with their rules.
- Lapeco installed simple motion sensor hunting cameras at collection centers and the waste disposal station to help with enforcement and management. The cameras catch incidents of illegal dumping or mistreatment of the collection centers. Staff view the videos, and follow-up with the offenders to clean up their wastes or pay for the cleanup. Use of the cameras has greatly improved compliance. There are many different collection centers and they are spread out over a large area in Kittilä. The cameras at the waste disposal stations and at many of the collection centers can be viewed live by staff. They do not need to leave the central office to check on facilities, which cuts down staff drive time substantially. Workers at the disposal stations also use the live cameras to discuss different real-time issues and determine the best approach problem approaches. Management operations have been significantly more efficient since the cameras were installed.
- Lapeco produced and distributed a short video that shows the annual mobile bulky/hazardous waste collection tour that they carry out each summer <https://vimeo.com/232802668>. This collection is covered by the regular annual waste fees, and it has been helpful for residents to see the service is available at no extra charge. It has also been a good educational tool for hazardous waste collection.



Community Contact: Janne Vuolli, Lapeco 358 040 0279 165  
[janne.vuolli@lapeco.fi](mailto:janne.vuolli@lapeco.fi)



# Contact List for Project

## CANADA

Northwest Territories			
Name	Organization/Title	Email	Phone Number
Giselle Beaudry	Environment and Natural Resources	Giselle_Beaudry@gov.nt.ca	867-767-9236 Ext. 53194
Diep Duong	Manager, Waste Reduction and Management, Environment and Natural Resources	Diep_Duong@gov.nt.ca	867-767-9236 Ext. 53192
Gerald Enns	Senior Technical Officer – Water & Sanitation Municipal and Community Affairs Government of the Northwest Territories	Gerald_Enns@gov.nt.ca	867-767-9164 Ext. 21080
Charles Klengenber	Director of Inuvialuit Lands		867-777-7000
Olivia Lee	Department of Community Affairs	Olivia_Lee@gov.nt.ca	867-767-9164 Ext. 21074

Nunavut			
Name	Organization/Title	Email	Phone Number
Kristi Lowe	Government of Nunavut	klowe@gov.nu.ca	867-975-7748
Jamessee Moulton	Government of Nunavut	jmoulton@gov.nu.ca	867-975-7745
David Oberg	Government of Nunavut	doberg@gov.nu.ca	867-975-7737
Sheldon Nimchuk	Director Project Development & Partnerships, Qikiqtaaluk Business Development Corporation	snimchuk@qcorp.ca	867-979-8405
Megan Lusty	Rankin Inlet, Nunavut	mlusty@gov.nu.ca	867-975-5478
Tim Brown	Director, Community Support and Infrastructure, Community and	Tim.Brown@GOV.NU.CA	867-975-5463

	Government Services		
Matthew Hamp	Director of Engineering & Sustainability	m.hamp@city.iqaluit.nu.ca	867-979-5653
Bill Westwell	Community Gov't. Services Infrastructure Dept.		867-975-5461
Justine Lywood	Plus Arctic (consultant worked with many communities)		902-293-1813

### Manitoba

Name	Organization/Title	Email	Phone Number
Angela Bidinosti	Sr. Environmental Specialist, Lands & Economic Development Directorate Indigenous Services Canada	angela.bidinosti@canada.ca	204-984-0964
Richard Bolton	Centre for Indigenous Environmental Resources	rbolton@yourcier.org	204-782-0041
Valaria Kuzivanova	Centre for Indigenous Environmental Resources	vkuzivanova@yourcier.org	204-956-0660 Ext. 7
Bruce Duggan	Boke consulting. (works directly with Island Lake communities)	bruce.duggan@bokeconsulting.com	204-890-7650

### British Columbia

Name	Organization/Title	Email	Phone Number
Emily Chu	Indigenous Affairs	echu@uniserve.com	604-347-6627
Sonya Sundberg	BC Govt.	Sonya.Sundberg@gov.bc.ca	
Avery Gottfried	BC Govt.	Avery.Gottfried@gov.bc.ca	

### Saskatchewan

Name	Organization/Title	Email	Phone Number
Shelly Nicolle-Phillips	Waste Stewardship at Government of Saskatchewan	shelly.nicollephillips@gov.sk.ca	306-787-6180
Gayleen Creelman	Electronic Products Recycling Association	info@recycleMYelectronics.ca	306-242-6006

Trevor Linford	Crown and Indigenous and. Northern Affairs Canada	trevor.linford@aandc- aadnc.gc.ca	306-501-2919
Joanne Fedyk	Saskatchewan Waste Reduction Council	joanne@saskwastereduction.ca	

<b>Yukon</b>			
<b>Name</b>	<b>Organization/Title</b>	<b>Email</b>	<b>Phone Number</b>
Sarah Chan	Environmental Protection Analyst Department of Environment	Yukon.ca Sarah.Chan@gov.yk.ca	867-667-5076
Jenna Rooney	Yukon Government Department of Community Service	Jenna.Rooney@gov.yk.ca	867-333-9341
Veronica Bartlett	Solid Waste Planner, Morrison Hershfield	vbartlett@morrisonhershfield.com	604-454-0402
Shane Kilpatrick	Crown Indigenous Relations and Northern Affairs Canada	Shane.Kilpatrick2@canada.ca	867 667-3253
Bridget Larocque	Arctic Athabaskan Council	doogie3@hotmail.com	

