Climate Change and Buildings – What's the Connection?

Where do greenhouse gas emissions come from? Most people will say from oil and gas production (28%) - and they would be right. Transportation is next in line at 22%.

But overall, heating and cooling buildings comes in at 13%.

In Canada's largest city, Toronto - and the GTA – heating and cooling buildings is the *largest* source of GHG emissions

The good news: there are technologies for reducing emissions from heating and cooling buildings. They can be applied to entire communities: individual large buildings like schools, hospitals, apartment buildings, factories, warehouses, and sports facilities - or individual homes.

How to Reduce Building Emissions for Entire Communities

Let's look at district heating and cooling.

District heating and colling refers to an underground system to serve a number of buildings of different sizes and shapes. They are connected by pipe in order to heat and cool the buildings by pumping hot or cold water as required. The pump can be powered by a variety of sources. It may be waste heat, wastewater, biomass, or electricity including solar/wind sources.

This is not a new technology: it has been around for centuries. For example, In Toronto's downtown. cooling from deep lake water is powered by waste heat. The heat comes from heating drinking water. They capture the waste heat and use it to power the pumps. This system covers much of the downtown with the potential to expand.

There are examples from around North America and the world: False Creek B.C., St. Paul's Minnesota, Copenhagen, Berlin, Tokyo… They use power from biomass (such as tree clippings), solar, waste heat from garbage incineration and so on.

Reducing Emissions for Single Buildings

Have you ever heard of Geoexchange?

It is an underground system to heat and cool a single building. They use pumps powered by electricity. The pump is located directly underneath; or under and adjacent to the building. They use the ground as a form of battery - or storage - for heat.

Fun fact: The first commercial geothermal heat pump dates back to 1946. It came into common use in Scandinavia in the 1970s after oil prices spiked. In Canada, there were significant inroads beginning in the late 1980s/early 1990s.

In Canada, geoexchange is an excellent solution for most new large buildings, with a very low carbon output. Currently, our electrical grid is low-carbon compared to most international systems. Many new large buildings are constructed with geoexchange technology.

The capital cost is high, but the operating cost is low. The trade-off allows geothermal energy companies to offer competitive heating and cooling costs that are guaranteed for decades.

Air-source Heat Pumps

These pumps are best for heating and cooling homes, or relatively smaller areas in large buildings, such as libraries or school gyms. They are more adaptable for retrofitting. They work by taking heat from the air outside, then pumping it indoors during the heating cycle. It removes heat from the air inside and pumps it outdoors during the cooling cycle. The equipment is above ground - next to, attached to, or on top of - the home or area to be heated and cooled. They are much more efficient than fossil-fuel based heating systems, but not as efficient as geoexchange.

Many older homes in Canada have been retrofitted with air-source heat pumps.

Let's use these technologies to reduce GHGs in buildings and communities.