Town of Oakville

Ecological Footprint Analysis

Draft Report, 2010

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Building Genuine Wealth

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Introduction

'Livable Oakville', the Town's Official Plan (2009) shares a vision of an environmentally sustainable, healthy, prosperous, culturally vibrant community where citizens enjoy a high quality life. The Plan outlines a process to ensure that all growth and development decisions reflect the Town's commitment to achieve sustainability. A key principle towards fulfilling Oakville's vision of a sustainable community is minimizing the Town's Ecological Footprint. Guiding Principle 2.2.3 of the Plan acknowledges that 'achieving sustainability' requires "minimizing the Town's ecological footprint; preserving, enhancing and protecting the town's environmental resources, natural features and areas, natural heritage systems and waterfronts; and achieving sustainable building and community design" (B-2).

In support of Principle 2.2.3, Oakville has committed to reporting the Ecological Footprint alongside other environment indicators as part of the State of the Environment Reporting process as outlined in Oakville's Environmental Strategic Plan. Reporting Oakville's Ecological Footprint complements more specific environmental reporting by offering an easy to understand assessment of where the Town stands in relation to overall sustainability objectives. The *Town of Oakville Ecological Footprint Analysis* measures Oakville's current Ecological Footprint, establishing a benchmark to track progress towards sustainability and offers a framework to educate citizens and policy makers, and inform decision making.

What is the Ecological Footprint

The Ecological Footprint is an accounting tool that measures the environmental impact of human consumption. The tool accounts for a populations' consumption of food, transportation, housing, goods and services and expresses the findings in terms of the land area needed to support that populations' consumption demands. The Ecological Footprint inverts the traditional concept of 'carrying capacity' (the population a given region could support) and instead seeks to determine the total land area required, regardless of where that land is located, to sustain a given population. The Ecological Footprint is unique in that it accounts for the environmental impacts of consumption regardless of where the burden of that consumption falls in terms of production

costs and pollution (Rees and Wackernagel, 1996). ***The Oakville Ecological Footprint, therefore, is the sum environmental impact of all Oakville residents' consumption no matter where in the world the environmental impact occurs***.

The Ecological Footprint tool makes it possible to estimate the area of land needed to support the consumption demands of Oakville residents. In more technical terms, the Ecological Footprint provides a snapshot in time and the trajectory over time of how much nature, expressed in a common unit of bioproductive space, is used exclusively for producing all the resources (food, energy, materials) a given population consumes and absorbing the wastes they produce, using prevailing technologies (Chambers et al. 2000). In essence, the Ecological Footprint is an accounting tool to measure the impact of human activity on the planet. At the macro level, if the human footprint exceeds the productive capacity of the biosphere then consumption patterns are clearly not sustainable. The Ecological Footprint directly acknowledges that there are limits constraining the function of ecological systems and services and assesses where we are in relation to those limits.

While the Ecological Footprint is an indicator of sustainable consumption, important factors other than consumption habits influence the Ecological Footprint. These include population size, technology, and gains or losses in eco-efficiency. For example, new technology such as zero-emission vehicles, or a reduction in population are factors which could lower Oakville's overall Ecological Footprint.

Global hectares

The Ecological Footprint expresses results in global hectares. A global hectare is a standardized hectare to account for the fact that different land types and different land categories have different productivity or biocapacity potentials. A common unit allows for the meaningful summation of different land types and categories and also allows for meaningful comparisons of footprint results between regions and countries. Land types are adjusted, reflecting the fact that land types (for example, agriculture land) have different productivity potentials depending on the region. Productivity potential can vary both within a country and across countries. The

productivity potential of the different land categories are also converted to global hectares so the different land categories can be summed into a total Ecological Footprint value. For example, cropland in the Ecological Footprint methodology is considered to be more productive than pasture land. The land category conversion factors are based on global scientific data and updated by the Global Footprint Network (Ewing et al., 2008).[1]

Calculation methodology

The Oakville Ecological Footprint is based on the sub national Ecological Footprint calculation approach proposed by Wilson and Grant as a consistent calculation strategy for Canadian communities (2009). The estimate has been refined with direct data from the Town of Oakville. The sub national Ecological Footprint calculation approach adapts the Canadian Consumption Land Use Matrix (CLUM) developed by the Global Footprint Network (2008) using the consumption expenditure model developed to assess the Ecological Footprint of Federation of Canadian Municipalities (FCM) communities by Wilson and Anielski (2004) and refined by Wilson (2008). The sub-national footprint calculation strategy adjusts national Ecological Footprint estimates based on proxies for the major consumption categories of the Ecological Footprint: food, shelter, mobility, goods, services, and government. The proposed approach follows the Global Footprint Network Standard 3 (2006) and produces an Ecological Footprint estimate that is compatible with the Global Footprint Network National Accounts (Ewing et al., 2008).

