Goal 3: Reduce Resource Consumption and Emissions

Consuming resources like energy and water, generating liquid and solid wastes that require treatment or disposal, and creating emissions of air pollutants are a burden we place on the environment - both globally and locally. To achieve long-term sustainability, cities need to reduce resource consumption and the creation of wastes.

Reducing our resource consumption can have multiple benefits to the community. Many resource services (e.g., water, sewage treatment) require large investments in facilities, such as water treatment plants, landfills and incinerators, and wastewater treatment plants. By using these resources more carefully, we can avoid expensive capital investments - or at least defer them further into the future. Conservation measures also reduce emissions of pollutants to the air and water and reduce infrastructure operating costs.

To measure the environmental burdens of our resource consumption, we use indicators that measure:

- **RRC-1**: Water Consumption
- **RRC-2**: Wastewater Generation
- **RRC-3**: Residential Solid Waste Disposal
- **RRC-4**: Residential Building Energy Use
- **RRC-5**: Greenhouse Gas Emissions
RRC-1: Water Consumption

Why is this Indicator Important?

Water may seem abundant in the Lower Mainland and we often take our high quality, plentiful water supply for granted. However, there are limits on the amounts we can consume that are imposed by our water storage and distribution infrastructure. For example:

- the amount of water that can be stored from the winter snow pack behind storage dams to be used later in the summer is limited. Meeting future demand will require either new storage dams, raising the current dams or substantial conservation measures.
- all the water in our system is treated to meet health guidelines. Municipalities pay for every litre of water that is treated, pumped and delivered - and these costs are passed on to residents and other users.
- the capacity of the water system to transport water around the region can be exceeded during summer peak hours.

Tracking water consumption helps us to understand whether efforts to conserve this resource are successful.

What is Being Measured?

Per capita residential consumption is a measure of our individual behaviour towards water consumption. Total residential water consumption includes the effect of both our individual consumption rates and the effect of our growing population. Comparing residential consumption allows residents to compare themselves to other municipalities.

What is Happening?

Residents of Richmond used about the same amount of water per capita in 2004 as they did in 1990. Combined with a population increase of over 40% during this period, our total residential water consumption has increased 45% since 1990 – totalling over 55,000,000 litres per day. This trend indicates that total water consumption will continue to increase as population grows.

Summary

Status:
In 2004, total residential water consumption was 45% greater than in 1990 - more or less in line with population growth.

Trend:
There has been no reduction in per capita residential water consumption over the past 15 years. Coupled with population growth, total residential water consumption continues to climb.

Outlook:
The City has begun a program of water conservation including voluntary single-family residential water meter installation and in 2004 began billing metered customers on a usage basis.
How Do We Compare?

Richmond’s residential water consumption is about mid-range amongst the municipalities of the Lower Mainland and well above comparable consumption data from Europe (see Figure 12).

**Fig. 11:** Residential Water Consumption, 1986-2004

**Fig. 12:** Comparison of Residential Water Consumption for Selected Jurisdictions
What is Being Done?

In 2004, the City implemented a voluntary residential watering metering program that provides residents with an alternative to flat rate billing. Participants receive a water meter and then pay for only the actual amount of water they use. The program includes incentives such as a first year guarantee that the customer will not pay more than in the flat fee system and free water conservation devices. Currently this program is available only to single-family homes.

The City also enforces lawn water sprinkling regulations in the summer and promotes water conservation awareness and education.

Water Consumption by Sector

Water has historically been delivered in Richmond on a “flat rate” basis whereby consumers pay a fixed yearly fee. Metered consumption - where users pay quarterly based on the amount they consume - was typically applied only to non-residential users.

Figure 13 shows a breakdown of water consumption by sector. Two-thirds of the water purchased by the City is unmetered, which includes most residential users, some institutional and agricultural connections, schools and municipal properties, as well as overall system losses.

For the remaining consumption (one-third of total), Figure 13 shows the estimated consumption based on use by sector. Note that these uses represent only the known metered consumption - for example, many institutional connections are unmetered.

