ENVIRONMENT

SUMMARY OF INDICATORS

CIW National Report 2012	Vaughan Wellbeing Report	
Ground-level ozone – population weighted in parts per billion	***Ground-level ozone*** – population weighted in parts per billion	
Absolute greenhouse gas emissions – megatons of carbon dioxide per year	***Absolute greenhouse gas emissions*** – megatons of carbon dioxide per year	
Primary energy production (petajoules)		
Water yield in southern Canada (cubic kilometres)	***Water yield and quality***	
Ecological Footprint		
Viable Metal Reserves Index		
Canadian Living Planet Index		
Marine Trophic Index		

- Comparable indicator available
- Similar indicator available
- No comparable indicator available

FINDINGS BY INDICATOR

GROUND-LEVEL OZONE

In 2008, the Ministry conducted a study (the York Region Air Quality Study) to determine if air quality measures collected at the air quality index (AQI) station located in Newmarket are representative of the heavily populated areas of Markham and Vaughan. For the period of August 22 to September 22, 2008, the City of Vaughan was monitored using a mobile air quality monitoring station.

The study found that, in general, air pollutant measurements (i.e., ozone and $PM_{2.5}$ concentrations) of Vaughan were adequately represented by measurements at fixed AQI stations in the surrounding fixed AQI stations located in Newmarket and Toronto North. However, traffic-related pollutants, such as NO_2, concentrations in Vaughan were more adequately measured by those recorded at the Toronto North station. (Ontario Ministry of the Environment, 2009)

Figure 1 shows the ozone annual means for the two AQI stations at Newmarket and Toronto North. Data from the Ontario Ministry of the Environment and Climate Change (2010) show that the ozone annual means for Toronto North increased by 9% over the 10-year period from 2003 to 2012 while the measures obtained from Newmarket decreased 1% over the same time period (Ontario Ministry of the Environment and Climate Change, 2010). In Ontario[1], an increasing trend of 8% over the same 10-year period was observed in ozone annual means (Ontario Ministry of the Environment and Climate Change, 2014).

While the annual means reported in Toronto North and Newmarket were within the index range for 'Good' air quality with 'No known harmful effects,' both stations reported maximum ozone concentrations in 2012 that were significantly above the provincial one-hour Ambient Air Quality Criterion (AAQC) of 80 ppb. For Newmarket, ground-level ozone concentrations measured at this station exceeded the provincial one-hour AAQC on 35 occasions. This was the third highest of all AQI stations across the province, after Grand Bend (109 occasions) and Sarnia (41 occasions). Across the province, ozone concentrations observed in urban areas were lower. This may be explained by the reaction between ozone and NO emitted by vehicles and other local combustion sources, which results in ozone depletion. (Ontario Ministry of the Environment and Climate Change, 2014)

Figure 1. Ozone annual means in parts per billion (ppb) for AQI stations located in Newmarket and Toronto North.

Year	Air Quality Index (AQI) Station	
	Toronto North	Newmarket
2012	25.7	29.4
2011	23.6	27.8
2010	24.8	31.5
2009	22.1	28.6
2008	22.7	29.5
2007	24.5	31.7
2006	23.3	28.8
2005	24.5	30.8
2004	22.5	28.3
2003	23.6	29.6
% change over 10-year period	+9%	-1%

Source: Ontario Ministry of the Environment and Climate Change. (2010). Publications – Air Quality in Ontario Report & Appendix (2003-2012). Retrieved from: http://www.airqualityontario.com/press/publications.php

[1] Data reported for Ontario are the composite annual means based on data collected from the 40 AQI monitoring sites across the province.

ABSOLUTE GREENHOUSE GAS EMISSIONS

Data from a baseline inventory of community greenhouse gas (GHG) emissions using year 2006 as the baseline estimated that the Vaughan community produced approximately 1.7 megatons of equivalent carbon dioxide per year or 6.8 tonnes per person per year. Divided by sector, it was estimated that 29.9% of annual GHGs were emitted from industry, 26.6% from residential (or energy) use, 21.6% from commercial and institutional uses, 19.8% from vehicles, and 2.1% from residential waste. Given the rapid growth of the population in the community, GHG emissions were expected to reach just over 2.6 megatons in 2026 if no action were taken to reduce emissions. (City of Vaughan, 2014) Similar to the trend observed at the national level (Canadian Index of Wellbeing, 2012), GHG emissions in the city of Vaughan has been rising and is projected to increase significantly if nothing is done to address this rising trend.