Consumption category proxy measures

Consumer goods and services

The Consumer goods and services category is adjusted using available income as a proxy. Available income is median after-tax household income minus shelter expenses, tax expenses, insurance expenses, savings and donations. Shelter expenses include gross rent or mortgage

[1] The Global Footprint Network (GFN) is the global authority on the Ecological Footprint. GFN coordinated the development of and maintains the Ecological Footprint calculation and reporting standards. In addition, GFN reports the National Ecological Footprint Accounts annually. Their website, www.globalfootprintnetwork.org, is an excellent clearinghouse for Ecological Footprint information.

payment, and the costs of electricity, heat and municipal services. Removing shelter expenses assumes that income allocated to mortgages, rent and municipal services is not available for spending on consumer goods and services.

Shelter – energy

The shelter energy footprint refers to the direct energy demands of households. The shelter energy footprint component is calculated using Oakville greenhouse gas inventory data for the residential sector. Greenhouse gas data is converted to Ecological Footprint values using The Global Footprint Network footprint intensity of carbon conversion factors.

Shelter – non energy

The non-energy component of the shelter footprint refers to the construction, maintenance, and other material inputs to support shelter. To adjust the shelter-non energy component we use dwelling size as a proxy of the resource inputs of the shelter. The calculation estimates dwelling space occupied per person by dividing the number of rooms per dwelling by the number of household members.

Mobility

To adjust the mobility or transportation component of the Ecological Footprint we use the average commuting footprint of the community as a proxy. We assume that commuting is a significant portion of household transportation use and reflects overall dependency on the automobile. The calculation to estimate the commuting footprint is the median commuting distance to work multiplied by the footprint of the different commuting transportation modes.

Food

To adjust the food footprint we use expenditure on food as a proxy of food consumption. We estimated food expenditure for Oakville using provincial expenditure on food by income quintile.

Government

To adjust the government component of the Ecological Footprint we use expenditure on provincial government services as a proxy. Given the challenge of attributing federal and provincial government services to local jurisdictions, the provincial Ecological Footprint associated with government services is adopted across the province. While government expenditures may vary by region within a province, government services such as roads, schools and health care serve all provincial citizens regardless of community.

Oakville Ecological Footprint

The average per capita Ecological Footprint of an Oakville resident is 9.0 global hectares per capita (gha/capita). Oakville's per capita Ecological Footprint is 25% larger than the Canadian average Ecological Footprint of 7.1 global hectares per capita and substantially above the global sustainability threshold of 1.8 hectares per capita.[2] The global sustainability threshold is determined by taking the total amount of bioproductive space in the world and dividing it by the total population.[3] Assuming an equal distribution of bioproductive space among the global population, Oakville residents, on average, are using five times more than their 1.8 hectare share of the global bioproductive space. In terms of total area, Oakville's Ecological Footprint occupies 1.5 million global hectares. This is over one hundred times the town's total land area (13,850 hectares) or more than double the size of the Greater Toronto Area (590, 365 hectares). Figure 1 depicts Oakville's Ecological Footprint in relation to Town boundaries.

[2] The Canadian Ecological Footprint of 7.1 gha per capita and the global sustainability threshold Ecological Footprint of 1.8 gha per capita are from the Global Footprint Network 2008 National Accounts.

