Environment and Health: Data 101

Seminar #1: CANUE Data | Illustrating Built Environment Equity

February 26 | 2021

Eleanor Setton[1] and Dany Doiron[2]

[1]University of Victoria

[2]Research Institute of the McGill University Health Centre

on behalf of the CANUE team

Presentation overview

Eleanor Setton | CANUE Managing Director and Environmental Exposure Expert

CANUE overview and data tour

Dany Doiron| CANUE Data Linkage Lead and Environmental Epidemiologist

Using CANUE data to explore built environment equity

My career journey….so far!

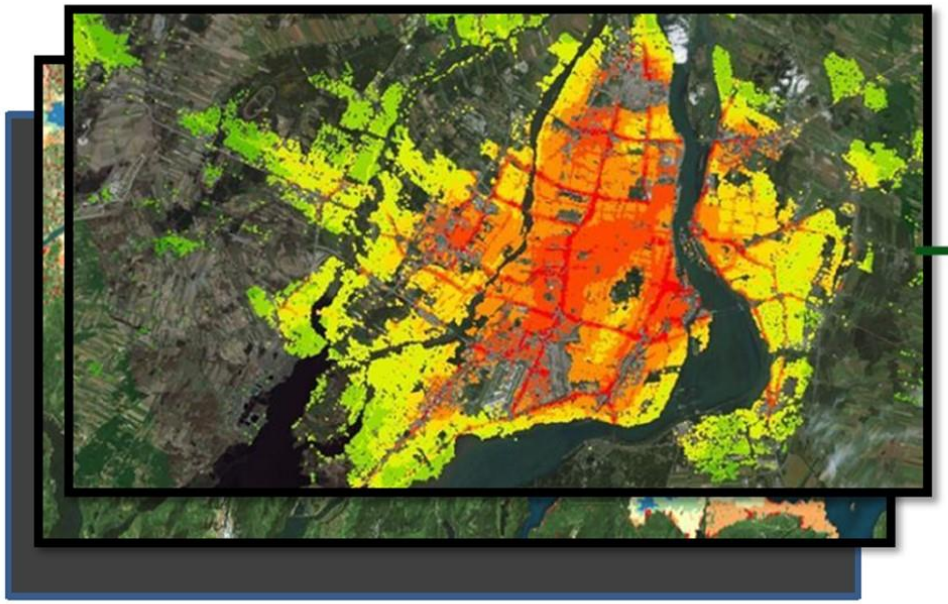
BA – Environmental Geography

MSc– Geography (Exploratory Spatial Data Analysis – Modifiable Areal Unit Problem Sensitivity)

Contracting/Consulting: Resource Management, Pipeline Project Impact Assessment, Hydroelectric Development Impact Assessment, Hydroelectric Lands Management

PhD Geography (Probabilistic exposure assessment – air pollution and workers/non-workers, males/female, exposure measurement error effects on epidemiological analyses)

Environmental Health – Epidemiology and Exposure Surveillance



Exposures – varying over space and time, like air pollution, noise, greenness, climate, walkability…

Epidemiological studies
Is there a relationship with health, and if so, how strong?

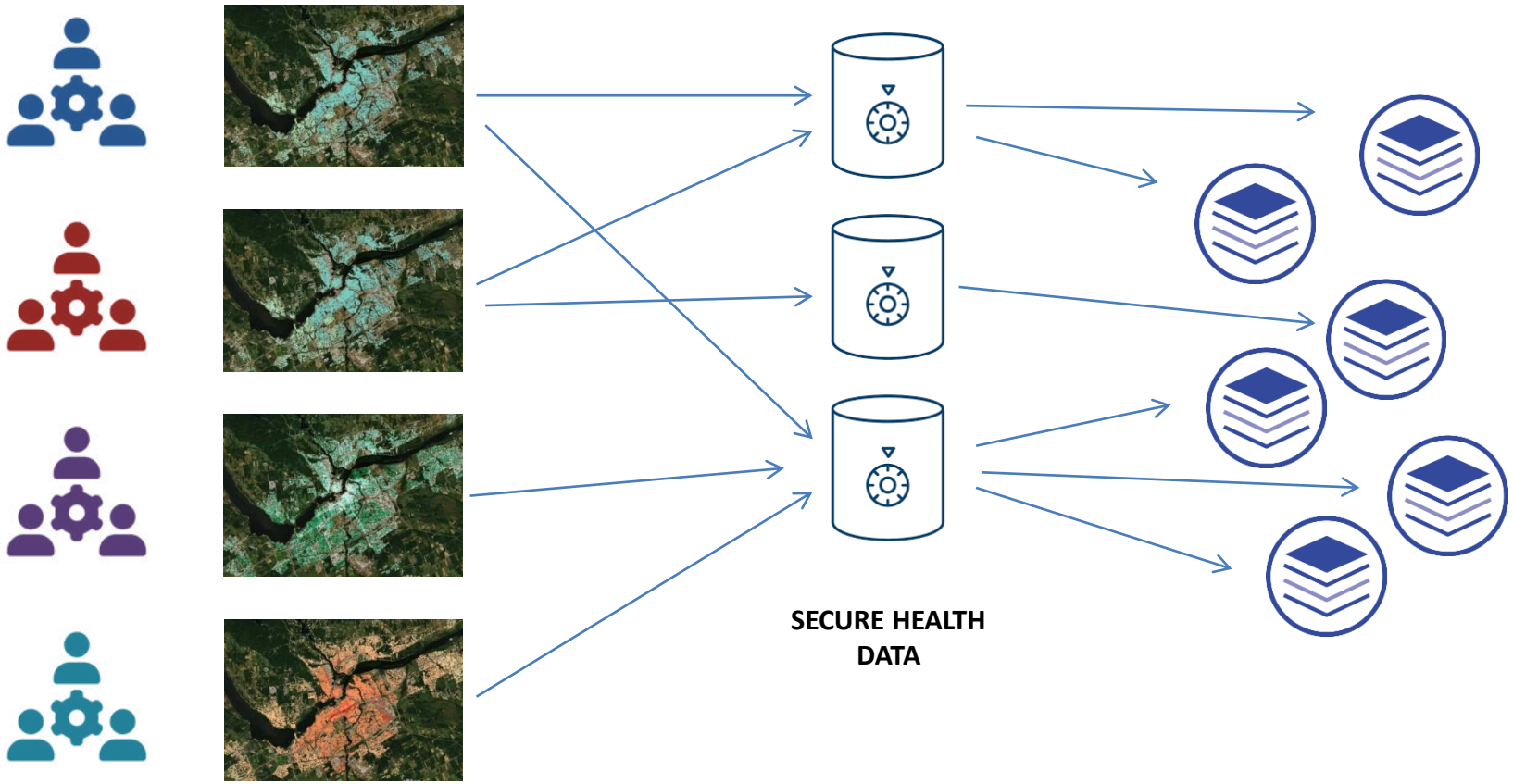
Population exposure surveillance
Where are the 'hotspots' and how many people live there? How does this change over time?

Knowledge transfer /exchange to move policy

How will changes in urban form improve or degrade health and equity?

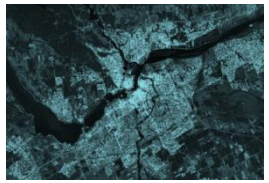
How will changes in urban form reduce or increase exposures ?

Environmental Health – Epidemiology and Exposure Surveillance



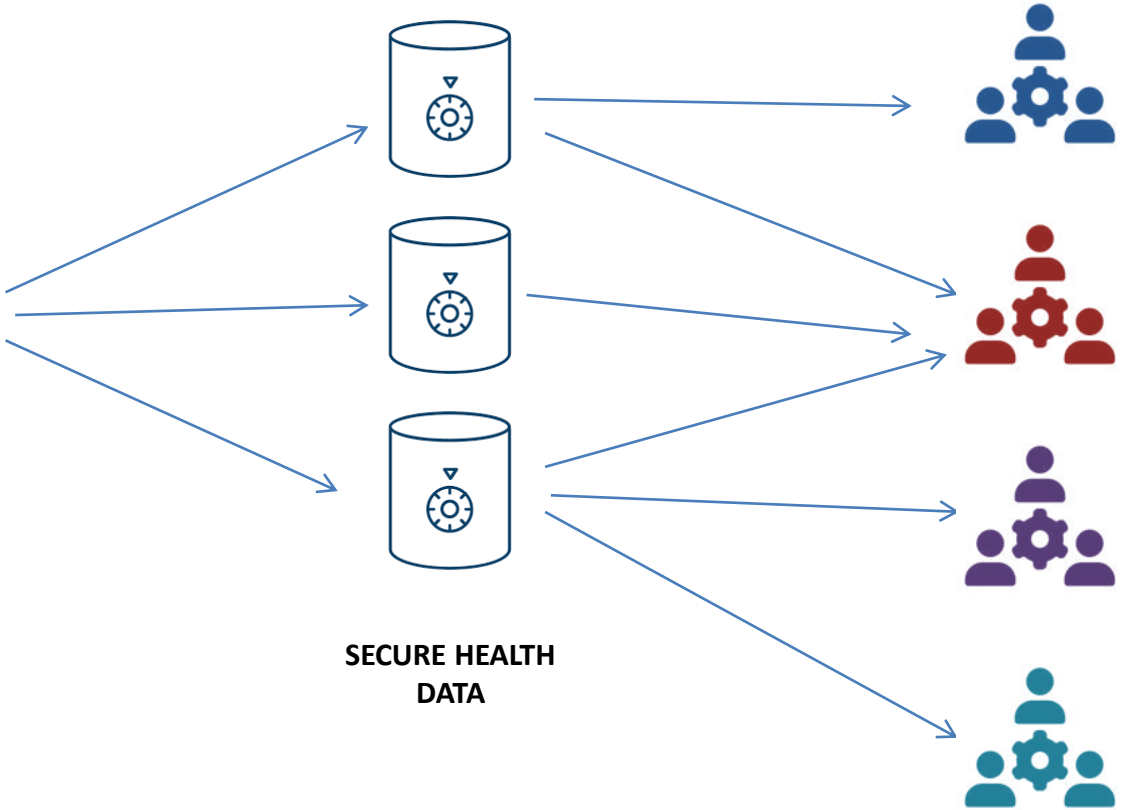
- DIFFICULT TO COMPARE
- DIFFICULT TO REPRODUCE
- DIFFICULT TO REUSE
- TIME-CONSUMING or REDUNDANT LINKING

Environmental Health – Epidemiology and Exposure Surveillance



INDEXED TO
POSTAL CODES → ACADEMIC USE

CANUE



- STANDARD METRICS
- STUDIES CAN BE REPRODUCED
- CAN BE USED BY MANY RESEARCHERS
- EFFICIENT FOR HEALTH DATA HOLDERs

The Canadian Urban Environmental Health Research Consortium (CANUE)

CANUE

ADVANCING RESEARCH ON URBAN LIVING AND HUMAN HEALTH

INCREASED SCIENTIFIC UNDERSTANDING of the interactions among the physical features of the urban environment and health will lead to cost-effective actions promoting healthy childhood development and aging, reducing the burden of chronic disease, and minimizing the impact of changing environments.