WATER QUALITY

Data from the Toronto and Region Conservation Authority (TRCA)'s Regional Watershed Monitoring Program (2015) showed that the water quality in Vaughan[2] ranges considerably (Figure 2). In the period 2005-2009, the sites in the main Humber River, East Humber River and Cold Creek subwatersheds all exhibited 'good' water quality. These sites have high forest cover (21-35%) and limited urbanization in the upstream catchments. The Black Creek subwatershed of the Humber River and the West Don subwatershed of the Don River both exhibited poor water quality. These sites are highly urbanized with limited forest cover (<5%) in their upstream catchments. The Humber River is among the watersheds in the TRCA's jurisdiction with 'good' overall water quality (Toronto and Region Conservation Authority and Greater Toronto CivicAction Alliance, 2011).

Figure 2. Water Quality for subwatersheds[1] in the Vaughan community, 2005-2009 average.

Township	Watershed	Waterbody	2005-2009 Grade[2]
Vaughan	Humber River	East Humber River	B
King	Humber River	Cold Creek[3]	A
Vaughan	Humber River	Humber River	B
Vaughan	Humber River	Black Creek	F
Vaughan	Don River	West Don River	D

Notes:

[2] The TRCA's Watershed Monitoring Program uses the Canadian Council of Ministers of the Environment (CCME) Water Quality Index (WQI) as a measure of water quality. The measure is based on the level of contamination, magnitude and frequency of excessive input for eight pollutants– chloride, *E. coli*, phosphorus, nitrogen, ammonia, nitrate, copper and zinc. Water is sampled at 36 locations throughout the TRCA's jurisdiction, including four sites in Vaughan and one site that flows into Vaughan.

1. Grab samples are collected once per month, year-round and is independent of precipitation (i.e. rain or shine) with seasonal averages calculated prior to the determination of the WQI.
2. Water quality assigned based on the Living City Report Card Grading Scheme (http://www.thelivingcity.org/lcrc/LivingCityReportCard_web_r1.pdf).
3. This site is north of the Vaughan northern boundary but the water flows into Vaughan.

Source: Toronto and Region Conservation Authority. (2015). *Regional Watershed Monitoring Program* [Custom cross-tabulation of data].

OBSERVATIONS

Vaughan is one of Canada's largest and fastest growing cities. The city observed rapid growth at a rate of over 185% since being incorporated as a city in 1991 (City of Vaughan, 2015). This growth is expected to continue to 2031 (City of Vaughan, 2015b). New residents and businesses and the activities that they engage in add to the GHG emissions in Vaughan. In addition, and as seen in the Time Use report, a large proportion of Vaughan residents drive motorized vehicles to work, which is a significant contributor to GHG. Ozone levels for Vaughan, which can be adequately represented by measures at the North Toronto and Newmarkert locations, are high. Action is required to reverse the trends observed in GHG emissions and ozone levels in order to prevent significant impacts to the environment and human health in this rapidly growing city.

Not surprisingly, sites within the Vaughan community with limited urbanization and high forest cover exhibited good water quality. Likewise, areas that are highly urbanized and limited forest cover showed poor water quality.

REFERENCES

1. Ontario Ministry of the Environment. (2009). York Region Air Quality Study 2008. Retrieved from: http://www.airqualityontario.com/downloads/YorkRegionAirQualityStudy2008.pdf
2. Ontario Ministry of the Environment and Climate Change. (2010). Publications – Air Quality in Ontario Report & Appendix (2003-2012). Retrieved from: http://www.airqualityontario.com/press/publications.php
3. Ontario Ministry of the Environment and Climate Change. (2014). Air Quality in Ontario – 2012 Report. Retrieved from: http://www.airqualityontario.com/downloads/AirQualityInOntarioReportAndAppendix2012.pdf
4. City of Vaughan. (2014). City of Vaughan Community Climate Action Plan. Retrieved from: http://www.vaughan.ca/cityhall/environmental_sustainability/General%20Documents/Vaughan%20Community%20Climate%20Action%20Plan%20-%20DRAFT.pdf

5. Canadian Index of Wellbeing. (2012). *How are Canadians Really Doing?* The 2012 CIW Report. Waterloo, ON: Canadian Index of Wellbeing and University of Waterloo.
6. Toronto and Region Conservation Authority and Greater Toronto CivicAction Alliance. (2011). *The Living City Report Card 2011 – An assessment of the environmental health of the Greater Toronto Area*. Retrieved from: http://www.thelivingcity.org/lcrc/LivingCityReportCard_web_r1.pdf
7. Toronto and Region Conservation Authority. (2015). *Regional Watershed Monitoring Program* [Custom cross-tabulation of data].
8. City of Vaughan. (2015a). Demographics. Retrieved from: https://www.vaughan.ca/business/market_indicators/demographics/Pages/default.aspx
9. City of Vaughan. (2015b). Population. Retrieved from https://www.vaughan.ca/business/market_indicators/demographics/Pages/population.aspx