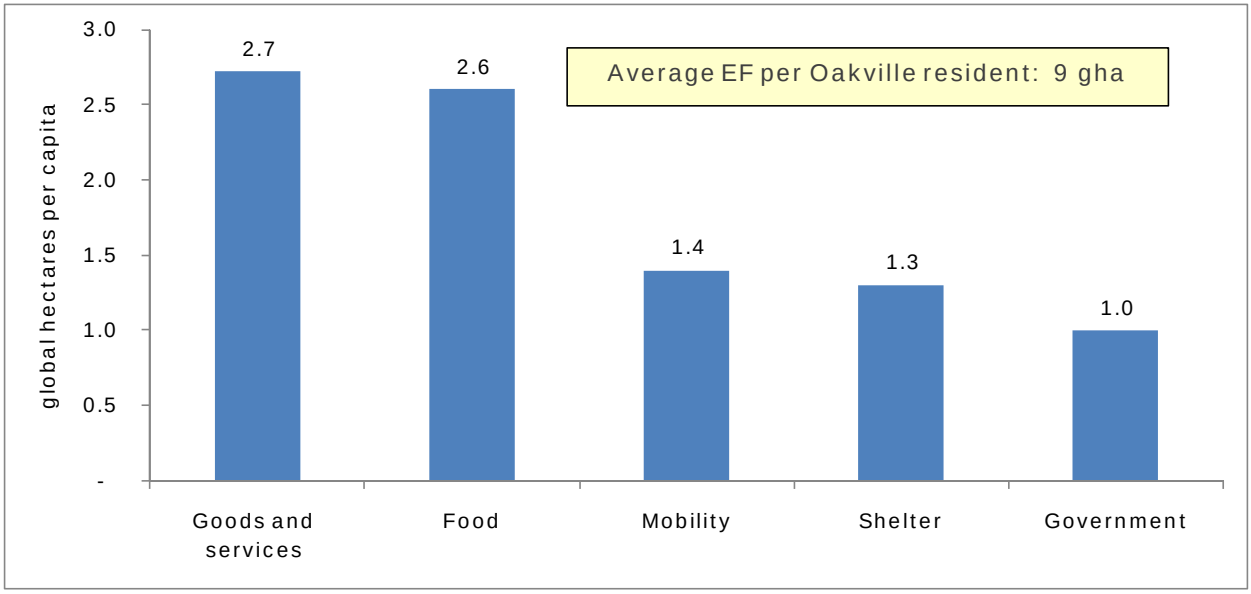
[3]The threshold amount is not a static number. It will change with changes in population and changes in the amount of available bioproductive space available. For example, population growth and loses in bioproductive space due to urbanization, desertification, and unsustainable forest harvesting practices will lower the threshold.

Figure 1: Oakville's Ecological Footprint

The Ecological Footprint is a measure of consumption. The model accounts for the consumption of materials and energy of a given population regardless of where in the world the extraction, production, and manufacturing occur. In fact, the majority of Oakville's Ecological Footprint falls outside its borders. Because of trade the impacts associated with resource extraction, food production, manufacturing and distribution do not necessarily occur within Oakville, Ontario or Canada.

The Oakville Ecological Footprint can be broken down by consumption category. Consumption categories include food, shelter, personal transportation (mobility), goods and services, and government. Figure one breaks down the Ecological Footprint by major consumption category.

Figure 2: Oakville Ecological Footprint by major consumption category



Of these categories, the consumption of goods and services accounts for 30% of the total Ecological Footprint. An additional 30% supports food consumption. Personal transportation or mobility accounts for 16%. Shelter which includes household energy consumption as well as the materials and energy used to maintain the shelter accounts for 14%. Government services account for 10%.

With a footprint, 25% above the Canadian average, Oakville has among the largest Ecological Footprints in the world. Table 1 compares Oakville's Ecological Footprint with the national average, select jurisdictions within Canada, select countries throughout the world and the global average. The jurisdictions selected within Canada are limited to provinces, cities, and communities with comparable calculation methodologies. The Ecological Footprint values of other countries are from the Global Footprint Network National Footprint Accounts (2008).

Table 1: Comparison of Oakville Ecological Footprint with select jurisdictions

Jurisdiction	EF (gha)	Jurisdiction	EF (gha)
Oakville	**9.0**	World average	2.7
Canada	7.1	United States	9.4
Alberta	8.8	Japan	4.9
Quebec	6.0	EU	4.7
Calgary	9.4	China	2.1

Sources: Global Footprint Network, 2008; Auditor General of Québec, 2008; Wilson, 2008; City of Calgary, 2007.

Oakville's higher footprint in comparison to the Canadian average is primarily due to higher levels of household income, allowing Oakville households to spend more and ultimately consume more than the Canadian average household. The other major contributing factor is a larger personal transportation footprint due primarily to higher commuting distances. Inter-provincial comparisons should be made cautiously. Source of electricity influences a community's ecological footprint value as well. For example, electricity derived from coal has a larger energy footprint than electricity derived from hydro-power. In Canada, communities access electricity through a provincial energy grid over which they have little influence. Instead of revealing the local lifestyle choices, a community's ecological footprint may reflect provincial energy choices that residents cannot directly influence (Wilson and Grant, 2009).

Regional Biocapacity

While the Ecological Footprint measures how much 'nature' a select a population is using. To give meaning to that amount it is important to understand how much 'nature' is available. At the global level there are approximately 2.1 hectares available per world citizen to support his or her consumption needs.

At the country level, Canada is in a unique situation where we have a very large country geographically and a relatively small population. Canada has a total biocapacity of 20 hectares per person. In fact, Canada enjoys the second largest amount of biocapacity per person in the world behind Gabon.

Taking a regional lens, however, highlights that footprints often exceed regional biocapacity. If we consider Oakville within a regional context (100 mile radius), the regional population consumption demands dramatically exceed available biocapacity. (The 100 mile radius was selected for illustration purposes). Populations are able to exceed local biocapacity by importing goods and services from other regions of the country and the world. In a global economy, the impact of consumption falls not just in your own backyard but all over the planet. The ecological footprint is a useful measure because it aggregates the impact of consumption and attributes it to consumer.

