

**ESTD17 - Cohort Capstone Project**  
**Dr. Jim MacLellan**  
**April 19, 2019**

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**Project:**

Socio-economic comparisons between ICIMOD countries to address gender disparities

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## **Statement of work**

Project: Socio-economic comparisons between ICIMOD countries to address gender disparities

Start Date: March 11, 2019

End Date: April 19, 2019

Number of Team Members: 2

### **Introduction**

The International Centre for Integrated Mountain Development (ICIMOD) is an intergovernmental knowledge sharing network comprised of the Hindu Kush Himalayan (HKH) countries: Afghanistan, Bangladesh, Bhutan, China, India, Myanmar, Nepal and Pakistan (ICIMOD, 2019). Political, economic, socio-cultural and climatic changes impact the livelihoods of the people in these mountain regions. It is ICIMOD's goal to create societies that are knowledgeable and adaptable to these conditions in order to promote healthy sustainable mountain development (ICIMOD, 2019).

Each country of the HKH poses their own unique differences and challenges with economy, culture, government, and environmental conditions, which influence gender roles, norms and development opportunities. For example, women in rural regions are often stewards of the environment and possess knowledge for sustainable practices obtained from their daily lives in caretaking roles that require them to collect resources such as water, wood or maintained pastures. This knowledge, though important is often neglected due to perceptions of gender. ICIMOD acknowledges this and released their Gender Equity Policy piece in 2013, paying particular attention to the importance of the role of women in adapting mountain development. As part of ICIMOD's goal of ensuring a sustainable and healthy mountain environment, they inquire the participation and knowledge from all people, including women.

To address environmental adaptation, the characteristics of the problem need to be accounted for; these can identify where the system has vulnerabilities and thus indicate areas for adaptive capacity, where actual change can be made (Maclellan, Morand & Fountain, 2011). In order for ICIMOD to create transnational guidelines for gender equity improvement, commonalities and differences between the countries need to be identified. It is acknowledged that quantitative data alone could not address the depth of the sensitivity and complexity of the issue of gender inequity. However, this data can act as a baseline for the foundation of guidelines and principles, while also being able to visually demonstrate the scope of the issue through simple statistics.

## **Objective**

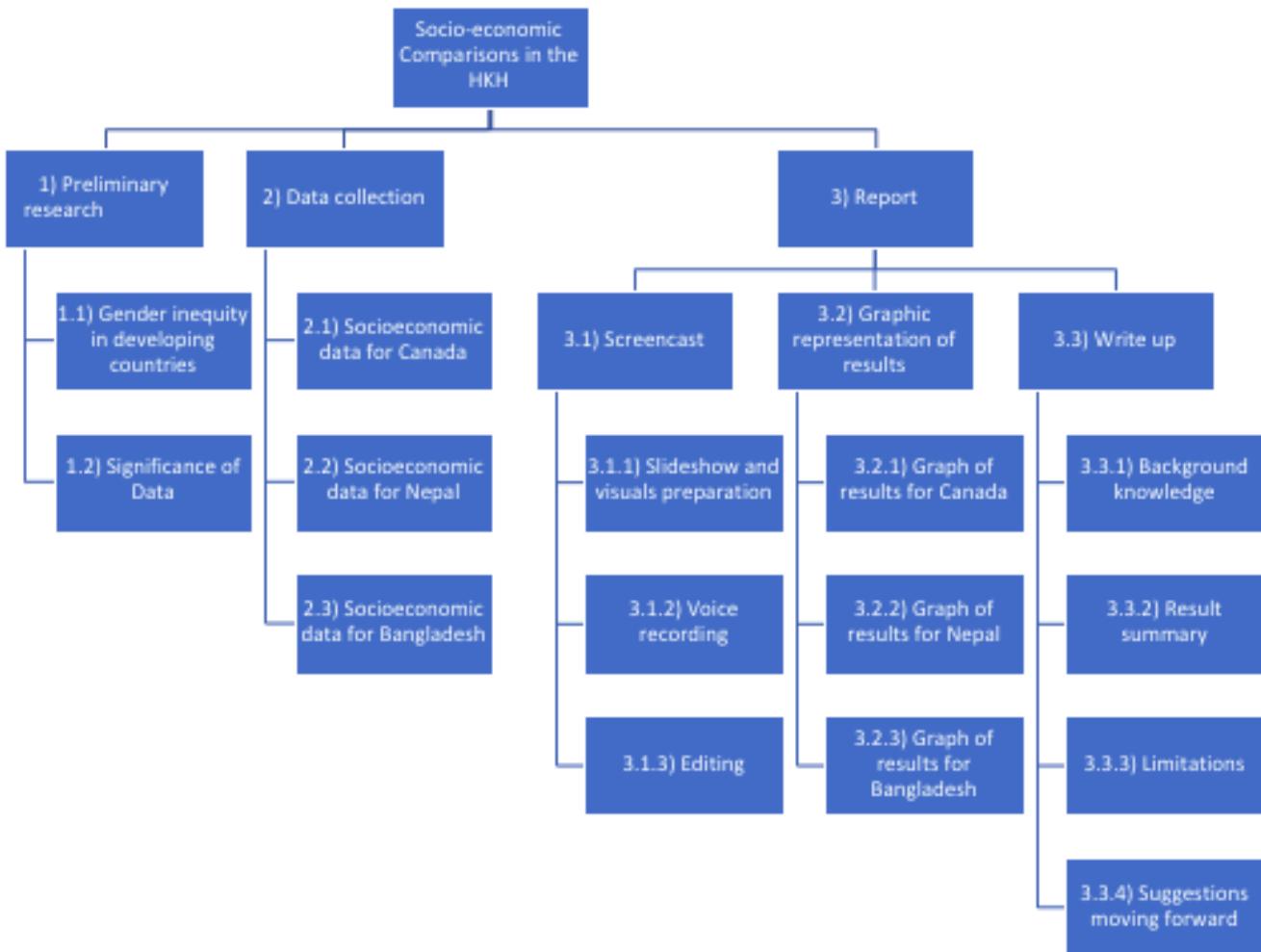
This project aims to serve as a preliminary analysis for a comparative study on the socio-economic data collected from the HKH countries on all leadership levels: municipal, provincial and national that cover general demographic information as well as gender specific data. It will specifically focus on data from Nepal and Bangladesh in comparison to data collected from Canada. It will address the commonalities and differences between results and data sources from the studied countries.

Data is sought to support adaptation decision making. However, the problem is that the data itself may not exist (MacLellan, Morand & Fountain, 2011). This research also aims to address these knowledge gaps to provide room for prospective projects to identify data collection methods or models to produce information that can complete these voids.

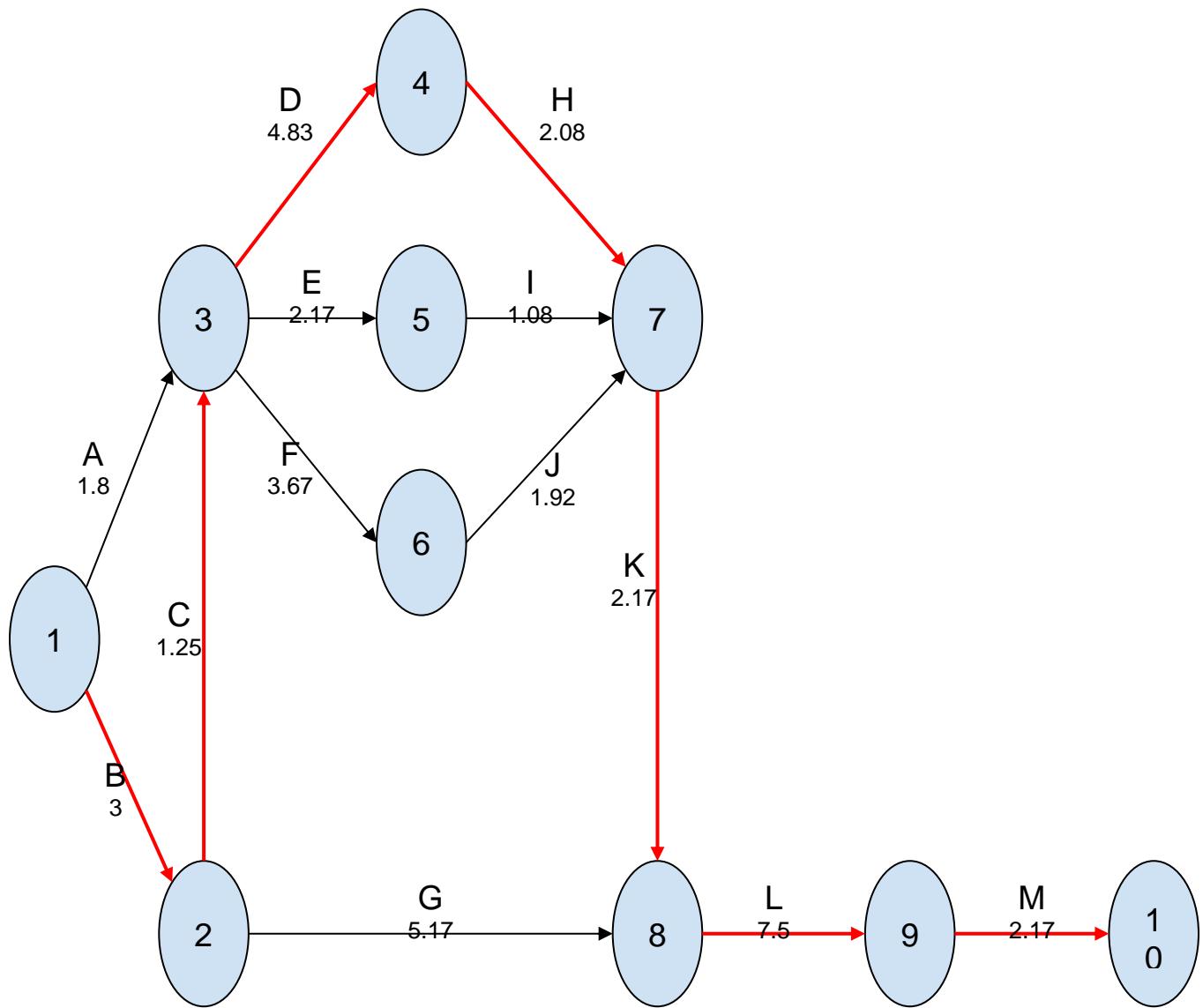
## **Core Deliverables**

- Comparative summary charts of socio-economic data at the local, regional and national levels
- Graphs to visually compare data results and identify data gaps
- Screencast to summarize research
- Final report to record project process and results
- Steps for future projects

## Work Breakdown Structure



## Pert Diagram



### Legend

- |   |   |
|---|---|
| A) Meeting with Research Librarian                    | F) Data collection for Bangladesh(city,province,national) |
| B) Analyzing information on gender/ data collection   | G) Constructing report draft                              |
| C) Synthesizing gender/data information               | H) Create graph for Nepal                                 |
| D) Data collection for Nepal(city,province,national)  | I) Create graph for Canada                                |
| E) Data collection for Canada(city,province,national) | J) Create graph for Bangladesh                            |
|   | K) Summary of results                                     |
|   | L) Create final draft                                     |
|   | M) Screencast creation                                    |
|   | N) Project termination                                    |

## Methods

Prior to searching and collecting data files, the first step was to establish which socioeconomic indicators to observe. To do this, our team referred to Wall and Marzall's work (2006) that discusses indicators for adaptive capacity towards climate change. Below are the tables that list out various indicators that are suggested for research enhancement. Bolded are the indicators that our team focussed on.

Table 1. Framework for adaptive capacity: resources, definitions and related variables

Resource	Definition	Variables
Social	People's relationships with each other through networks and the associational life in their community	<ul style="list-style-type: none"> <li>- Community attachment</li> <li>- Social cohesion</li> </ul>
Human	Skills, education, experiences and general abilities of individuals combined with the availability of 'productive' individuals	<ul style="list-style-type: none"> <li>- <b>Productive population</b></li> <li>- Education infrastructure</li> <li>- <b>Education levels</b></li> </ul>
Institutional	Government-related infrastructure (fixed assets) – utilities such as electricity, transportation, water, institutional buildings and services related to health, social support, and communications	<ul style="list-style-type: none"> <li>- Utilities infrastructure</li> <li>- Emergency preparedness</li> <li>- Health Services</li> <li>- Communication services</li> </ul>
Natural	Endowments and resources of a region belonging to the biophysical realm, including forests, air, water, arable land, soil, generic resources, and environmental services	<ul style="list-style-type: none"> <li>- Potable water quality</li> <li>- Potable water quantity</li> <li>- Surface water</li> <li>- Soil conditions</li> <li>- Forest reserves</li> <li>- Fish reserves</li> </ul>

Economic	Financial assets including built infrastructure as well as a number of features enabling economic development	<ul style="list-style-type: none"> <li>- <b>Employment levels and opportunities</b></li> <li>- Economic assets</li> </ul>
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Taken from Wall & Marzall's *Adaptive Capacity for Climate Change in Canadian Rural Communities* (2006)

Table 2: Framework for adaptive capacity with possible indicators

Resource	Variable	Indicator
Social	Community attachment	<ul style="list-style-type: none"> <li>- Buckner scale</li> </ul>
	Social cohesion	<ul style="list-style-type: none"> <li>- Trends in mobility rates</li> <li>- Number of community events</li> </ul>
Human	Productive population	<ul style="list-style-type: none"> <li>- <b>Trends in dependency ratios</b></li> </ul>
	Education infrastructure	<ul style="list-style-type: none"> <li>- School/institutional availability measure</li> </ul>
	Education levels	<ul style="list-style-type: none"> <li>- <b>Trends in years of schooling completed</b></li> </ul>
Institutional	Political action	<ul style="list-style-type: none"> <li>- Elected representation</li> </ul>
	Utilities Infrastructure	<ul style="list-style-type: none"> <li>- Age and condition</li> </ul>
	Emergency preparedness	<ul style="list-style-type: none"> <li>- Number of programmes available</li> </ul>
	Health services	<ul style="list-style-type: none"> <li>- Services available</li> </ul>
	Communication services	<ul style="list-style-type: none"> <li>- Availability of local radio/ TV/ ARES</li> </ul>
Natural	Potable water quality	<ul style="list-style-type: none"> <li>- Frequency of contamination</li> </ul>

Potable water quantity	<ul style="list-style-type: none"> <li>Frequency of shortage measure</li> </ul>
Surface water	<ul style="list-style-type: none"> <li>Quality/quantity assessment</li> </ul>
Soil conditions	<ul style="list-style-type: none"> <li>Percentage of class 1 land</li> <li>Erosion/ quality measure</li> </ul>
Forest reserves	<ul style="list-style-type: none"> <li>Diversity/ age measure</li> </ul>
Fish reserves	<ul style="list-style-type: none"> <li>Quality/ quantity measure</li> </ul>
Economic	Employment levels and opportunities <ul style="list-style-type: none"> <li>Trends in job diversity</li> <li><b>Trends in employment rates</b></li> </ul>
	Economic assets <ul style="list-style-type: none"> <li>Trends in income level</li> <li><b>Trends in home ownership rates</b></li> <li>Local business ownership rates</li> </ul>

*Taken from Wall & Marzall's Adaptive Capacity for Climate Change in Canadian Rural Communities (2006)*

Knowing the potential difficulty, we may come across in data collection within the HKH countries, we decided to stick with demographic information that is most commonly collected in census or survey data.

The second step was meeting with a research librarian that could assist us in determining dependable internet sources that could be used for collecting socio-economic data. This was an essential step as we were provided with a list of reliable data sources

To facilitate communication and organization of the information sources used, Google Drive was acted as our main work platform. Here, we established a comprehensive, interactive chart that represents knowledge gaps, comparisons between countries, provinces and cities as well as the direct links for each source of information.

Using the information that we had, comparative bar charts were created to visualize the findings. The initial plan was to create radar diagrams (amoeba charts as Wall and Marzall (2006) refers them as). The radar diagrams would have depicted the differences in indicator results between the three government levels. However, due to a lack of consistent information, this was not possible. Instead, a variety of bar charts were created for visual representation. These can be found in the following section as well as [Appendix A](#).

## Results

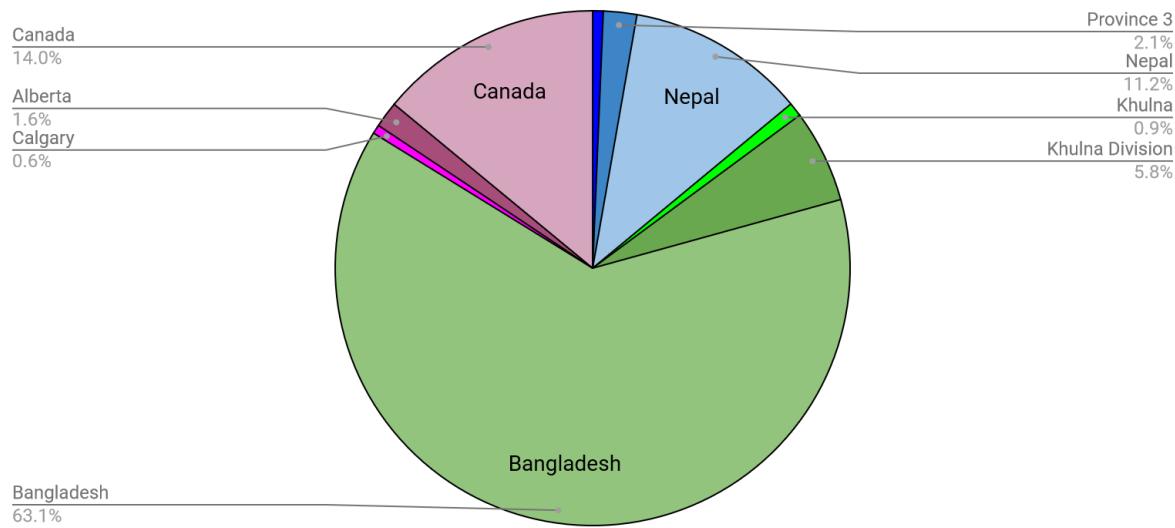
**Table 3.** Total socio-economic data collected

	City			Province			Country		
Indicator	Kathmandu	Khulna	Calgary	Province 3	Khulna Division	Alberta	Nepal	Bangladesh	Canada
Household #	<a href="#">436344</a>	<a href="#">547347</a>	<a href="#">489271</a>	<a href="#">1270797</a>	<a href="#">3707047</a>	<a href="#">1654129</a>	5427302	<a href="#">31705684</a>	<a href="#">14072080</a>
Population	<a href="#">1744240</a>	<a href="#">2318527</a>	<a href="#">1486050</a>	<a href="#">5529452</a>	<a href="#">15386663</a>	<a href="#">4307110</a>	<a href="#">29620000</a>	<a href="#">166370000</a>	<a href="#">36950000</a>
Population (male)	<a href="#">913001</a>	<a href="#">1175686</a>	<a href="#">744427</a>	<a href="#">2747633</a>	<a href="#">7708350</a>	<a href="#">2167207</a>	<a href="#">14390000</a>	<a href="#">83860000</a>	<a href="#">18340000</a>
Population (female)	<a href="#">831239</a>	<a href="#">1244226</a>	<a href="#">741623</a>	<a href="#">2781819</a>	<a href="#">7678313</a>	<a href="#">2139903</a>	<a href="#">15230000</a>	<a href="#">82510000</a>	<a href="#">18610000</a>
Education (Primary total, Grade 1-5)	<a href="#">172232</a>	<a href="#">249089</a>	<a href="#">411623</a>	<a href="#">728154</a>	<a href="#">20432</a>	<a href="#">252963</a>	<a href="#">4265000</a>	<a href="#">18605000</a>	<a href="#">2319000</a>
Primary (male)	<a href="#">89918</a>	<a href="#">107043</a>		<a href="#">369463</a>	<a href="#">10471</a>	<a href="#">129837</a>	<a href="#">130.3</a>	<a href="#">115.2</a>	<a href="#">101.4</a>
Primary (female)	<a href="#">82314</a>	<a href="#">142038</a>		<a href="#">358691</a>	<a href="#">9961</a>	<a href="#">123126</a>	<a href="#">140.7</a>	<a href="#">122.1</a>	<a href="#">101.5</a>
Education (Secondary total, Grade 6-12)				<a href="#">683509</a>	<a href="#">22231</a>	<a href="#">339891</a>	<a href="#">3277000</a>	<a href="#">15788000</a>	<a href="#">2641000</a>
Secondary (male)	<a href="#">92754</a>	<a href="#">76927</a>		<a href="#">288998</a>	<a href="#">11974</a>	<a href="#">173298</a>	<a href="#">67.1</a>	<a href="#">65.6</a>	<a href="#">112.2</a>
Secondary (female)	<a href="#">85201</a>	<a href="#">74259</a>		<a href="#">394511</a>	<a href="#">10257</a>	<a href="#">166590</a>	<a href="#">72.1</a>	<a href="#">72.5</a>	<a href="#">113.9</a>
Education (Post Secondary total)		<a href="#">110172</a>	<a href="#">603750</a>			<a href="#">172431</a>	<a href="#">361000</a>	<a href="#">2699000</a>	<a href="#">1775496</a>
Education (male)		<a href="#">65698</a>				<a href="#">69354</a>	<a href="#">11.4</a>	<a href="#">20.3</a>	<a href="#">753675</a>
Education (Female)		<a href="#">44474</a>				<a href="#">103077</a>	<a href="#">12.2</a>	<a href="#">14.2</a>	<a href="#">1021821</a>
GDP (Per Capita)	/	/	/	/	/	/	<a href="#">722</a>	<a href="#">1355</a>	<a href="#">42154</a>
GDP Growth Rate	/	/	/	/	/	/	<a href="#">0.4%</a>	<a href="#">7.1%</a>	<a href="#">1.5%</a>
Migrants (International includes refugee)	/	/	/	/	/	/	<a href="#">502670</a>	<a href="#">1500921</a>	<a href="#">7861226</a>
Migrants (Refugees)	/	/	/	/	/	/	<a href="#">24438</a>	<a href="#">307530</a>	<a href="#">134517</a>
Unemployment (rate)			<a href="#">9.5</a>	/	/	/	<a href="#">2.7%</a>	<a href="#">4.4%</a>	<a href="#">6.3%</a>
Unemployment (rate- male)				/	/	/	<a href="#">3.2%</a>	<a href="#">3.3%</a>	<a href="#">6.9%</a>
Unemployment (rate - female)				/	/	/	<a href="#">2.2%</a>	<a href="#">6.9%</a>	<a href="#">5.6%</a>

*Description: It is a compilation of information from various sources and from various years.  
Refer to embedded hyperlinks for direct sources.*

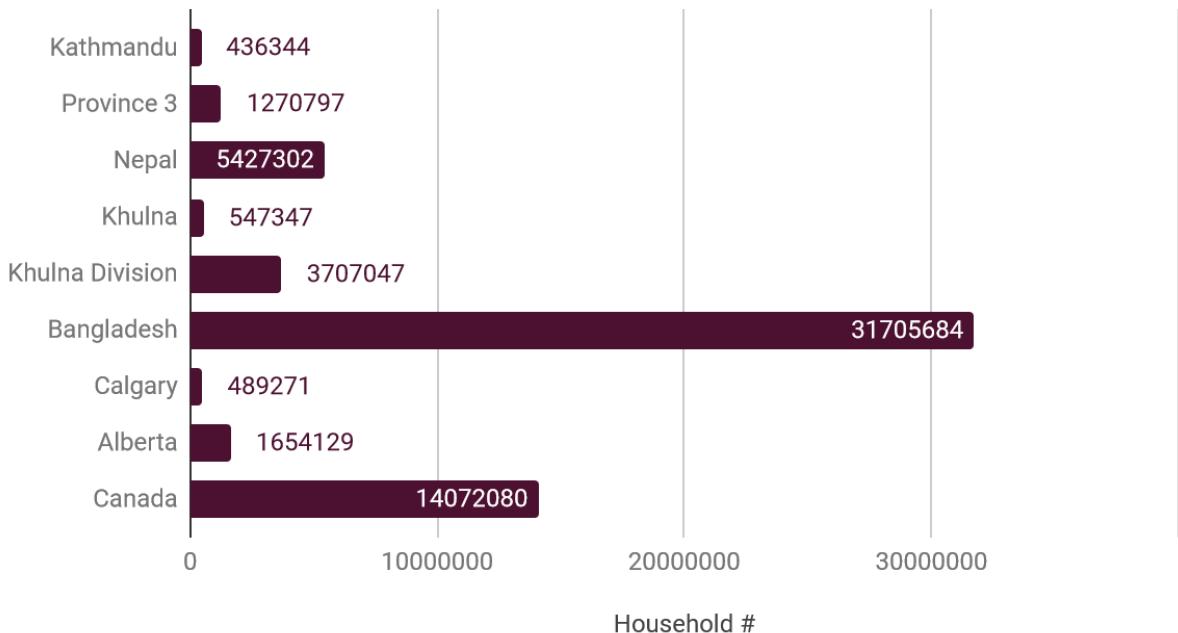
## Graphs

Total population for city, province and country (in percentage)



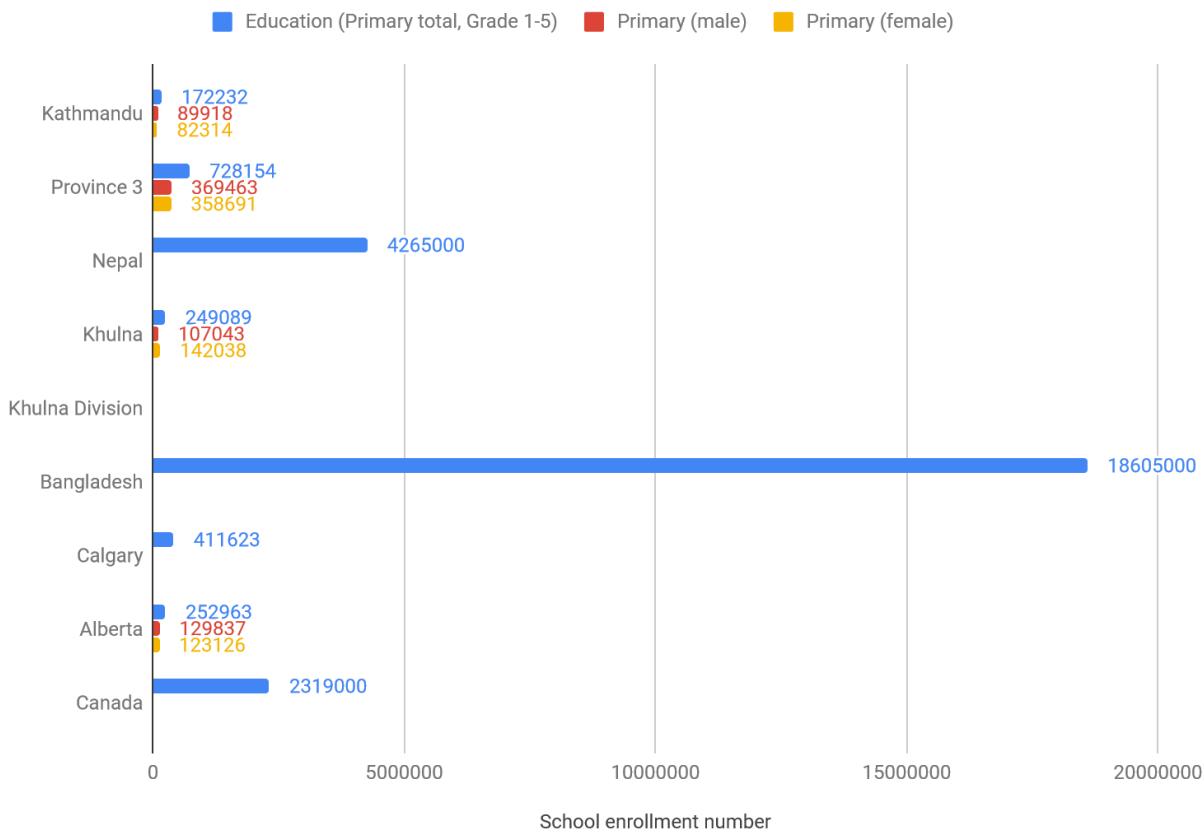
Pie chart shows the total population for municipal, provincial and national scale level. We see from the chart that both Nepal and Canada have similar number of populations with Canada being having a bit more, 14% compared to Nepal's 11%. However, as you scale down to provincial level, Nepal's province received more population than Alberta (one of Canada's provinces). On the other hand, Bangladesh has the greatest number of people living. Khulna Division itself has the population combined to all of Calgary, Alberta, Kathmandu and Province 3 (Nepal) population. Note that the missing label for dark blue colour is the city of Kathmandu population.