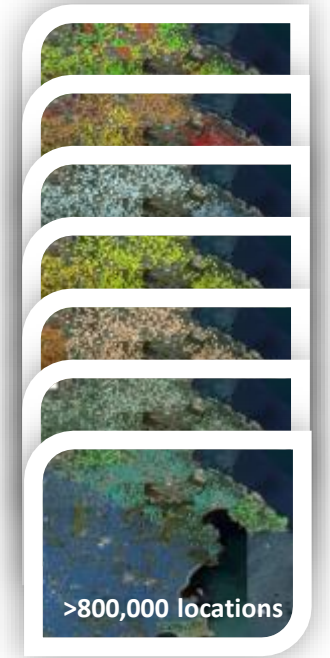
DATA AND TOOLS
We use and develop tools to process complex data from diverse sources into a simple, easily readable common format.

LINKING TO HEALTH
We provide data directly to researchers and a wide range of health data organizations who pre-link and distribute data securely.

ENABLING RESEARCH
We can focus on answering complex research questions in a single neighbourhood or across countries with ease using comparable data.

CANUE DATA PORTAL
- Nitrogen Dioxide
- Fine Particulates
- Sulfur Dioxide
- Ground-level Ozone
- NDVI greenness
- Nighttime Light
- Heat & Cold events
- Rain, Snow & Soil Moisture
- Local Climate Zones
- Material & Social Deprivation
- Marginalization
- Gentrification
- Active Living Index
- Access to Employment
- Ultraviolet

COMING SOON
- Food environment
- Noise
- Transportstion
- Hi-res satellite-derived metrics



HEALTH DATA PARTNERS

CANUE data are sent directly to health data organizations so researchers can have one-stop access to environmental and health data:

CLSA ÉLCV — CANADA'S LARGEST AGING COHORT

CanPath Canadian Partnership for Tomorrow's Health — CANADA'S LARGEST POPULATION COHORT

populationdata BC; NB-IRDT New Brunswick Institute for Research, Data and Training; Manitoba Centre for Health Policy — ADMINISTRATIVE HEALTH DATA

CHILD — CANADA'S LARGEST BIRTH COHORT

We are now working on the next wave of pre-linking with Canada's wealth of census-based cohorts, surveys, and administrative health data via the Pan-Canadian Real-World Health Data Network.

> 200 Data requests

Researchers and students >275

>40 Peer-reviewed papers

Dissertations and theses 6

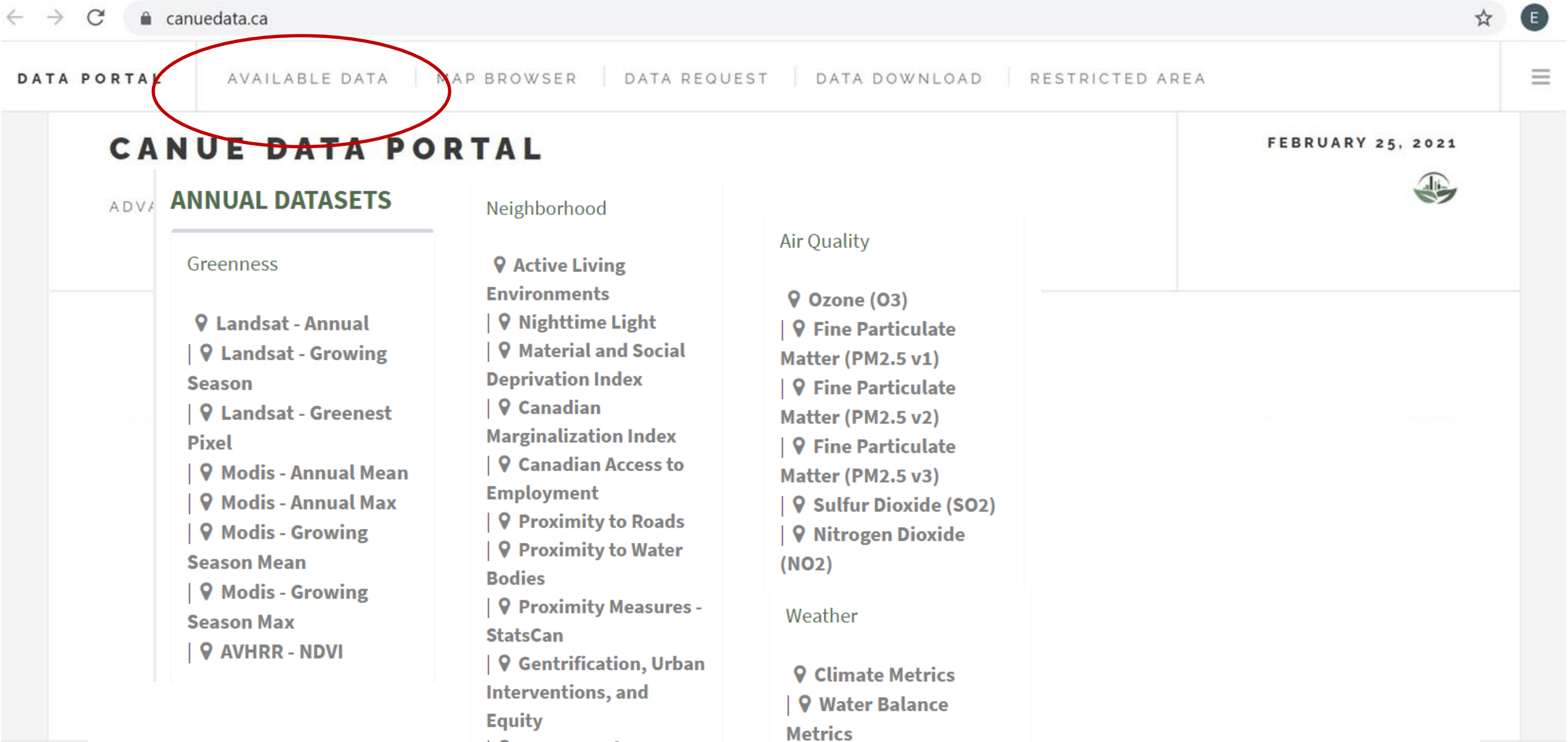
University of Toronto; University of Victoria; compute canada | calcul canada; CIHR IRSC

COLLABORATING NOW TO BUILD THE FUTURE

We see the future as a global living laboratory that connects international environmental health researchers and knowledge users with a common goal to increase human wellbeing . We are looking to connect with major cohorts and data initiatives around the world.

CONTACT: info@canue.ca

https://canue.ca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DATA PORTAL
AVAILABLE DATA
MAP BROWSER
DATA REQUEST
DATA DOWNLOAD
RESTRICTED AREA
CANUE DATA PORTAL
FEBRUARY 25, 2021
ANNUAL DATASETS
Greenness
Landsat - Annual
Landsat - Growing Season
Landsat - Greenest Pixel
Modis - Annual Mean
Modis - Annual Max
Modis - Growing Season Mean
Modis - Growing Season Max
AVHRR - NDVI
Neighborhood
Active Living Environments
Nighttime Light
Material and Social Deprivation Index
Canadian Marginalization Index
Canadian Access to Employment
Proximity to Roads
Proximity to Water Bodies
Proximity Measures - StatsCan
Gentrification, Urban Interventions, and Equity
Green Roads
Urban Sprawl
Air Quality
Ozone (O3)
Fine Particulate Matter (PM2.5 v1)
Fine Particulate Matter (PM2.5 v2)
Fine Particulate Matter (PM2.5 v3)
Sulfur Dioxide (SO2)
Nitrogen Dioxide (NO2)
Weather
Climate Metrics
Water Balance Metrics
Local Climate Zone

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CANUE DATA PORTAL

ADVANCING RESEARCH ON URBAN LIVING AND HUMAN HEALTH

FEBRUARY 25, 2021

WELCOME TO CANUE DATA PORTAL

Back to Portal

Next >>

CANADIAN URBAN ENVIRONMENTAL HEALTH RESEARCH CONSORTIUM

In order to receive data from CANUE, your institution must participate in the DMTI Spatial SMART Consortium Agreement. If your institution is not listed below, contact info@canue.ca.

Before you can access data, you will be asked to download, sign and return a data sharing agreement. Once it is completed, your project will be activated and you will be notified.

