AI for the Resilient City
2023

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The Opportunity & Importance of Climate Solutions (& Technology)

Resiliency planning and **Climate Action** has found its way and is still finding its way to the top of the municipal and community agendas. The need to prepare for climate-related hazards — from droughts to wildfires, heat waves to rising global temperatures — has never been more urgent.

- 70% of cities are already dealing with the effects of climate change, and nearly all are at risk[1]. In 2018 alone, **$1.9B** was spent in Canada restoring infrastructure impacted by climate change

- In 2022 the impacts of climate change rose above **$3.1B** in insured damages.

With a requirement for humanity to curb emissions globally by 2030 and 2050 respectively, we cannot address the level of change required without the use of technology.

- Advances in solar panels

- Efficient building development with smart and efficient homes

- New types renewable energy such as wave/tidal action

- Utilizing computing power to better model the impacts of climate change and understand how we can most effectively develop infrastructure, public spaces as well as our homes, communities, cities and countries.
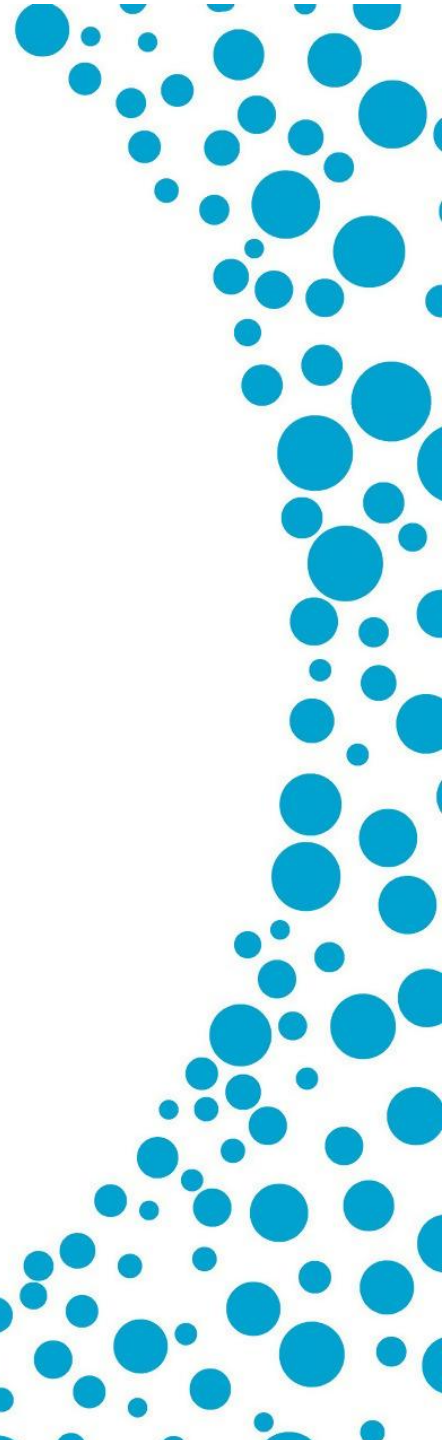
AI for the Resilient City: A scalable data visualization and analytics tool that allows governmental stakeholders to recognize the most impacted areas by changing climates, with the ability to identify where investments and policy decisions for adaptation and mitigation interventions may be most suitable and have the greatest benefit to the community and environment.

This tool can be replicated by a municipality using open source data to advance the same or like climate resilience efforts.

Overview - AI for Resilient Cities (Up to Feb 23')

Vision: Plan for, mitigate and adapt to the impacts of climate change—together, using data and technology.

What: Scalable planning, data visualization and analytics tool, with the future goal of projecting climate scenarios and stakeholder planning scenarios at the community level in relation to extreme heat and the Urban Heat Island Effect Identifies baseline of most impacted areas in the city and regions utilizing several layers of datasets, open-sourced and proprietary.

