

There is money down the drain

We could get more value from our waste

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ON the rare occasions that North Shore residents spare a thought for what they flush down the toilet, it is unlikely many imagine its ultimate destination as an old mine in the province's interior.

But under our current treatment system, that is precisely where a large component -- the solid component -- of our sewage winds up. Solids are filtered out of North Shore wastewater at the Lions Gate treatment plant, loaded into trucks and driven hundreds of kilometres to abandoned mines near Logan Lake and Princeton where they are spread around in reclamation projects.

The process, while beneficial, squanders a tremendous opportunity, according to some experts. That sewer sludge, together with solid waste (garbage, to most of us), could be dealt with in a much more efficient way that in fact generates energy -- and money -- according to a recent report from the provincial government.

As the region draws up plans for the Lions Gate plant's \$400-million replacement, advocates are hoping the idea will be central to the new system. Otherwise, our community will have flushed a golden opportunity down the toilet.

By modern standards, the North Shore's current system is remarkably simple. Sewage is piped from the community's 70,000 homes to the Lions Gate Wastewater Treatment Plant next to the mouth of the Capilano River. There, solids are filtered and settled out for shipment, and the liquid component is ejected more or less untreated into Burrard Inlet. As much as 90 million litres a day flows out of an underwater pipe just west of the Lions Gate Bridge.

Our garbage follows a similarly straightforward path. Refuse is picked up at curbside and crushed. Some of the region's refuse winds up incinerated in the waste-to-energy station in Burnaby, but the bulk is loaded on to large transport trucks and hauled to a landfill.

With a few minor variations, this is more or less the way communities across the province deal with their waste. Some are a little more sophisticated -- using secondary treatment plants to digest their sludge before it is ejected, for example -- and some less so (such as Victoria, which does little more than screen their sewage before pouring it into the ocean) but overall they treat their waste in the same way: as waste.

"Right now, all our sewage systems are designed to treat sewage and dispose of whatever's left," said Christianne Wilhemson, a program co-ordinator with the Georgia Strait Alliance.



CREDIT: NEWS photo Mike Wakefield
CHRISTIANNE Wilhemson, a program co-ordinator with the Georgia Strait Alliance, wants to see the Lions Gate Wastewater Treatment Plant replaced with a system that would generate energy and money for the community while producing almost zero waste. A recent report from the province suggests that might just be possible.

"That's basically the principle behind it. You treat it and you get rid of it."

But a group of experts hired by the provincial government wants that philosophy to change. In a report called *Resources from Waste*, delivered to the Ministry of Community Services in February, the authors suggested that our garbage and sewage could be combined into a single, integrated resource management (IRM) system, which could reduce our release of waste into the environment almost to zero. To explore the idea, the authors used the Capital Regional District (Victoria and its surroundings) as a case study.

The plan would work like this:

Sewage from homes and businesses would be piped to a network of small -- possibly underground -- treatment plants that would separate out the solids and treat the liquid component to a tertiary level. That means the water coming out of the plants would be safe and sterile, but not quite good enough for drinking. That water -- called grey water -- could then be returned to the system for non-drinking purposes, such as lawn watering, toilet flushing, industrial uses or even to replenish streams.

The removed solids -- the sludge -- could then be pumped through small pipes fitted inside existing sewage pipes to a central anaerobic digester, where microbes would break it down and produce "biogas" -- essentially methane. That methane could then be used as a relatively clean source of fuel for vehicles or other uses such as heating.

Residue from the digester -- whatever wasn't eaten up -- would be sent on to a gassifier, a machine that would heat the residue in the absence of oxygen in order to convert it to "syngas" -- also methane, but less pure. That gas would in turn be burnt in a generating facility (a "cogen" in the parlance of the authors) to produce electricity.

Any metals and minerals left over from the process could be recycled.

The system would take in more than sewage, however. Organics from the solid waste stream -- our garbage -- would also be thrown in the mix. Wet organic waste from residential and restaurant kitchens could be picked up at curbside and trucked to the same anaerobic digester to produce additional biogas. Dry organic waste -- clippings from yards and public space -- could be tossed in at the gassifier stage to boost syngas output and ultimately produce more electricity.

Energy can be also generated by the system in the form of heat, according to the authors. Sewage tends to be warmer than its surroundings. By installing heat pumps -- devices that transfer heat energy from one place to another -- in the sewage treatment facilities, that warmth can be harvested and injected into a municipal heating system, used to keep facilities such as schools and hospitals toasty for their occupants. The resulting lower-temperature sewage can be used indirectly to cool buildings.

"Resources need to be used more than once," said Jon O'Riordan, an adjunct professor in the faculty of interdisciplinary studies at UBC and one of the authors of the report. "They have value. The more you use them the more value you extract."

All this heat and electrical energy translates into income for the municipality, said the authors. Not only can it save money on heating and fuel bills, but the system should generate enough excess gas and electrical power to sell off for a handsome profit. In fact, they estimate the Victoria case study would generate as much as \$60,000,000 annually over and above the expenses of the system.

And that estimate could be conservative, said O'Riordan.

"We assumed biofuels would be priced at 75 per cent of market level so it would attract people to it," he said. "We didn't fully account for the carbon tax and escalation of oil prices

that has taken place since we wrote the report."

The change should also substantially reduce a community's greenhouse gas output, said O'Riordan. While burning the methane generated by the system does produce carbon dioxide, the process is effectively carbon neutral. The plant material (the organic waste) from which it is made took carbon dioxide out of the atmosphere as it grew originally. So burning it simply re-releases the same gas into the air to be cycled anew. That's different from the burning of fossil fuels, which effectively pumps carbon out of the ground and adds it to the atmosphere's overall load.