ATLANTIC REGION	QUEBEC	ONTARIO	ONTARIO	WESTERN REGION	WESTERN REGION
Dalhousie University	Concordia University	Brock University	University of Ontario Institute of Technology	MacEwan University	University of Lethbridge
Memorial University	Ecole Polytechnique de Montreal	Carleton University	University of Ottawa	Mount Royal University	University of Manitoba
Saint Mary's University	McGill University	McMaster University	University of Toronto	Simon Fraser University	University of Northern British Columbia
Universite de Moncton	Universite de Montreal	Nipissing University	University of Waterloo	University of Alberta	University of Regina
University of New Brunswick	Universite Laval	Queen's University	University of Windsor	University of British Columbia	University of Saskatchewan
		Ryerson University	Western University	University of Calgary	University of Victoria
		Trent University	Wilfrid Laurier University		University of Winnipeg
		University of Guelph	York University		

Back to Portal

Next >>

Enter a short project name (DO NOT use space, punctuation and special characters):

myproject

Project Password (This password will be shared with all team members):

••••••••••

Project Title:

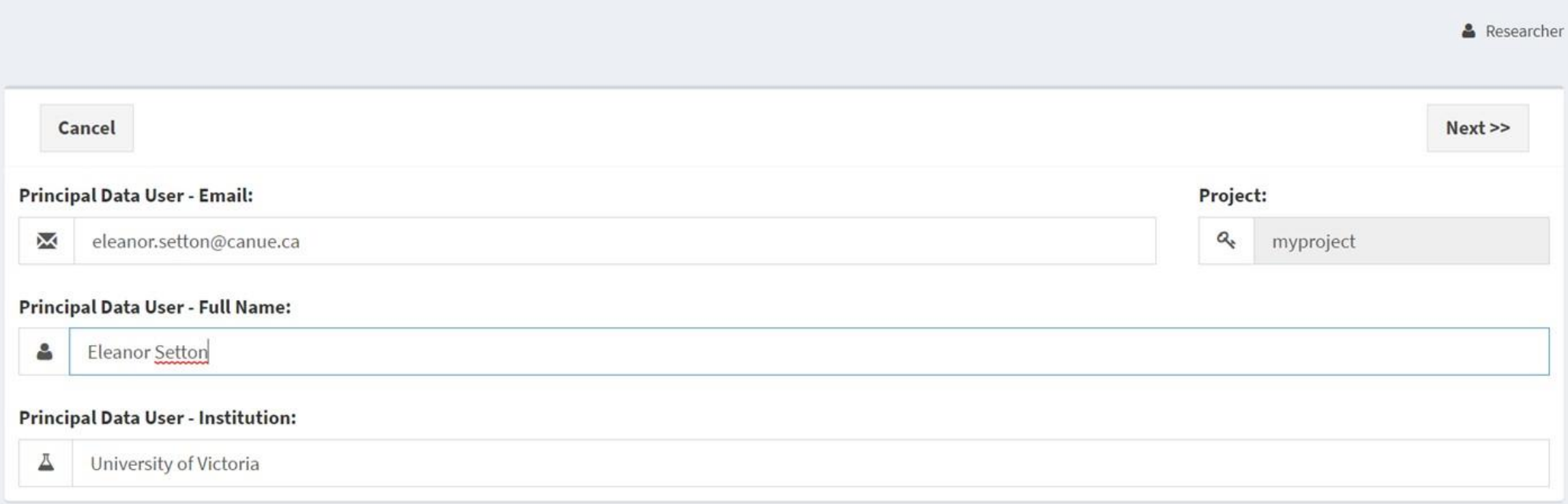
air pollution and lung disease

Lead Institution:

University of Victoria

Project Summary:

This project will look at lung disease in a cohort of elderly people in BC.


Researcher
Cancel
Next >>
Principal Data User - Email:
eleanor.setton@canue.ca
Project:
myproject
Principal Data User - Full Name:
Eleanor Setton
Principal Data User - Institution:
University of Victoria

Cancel

Next >>

Team Member - Email:

Project:

myproject

Team Member - Full Name:

Team Member - Institution:

Team Member - Degree Program(If Student):

- Member allowed to download data
- Member not allowed to download data.

Save

Back to Portal

Download CANUE Data Use and Sharing Agreement by pressing the button below

Sign the agreement and send it to info@canue.ca.
Your project will be unlocked as soon as we receive the agreement signed.

Thanks!

Download

CANUE

The Canadian Urban Environmental Health Research Consortium

Data Sharing and Use Agreement
Data Browser

1 – PURPOSE OF AGREEMENT

This agreement documents the sharing and use conditions related to data distributed by the Canadian Urban Environmental Health Research Consortium (CANUE), the intended use of the dataset(s), the Principal Data User who takes delivery of the data and accepts responsibility for ensuring these conditions are fulfilled, and the project team members who will have access to the datasets. The signature of the Principal Data User is required to fully execute this agreement. Copies of this agreement must be provided to CANUE by email (info@canue.ca). CANUE will forward copies to all original data developers as per the exposure data source contact listed in the associated metadata files.

2- DISCLAIMER

Data are provided as-is. While substantial efforts are made to ensure the accuracy of data and associated documentation, complete accuracy cannot be guaranteed. CANUE makes no guarantee, either express or implied, including but not limited to, the fitness for any purpose. The Data User holds all parties involved in the production or distribution of the data harmless for damages resulting from its use or interpretation.

3 – INTENDED USE(S)

Use of CANUE datasets is restricted to academic, research, educational, or other not-for-profit purposes.

☐ I am affiliated with a Canadian academic institution listed in Addendum 1. (if no, please contact info@canue.ca to identify possible study collaborators)

☐ I have read the associated metadata files for the indicated datasets/variables and agree to abide by the limits for data sharing and use conditions contained in each file.

☐ I will ensure all project team members are aware of and abide by the limits for data sharing and use conditions set out in each metadata file.

☐ I understand this agreement will be terminated immediately upon breach of, non-compliance with, any of its terms and/or those contained in each metadata file, and that I may be held responsible for any misuse that is caused or encouraged by failure of myself or members of the project team to abide by the terms of this agreement.

☐ I agree to provide CANUE staff with information, upon request, on how the analytical results were disseminated, i.e., published journal articles, academic or professional conference abstracts, posters and presentations, invited presentations and webinars, and project reports.