Fig. 13: Water Consumption in Richmond by Sector, 2001
Looking Forward

In the future, wholesale water costs (charged by the GVRD to municipalities) are expected to rise from about $0.20 per cubic meter in 2004 to $0.37 in 2008 and $0.45 by 2015. These increases are required to pay for new treatment facilities and infrastructure. As these costs will be passed on through the municipalities to consumers, the financial incentive for water conservation will increase.

What Can Citizens Do?

- Install water conserving fixtures and appliances.
- Obey summertime lawn watering regulations.
- Get in the habit of turning off running faucets when brushing teeth or washing dishes.
- Do full, rather than partial, loads of laundry or dishes.
- Check toilets regularly for leaks.
- Sign up for voluntary residential watering metering and keep track of your usage levels.

A Closer Look: Residential Water Meters

Residential water metering is only one part of a program to reduce water consumption that includes education and outreach campaigns, provision of water efficiency kits, and home and business audits. Metering, with its pricing based on the amount consumed, has been shown to be a highly effective measure at both raising awareness and providing citizens with direct feedback on their water consumption.

Currently water service is provided on a flat fee basis where the customer pays a fixed yearly amount, regardless of how much water they use. With a water meter installed, consumers can pay based on their actual use. A nationwide water survey in 2001 showed that in municipalities that charged according to the volume of water used (metered), the average daily consumption rate was 272 litres per capita, while in communities that charged a flat or fixed rate, used 474 litres per capita - 74% higher! Metering and consumption-based pricing are clearly valuable demand management tools for promoting the responsible use of water resources.

In 2004, the City began allowing residents in single-family houses to pay on a metered basis for the water they use. As of November 2005, there are 7,214 metered residential connections or about 15% of the total. (see www.watermeter.ca).
RRC-2: Wastewater Generation

Why is this Indicator Important?

Wastewater generated by residential, commercial, and industrial activity must be treated before being discharged into the Fraser River. Increases in flows will eventually result in a requirement for expansions to the infrastructure - usually the wastewater treatment plant.

The volume of wastewater created depends upon several factors including: the amount of water we use; the amount of industrial and commercial discharges; the amount of storm water that enters the sewer system due to improper connections of storm lines; and the condition of the sewer system, which if not maintained will allow groundwater to leak into the network.

What is Being Measured?

Total wastewater flow (averaged on a daily basis in millions of litres per day) is measured at the Lulu Island wastewater treatment plant, which serves the majority of Richmond (i.e., the western half of Lulu Island). The average per capita flow (in litres per capita per day) is calculated based on the total flow.

What is Happening?

Total flow volumes have increased 50% from 1990 to 2004, growing at a rate slightly faster than the population. As a result, per capita wastewater generation is also increasing - from around 350 L per capita per day (L/c/d) in the early 1980s, to 400 L/c/d in 1990, to 450 L/c/d in 2004 (Figure 14). These increases are likely the result of increased industrial discharges to the sewer system, increased storm flow and groundwater entering the sewer collection network, and more discharges to the sewer network from residents.

What is Being Done?

The GVRD has a Liquid Waste Management Plan in place, which outlines measures to manage liquid waste in the region, and includes a process for expanding the Lulu Island plant to accommodate increased volumes. The GVRD also maintains a source control program that regulates all industrial discharges into the sewer system to prevent harmful compounds being released that might otherwise harm the environment, upset the sewage treatment plant processes, or damage the sewer collection network.

Summary

Status:
Wastewater generation is increasing - per capita wastewater flows are up 13% from 1990 to 2004.

Trend:
Increased per capita flows combined with increased population has resulted in wastewater flow volumes increasing faster than the population growth rate.

Outlook:
The trend is likely to continue. To accommodate this, an expansion of the Lulu Island wastewater treatment plant has already been defined and will be completed by 2008. This expanded capacity is projected to handle growth for a decade.
Looking Forward

A partial expansion of the Lulu Island wastewater treatment plant is undergoing design and should be in service by 2008. This upgrade will ensure that full treatment can be provided to all expected flows for the next decade, after which it is expected that there will be a requirement for further expansion of the plant.

What Can Citizens Do?