To estimate biocapacity, hectares of land are converted to global hectares (the normalized unit that the Ecological Footprint is expressed in) using yield factors which reflect the different bioproductivity potential of land in Ontario compared to average world yields. The biocapacity values for each land category are converted into global hectares using the Global Footprint Network equivalence factors (2008).

Within a 100 mile radius of Oakville there are 8.4 million global hectares of available biocapacity. Table 2 presents available biocapacity within a 100 mile radius of Oakville by land type.

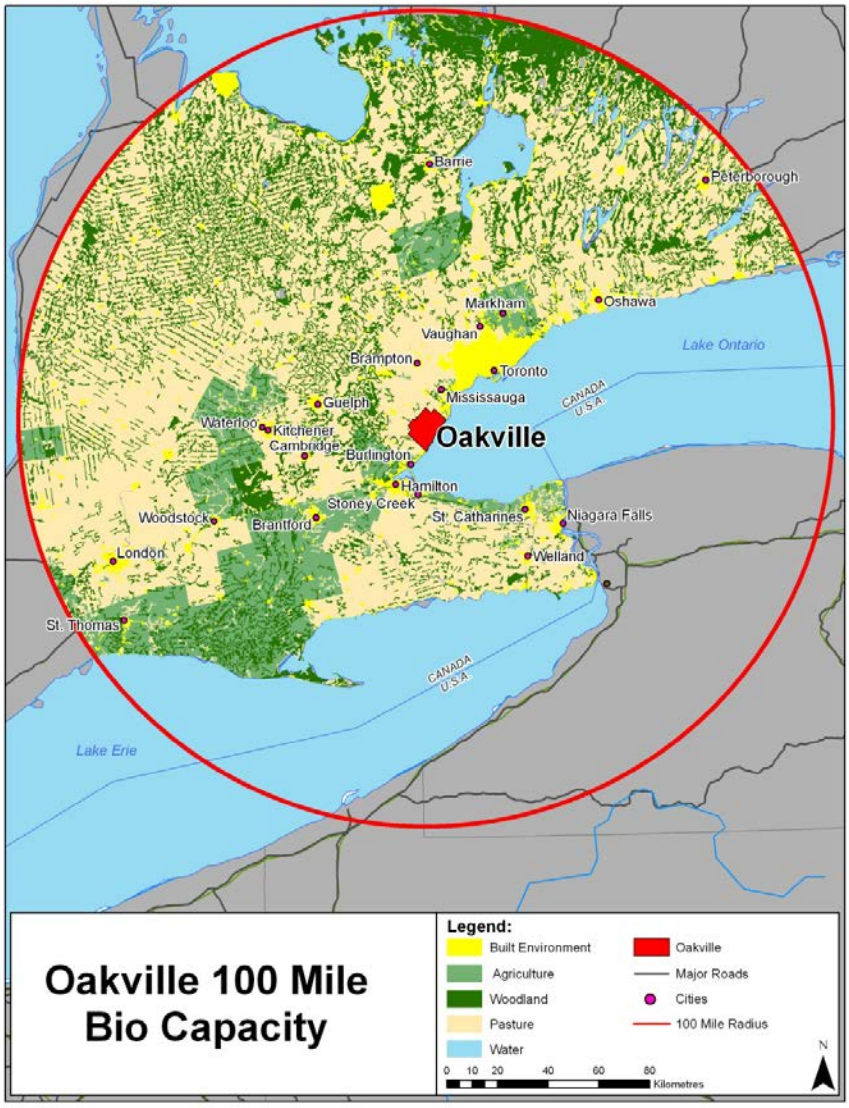
Figure 3 maps the land types within a 100 mile radius of Oakville.

Table 2: Available Biocapacity within a 100 mile radius of Oakville

Land type	Biocapacity (global hectares)
Agricultural	1,878,168
Pasture	1,509,351
Water	561,287
Woodland	4,491,908
Total	**8,440,714**

The region within a 100 mile radius of Oakville supports a population of over 8 million people meaning that there is approximately 1 global hectare available per person to support his or her consumption demands, (much less than the 9 hectares that the average Oakville resident uses).

Figure 3: Biocapacity within 100 miles of Oakville



Ecological Footprint Component Analysis

The following section explores in greater detail the individual Ecological Footprint components. For each component we analyze a contributing factor, explore the contributions of best practices and discuss options moving forward.

