

In 2019, Esquimalt Council declared a Climate Emergency targeting a 30% greenhouse gas (GHG) reduction by 2030 and carbon neutrality by 2050. In support of this, a study of Integrated Resource Management (IRM) was commissioned, which concluded that GHG reductions are possible and could reduce taxpayer costs.

Council is inviting feedback from residents and this document provides an overview of what's involved.

WHAT IS IRM AND WHY GASIFICATION?

Waste contributes ≈11% of GHGs in Canada. Integrated Resource Management (IRM) helps reduce GHGs by extracting maximum use and value from waste to reduce taxpayer costs, recover heat and other resources, and reduce other emissions.

Esquimalt has a wide range of wastes (Figure 1) so addressing them is complex. Composting, anaerobic digestion and similar approaches only address ≈11% of the waste and there is little demand for the output. Biofuel and similar approaches either don't handle enough of the waste stream, or are still developing or difficult to locate in Esquimalt.

Incineration, pyrolysis and gasification can address up to ≈91% of Esquimalt's wastes. Incineration requires pollution management that has previously raised concerns and systems have lower yields and recovery than alternatives. Both pyrolysis & gasification avoid burning or producing toxins and smoke, but pyrolysis is less efficient. Internationally, gasification systems processing waste have over 1,000 years' combined operations, so the option assessed for Esquimalt uses Advanced Gasification, which is high-yielding. Gasifiers heat waste to produce a syngas, used to generate heating, cooling and other products.

IN SUMMARY

WHAT & WHY

- A different approach to managing waste;
- Reduce GHGs and taxpayers' costs.

RESIDENTS' BENEFITS

- Dividend of up to ≈\$360/door, net average;
- Could generate \$226m over 30 years;
- Small, local plant – reduces trucking;
- No odour or noise;
- Reduced & simpler waste separation, less bins.

ENVIRONMENTAL BENEFITS

- Exceed Corporate carbon reduction targets;
- Reduce the community's overall GHGs by ≈12%;
- Equivalent to removing ≈970 cars/year;
- Up to ≈91% landfill diversion;
- Improved recycling;
- Generates clean energy to displace fossil fuels;
- Produces sterile fertilizer & sequesters carbon;
- Simplest, most economic GHG reduction option.

INTANGIBLE BENEFITS

- Examples have attracted business, jobs, enhanced education, training, and eco-tourism;
- Raises community profile, enhances civic pride;
- Creates broader economic stimulus & jobs with local re-investment and re-spending effect.

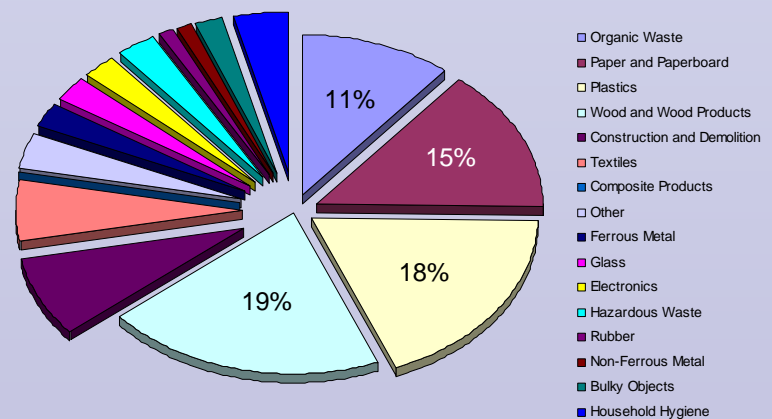


Figure 1: Waste composition, dry volume

CONTEXT

Currently, recycling handles metals, plastics, glass and other materials through Blue Box recycling. Almost $\approx 6,500$ tonnes of waste is collected annually (≈ 347 kg/person). Garbage is landfilled at Hartland Road in Saanich with yard and garden wastes received at Canteen Road, and separated organics mostly sent to the Lower Mainland for composting. With Hartland landfill nearing capacity and costs rising, change is needed to address waste and is important to reduce GHGs.