Principal Data User – Name	Project Name
Signature	Date

canuedata.ca

DATA PORTAL | AVAILABLE DATA | MAP BROWSER | DATA REQUEST | DATA DOWNLOAD | RESTRICTED AREA

CANUE DATA PORTAL

ADVANCING RESEARCH ON URBAN LIVING AND HUMAN HEALTH

FEBRUARY 25, 2021

WELCOME TO CANUE DATA

CANUE Data Download

Sign in to start your session

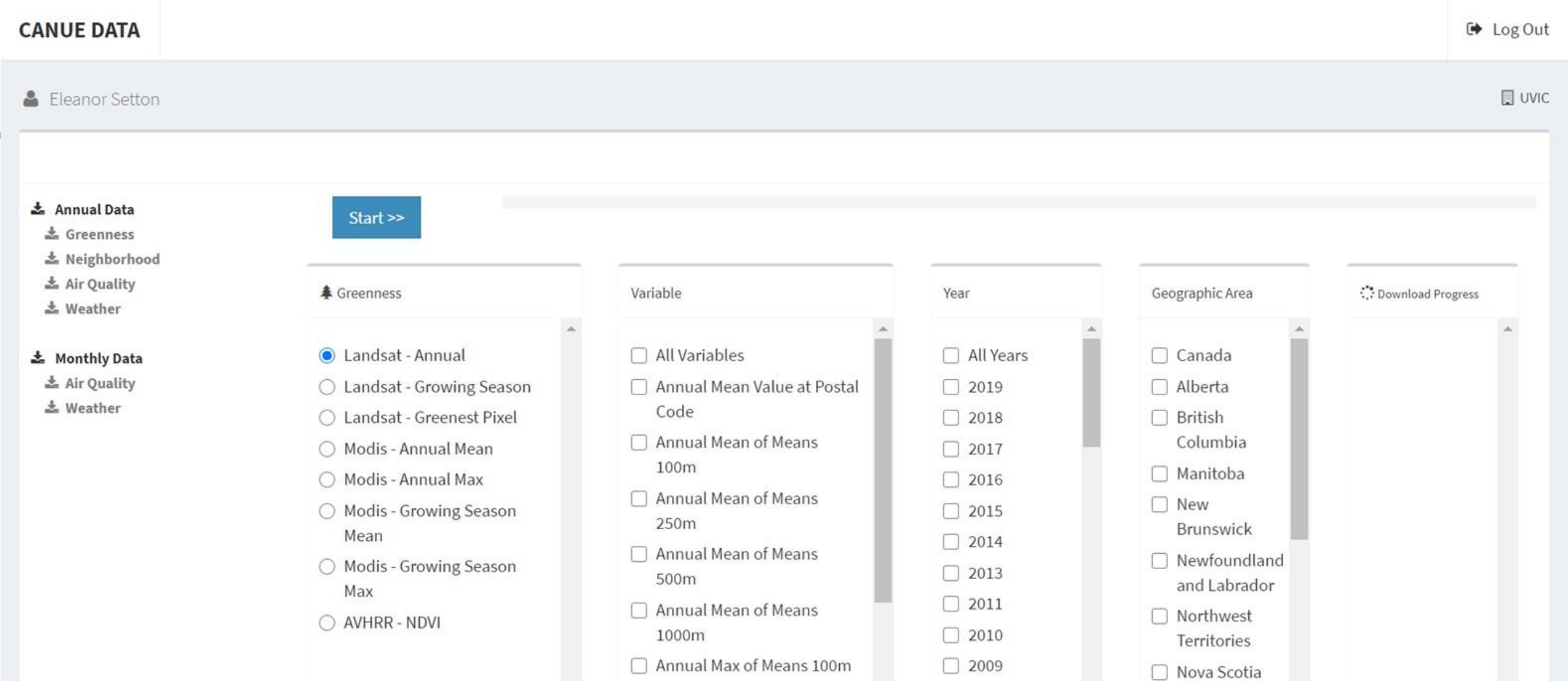
newes

elsetton@gmail.com

•••••••

Sign In

Back to Canue Data Portal


CANUE DATA
Log Out
Eleanor Setton
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Annual Data
Greenness
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Greenness
Landsat - Annual
Landsat - Growing Season
Landsat - Greenest Pixel
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AVHRR - NDVI
Variable
All Variables
Annual Mean Value at Postal Code
Annual Mean of Means 100m
Annual Mean of Means 250m
Annual Mean of Means 500m
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Annual Max of Means 100m
Year
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2019
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2017
2016
2015
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2013
2011
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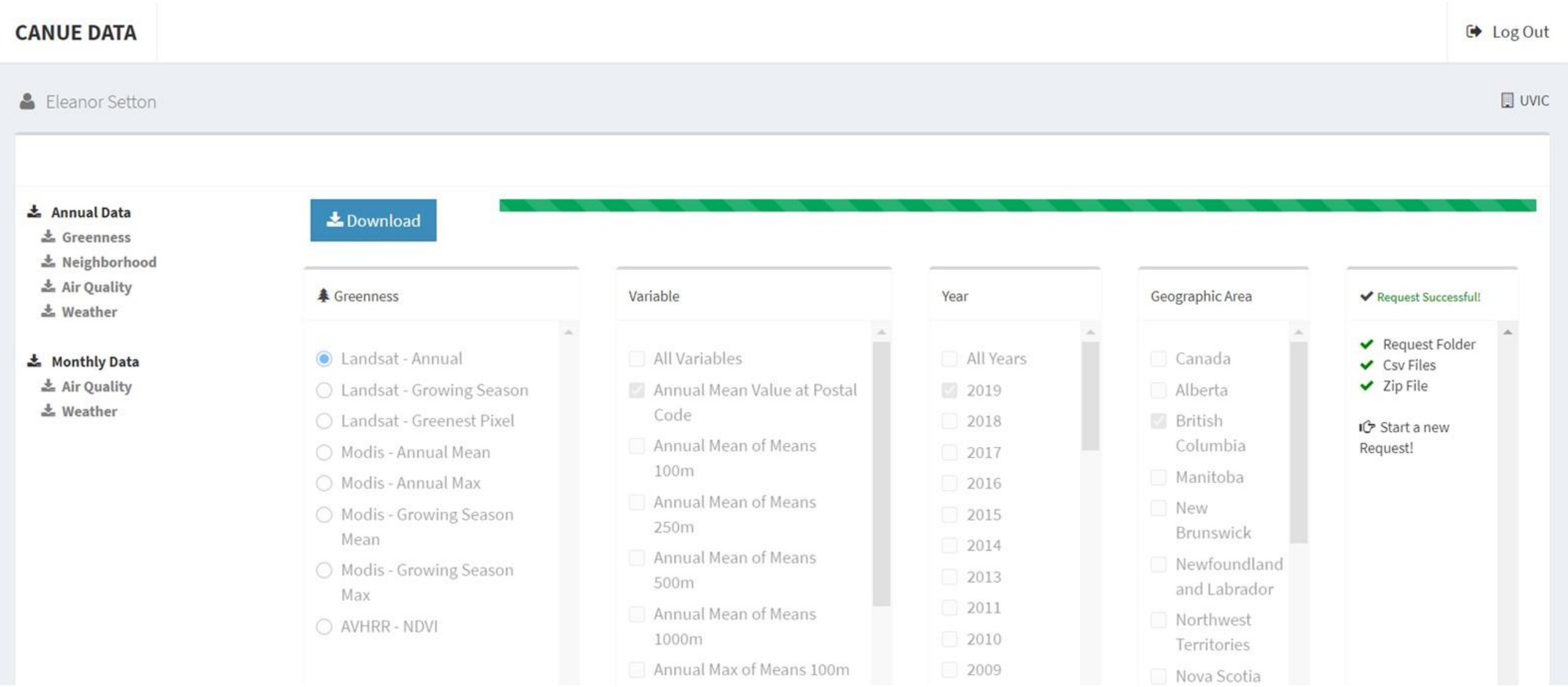
2009
Geographic Area
Canada
Alberta
British Columbia
Manitoba
New Brunswick
Newfoundland and Labrador
Northwest Territories
Nova Scotia
Download Progress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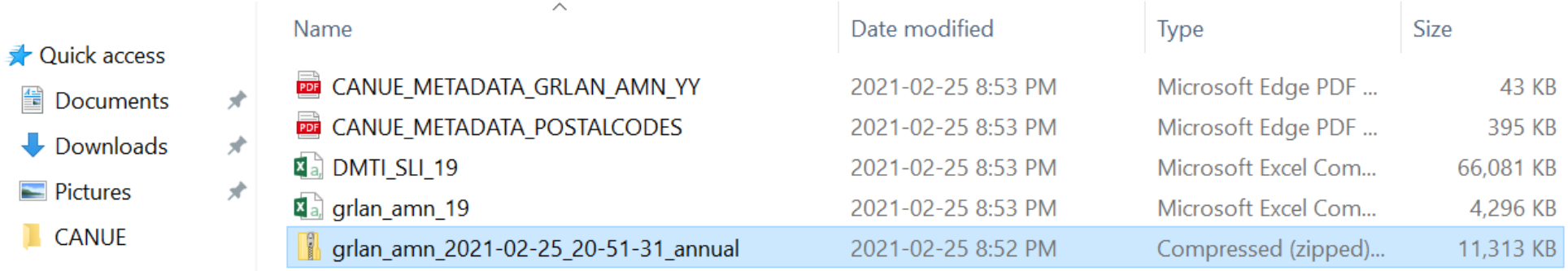
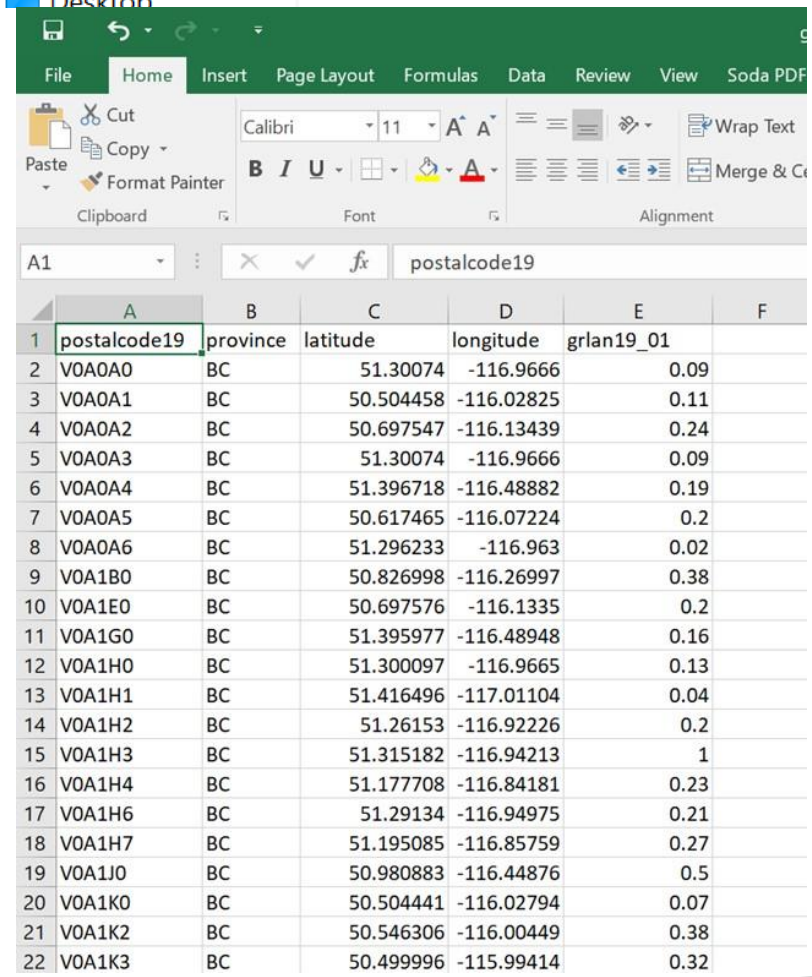
Alberta
British Columbia
Manitoba
New Brunswick
Newfoundland and Labrador
Northwest Territories
Nova Scotia
Request Successful!
Request Folder
Csv Files
Zip File
Start a new Request!





File Home Insert Page Layout Formulas Data Review View Soda PDF

Cut Copy Format Painter Paste Clipboard

Calibri 11 Wrap Text Merge & C Font Alignment

A1 postalcode19

	A	B	C	D	E	F
1	postalcode19	province	latitude	longitude	grlan19_01	
2	V0A0A0	BC	51.30074	-116.9666	0.09	
3	V0A0A1	BC	50.504458	-116.02825	0.11	
4	V0A0A2	BC	50.697547	-116.13439	0.24	
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6	V0A0A4	BC	51.396718	-116.48882	0.19	
7	V0A0A5	BC	50.617465	-116.07224	0.2	
8	V0A0A6	BC	51.296233	-116.963	0.02	
9	V0A1B0	BC	50.826998	-116.26997	0.38	
10	V0A1E0	BC	50.697576	-116.1335	0.2	
11	V0A1G0	BC	51.395977	-116.48948	0.16	
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21	V0A1K2	BC	50.546306	-116.00449	0.38	
22	V0A1K3	BC	50.499996	-115.99414	0.32	

VARIABLES

GRLANYY_01 - Annual Mean Value at Postal Code

Annual mean NDVI at postal code (range -1 to 1)

GRLANYY_02 - Annual Mean of Means 100m

Mean of annual mean NDVI within 100 m (range -1 to 1)

GRLANYY_03 - Annual Mean of Means 250m

Mean of annual mean NDVI within 250 m (range -1 to 1)

GRLANYY_04 - Annual Mean of Means 500m

Mean of annual mean NDVI within 500 m (range -1 to 1)

