

Collection Program Examples

Example 1: A Community of 400, with 100 households, needs a collection program and wants house-to-house. Houses don't have garbage cans, they stick their garbage out in bags. The collection cart can hold 20 bags of trash. Each household averages 8 bags of trash in one week. The potential collector timed a trip to the site from the middle of town on ATV. It took about 20 minutes to drive to the site and back. He practiced loading and unloading 10 bags of his own trash into a pile that would be similar to what he would do at a household and at the dumpsite (i.e. the bags were 30 ft from the cart). He used good backlifting techniques to avoid any back injury and carried two at a time. He took a rest when he needed. When he added all the numbers, it took on average about 30 seconds to load one bag, and 30 seconds to unload one bag (i.e. taking 2 bags at a time, each household would require 8 bags x 30 seconds = 4minutes to load, and 4 minutes to unload. Total loading and unloading then was about 8 minutes/8 bags = 1 minutes per bag.

****HOW LONG WILL IT TAKE TO COLLECT TRASH FROM EVERYONE?***

➤ **How much waste** is there from all the households in town?

Total trash in town each week = 100 households x 8 bags = **800 bags**.

➤ He will need **this many trips** to collect those bags:

800 bags/20 bags in a cart = **40 trips**.

➤ **It will take this long** to make those trips:

40 trips x 20 minutes per trip + (2minute / 2 bag load:unload) x 800 bags =
800 minutes + 800 minutes = 1600 minutes = **26.7 hours**.

He has a decision to make. Can he work that many hours to start off his business?? HE was hoping to spend less hours per week in collection. Remember there is time spent in collecting payment, maintaining the equipment, getting his safety gear on, interacting with the council, etc. Suppose he wants to work less hours.

Regular trash must be collected at least once per week to avoid garbage stink. (Twice per week in warm climates). So he can't collect garbage less often.

➤ **Getting a bigger cart??** If he gets a bigger enclosed cart that can hold 40 bags of trash, or is able to hitch a second cart to his first cart, he would make less trips:

800 bags/40 bags in a cart = 20 trips.

➤ **So the amount of time** he needs is:

20 trips x 20 minutes per trip + 1 minute per bag load/unload x 800 bags =

$$400+800 = 1200 \text{ minutes} = \mathbf{20 \text{ hours.}}$$

There is other time associated with collecting, such as bookkeeping & bill collecting if this is his business, or he will need to keep logs and interact with the billing office, and take time to get the atv and drop it off if it is the tribe's business.

So, what else can he do to reduce time??

He can convince the IGAP office or Tribe or City to set aside funds for **garbage cans so that all the bags can fit in 1 or 2 cans**. That way, it would take him less time to load the bags.

➤ He was loading bags 2 at a time. With 8 bags per household, he was making 4 trips to their doorstep. If everyone had a can, and each can fit 4 bags, he could make only 2 trips to the door instead. So the loading time would now be cut in half, to one minute per household. The unloading time would be the same. With his bigger cart, the total time now would be:

$$20 \text{ trips} \times 20 \text{ minutes per trip} + (2 \text{ minute per household loading} + 4 \text{ minutes per household unloading}) \times 100 \text{ households} = \\ 400 + 600 = 1,000 \text{ minutes} = \mathbf{16.7 \text{ hours.}}$$

What else can he do? He can convince the council to have **households place their cans out on the road** - so he can drive right up to them. One way to convince folks is to let them know their bill will be higher if they don't follow good practices! So the loading time might be cut in half again to 1 minute per household.

$$400 + 5 \text{ minutes} \times 100 \text{ households} = 900 \text{ minutes} = \mathbf{15 \text{ hours}}$$

What else? He can convince the council to make a transfer station. Suppose there was a place to dump the bags just outside of town. The bags could be transferred to the site once every two weeks. Or maybe the transfer station is a dumpster that the loader could pull over to the site 1 time per week. The loader operation is expensive—but it would only require 2 hours, or about \$60 of O & M. (About \$30/hr is a reasonable) & M cost for a small loader). The loader could pull all the garbage then in one haul.

➤ **How big does the dumpster need to be?**

For that question, you'll need the waste volume. The collector did a waste assessment and found the town generated 2 lbs per person per day.

$$400 \text{ people} \times 2 \text{ lb} = 800 \text{ lbs per day} = 5600 \text{ lbs per week.}$$

The weight of Regular household trash that is consolidated in trash bags and dumpsters is about 225 lbs per cubic yard of trash. So the dumpster size would need to be:

$$5600/225 = 24.8 \text{ yards of waste}$$

You would need either a 30 yard dumpster or three 10 yard dumpsters. If you have 3 ten-yard dumpsters, you would need 3 trips to the dump.