Phase 1 with the City of Calgary: Support data-driven decision-making through a replicable application

- How high temperature/low temperature zone across wards compare on the ground (water bodies, greenspace, open field)
- Thermally comfortable Playgrounds (urban tree canopy, water features)
- Building policies (height, pervious surfaces, old/new builds)
- Population density co-relation to UHI

Phase 2 with the Peel Region & Toronto and Region Conservation Authority (TRCA)

- Urban Heat Island mapping and visualization across the entire Peel Region breaking down and understanding effects across multiple municipalities
- Neighbourhood greening and planning programs using data from the tool
- Data driven tool to drive story telling at the political, policy, and management level

Phase 2: Peel Region AI Tool

Working with the Toronto and Region Conservation Authority (TRCA) and the Peel Region to support the need for more data driven visualization tools relating to extreme heat and urban heat island effect. With the future goal of creating vulnerable population layers and projecting future climate scenarios onto the existing data.

- Understand how Peel Region's urban heat island effects have changed over the last few years (2013-2020).

- Identify contributing factors and leverage decision-making and policy shifts to counter the effects of UHI in built and natural environments.

- Identify hotspots that are most impacted through UHI within the region.

- An intention to apply the insights from the visualization in initiatives:

  - ✓ **At the Neighbourhood scale**: Utilizing insights from the tool to aid programs like Sustainable Neighbourhood Action Program

  - ✓ **At the Watershed scale**: UHI Analysis incorporated into climate mitigation and adaptation plans for Peel Region watershed planning