## Number of Households



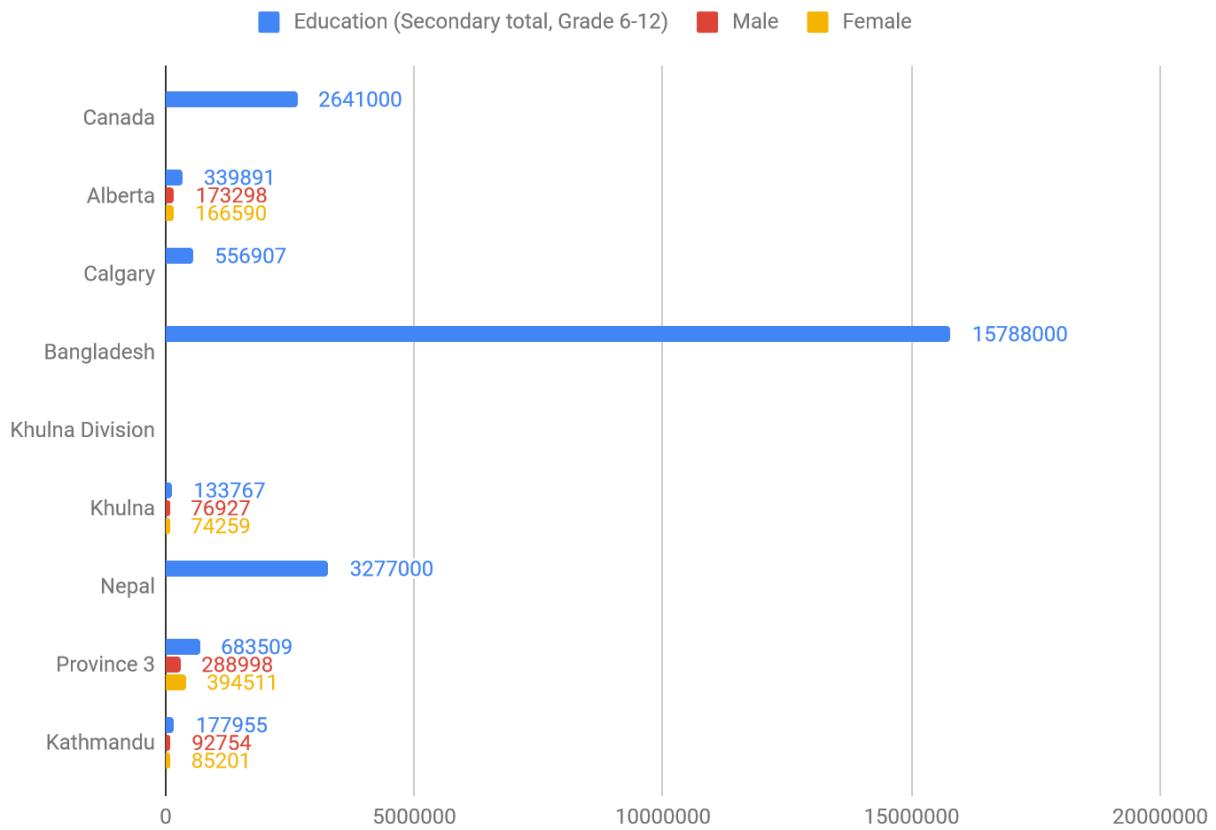
In this bar graph we see the number of households from local to national scale for three countries. Here we know from the previous population fact that Bangladesh has the most number of population occupying the most number of households. On the other hand, both Nepal and Canada have similar number of total populations, but Canada has more households number than Nepal. This explains large household size - five or above persons per households being observed in Nepal (from local to national scale) and small household size - three or below persons per households being observed in Canada.

## Primary school enrollment (Grade: 1-5)



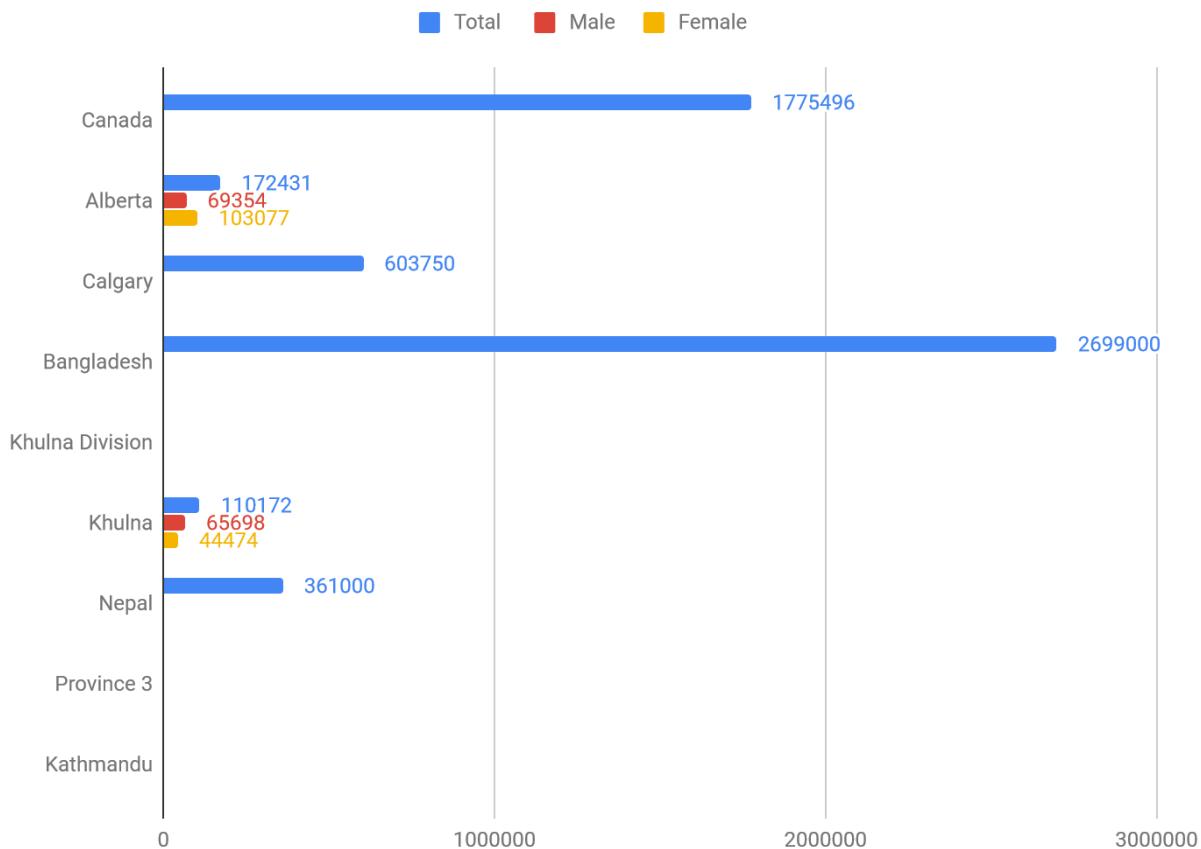
In this bar graph, we are missing male and female data for city of Calgary, Canada, and Nepal. Also missing primary school data for the Khulna Division. For this reason, we are unable to compare between provinces such as Alberta and Khulna Division. So far, what we have is that both Nepal and Canada have identical number of male and female students attending Grade 1-5. Also noticed that Khulna has more female students enrolled than male students.

## Total number of secondary school enrollment by Sex



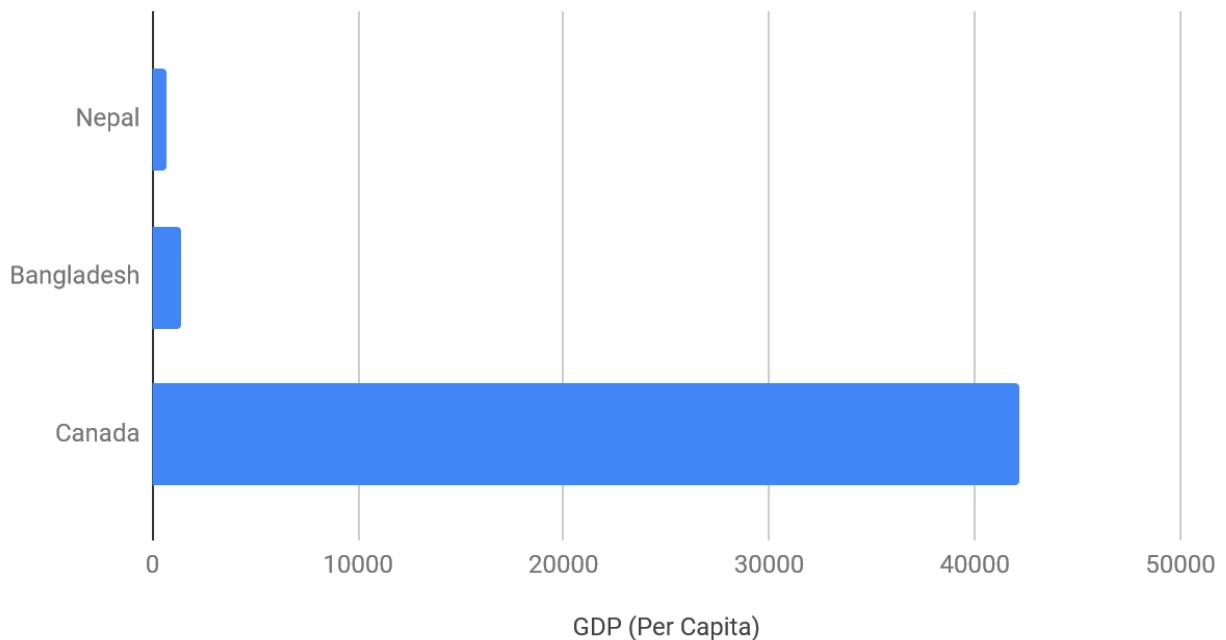
Similarly, from the previous chart, we are missing data for Khulna Division. Also missing is the male/female student enrollment data for Calgary, Canada and Nepal. From the graph, we observed that both Kathmandu, Khulna and Alberta have the higher number of male students enrolled in secondary school than female.

## Total number of post-secondary school enrollment by sex



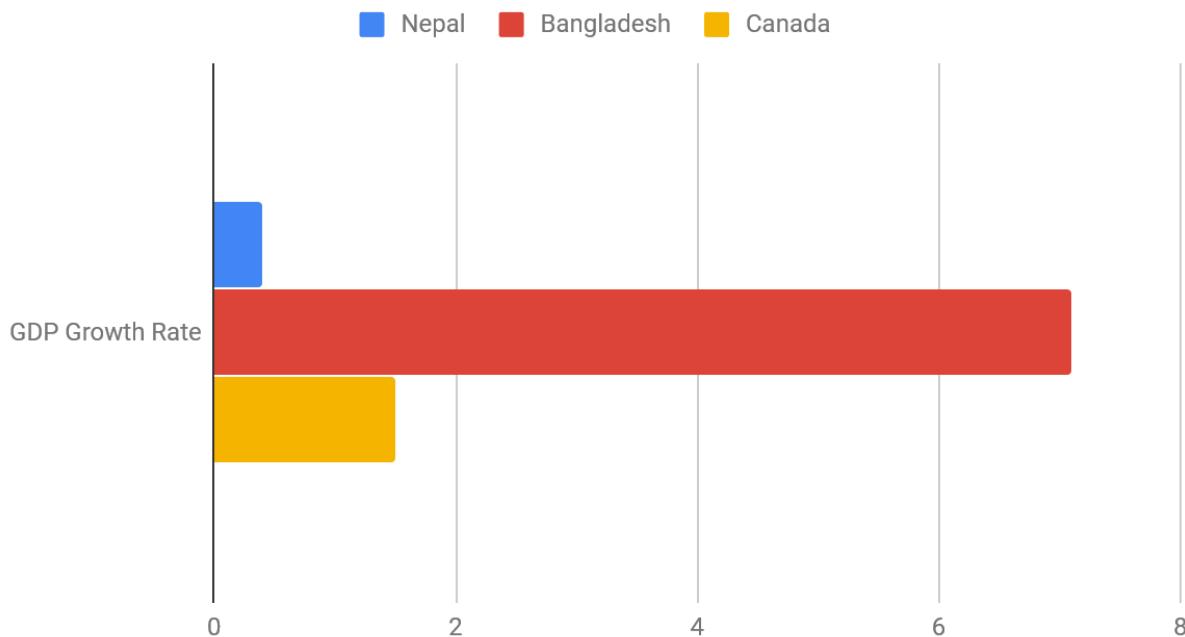
As we go from primary to post-secondary school, the number of female students enrolling are decreasing at the city of Khulna. This shows the gap between male and female students which indicates that men tend to receive more education than women, hence men are more likely to be literate. This is called gender biased education where one group of people is treated differently than another in educational setting. On the other side, Alberta has more female students enrolled in the post-secondary institutions tells us that women in this region are given the opportunity to educate themselves, achieve the highest level of education and are more likely to be literate than places such as in Bangladesh. In recent decades, western regions such as Alberta (where educational bias is limited) are attracting parents in many non-Western regions to raise their children (especially female) in western countries. This leads to high number of people migrating to the western countries because of less gender bias towards education, better policy and guidelines with regards to climate change adaptation.

## GDP (Per Capita), 2016



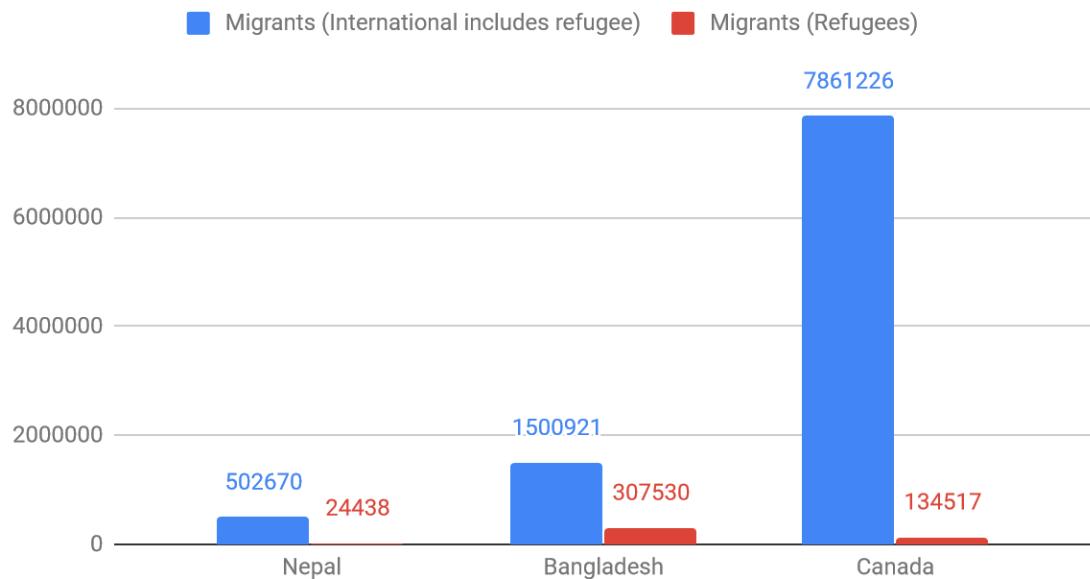
In this graph, Canada is experiencing higher GDP per capita than Nepal and Bangladesh means that Canada is having a more productive, a more advanced economy where individuals are enjoying the highest standard of living. GDP or income per capita is calculated by the total income of individuals in a specific area dividing by the total number of populations in that area.

## GDP Growth Rate (2016)



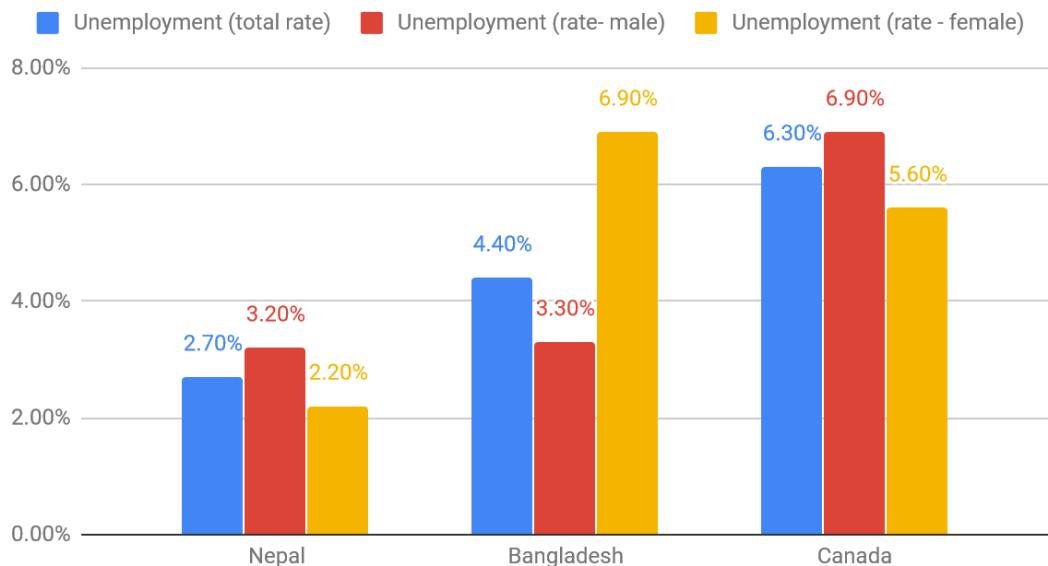
Bangladesh is experiencing the highest growth rate in this chart explains that the market value of the goods and services produced in that country has increased from one year to another. This takes into the account on the effects of inflation rate. Allowing buying power for Bangladesh that attracts western countries such as Canada to share their technology and knowledge to Bangladesh in order to sustain the environment from climate change. Nepal has the lowest growth rate in 2016 tells us that the country was experiencing a bad economy usually lower earnings for companies which translates into lower stock prices.

## Number of migration



Canada is experiencing the highest number of migrations explaining the pull factor of migration. Pull factors usually occurs in the developed countries that attracts individuals from developing countries to leave their home. Because of better economic opportunities, better education facilities, more job types, higher income levels and a promise of life and security.

## Rate of Unemployment (in percentage)



Unemployment rates were observed at the national level. Values in this chart are consistent by year (2018) and all come from the UN database. Nepal shows the lowest overall unemployment

rate while Canada has the highest. Bangladesh, however, shows the greatest unemployment gap between males and females; where females have the highest unemployment rate and males have the lowest. Nepal and Canada on the other hand, show higher unemployment among males than females.

## Discussion

The big climate adaptation factor we observed in Table 3 was education and unemployment. Our results show a generally higher count of females in educational institutions than males on a national level. On provincial and local levels however, males tended to show higher school attendance than females. By observing the unemployment rates, the difference between male and females were minimal for Nepal and Canada. In fact, those countries showed higher rates of women working than men. Contrarily, Bangladesh showed the highest unemployment rate for women, and largest difference between male and female unemployment. This can be an indication of gender inequity and social norms that may not value women in education as highly as men.

Education is the opportunity for people of various walks of life to obtain knowledge and apply those skills to benefit society. This can also mean the ability to come up with solutions and contribute to the preparation of a sustainable community and climate change adaptation (Wall & Marzall, 2006). Valuing women in the academic and work fields are necessary to contribute to the collection and application of knowledge and ideas.

We observed in the pie chart that Bangladesh has a large number of population (and is still growing) which is concerning because it leads to resource scarcities and environmental degradations. Increase number of population results in increase number of resource consumption. Resource scarcities such as natural gas (common source of energy producing electricity) are likely to limit future economic growth. The lack of; maintaining the food demand, proper water storage, providing clean source of drinking water are some of the crisis people are facing in many developing countries. Bangladesh need to develop policies and incentives to stop population growth and provide support to the group of people who are in the most vulnerable situation. Government officials and businessmen need to shift their focus from increasing their own wealth and fight for increased food production to people struggling just to stay alive for another day. Developed countries such as Canada can lend their support on funding post-secondary education to communities such as Khulna Division and promote women to participate in acquiring knowledge and have their voice shared to public just like men. Uniting together by reducing gender gap is one of the steps to protect our environment.

## Limitations

Although Wall and Marzall (2006) established important key indicators for climate adaptation and sustainable development, our work demonstrates that the necessary data is not always available and contains several knowledge gaps that can limit the progression of further research, policy developments or frameworks.

Table 3 is a compilation of information from various sources and from various years. The trouble with all the data is an inconsistency in when the information was collected. Surveys and censuses do not typically happen on an annual basis and countries such as Nepal only had their last census in 2011, making the majority of their credible data outdated by 8 years.

There is also an inconsistency in the measurement of each indicator. For example, on a national level, Canada has population numbers on post-secondary student enrollment, but for both Nepal and Bangladesh, data was only found through the UN databank as ratios, not as a population.

Due to the variability in the representation of data, we had to manually make adjustments to suit the data table. For example, we can look at Calgary's total school enrollment. The data that was found for Calgary only showed total enrollment per grade in each school that was in the municipal region. We had to add up all the applicable enrollment numbers from each school in order to add it to the chart. This was a similar case for other variables that we researched.

### **Conclusion and steps moving forward**

On top of having stable information on gender, we think ICIMOD could benefit from having a statistical database of their own that contains consistent information that could go beyond gender data alone. To expand on this project, there are different steps that can be taken. One would be to continue demographic research across the remaining HKH countries and again comparing cities that contain similar population counts. Another potential step forward is to concentrate the observations between Bangladesh, Nepal and Canada by collecting data on the remaining climate adaptation indicators that were not observed in this study (refer to tables 1 and 2 above). Upon the synthesis of this information, we can proceed towards creating surveys and identifying data formats to fill knowledge gaps and construct a uniform dataset. Filling the gaps would help us visualize the pattern in finding the gender-related issue and show it to the policymaker in those affected areas.