Shelter - residential energy consumption

The Oakville residential energy footprint increased by 11% between 2006 and 2008. The rise in footprint reflects a 12% increase in natural gas use and a 7% increase in total electricity use. When accounting for population growth, the residential energy footprint increased on average by 6% per person over the two year period. Despite efforts by the Town and others to encourage energy efficiency and energy conservation, average household energy use continues to increase. Table 3 summarizes residential energy consumption and footprint data.

Table 3: Residential energy consumption data

Residential sector	2006	2008	% change
Electricity (kWh)	576,939,414	618,397,616	7%
Natural gas (M^3)	133,077,487	149,202,613	12%
Residential sector EF (gha)	120,094	132,851	11%
Population	165,600	173,600	5%
kWh per capita	3,484	3,562	2%
M^3 per capita	804	859	7%
EF per capita (gha)	0.73	0.77	6%

Sources: Union Gas, Ltd. 2009; Oakville Hydro, 2009.

The Town of Oakville now tracks residential energy consumption data as part of the Greenhouse Gas Inventory monitoring commitment. Having this rich data set and time series data will improve the Town's capacity to understand trends over time and drivers of residential energy consumption.

Best practice - green electricity:

The Green Light Pacts program was initiated in 2003. Through this program, Oakville Hydro purchases green energy on behalf of customers. Pacts can be purchased for either all or a portion of a business or residential account. The program has 99 residential customers and the Town of

Oakville has purchased pacts annually since the program's inception. Bullfrog Power also offers the opportunity for residents and businesses to purchase green power. 72 homes currently purchase green electricity from Bullfrog Power. Using green electricity reduces the average household's Ecological Footprint by over half a hectare or approximately 6%.

Footprint savings:

The total number of households using green electricity (171) represents 0.03% of Oakville's total housing stock. If 10% of Oakville households purchased green power, it would lead to an Ecological Footprint savings of over 3,100 hectares per year. If 25% of Oakville households purchased green power, it would lead to an Ecological Footprint savings of 7,750 hectares per year. Table 4 summarizes ecological footprint savings by switching to green electricity.

Table 4: Ecological Footprint savings by switching to green electricity

Total housing stock	56,581
Current households enrolled (0.3%)	171
Savings per household (gha)	0.55
Footprint reduction (current) (gha)	**94**
Footprint reduction (10%) (gha)	**3,101**
Footprint reduction (25%) (gha)	**7,753**

Sources: Statisics Canada, 2006 Census; Town of Oakville, 2008.

Best practice - landfill gas project:

The Halton Region and Oakville Hydro Landfill Gas Project collects landfill gas to generate electricity. The project generates enough electricity to support 1,500 homes providing the community an Ecological Footprint savings of 822 hectares.

Mobility – commuting

According to Statistics Canada (2006) mode of transportation to work data for Oakville, 73% of workers travel to work in their personal vehicle as the driver, 7% travel by carpool, 14% use public transportation, and 4% either walk or cycle. Table 5 presents mode of transportation to work data for the employed labour force with a usual place of work aged fifteen years and older. Using data available from the Town of Oakville we are able to break down the personal vehicle data into car and light truck, SUV and minivan categories.

Table 5: Mode of transportation to work

Transportation mode	Total	Percent*
Car (as driver)	31,439	40%
Light truck, SUV, minivan (as driver)	26,061	33%
Car (as passenger)	3,100	4%
Light truck, SUV, minivan (as passenger)	2,570	3%
Public transit	11,185	14%
Walked/bicycled	3,205	4%
Other	760	1%
Total	**78,320**	**100%**

* Individual percents do not add up to 100% due to rounding.
Sources: Statistics Canada, 2006; Town of Oakville, 2004.

The estimated carbon footprint of Oakville commuters based on the above commuting data and an average daily commute of 20 km (typical of someone living in Halton Regional Municipality and assuming a commuting schedule of 50 weeks per year, Monday to Friday) is 90.6 million kg of CO_2e. The corresponding Ecological Footprint of Oakville Commuters is 36,900 hectares.

Best Practice – public transit, cycling, walking:

Taking public transit, walking, or cycling to work as opposed to commuting by car reduces the average person's footprint by approximately 0.50 hectares.[4] Assuming an average daily commute of 20 km, travelling by car generates thirteen times more CO_2e emissions than commuting by bus. Table 6 presents the CO_2e emissions and associated footprint by commuting 20 km per day over the year for different modes of transportation.

Table 6: CO_2e emissions and associated footprint by mode of transportation to work

Mode of transportation	Carbon footprint (Kg CO_2e)	Ecological Footprint (gha)
Car	1,194	0.51
Light truck, SUV, minivan	1,836	0.70
Transit bus	88	0.02
Cycling or walking	0	0.00

Note: Assumes an average daily commute of 20km. Annual estimate based on 50 weeks, Monday to Friday.
Sources: Statistics Canada, Census. 2006; Environment Canada, 2008.