GRLANYY_05 - Annual Mean of Means 1000m

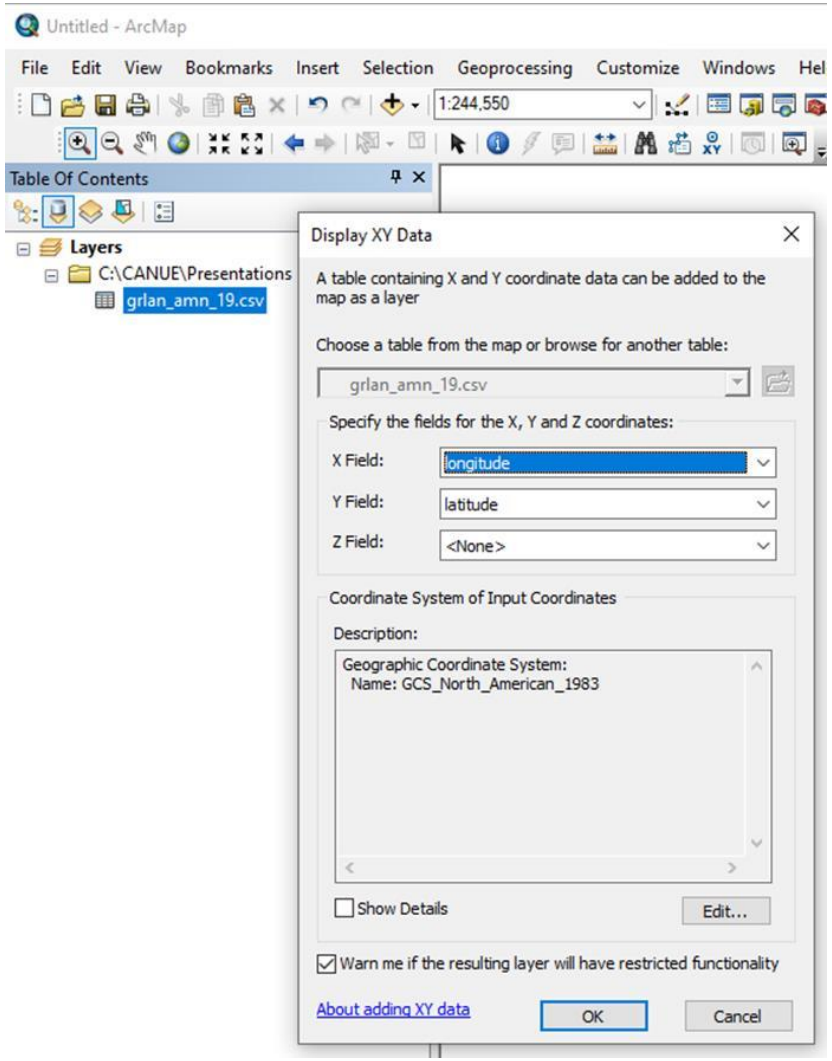
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Table Of Contents
Layers
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Display XY Data
A table containing X and Y coordinate data can be added to the map as a layer
Choose a table from the map or browse for another table:
grlan_amn_19.csv
Specify the fields for the X, Y and Z coordinates:
X Field: longitude
Y Field: latitude
Z Field: <None>
Coordinate System of Input Coordinates
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Show Details
Edit...
Warn me if the resulting layer will have restricted functionality
About adding XY data
OK
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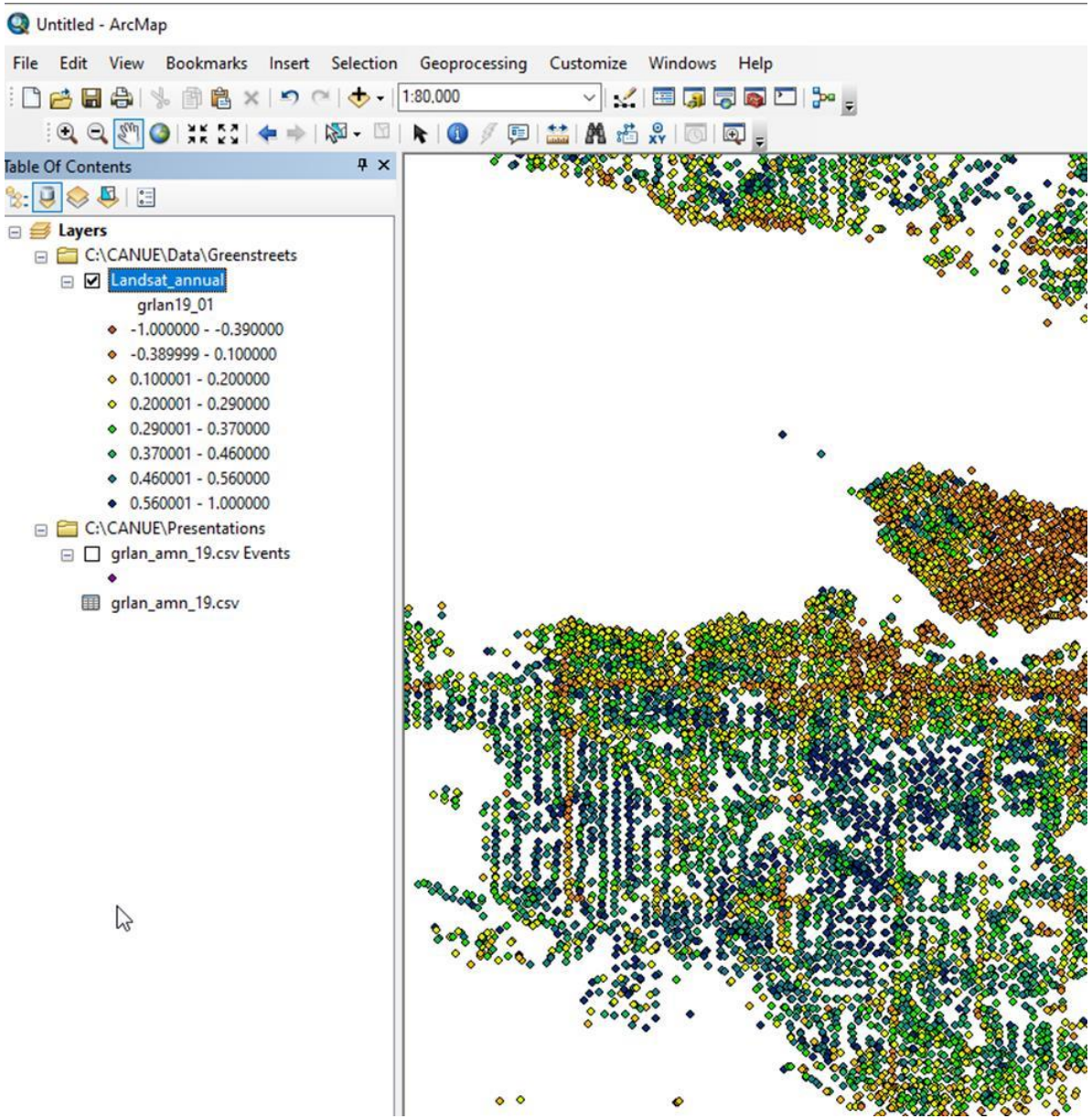
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0.100001 - 0.200000
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0.460001 - 0.560000
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grlan_amn_19.csv Events
grlan_amn_19.csv

Looking forward…

New data →

- OSM-derived layers (parks and recreation density, amenities density, transit density)
- OSM/Microsoft building footprints via ML – landuse index (residential, commercial, core)
- Planet 3m satellite derived NDVI
- Noise and transportation models for select cities

Hackathon→

- Challenge teams to develop new metrics using some of our input data/new input data
- High visibility for teams, data could be used widely by leading researchers

Virtual Annual General Meeting →

- May 18th speakers
- Three options to attend a feedback/work session for shaping the next 5 years of CANUE

Presentation overview

Eleanor Setton | CANUE Managing Director and Environmental Exposure Expert

CANUE overview and data tour

Dany Doiron| CANUE Data Linkage Lead and Environmental Epidemiologist

Using CANUE data to explore built environment equity

My background

BA. Geography and Biology

↓

Masters Public Policy → Thesis on Built environment and active transportation

↓

Research assistant/associate

↓

PhD Epidemiology → Thesis on Air pollution respiratory health effects

↓

Data linkage lead / environmental epidemiologist

Case study: CANUE data for environmental equity research in Canada

Environment International 143 (2020) 106003

Contents lists available at ScienceDirect

Environment International

journal homepage: www.elsevier.com/locate/envint

Healthy built environment: Spatial patterns and relationships of multiple exposures and deprivation in Toronto, Montreal and Vancouver

Dany Doiron[a,*], Eleanor M. Setton[b], Kerolyn Shairsingh[c], Michael Brauer[d], Perry Hystad[e], Nancy A. Ross[f], Jeffrey R. Brook[c,g]

Toronto

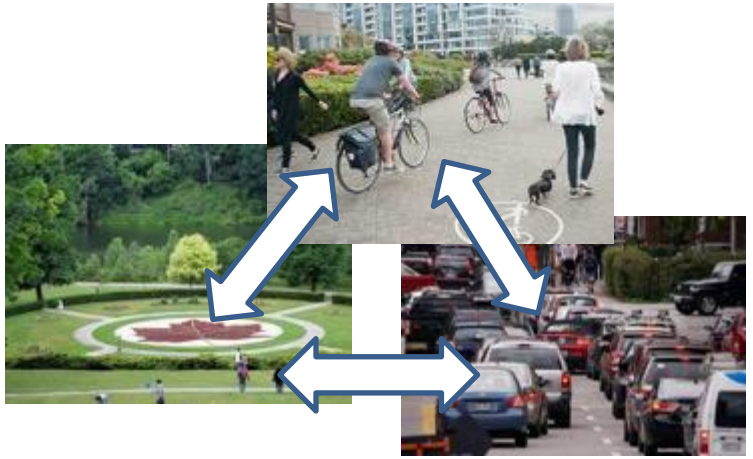
Montreal

Vancouver

Case study: CANUE data for environmental equity research in Canada

Objectives:

1. Explore **spatial distribution** of walkability, ambient air pollution, and greenness in Canada's three largest cities
2. Assess how exposures are **distributed across socioeconomic deprivation** gradients
3. Identify areas with **clusters of favorable and unfavorable attributes – i.e. "sweet" and "sour" spots**



Data:

1. Canadian Active Living Environments (Can-ALE) Index
2. NDVI greenness
3. Nitrogen dioxide (NO_2) air pollution
4. Material deprivation index

Case study: CANUE data for environmental equity research in Canada

Methods:

Environmental equity analyses:

- Exposure in tertiles across material deprivation in quintiles
- Calculate proportion of postal codes characterised by *low* (and *high*) exposure tertiles within each deprivation quintile
- Divide by the overall proportion of *low* (and *high*) exposure across a given city (=33.3%)

Result-> Identify prevalence of high or low exposure in each deprivation quintile relative to city-wide prevalence

Spatial distribution of "sweet" and "sour" spots

- **Sweet spots:** postal codes characterized by **low air pollution**, **high greenness**, **high walkability**
- **Sour spots**: postal codes characterized by **high air pollution**, **low greenness**, **low walkability**

Case study: CANUE data for environmental equity research in Canada

Results: Environmental equity analyses

Walkability

High deprivation area: ~50% lower prevalence of highly walkable areas
Low deprivation areas: 68% to 114% higher prevalence of highly walkable areas