## Appendix

### Appendix A - Additional graphs

Figure A1: Bar graph showing the three cities population data by Sex

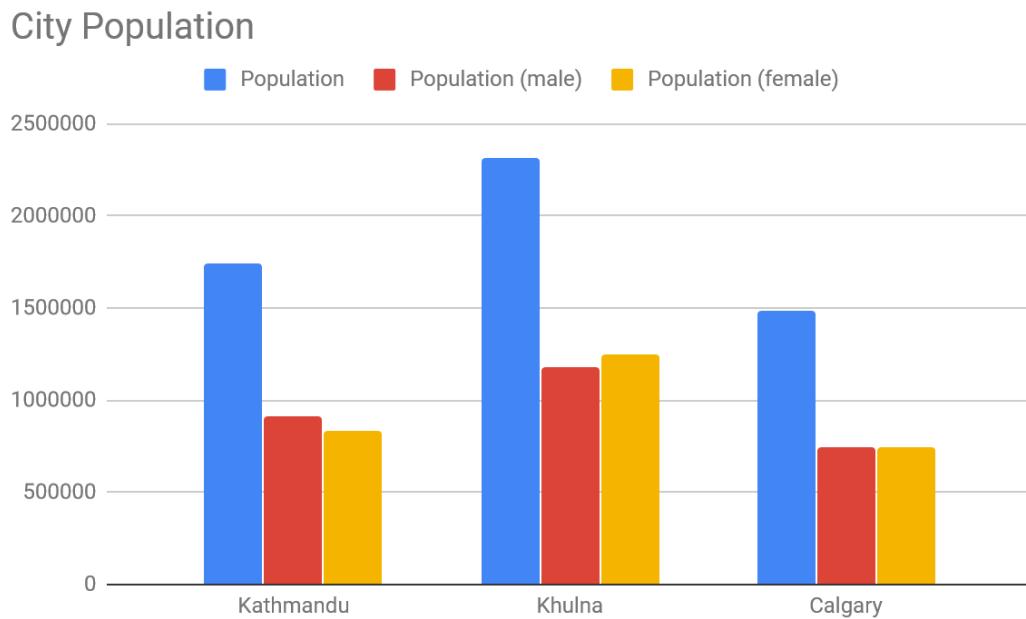


Figure A2: Bar graph showing the three provinces population data by Sex

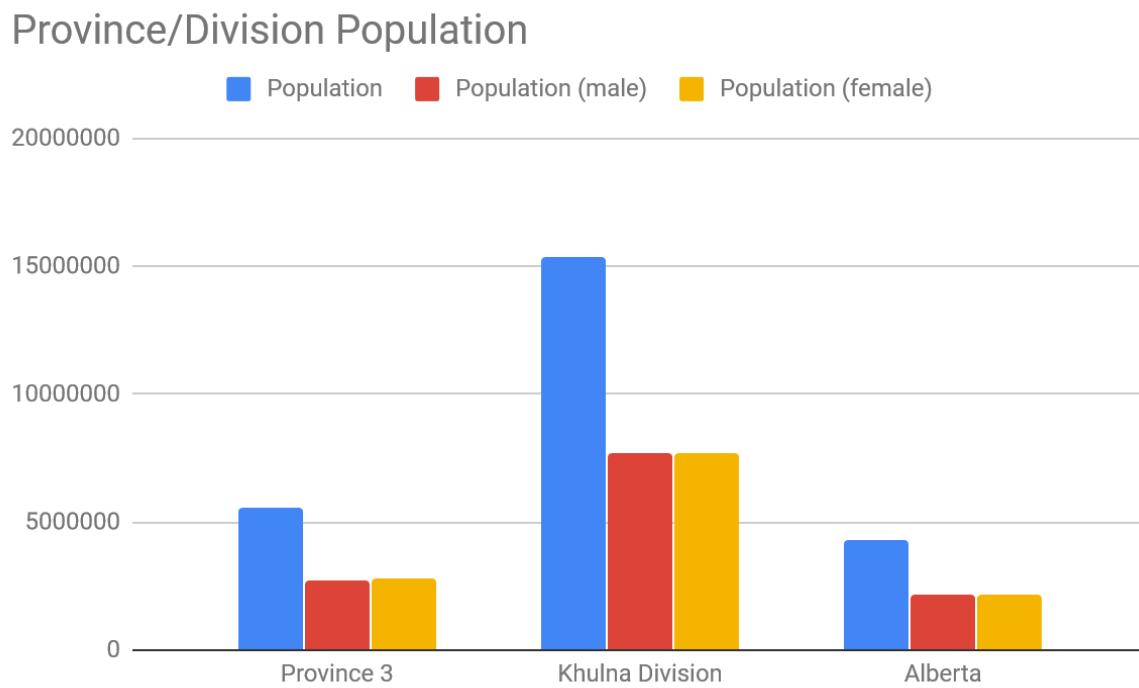


Figure A3: Bar graph showing the three provinces population data by Sex

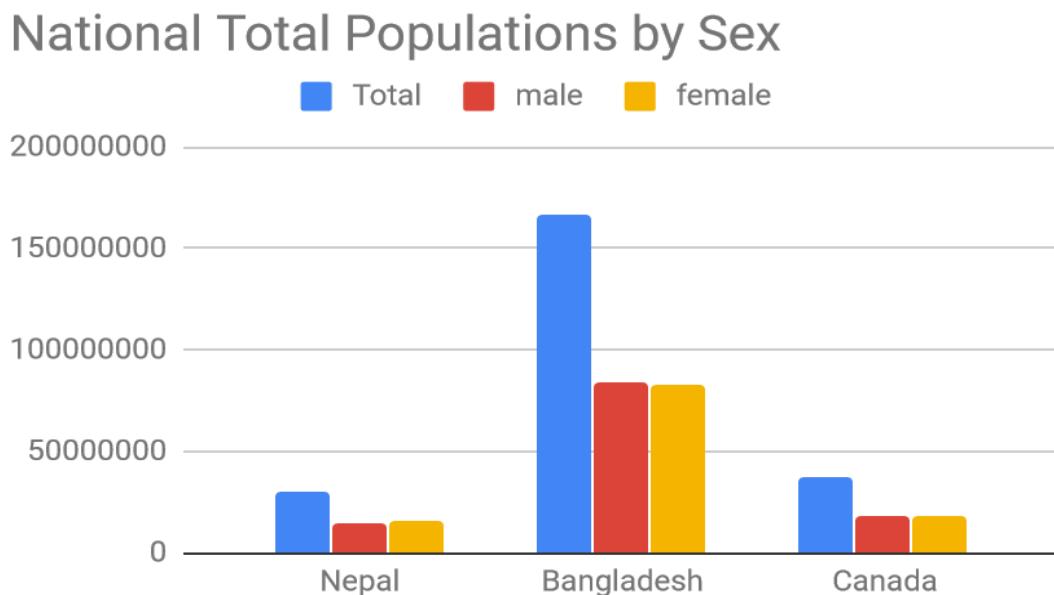


Figure 4: Primary school enrollment population by municipality

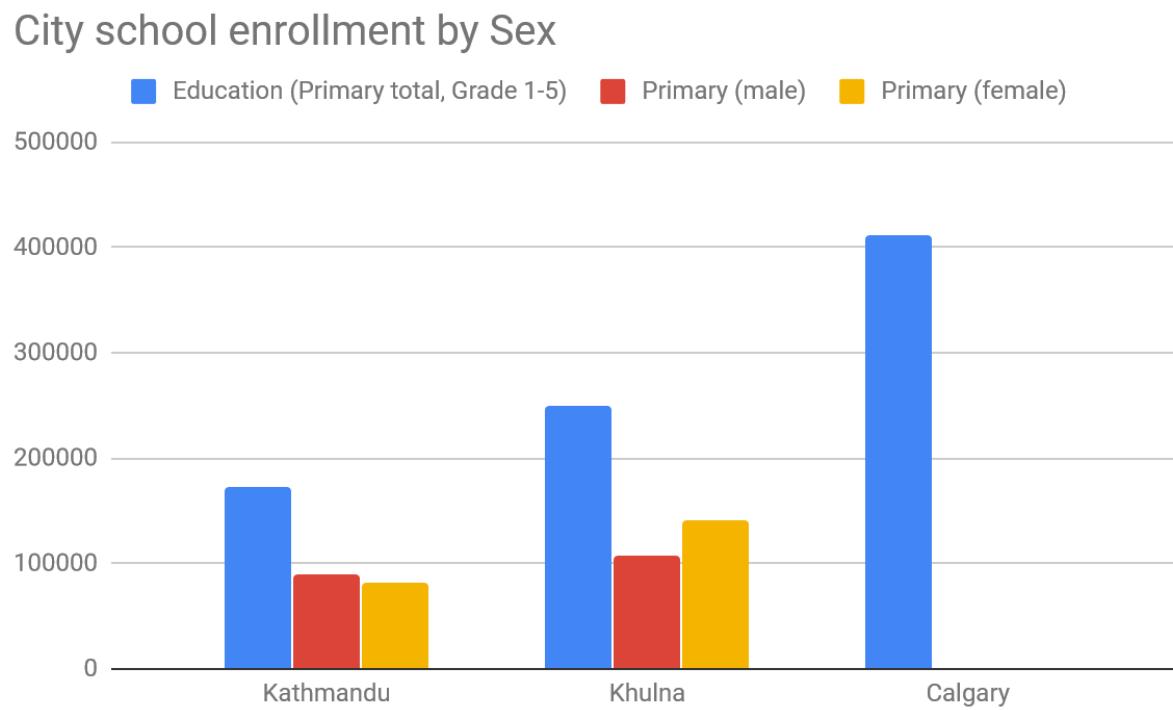


Figure 5: Primary school enrollment population by province

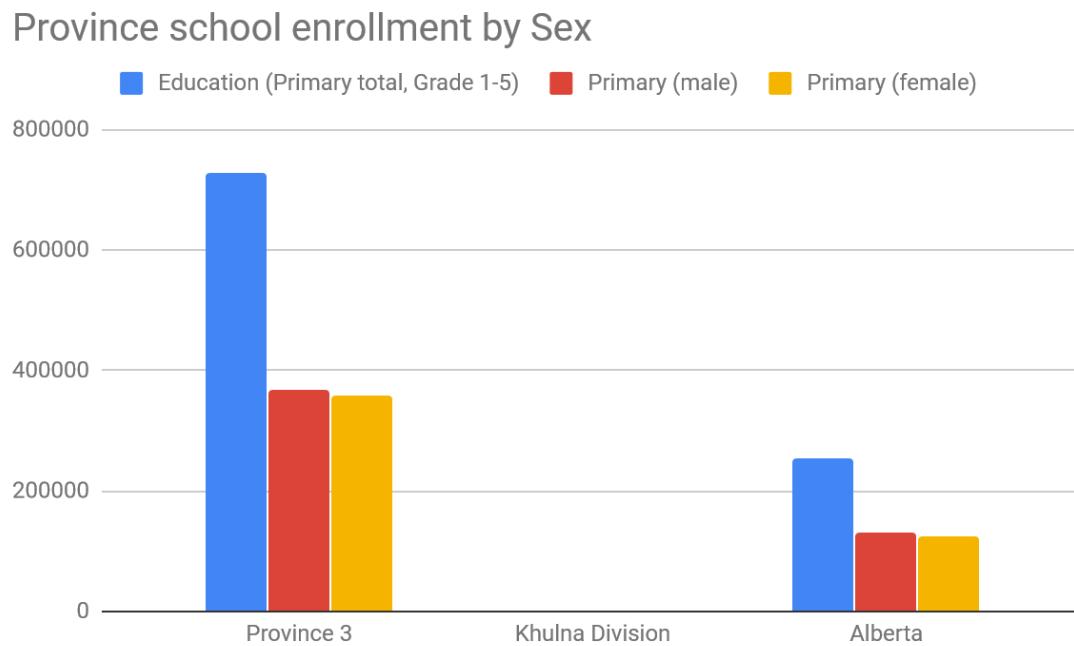


Figure 6: Primary school enrollment population by country

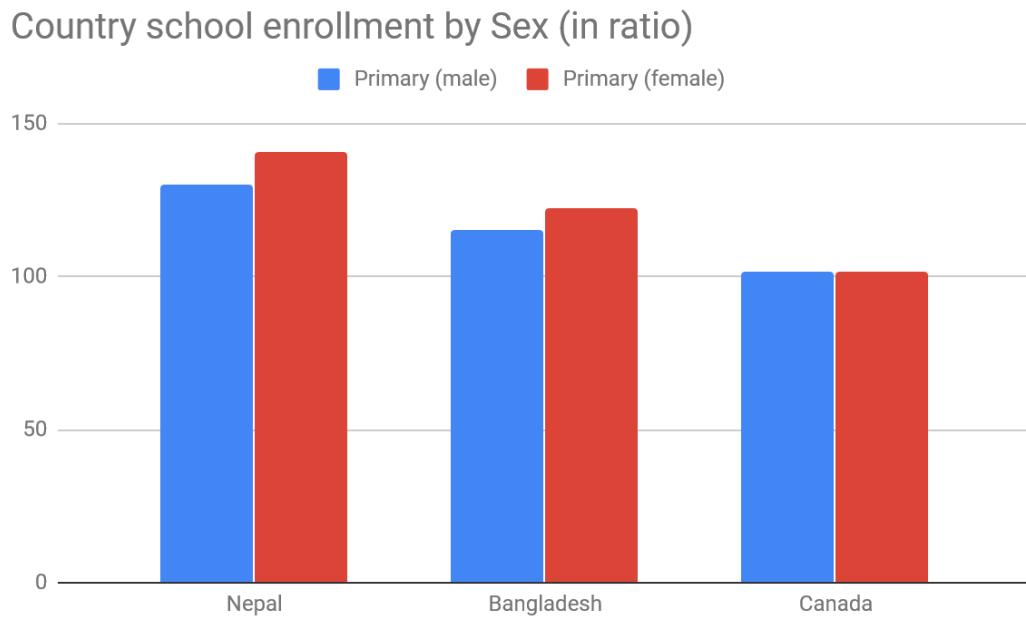


Figure 7: Secondary school enrollment population by municipality

### City school enrollment by sex

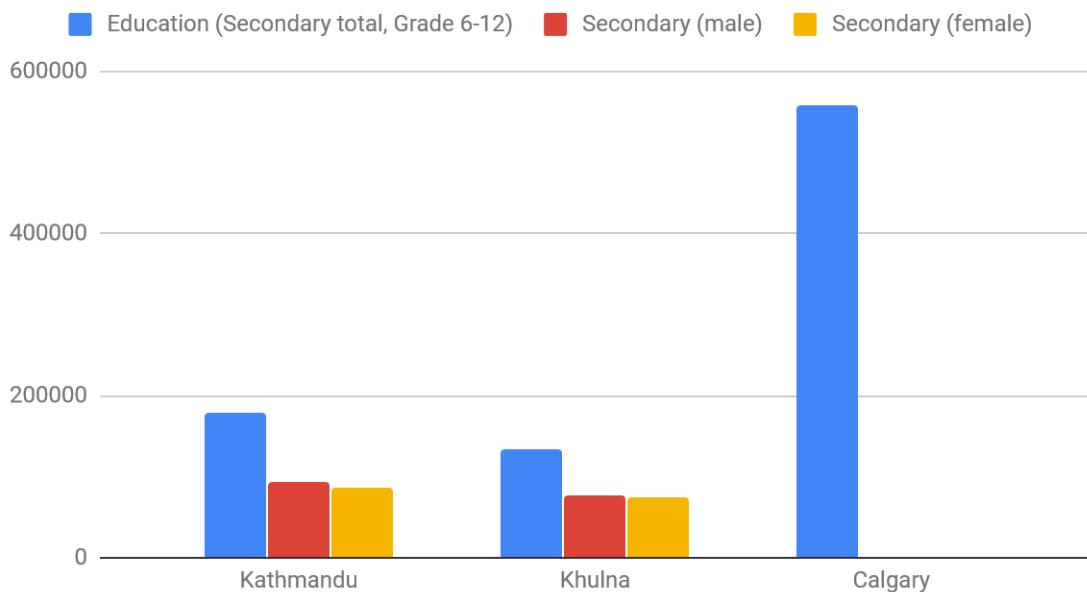


Figure 8: Secondary school enrollment population by province

### Province school enrollment by sex

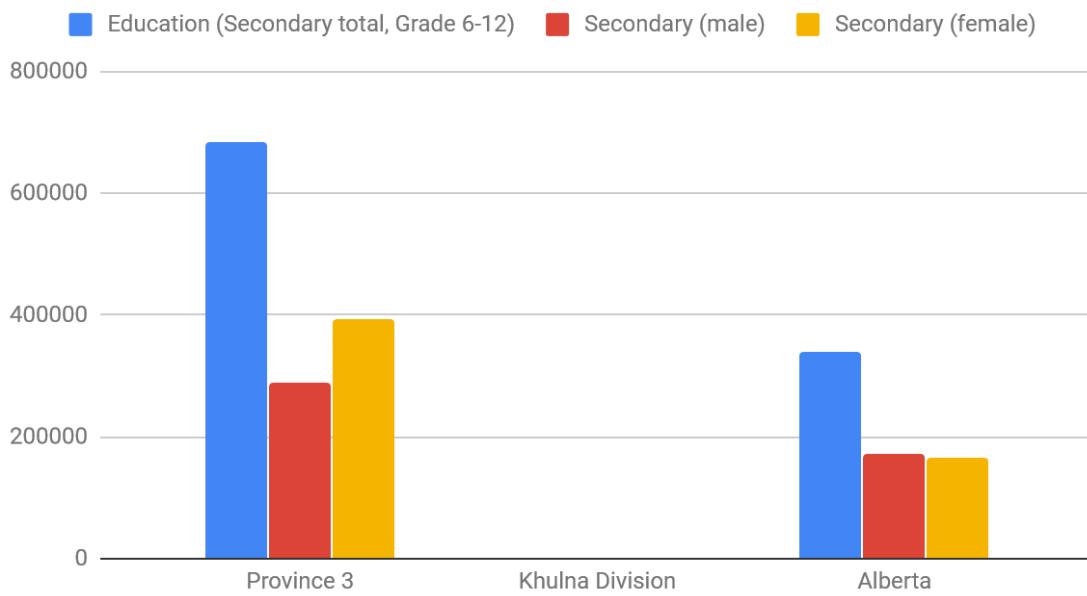
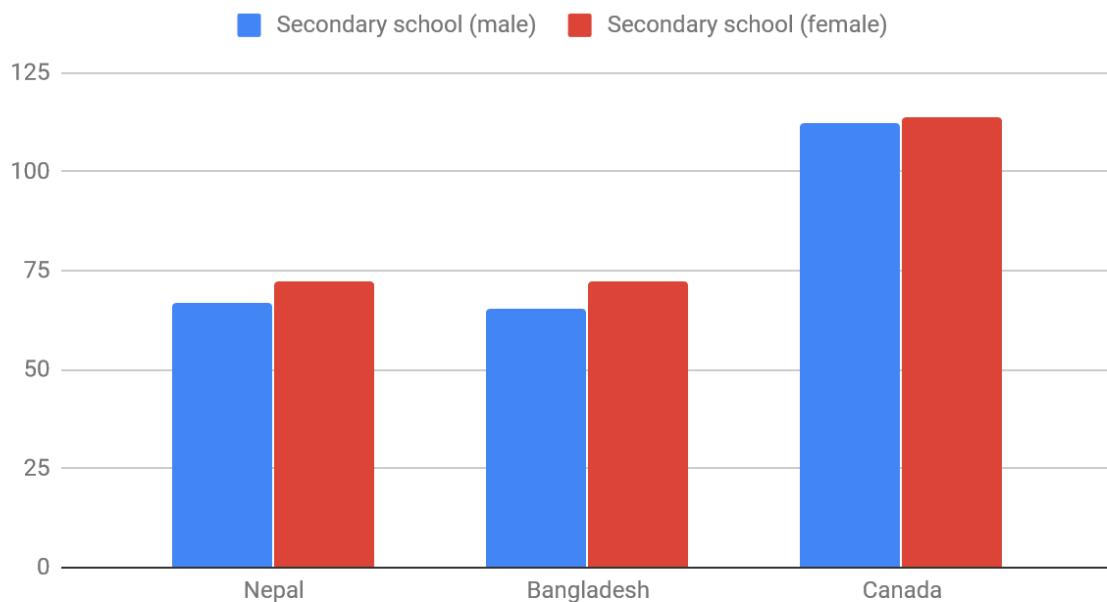


Figure 9: Secondary school enrollment population by country

## Country school enrollment by Sex (in ratio)



## Appendix B: Individual contribution to the final project

I am excited to discuss my contribution to you for this project. But before that, why did I choose to do this project? Well, after submitting the final wiki in Fall, I wanted to discuss some of the rising issues in the global south and then you mentioned ICIMOD (and their goals). After consulting with you in the beginning of the winter semester, I decided to compare Nepal and Canada in terms of demography then Bangladesh, my home country into the topic. Now let's talk about what I did to come up with the final report. I spent most of the time digging into the data I can find, put it in the google sheets and excel spreadsheet. I told Monica to meet with the data librarian Deena Yanofsky because at that time finding the city and national level data of Nepal was difficult. Madam Deena provided me some useful sources such as the UN data. Filling the table for city, province and country was my mission. After painstakingly collecting and putting numbers into the table, I wasn't sure how to create an amoeba chart. Before choosing the topic, I wanted to use ArcGIS to visualize the data using census tract boundaries as the base layer. But due to the lack of time, my only option left was to create pie chart and bar graphs. Consulting with you before making the decision was really helpful. I filled the table, then created pie chart for the total number of populations for districts, provinces, and countries. Then created bar graphs for; number of households, education (primary, secondary, and post-secondary), number of migrants, GDP and unemployment rates. Then wrote the descriptions for each graph, added my thoughts into the discussion and conclusion section. After, I added all my data sources into the bibliography.

## **Appendix C: My contribution throughout the course (ESTD17)**

For the Final WIKI, I have listed my part below (highlighted in yellow colour):

# **Rouge National Urban Park**

From Wikipedia, the free encyclopedia

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For the park in Detroit, see [River Rouge Park](#)

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### Rouge National Urban Park (RNUP)

is a [national urban park](#) in [Ontario, Canada](#).

Most of the park is located in [Toronto's](#) suburban district of [Scarborough](#), while parts of the park are in the bordering cities of [Markham](#) and [Pickering](#). A rich assembly of natural, cultural and [agricultural](#) landscapes, Rouge National Urban Park is home to over 1,700 species of plants and animals, some of the last operational farms in the [Greater Toronto Area](#), rare [Carolinian](#) ecosystems, Toronto's only campground, and human history dating back over 10,000 years, including some of Canada's oldest known [Indigenous](#) sites.

Since 2011, [Parks Canada](#) has been working to nationalize and nearly double the size of the original Rouge Park.<sup>i</sup> Parks Canada is planning to add more trails, education and orientation centres and improved signage and interpretive panels and displays throughout the park. Parks Canada introduced new educational programs to the park, including Learn-to-Camp, Learn-to-Hike, fire side chats, and other complimentary programming. Once fully established, the park will span 79.1 square kilometres (30.5 sq. mi). Parks Canada currently manages or has a direct interest in 62.9 square kilometres (24.3 sq. mi) of this area.<sup>ii</sup>

### Rouge National Urban Park

IUCN category V (protected landscape/seascape)



The Rouge Pond, near the mouth of the Rouge River, at Rouge National Urban Park



Location	<a href="#">Greater Toronto, Ontario, Canada</a>
Coordinates	<a href="#">43°48'30"N 79°09'00"W</a> <a href="#">43.8083°N 79.15°W</a> <a href="#">Coordinates: 43°48'30"N 79°09'00"W</a> <a href="#">43.8083°N 79.15°W</a>
Area	62.9 km <sup>2</sup> (24.3 sq. mi)
Created	May 15, 2015
Operator	<a href="#">Parks Canada</a>
Website	<a href="http://www.pc.gc.ca/fra/pn-np/on/rouge/index.aspx">www.pc.gc.ca/fra/pn-np/on/rouge/index.aspx</a>

## History

### Natural History

Water from glaciers melting 12,000 years ago formed ancestral [Lake Ontario](#), which covered this entire area. A large ice lobe, roughly 20 metres thick, blocked the lake from draining eastward, leaving water levels high as the lake slowly drained south to what is now the [Mississippi River](#). The ice lobe finally retreated, draining the lake to the [St Lawrence River](#) and forming the [Great Lakes](#) as we see them today. Glaciation occurred when average annual temperatures were only 2 - 5 °C lower than present. The small decrease in temperature caused big changes to the landscape, similarly small changes in average annual temperatures now could cause major changes to the natural environment soon.

Map ascribed to Louis Joliet (after 1673) showing Ganatchakiagon and the Rouge trail



Outcrops of rock formed during the last glacial period found in Rouge National Urban Park are important to geologists studying seismic activity, the risk of earthquakes in the GTA. Faults are visible indicating significant earthquake activity between 80,000 and 13,000 years ago.

### Human History

The human history of Rouge National Urban Park goes back over 10,000 years. [Paleolithic](#) nomadic hunters, [Iroquoian](#) farmers, early European explorers, and the multicultural suburban population that one can see around the park today are all part of this history. Since humans began living in the present Great Lakes-St Lawrence Lowlands in Ontario, many groups of people made the lands and waters now protected in Rouge Park their home. The river and its valleys, uplands, forests and wetlands, along with the animal and plant species that lived here, sustained small nomadic groups, and later larger, permanent settlements long before the rapid urbanization of the 20th century altered the landscape dramatically.

Inspired by the scenery of the Rouge, [F.H. Varley](#), one of the renowned [Group of Seven painters](#), captured the banks of the Rouge River in Markham on canvas during the 1950s as a lasting memory of their beauty.

### Toronto Carrying-Place Trail National Historic Event

This was an original portage route along the [Rouge River](#) to the [Holland River](#), linking [Lake Ontario](#) to [Lake Simcoe](#).<sup>iii</sup> This route was created by Indigenous Peoples, and later used by early European traders, explorers and settlers. The Rouge River route is not currently marked by a federal historical marker, but the western branch of the route, following the [Humber River](#), has one acknowledging both forks of the route. The [Toronto Carrying-Place Trail](#) was

designated a National Historic Event on the advice of the national Historic Sites and Monuments Board in 1969.

## Bead Hill National Historic Site

Bead Hill is an archaeological site of an intact 17th century Seneca village and was designated a National Historic Site in 1991.<sup>iv</sup> <sup>v</sup>The site includes the remains of an Archaic campsite, dating about 3,000 years old. Minimal excavations have been carried out, and the site includes a naturally protected midden, which is thought to contain a wealth of material. Because of its sensitive archaeological nature, it is not open to the public nor readily identified in the park. Its National Historic Site designation was prompted by imminent development plans that could have encroached on the area.

## Park History

The original Rouge Park was established in 1995 by the Province of Ontario in partnership with cities of Toronto, Markham and Pickering and the Toronto and Region Conservation Authority. The original park consisted of approximately 40 square kilometres of parkland in Toronto, Markham and Pickering.

In laying the groundwork for the park's establishment, Parks Canada has consulted and collaborated with over 20,000 Canadians and 200 organizations, including Indigenous People, all levels of government, community groups, conservationists, farmers and residents.

The most well-known part of the original Rouge Park, near the Toronto Zoo and Rouge Beach areas, remain open and are managed on an interim basis by the Toronto and Region Conservation Authority in partnership with Parks Canada and municipalities. As Rouge National Urban Park becomes fully operational, former Rouge Park lands will transfer to Parks Canada and become part of the much larger (79.1 km<sup>2</sup>) Rouge National Urban Park. Most remaining 'Rouge Park' lands were expected to transfer to Parks Canada in 2017.

Once fully established, Rouge National Urban Park will be the largest urban protected area in North America. It stretches from Lake Ontario in the south, north to the post-glacial Oak Ridges Moraine in the north.

On May 15, 2015 the *Rouge National Urban Park Act* came into force, formally establishing Rouge National Urban Park.

The park is open with free admission to visitors 365 days per year, though there are camping fees. There are currently over 12 kilometres of rustic hiking trails in the Toronto and Markham areas of the park, though Parks Canada has plans to significantly expand the trail network and provide a contiguous link from Lake Ontario to the Oak Ridges Moraine. In Toronto, the park is accessible by public transportation by TTC and GO Transit.