[4] Taking public transit as opposed to travelling by car reduces the average Oakville footprint by 0.49 hectares. Walking or cycling as opposed to travelling by car reduces the average Oakville footprint by 0.51 hectares.

Footprint savings:

If 5% of current commuters who travel by single occupancy vehicle switched to public transit and another 5% opted to walk or cycle it would reduce Oakville's Ecological Footprint by 1,580 hectares. If 25% of current commuters who travel by single occupancy vehicle switched to public transit and another 25% opted to walk or cycle it would reduce Oakville's Ecological Footprint by almost 8,000 hectares.

Table 7 presents the average Ecological Footprint savings of commuting by public transit in lieu of commuting by car for different scenarios.

Table 7: Ecological Footprint savings commuting

Total commuters (labour force 15+)	78,320
% of commuters using public transit	15%
% of commuters walking or cycling	4%
Savings per commuter (gha)	0.50
Footprint savings (gha) (+5% public transit/ +5% walking or cycling)	**1,580**
Footprint reduction (gha) (+25% public transit/+25% walking or cycling)	**7,885**

Best practice - Active Transportation Master Plan:

In 2009, the Town developed an Active Transportation Master Plan. The Plan establishes a vision and action plan for increasing the accessibility and use of alternative transportation modes such as walking and bicycling. The Plan's focus on public transit, walking, cycling, travel demand management (TDM), and changes in land use planning supports a more sustainable transportation future. While it is difficult to attribute an Ecological Footprint savings to the Active Transportation Master Plan, the vision and policy direction supports a lower community transportation footprint.

Best Practice - Smart Commute Halton:

In December 2006, the Town of Oakville announced its participation in Halton Region's Smart Commute initiative to help reduce single occupant vehicle trips travelling during peak traffic

conditions and help improve air quality. Current initiatives offered to Town employees include carpool ride-match service, dedicated carpool parking spaces, discounted monthly Oakville Transit passes, bicycle lockers, shelters and locks, emergency ride home program and an education campaign. The program is currently being expanded to outside organizations.

Food - local food availability

The average Oakville resident uses 2.6 global hectares to support his or her food consumption. The total food footprint of the town is 431 thousand global hectares. Using a 100 mile radius for illustration purposes, there are 514 thousand hectares of agriculture land and 2.7 million hectares of pasture within a 100 mile radius of Oakville. Converting the data to global hectares means there are 3.9 million global hectares of land capable of supporting food production in the region suggesting that the potential to access local food is in theory there. This, of course, assumes that food grown and animals raised in this region are directed to local markets. This land has also not been set aside to support Oakville residents only. As noted, the population of the zone within a 100 mile radius of Oakville supports a population of over 8 million people.

Best practice community garden plots:

While Southern Ontario has a significant amount of agricultural land and pasture land, Oakville residents are dependent on food imports from agricultural land outside of regional boundaries. In fact, Michael Pollen, author of the Omnivore's Dilemma, estimates that in North America the average food item travels over 1,500 miles or 2,400 kilometers from farm field to table. Eating local food and growing your own food offers an opportunity to lower the ecological footprint of food consumption. While there are no statistics about the amount of people who have food gardens, The Town has 189 garden plots available for rent at four locations.[5] In 2008, approximately 70% of the plots were rented.

[5] Garden Plot locations include Bronte Park (70 plots), Lyons Lane (48 plots), Kingsford Gardens (33 plots), and Shell Park (38 plots).

Government - Town of Oakville corporate operations

Greenhouse Gas Inventory data for The Town of Oakville corporate operations can be used to estimate a Town operations Carbon Footprint. In 2008, the Town of Oakville corporate operations carbon footprint totalled 15,586 tonnes of CO_2e or 4,330 global hectares. Town buildings generate 67% of the carbon footprint, the vehicle fleet generates18%, and street lights and traffic lights generate 15%.[6]

In 2008, Town council adopted a resolution to reduce corporate GHG emissions by 20% below 2004 levels by 2014. The target requires a reduction of 6,200 CO_2e or 40% from 2008 emission levels. Table 8 reviews GHG emission levels and targets.

Table 8: GHG emission levels and target

2004 levels:	11,690 t CO_2e
2008 levels:	15,586 t CO_2e
2014 target:	9,352 t CO_2e

Source: Town of Oakville, 2008.

Reaching the 2014 target will reduce Oakville's Ecological Footprint by 1,725 hectares per year over current levels. Reducing the Town's corporate operation's Ecological Footprint communicates a strong message of responsibility and action to the community.