- Actively pursue water conservation for activities that discharge into sewers. This could include using low flow toilets, water efficient fixtures and appliances, and reducing unnecessary running of taps and faucets.
- Do not put chemicals or petroleum products into sewer systems or surface drains. These can harm the sewer network of the wastewater treatment plant processes.
- Do not put greases or cooking oils down drains.
- Businesses can investigate opportunities to conserve water and reduce discharges to the sewer system.
- Lobby for the development of grey water recycling systems.
- Encourage the development of efficient recycling systems in residential towers.

Fig. 14: Wastewater Flows to the Lulu Island Plant, 1984-2004
RRC-3: Residential Solid Waste Disposal

Why is this Indicator Important?
Each year, residents and businesses in the region send thousands of tonnes of solid waste to landfills or incinerators. The GVRD maintains three disposal facilities – the Vancouver Landfill in Delta, the waste-to-energy incineration facility in Burnaby, and the Cache Creek Landfill. In 2007, the Cache Creek Landfill is scheduled to close. This facility takes almost 30% of the waste generated in the Lower Mainland - about 400,000 tonnes of waste per year. A new landfill site is currently being considered but has not yet been finalized. Regardless, landfills consume valuable land and burying wastes can have environmental impacts. For example, decomposing wastes produce methane gas that contributes to global warming. Additional air emissions are generated from transporting wastes to the landfills or incinerators.

What is Being Measured?
Solid waste is measured by the weight of the material, typically reported as tonnes or kilograms (kg). This indicator provides data on the annual amount of solid waste disposed in landfills or incinerated by residents of single-family dwellings – both the total amount and the amount produced per capita.

The indicator shows the waste produced by single-family dwellings (including two-family dwellings), which today house about 61% of Richmond residents. For these dwellings, waste pickup is performed by the City. The indicator does not include waste from residents of multi-family dwellings such as apartments and town homes, or from commercial or industrial sources. The waste from these sources is handled by numerous private sector waste collectors and data is not available.

What is Happening?
In the early 1990s, the BC Ministry of Environment set a goal that all municipalities should reduce per capita solid waste disposal to 50% of 1990 levels by 2000. Under this mandate the City and the Regional District developed many recycling and waste reduction programs during the mid 1990s. Total single-family waste disposal in Richmond was over 25,000 tonnes per year in the early 1990s and had dropped to less than 20,000 tonnes per year since 1996.

On a per capita basis, from 1990 to 2000, Richmond residents reduced their waste sent to disposal from 299 kg to 163 kg per capita per year (the lowest in the past 15 years). Since then, per capita amounts have been increasing and in 2004 disposal had increased to 176 kg per capita per year.

Summary

Status:
Residents living in single-family homes in Richmond generated 176 kg of solid waste per capita per year in 2004.

Trend:
From 1990 to 2000, Richmond reduced its annual waste disposal from 299 kg to 163 kg per capita (the lowest in the past 15 years). Since then, per capita amounts have been increasing and in 2004 disposal had increased to 176 kg per capita per year.

Outlook:
Increasing proliferation of single use disposable products and increasing population in Richmond will lead to increases in the amount of total and per capita waste generated.
What is Being Done?

Recycling programs in Richmond date back to the early 1990s. The significant drop in the amount of solid waste disposed between 1995 and 1996 was primarily due to the introduction of a yard trimmings collection program by the City. In 2004, the yard trimmings collection program diverted just over 11,000 tonnes of organic material from the landfill. Residents of single-family dwellings in Richmond have a number of waste reduction programs available to them, including curbside pick up of recyclable materials and yard waste, and the Product Care program for paint and other toxic consumer products. The City Recycling Depot takes appliances, large metal items, yard waste, and all other blue box recyclable material. Household hazardous wastes can be recycled at a number of privately operated facilities around Richmond. In 2004, just over half of the 38,400 tonnes of solid waste generated by the single-family residential sector was recycled or composted through the City’s various recycling programs and the yard and gardens trimming collection program.