The role of civil society within conservation efforts of a green space was enhanced through expertise and science which allowed legalizing the civil society claims to the public. The civil society came up with their own expertise to validate their ecologically based arguments that could also stand up to competing alternative positions. The ecological restoration or monitoring programs that the civil society was involved in was a stride towards a booming long-term movement.<sup>vi</sup>

## Physical Geography

### Artificial Wetlands

The created wetlands within the Rouge Park watershed serve ecological benefits like providing a reduction in flood force, a reduction in extreme nutrient amount as well as being a crucial habitat for organisms that are semi-aquatic. However, a problem has been shown to occur amongst the created wetlands in regard to the potential they have for producing [methyl mercury](#) (MeHg). After the water, [sediment](#) and the [invertebrates](#) from the wetlands were sampled, it was determined that the MeHg concentrations decrease with an increase in the wetland age with the net production of MeHg being especially high in newly created wetlands. The proof of understanding behind these results has come from the fact that in younger wetlands the iron-reducing bacteria maybe adding methane to the inorganic mercury causing increase in production of MeHg. On the other hand, the organic matter that gets accumulated in the aged wetlands can bind inorganic mercury so that bacterial methylation is not able to take place.<sup>vii</sup>



A 3D map showing the different geography in the park

Chris Brackley/Canadian Geographic. (n.d.).  
Map\_rouge\_urban\_park\_lg [A 3D representation of Rouge National Urban Park, highlighting key areas].  
Retrieved October 20, 2018, from  
[https://www.canadiangeographic.ca/sites/cgcorp/files/images/web\\_articles/magazine/ja13/rouge\\_urban\\_park/map\\_rouge\\_urban\\_park\\_lg.jpg](https://www.canadiangeographic.ca/sites/cgcorp/files/images/web_articles/magazine/ja13/rouge_urban_park/map_rouge_urban_park_lg.jpg)

### Farmland

People have been farming in the Rouge Valley for thousands of years. Rouge National Urban Park protects large tracts of Class 1 ([External Link](#)) farmland, the rarest and most fertile soil in Canada. Since 2015, Parks Canada has partnered with park farmers, Indigenous partners, and [conservation](#) groups to complete 31 conservation and agricultural enhancements projects in Rouge National Urban Park. To date, more than 32 hectares of wetland and riparian habitat and 20 hectares of forest have been restored, and over 38,000 native trees and shrubs have been planted.

Parks Canada has committed to preserving the park's farmland and working farms in a way that contributes to the overall health of the park while also providing unique visitor farm experiences. The park is home to two well-known farmers markets, Whittamore's Farm (closed 2017) and Reesor's Farm Market.

## Agricultural Integrity

The park strives to utilize the incredibly fertile agricultural land contained within its borders. The soils in the park are Class 1 ([External Link](#)), which are extremely rare and endangered in Canada. Development of residential buildings has occurred on these fertile soils and the park has also planted trees on it. Although tree planting is encouraged to maintain ecological integrity, planting trees on Class 1 soil causes the area surrounding the roots to lose its productivity. This lost capacity lowers the amount of land that is useable for food production, directly impacting the availability and amount of locally grown food. Farmers have urged the park to be more specific and careful when planting trees.<sup>1</sup>

## Farming and Conservation

Beginning in 2015, Parks Canada began to partner with park farmers and the [Toronto and Region Conservation Authority](#) to complete 31 conservation and agricultural enhancements projects in Rouge National Urban Park.

### Biodiversity and Wildlife



[White Tailed Deer](#) at the Rouge National Urban Park, one of over 1,700 species of plants, animals, and fungi located within the Park.

This urban park features numerous fauna such as [white-tailed deer](#), mice, [opossums](#), [raccoons](#), [hawks](#), [coyotes](#), [skunks](#), [ducks](#), [beaver](#), [bald eagles](#), [shrews](#), [red foxes](#), [turkeys](#), [weasels](#), [golden eagles](#), [river otters](#), [kestrels](#), [moles](#), [swans](#), [minks](#), [bats](#), [woodchucks](#), and [porcupines](#).

The park has over 1,700 species of plants, animals and fungi, as verified in the 2012 and 2013 Ontario [BioBlitz](#) surveys.

- 1006 plant species, including 6 which are nationally rare and 92 which are regionally rare.
- 261 bird species, 5 of which are nationally rare breeding birds and 4 other breeding birds of special concern as well as numerous locally rare, area-sensitive raptor and colonial birds
- 65 fish species, 2 of which are nationally vulnerable
- 40 mammal species, some are locally rare

<sup>1</sup> Gill, J. (2017). The Rouge Uncovered: Community Participation, Urban Agriculture and Power Dynamics in the Creation of Canada's first National Urban Park. (*Unpublished master's thesis*). Department of Geography and Planning, University of Toronto, Toronto, Canada.

- 21 reptile and amphibian species, some are locally rare

## **Bill C-40**

The Rouge National Urban Park Act, also called the Bill C-40, is a tailor-made approach for protecting the Rouge. As proposed by Bill C-40, there will be laws protecting wildlife, ecosystems, cultural landscapes, water, [fossils](#), and artifacts. The act also proposes wardens who will look after the park and patrol all year long. Wardens will be working closely with the local police to protect the visitors and the resources. The Rouge National Urban Park Act specifically prohibits activities such as poaching, polluting, dumping, theft of fossils, harassment of wildlife, hunting and mineral extraction.<sup>viii</sup>

### **Invasive Species**

#### **Dog-Strangling Vine (*Cynanchum rossicum*)**

refers to two invasive plants native to Eurasia-Black swallow wort and pale swallow wort. They are members of the milkweed family and were introduced to [Northeastern United States](#) in the mid-1800s for use in gardens. However, in recent years it has spread rapidly throughout central and [Southern Ontario](#).



Image of Dog Strangling Vine Retrieved from  
<http://www.invasivespecies.com/dog-strangling-vine/>

Dog Strangling vine prefers open sunny areas, but they can grow well in light shade as well. It grows up to two metres high by wrapping itself around trees, plants or even light poles hence the name strangling vine. Dog strangling vine forms dense strands that could possibly crowd out native plants and young trees, preventing forest regeneration. The roots and leaves may be [toxic](#) to [livestock](#), [deer](#) and other animals also avoid dog strangling vine, which could increase grazing pressure on other more palatable native plants.<sup>2</sup>

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<sup>2</sup> Dog-Strangling Vine – Ontario's Invading Species Awareness Program. (n.d.). Retrieved from <http://www.invasivespecies.com/dog-strangling-vine/>

## Garlic Mustard (*Alliaria Petiolata*)

Garlic Mustard is an invasive herb native to Europe and it was brought to North America in the early 1800s for use as an edible herb. It has a strong, distinctive smell similar to garlic hence the name garlic mustard. Since its arrival in North America, it has escaped into the wild and soon became one of Ontario's most aggressive invasive plants.

Garlic Mustard seeds are easily spread by people and animals. Furthermore, they can remain in the soil for up to 30 years and still be able to sprout. They can grow in a wide range of sunny and fully shaded habitats.

This plant can invade relatively undisturbed forests. Once established, it can displace native wildflowers like trilliums and trout lily. It interferes with the growth of fungi that bring nutrients to the roots of the plants.<sup>3</sup>



Image of Garlic Mustard Retrieved from:<http://www.invadingspecies.com/garlic-mustard/>

## Common Buckthorn (*Rhamnus Cathartica*)

Common Buckthorn is a small shrub or tree native to Eurasia. It was introduced to North America in the 1800s as an ornamental shrub and was widely planted for fencerows and windbreaks in agricultural fields. Common buckthorn can thrive in a wide range of soil and light conditions, enabling it to invade a variety of native plants.

Common Buckthorn forms dense thickets that crowd and shade out native plants. Furthermore, it can alter nitrogen levels in the soil, creating conditions that can benefit its own growth while discouraging the growth of other native species. Additionally, it produces a large number of seeds that germinate quickly and prevent the natural growth of native trees and shrubs.



Image of Common Buckthorn Retrieved from:<http://www.invadingspecies.com/common-buckthorn/>

Common Buckthorn also provides host for an invasive insect "Soybean Aphid", an insect that damages soybean crops. It uses buckthorn as a host plant to survive winter.<sup>4</sup>

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<sup>3</sup> Garlic Mustard – Ontario's Invading Species Awareness Program. (n.d.). Retrieved from <http://www.invadingspecies.com/garlic-mustard/>

<sup>4</sup> Common Buckthorn – Ontario's Invading Species Awareness Program. (n.d.). Retrieved from <http://www.invadingspecies.com/common-buckthorn/>

## Asian Longhorn Beetle (*Anoplophora Glabripennis*)

Asian longhorned beetle or known as starry sky beetle. It is an invasive forest pest with no natural enemies in North America that attacks all broadleaf trees, with native Maples trees being its preferred host.

It was introduced to North America in the 1990s through untreated wooden shipping pallets. In their larvae state, they will tunnel through the living tissue of the tree stopping the flow of water and nutrients, ultimately killing the it.<sup>5</sup>

Insecticides do not protect trees, therefore, trees must be cut down and burnt or chipped. It also cause a potential decline in hardwood (broadleaf) trees and pose major consequences for Ontario's wildlife and biodiversity, negatively affecting future generations.<sup>6</sup>

## Emerald Ash-Borer (*Argrilus planipennis*)

Emerald ash-borer is a forest pest native to Asia and it has killed millions of Ash trees in SouthWestern Ontario, and the great lake states. The Emerald Ash Borer attacks both healthy and stressed Ash trees. During its larvae state, it travels tunnel through the tree's vascular system which delivers water, nutrients and sugars through the tree.

It attacks both stressed and healthy Ash Trees and once infested, the mortality of Ash trees is nearly 100%. It is extremely harmful to urban and rural biodiversity and the loss of valuable timber that is used for furniture, building and recreational products.<sup>7</sup>



Image of Longhorn beetle in larvae state. retrieved from:  
<http://www.invadingspecies.com/asian-long-horned-beetle/>



Image of Longhorn beetle. Retrieved from:  
<http://www.invadingspecies.com/asian-long-horned-beetle/>



Image of Ash Borer beetle both mature and larvae state retrieved from:  
<http://www.inspection.gc.ca/plants/plant-pests-invasive-species/insects/emerald-ash-borer/areas-regulated/eng/1347625322705/136786033>

<sup>5</sup> Asian Long-horned Beetle – Ontario's Invading Species Awareness Program. (n.d.). Retrieved from <http://www.invadingspecies.com/asian-long-horned-beetle/>

<sup>6</sup> Government of Canada, Canadian Food Inspection Agency, & Plant Health and Biosecurity Directorate. (2016, May 25). Asian Longhorned Beetle – *Anoplophora glabripennis*. Retrieved from <http://www.inspection.gc.ca/plants/plant-pests-invasive-species/insects/asian-longhorned-beetle/eng/1337792721926/1337792820836>

<sup>7</sup> Government of Canada, Canadian Food Inspection Agency, & Plant Health and Biosecurity Directorate. (2018, October 16). Areas Regulated for the Emerald Ash Borer. Retrieved from

## Conservation

### Blanding's Turtle Conservation

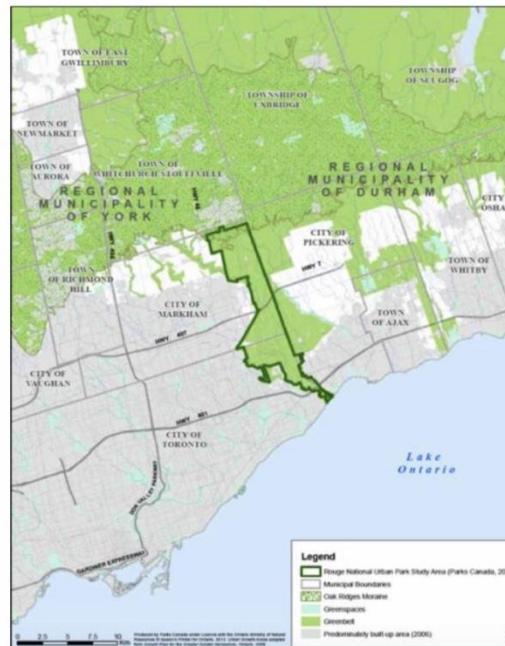
Since 2014, Parks Canada has worked with the [Toronto Zoo](#) to rear and release 113 baby [Blanding's turtles](#) in the park; a threatened species, prior to this initiative, it was believed that only seven turtles remained in the park.<sup>ix</sup>

### Green Space Conservation and Expansion

Parks Canada identifies the integral role Rouge Park can play in protecting surrounding [green space](#) and natural areas. The map above indicates the natural areas and urban green spaces that surround the Park. Parks Canada intends to connect to these areas directly, with transit options planned - from [bike lanes](#) and mobile "way finding" applications to [public transit](#) and carpool parking options - between these areas and the park. Furthermore, there is a drive to affiliate these areas with the Park which will allow for cooperation between Parks Canada and the surrounding municipalities. The goal is to have the municipalities create a trail network that includes the park, design park programs, issue multimedia and park signage to "celebrate the park's gateway role to the Rouge [watershed](#) and the [Greenbelt](#)" and to ensure that they are following a shared set of [land use](#) rules near the park that are compatible with its goals.<sup>8</sup>

Since being accredited as a national park, Ontario transferred more than 1600 acres to the expansion of the Rouge Park allowing for permanent protection of green space.<sup>9</sup> Some of the conservation benefits of the park that directly link to the green space are:<sup>10</sup>

- Year round law enforcement will ensure [wildlife](#), [ecosystems](#), and [water](#) are protected to the full extent of the law
- A focus on restoring native ecosystems, wildlife and [landscapes](#)
- Protection of [nature](#), [culture](#), and agriculture



Map of the green space surrounding the Rouge Urban National Park (bold).

Retrieved from the Rouge Park

<sup>8</sup> <http://www.inspection.gc.ca/plants/plant-pests-invasive-species/insects/emerald-ash-borer/areas-regulated/eng/1347625322705/1367860339942>

<sup>9</sup> Parks Canada. (2014). "Rouge National Urban Park Draft Management Plan." Retrieved Nov. 27, 2018.

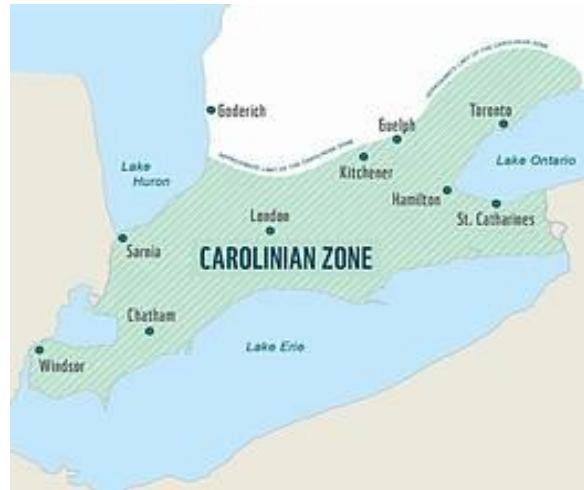
<sup>9</sup> Governments of Canada and Ontario Announce Historic Rouge National Urban Park Land Transfer. (2017, October 21). Retrieved November 27, 2018, from <https://www.newswire.ca/news-releases/governments-of-canada-and-ontario-announce-historic-rouge-national-urban-park-land-transfer-652109573.html>

<sup>10</sup> Parks Canada Agency, & Government of Canada. (2017, June 12). Top 10 conservation benefits. Retrieved November 28, 2018, from <https://www.pc.gc.ca/en/pn-np/on/rouge/info/top10>

The Toronto and Region Conservation Authority (TRCA) looks to improve the green space in Toronto to provide habitat for wildlife and support [human health](#) and [recreation](#).<sup>11</sup> In addition, the TRCA will work with other governments to ensure that citizens in surrounding municipalities of the Rouge Park, are easily connected to the green spaces and natural areas.<sup>12</sup>

## Forest Conservation and Revitalization

Rouge Park is located on the eastern edge of the [Carolinian Forest](#) and is one of the last two zones that keep it intact.<sup>13</sup> In order to preserve the forests in the Rouge Parks Canada has collaborated with park farmers, Indigenous partners, schools and conservation groups to restore hectares of forest habitat by planting 65,000 native trees and shrubs.<sup>14</sup>



Map of Carolinian Forest in Ontario. Retrieved from: <https://trca.ca/conservation/watershed-management/rouge-river/watershed-features/>

## Watershed

The Rouge National Urban Park holds land that drains into 3 separately defined [watersheds](#). It also suffers the [effects of urbanization](#) due to increasing amounts of [impermeable surfaces](#) (rooves, roads, sidewalks etc.). The effects of its geographic location have unique implications on the ecosystem; as water carries contaminants on the surface via [surface run-off](#)/ rivers/ streams, [percolates](#) through soil, and the subsurface. See [Water Pollution](#), [Soil and Subsurface Pollution](#), and [Flooding](#).

<sup>11</sup> Greenspace Management. (2018). Retrieved November 28, 2018, from <https://trca.ca/conservation/greenspace-management/>

<sup>12</sup> Parks Canada. (2014). “Rouge National Urban Park Draft Management Plan.” Retrieved Nov. 27, 2018.

<sup>13</sup> Reeves, A. (2016, September 28). Saving the Rouge, Canada's Largest Urban Park. Retrieved November 26, 2018, from <https://ontariornature.org/news-release/saving-the-rouge-canadas-largest-urban-park/>

<sup>14</sup> Parks Canada Agency, & Government of Canada. (2018, April 30). Forest habitat. Retrieved November 26, 2018, from <https://www.pc.gc.ca/en/pn-np/on/rouge/nature/environnement-environment/foret-forest>

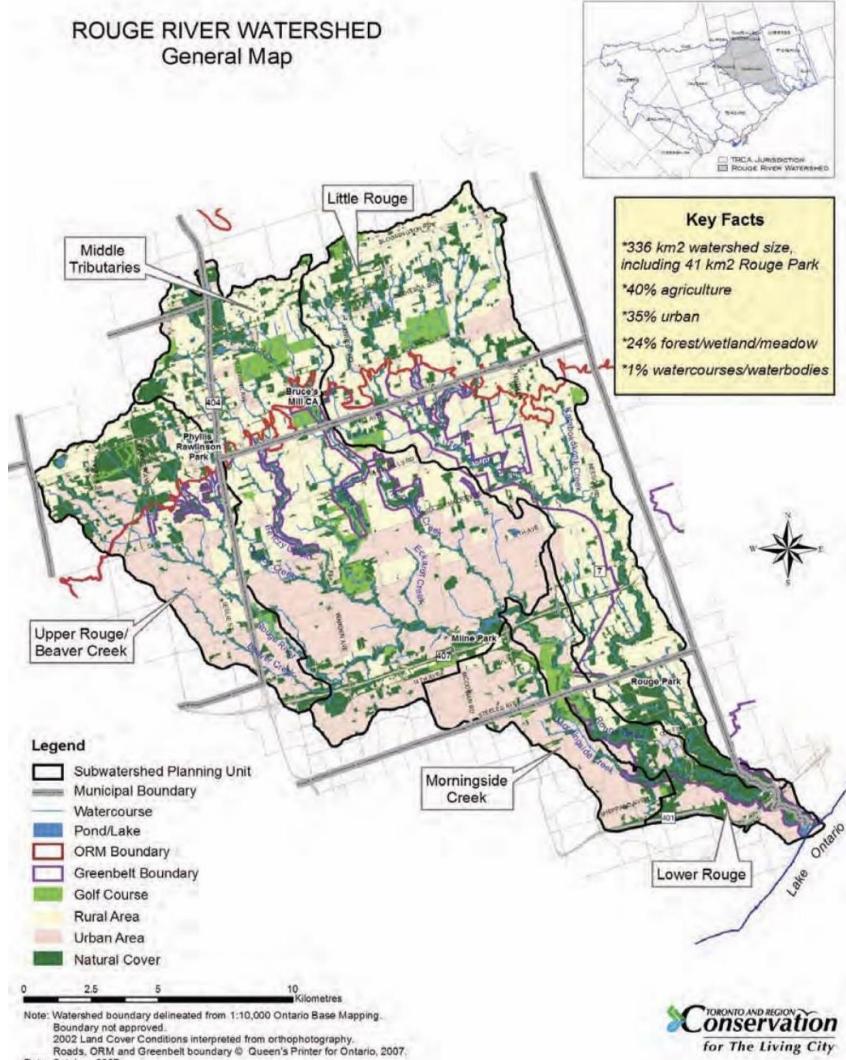
## Watershed Management

The Rouge Urban National Park roughly covers the lower third of the Rouge River watershed, while the central third and western areas are highly urbanized and the northeastern area is mostly rural with agricultural land uses. The whole watershed covers an area from the Oak Ridges Moraine to Lake Ontario. (see figure).<sup>15</sup>

The Park contains land area that drain into three different watersheds. The namesake Rouge River, Petticoat Creek, and Duffins Creek.<sup>16</sup> The Rouge and Duffins flow from the south slope of the Oak Ridges Moraine, and Petticoat Creek sits between the two watersheds, starting farther south closer to Lake Ontario.

## Rouge River Watershed

The Rouge River watershed is still in the transition period to the federal protection and management plan. However, the TRCA does identify the current issues facing the watershed, most of them a direct result of urbanization. Surface runoff has contributed to a reduction of water quality, an increase in flow volume in the stream network and increased erosion and sedimentation along the channel. These have led to a loss of wildlife and biodiversity, and a decrease in the land's ability to mitigate human impacts. Development and restoration of management infrastructure to better control these impacts is ongoing,<sup>17</sup> and the transition to a federally protected area could open more funding to these projects.



Map of the Rouge watershed. Retrieved from: Toronto Regional Conservation Authority (2007). "Rouge River Watershed Plan." Retrieved from <http://trca.on.ca/dotAsset/37800.pdf> on Nov. 27, 2018.

<sup>15</sup> <https://trca.ca/conservation/watershed-management/rouge-river/watershed-features/>

<sup>16</sup> Parks Canada (2014). "Rouge Review: Rouge National Urban Park Initiative." Retrieved Nov. 28, 2018.

<sup>17</sup> <https://trca.ca/conservation/watershed-management/duffins-creek/issues-challenges/>

## Duffin's Creek Watershed

Ongoing management includes a salmon restoration project, initiated in 2006. Duffins Creek was chosen as one of the sites for the [Atlantic salmon](#) restoration program in Lake Ontario. The TRCA partnered with the [Ontario Ministry of Natural Resources](#), the [Ontario Federation of Anglers and Hunters](#), and [Ontario Power Generation](#) on the project to bring a self-sustaining salmon population back to the Lake Ontario habitat.<sup>18</sup>

Recent successes in the area was the completion of a project initiated in the late 1990s that saw the conversion of an unused aggregate mine pit back to natural cover. The mine site was



Left, the open-pit aggregate mine in 1999. Right, the restored site, taken in 2012

Retrieved from: <https://trca.ca/conservation/watershed-management/duffins-creek/projects/>

purchased in 1999 after the local community raised the funds and partnered with [Charles Sauriol Environmental Land Trust](#), and it has since been filled and recovered with greenery. The site is now part of the Oak Ridges trail system, and includes 75km of multi-use trails.<sup>19</sup>

Management of the watershed is ongoing. The TRCA has identified several issues facing the watershed:<sup>20</sup>

- Increasing urbanization leading to a reduction in water quality. The TRCA is actively working to keep the watershed healthy and improving the water quality without disrupting [urban growth](#) and continuing open access to recreation and [tourism](#) opportunities the watershed has to offer.
- Promoting [sustainable](#) land use and planning activities to mitigate effects of climate change, such as increased duration and intensity of rainfall events and seasonal change shifts.

## Petticoat Watershed

The TRCA lists one ongoing project in the watershed, ecological enhancements in Altona Forest.<sup>21</sup> The TRCA gives credit to the agricultural community in the north end of the watershed

<sup>18</sup> <https://trca.ca/conservation/watershed-management/duffins-creek/projects/>

<sup>19</sup> <https://trca.ca/conservation/watershed-management/duffins-creek/projects/>

<sup>20</sup> <https://trca.ca/conservation/watershed-management/duffins-creek/issues-challenges/>

<sup>21</sup> <https://trca.ca/conservation/watershed-management/petticoat-creek/projects/>

for being “good stewards” to the area. Natural and Rural areas make up roughly two-thirds of the watershed, and are protected by provincial initiatives.<sup>22</sup>

The issues identified by the TRCA include:<sup>23</sup>

- Direct surface runoff from the urbanized southern portion of the watershed. The TRCA proposes “[rainwater harvesting](#) and re-use” for outdoor water needs by individual property owners in the area.
- Protect and restore the watershed’s natural areas by improving sustainability projects in the urbanized areas of the watershed.
- Like the Duffins, climate change poses risks to the watershed. Similar actions are proposed for the Petticoat Creek watershed.

### **Friends of the Rouge Watershed**

Friends of the Rouge Watershed ([External Link](#)) is a non-profit, community-based environmental protection and conservation organization that aims to protect and restore the Rouge Watershed located in Scarborough, Ontario.<sup>x</sup> They also contribute to the ecosystems within the watershed by creating habitat structures like raptor posts for owls and hawks to perch onto, which will regulate rodent populations.<sup>xi</sup>

### **Stormwater Management**

[Stormwater](#) refers to rainwater and melted snow that flows over roads, parking lots, lawn and other sites in urban areas. Stormwater management practices help to minimize the impact of [runoff](#) flowing into lakes and streams<sup>24 25</sup>

The possible impacts of stormwater can cause:

- Increased downstream flooding risks
- River bank and bed erosion
- Increased [turbidity](#)
- Aquatic Habitat destruction
- Changes in the stream flow regime
- Combined [sewer](#) overflows
- [Infrastructure](#) damage

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<sup>22</sup> <https://trca.ca/conservation/watershed-management/petticoat-creek/>

<sup>23</sup> <https://trca.ca/conservation/watershed-management/petticoat-creek/issues-challenges/>

<sup>24</sup> Stormwater Management. (n.d.). Retrieved from <https://trca.ca/conservation/stormwater-management/>

<sup>25</sup> Parks Canada Agency, & Government of Canada. (2018, November 01). Seasonal hazards. Retrieved from <https://www.pc.gc.ca/en/pn-np/on/rouge/securite-safety/saison-season>

## Erosion Prevention

The Rouge park consist of acres of protected land right in the middle of a [metropolitan area](#). The location of the park makes it vulnerable to storm surges and erosion. The Rouge River has flowed slower since 1961 when flood prevention measure, taken after [Hurricane Hazel](#). Spring [gravel](#) was picked up from fields and banks or rivers and pushed downstream.

Consequently, a great amounts of gravel collected in the Rouge Rivers where the current slowed in wider sections and in the inside of the [meanders](#).

Many decades of urban development have led to increased [erosion](#) and channel instability. Erosion can cause sediment loading in [streams](#) and impacts [aquatic life](#). Eroded sediments can carry sediments loading in streams and impact aquatic life. Rouge park are susceptible to erosion by water. Erosion of [groundwater](#) seepage issue result in the slope instability thus increase the chance of [flooding](#).