For 3 trips to the dump, you might need about 4 hours of loader operation =
 $4\text{hr} \times \$30 \text{ per hour O \& M} + 4 \times \$25/\text{hr operator wage} = \$225 \text{ per week for the transfer station operation.}$

But the hours you need to collect become much less. Instead of 20 minutes roundtrip to the dump, it is 5 minutes roundtrip to the transfer station. You need $\frac{1}{4}$ the time.

Let's say you have garbage cans. **The total time for cart collection would now be:**

$$20 \text{ trips} \times 5 \text{ minutes per trip} + (2 \text{ minute per household loading} + 4 \text{ minutes per household unloading}) \times 100 \text{ households} = \\ 100 \text{ minute} + 600 \text{ minutes} = 700 \text{ minutes} = \mathbf{11.7 \text{ hours.}}$$

This cuts your hours down from 15 to about 12. But the additional cost is \$225. That means for the 3 hours of saved collection time, it is costing:

$$\mathbf{\$225/3\text{hr} = \$75/\text{hr.}}$$

In our example, the transfer station only makes sense if the collector is being paid more than \$75/hr. But in other situations, especially where the total travel to the dump is much longer, a different set of numbers can often result in the transfer station being the cheapest option.

The point is that there are many different combinations of designs that you can make to make your collection program more efficient. Spend a few days playing with numbers before you decide what design is best.

➤ Now—the big question: **How much money should you charge households??**

You know you need to charge for the collection hours. What are your other costs?

- **bookkeeping and bill collecting.** This will take between 5 - 40 hours per week. In the best scenario, your community has bought in to the collection service and you have full support from everyone. You will only have a few problem households, and these households will take about 10 hours each month to phone, nag, convince, etc. Otherwise, you can set up a quick billing system—such as every 1st of the month you collect money from houses. OR maybe you collect money each trip, or even better

convince the city to include the charge in the utility bill! You can offer incentives such as discounts, and in the end if you have to drop some households, you will. This work book does not get into the methods of bill collecting. See your collection program handouts for some tips and what other villages do.

But let us say you have determined it will take about an extra **8 hours** each week to handle payments, so you will be working a total of about **23 hours** each week.

- **Gas & oil.** You'll need to calculate how much gas & oil you'll need. Perform several practice runs and see how much gas & oil you use. Let's say it takes \$100 each week for gas & oil.

-**Other maintenance/replacement costs.** If you use your own atv, you'll need to replace it in about 5 years. So you'll need to set aside money for that.

$$= \$8000/5 \text{ years} = \$1600 \text{ per year.}$$

- **Tires.** Let's say you pop or wear out 2 tires per year.
= \$75/tire x 2 = \$150 per year.
- **Other?** If you have your own business, you'll need a business license to perform legally. They are easy to get, and cost about \$50 per year.
- **Other system costs.** If the transfer station/loader or another component of trash collection is present, you'll need to include these costs—unless the tribe/city/or other entity can fund them. The Carts themselves breakdown after a while and need maintenance, including tires, etc. Other system components might include paying to the city for the bookkeeper that processes your bills. Any other people you need to pay? Other facility costs? Do you need better ATV insurance? For our example, we'll say the other costs = \$1000.

Totaling the yearly costs!

$$\text{ATV replacement costs} + \text{tire cost} + \text{business license} + \text{gas \& oil per week} \times 52 \\ \text{weeks} + \text{other system costs} = \text{Total cost}$$

$$\$1600 + \$150 + \$50 + \$100 \times 52 + \$1000 = \mathbf{\$8000}$$

Now, how much does the waste collector need for 34 hours of work each week?

Let's say \$31824 = \$26.60/hr for 23 hours of work (tho there is extra hours of work not counted for miscellaneous tasks)

How much do you need to charge households?:

$$(8000+31824)/(100 \text{ households}) = \$398 \text{ per year} = \mathbf{\$33.18 \text{ per month.}}$$

If all of the community outreach you've done led to the community being willing to pay about that much - you're done! If the community only wants to pay \$20/month (or only half the community is willing to pay fees, and the other half won't)—then you'll need to make decisions about additional outreach, or cutting your salary, or looking at ways to cut down on costs (a bigger cart?)...etc. OR developing a bin drop-off system instead.

Mini Transfer Station Set up Example

One way to cut costs substantially is to establish a bin drop-off system. The main disadvantages are that this system costs quite a bit to set up (you'll need to work with IGAP to find funds), and it is not as easy for households because they must take their trash to the bins, versus having their trash picked up.

The best thing you can do to create a successful bin drop-off program is to design it properly in a way that meets the community needs. Make sure you have enough bins for them to not overflow with garbage (and keep in mind if there might be a few weather days where emptying bins is not possible). And make sure all the households have bins close enough to them, or at least on the way to town or the dump so they are convenient. Several villages locate bins close to Elders homes as a priority.