NO_2 air pollution

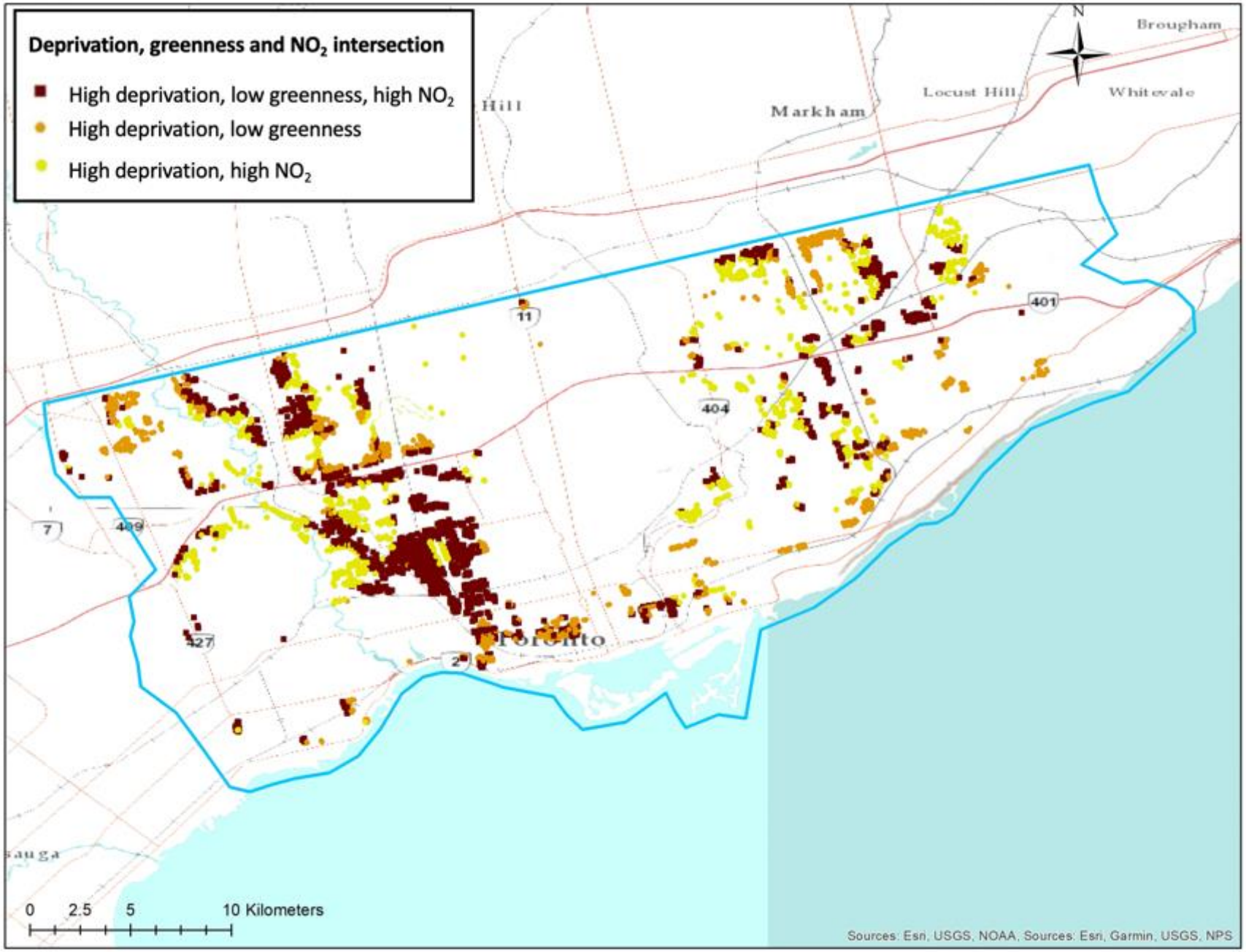
High deprivation areas:

- Between 18% and 80% less likely to experience low levels
- And 38% (Toronto) and 23% (Vancouver) more likely to experience high air pollution

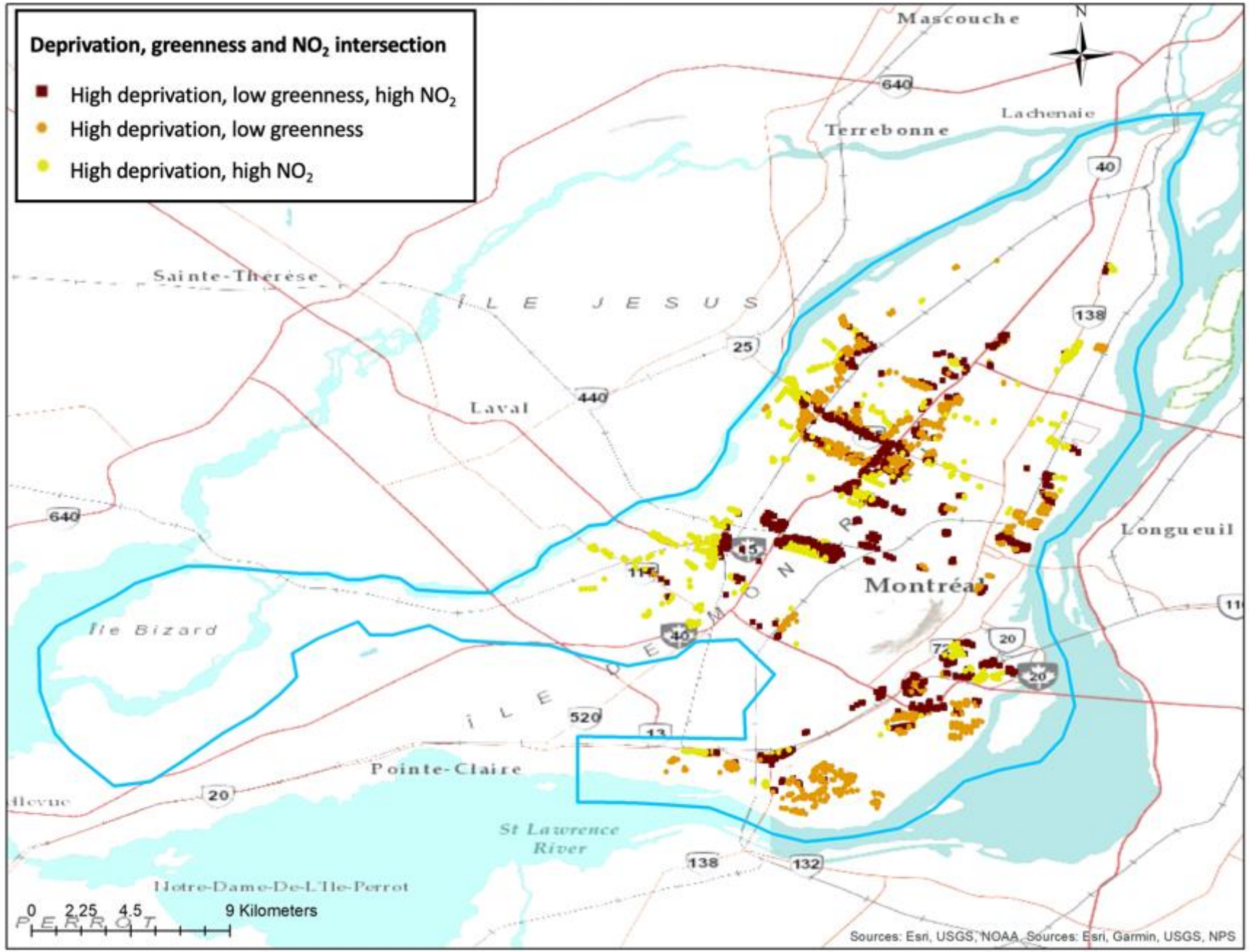
Greenness

High deprivation areas: ~50% as likely to be surrounded by high greenness, and between 23 and 44% more likely to experience low greenness

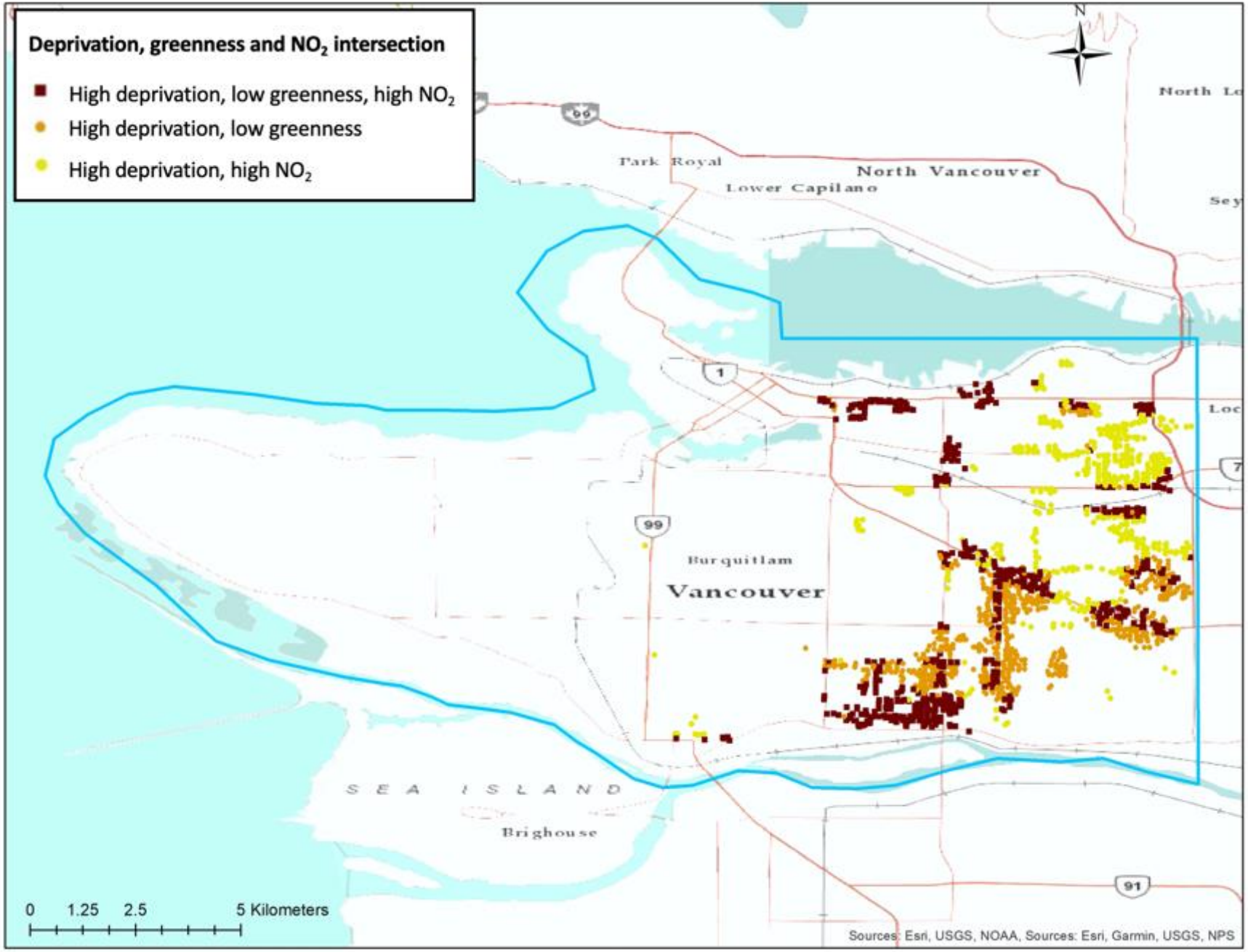
Intersection between material deprivation, greenness and NO2 in the city of Toronto