Best practice - traffic and street light retrofits:

Retrofits have dramatically reduced the carbon footprint associated with traffic lights and street lights. Retrofitted lights produce a third of the carbon footprint as a standard non retrofitted light. Since 2004 traffic light retrofits have reduced Oakville's Ecological Footprint by 144 hectares. The Town is in the process of upgrading street lights to LED lights replacing the current high pressure sodium light technology. Upgrades, in 2008, resulted in an Ecological Footprint savings of 306 hectares. Based on the 2008 inventory data, a complete conversion to

[6] The town vehicle fleet does not include GHG emissions associated with using personal vehicles for town business.

LED technology could save an additional 300 hectares per year. Total potential Ecological Footprint Savings equals 750 hectares.

Best Practice - LEED Certification of new buildings:

The Town has committed to build new municipal facilities over 500 m^2 to a minimum of LEED silver certification standard. LEED buildings have a smaller material Ecological Footprint than traditional construction and reduce the carbon footprint by 25% to 50% when compared to traditional construction. The Town's LEED Certification policy will foster a much smaller future municipal facility footprint. The new Transit Facility, the Queen Elizabeth Park Community Centre and North Park Quad Pad are examples of current Town buildings that are being built to LEED standards.

Ecological Footprint Comparisons

International Comparisons

From a global perspective, the Oakville Ecological Footprint is significantly larger than the global average Ecological Footprint of 2.7 hectares per person. In fact, with an Ecological Footprint over 3 times larger than the global average, Oakville has among the largest per capita Ecological Footprints in the world. When comparing the Oakville Ecological Footprint to other countries, Oakville ranks 3rd among countries with the largest Ecological Footprints behind only the United Arab Emirates (9.5 gha/capita), and the United States (9.4 gha/capita). Oakville exceeds the average footprint of high income countries (as defined by the World Bank) by over 40%. Table 9 presents the top ten countries with the largest per capita Ecological Footprints and the average by global income category. All national Ecological Footprint results presented in this section are from the Global Footprint Network National Ecological Footprint Accounts (2008 Report).

Table 9: Countries with the largest Ecological Footprints

Largest Ecological Footprints	EF/ Capita
United Arab Emirates	9.5
United States of America	9.4

Oakville	**9.0**
Kuwait	8.9
Denmark	8.0
Australia	7.8
New Zealand	7.7
Canada	**7.1**
Norway	6.9
Estonia	6.4
World	**2.7**
High income countries	6.4
Middle income countries	2.2
Low income countries	1.0

Source: Global Footprint Network, 2008.

It is often argued that it is unrealistic to assume that Canada or regions within Canada can attain a dramatically smaller footprint. The assumption is that Canadians would have to give up their high quality of life, security, or that geography and climate make it impossible for Canada to have a substantially lower footprint.

There is evidence, however, to suggest that other countries are able to enjoy high quality of lives, experience happiness, and be financially well off on smaller Ecological Footprints. Similarly, there are countries with cold climates, resource based economies, and similar values that have Ecological Footprints much smaller than Oakville and Canada.

High Quality Life

The United Nations Human Development Index (HDI) is considered a proxy of quality of life and well being. The index is made up of three equally weighted sub-indices measuring economic well being, health, and educational attainment (2007). If we look at the Ecological Footprint of the top ten countries which rank highest on the HDI, the Ecological Footprints range from a low of 4.0 gha per capita in the Netherlands and Japan to a high of 7.8 gha per capita in Australia. Table 10 presents the Ecological Footprint of the countries which rank in the top ten on the Human Development Index. All of these countries have Ecological Footprints lower than Oakville's.

Table 10: Ecological Footprints of countries which rank highest on the HDI Index

Top 10 Ranking Human Development Index	HDI Score	EF/ Capita	Comparison With Oakville EF
Norway	0.971	6.9	77%
Australia	0.970	7.8	87%
Iceland	0.969	n.a	n.a
Canada	**0.966**	**7.1**	**79%**
Ireland	0.965	6.3	70%
Netherlands	0.964	4.0	44%
Sweden	0.963	5.1	57%
France	0.961	4.9	54%
Switzerland	0.960	5.0	56%
Japan	0.960	4.9	54%
Oakville	**n.a**	**9.0**	**100%**

Sources: United Nations Development Programme, 2009; Global Footprint Network, 2008.

Happiness

If the objective of the human experience is to be happy, there is ample evidence to suggest that people are able to experience high levels of happiness with dramatically lower footprints. If we examine the countries which rank in the top ten according the World Database of Happiness (Veenhoven, 2009), Ecological Footprints range from a low of 2.3 gha/capita in Costa Rica to a high of 8.0 gha/capita in Denmark. Table 11 displays these findings.