Example: A town of 400 people and 100 households wants to pay as little as possible for a collection program. They applied to Rasmuson Foundation, their local CDQ, and used some IGAP funds so that they can afford to purchase some bins.

➤ Assuming the same waste generation as the above example, how many bins do they need??

We have 24.8 cubic yards. If the town purchases (or makes) enclosed trash carts like those at Tag-Along-Trailers, each cart is about 4 cubic yard:

HOW MANY CARTS/DUMPSTERS WILL YOU NEED?

For **once per week** pickup, you'll need:

$$24.8 \text{ yards of waste} / 4 \text{ cubic yard carts} = 5 \text{ carts.}$$

These carts are about \$3000 including shipping, so the cost would be:

$$5 \text{ carts} \times \$3000 = \$15000.$$

Even though people could cram their bags into 5 carts, the limiting factor here is whether 5 stations is enough for households to participate in the program. AND when you have so few carts—the waste tends to be unevenly distributed. It is very unlikely that you won't end up with at least 1 cart being over-used to the point that wastes are littered all over. Most folks won't want to spend time smashing their bags into full carts, so the actual capacity of the carts might be closer to 3 cubic yards. **You'll more likely need at least 8carts.**

BUT—Maybe you only have \$15000 to purchase carts. What can you do??

You can increase the number of times you collect each week. If you collect twice per week, you have essentially doubled the space in bins. That would take care of the overcrowding, and 5 bins would be plenty of space. The problem is that the operation cost also almost doubles, because the waste collector must work twice as many hours when collecting twice each week. (Billing houses however takes the same amount of time).

So there is a tradeoff—you need to weigh startup costs with operational costs.

➤ What if we want to **keep about the same startup purchase cost** of bins, but we need **more bin locations** so that households want to participate?? In that case, you can look at less costly bins that hold smaller garbage volumes.

For example, you can purchase open carts that are \$1,000 apiece that carry about 1 cubic yard, (or you can make your own covered carts for less than that). Because they are open they are easier for people to unload their garbage even when full.

For \$15000 how many carts can you buy??

$$15000/1000 = 15 \text{ carts}$$

Is that enough room for 1x per week pickup??

$$15 \text{ carts} \times 1 \text{ yard} = 15 \text{ cubic yards. We have 24.8 yards of garbage though!!}$$

➤ So we would need to pickup more than 1 time per week:

HOW MANY PICKUPS DO YOU NEED PER WEEK?

24 cubic yards/15 yard capacity = 2 pickups per week for fifteen 1-yard carts (some of the carts might only need 1x/week).

Unfortunately, if you have any wind at all or bears or foxes or ravens, you'll need to cover your carts. If you cover your carts, the cart capacity goes down to about $\frac{1}{2}$ yard (the waste can't get piled up over the sides). So you will need to either pickup 4 times each week, or purchase twice as many.

So in this example you are weighing whether you want to purchase for \$15,000 in startup costs:

five 4-yard bins at twice pickup per week (with a lot of excess room),
five 4-yard bins at once per week (with probably some litter around some of the bins),

15 1-yard open bins at twice per week collection with lots of litter all over the place

15 1-yard covered bins at four times per week collection.

You can fabricate your own carts to be the exact volume you want. Or you can ask a welder to manufacture a custom size. The problem with ordering a custom size is that it will likely cost a lot more per cart. You might as well get the larger standard cart.

Let's look at the tradeoff here:

1 time per week collection for five carts = about 6 hours of operation?? We won't go into all the costs for an operation, but taking the atv-only costs from the above example:

$$\text{ATV replacement costs} + \text{tire cost} + \text{business license} + \text{gas \& oil per week} \times 52 \text{ weeks} = \text{Total cost}$$

To calculate the gas & oil each week, perform a dry run - pretending to collect carts from the planned locations, and having the engine run while you are emptying out trash bags at the site. Let's say the cost is \$25 for gas & oil to make those 6 trips to the dump.

$$\$1600 + \$150 + \$50 + \$25 \times 52 = \mathbf{\$3100}$$

To pay an operator for 1 day to collect the carts each week, it would cost:

$$\mathbf{8 \text{ hrs} \times \$18/\text{hr} \times 52 \text{ weeks} = \$7488 \text{ per year.}}$$

So the total comparable household monthly operation costs to the house-to-house collection system is:

$$(\$7488 + 3100) / 100 \text{ households} = \$105 \text{ per year} = \mathbf{\$8.82 \text{ per month}}$$
 (about 1/4th the cost)

In fact, you can probably convince folks to pay twice that much. That way you can collect twice per week or spend time organizing the recycling center or salvage yard, or lots of other tasks!