Erosion is triggered primarily by the heavy [snowmelt](#) in the spring when seepage from groundwater is the most active and intense rainfall during the summer. Erosion caused a section of the Rouge River watershed to become unstable and is experiencing channel enlargement. Relocating trails away from erosion prone areas and steep slopes and improve the safety of road and rail crossing.<sup>26 27</sup>

## Climate Change

According to the [Intergovernmental Panel on Climate Change](#) (IPCC) the average global temperature has increased 0.8°C above



Extensive erosion of Rouge Urban National Park

Retrieved from: <https://www.toronto.com/news-story/6964754-stories-from-rouge-park-gravel-down-the-rouge-river-causing-erosion-destroying-trees-and-hiking-trails/>



Image of Eroded Rouge Urban National Park

Retrieved from <https://www.toronto.com/news-story/6964754-stories-from-rouge-park-gravel-down-the-rouge-river-causing-erosion-destroying-trees-and-hiking-trails/>

<sup>26</sup>Parks Canada Agency, & Government of Canada. (2018, November 01). Seasonal hazards. Retrieved from <https://www.pc.gc.ca/en/pn-np/on/rouge/securite-safety/saison-season>

<sup>27</sup>Noonan, L. (2016, November 14). STORIES FROM ROUGE PARK: Gravel down the Rouge River causing erosion, destroying trees and hiking trails. Retrieved from <https://www.toronto.com/news-story/6964754-stories-from-rouge-park-gravel-down-the-rouge-river-causing-erosion-destroying-trees-and-hiking-trails/>

the pre-industrial age and is set to increase to 1.5°C. Climate change has several negative effects on the Rouge National Urban Park. Increasing temperatures will threaten endangered species further, such as a cold-water fish species, the [Redside dace](#). Additionally, Climate Change causes shifts in regular [climactic, weather](#) and [hydrologic](#) patterns such as causing periodic [drought](#). The droughts affect both flora and fauna in the park especially the [riparian lands](#) and [wetlands](#). A warmer climate alters suitable habitats for local existing species and migratory species such as birds that fly in and feed in the RNUP. Climate change also affects seasons; either delaying or causing early arrival. This affects all organisms.<sup>28</sup>

## Ecosystem Impacts

The Park helps to preserve native species of flora and fauna as well as the unique habitat and iconic landscape for the welfare of future generations. With its vast biodiversity, the Park is an important site for studying some of the most unique plant and animal species.<sup>29</sup> Temperature rise within the ecosystem could devastate or lead to the disappearance of various habitats essential for healthy populations of animals and plants.<sup>30</sup> Hotter temperatures as well as poor rainfalls and unpredictable rainfall patterns also pose a serious threat to ecosystem growth. These changes can affect the availability and timing of food sources of these birds. For example, the early arrival of spring which may lead to migratory birds not getting their peak period for catching insects from the northern breeding sites.<sup>31</sup> The connection of the [Oak Ridges Moraine](#) to the lake via the RNUP safeguards and creates a corridor allowing plants and animals to shift or migrate in response to climate change. These areas also offer essential ecosystem services, for instance, stabilizing the soil, providing clean water, improving the quality of air, storing carbon and, reducing the effects of flooding which may all be altered with a changing climate.

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<sup>28</sup> Rouge national urban park climate change. (2018). Parks Canada. Retrieved from <https://www.pc.gc.ca/en/pn-np/on/rouge/nature/conservation/climat-climate>

<sup>29</sup> Rouge National Urban Park (2014, June). Rouge National Urban Park Management Plan. Retrieved from <http://www2.markham.ca/markham/ccbs/indexfile/Agendas/2014/Development%20Services/pl140909/Rouge%20Park%20App%20B.pdf>

<sup>30</sup> Rouge National Urban Park (2018, April 30). Climate change. Government of Canada. <https://www.pc.gc.ca/en/pn-np/on/rouge/nature/conservation/climat-climate>

<sup>31</sup> Government of Canada (2018). Rouge National Urban Park. Retrieved from: <https://www.pc.gc.ca/en/pn-np/on/rouge/nature/conservation/climat-climate>

## Deforestation

A very large portion of The Rouge National Urban Park is covered by forests. The forests are very important to the park because they provide homes and microenvironments for flora and fauna to flourish. Trees not only benefit regional ecosystems, but also contribute to mitigating climate change, through their capacities to [sequester carbon](#).<sup>32</sup> When the trees from forests are removed for development,

agriculture or harvesting it causes carbon emissions. Through the processing off wood, reduction in carbon sequestration within trees and through release in the [decomposition](#) sequestered carbon is or can be released.<sup>33</sup> Trees not only help reduce atmospheric carbon emissions, but also relieve adverse effects, such as [eutrophication](#), of excess [Nitrogen and Phosphorous fertilizers](#) that make be released in [run-off](#) from nearby farms. Deforestation not only contributes to climate change, but it also contributes to biodiversity loss and loss of land, due to erosion. Trees help maintain the stability of soil, through their removal more soil loss may occur. A good way to prevent any human activity from interfering with the forests is to include protected areas where humans cannot enter. The park has already included protected areas for this purpose.<sup>34</sup> Protected areas are beneficial in mitigating climate change because they strengthen ecosystems, increasing their resiliency. The rate of deforestation is much slower within protected areas.<sup>35</sup>



An image of the edge of forest cover beside a bluff of eroded soil in Rouge National Urban Park. Photo by Peter Andrew Lusztyk  
Retrieved from: <https://www.canadiangeographic.ca/article/canadas-first-national-urban-park>

<sup>32</sup> Forest Habitat (2018). Retrieved from <https://www.pc.gc.ca/en/pnnp/on/rouge/nature/environnement-environment/foret-forest>

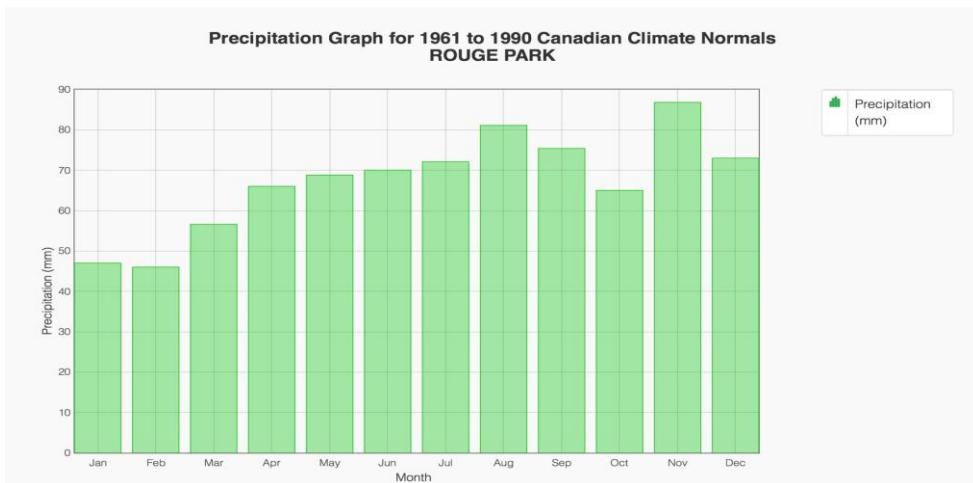
<sup>33</sup> Bebber, D.P., & Butt, N. (2017). Tropical protected Areas Reduced Deforestation Carbon Emissions by one-third From 200-2012. Scientific Report, 7, 1-7. Retrieved from <https://www.nature.com/articles/s41598-017-14467-w>

<sup>34</sup> Climate Change (2018). Retrieved from <https://www.pc.gc.ca/en/pnnp/on/rouge/nature/conservation/climat-climate>

<sup>35</sup> Parks Canada: Science and Conservation Retrieved from: <https://www.pc.gc.ca/en/nature/science/climat-climate>

## Temperature and Precipitation Analysis

In the Toronto Rouge Park weather station historical data<sup>36</sup> of 1961 to 1990 the maximum precipitation was 86.8 mm. In comparison, the Toronto Buttonville weather station historical data<sup>37</sup> from 1981 to 2010 has a maximum temperature and precipitation volume which is 26.3°C and 96.4 mm, slightly higher than the other dataset. Both temperature and precipitation are weather factors which contribute to climate change of a place. Temperature and precipitation vary from one location to another. In forested areas it tends to be more humid and cooler, see [Park Cooling Islands](#).



Precipitation Graph for 1961 to 1990 Canadian climate Normal Rouge Park

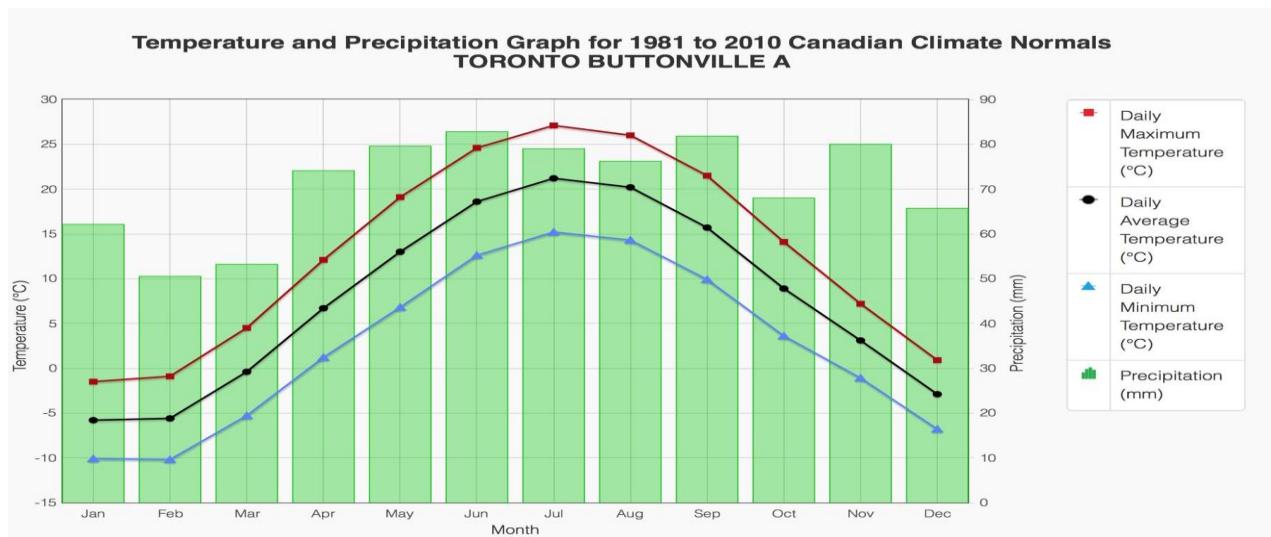
Averages and Extremes		
Category (Period of Record)	Value	Year
Average Maximum Temperature		
Average Minimum Temperature		
Monthly Frequency of Precipitation		
Highest Temperature		
Lowest Temperature		
Greatest Precipitation (1960-1993)	25.4 mm	1965
Greatest Rainfall (1960-1993)	25.4 mm	1965
Greatest Snowfall (1960-1993)		
Most Snow on the Ground (1984-1993)	6.0 cm	1986

Rouge Park - Almanac Averages and Extremes from 1960- 1993.<sup>38</sup>

<sup>36</sup> Ray, A. J., Liebmann, B., & Allured, D. Section II. Change Agents—Current and Future Toronto and Region Conservation Authority (2018). Meeting the Climate Challenge. Retrieved from: <https://trca.ca/conservation/climate-change/>

<sup>37</sup> Toronto and Region Conservation Authority (2018). Meeting the Climate Challenge. Retrieved from: <https://trca.ca/conservation/climate-change/>

<sup>38</sup> Toronto Buttonville A Ontario - Almanac Averages and Extremes from 1986- 2015. Retrieved from [http://climate.weather.gc.ca/climate\\_data/almanac\\_e.html?StationID=4841&period=1&searchMethod=contains&txtStationName=Buttonville+A&month=11&day=26](http://climate.weather.gc.ca/climate_data/almanac_e.html?StationID=4841&period=1&searchMethod=contains&txtStationName=Buttonville+A&month=11&day=26)



Temperature and Precipitation Graph for 1981 to 2010 Canadian Climate Normal  
Toronto Buttonville.<sup>39</sup>

Averages and Extremes		
Category (Period of Record)	Value	Year
Average Maximum Temperature		
Average Minimum Temperature		
Monthly Frequency of Precipitation	54 %	
Highest Temperature (1987-2015)	9.6 °C	1996
Lowest Temperature (1987-2015)	-24.5 °C	2011
Greatest Precipitation (1987-2015)	18.6 mm	2006
Greatest Rainfall (1987-2015)	18.6 mm	2006
Greatest Snowfall (1987-2015)	13.2 cm	1994
Most Snow on the Ground (1987-2015)	41.0 cm	1999

Toronto Buttonville - Almanac Averages and Extremes from 1987-2015. <sup>38</sup>

<sup>39</sup> Canadian Climate Normals 1981-2010 Station Data . Retrieved from :  
[http://climate.weather.gc.ca/climate\\_normals/results\\_1961\\_1990\\_e.html?searchType=stnName&txtStationName=rouge+park&searchMethod=contains&txtCentralLatMin=0&txtCentralLatSec=0&txtCentralLongMin=0&txtCentralLongSec=0&stnID=974&dispBack=1](http://climate.weather.gc.ca/climate_normals/results_1961_1990_e.html?searchType=stnName&txtStationName=rouge+park&searchMethod=contains&txtCentralLatMin=0&txtCentralLatSec=0&txtCentralLongMin=0&txtCentralLongSec=0&stnID=974&dispBack=1)

## **Climate Mitigation Strategies**

Toronto and Region Conservation Authority's climate mitigation approach focuses mainly on conservation, human health benefits, and eco-efficiencies. The task force is committed to minimizing greenhouse gases, developing new partnerships to speed up the execution of new technologies, increasing public awareness through The Living City Campus, and engaging the community members through various community transformation programs. According to TRCA, energy production and consumption contribute to over 80% of the greenhouse gas emissions in Canada. Therefore, going by the National Round Table on the Environment and the Economy (NRTEE), considerable (60%) reductions in the greenhouse gas emissions can be realized if energy is utilized more efficiently and if carbon emission is minimized in the energy production process. To achieve this, NRTEE proposes the deployment of different greenhouse gas emission-reduction technologies in different sectors.<sup>40 41</sup>

## **Adaptive Management of Watersheds**

Toronto and Region Conservation Authority is currently coming up with the "next generation" of watershed plans in its attempts of addressing climate change, as well as adaptive management. In order to realize its goals, TRCA is collaborating with climate prediction models through the Humber and Rouge rivers watershed plans for better preparation for future variability. <sup>40 41</sup>

## **Mitigating Increased Storm Water**

For the purposes of addressing the effect of increased surface runoff from the urban sprawl, innovative water balance technologies and storm-water management system are also being developed through STEP (Sustainable Technologies Evaluation Program). Examples include bioretention swales, permeable pavement, rooftop gardens, air biofiltration systems, and rainwater harvesting systems. <sup>40 41</sup>

### **Urban pollution**

Protected areas like the Rouge National Urban Park provide space for recreation and respite and

are beneficial for natural resource preservation. Like many other parts of the city, the park has experienced pollution as a result of natural processes and human activity. There are numerous prominent sources of anthropogenic pollution within the park, that can be broken down into categories such as; light pollution, noise pollution, air pollution, water pollution, and soil.

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<sup>40</sup> Toronto and Region Conservation Authority (2018). Meeting the Climate Challenge. Retrieved from: <https://trca.ca/conservation/climate-change/>

<sup>41</sup> Toronto and Region Conservation Authority (n.d). Meeting the Challenge of Climate Change. Retrieved from: <http://www.trca.on.ca/dotAsset/16642.pdf>

## Light pollution



Night time map of the GTA showing light emissions, Toronto seen as the large concentration in the middle. Rouge National Urban Park is the black indent on the right side of Toronto.  
NASA. (n.d.). BlackMarble\_2016\_B1 [Portion of NASA Black marble composite over the north atlantic]. Retrieved October 20, 2018, from  
[https://www.nasa.gov/specials/blackmarble/2016/tiles/BlackMarble\\_2016\\_B1.jpg](https://www.nasa.gov/specials/blackmarble/2016/tiles/BlackMarble_2016_B1.jpg)

The largest source of [light pollution](#) is urban areas. Unlike other forms of [pollution](#), light pollution is often forgotten or deprioritized as a concern. The park is in the north east portion of [Toronto](#); the largest city in [Canada](#). Toronto is also the largest source of light pollution in [Ontario](#), Canada. Because of this Rouge National Urban Park is rated as a class 7 on the [Bortle scale](#) for most of its area, however a portion in the north east is class 6<sup>42</sup>. Compared to [Algonquin Provincial Park](#) (233 km away) with Class 1 ([External Link](#)) rating. This means that the clouds over Rouge national park are lit up at night and the sky is light grey at night instead of black. Studies of shown on both [diurnal](#) and [nocturnal](#) wildlife exposed to light for long durations during times they are not supposed to be can cause a range of harmful side effects from diseases, to irregular reproductive patterns, and irregular hormone levels. In Addition to this, research has shown that parks with higher Bortle rankings decrease satisfaction and arousal in humans as well. They have also been shown to make people feel less safe, reduce the pleasure experienced by visitors<sup>43</sup>. While at the same time they felt more familiar with the parks with higher Bortle rankings. Organizations like the [Royal Astronomical Society of Canada](#) (RASC) are currently trying to raise awareness of light pollution in Toronto and proposing methods to reduces it on an individual and city basis<sup>44</sup>. Such as turning off outdoor lights at night, closing curtains at night, or simply keeping others informed.

<sup>42</sup> Light pollution map. (n.d.). Retrieved from <https://www.lightpollutionmap.info/>

<sup>43</sup> Benfield, J. A., Nutt, R. J., Taff, B. D., Miller, Z. D., Costigan, H., & Newman, P. (2018). A laboratory study of the psychological impact of light pollution in national parks. *Journal of Environmental Psychology*, 57, 67-72. doi:10.1016/j.jenvp.2018.06.006

<sup>44</sup> Royal Astronomical Society of Canada: Toronto Centre. (n.d.). Retrieved from <https://rascto.ca/content/fighting-light-pollution>

## Water Pollution

The level of water pollution at Rouge Park has been steadily increasing, despite numerous actions being taken to control the level of pollution on the water body around the park. Due to the park's proximity to the city and the highways running through it is subjected to lots of pollution, especially from run-off.

Some of the components discovered to causes water pollution in the park include:

### Organic and Metal Contaminants

Organic pollutants such as pesticides have been linked to adverse health effects in humans, terrestrial wildlife species, and aquatic life around Rouge Park.

Researchers identified forty-one harmful contaminants that were then prioritized for management in the [Great Lakes Basin](#) ecosystem under the [Canada Ontario Agreement \(COA\)](#). Even though

some chemicals were eliminated in the 70s in the Toronto area, pollutants like [DDT](#) and [PCBs](#) are still detected in the Rouge Park River. These chemicals reside in the hydrological system, as well as in the animal tissue of species within the river, for lengthy periods of time.<sup>45</sup> Other sources include metals in run-off from corroding cars and bridges on the highways, where rusting accelerates in winter due to [road salt](#).



A photo showing stormwater erosion inside the Park. Photo courtesy of Friends of Rouge Watershed

[http://www.frw.ca/albums/Correcting-Stormwater-Mistakes/Serious\\_Erosion\\_of\\_Morningside\\_Stream\\_below\\_Malvern\\_Outfall\\_2998\\_IMG0061.jpg](http://www.frw.ca/albums/Correcting-Stormwater-Mistakes/Serious_Erosion_of_Morningside_Stream_below_Malvern_Outfall_2998_IMG0061.jpg)

## Trace Metals

The Rouge River watershed has been [dewatered](#) along [16th Avenue](#) to expedite construction of infrastructure. The process involved the pumping of groundwater directly from the underground aquifers and into the river system. This process overlooks the natural filtration process and causes unusually high levels of trace metals to rise to the upper surface. Due to this development, high levels of manganese and iron were recorded as having been elevated in one well; iron was recorded as twice the level allowed by the Canada Ontario Agreement. The levels detected had the potential to affect the growth of some aquatic plants and affect the reproduction of the marine organisms. Dewatering was stopped in 2006.<sup>46</sup>

<sup>45</sup> Struger, J., T. Fletcher, P. Martos, B. Ripley, G. Gris. 2002. Pesticide Concentrations in the Don and Humber River Watersheds (1998-2000), Environment Canada and Ontario Ministry of the Environment, City of Toronto.

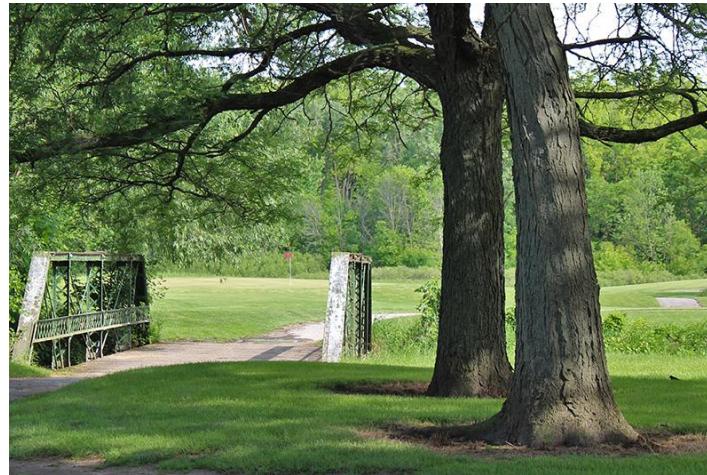
<sup>46</sup> Aquafor Beach Limited. (2006). Stormwater Management and Watercourse Impacts: The Need for a Water Balance Approach. Prepared for the Toronto and Region Conservation Authority. Toronto.

## Spills

Substances that spill in the river gather in the sediment and contaminate the environment, reducing the quality of life around the habitat, which mostly affects bottom-feeding organisms and [benthic invertebrates](#). Findings of spillage volumes around three municipalities which included the Rouge River park watershed showed between 1988-2000 the park experienced high chemical spillage of approximately 90 chemicals; of which most of the spills diverted to the Rouge River Watershed or one of its tributaries. A recent spill on the Rouge River lead to severe consequences for marine life, especially for fish 4 km downstream.<sup>47</sup>

## Golf Courses

24 golf courses are situated across the Rouge Park, and this type of land usage is associated with the application of pesticides and plant fertilizer to enhance the foliage around the courses. In the event of improper management, these practices can be detrimental to Rouge Park because pesticides wash into the rivers and streams when it rains or after lengthy irrigation periods thus causing water pollution.



A Golf Course along the Rouge Park.

Retrieved from: <http://www.rouge.golf/>

As an urban city with a population of 2.8 million people Toronto is exposed to and creates a significant degree of air pollution. Rouge National Urban Park, while also being significantly affected by pollution, plays an important role in removing air pollution. In the Ontario Greenbelt study, the CITY- green software was employed to assess the amount of air pollutants successfully removed by the tree canopy cover across the study area. In view of the air quality inside the Greater Toronto Area, it calculated that trees in the Greenbelt removed about 60 kilograms of pollutants per hectare per year, including 1.2 kg of [carbon monoxide](#), 4.2 kg of [sulfur dioxide](#), 7.5 kg of [nitrogen dioxide](#), 16.8 kg of [particulate matter](#) and 30.3 kg of [ozone](#). It has also been estimated that about 48,260 kilograms of pollutants were removed by the Rouge Park's forests and 1,854 kilograms by plantations and hedgerows in the [urban park](#).<sup>48</sup>

The absorption of air pollution by trees along with [climate change](#) regulation from [carbon storage](#) in trees, plants and soils are greatly undervalued in market economies, despite being worth trillions of dollars per year. The total estimated annual value provided by this service is equal to \$382,057 per year, or \$475 per hectare per year of natural forest cover plus \$14,679, or

<sup>47</sup> Li, J. 2002a. Spill Management for the Toronto AOC, the City of Toronto Study, Ryerson Polytechnic University. Toronto.

<sup>48</sup> Wilson, S. (2012, September). Canada's Wealth of Natural Capital Rouge National Park. Retrieved from <Https://Davidsuzuki.org/Wp-Content/Uploads/2012/09/Rouge-National-Park-Canada-Wealth-Natural-Capital.pdf>

\$237.50 per hectare of plantation and hedgerow cover. The Rouge Park forest cover across the total study area removed an estimated 480,343 kilograms of pollutants from the air, and plantation and hedgerow cover removed an additional 59,082 kilograms. The annual value of this

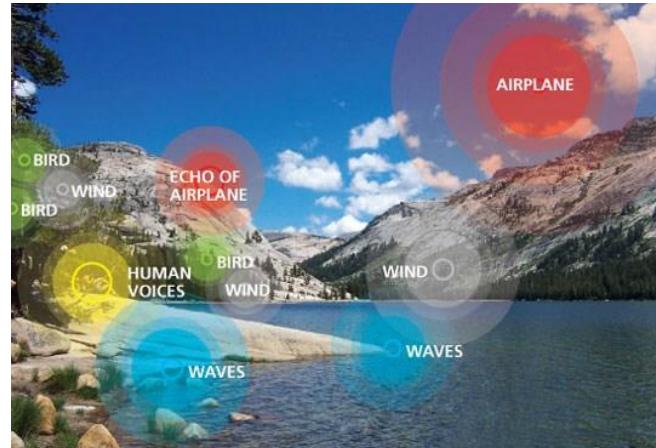
service for the total study area was an estimated \$3.8 million per year for forests, plus \$467,730 for plantations and hedgerows in Rouge Park.<sup>48</sup>

Major issues leading to an increase in air pollution around Rouge Park area are:

- The proposed [Pickering Airport](#): The pickering airport has been planned to develop in the lands adjacent to the Urban Park. While the total costs of environmental damage remain unknown, the fumes from the planes and construction would lead to further air Pollution.<sup>49</sup>
- Major Highways: The city's major highways ([401](#) and [407](#)) also pass through the Rouge Park and lead to more air pollution in terms of releasing nitrogen oxide and carbon monoxide into the air.

## Noise Pollution

Due to its proximity to the city of Toronto, Rouge National Urban Park deals with much more [noise pollution](#) than most national parks. This is further amplified by the [401](#) and [407](#) highways that run through the park. A study of [environmental noise](#) conducted by the city of Toronto highlighted that areas that are near highways often suffer from more intense noise. However, there is a clear decrease in total noise levels in the park during the day and night compared to the surrounding areas. The noise levels range from less than 40 dB ([Decibel](#)) to 60 dB during the day, to less than 40 dB during the night, excluding the highways.<sup>50</sup> This is a considerable amount of noise compared to other national parks which have minimal levels of noise emissions around or in them. The noise pollution produced by the highways can have negative effects on the wildlife and visitors since those areas are observed to produce over 70 dB. The 401 is the busiest highway in Canada and the 407 also experiences large amounts of traffic. This massive amount of traffic make the highways the largest sources of noise emission in the area.



