

# An Interactive Exploration of Greenhouse Gas Emissions in Ontario

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Hi. Welcome to our presentation on using the Interactive Exploration tool to discover more about Greenhouse Gas Emissions produced by Ontario facilities.



## Meet the Team



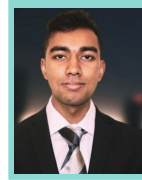
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Houseknecht



**Ever**  
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Tkachenko



**Khushil**  
Nagda



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Gazi

This is the product of a collaboration with myself, Ever, Ivanka, Khushil, and Zeeshan, and we're really proud to give you details on our website and how to make the most of the tool we've built for you.



## The Problem: Ontario GHG Emissions

**Greenhouse gas (GHG) emissions** contribute to climate change

- Health, environmental, economic, and social impacts
- Everyone affected, especially vulnerable communities

**Audience:**

- **Ontario citizens** curious about GHG emissions in their community
  - Understand local context, emitters and patterns

**Gaps remain** in GHG education

- Misinformation, abstraction, non-user-friendly data



Greenhouse gasses are a leading cause of climate change. Air pollution from greenhouse gasses also have profound impacts on health, environment, and the economy.

Because, you, as Ontario citizens, are the most directly affected by nearby carbon emitting facilities, we've built this tool in order to help you understand your local pollution context, such as who is emitting the most pollution in your area, or temporal and spatial patterns.

In most cases, the data surrounding greenhouse gases are extremely large in quantity and entirely numerical, so they're not very digestible for the average citizen. So, overall, we have built this tool as a way for you to have the fullest information on the area you live in as you possibly can by building out graphs, charts, and other visual tools for you to better understand these pollutive patterns.



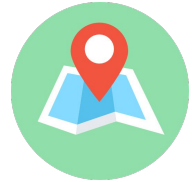
## The Solution: Map Dashboard

We propose an **interactive map** and **dashboard**

- Users can **visually explore** emissions by location, company, time, and industry
- Multiple linked views of related data
- Filters and selection for a reader-driven story

Visualize GHG emissions where they live and work

- Gain understanding of scope and scale of the problem
- Advocate for environmental protections



Thank you Shay, now I would like to describe the solution that we came up with.

### Solution

We built an interactive Dashboard that displays maps of GHG emissions across Ontario.

Maps are very intuitive and exciting to explore so no background in statistics or climate change is required allowing our tool to be used by the General Public.

### How it Works

Interactivity was an essential component in our solution as it would allow the audience to dig deep into the specific data points, including viewing GHG emissions around their houses!

We encoded interactive features that would allow the audience to zoom in and out, pan the view and adjust various filters such as selecting specific regions, companies and industries in Ontario.

### Impact

This tool has the potential to significantly transform the perception of climate change among Ontarians. By enabling users to investigate GHG emitters in their own neighborhoods, it not only fosters a deeper understanding of the scale of emissions in their local areas but also contextualizes Ontario's contribution to Canada's overall environmental footprint.

by the public.



**(Demo Video Here)**



# Scientific Process

## Background research

- Key social issues in Canada -> climate change -> GHG
- Potential sources of GHG data -> official recordings by Ontario government

## Investigation

- Adding specific coordinates to each facility
- Grouping industries by type
- Exploring mediums (R, Tableau)



Due to the spatial nature of the data, a **map** is the most effective design

Sources: <https://www.hrw.org/world-report/2022/country-chapters/canada>  
<https://www.statista.com/statistics/481142/greenhouse-gas-emissions-in-canada-by-province/>  
<https://www.nationalobserver.com/2021/10/21/news/canadas-100-dirtiest-emitters>

Thank you guys for the demo video, we will now be delving deeper into the scientific process that guided us in analyzing and visualizing the GHG emissions in Ontario. Our project is grounded in rigorous background research. We went through academic journals, government reports, and additional research regarding the key issues in Canada. This led us to documents such as the Human Rights Watch World Report for Canada. We learned Canada was a top 10 global greenhouse gas emitter, and thus we wanted to further investigate this matter. We proceeded to do further research and found out that Alberta was a leading emitter of greenhouse gas emissions followed by Ontario. Now, we wanted to narrow our scope even more so we analyzed the difference between Alberta and Ontario. Since Alberta's emissions were mainly due to the oilsands, we decided to choose Ontario since it contained a diverse mix of industries we could further investigate, and for the sake of relevance to us and our audience. Furthermore, we looked at various datasets, and ended up with official data by the Ontario government, ensuring reliability and relevance.

In terms of the investigation, we mapped out the locations of various emission facilities, adding specific coordinates to each. We then categorized these facilities by industry type to analyze patterns and impacts more effectively, as a result leading to a more comprehensive data visualization for our audience.

While doing this investigation, we had to make use of R for data manipulation and analysis, as well as tableau for the visualization. The reason for using Tableau as our final visualization tool was due to the fact that compared to other tools, tableau allowed easy implementation and interaction with data through filters, sliders (like the

time slider for emissions), and other interactive capabilities, making it easier to explore and discover patterns and insights.

Moving on, in terms of the actual visualization itself, we decided a map would be the most effective design. This was essentially a “no-brainer” since a map would allow us to gain more information compared to other alternatives which will be discussed in the next slide.





## Scientific Process

### Alternatives

- Bar chart of top emitters
- Scatterplot of emissions over time
- Other maps (choropleth, glyphs)
- Shiny (R)



### Limitations

- Registered emitters only
- Generalized industry types



We considered alternative designs for our visualization solution. A bar chart of top emitters would use the effectiveness principle to encode emissions with the most salient channel. However, a bar chart does not capture the rich spatial aspect of our data. We considered a scatterplot of emissions over time to display temporal trends more clearly than filtering by year in our map. Similarly, a scatterplot misses out on the spatial aspect of the data and how temporal trends are distributed spatially. Thus, a map proved to be the most efficient and useful.

Nonetheless, our solution does have some limitations. The data only includes facilities registered to report their GHG emissions to the Ontario Government. Smaller businesses which may contribute some emissions are not included, so the map doesn't give viewers the full picture. However, this data is also not available publicly to map, thus we worked with the data we had. Industry type was also aggregated into less categories to reduce cardinality and ease perception. With that being said, even though our visualization has its limitations, a lot of it was on purpose due to us wanting to enhance the readability and comprehensiveness of the information we are trying to display.



## Conclusion

Our interactive map dashboard is a public education tool for Ontario citizens and officials

To address climate change and rising GHG emissions, citizens must understand the problem in a local context