Your costs might be completely different (lower or higher). But in almost any case, a bin drop off system is significantly less money than house to house. BUT remember the **best collection system is the one that the community uses.**

We did not calculate in business fees here either. Most villages charge **businesses much more than households.** Stores and schools are often \$100 to even \$200 per month. Offices are less, but typically at least \$15 more than households. A total typical business and office payment in a village might bring in about \$600/month, or \$4800/year. In our example, **that reduces the charge for households by another \$4/month.** You might find that some households, apartments, teacher housing will pay extra for household collection, even if you have a bin drop-off system.

The main point of these examples is for you to understand the way that costs work and that you have the ability to change the system design to accommodate your community. If

you decide to go into business yourself, you can use these calculations to develop a business plan that can be funded by a workforce development entity. And if the tribe or city decides to support a collection program, they can use these calculations to request funding.

And you may be able to identify a sustainable source of subsidization—such as IGAP or city /tribal general funds. You can also try fundraisers each year, such as tournaments or overnight gyms for the kids, etc. Other possible funding includes equipment rental to outside projects, fees for special wastes (e.g. \$50 per refrigerator, \$25/battery), bingo, recyclable revenue (you will need to receive free backhaul to make money).

One Final Example

The same 400 person community (100 households total) has decided to start a house to house collection program for \$35 per household, and charging the school \$200/mo, the 2 stores \$100/mo, and the 7 offices & small businesses (Tribal, city, corp, etc.) \$50/mo. In addition, they will pass an ordinance making it illegal to store used refrigerators & freezers in yards, and requiring a \$50 fee for disposal. People who recycle their cans get a \$5 off discount per month. The 5 Elder only households are \$20 per month. The 10 low income households are \$10 per month, and are required to volunteer 4 hours each month to collect recyclables. Bingo revenues will pay for \$5,000 per year. Only half of the households pay, but all of the businesses pay.

How much income is coming to the program, and do they still need more money?

Total income = regular household fee + low-income fees + elder fees + school fee + store fees + other business fees +refrigerator fee +bingo.

Yearly = (85 households * \$35/mo * 12 mo)*50% payment + (10 low income houses * \$10/mo * 12)*50%+(5 Elder houses * \$20/mo*12)*50% + (\$200/mo* 12 mo) + (2*100/mo * 12 mo) + (7 * \$50/mo * 12 mo) + refrigerator fees + \$5000

=17850+600+600+\$2,400+\$2,400+ \$4,200 + fridge fees +5,000
= **\$33,050 + fridge fees**

Refrigerator Income:

You must calculate how many refrigerators and freezers are generated each year for disposal.

1. How many households have a refrigerator or freezer?

Ans: probably all 100 of them

2. How many on average do households own - total for refrigerators and freezers?

Ans: Let's say that we estimate 60 households have 1 fridge and 1 freezer and 40 have 1 fridge and 2 freezers. So the average per household would be:

$$\begin{aligned} &60 \text{ households} * (1 \text{ fridge} + 1 \text{ freezer}) + 40 \text{ households} * (1 \text{ fridge} + 2 \\ &\text{freezers}) = 120 + 120 = 240 \text{ fridges \& freezers for 100 households} \\ &= 240/100 \text{ average per household} = 2.4 \text{ average per house} \end{aligned}$$

3. Ok - all of those freezers and fridges aren't going to be dumped in the same year. They get dumped at the end of their useful life. So, unless the whole village purchases their appliances at the same time, you will on average get some of the appliances discarded each year. The only other number you need now is: **how long on average do households use their fridges and freezers before they buy or find a new one?** Another way to ask this is what is the average useful life of a fridge/freezer? IN higher income communities, an average lifetime would be about 15 years. Let's say for this community you know that people use their fridges for more like 25 years. This means some households might get a new one sooner, and some later, but on average 25 years is the time when they get rid of them.

So for that 240 fridges and freezers— on average you'll get some discarded each year:

$$240 \text{ fridges \& freezers} / 25 \text{ years} = 9.6 \text{ fridges/year.}$$

The amount of fees on average you'll get from charging folks to pick up their appliance and bring it to the dump each year then is:

$$= 9.6 * \$50/\text{fridge} = \mathbf{\$480.}$$

You might get 2 fridges 1 year and none the next, but on average you can count on \$480/year.

Back to the total expected Program Income:

$$\$33,050 + \text{fridge fees} = \$33,530.$$

That is plenty for a bin drop off system - The waste collector could be paid for about 30 hr/week with enough gas & oil for twice per week collection. They need

about \$38,824 for house-to-house collection for the full community. They will need to convince more houses to pay, or service only the houses that pay.