

INDEX NEWS

Bio Capacity V Edition

Dec 2017

What To Expect

In the December 2017 Edition **we are awarding 3 cities the title "Canada's Greenest City 2017"**. The top city in each city size category will receive the award. After 2 years of studying Canadian cities and collecting thousands of data points, we can say with confidence that this study is now comprehensive enough to measure city ecological footprints.

The scoring process is fully automated including the generation of city data spreadsheets and graphs. All our data and results are released to the public domain. We encourage others to use it in their research.

The data used measures the anthropogenic impact of over 50% of the Canadian population. The index is focused on measuring impacts from Nature's perspective. This is accomplished by using indicators that measure greenspaces, weather, seasons, climate and human activity. There are also Indicators for population pressures, housing, water consumption, waste, land use and city efficiencies.

In each edition we iteratively advance the science and widen the scope of the data. Over time this approach should be able to outpace any other method of studying anthropogenic effects.

"If we are to build greener cities then we must first see Nature clearly"

"Our roadmap does not extend beyond its research horizon"

- Marlon Kevlar



Research shows that looking at the color green can stimulate creativity

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Incrementally Refinements of Indicators

Edition	Indicator Refinements
1st	Introduce Indicator
2nd	Add Detail to Indicators
3rd	Add Weighting to Formulas
4th	Automate short periodic data
5th	Historic Seasonal Adjustments



Data Driven

This study uses data that can be realistically collected. Surprisingly this has enhanced research because it forces us to look at the data more creatively.

Example:

The traditional way of calculating population density is conditional.

$$\text{Pop} / (\text{Area})$$

It is inaccurate because we do not build homes in parks, lakes, rivers. A better formula is

$$\text{Pop} / (\text{Area} - \text{Greenspaces})$$

Many statistics commonly used have assumptive conditions.

The goal is to incrementally study and measure the anthropogenic impact of cities

Roadmap

Currently this study along with the GreenScore City Index are in the *Bio Capacity* phase. The rating system that runs the index has the capacity to process every city on the planet. Our website and Operational Support Systems (OSS) require greater financial investment before we can add more cities or expand the index into other countries

Bio Capacity Editions are focused on collecting data and developing indicators that achieve the objectives listed in the diagram above.

New indicators are introduced after 50% of the data is collected. Indicators are given a starting formula which is incrementally refined over multiple editions. This allows time for field work, data collection, studies and city feedback for the refinement process.

Natural Footprint: The focus is now on identifying and measuring agricultural lands, urban farming operations and green roof areas. Indicators that calculate bio capacity are also being scoped.

City Footprint: The focus is on studying parking lots and other catch basins that collect and channel flood waters during extreme weather events.

Partnerships

ICLEI Canada, we are building a working relationship for the GHG emissions indicator.

STAR Communities, we are building a working relationship for the purpose of scoring cities in the USA.

FCM, we are exploring study funding and FCM representation on our Index Steering Committee.

Global Footprint Network, We are building a partnership for collaborative expertise and data sharing.

WWF Canada, we are exploring areas of expertise overlap.

BOMA Canada, We are studying the BOMA BEST certification program.

Ministry of Environment & Climate Change, we are exploring funding, data sharing, and scientific expertise.

Cities Studied, we regularly communicate with multiple departments for feedback, data sharing, direction and expertise.

Indicator	Score	Formula	Source Data	Unit
City	0.0000	Large if pop>450k; Medium if pop>150k; otherwise	L	si
Population	0.9658	1 - Normalized Population	593638	co
Area	0.9434	1 - Normalized Area	266.36	Kr
City	0.3767	Normalized(Population / (Area - GreenSpace Area))	2638	Pop/
GreenSpace Pressure	0.1095	1 - Normalized(Percent Growth), if <0 use 0	13.3	per
Transportation (bus,bike,walk)	0.0000	Sum of Normalized(Percentages x Weight)**	0	per
Distance for solo commutes	0.6667	1 - Normalized(Median Driving Distance)**	0.3333	K
Distance outside city	0.0000	1 - Normalized(Dwelling Count x Percentage)	0	co
GreenSpace	0.9478	1 - Normalized(Dwelling Count*)	1304875	co
Emissions	0.0158	1 - Normalized(Total Particulate Matter Emissions)	181534	Ton
Garbage	0.8389	1 - Normalized Garbage Tonnage	214952	Ton
Recycling Rate	0.4510	Percentage of Garbage Recycled	45.1	per
Organic Tonnage	0.0153	Score = Normalized(Residential Organic Tonnage)	36275	Ton
Water Usage	0.2349	1 - Normalized(Water Usage)	795	L/Cap
GHG	0.3902	1 - Normalized City GHG	171	Mto
Renewable Capacity	0.2810	Renewable Capacity / Total Capacity	0.281	M
Clear Landing Page	1.0000	Clear landing page score = 1, otherwise score = 0	1	boo
Winter	0.2178	Normalized(Winter Min Monthly Avg) x 40%	-6.7	Cel
Summer	0.0000	1 - Normalized(Summer Max Monthly Avg) x 60%	26.8	Cel
Climate Index	0.2353	1 - Normalized(Actuaries Climate Index)	0.71	num
	0.1499	Normalized	3600	F
	0.5448	Normalized	850	co
	0.0297	Normalized	512	F
Rate Zone	0.4167	Normalized	60	num
Indicator Count	2.6000	Indicator Count - (missing data point count)	26	co
	0.0000	0 x Normalized(Sum(All DataDate years))	44319	num
	11.4312	Sum of Normalized Scores		
TOTAL SCORE	114	10 x Rounded(Score)		

Example from a downloadable Spreadsheets

Data Requests

All data points are periodical and the majority of them are update annually. Any report containing the data points can be collected. We accept official website links, PDF files, emails and virtually any data format.

- **Infrequent Data Changes** Some indicator data does not change often for example city size, new greenspaces, wilderness reserves, etc..
- **Out-of-Date Data** is highlighted in the spreadsheets and can be downloaded from each city's webpage. All out-of-date data has a small negative impact that is reflected in the **Data Freshness Indicator**. This should encouraged cites to send us updates proactively.
- **Missing Data Points** Any missing data points are FLOOR scored which means they are given a score of zero.
- **Indicator Ceilings** Some cities have data points that dwarf all other cities. In these cases the data point maximum is awarded to the next highest and the city's data point is ceilinged.

In 2018 we will be studying periodic data with the intent of understanding city reporting cycles so data request can be synchronized to data availability.

Data Freshness

The only fair way to decide what is out of date is through consensus by the majority of cities being studied. This takes into account the lead time needed to compile most statistics. Fortunately it can be done mathematically without the need to contact anyone. The calculation is done separately for each city size because smaller cities have fewer human resources and thus need longer lead times.

The Formula

1. Average the date year of the newest 50% of data points per indicator
2. If $(Avg\ Year) - (City\ Data\ Point\ Year) > 0.5$ the data point is out of date
3. Count out of date data points for each city and divide by 10
4. Lower is better

Data Freshness was added as an incentive for cities to send us up to date data. This Index is comprised of many comparative indicators which means score results become more accurate when participation rates are higher.

$$\text{Normalized} = \frac{(\text{city value} - \text{minimum value})}{(\text{maximum value} - \text{minimum value})}$$

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