

# Greenomatics

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## Mission Statement

Our vision for sustainable urban development is the reduction of single-household grocery trips through a grocery delivery service in Calgary. With our app, users will be able to see how a delivery service that accommodates multiple homes can further environmental sustainability through decreasing the emissions of single-household grocery trips.

## Characteristics

Our web application calculates the carbon dioxide (CO<sub>2</sub>) emissions, fuel cost and time spent for each round trip to the grocery store. The user specifies their starting point and a grocery store of their choice. The icons can be used as reference points for grocery stores in the region. In addition, the number of trips can be modified through a drop-down menu. By showing the amount of CO<sub>2</sub> emitted, cost of fuel and time spent for each grocery trip, we hope this will encourage clients to use our future delivery service.

## Goal

Our goal is to show the amount of CO<sub>2</sub> that is emitted and the cost of fuel for each single-household grocery trip in Calgary. The application will calculate the round trip emissions and fuel cost from a user-defined starting point to their preferred grocery store. We hope that these numbers will encourage users to sign up for our future delivery service to reduce their CO<sub>2</sub> emissions. In the future, we hope that our service will change the way people shop for groceries and reduce the need for large parking lots that could be converted to green space.

## Using our App

1. Go to website: <https://uowaterloo.github.io/greenomatics/index.html>
2. Click on the Log-in button on the top right banner to login to the Greenomatics Website with your credentials.  
PS. Since it's just a dummy, you can log in with any fake credentials.
3. Once you log in, you'll be able to see the dashboard. In the box labelled App Overview, the web application will show up. Click the button "Expand" to open the web application in a new window.

4. Input your start location and end locations. The grocery store icons can be used for reference. Users can add additional stops using the “Add Stop” button.
5. The number of trips can also be chosen in the drop-down menu labelled “Trips”.
6. The directions dashboard will show the carbon emissions, fuel cost and time saved per user-defined number of trips.

## Calculations

### CO2 Emissions

The CO2 emissions are calculated based on the distance (in kilometres) of the user-defined trip multiplied by the amount of CO2 emitted per kilometre. The result was multiplied by 2 for round-trip(s) and multiplied by the user-defined number of trips. According to the United States Environmental Protection Agency [EPA] (2018), 404 grams of CO2 is emitted by the average car per mile. This was converted into metric units in Equation 1 and the final calculation for the CO2 emissions per round-trip is shown in Equation 2.

$$\frac{404 \text{ grams of CO}_2}{1 \text{ mile}} = \frac{251 \text{ grams of CO}_2}{1 \text{ km}} \quad (1)$$

$$CO_2 \text{ Emissions} = Distance * 251g * 2 * Trips \quad (2)$$

### Fuel Cost

The fuel costs are calculated based on the distance (in kilometres) of the user-defined trip divided by the average fuel efficiency of a car multiplied by the annual average cost of gas. Like the CO2 emissions, the result was multiplied by 2 to show results for round-trip(s) and again multiplied by the user-defined number of trips. EPA’s (2018) average fuel efficiency of 22 miles per gallon was converted to metric units (see Equation 3). The average cost of regular gas in Calgary was \$1.198 / L in 2018 (Statistics Canada, n.d.). The final equation for fuel cost is shown in Equation 4.

$$\frac{22 \text{ miles}}{1 \text{ gallon}} = \frac{9.353 \text{ km}}{1 \text{ litre}} \quad (3)$$

$$Fuel \text{ Cost} = Distance / 9.353 * \$1.198 * 2 * Trips \quad (4)$$

## Limitations

A considerable amount of time was spent attempting to make a widget that incorporates basic grocery items for users to select and order. Due to time limitations, we were unable to incorporate this into our application or webpage. Additionally, the webpage is only a mock-up

website that provides a template for the service we are hoping to achieve. However, we wanted to create this webpage as a template for how our future service would function.

## Acknowledgements

We want to acknowledge the EarthLink 2017 ECCE App Challenge team, as we drew inspiration from their idea of calculating CO<sub>2</sub> emissions for each grocery trip. Ultimately, their idea allowed us to create our emissions widget to hopefully encourage users to opt for an environmentally sustainable grocery delivery service based on the emissions, fuel costs and time spent on single-household grocery trips.

## References

Statistics Canada. No date. 18-10-0001-01 Monthly average retail prices for gasoline and fuel oil, by geography (table). CANSIM (database). Retrieved from <https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1810000101>

United States Environmental Protection Agency. (2018, May 10). Greenhouse Gas Emissions from a Typical Passenger Vehicle. Retrieved from <https://www.epa.gov/greenvehicles/greenhouse-gas-emissions-typical-passenger-vehicle>