A large portion of the waste generated could be eliminated through careful purchasing, reduction of consumption, re-use, or recycling. As well, much more organic material could be composted. Several provinces have achieved organics diversion rates in excess of 50% through composting programs (e.g., Nova Scotia and Prince Edward Island).
Looking Forward

The current trend is one of slowly increasing per capita waste generation for single-family residents. Combined with population growth, the total waste generated by Richmond residents will also continue to increase.

What Can Citizens Do?

- Continue efforts to recycle and implement composting wherever possible. Compost boxes and other helpful information are available from the City. (see www.richmond.ca)
- Make conscious choices to reduce the purchase of excess packaging, disposable products and single use items.

❓ Did You Know...

The BC Ministry of Environment has established programs to return and recycle many existing products including beverage containers, lead-acid batteries, lubricating oil and used oil filters, medications, paints, solvents/flammable liquids, gasoline, pesticides, and tires. These “Extended Producer Responsibility Programs” place the costs of collection and recycling on the seller and buyer and not on taxpayers. In 2005, the province announced its intentions to establish a system for the recycling of “e-waste” (computers, televisions, cell phones, etc.) by 2007.
RRC-4: Residential Building Energy Use

Why is this Indicator Important?

We use energy - primarily electricity and natural gas - for space heating, cooking, appliances and lighting, and to power our economy. We have historically enjoyed cheap, affordable energy but our energy infrastructure has limits. Electricity in BC is primarily produced from hydroelectric facilities (although a portion is generated from fossil fuels). Growth in BC over the past decades has created requirements for new electricity generation capability and all forms of electricity generation have some environmental impacts.

The natural gas that we consume in the Lower Mainland typically originates from the Peace River area in the province’s northeast and Alberta. Shortages of supply in North America have driven prices to near record highs all over North America and they are not expected to decline any time soon.

What is Being Measured?

Energy consumption is typically measured in kilowatt-hours (kWh) of electricity and gigajoules (GJ) of natural gas. This indicator shows how much energy is used by residential consumers in Richmond. At present, only data for electricity is available. For future updates, natural gas data will become available each year.

What is Happening?

An average single-family dwelling uses approximately 10,000 kWh of electricity each year and 100 GJ of natural gas.

Per capita energy consumption in single-family residences in Richmond has increased slightly from 1996 to 2004 and averages around 3,000 kWh per capita. However, the population in Richmond has increased by 13% over the same period - resulting in an increase in total consumption.

Natural gas consumption for single-family houses is about 20 GJ per capita per year. A long-term trend for natural gas consumption cannot be determined due to limited data availability.

Condominiums and multi-family dwellings use much less energy per unit, and many do not use natural gas at all for water or space heating. Currently, this natural gas use cannot be tracked separately through gas records but will be in the future through Terasen Gas.

Summary

Status:
Richmond residents use about 3,000 kWh per capita per year of electricity per capita per year.

Trend:
Per capita energy (electricity) usage has remained unchanged over the last few years, but total energy use has increased with population growth.

Outlook:
Multi-family dwellings use less energy (per capita) than single-family dwellings. As more multi-family dwellings are built, total consumption will increase, though per capita energy consumption is expected to decline.
What is Being Done?

BC Hydro has developed energy efficiency programs for residents that include compact fluorescent light bulb promotions and exchanges of old, high energy consuming appliances and light fixtures. These programs are part of a broad conservation strategy called PowerSmart that aims to reduce consumption by all electricity users.

Terasen does not have energy conservation programs targeted at the residential level but works with large users through its “Gas Efficient Boiler Program” to encourage the use of high-efficiency, natural gas hydronic (i.e., circulating water) space-heating systems in new construction and retrofit applications.

In general, energy conservation is the responsibility of the individual and residents need to take the initiative to reduce their electricity and gas consumption.

Fig. 16: Per Capita Residential Electricity Consumption, 1996-2004
Looking Forward

We expect that per capita residential electricity consumption will continue at the same level, and that population increases will result in increases in total demand. The trend of development in Richmond is towards multi-family dwellings and these are much more efficient than detached dwellings for heating and cooling requirements. Over many years, this transition may result in a decline of per capita energy (combined electricity and natural gas).