<b>Ontario (didn't hear back from these contacts)</b>			
<b>Name</b>	<b>Organization/Title</b>	<b>Email</b>	<b>Phone Number</b>
Atif Durrani	Ontario Ministry of the Environment, Conservation and Parks	atif.durrani@ontario.ca	416-314-5135
Jo-Anne St. Godard	Recycling Council of Ontario	joanne@rco.on.ca	

<b>Alberta (didn't hear back from these contacts)</b>			
<b>Name</b>	<b>Organization/Title</b>	<b>Email</b>	<b>Phone Number</b>
Patrick Kane	Alberta Environment and Parks	patrick.kane@gov.ab.ca	780-422-2136
Christina Seidel	Executive Director of the Recycling Council of Alberta (RCA)	www.sonnevera.com	403-843-6563

<b>Quebec - Nunavik Region (didn't hear back from these contacts)</b>			
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Name	Organization/Title	Email	Phone Number
Marie Claude	Nunavik	marieclaud.gilbert@aadnc-aandc.gc.ca	418-951-7356
Marie Dussault	Government Du Québec		

### Newfoundland and Labrador (didn't hear back from these contacts)

Name	Organization/Title	Email	Phone Number
Ashley Burke	Multi-Materials Stewardship Board (MMSB)	aburke@mmsb.nl.ca	709-753-0958
Andrea Hoyt	Nunatsiavut	andrea.hoyt@nunatsiavut.com	
Mary Denniston	Nunatsiavut	mary.denniston@nunatsiavut.com	709-922 -2942 Ext. 225
Gordon Murphy	Government of Newfoundland and Labrador		

### Canada-Wide

Name	Organization/Title	Email	Phone Number
Shelby Kerbel	Scout Environmental (worked with 17 communities across Canada on end of life vehicle depollution project)	skerbel@scoutenvironmental.com	416-697-8717

## ALASKA

### Solid Waste Alaska Task Force

Name	Organization/Title	Email	Phone Number
Rebecca Colvin	Rural Landfill Specialist Alaska Department of Environmental Conservation (ADEC)	rebecca.colvin@alaska.gov	907-451-2174
Trisha Brower	Rural Landfill Specialist Alaska Department of Environmental Conservation (ADEC)	trisha.bower@alaska.gov	907-451-2174

Anahma Shannon	Kawerak, Inc,	ashannon@kawerak.org	907-443-4249
Desirae Roehl	CEM Program Manager Alaska Tribal Health Consortium (ANTHC)	droehl@anthc.org	907-729-3496
Oxenia O'Domin	Capacity & Training Track Lead Alaska Tribal Health Consortium (ANTHC)	orodomin@anthc.org	907-729-3492
Ted Jacobson	SEE, Environmental Protection Agency	ted.ssws@gmail.com	
Stephen Price	Rural Landfill Specialist Alaska Department of Environmental Conservation (ADEC)	Stephen.price@alaska.gov	907-451-2174

## FINLAND

Finland			
Name	Organization/Title	Email	Phone Number
Gunn-Britt Retter	Sami Council	gbr@saamicouncil.net	47-994-90-344
Tuuli Ojala	SDWG Arctic Council	Tuuli.Ojala@formin.fi	
Jukka Alatervo	Centre for Economic Development, Transport and the Environment of Lapland (ELY)	jukka.alatervo@ely-keskus.fi	358-40-537-5477
Eira Luokkanen	Centre for Economic Development, Transport and the Environment of Lapland (ELY)	Eira.luokkanen@ely-keskus.fi	
Helena Dahlbo	Senior Researcher, Finnish Environment Institute SYKE	helena.dahlbo@ymparisto.fi	358-295-251-095
Tuija Ahrikkala	Perämeren Jätehuolto Oy	tuija.ahrikkala@pmjh.fi	358-40-747-3589
Janne Vuolli	Lapeco	janne.vuolli@lapeco.fi	358-40-0279-165

Osmo Aikio	Lapin Jätehuolto kuntayhtymä	osmo.aikio@lapeco.fi	
Juha Torvinen Maria Aro	Napapiirin Residuum Oy	juha.torvinen@residuum.fi Maria.Aro@residuum.fi	358-20-7120-238
Sanna Alaruikka	Pidä Lappi Siistinä ry (Keep Lapland tidy association)	posti@pidalappisiistina.fi (NGO) <a href="https://www.pidalappisiistina.fi">https://www.pidalappisiistina.fi</a>	
Jarno Valkonen	University of Lapland Doctor of Social Science Professor, (Sociology)	jarno.valkonen@ulapland.fi	358-40-484-4237
Piippa Wäli	Environmental inspector, Lapland	Piippa.wali@kittila.fi	
Sannamari Pehkonen	Environmental inspector, Lapland	sannamari.pehkonen@rovaniemi.fi	
Metsähallitus Forest Management		<a href="http://www.metsa.fi/web/en/forest-management">http://www.metsa.fi/web/en/forest-management</a>	
Reindeer Herder's Association		<a href="https://paliskunnat.fi/reindeer/">https://paliskunnat.fi/reindeer/</a>	
Veera Kinnunen	University of Lapland	veera.kinnunen@ulapland.fi	

**DIRECT COMMUNITY CONTACT**

<b>CANADA</b>
Arviat
Sambaa K'e
Ulukhaktok
Tuktoyaktuk
Kwadacha
Kitkatla
Bella Bella
St Teresa Point
<b>FINLAND</b>
Ylitornio
Kittilä
Inari
Saariselka

<b>ALASKA</b>
Golovin
White Mountain
Ekwok
Gustavus
Nulato