FINDINGS

IRM plants process waste and recover resources that have value and most of Esquimalt's wastes can be converted and the resources recovered. Various options were assessed, with the recommended option summarized as follows:

General

The recommended plan assumes a gasification plant operating 24/7/365, expandable as needed to cope with increasing waste as the community grows. This lowers costs and helps reduce risk.

The recommended site is an unused portion of the Public Works Yard located on Canteen Road. No additional trucks are needed (the trucks are already circulating), with deliveries up to three times per day.

There are no odours from gasifiers and the plant would be under an acre, housed in a modern industrial building. A flue stack would be required, similar to existing major buildings in Esquimalt.

While the current waste management approach could continue for a few years longer, Hartland Landfill is scheduled to close by 2048, which is expected to raise costs. An IRM facility can avoid most of this risk and cost and exceed other options for reducing GHGs.

Environmental & Resources

At buildout, the plant is expected to divert up to $\approx 9,000$ tonnes of waste annually from Hartland Landfill with GHG reductions of $\approx 4,500$ tonnes of carbon dioxide equivalent (CO_2e) annually, equivalent to taking 970 cars off the road and eliminating the Township's corporate carbon footprint.

The plant is expected to produce $\approx 1,210$ tonnes of biochar, usable as a natural (fossil-free) sterile soil supplement, sequestering $\approx 3,550$ tonnes of CO_2e GHGs per annum.



Figure 2: Systems in California & Louisiana

Emissions are similar to natural gas boilers and the plant is anticipated to recover ≈17,600 MWh of heat annually, which will replace natural gas and oil. Electrical energy generation has not been assumed but can be added later.

Financial The facility has the potential to yield ≈\$226 million surplus over its life cycle, equal to a maximum average taxpayer benefit of ≈\$360 per home per year.

The plant is expected to cost ≈\$15m to build, expanding to ≈\$21m over time (±15%), with operating and maintenance costs of ≈\$1.7m annually. Grants may be available but are not assumed. Annual revenues are projected to average ≈\$5.8m/yr once the plant hits capacity.

Summary Metrics - Recommended Option Scenario 2b

General	
Estimated total capital cost (upper range costing)	≈\$21.3m
Estimated annual O&M cost	≈\$1.7m
Tonnes/yr landfill diversion	≈9,000 t/yr
Public sector model	
Internal Rate of Return (before debt)	22%
Total net taxpayer profit (30yr life cycle)	≈\$226m
Taxpayer dividend per yr, avg 1st 10 yrs	≈\$360/home
Private sector model	
Leveraged IRR (30% equity, net of debt)	48%
Total net profit after debt, leveraged (30yr life cycle)	≈\$235m
Environmental & resource recovery	
GHG tCO ₂ e/yr reduction	4,500 tCO ₂ e/yr
CO ₂ e reduction, life cycle vehicles equivalent	29,100 cars
Total biochar tonnes/yr	1,210 t/yr
Sequestered carbon (30yr life cycle)	≈107,000 tCO ₂ e
Face yield, mw thermal	≈2.00 mw
Total recovered mw thermal (30 yr life cycle)	≈528,000 mWh

Figure 3: Summary metrics

Procurement The largest financial and environmental benefits would be obtained by the Township building the plant, which means having to manage the risk if the benefits are important. Other options such as a limited concession can reduce risk, with ownership reverting to Esquimalt. While this would reduce risk, it would also reduce potential revenues.

Other Benefits Comparable systems in Europe have generated employment and stimulated economic development by attracting environmentally-minded businesses in education, training, and eco-tourism, and has had a positive impact by raising community profile, identity and pride. It retains more investment in the community, increasing the local re-spending effect.

FEEDBACK

The Township of Esquimalt is inviting your feedback with online information available from the Township's [project web site](#). This includes a brief explanatory [video](#), this [Overview](#) and a more detailed [Summary](#) of the project, the detailed [Technical Report](#) with [presentation to Council](#) and the [Mayor and Council's comments](#). Technical information on IRM and gasification is available from Pivotal's [library](#).

A webinar will be held with details posted on the [project web site](#). Please look out for us at the Esquimalt Farmer's Market or complete the [Survey](#). Your feedback is welcome.