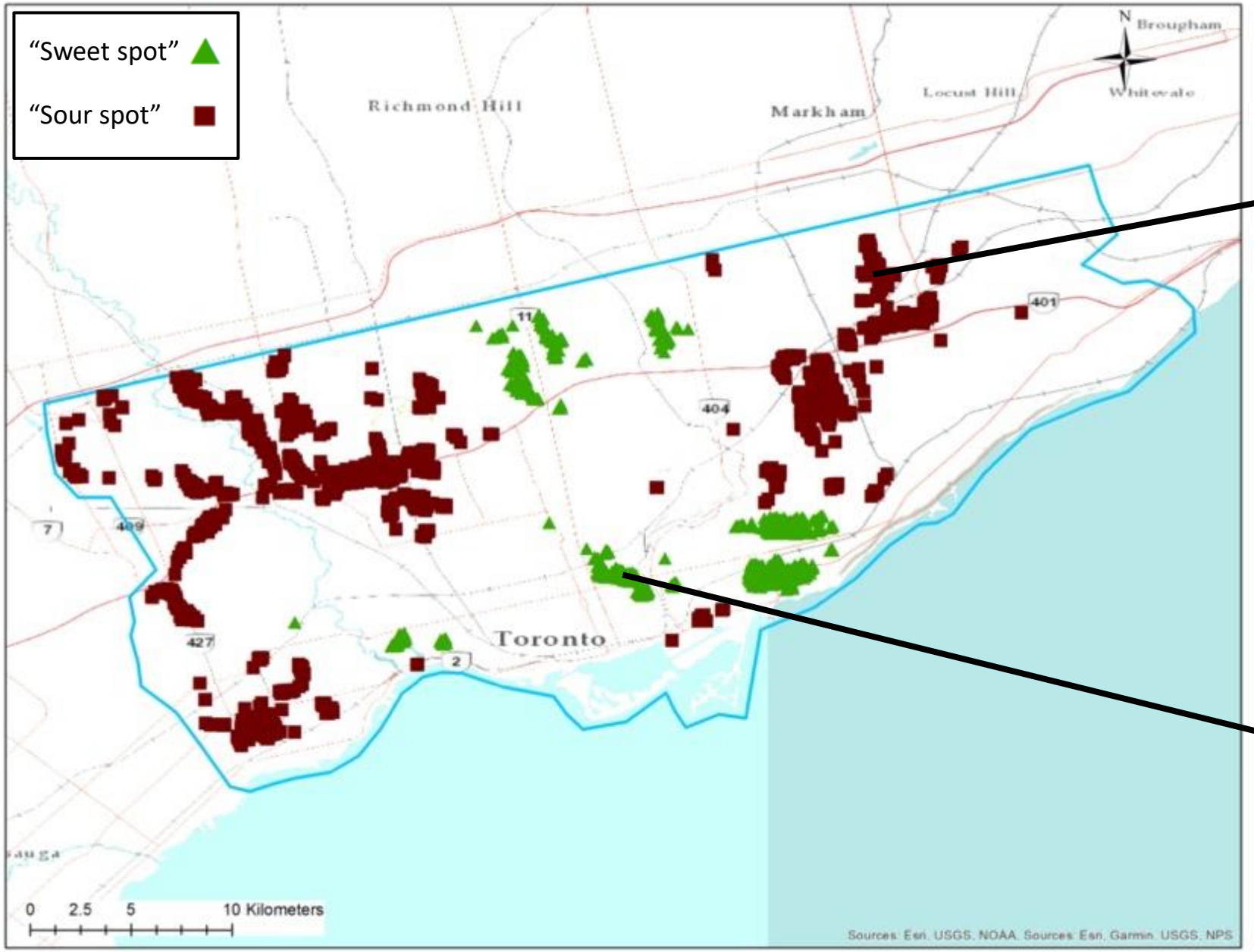
Intersection between material deprivation, greenness and NO2 in the city of Montreal



Intersection between material deprivation, greenness and NO2 in the city of Vancouver



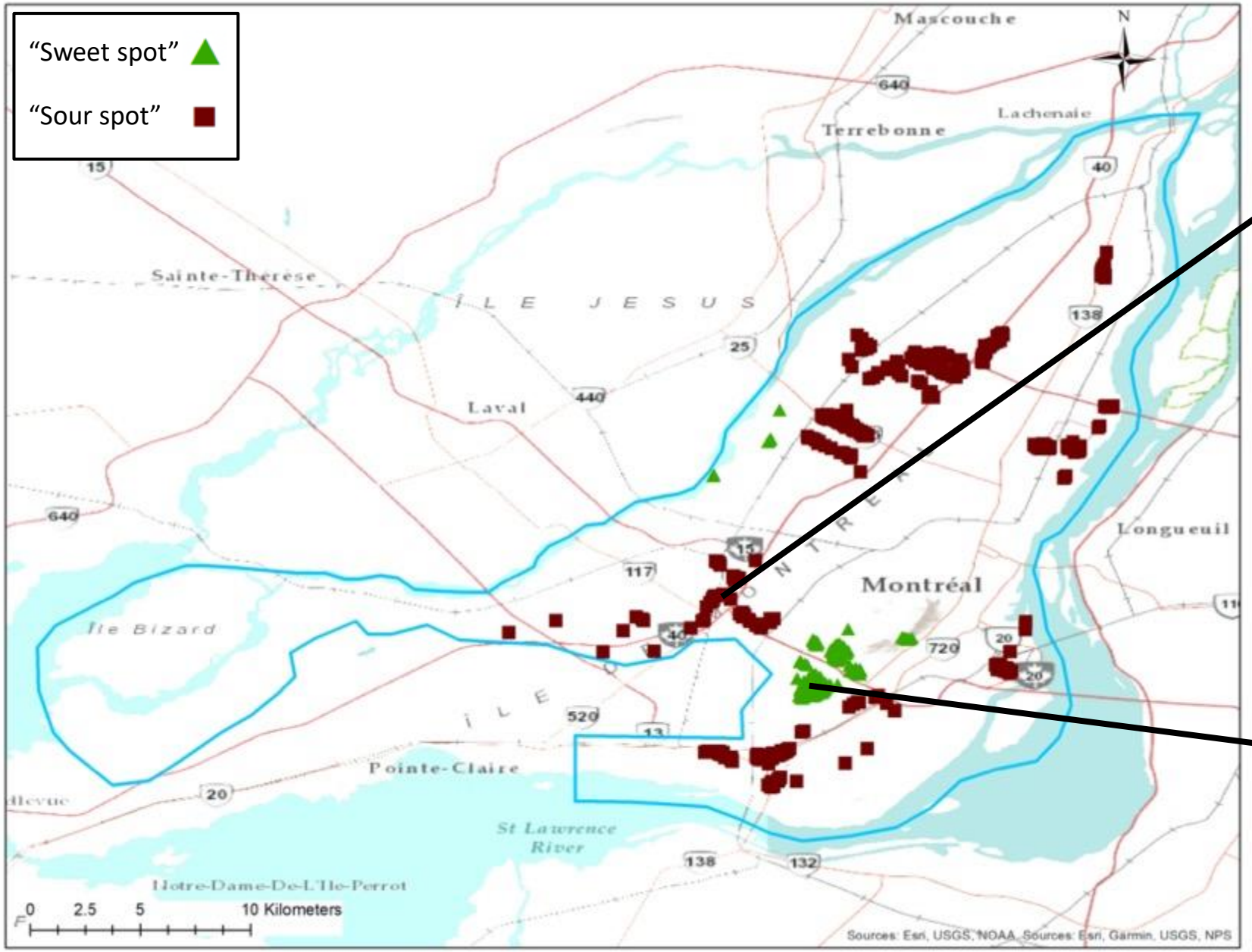
“Sweet” and “sour spot” postal codes in the city of Toronto



“Sour spot” example

“Sweet spot” example

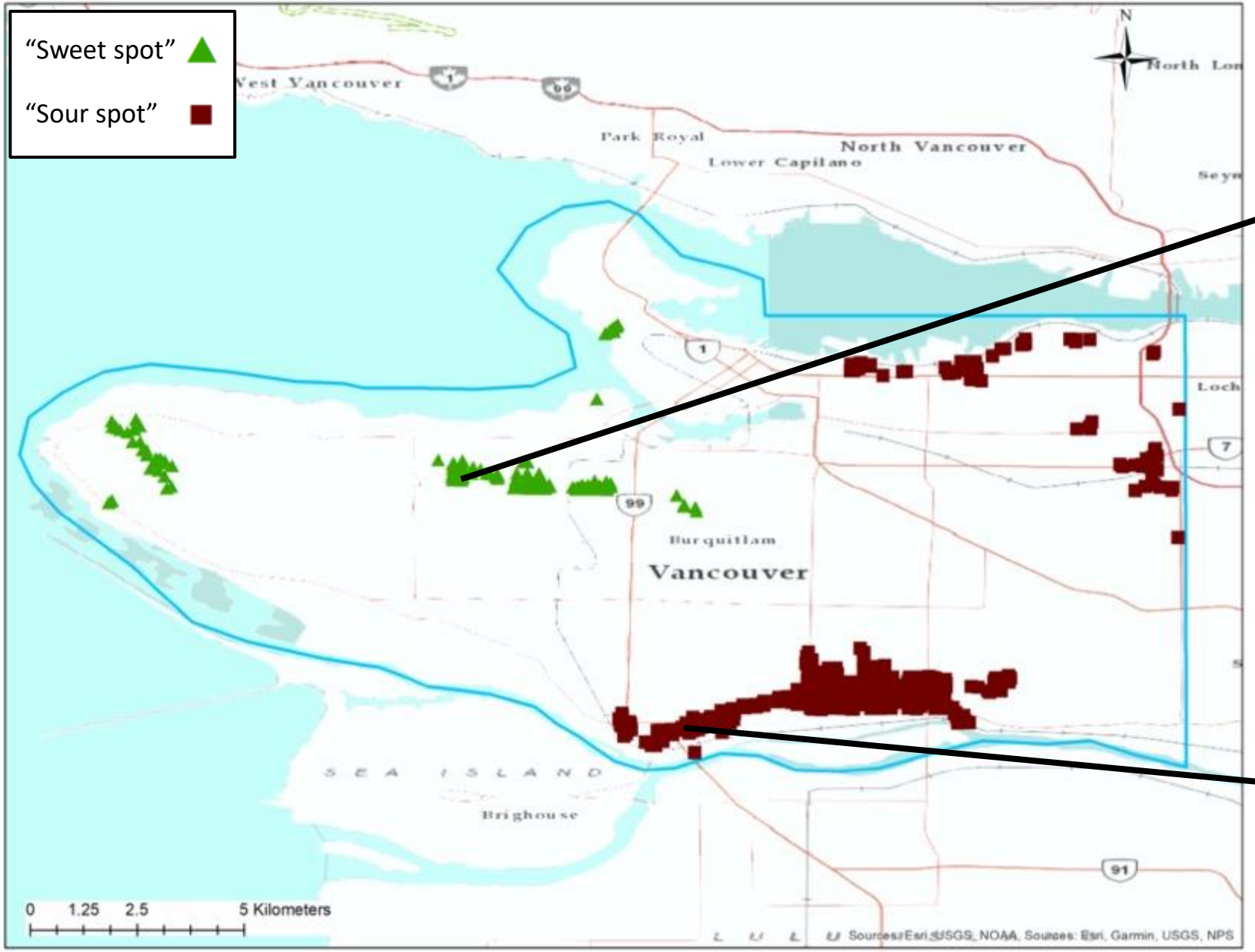
“Sweet” and “sour spot” postal codes in the city of Montreal