  - ✓ **At the local municipality scale**: Use of the application to better inform decision making and policy measures relating to extreme heat
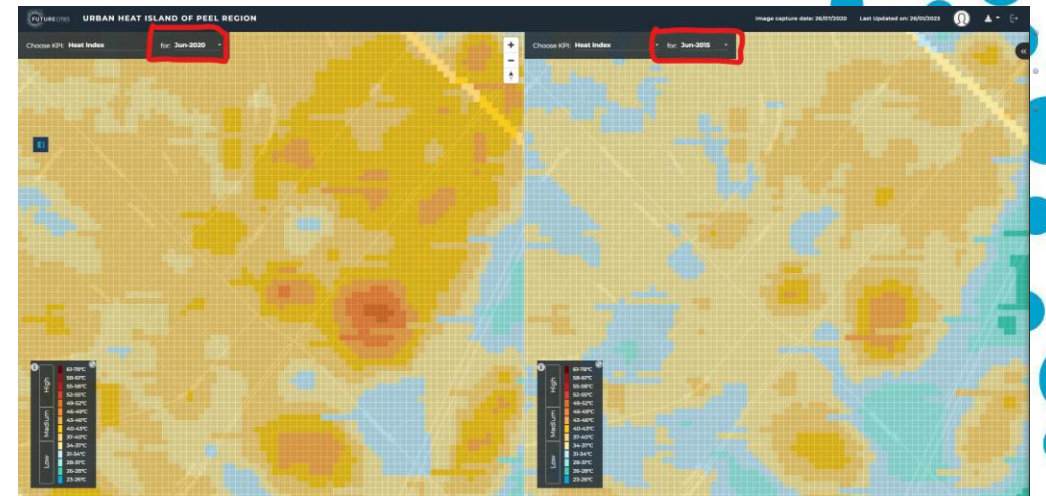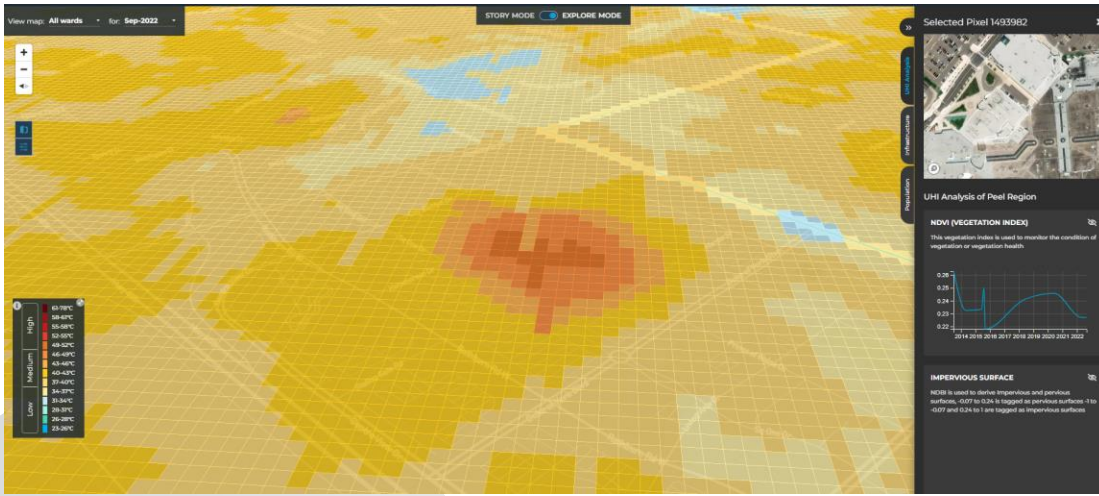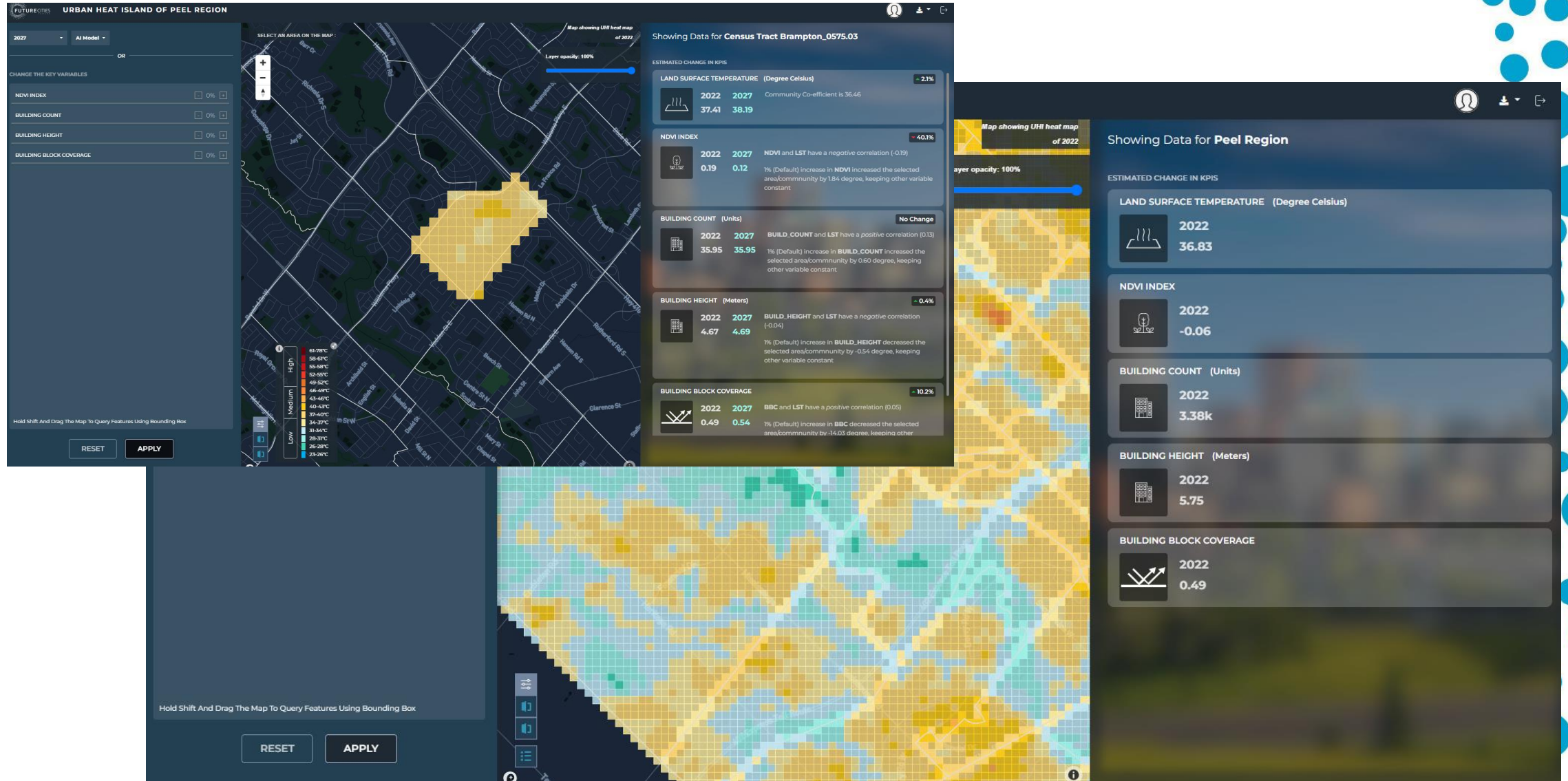
Application Modes
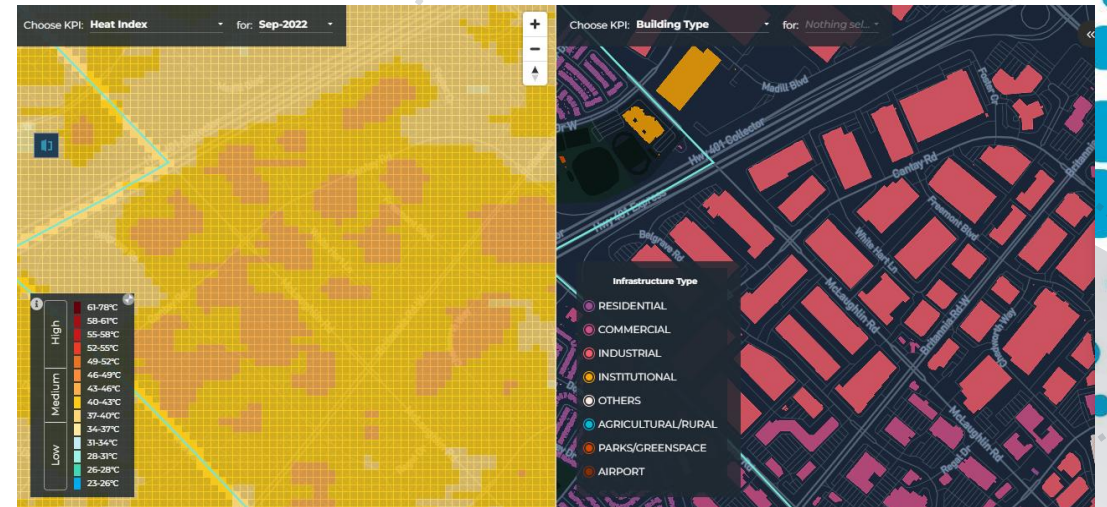
Explore   Compare