An example soundscape with noise pollution in warm colours. Retrieved from:

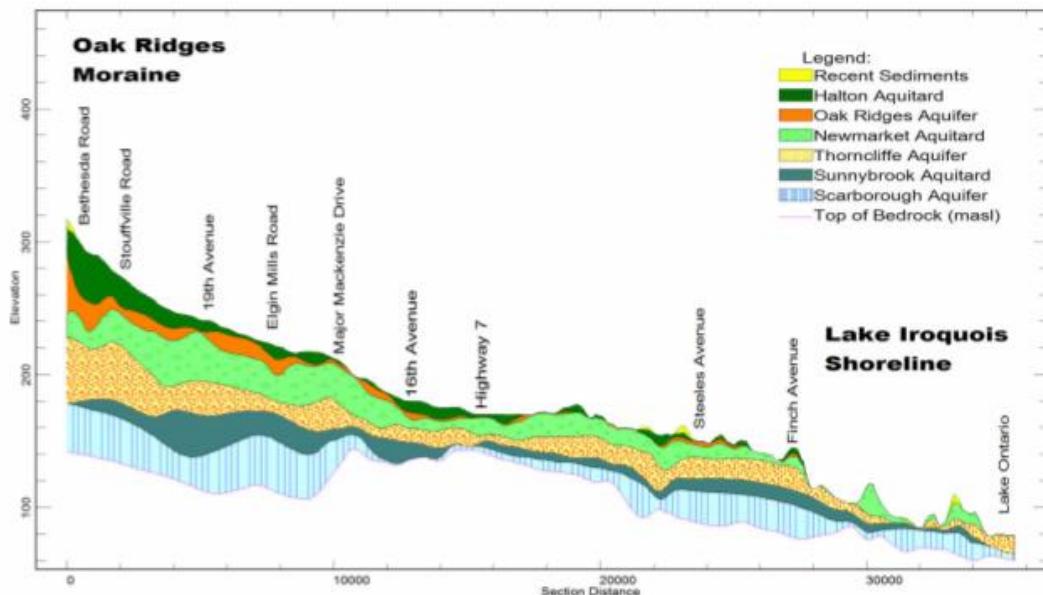
<https://www.nps.gov/yose/learn/nature/soundscape.htm>

<sup>49</sup> Sierra Club Foundation Canada. (2017, July 5). Red Flags Waving for Rouge National Urban Park. Retrieved from [www.sierraclub.ca/en/rouge-national-urban-park](http://www.sierraclub.ca/en/rouge-national-urban-park)

<sup>50</sup> Oiamo, Tor & Rainham, Daniel & Davies, Hugh & Rinner, Claus & Drew, Kelly & Macfarlane, Ronald & Sabaliauskas, Kelly. (2017). Environmental Noise Study in the City of Toronto.

Noise emission can have negative effects on wildlife due to reduction of the sound quality of the natural habitat, causing stresses species are not adapted for.<sup>51</sup> This is often the case for humans as well, where lower quality of life and higher rates of physiological issues such as heart disease and hearing problems are consistent near sources of high noise emission. However, the Rouge plays an important role in this, providing an environment where the noise pollution is relatively lower than surrounding areas. The damped city noise results in higher levels of satisfaction in residents this is due the perception of human made sounds as an annoyance. Contrastingly, natural sounds from the environment are perceived as pleasant<sup>52</sup>. Noise is considered to be one of the biggest factors of reduced satisfaction in green spaces.

## Soil and Subsurface Pollution



Geologic Cross section of the Main Rouge River. [Aquifers](#) hold water, and [aquitards](#) essentially block water. Retrieved from: <http://www.trca.on.ca/dotAsset/37810.pdf> pg 10

[Soil pollution](#) in the Rouge National Urban Park is mainly caused by industrial activity, agricultural activities, and improper waste disposal practices in the area. [The Highland Creek](#) watershed is comprised of layers of soil over subsurface deposited over many thousands of years which is comprised of three major [aquifers](#), known as the Upper, Middle, and Lower [Aquifers](#).<sup>53</sup> Some surfaces in the park are impermeable, such as hard compacted paths, paved paths, and roads; resulting in issues related to [storm-water runoff](#). Some subsurface layers are

<sup>51</sup> Iglesias-Merchan, C., Horcajada-Sánchez, F., Diaz-Balteiro, L., Escribano-Ávila, G., Lara-Romero, C., Virgós, E. & Barja, I. (2018). A new large-scale index (AcED) for assessing traffic noise disturbance on wildlife: Stress response in a roe deer (*capreolus capreolus*) population. *Environmental Monitoring and Assessment*, 190(4) doi:10.1007/s10661-018-6573-y

<sup>52</sup> Rey Gozalo, G., Barrigón Morillas, J. M., Montes González, D., & Atanasio Moraga, P. (2018). Relationships among satisfaction, noise perception, and use of urban green spaces. *Science of the Total Environment*, 624, 438-450. doi:10.1016/j.scitotenv.2017.12.148

<sup>53</sup> Causes and Effects of Soil Pollution. (2016, December 25). Retrieved from <https://www.conserve-energy-future.com/causes-and-effects-of-soil-pollution.php>

comprised of more permeable sands and gravels, making them susceptible to receiving surface contaminants. When soils are contaminated the pollutants percolate into the subsurface, also spreading the contamination into the aquifers which are vital for groundwater transportation and storage.

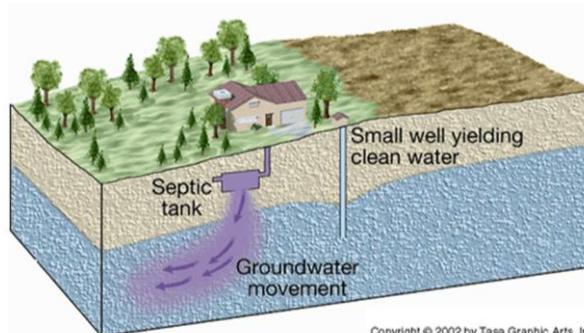
The Rouge National Urban Park is home to class-one soil, which is the rarest, richest, and most fertile soil in Canada.<sup>54</sup> As a result, the Rouge valley has been utilized for farming for thousands of years and due to the nature of Rouge National Urban Park and its land use, soil contamination and pollution is detrimental for the park and for the individuals who utilize its fertile soil.

The increased accumulation of pollutants and concentration of contaminants in the area, mainly from agricultural practices, has the potential to lead to toxic levels of pollution in the soil and aquifers. The Rouge National Urban Park Management Plan recognizes the importance of the conservation of the park's soils for farming, however it lacks mention of any specific soil conservation practices.

Examples of current risks currently facing the soil quality of the soil in Rouge National Urban Park are:

The Proposed Pickering Airport. The airport would be developed to be directly adjacent to the park, of which the environmental damage assessment is difficult to measure, but generally, planes are deadly for birds and threaten nearby wildlife, and the fumes from planes and pollution from construction would lead to contamination of the soils, waterways, and air surrounding the park.<sup>55</sup>

Septic Systems. In many of the older communities around the watershed, septic systems with a lifespan of 10-15 years are still being used and, if these systems fail, they have the potential to introduce contaminants into the soil and groundwater systems.<sup>56</sup>



<sup>54</sup> Rouge National Urban Park. (2018, October 22). Retrieved from [https://en.wikipedia.org/wiki/Rouge\\_National\\_Urban\\_Park](https://en.wikipedia.org/wiki/Rouge_National_Urban_Park)

<sup>55</sup> Red Flags Waving for Rouge National Urban Park. (2017, July 05). Retrieved from <https://www.sierraclub.ca/en/rouge-national-urban-park>

<sup>56</sup> Causes and Effects of Soil Pollution. (2016, December 25). Retrieved from <https://www.conserve-energy-future.com/causes-and-effects-of-soil-pollution.php>

## Natural Hazards

There are numerous [natural hazards](#) associated with Rouge Park which may be either mitigated or amplified depending on park development and management. Hazards include [extreme heat](#), [extreme cold](#), and heavy [precipitation](#). In addition to this [climate change](#) and [pollution](#) threaten to amplify these risks.

### Wildfires

[Wildfires](#) are a natural part of most [ecosystems](#) and they can happen from [droughts](#) that cause dry grass to catch fire, or lightning setting the forest in fire. Overtime the [forest](#) will naturally replenish and regrow.<sup>57</sup>

On April 28, 2003, a [CP Rail](#) train that was traveling through Rouge Park sparked a disastrous wildfire. The wildfires killed thousands of trees, threatened farms, homes, and historical buildings. Dozens of [firefighters](#) were dispatched to control and prevent it from spreading to other parts of the park. In some areas the flames spread over twenty feet; up pine and cedar trees.<sup>58</sup>

The wildfire has adverse immediate and long-term effects as habitats were extremely damaged. After the fire was stopped, [communities](#), [organizations](#), and the [government](#) worked together to restore the park to its original state.<sup>58</sup>



Rouge Park - Tree Candling can cause jump fires, enlarging the flames



Rouge Park - Wildfire consumed numerous young trees

<sup>57</sup> McKenzie, D., Gedalof, Z., Peterson, D. L., & Mote, P. (2004). Climatic change, wildfire, and conservation. *Conservation Biology*, 18(4), 890–902.

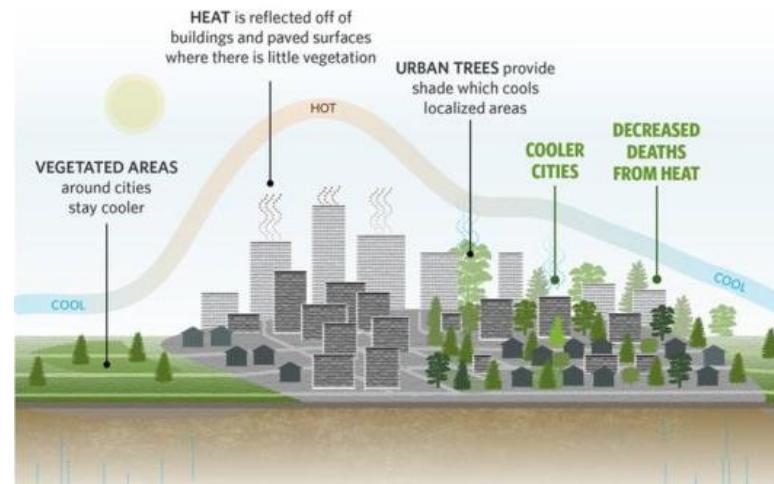
<sup>58</sup> Wildfire in rouge park. (n.d.). Retrieved October 20, 2018, from <http://www.frw.ca/print.php?ID=47&PHPSESSID=c4c1fa09f8b7d9e0d06b960b3d1cd730>

## Extreme Temperatures

### Park Cooling Islands

During the Summer months heat waves pose a threat to people and animals in and around the park. Prolonged periods of high temperatures are responsible for numerous deaths each year in the city of Toronto due to dehydration and heat stroke.<sup>59</sup> It is estimated that due to climate change the province of Ontario will warm by 2 to 5 degree by the end of the twenty first century, as a result, the frequency and severity of these heat waves is expected to increase in the near future.<sup>59</sup>

Rouge Park serves as a local cool island which provides relief from high temperatures during heat waves and reduces the heat of the surrounding urban area.<sup>59 60</sup> One of the most prominent effects of a large urban area is the urban heat effect or urban heat island phenomenon in which the extensive use of concrete along with high population density results in elevated temperatures.<sup>59</sup> Large scale parks assist in overcoming this problem by providing local residences and wildlife an area of refuge during heat waves and by cooling the surrounding area through a process known as the Park Cooling Island.<sup>59 60</sup> Temperatures of parks in Vancouver, and Montreal were shown to be on average 1-2 degrees lower than their surrounding areas and in ideal conditions can be 5 degrees cooler than their surrounding area. The influence of parks on air temperature has been shown to be limited to about one park-width distance. Rouge Park, once full established, will encompass 79.1 km<sup>2</sup> of land meaning it will provide cooling benefits to a very large area of land outside of its boundaries.<sup>60</sup> ([External Link](#)) This cooling effect provided by Rouge Park serves a vital role in mitigating the effects of heat waves on the surrounding urban environment which will become increasingly important as the temperatures rise. <sup>59</sup>



A diagram illustrating Urban Heat Islands (Areas) and Park Cooling Islands (Areas). Retrieved from:  
<https://www.bbc.com/news/science-environment-37813709>

<sup>59</sup> Smoyer-Tomic, K. E., & Rainham, D. G. (2001). Beating the Heat: Development and Evaluation of a Canadian Hot Weather Health-Response Plan. *Environmental Health Perspectives*, 109(12), 1241-1248.  
doi:10.1289/ehp.011091241

<sup>60</sup> Parks Canada Agency. (2018, November 01). Seasonal hazards - Rouge National Park. Retrieved November 27, 2018, from <https://www.pc.gc.ca/en/pn-np/on/rouge/securite-safety/saison-season>

## Extreme Cold

Rouge Park contains a number of trails, isolated areas, and bodies of water all of which can be potentially dangerous to visitors in winter months. There is currently no winter maintenance of trails or artificial lighting. Trails many contain steep or rocky sections which can become extremely slippery once coated with ice.<sup>60</sup> During periods of extreme cold hypothermia can become a danger to visitors of the park and it is important to note that due to the parks size and prevalence of isolated areas it can be dangerous during the winter to explore it without ample time before early sunsets, alone, or without a method of calling for help.<sup>60</sup> See the Rouge National Urban Park Website for Winter Seasonal Hazards.



Rouge Park Trail in the winter.

Retrieved from:

[https://rougenationalnowdotcom.files.wordpress.com/2016/01/la-3-scene20160113\\_105710\\_s.jpg](https://rougenationalnowdotcom.files.wordpress.com/2016/01/la-3-scene20160113_105710_s.jpg)

## Extreme Weather

### Thunderstorms

Rouge Park particularly in the spring when heavy precipitation is common is vulnerable to the effects of thunderstorms which include flooding, and wind damage.<sup>60</sup> These two effects can be very hazardous to visitors of the park during and after the storms. Heavy winds will damage trees in the park which may lead to obstructed paths or hanging branches which may fall on passing visitors. After heavy storms paths may not be accessible to all visitors.

### Flooding

Floods naturally happen in Rouge National Urban Park (RNUP). There are many streams that run through the park and its southern border is Lake Ontario. Flood plains are areas of low ground adjacent to streams that are prone to flooding. When large storms or melts occur, they increase the volume of water flowing into streams, flood plains are then covered in the water that overflows from the streams.<sup>61</sup> The lake level also varies and can flood shorelines as it did in 2017. Flooding is a normal occurrence that can happen quickly and unpredictably. The process of recovery may take days or even months, as the excess water will stay in an area until the earth absorbs it or is carried away. Floods can destroy property, infrastructure and resources that people may depend on. During floods the RNUP serves as a sponge, absorbing water, but is also

<sup>61</sup> WaterPortal, A. (2018, October 29). Environmental Impacts of Flooding. Retrieved from <https://albertawater.com/what-are-the-consequences-of-flooding/environmental#ftnt1>

negatively impacted; as flood plains extend into agricultural areas, near houses and cover much of the area bordering the lake. Flooding can impact: the wellbeing of wildlife and livestock, cause riverbank erosion and sedimentation and propagate the dispersal of nutrients and pollutant. It can also impact local landscapes and habitats.<sup>62</sup>

### Impacts

Floods can be very destructive to transit corridors and other infrastructure like telecommunication towers within the floodplain. Fundamentally floods distribute massive amounts of water and sediment over an enormous land area. The sediments left behind by the receding waters lend highly productive agricultural land.<sup>63</sup> Many farms are therefore established in the Rouge River floodplain, particularly in the northern part of the park. Subsequent flooding of the river however can put these farms at risk by damaging crops and reducing farm output. Flooding in urbanized areas tends to be better controlled than in more rural areas. There is more infrastructure in place such as berms, spillways, and sewage channels to manage drainage. Floods can destroy homes and infrastructure and standing floodwater can cause further damage to property. Furthermore, floodwaters can pick up contaminants and carry them downstream as the water recedes.

[63](#)

### **Climate Change's Effects on Disasters**



A Portion of the Floodplain map of the Rouge Park Area.

Retrieved from: <https://trca.ca/conservation/flood-risk-management/flood-plain-map-viewer/>

<sup>62</sup> Zaalberg, R., Midden, C., Meijnders, A., & McCalley, T. (2009). Prevention, adaptation, and threat denial: Flooding experiences in the netherlands. *Risk Analysis*, 29(12), 1759- 1778. doi: 10.1111/j.1539-6924.2009.01316.x

<sup>63</sup> Li, C., Cheng, X., Li, N., Du, X., Yu, Q., & Kan, G. (2016). A Framework for Flood Risk Analysis and Benefit Assessment of Flood Control Measures in Urban Areas. *International journal of environmental research and public health*, 13(8), 787. doi:10.3390/ijerph13080787

[Greenhouse gas](#) emissions have significantly altered global [climate](#) and [weather](#) events, with these changes in historic patterns increased extreme heat waves and cold temperatures will continue to be experienced. The increase in [droughts](#), heavy precipitation and [temperature](#) caused by climate change can increase the outbreak of [wildfires](#), and [floods](#).<sup>64</sup>

In Rouge park the unusually dry conditions allowed a fire on April 28, 2003 to spread and burn zigzag cedar fence lines that had lasted more than 100 years. These [wildfires](#) will become more frequent and costlier if [global warming](#) continues.<sup>65</sup> [Extreme precipitation](#) in the form of rain and snow/ snow melt overwhelm the natural absorbency of the park and will overflow the water systems.

## Governance

With the inception of the Rouge National Urban Park, management responsibility has been handed over to Parks Canada and ultimate decision making regarding the Rouge Valley and its conservation efforts is the primary responsibility of the [Government of Canada](#) through Parks Canada.

National parks are a special type of public lands administered by the federal government under the provisions of the National Parks Act. The establishment of new park relies on a variety of factors:

- Identifying Representative Natural Areas
- Selecting Potential Park Areas
- Assessing Park Feasibility
- Negotiating a New Park Agreement
- Establishing a New National Park in Legislation<sup>66</sup>

The laws and politics surrounding the creation of an [urban conservation](#) area in the [Rouge Valley](#) evolved over the last few decades.

In 1988, [Prime Minister Brian Mulroney's Progressive Conservative](#) government committed funds for conservation efforts in the Rouge Valley. In 1994, the Rouge Park Management Plan was released under [New Democratic Party \(NDP\)](#) premier [Bob Rae](#), and the park opened the next year and was managed by the Rouge Park Alliance which collaborated with the local community and all levels of government.

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<sup>64</sup> Allen, C. D., Macalady, A. K., Chenchouni, H., Bachelet, D., McDowell, N., Vennetier, M., ... Cobb, N. (2010). A global overview of drought and heat-induced tree mortality reveals emerging climate change risks for forests. *Forest Ecology and Management*, 259(4), 660–684. <https://doi.org/10.1016/j.foreco.2009.09.001>

<sup>65</sup> Wildfire in rouge park. (n.d.). Retrieved October 22, 2018, from <http://www.frw.ca/print.php?ID=47&PHPSESSID=c4c1fa09f8b7d9e0d06b960b3d1cd730>

<sup>66</sup> Parks Canada. (n.d.). National Parks System Plan. Retrieved November 26, 2018 [https://pcacdn.azureedge.net/-/media/docs/v-g/pnnp/SysPlan\\_e.pdf?modified=20090819113553&la=en&hash=ACE8AFD3DA0BA91F5C29ED01DD257571177A9DA6](https://pcacdn.azureedge.net/-/media/docs/v-g/pnnp/SysPlan_e.pdf?modified=20090819113553&la=en&hash=ACE8AFD3DA0BA91F5C29ED01DD257571177A9DA6)

In the Speech from the Throne (June 2011), [Stephen Harper](#)'s federal Conservative government announced that it would work to establish a national urban park in the Rouge River valley.<sup>67</sup>

In May 2012, the Government of Canada announces that they would provide \$143.7 million in funding for the first ten years to establish, maintain and to run operations in Rouge National Urban Park, and \$7.6 million annually thereafter.<sup>68</sup>

In June of 2013, the province of Ontario commits to transferring 21.5 km<sup>2</sup> of land to Parks Canada for Rouge National Urban Park via the Federal-Provincial Agreement. [Transport Canada](#) also confirms their intention to transfer 19.1 km<sup>2</sup> of land to Parks Canada for Rouge National Urban Park. Parks Canada has committed to working closely with the province of Ontario, the Toronto and Region Conservation Authority, and municipal governments to establish appropriate management of the park.

In June 2014, Bill C-40 known as The Rouge National Urban Park Act is tabled in [Parliament](#) and on June 21, Parks Canada releases Rouge National Urban Parks' draft management plan for public review and feedback. This document will guide the management of the park over a 10-year period.<sup>69</sup>

Under the management section of the Act "The Minister is responsible for the administration, management and control of the Park, including the administration of public lands in the Park and, for that purpose, the Minister may use and occupy those lands". This section also provides that the Minister may establish a committee to advise the Minister on park management.<sup>70</sup>

The Act also requires that within five years of the establishment of the Park, the Minister must prepare a management plan that sets out a long-term vision for the Park. The management section, also provides specific directives for what should be included in the management plan including: protection of natural and cultural heritage, the presentation of agricultural heritage and the installation and maintenance of infrastructure and provide for public consultations. The law gives the Minister the power to enter into agreements with other levels of government and organizations it also provides superintendents of the land with power to install or maintain public



Stephen Harper makes an announcement on July 11th, 2015 at Pickering Recreational Complex: Doubling the federal government's initial contribution to Rouge National Urban Park.

<https://globalnews.ca/news/2105498/harper-says->

<sup>67</sup> Finkelstein, M. W. (2018). Rouge National Urban Park. In The Canadian Encyclopedia. Retrieved from <https://www.thecanadianencyclopedia.ca/en/article/rouge-national-urban-park#>

<sup>68</sup> Parks Canada (2017). National Parks management planning. <https://www.pc.gc.ca/en/agence-agency/biblib/docs2b>

<sup>69</sup> It takes a community to create a national urban park - Rouge National Urban Park. (2017). Retrieved October 16, 2018, from <https://www.pc.gc.ca/en/pn-np/on/rouge/info/jalons-milestones>

<sup>70</sup> Westoll, A. (2012). UTSC partners with Parks Canada on Rouge National Urban Park | University of Toronto Scarborough - News and Events. Retrieved October 16, 2018, from <https://utsc.utoronto.ca/news/events/archived/utsc-partners-parks-canada-rouge-national-urban-park>

infrastructure.<sup>71</sup>

The National Park management plan establishes a vision looking 15 or more years into the future. Its primary goal is to ensure that there is a clearly defined direction for the maintenance or restoration of ecological integrity and, in the light of this primary goal, for guiding appropriate use. Direction is also described for the heritage presentation programs, which are recognized as a fundamental means for achieving both protection and use objectives. <sup>71</sup>

The Canada National Parks Act requires that a management plan be prepared every five years for each National Park. A Draft Management Plan was designed in 2014 for the Rouge National Urban Park to be an adaptable plan holding 5 key strategies with numerous objectives:

**Key Strategy 1:** A Canadian First – Fostering a New Way of Thinking about Protected Heritage Areas in an Urban Setting

**Key Strategy 2:** A Dynamic, Cohesive Rouge – Managing Change in Support of a Healthy and Resilient Park Landscape

**Key Strategy 3:** A Connected and Relevant Rouge – Forging Emotional and Physical Connection with the Park

**Key Strategy 4:** Success through Collaboration – Nurturing Strategic Relationship to Advance Shared Objectives.<sup>72</sup>

December 12, 2014 - Parks Canada signs a binding land assembly agreement for the remaining park lands identified for Rouge National Urban Park with Toronto and Region Conservation Authority, the cities of Toronto, Markham, and Pickering, and the municipalities of York and Durham.<sup>73</sup>

The Rouge National Urban Park Act came into force on 15 May 2015 officially establishing the park.<sup>74</sup> In July, the Government of Canada announces they will contribute an additional 21 km<sup>2</sup> of new lands to Rouge National Urban Park, making it the largest and best protected urban park of its kind in North America once fully established. <sup>72</sup>

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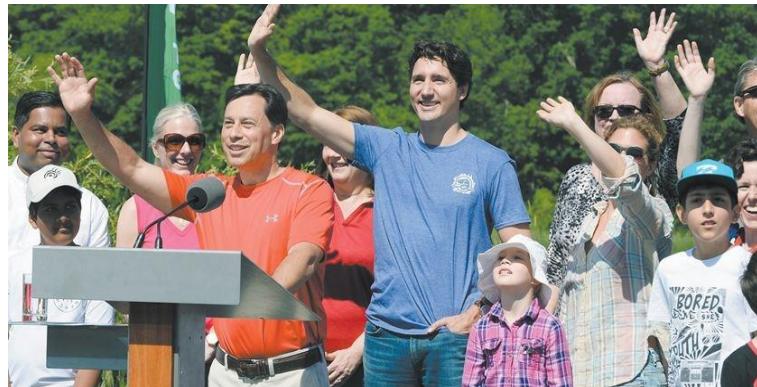
<sup>71</sup> Parks Canada. (n.d.). National Parks System Plan. Retrieved November 26, 2018  
[https://pcacdn.azureedge.net/-/media/docs/v-g/pnnp/SysPlan\\_e.pdf?modified=20090819113553&la=en&hash=ACE8AFD3DA0BA91F5C29ED01DD257571177A9DA6](https://pcacdn.azureedge.net/-/media/docs/v-g/pnnp/SysPlan_e.pdf?modified=20090819113553&la=en&hash=ACE8AFD3DA0BA91F5C29ED01DD257571177A9DA6)

<sup>72</sup> Parks Canada (2015). Rouge National Urban Park Management Plan. <https://www.pc.gc.ca/en/pnnp/on/rouge/info/~/media/028EC69FE3264676AD660595012FED36.ashxnp/on/rouge/info/~/media/028EC69FE3264676AD660595012FED36.ashx>

<sup>73</sup> It takes a community to create a national urban park - Rouge National Urban Park. (2017). Retrieved October 16, 2018, from <https://www.pc.gc.ca/en/pn-np/on/rouge/info/jalons-milestones>

<sup>74</sup> Finkelstein, M. W. (2018). Rouge National Urban Park. In The Canadian Encyclopedia. Retrieved from <https://www.thecanadianencyclopedia.ca/en/article/rouge-national-urban-park#>

Since the announcement of the proposed National Park in the Greater Toronto area there has been criticism of the management of it. In a 2015 article, [The Toronto Star](#) outlined the skepticism held by an environmental legal review board called Ecojustice that the Rouge legislation was too weak in terms of protecting the natural environment and that it fails to prioritize the preservation of ecological integrity. Due to this dispute the Ontario Government stated that there would be no further transfers of provincial land until the legislation was strengthened. Following this review the changes were made to improve the governance of the National Park.<sup>75</sup>