Table 11: Ecological Footprint of happiest Countries

Top 10 Happiness Ranking	Happiness Score (0-10)	EF/ Capita	Comparison with Oakville EF
Costa Rica	8.5	2.3	26%
Denmark	8.3	8.0	89%
Iceland	8.2	n.a	n.a
Switzerland	8.0	5.0	56%
Canada	**8.0**	**7.1**	**79%**
Finland	7.9	5.2	58%
Mexico	7.9	3.4	38%
Norway	7.9	6.9	77%
Panama	7.8	3.2	36%
Sweden	7.8	5.1	57%
Oakville	**n.a**	**9.0**	**100%**

Sources: Veenhoven, R., 2009; Global Footprint Network, 2008. .

Economic Wealth

Higher levels of GDP per capita or income per capita are correlated with higher EF values (Rees and Wackernegal 1996; Wilson 2007). In spite of the correlation, countries have been able to achieve high levels of economic prosperity with different footprint sizes. Table 12 lists the top ten countries with the highest GDP per capita (PPP) in the world. GDP Purchase Price Parity (PPP) is a measure of GDP that takes into account the difference in purchasing power between countries. It is a measure of GDP which equalizes the purchasing power of different currencies. Ecological Footprints range from a high of 9.5 ha/capita in the United Arab Emirates to a low of 4.2 ha/capita in Singapore.

Table 12: Ecological Footprint of top ten richest countries

Top 10 highest GDP/Capita in the world (PPP) (2007)*	GDP/ Capita (PPP) $US	EF/ Capita	Comparison with Oakville EF
Liechtenstein	85,382	n.a	n.a
Luxembourg	79,485	n.a	n.a
Qatar	74,882	n.a	n.a
United Arab Emirates	54,626	9.5	106%
Norway	53,433	6.9	77%
Brunei Darussalam	50,200	n.a	n.a
Singapore	49,704	4.2	47%
Kuwait	47,812	8.9	99%
United States	45,592	9.4	104%
Ireland	44,613	6.3	70%
Switzerland	40,658	5.0	56%

Sources: United Nations Development Programme, 2009. Global Footprint Network, 2008.

In terms of Western countries with the largest economies, if we compare the Ecological Footprints of the G8 nations (G7 + Russia), with the exception of the United States and Canada, the remaining countries have Ecological Footprints around half the value of Oakville's Ecological Footprint. Table 13 reports the Ecological Footprint of G8 countries.

Table 13: Ecological Footprint of G8 Nations

G8 Countries	EF/ Capita	Comparison with Oakville EF
Britain	5.3	59%
Canada	**7.1**	**79%**
France	4.9	54%

Germany	4.2	47%
Italy	4.8	53%
Japan	4.9	54%
Russia	3.7	41%
United States	9.4	104%
Oakville	**9.0**	**100%**

Source: Global Footprint Network, 2008.

Coldest Climate

Canada's cold climate is often used to rationalize our large per capita Ecological Footprint. Energy consumption affiliated with our homes (Oakville) accounts for 30% of the total energy footprint. Approximately 60% of that amount can be attributed to space heating. Of those countries which have the coldest climates in the world, Ecological Footprint values range from a low of 3.4 gha per capita in Kazakhstan to a high of 7.1 gha per capita in Canada. Table 14 lists the counties with the coldest climates in the world. The country ranking, as listed by the World Climate database (2008), is based on the climate of the capital city.

Table 14: Ecological Footprint of coldest countries in the world

Coldest (based on capital cities)	Average annual temperature	EF/ Capita	Comparison with Oakville EF
Mongolia	-1.3 °C	3.5	39%
Kazakhstan	1.0 °C	3.4	38%
Russia	4.2°C	3.7	41%
Finland	4.5°C	5.2	58%
Iceland	4.6°C	n.a	n.a
Estonia	5.2°C	6.4	71%
Belarus	5.5°C	3.9	43%
Canada (Ottawa)	5.5°C	7.1	79%
Norway	5.6°C	6.9	77%
Sweden	5.8°C	5.1	57%
Oakville	**7.9°C**	**9.0**	**100%**

Sources: World Climate, 2008; Global Footprint Network, 2008.

Conclusion

The Oakville Ecological Footprint Analysis report provides a snapshot of Oakville's current Ecological Footprint based on the 2008 National Footprint Accounts and provides a benchmark

to measure future progress against. Reporting Oakville's Ecological Footprint offers an easy to understand assessment of where the Town stands in relation to overall sustainability objectives. The Ecological Footprint, in combination with a set of complementary indicators, provides a comprehensive framework for setting targets and measuring progress towards sustainability goals. As demonstrated in the report, the Ecological Footprint can also be used to track the savings of planning and policy decisions and other community actions. More generally, it has been widely successful as a tool to raise awareness about the impact of lifestyle and consumption choices and support efforts to live more sustainably.

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