Application Modes: Scenario Mode

Identifying the Impact of the Program (2021- Spring 2023)

- **City of Calgary**
  - Climate impact related risk profiles for all 23 neighbourhoods in the city of Calgary
  - Planning of 10 public infrastructure projects, 5 planning proposals, climate action related items and several new up and coming projects.
  - Replicated the application for direct integration into their own data visualization platform.

- **Region of Peel**
  - Vulnerability initiatives, incl. Enterprise Climate Change Risk, Financial Planning & Infrastructure Adaptation Assessment, and the Resilient Roof Retrofit Feasibility Study and urban forestry Initiatives (Urban Forest Management Plan, Peel Canopy Cover Assessment Update) and others.

- **Toronto & Region Conservation Authority**
  - Nature Based Climate Solutions Prioritization Tool
  - Sustainable Neighbourhoods Action Plan team and Partners for Project Green (PPG)

The Future of AI for The Resilient City & What's Next

- Increasing diversity of datasets & variables within the tool.
  - Looking at community vulnerability to extreme heat as an example
  - Public Spaces relationships to UHI
  - Canopy cover change over time using machine learning.
- Scaling of the tool to 2 NEW municipalities/ communities.
- Continue to enhance the newly created Scenario Mode & increase models available in the mode.
  - External validation of Scenario planning

Thank you!

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