Prime Minister of Canada, Justin Trudeau and family seen here along with [Scarborough MPP Brad Duguid](#) at the Paddle the Rouge event in June 2016. [www.toronto.com/community-story/7376620-ontario-expected-to-hand-its-rouge-valley-land-to-rouge-national-park/](http://www.toronto.com/community-story/7376620-ontario-expected-to-hand-its-rouge-valley-land-to-rouge-national-park/)

June 9, 2016 - The Government of Canada tabled amendments to the Rouge National Urban Park Act to ensure that the ecological integrity of the park is the first priority in the park's management. Bill C-18, An Act to amend the Rouge National Urban Park Act, was introduced by the [Minister of Environment and Climate Change](#). Clause 2 of Bill C-18 replaces section 6 of the Act with a new, stricter requirement that the minister's first priority, when considering all aspects of the management of the park, be maintenance or restoration of ecological integrity-giving this park the same level of ecological protection as other national parks.<sup>76</sup> On June 19, 2017 - Bill C-18 receives Royal Assent, amending the management section of the Rouge National Urban Park Act.<sup>77</sup>

In October 2017, the province of Ontario officially handed over 22.8-square kilometers of land to Parks Canada, which brings the total area of Rouge National Urban Park to 79.1-square kilometers.<sup>78</sup>

November 7, 2018 – The Toronto and Region Conservation Authority transfers more than 190 hectares (470 acres) of land in [Bob Hunter Memorial Park](#) to Parks Canada to help complete Rouge National Urban Park.<sup>77</sup>

<sup>75</sup> Parks Canada (2017). National Parks management planning. <https://www.pc.gc.ca/en/agence-agency/biblib/docs2b>

<sup>76</sup> Williams, T., & Becklumb, P. (2016). Legislative Summary of Bill C-18: An Act to amend the Rouge National Urban Park Act, the Parks Canada Agency Act and the Canada National Parks Act. Retrieved October 16, 2018, from

[https://lop.parl.ca/sites/PublicWebsite/default/en\\_CA/ResearchPublications/LegislativeSummaries/421C18E](https://lop.parl.ca/sites/PublicWebsite/default/en_CA/ResearchPublications/LegislativeSummaries/421C18E)

<sup>77</sup> It takes a community to create a national urban park - Rouge National Urban Park. (2017). Retrieved October 16, 2018, from <https://www.pc.gc.ca/en/pn-np/on/rouge/info/jalons-milestones>

<sup>78</sup> CBC. (2017, October 21). Ontario hands over last piece of land for Rouge National Urban Park, but skeptics remain. CBC News. Retrieved from <https://www.cbc.ca/news/canada/toronto/rouge-urban-park-ontario-leases-farms-1.4365896>

## Government and Authority

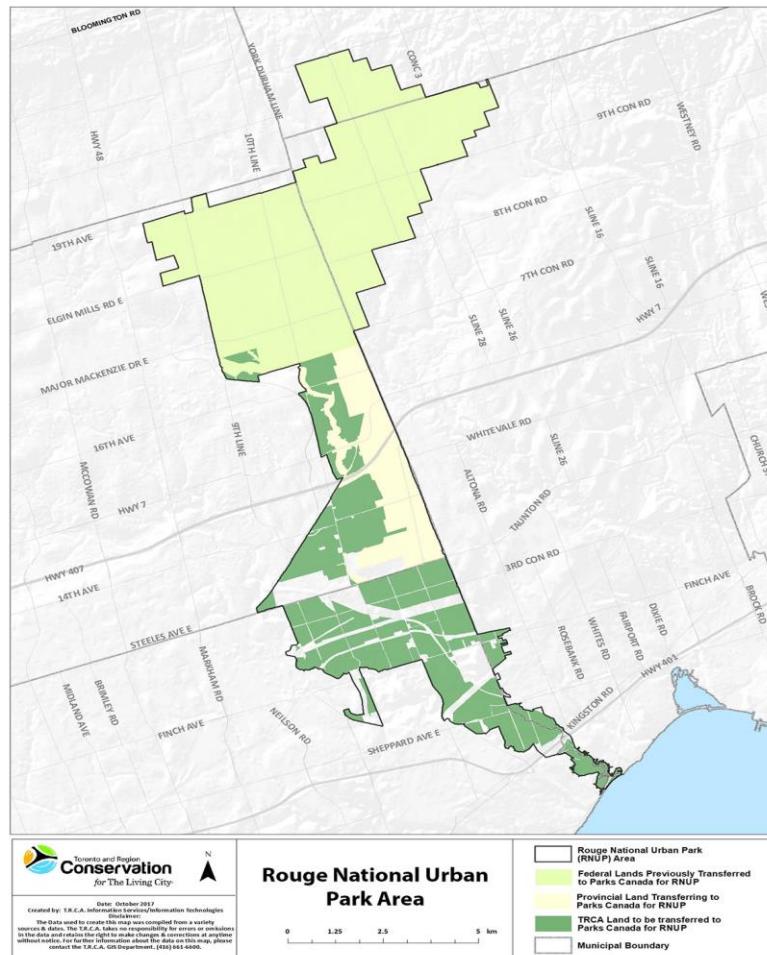
### Partners

#### Parks Canada

Parks Canada makes the important contribution on connecting the network of national nature, histories and marine conservation areas. Parks Canada pays attention to the management of tourism and ensures that visitors can enjoy their experiences in Rouge. Parks Canada tries to achieve the sustainability in the park and ensure the continued health of the park.<sup>79</sup>

#### Toronto and Region Conservation Authority (TRCA)

The TRCA is the service provider for Park's development and management. It is the active land manager, park advocate and one of the founding members of the former Rouge Alliance. The TRCA transferred 5,600 acres within its jurisdiction to [Parks Canada](#) to help create Rouge National Urban Park. The TRCA commits to introducing professional knowledge and leadership and to the restoration of the Rouge River and park. They work with all levels of government to protect the Rouge's agricultural and natural landscapes as well as its cultural heritage.<sup>80</sup>



Map of Rouge National Urban Park. Retrieved from: [https://s3-ca-central-1.amazonaws.com/trcaca/app/uploads/2017/10/17170738/Rouge-National-Urban-Park-Map-v5\\_RESIZE.jpg](https://s3-ca-central-1.amazonaws.com/trcaca/app/uploads/2017/10/17170738/Rouge-National-Urban-Park-Map-v5_RESIZE.jpg)

<sup>79</sup> Parks Canada. (2014). Rouge National Urban Park: Management Plan. Retrieved from:

<https://www.pc.gc.ca/en/pn-np/on/rouge/info/~/media/028EC69FE3264676AD660595012FED36.ashx>

<sup>80</sup> Rouge Park. (2017). ROUGE NATIONAL URBAN PARK: ONE STEP CLOSER. Toronto and Region Conservation Authority. Retrieved from <https://trca.ca/news/rouge-national-urban-park-one-step-closer/>

## **Partners**

### **Research and Education Partners**

#### Royal Ontario Museum (ROM)

Experts and avid naturalists from the ROM join in Rouge Park Bioblitz to make contributions to the knowledge base of biodiversity in Canada's first national urban park, hoping and striving to inspire a younger generation of scientists.<sup>81</sup>



Getting for the 2012 Ontario Bioblitz in Rouge Park.

Retrieved from: [https://www.rom.on.ca/sites/default/files/styles/blog\\_large/public/blog\\_post.thumbnail/1-2012-06-15\\_brennan\\_caverhill\\_ina?itok=xI9QcY7](https://www.rom.on.ca/sites/default/files/styles/blog_large/public/blog_post.thumbnail/1-2012-06-15_brennan_caverhill_ina?itok=xI9QcY7)

#### Toronto Zoo

Since 2015, Toronto Zoo has cooperated with Parks Canada to help find bats in Rouge Urban National Park. Staff in the park collect acoustic data of bats' activities and Zoo staff analyze and interpret the data. The Rouge Park and Toronto Zoo have recorded 10 thousand bat observations together.<sup>82</sup>

On June 30th, 2014 the Toronto Zoo, Parks Canada, Toronto and Region Conservation Authority (TRCA), and Earth Rangers reintroduced 10 baby Blanding's turtles to the pond in Rouge National Urban Park. It is an important partnership for biodiversity conservation and revitalization.<sup>83</sup>



Blanding's Turtle Release into Rouge Park. Retrieved from <http://www.torontozoo.com/press/2018/?pg=20180621>

#### University of Toronto Scarborough

University of Toronto Scarborough campus signed an agreement with Rouge National Urban Park to become Park's primary research and education partner with Parks Canada in November 2011.<sup>84</sup>

<sup>81</sup> Phillips,A. (2017). First, Tarantulas in Rouge Park; what's next?. Royal Ontario Museum. Retrieved from <https://www.rom.on.ca/en/blog/first-tarantulas-in-rouge-park-whats-next>

<sup>82</sup> Toronto Zoo. Bat Research at the Zoo. Retrieved from <http://www.torontozoo.com/bats/?pg=Research>

<sup>83</sup> Baby Turtles Released in the Future Rouge National Urban Park-Toronto Zoo. (2014). Retrieved from <http://www.torontozoo.com/press/releases.asp?pg=20140630>

<sup>84</sup> UTSC partners with Parks Canada on the Rouge-UTSC. (2012). Retrieved from <https://utsc.utoronto.ca/news-events/commons-magazine/utsc-partners-parks-canada-rouge>

## OCAD University

Min Sook Lee and Laura Millard from OCAD led a cross-disciplinary course and held an exhibition for projects at Rouge Beach in 2017. This exhibition provided opportunities for students to explore diverse issues including concepts of nature and nationhood.<sup>85</sup>

### Photographer-in-Residence

In 2016, Parks Canada partnered with OCAD University to hire the park's first "Photographer-in-Residence" Heike Reuse. Heike's work was featured in the *Toronto Star*, CBC and *Metro*, and she also staged an exhibition in downtown Toronto.<sup>xii</sup>



End of semester presentation of OCADU LandMarks students' project plans. Retrieved from <https://www2.ocadu.ca/sites/www2.ocadu.ca/files/styles/large/public/poster/LandTalks.jpg?itok=sgfhHJoZ>

## Partners from the Public

### Public Engagement

Rouge National Urban Park draft management plan released for public engagement. Citizens made their feedback and analyzed the draft plan during the five-month period of the formal public engagement process from June to October, 2014. Around 10,000 Canadians and over 100 stakeholder groups made their input in the draft plan.<sup>86</sup>

Under the Rouge National Urban Park Act, the Minister must provide chances for the public to participate in the development of the management plan or any other matters that the Minister considers relevant, including by Aboriginal organizations.<sup>87</sup>

<sup>85</sup> <https://www2.ocadu.ca/sites/www2.ocadu.ca/files/styles/large/public/poster/LandTalks.jpg?itok=sgfhHJoZ>

<sup>86</sup> Draft management plan: Rouge National Urban Park draft management plan released for public engagement- Parks Canada.(2017). Retrieved from <https://www.pc.gc.ca/en/pn-np/on/rouge/info/directeurmanagement>

<sup>87</sup> <https://laws-lois.justice.gc.ca/eng/acts/R-8.55/page-1.html#h-5>

## Indigenous Partnerships

Parks Canada is working with Indigenous Partners who have historic and present-day connections to the park. Parks Canada's Indigenous partners play a role in and make significant contributions to all aspects of park operations, including helping to restore and enhance park ecosystems and farmland, sharing traditional stories and cuisine at in-park programs and events, and participating in and helping to monitor archaeological work throughout the park.<sup>xiii</sup>



The Official Land Transfer Ceremony from the Government of Ontario to Parks Canada. Retrieved from: <https://jphilpott.liberal.ca/news->

### Indigenous Partners

The Rouge National Urban Park First Nations Advisory Circle was established in 2012 which is set up by Parks Canada and 10 Indigenous Groups. The Advisory Circle creates opportunities for indigenous people to express their interest, and natural and cultural knowledge to the park.<sup>88</sup>

The First Nations Advisory Circle consists of:

The seven Williams Treaties First Nations:

- Mississaugas of Scugog Island First Nation
- Hiawatha First Nation
- Alderville First Nation
- Curve Lake First Nation
- Chippewas of Georgina Island First Nation
- Chippewas of Rama First Nation
- Beausoleil First Nation

As well as:

- Mississaugas of the New Credit First Nation
- Six Nations of the Grand River
- The Huron-Wendat Nation

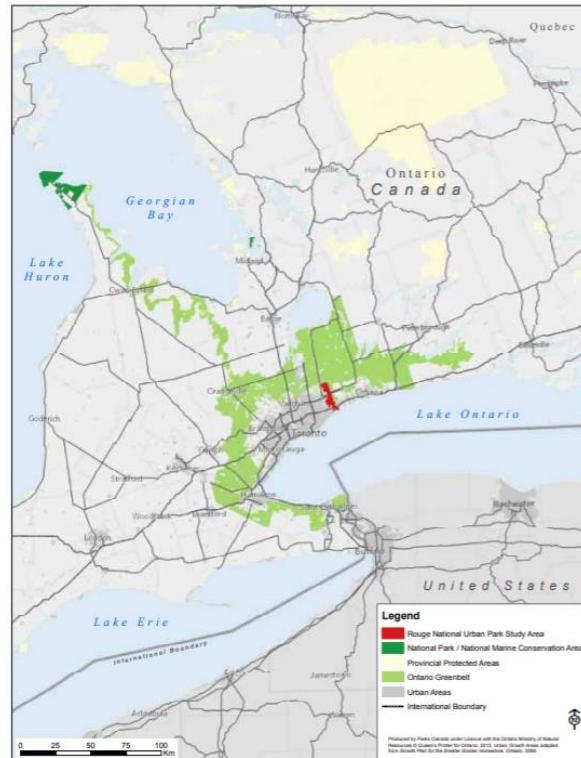
<sup>88</sup> Indigenous partners-Parks Canada.(2017). Retrieved form: <https://www.pc.gc.ca/en/pn-np/on/rouge/info/partenaires-partners/indigene-indigenous>

## Management Plan

The Management Plan is specially designed to protect the diversity of the landscape in the heart of our nation's largest city; providing guidelines for the park's management for the next 10 years.

The plan strives to maintain the natural, cultural, and the agricultural landscapes for future patrons through the park's vision, management strategies, objectives and actions that help support conservation. Public, Indigenous and local business partnerships are highlighted as important proponents to decision making and management, as communal involvement lays the foundation for a strongly protected park.

With a community centred foundation, the Plan provides a framework to guide the implementation of activities and initiatives. Conservation, protection and enhancement with a social-impact focus allows urban parks to flourish as they are inherently interconnected with the built infrastructure; playing a significant role in buffering and mitigating the effects of climate change on urban areas. Conservation areas also help to conserve biodiversity and create more resilient ecosystems that can adapt to the changing climate, also fostering a healthy community.<sup>89</sup> See [Benefits to Surrounding Populations](#).



MAP 1: Regional Setting

## Key Strategy 1

A Canadian First— Fostering a New Way of Thinking about Protected Heritage Areas in an Urban Setting

### Targets

- The park will be a mixture of natural, cultural, and agricultural resources and contribute to larger watershed objectives

### Actions

- Manage the park to enhance ecosystem health by focusing on protecting and restoring existing ecosystems.
- Manage the park in a way that the protection and conservation of natural and cultural resources will occur in a mutually supportive manner. <sup>89</sup>

### Desired Outcomes

<sup>89</sup> Parks Canada (2015). Rouge National Urban Park Management Plan. <https://www.pc.gc.ca/en/pn-np/on/rouge/info/~media/028EC69FE3264676AD660595012FED36.ashx>

- Rouge National Urban Park contributes tangibly to the Government of Canada's National Conservation Plan by connecting Canadians in the GTA to nature, and by furthering their appreciation and understanding of the conservation of lands and waters, ecosystem restoration, and Canada's network of protected heritage areas.
- A unique approach to conservation enhances ecosystem health by way of a harmonious and dynamic mosaic of natural lands that embraces agricultural and cultural landscapes and the presence of people living and working in the park.
- Farming is integrated with other park objectives in a way that supports the park farming community as a permanent and valued part of the park.<sup>89</sup>

## Key Strategy 2

### A Dynamic, Cohesive Rouge— Managing Change in Support of a Healthy and Resilient Park Landscape

**Desired outcomes**

- The park's natural ecosystems, cultural heritage, and agricultural system will be highly adaptive and resilience to the climate change.
- A high level of functionality for the park that contributes to the larger natural, cultural, economic, and social value of the watersheds and region in which it sits.

**Actions**

- Apply Parks Canada Principles and Guidelines for Ecological Restoration in Canada's Protected Natural Areas.
- Protect the ecosystem within the park, to maintain the habitat to serve a variety of wildlife species.
- Restoring the hydrological functions, protecting the water quality.
- Implement restoration projects
- Protect and conserve species-at-risk through a multispecies, ecosystem approach that:
  - Continues to meet the legal and conservation obligations for the protection and recovery of species under the Species at Risk Act.
  - Assesses the conservation status of federally and provincially listed species-at-risk at the park level, as well as establishes and implements priority conservation activities that support the recovery of species-at-risk in the park.
  - Applies standardized methods to characterize and evaluate threats (e.g., as developed by the IUCN and The Conservation Measures Partnership).
  - Where appropriate, involves communities in and around the park in species recovery, monitoring, and habitat restoration, including the park farming community in the integration of beneficial management practices on agricultural lands that sustain species-at-risk.<sup>89</sup>



MASTER PERSPECTIVE OF A HYPOTHETICAL PARK LANDSCAPE MOSAIC; SMALLER "VIGNETTES" FROM THIS PERSPECTIVE ARE FOUND IN SUBSEQUENT SECTIONS OF THE DRAFT MANAGEMENT PLAN TO ILLUSTRATE SPECIFIC IDEAS

## Park Initiatives

### National Park Tourism

Delivering national initiatives (e.g., Xplorer, oTENTik accommodation) to reach new audiences by promoting and cross-promoting, branding, undertaking outreach, advertising, and cultivating relationships with the tourism industry.

### Beare Hill Park Project

The Beare Road Park Master Plan was proposed in 2013. It advocates for the closed Beare Road Landfill area to be turned into a park called Beare Hill Park that is integrated into the Rouge National Urban Park. The Beare Road Landfill closed in 1983 and has since been partly reforested and converted into a wetland. It is currently surrounded by the park to the west, north and east. There is an official trail in the Rouge National Urban Park where the hill can be viewed from, but it does not allow access to the landfill area. Dirt trails to the hill have been created by patrons of the park who wish to gain a better view of Eastern Greater Toronto as it is one of the tallest points in the area. There is no solid barrier between the park and the landfill which allows animals and park patrons alike to traverse through the space, believing it to part of the park. The wetlands at the site are significant for many species such as bobolink, milk snakes and the Blanding's Turtle (a threatened species in Ontario) so Rouge Park conservation authorities work often in the area. On June 27, 2017 The City of Toronto held a meeting to discuss the progress of the Beare Hill Park and confirmed its integration into the greater Rouge National Urban Park. Work on the area has begun and it is predicted that the site will be open for the public in 2019. Plans for the site focus on trails for recreation, an observation deck and a focus on educating the public about how closed landfills are managed and rehabilitated.



Map showing location of Beare Hill Park. Retrieved from: [https://www.toronto.ca/wp-content/uploads/2017/11/9762-2017-06-27\\_BeareHillPark-DetailedDesignProject-details.pdf](https://www.toronto.ca/wp-content/uploads/2017/11/9762-2017-06-27_BeareHillPark-DetailedDesignProject-details.pdf)

## Urban Agriculture Scarborough Food Deserts

Pockets of Scarborough are low-income; often associated with [food deserts](#). The lack of access to culturally appropriate, fresh and affordable food may in part be addressed through connections of surrounding neighbourhoods to food through the park.<sup>90 91 92</sup>

## Cultural Food Representation

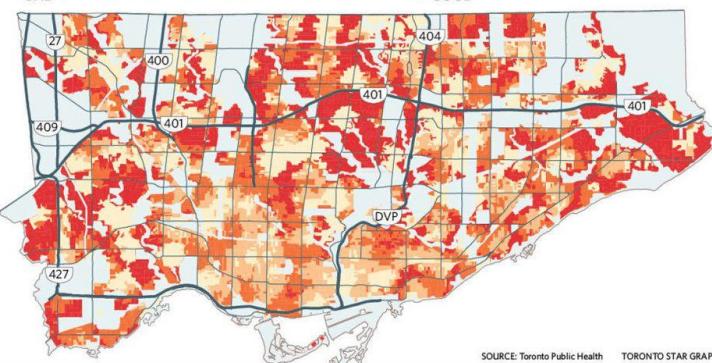
Farmers and participants in discussions about agriculture regarding the future of the RNUP were and are not proportionally representative of the surrounding communities, or cities. The farmers and decision makers regarding the future of RNUP farming have predominantly been Caucasian.<sup>90</sup> Without culturally diverse farmers or at least, conscious farmers, the locally grown crops may not benefit the surrounding communities that are most in need of fresh and accessible produce. This lack of diversity is exclusionary.<sup>93</sup> With increased diversity of farmers, there will be a greater potential to enhance [food security](#) and local food production. The one culturally diverse garden within the park, Judy's Tropical Garden (See [External Links](#)), was started by a Filipino nanny a local farmer; exemplifying the potential for diverse agriculture on Class 1 land ([External Link](#)).<sup>90</sup>

## Land Access in the Park

The RNUP is aiming to facilitate land access for leasing small-scale farming.<sup>90</sup> This and the proximate access to large-scale farmers can reconnect people to food production; shifting the local community away from structural dependencies on unsustainable forms of food production.<sup>91 92 93</sup>

### Swamped with unhealthy options?

The index is calculated by dividing the number of "healthier food retail" establishments by the total number of food establishments, multiplied by 100. Those areas appearing darker red reflect a lower index of healthy food establishments.



SOURCE: Toronto Public Health TORONTO STAR GRAPHIC

A map of food deserts in the GTA, Scarborough (East) heavily coloured red, indicating a lack of healthy food retailers. Retrieved from:  
<https://www.thestar.com/news/gta/2015/11/10/are-you-living-in-an-unhealthy-food-desert/>

<sup>90</sup> Gill, J. (2017). The Rouge Uncovered: Community Participation, Urban Agriculture and Power Dynamics in the Creation of Canada's first National Urban Park. (Unpublished master's thesis). Department of Geography and Planning, University of Toronto, Toronto, Canada.

<sup>91</sup> Jacobs, R. C. (2017). Understanding Neighbourhood Food Access: Practices and Perspectives of Residents of Scarborough Village, Toronto. (Unpublished master's thesis). Department of Geography and Planning, University of Toronto, Toronto, Canada.

<sup>92</sup> Rouge Park Management Plan. (2014). Province of Ontario. Retrieved from: <https://www.pc.gc.ca/en/pn-np/on/rouge/info/~/media/028EC69FE3264676AD660595012FED36.ashx>

<sup>93</sup> Tornaghi, C. (2014). Critical Geography of urban agriculture. *Progress in Human Geography*, 38(4), 551-567. doi:10.1177/0309132513512542

## Recreation and Activities

Activities such as [canoeing](#), [kayaking](#) and stand-up paddle boarding are popular on the Rouge River and in Rouge Marsh, near the [Lake Ontario](#) shore. The park offers 25 km of [trails](#) to [hike](#), with approximately 75 additional kilometres planned. The expanded trail system is intended to connect the park to the surrounding communities, from Lake Ontario to the Oak Ridges Moraine. Rouge is also a popular place to swim, [cycle](#), [birdwatch](#) and [fish](#). Yearly educational initiatives include guided walks, children's programming, citizen [science](#) projects and introductory workshops on [camping](#).



Water Sports in Rouge National Urban Park. Retrieved from:  
<https://www.pc.gc.ca/en/pn-np/on/rouge/activ/eau-water>

Visitors are welcome to relax on sandy Rouge Beach before going for a refreshing swim in Lake Ontario. [Toronto Public Health](#) conducts daily water quality testing at the beach throughout the summer to ensure that it is safe for swimming and there is a lifeguard on duty when the beach is officially open. There are washrooms available during the summer months.

There are many volunteer opportunities at Rouge National Urban Park such as volunteering as a photographer, guided walk leader, environmental monitor, park host or as an outreach volunteer. Openings depend on the time of the year, and each have different commitments. The best way to find out or stay updated about the latest news, events and opportunities is by joining the Parks Canada electronic mailing list.

## Accessibility

Rouge park has numerous access points, in addition to those there are two welcome areas where visitors can obtain information about the park from [Parks Canada](#) staff throughout the fall to spring season. These welcome areas are located in the northern sector, in the city of [Markham](#) and in the southern portion of the park, near the Toronto Zoo. Glen Rouge Campground, at the junction of the Rouge River and Little Rouge Creek, is the only campground located in the city of Toronto.

According to the geographic location of the park, popular north-south roads for cycling include [Meadowvale Road](#), Beare Road, 11th Concession, and Reesor Road. There is also a multi-use pathway that runs along the west side of Meadowvale Road near the Toronto Zoo. Reesor Road runs through a large portion of the park, from the Toronto Zoo area to just south of Stouffville, near the north end of the park. These north-south routes can be connected by east-west roads. If a cyclist is looking for a more remote experience, then he/she can head to the far northeast corner of the park where many quiet country roads are waiting to be explored. For a more relaxing bike ride, there is an option of connecting to the multi-use Waterfront Trail at Rouge Beach, which runs both east and west along the shore of Lake Ontario.

## Highlights of Services Offered

Free admission, programming and events: RNUP will always be free to eliminate the potential barrier to access of cost. Other efforts are put in place to welcome foreigners and new immigrants.<sup>94</sup>

### Learn-to Camp

Specifically targeting families with young children and newcomers, this program helps to break down the barriers of lack of confidence and or lack of knowledge with camping. Recognizing not all have easy access to parks, RNUP holds free workshops in community hubs across the GTA. A summer overnight program, for a low cost offers families a tent, sleeping mats, camp stove, and workshops on camping to further educate.<sup>94</sup>



Learn to Camp held in a community Centre. Retrieved from:  
<https://www.pc.gc.ca/en/pn-np/on/rouge/activ/iac-ltc>

### The App

Translated to simplified Chinese in recognition that many of the park's visitors may appreciate the app in this language, possibly eliminating language barriers. The park also accepts two major Chinese payment methods such as Union Pay.<sup>94</sup>

### Transportation

Rouge National Urban Park is reachable by foot, car, train, bus, subway, and even canoe. Cycling is also a great way to reach the park. Plan your route using Google Maps cycling directions or OpenStreetMap.<sup>94</sup>



TD Park Bus "The Rouge Express" Retrieved from: <https://www.pc.gc.ca/en/pn-np/on/rouge/info/nouvelles-news/20180630-parkbus>

A free summer-run Parkbus funded by TD and MEC as well as proximity to public transit promotes accessibility.