“Sour spot” example

“Sweet spot” example

“Sweet” and “sour spot” postal codes in the city of Vancouver



“Sweet spot” example

“Sour spot” example

Case study: CANUE data for environmental equity research in Canada

Policy relevance

Urban planners, policy makers and public health professionals can leverage urban environmental data when developing new policies and interventions:

Refine investments and prioritize areas for interventions.

Reliably benchmark municipalities and track patterns in urban environmental risks

Facilitate comparisons of urban environmental risks across populations

Real-life example in Montreal

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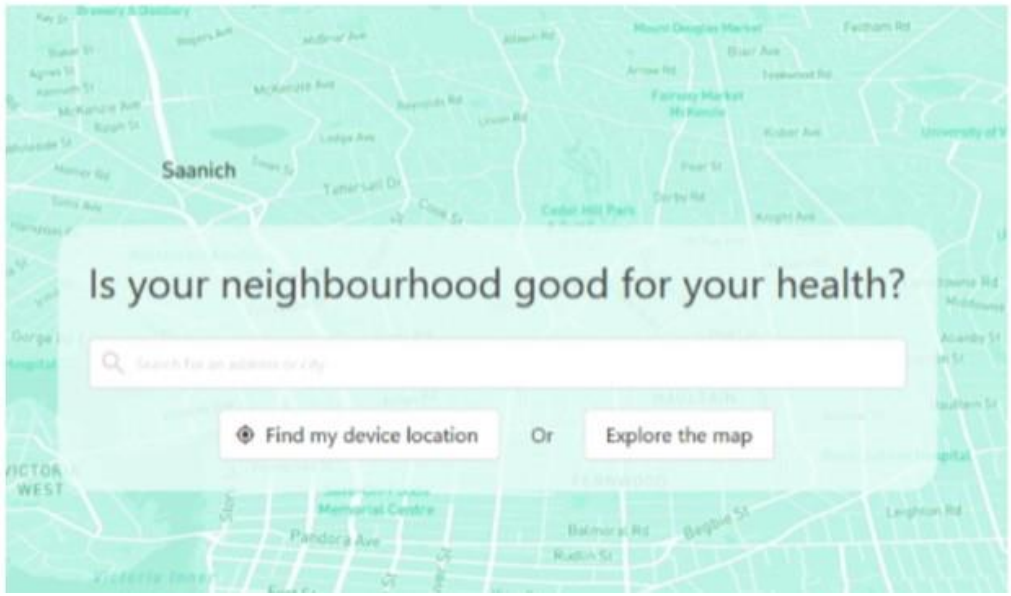
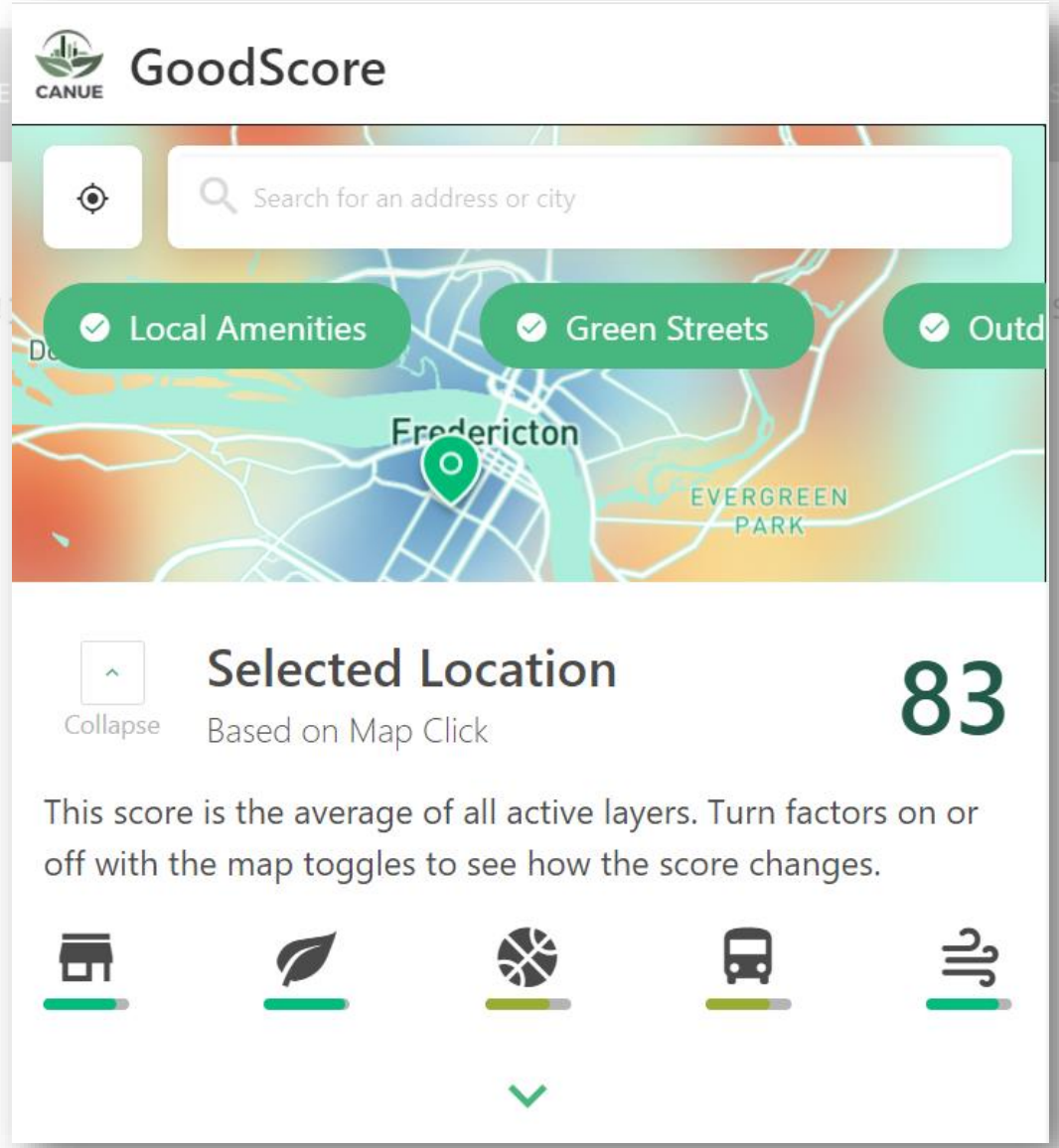
TRY THE PROTOTYPE TODAY

TELL US WHAT YOU THINK! TAKE THIS SHORT SURVEY TO LET US KNOW WHAT NEW DATA AND FUNCTIONS YOU WOULD LIKE TO SEE.

Our first survey phase ends March 12th | 2021

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For more information visit:

CANUE website: www.canue.ca
CANUE data portal: www.canuedata.ca

Case study: CANUE data for environmental equity research in Canada

Results: Environmental equity analyses

Walkability, NO_2, and greenness tertiles: relative postal code prevalence rate by quintiles of material deprivation*.

	All postal codes	Low walk.	Low NO_2	Low green	High walk.	High NO_2	High green
Proportion of all postal codes (%)	100	33.3	33.3	33.3	33.3	33.3	33.3
Toronto (prevalence rate)							
1 (low deprivation)	1.0	0.59	0.80	0.66	1.68	0.70	1.58
2	1.0	0.92	1.14	0.77	1.17	0.76	1.26
3	1.0	1.17	1.22	0.92	0.87	0.90	1.03
4	1.0	1.16	1.03	1.17	0.72	1.24	0.69
5 (high depr.)	1.0	1.19	0.82	1.44	0.50	1.38	0.45
Montreal (prevalence rate)							
1 (low depr.)	1.0	0.79	0.74	1.13	1.70	1.26	1.11
2	1.0	1.00	1.12	0.94	1.30	1.08	1.29
3	1.0	1.25	1.28	0.75	0.75	0.89	1.27
4	1.0	1.09	1.18	0.90	0.71	0.78	0.87
5 (high depr.)	1.0	0.87	0.65	1.23	0.57	0.95	0.51
Vancouver (prevalence rate)							
1 (low depr.)	1.0	0.59	1.47	1.82	2.14	0.88	0.69
2	1.0	1.39	1.77	0.53	1.06	0.61	1.59
3	1.0	1.18	1.12	0.62	0.68	0.99	1.33
4	1.0	1.15	0.48	0.68	0.51	1.21	0.97
5 (high depr.)	1.0	0.74	0.20	1.25	0.55	1.23	0.43

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