If that organic waste were thrown into a landfill, as is often the case at the moment, it would decompose in an oxygen-poor environment, releasing methane directly into the atmosphere, he said. Unburnt, the gas is more than 20 times more powerful than CO₂ in terms of its planet-warming effects. The authors estimated switching to the system could cut the CRD's greenhouse gas output by as much as 25 per cent.

They cited other benefits as well. The small, scattered treatment plants envisioned would be much less obtrusive than a single, large facility, said the authors. Smaller than a normal house, the plants could be buried out of sight in areas already under municipal control such as intersections. By drawing water out of sewage and pumping it back into the supply side of things, it could reduce our use of drinking water for non-drinking purposes, lessening the burden on reservoirs. And because the plants would be networked, they would provide a level of redundancy in the event one of them fail or needs to be taken off line.

With plans afoot for a treatment upgrade in the coming years here, O'Riordan believes the North Shore is a prime candidate for the adoption of such a system.

So what are the odds it will actually happen? That's hard to say, but it seems that at least some elements of the plan will be making an appearance here.

"Even before this report, there are many recovery issues in particular around material and energy recovery from liquid waste that we've been pursuing," said Fred Nenninger, division manager of regional utility planning with Metro Vancouver. "We're very much interested in this."

Metro has received the provincial report, and will be going through it in the near future, he said. And staff have met with the authors to discuss some of the recommendations.

But already the region has taken steps that move it away from the model the authors proposed. Last month, the region announced it had bought the three-hectare parcel of land under the old BC Rail passenger Station at McKeen Avenue and West First Street in North Vancouver for a new wastewater treatment plant tentatively slated for 2020.

While plans are in the very early stages, in general terms the plant will be following the traditional model. Sewage will flow from the community's homes and businesses to a single, large facility, where the vast majority of it will likely be treated to the secondary level only, meaning it will not be suitable for re-use.

That is a markedly different approach to the multiple-small-plant model outlined in the report.

"We don't think it's optimum to do that," said O'Riordan. "Pumping a large amount of sewage to one plant is expensive. It makes sense to tap the resource upstream in four or five plants."

O'Riordan and the other authors have suggested that the region commission a study of the community to see just how fully the integrated resource management approach could be applied.

"That's not a big job. It would take four to six months in my mind," said O'Riordan. "It makes sense to take a zone of Metro Vancouver and see how it works."

Nenninger expressed some reservations about the viability of certain aspects of the IRM model in this community. For one thing, it doesn't make sense to treat effluent to a tertiary level if there's nowhere to reuse it, he said. As it stands, there are only a limited number of places water from the planned new plant could go.

"You don't need tertiary treatment to put it in the ocean," said Nenninger.

That said, a small amount could be treated to that level for use within the plant itself, and opportunities may arise as the community develops around the site, he said

"If there are other industries in the area that there's a business case to be able to get water to . . . then yeah, let's build some of that into this new plant," said Nenninger.

There are also difficulties with fundamentally changing a system when the pipes are already in the ground, he said. "We're not going to be able to snap our fingers and the central treatment systems are going to disappear overnight," said Nenninger. "There's just too much infrastructure out there . . . we have to deal with."

He also expressed doubts about the practicality of drying out biosolids enough to be used in a gassifier. "You almost spend as much energy drying the water off as you (get out of it)," said Nenninger.

That was a point O'Riordan took issue with.

"If you look at it by itself, that might be correct," said O'Riordan. "But the other component of integration is to link solid waste with liquid waste."

By the time kitchen scraps and other organics are added to the mix, he said, the amount of energy extracted should more than counterbalance the energy put in.

And in doing any cost analysis, the region should consider the costs of alternatives. Given that the province has committed to reducing its greenhouse gas emissions by 33 per cent over the coming decade or so, communities will soon be forced to find ways to cut back their output. There is no guarantee that the alternatives they will have to look at if they don't adopt the IRM system will be any more cost effective, said O'Riordan.

"If Metro doesn't do that then they have to come up with some other way of reducing greenhouse gases," he said.

Despite his reservations, Nenninger still believes portions of the plan can be adapted to Metro's current upgrade scheme. Biogas generated on site will likely help power the new facility itself; some of the biosolids might be burnt to power industrial facilities; and it might be possible to use some of the heat from the effluent to warm nearby buildings. The region is also looking at throwing some elements of the solid waste stream in the digester that will be on site.

But Wilhelmson is not convinced the region is trying hard enough to adopt the integrated system more fully.

"What's concerning me is that Metro Vancouver has dismissed the idea of, for instance, smaller plants," she said. "The region is starting to think about this . . . but they're not thinking big enough."

That said, it appears lower levels of government may be considering adopting the plan far

more fully -- at least in places. Planners involved in West Vancouver's Upper Lands development have actually hired one of the report's co-authors to look at its possible application in the unbuilt portions of the neighbourhood, said O'Riordan.

"The people developing British Properties are very interested in IRM and applying that to their entire new development" he said. "Essentially none of the waste would leave their site. In principle, they would use it all."

In the end, the system would only be a stepping stone on the path to a more sustainable style of living, said Wilhelmson. But it is important nonetheless.

"We should be lowering our need for energy overall, ideally, but the truth is we need fuels in the mean time," said Wilhelmson.

"That's what I would ask the community to do before they start building anything. Just make sure . . . whatever they choose is not just the best thing for now, but also 30 years from now."

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