<sup>94</sup> Kinnon, E. Rouge National Urban Park. Acting External Relations Manager (Email Communication, October 17, 2018).

## Educational Programming

In 2016, Parks Canada offered over 300 free public events in the park, including Frog Watch, Hoot and Howl, weekly guided walks, Art in the Park, the Fall Walk Festival, BioBlitz, Learn-to-Camp, Taste of the Trail and more.<sup>94</sup>

### Xplorer<sup>95</sup>

Is a program aimed at engaging children at Parks Canada protected heritage areas by way of a booklet filled with fun activities that guides their discovery of each unique place they visit.

### Free Weekly Guided walks<sup>96</sup>

Walks with knowledgeable staff or volunteers offer visitors the opportunity to more comfortably explore the park. Guides take patrons along trails and provide educational information.

## Trail Expansion

Parks Canada is planning to significantly expand the park's 12 km trail network by adding dozens of kilometres of new trails in effort to provide a contiguous connection from [Lake Ontario](#) to the [Oak Ridges Moraine](#). Plans are also underway to link park trails with regional trails outside the park located in the cities of Toronto, Markham and Pickering and in the Township of Uxbridge.

## Visitor's Safety

When visiting the park there are associated risks to visitors. Parks Canada attempts to mitigate these risks through branding, signage, wayfinding, trailheads, presentations, maps, mobile and web applications. There are also rules (bylaws) in place for all visitors to have the best experiences possible.

## Ticks

[Black Legged Tick](#) populations have in recent years been expanding at rapid rates both in



A tick that has bitten someone. Retrieved from: <https://www.cnn.com/2017/05/23/health/tick-explainer/index.html>

<sup>95</sup> Xplorers Program Parks Canada Agency. Government of Canada. <https://www.pc.gc.ca/en/pn-np/on/rouge/activ/xplor>

<sup>96</sup> <https://www.pc.gc.ca/en/pn-np/on/rouge/activ/guide>

[Ontario](#) and in the North Eastern United States.<sup>97</sup> These ticks which are present in Rouge Park carry [Lyme disease](#). Lyme Disease or Lyme borreliosis effects the nervous system causing [arthritis](#), late eye response, and problems associated with the [nervous system](#) and [heart](#).<sup>98</sup>

Ticks are present in Long Grass and due to their function as a vector of disease can be extremely hazardous to Rouge Park visitors. [Parks Canada](#) recommends the following when visiting the park to prevent infection:<sup>99</sup>

1. Stay on official trails – ticks are often found in long grasses.
2. Wear protective clothing to prevent ticks from attaching to your skin. Wear closed toed shoes, long sleeve shirts that fit tightly around the wrist, and long-legged pants tucked into your socks or boots.
3. Use insect repellents containing [DEET](#). Apply to both clothes and skin. Always read the label and follow instructions for use.
4. If possible, avoid contact with low bushes and long grasses. For example, if hiking or walking, stay in the centre of the trail.
5. Wear light coloured clothing to help you to find any ticks more easily.
6. Check for ticks on and under clothing, especially after being in areas where ticks may live.
7. Keep a pair of tweezers and a small bottle of hand sanitizer handy for proper tick removal and treatment.
8. Shower or bathe within two hours of being outdoors to wash away loose ticks.

## Pets

All dogs are welcome in Rouge National Park; however, all dogs are required to be on leash in the woods as well as in the beach. City of Toronto pet by-laws apply regarding leashing and picking up after your dog.

## Cannabis Use

In Parks Canada campgrounds, [cannabis](#) consumption will be limited to the visitor's campsite. Consumption is not permitted in campground common areas: [playgrounds](#), kitchen shelters, washrooms, trails, and roads.



Signage indicating Dogs/pets must be leashed.

Retrieved

from: <https://www.thecanadianencyclopedia.ca/en/article/rouge-national-urban-park>

<sup>97</sup> Khatchikian, C. E., Prusinski, M. A., Stone, M., Backenson, P. B., Wang, I., Foley, E., . . . Brisson, D. (2015). Recent and rapid population growth and range expansion of the Lyme disease tick vector, *Ixodes scapularis*, in North America. *International Journal of Organic Evolution*, 69(7), 1678-1689. doi:10.1111/evo.12690

<sup>98</sup> Strle, F., & Stanek, G. (2009). Clinical Manifestations and Diagnosis of Lyme Borreliosis. Retrieved November 30, 2018, from <https://doi.org/10.1159/000213070>

<sup>99</sup> Parks Canada Agency. (2017, November 09). What's the tick situation in the Rouge? Retrieved November 30, 2018, from <https://www.pc.gc.ca/en/pn-np/on/rouge/securite-safety/tiques-ticks>

## Smoking and Vaping

Smoking and vaping are not allowed in the campground common areas and playground, but allowed in others area such as trails and public use area.

## Rules and Regulations

### Law enforcement

RNUP has a close working relationship in law enforcement in apply to suite for federal, provincial and municipal to help focus on natural and cultural resource protection and visitor enjoyment. The park is moving from a jurisdictions phases and transition to National Urban Park status.

## Drones

Parks Canada have strict limits to the use of drones, due to the pose risks and disturb to wildlife and visitors. Flying drone in the park without park approval may result in law enforcement and a fine up to \$25000.

## Visitor Hotline

The Hotline provides basic information of the park and may help with trip planning as well.

Telephone: 416-264-2020

## Facilities

### Visitor Centre

Visitor centres are open from 9am to 5:30 p.m., along with pop-up centres that can be found around the park running from 10 a.m. to 5 p.m. The team offers a variety of visitor services ranging from first aid to customized tips based on an individual's wants and needs.

### Rouge Valley Conservation Centre

Founded in 1995, it is the park's nature center and is operated by the non-profit Rouge Valley Foundation. The Centre works on environmental restoration, monitoring and research in the park with teams of volunteers who have been supporting the programs since 1995. The center offers guided walks and environmental education programs, nature programs, and energy programs in the park for the general public's interest.<sup>100</sup>



The Rouge Valley Conservation Centre. Retrieved from:

[http://www.rvcc.ca/Rouge\\_Valley\\_Consevation\\_Ce](http://www.rvcc.ca/Rouge_Valley_Consevation_Ce)

<sup>100</sup> [http://www.rvcc.ca/Rouge\\_Valley\\_Consevation\\_Centre.html](http://www.rvcc.ca/Rouge_Valley_Consevation_Centre.html)

## Camping

Glen Rouge Campground: Rouge Park is the only campground in the City of Toronto, the Glen Rouge Campground is easy to reach from the highways and is on the banks of the Rouge River. There are total 29 Terms and conditions for the visitors which are permit and issued under the [Conservation Authorities Act](#), and all activities are subject to both federal and provincial law.



The oTENTik accommodations available for rent throughout the year. Retrieved from:  
<https://www.pc.gc.ca/en/voyage-travel/hebergement-accommodation/otentik>

### oTENTik<sup>101</sup>

Is a permanent structure that cross between a tent and cabin which is available to rent out throughout the year in Rouge Park.

## Future Education and Entrance Facilities

Several education and orientation centres, facilities, signage and interpretive panels are being planned in the Toronto and Markham areas of the park.

### Benefits to Surrounding Populations

Rouge National Urban Park (RNUP) crosses the boundaries of the City of Toronto, Pickering, Markham and the Township of Uxbridge. The RNUP location is uniquely located in the [environmentally racialized](#) areas of [Scarborough](#) and [Pickering](#)<sup>102</sup>; with historic and present industrial land uses. It also is worth noting the [Pickering nuclear power plant](#) is in the vicinity.



Visitors benefit from the natural environment provided by the park.  
Retrieved from: <http://yorkurbanist.com/2011/07/11/rouge-park/>

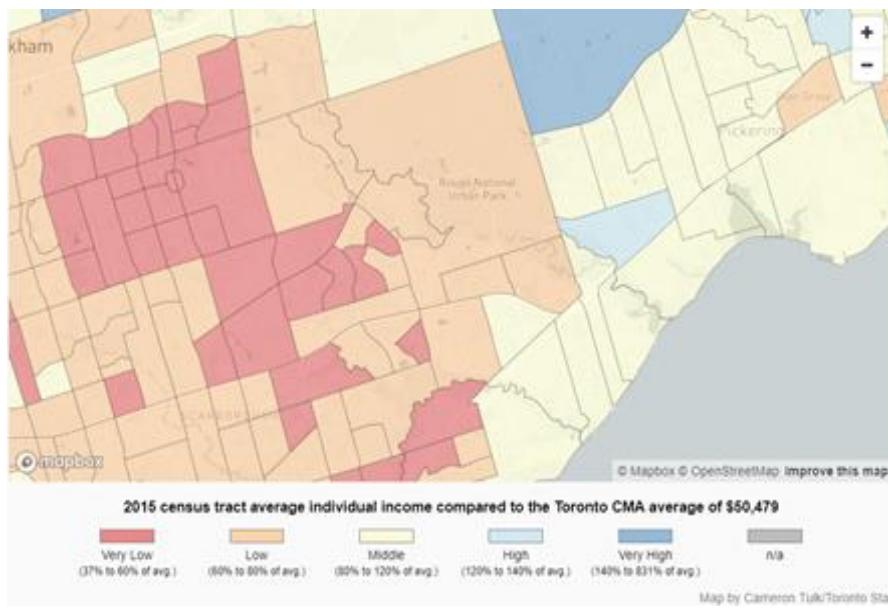
<sup>101</sup> Stay Overnight: Otentik Parks Canada Agency- Government of Canada - <https://www.pc.gc.ca/en/voyagetravel/hebergement-accommodation/otentik>

<sup>102</sup> Teelucksingh, C. (2007). Environmental Racialization: Linking Racialization to the Environment in Canada. Routledge, 12(6) 645-661. doi: 10.1080/13549830701657455

The effects of good parks on one's mental and physical well-being are universally beneficial to all populations; this is true to the extent of the park's good standard.<sup>103</sup> Parks may result in an increased quality of life in many ways such as socially and in both increased mental and physical well-being. Parks, excluding environmental and [ecological services](#), provide important social and psychological [benefits to communities](#). They fulfill important immaterial and non-consumptive needs; such as spaces for quiet relaxation.<sup>104</sup> Due to environmental racialization and local [food deserts](#), RNUP may be especially beneficial to its closest surrounding communities and their services strive to cater to community demands.<sup>105</sup>

## Environmental Racialization in Scarborough

Scarborough's present and history of being a more industrial area leads to higher exposure to environmental contaminants and pollution. The heavy reliance on cars due to inefficient public transportation and a lack of focus on the pedestrian environment also decreases physical well-being and increases said exposures.<sup>102</sup> See [Accessibility](#).



A portion of the Average Individual Income Compared to the Toronto Certified Management Accountant Average map. Portion retrieved from:  
<https://www.thestar.com/news/gta/2017/11/09/do-your-neighbours-make-more-than-you-search-out-map-of-income-in-the-gta.html>

## Benefits to Scarborough's Population

Seen in the image "[A portion of the Average Individual Income Compared to the Toronto Certified Management Accountant Average map](#)" ([External Links](#)) the communities directly surrounding the RNUP are low income, and much of nearby Scarborough ranges on the lower

<sup>103</sup> Francis, J., Wood, L. J., Knuiman, M. & Giles-Corti, B. (2012). Quality or quantity? Exploring the relationship between Public Open Space attributes and mental health in Perth, Western Australia. *Social Science & Medicine*, 74, 1570-1577. doi: 10.1016/j.socscimed.2012.01.032

<sup>104</sup> Chiesura, A. (2004). The role of urban parks for the sustainable city. *Landscape and Urban Planning*, 68, 129-138.

<sup>105</sup> Kinnon, E. Rouge National Urban Park. Acting External Relations Manager (Email Communication, October 17, 2018).

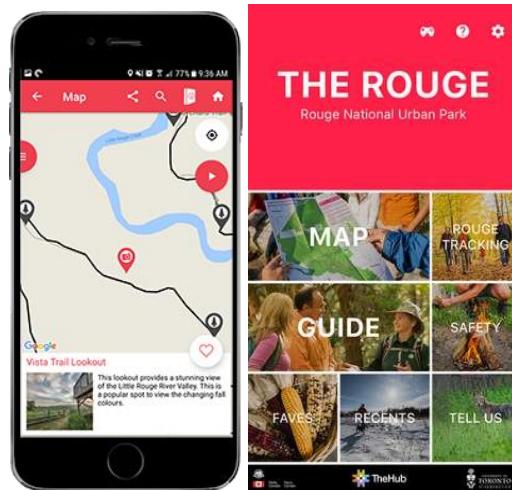
end. Scarborough is 56% immigrants, where 7% of the immigrants have immigrated in the last 7 years.<sup>106</sup> Health benefits from green spaces may be strongest among disadvantaged groups; mixed-income populations exposed to the greenest environments had the lowest level of health inequality related to income deprivation.<sup>107</sup> In addition, the mental health benefits are seen to eliminate discrepant health between different socio-economic statuses.<sup>108</sup>

## Park technology

### Apps

#### The Rouge App

Beginning in 2016, students from the [University of Toronto Scarborough](#) (The Arts & Science Co-op and Masters of Environmental Science Departments) and the Hub (the University's center for entrepreneurship) have worked in collaboration with Parks Canada to release the Rouge App, an application designed to provide park visitors with an interactive and informative guide in the palm of their hand.<sup>xiv</sup> Information was collected from Parks Canada staff, indigenous communities, locals, scientists and historians for content.<sup>xv</sup> Features include: trail and landscape information, landmarks, cultural and historical information, GPS distance tracker, safety information on poisonous flora and fauna, a memory game for children, rewards for hiked distances, as well as an option to report issues.<sup>xvi</sup> The app was launched on October 21, 2017 and is available on both IOS and Android phones in English, French and now, Simplified Chinese to celebrate the 2018 Canada-China Year of Tourism initiative.<sup>xvii</sup>



#### INaturalist

[Parks Canada](#) has a partnership with [INaturalist](#), an online platform (and App) where people can upload observations of plant, insect and animal life in their area and contribute to citizen science. Through their partnership, they host [BioBlitz](#) events in their National Parks. Bioblitz are day (or multiday) events where visitors can interact with scientists and community members to find specific species of plants, insects or animals. Through June 24 and 25 of 2017,<sup>xviii</sup> the Rouge National Urban Park hosted a Bioblitz event, the first since being recognized as a

<sup>106</sup> Statistics Canada. (2016). Scarborough. Census Profile, 2016 Census. Retrieved from: <https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/search-recherche/results-resultats.cfm?Lang=E&TABID=1&G=1&Geo1=FED&Code1=35094&Geo2=PR&Code2=35&SearchText=scarborough&SearchType=Begins&wb-srch-place=search>

<sup>107</sup> Braubach, M., Egorov, A., Mudu, P., Wolf, T., Ward Thompson, C., & Martuzzi, M. (2017). Effects of Urban Green Space on Environmental Health, Equity and Resilience. In N. Kabisch, H. Korn, J. Stadler, & A. Bonn (Eds.), Nature-Based Solutions to Climate Change Adaptation in Urban Areas: Linkages between Science, Policy and Practice. Cham: Springer International Publishing, 187-205. [https://doi.org/10.1007/978-3-319-56091-5\\_11](https://doi.org/10.1007/978-3-319-56091-5_11)

<sup>108</sup> Allen J, Balfour R (2014) Natural solutions for tackling health inequalities, UCL Institute of Health Equity. <http://www.instituteofhealthequity.org/projects/natural-solutions-to-tackling-health-inequalities>.

National Park. Participants were found to have recorded 43 different mammalian species on the iNaturalist site.<sup>109</sup>

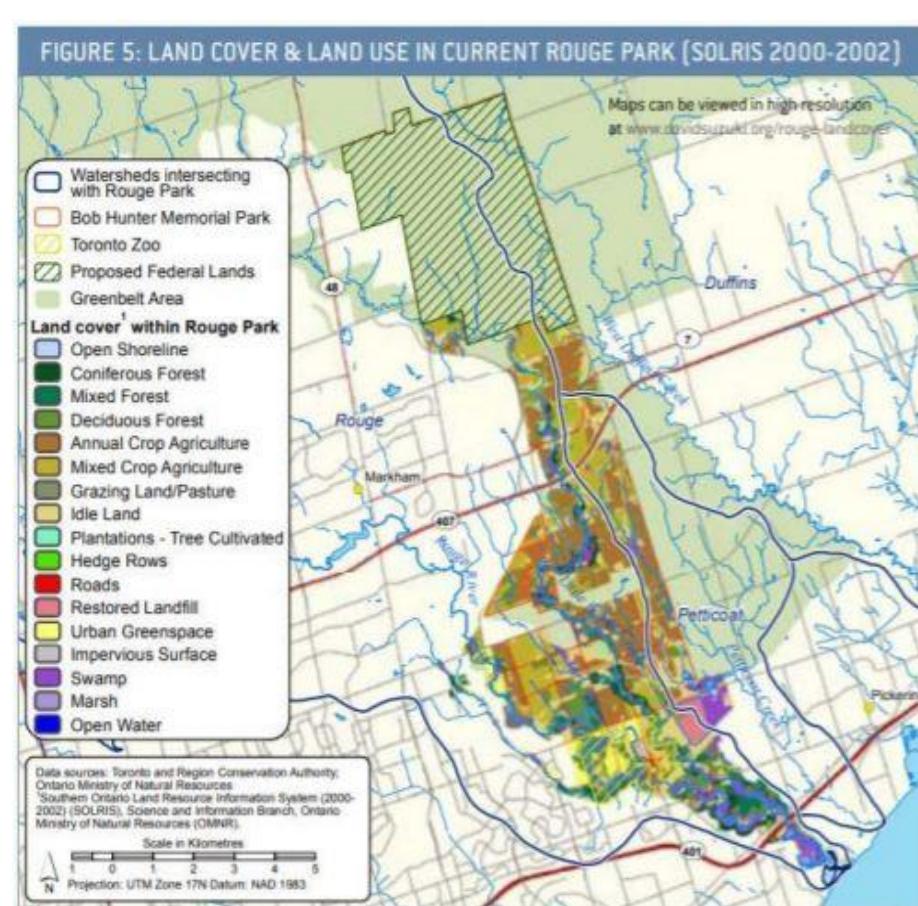
### GIS Application

Use of Geographic Information Systems (GIS) techniques for the park provides mapping of the distribution of land cover, land use in Rouge Park, and the surrounding watersheds. The extraction of land cover data using the Southern Ontario Land Resource Information System (SOLRIS) ([External Links](#)) to estimate the area of each land cover type, ecosystem type, and land use type.

SOLRIS is an essential tool to analyze the park's wetland cover and estimate the total

carbon (per hectares) stored by the swamps and marshes.<sup>109</sup>

Using CITYgreen's carbon module (spatially based GIS software tool) to map the annual amount of carbon uptake (sequestration) by forests. The tool quantifies the removal of carbon dioxide by trees based on the estimated age distribution of forest land cover by assigning three age distributions types: Type 1 represents a distribution of young trees, Type 2 represents older trees, and Type 3 describes a site with a balanced distribution of ages.<sup>109</sup> Rouge Park is part of the Greenbelt so the average results from the CITYgreen analysis applies decision-makers to estimate the tonnes of carbon taken up per hectare. From the estimated results we can calculate and compare the latest data with data from previous years to find any changes (increase or decrease of carbon sequestration) of forest behaviour. The decrease of carbon sequestration would mean either the human impact in the park by cutting down trees, resulting deforestation or loss of trees due to forest fires.



Land use cover and land use in current Rouge Park from the David Suzuki Foundation Mapping

<sup>109</sup> Wilson, Sara (September 2012). "Canada's Wealth of Natural Capital: Rouge National Park" (PDF). David Suzuki Foundation

## GIS in Park Management

Two of the tools that are being used to further the sustainability agenda are the use of GIS as a mapping tool for the park and spatial analysis techniques. The TRCA ([Toronto and Region Conservation Authority](#)) has a collection of thematic layers containing information about the watersheds that can be linked together by geography. These layers are used for decision-making support and solutions to [ecological restoration](#), property acquisition, [fisheries management](#), [planning](#) and [floodplain mapping](#).

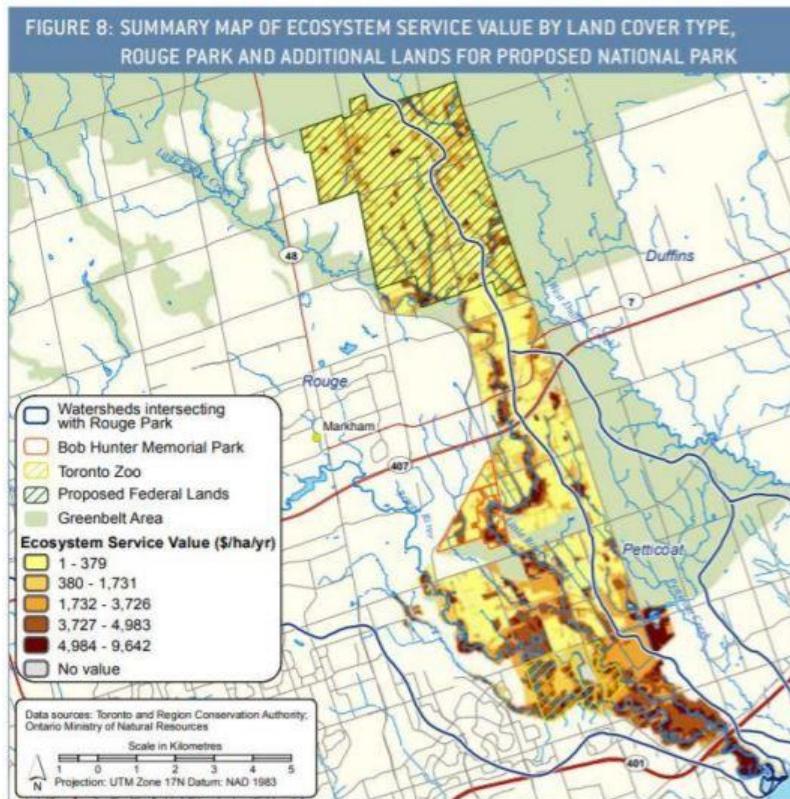
The TRCA and the City of Toronto have a georeferenced digital [ortho-photo](#) dataset of the GTA at a

resolution of 0.5 meters, which is the most accurate and comprehensive digital data for the GTA. This ortho-photo is used by TRCA biologists and the City of Toronto Natural Heritage Study to identify and digitize natural habitats and then analyze that data in relation to surrounding land uses, habitat patch size and shape.<sup>110</sup>

GIS was also used as a tool to ecologically assess the master plan for the Rouge Park Trails. A sensitivity analysis was done for the park, which involved plotting the location of rare plant and animal species, identifying [wetlands](#) and other sensitive habitats, and important nesting and breeding areas for wildlife. The mapping process involved the use of geo-referenced ecological data from sources like [MNR](#), TRCA and Rouge Park to be mapped onto digital aerial photos of Rouge Park so that specific locations of sensitive species and habitats could be determined.

The data that was mapped includes flora and fauna occurrences, provincially and locally significant wetlands, vegetation communities, Environmentally significant areas (ESAs) and interior forest habitat.<sup>111</sup>

The David Suzuki Foundation has also used GIS and spatial analysis to map the value of natural capital in the Rouge National Park. The foundation mapped the distribution of land cover and land use in the Rouge Park and the surrounding watersheds, as well as the average



Ecosystem service value by land cover type, Rouge Park and additional lands for proposed National Park

<sup>110</sup> GIS Mapping - Toronto and Region Conservation Authority (TRCA). Toronto and Region Conservation Authority (TRCA). Retrieved 2018-10-21.

<sup>111</sup> Rouge Park Draft Final Trails Master Plan Review (PDF), Ontario Trails. Nov 13th, 2011

ecosystem service value per hectare by land cover type. The data was from the 2000-2002 Southern Ontario Land Resource Information System (SOLRIS). <sup>112</sup>

### External Links

Class 1 Soil: [Overview Of Classification Methodology for Determining Land Capability For Agriculture](#)

[Friends of the Rouge Watershed](#)

[More strategies in Urban Heat Island Cooling \(US EPA\)](#)

[RNUP Website: Winter and other seasonal hazards](#)

[Judy's Tropical Garden](#)

[Full Interactive Map of the Average Individual Income Compared to the Toronto Certified Management Accountant Average](#)

[Southern Ontario Land Resource Information System](#)

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#### From Original Wiki:

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<sup>1</sup> [Governments of Canada and Ontario Announce Historic Rouge National Urban Park Land Transfer](#), NewsWire, 2017-10-21, retrieved 2018-03-22

<sup>1</sup> See also the [Aurora Huron Ancestral Village](#) in [Whitchurch-Stouffville](#).

<sup>1</sup> [Bead Hill](#), Directory of Designations of National Historic Significance of Canada

<sup>1</sup> Bead Hill, Toronto National Historic Sites Urban Walks - Parks Canada

<sup>1</sup> ["Info"](#) (PDF). [www.collectionscanada.gc.ca](#).

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<sup>112</sup> Wilson, Sara (September 2012). "Canada's Wealth of Natural Capital: Rouge National Park" (PDF). David Suzuki Foundation. Retrieved October 21st, 2018.

## **Appendix C:** My accomplishment statement



*Figure 1: Tanvir Khan!*

It was an honour to have you teaching in the following courses I took: ESTB01, ESTD19, ESTD17 and ESTD18 (all in Fall 2018 and Winters 2019!). Honestly, you became one of my favourite teachers in my entire academic years. I learned to be confident in public, have patience, able to multi-task, stay calm and focused (which is one of the most important ability I have accomplished this year!). You have guided my inner strengths/ skills, making me realize to put in good use for upcoming years to come. Sharing your knowledges and experiences to us has made a big influence into my life realizing how people interact with the ecosystem and how the ecosystem responds back to the people. The amount of risks needed to take part in an event in order to achieve the goal can guide us finding the solution. The biggest risk I took in my life was marrying at the age of 21. Now, I turned 28, seeing my small lad hanging on my shoulder, this feeling of joy is too great, and the risk was worth taking! World is a truly big and infinite place we are living, that's what I learned in ESTD19-Risk course. Thus far, I have managed to reach fourth year in my undergraduate at University of Toronto Scarborough and about to graduate this November 2019. At a certain point, I used to believe myself a big loser (I still am) but after crossing through many obstacles in my path, my mind and body is more matured now.

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