What Can Citizens Do?

• Buy energy efficient appliances and computer systems (e.g., EnergyStar rated).
• Replace your incandescent light bulbs with compact fluorescents.
• PowerSmart your home with good insulation and use energy saving devices to reduce electrical and furnace use.
• Have an EnerGuide for Houses evaluation conducted for your home to assess how your current home performs and identify how you can reduce energy consumption and save money at the same time.
• Take the One-Tonne Challenge to reduce greenhouse gas emissions (www.climatechange.gc.ca/onetonne).
• Undertake the energy conservation projects listed in the 2001 Richmond Environmental Project Guidebook (see www.richmond.ca)
RRC-5: Greenhouse Gas Emissions

Why is this Indicator Important?

Greenhouse gas (GHG) emissions can accelerate the natural ‘greenhouse effect’ (which keeps heat in the earth’s atmosphere) and result in global climate change. Global climate change is expected to have serious impacts on our weather, meteorological and ecological support systems. Potential impacts of climate change include:

- sea level rise and increased flooding risk;
- more extreme weather events like storms, floods, and droughts;
- diminished water supplies;
- diminished fishery resources as a result of warmer oceans and rivers; and,
- diminished forestry resources as a result of increased incident of fire, insect outbreaks and disease.

The major sources of greenhouse gases are from combustion of fossil fuels such as oil, natural gas or coal, and from the decomposition of organic wastes in landfills. Within Richmond, the primary GHG sources are the burning of natural gas and petroleum.

What is Being Measured?

No indicator was measured for this report as there is currently no reportable data available for Richmond. As Richmond develops its emissions baseline and forecast, there will be information with which to track GHG emissions in future years.

What is Being Done?

- Canada has committed in the Kyoto Protocol (which came into effect in 2004) to reduce total greenhouse gas emissions to 6% less than 1990 levels by 2012. The federal government has been developing actions and program funding to help industries, communities and individuals reduce their emissions.
- Municipalities have an important role to play as much of the GHG emissions are related to vehicles and housing - which can be influenced by municipal actions. In 2001, the City of Richmond joined the Federation of Canadian Municipalities’ Partners for Climate Protection Program. This program is a five milestone framework to define an emissions baseline, establish a forecast of future emissions, define a reduction target, and develop community plans to manage these emissions. Richmond is working to define a baseline emissions inventory and the information from this will be used to help create a forecast and reduction targets.

Summary

Status:
There is currently no complete indicator data of greenhouse gas (GHG) emissions for Richmond. The City is working to develop its GHG emissions baseline as part of the Partners for Climate Protection program.

Trend:
No trend data on GHG emissions in Richmond is currently available, but the growth in the population and associated increases in vehicle traffic, housing and commercial activities have likely resulted in increased total GHG emissions over the past several decades.

Outlook:
Unknown.
- Richmond is one of 40 Canadian communities chosen to implement the One-Tonne Challenge, a two year initiative running from 2004-2006 that encouraged all Canadians to reduce their GHG contributions by 20% or one tonne. The Richmond Community Challenge (RCC) is a partnership between Richmond School District #38, the Vancouver International Airport Authority, Passion for Action (an environmental education company) and the City. During the first year, the RCC implemented a community outreach program by identifying student and youth ambassadors to engage the community of Richmond to take the challenge. Year Two of the challenge will focus on developing an idle free program in Richmond.

- The GVRD’s new air quality management plan completed in 2005 includes a commitment to help reduce greenhouse gas emissions in the region. This is a substantial development as it allows greenhouse gases to be managed at a regional level.

Looking Forward
Experiences in other growing communities suggest that total GHG emissions will continue to increase, unless we learn to change our behaviours in order to reduce emissions.

What Can Citizens Do?
- Reduce your use of fossil fuels, drive less, and use energy efficient appliances.
- Plant trees, keep and support green spaces.
- Walk - don’t drive.
- Ride a bike or take transit to work just one day per week.
- Take the One-Tonne Challenge and find more ways to reduce your GHG profile (www.climatechange.gc.ca/onetonne).