



www.carexcanada.ca

Surveillance of environmental & occupational exposures for cancer prevention

Surveillance de l'exposition aux agents cancérogènes en milieu de travail et dans l'environnement pour la prévention du cancer

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What IS CAREX?

- **CAR**cinogen **EX**posure
- Based on Finnish initiative for the EU
 - Occupational focus
- Canada- augmented with environmental exposure data
 - Added GIS component
 - Added pesticide focus
- Funded in 2007
 - Canadian Partnership Against Cancer



The screenshot shows the CAREX website interface. At the top, there is a header for the Finnish Institute of Occupational Health with navigation links for Main page, Topics, International Collaboration, Advisory Services, Training, Research, Media Services, FIOH, and Contact. A search bar is also present. Below the header, the page is titled 'Chemical safety - Carex'. A sidebar on the left lists 'Carex', 'Countries', 'Description of CAREX', and 'REACH'. The main content area features a colorful bar with the word 'Information' and the title 'CAREX'. Below this, it is described as an 'International Information System on Occupational Exposure to Carcinogens'. Three bullet points provide details: CAREX is a MS Access database with exposure estimates from 15 countries; it contains information on industrial distribution and exposure data; and the website provides descriptive reports and data tables. A 'Further information' section on the right links to 'Definition of agents and exposure (pdf)' and 'Contact us' with the name Timo Kauppinen. The page is dated 'Modified 21.06.2010 Högström Sointu'.

Cancer due to Occupational Exposures (using WHO Exposure Models) Steenland- 2003

Lung Cancer	6-13%
Larynx Cancer	1-20%
Nose/nasopharynx	33-46%
Mesothelioma	85-90%
Bladder cancer	7-19%
Kidney cancer	0-2%
Liver cancer	1%
Skin cancer	1-6%
Leukemia	1-3%

Burden of exposures

The WHO estimates globally, 19% of all cancers are attributable to the environment, including the work setting, resulting in 1.3 million deaths each year.

Sample of **preventable** exposures associated with human cancer¹

Exposure	Sufficient Human Evidence	Limited Human Evidence
Asbestos	Lung, larynx, mesothelioma, ovary	Colorectal, pharynx, stomach
Arsenic	Lung, skin, urinary bladder	Kidney, Liver, Prostate
Benzene	Leukemia	Multiple Myeloma, NHL
Radon	Lung	Leukemia
Silica Dust	Lung	
Solar Radiation	Skin	Eye

CAREX: Objectives

- Which carcinogens are a concern in Canada?
- How many Canadians are exposed to workplace and environmental carcinogens?
- How and where are they exposed
 - What sources/pathways (air, soil, food)
 - What types of workplaces
 - Which communities
- How high are exposures?
 - Where data is available

Preliminary work: Prioritization

- Based on:
 - carcinogenicity and other toxic properties
 - Presence in Canadian workplaces and communities
 - Can we assess exposure?
- Results of this phase:
 - Priority list of 73 IARC carcinogens
- Created Carcinogen profiles
 - Unique to Canadian context

CARCINOGEN PROFILE

Trichloroethylene
CAS No. 79-04-6

Regulations and Guidelines

OCCUPATIONAL EXPOSURE LIMITS

CANADIAN JURISDICTIONS	DEL (ppm)
Canada Labour Code	10
BC, MB, ON, NL, PE, QC	25 (10h)
AB, SK, NS	50
DC	100 (10h)
NT, NU, YT	100
100 (10h)	

OTHER JURISDICTIONS

JURISDICTIONS	DEL (ppm)
ACGIH 2018 TLV	10
NIOSH	25 (10h)
NIOSH LEL	21
NIOSH PEL	27 (10h)
NIOSH PEL	100 (10h)

Canadian Environmental Guidelines

JURISDICTIONS	LIMIT (mg/L)	YEAR
Canadian Drinking Water Guidelines	1000	2008 (B)
Canadian Indoor Air Quality	None	2011 (B)

Canadian Agencies/Organizations

AGENCY	DESIGNATION/POSITION	YEAR (REF)
Health Canada	DSL - low priority substance, LACMS not managed	2006 (B)
CCPC	Substance (paragraph 1) and 2 (Paragraph 10)	(B)
CCPA 1999	Users of 4,000 kg/y of PSC or TCE for use of metal degreasing that comply with the regulations	2003 (B)

General Information:
Trichloroethylene is a clear liquid at room temperature with a sweet, chloroform-like odor (1). Produced commercially since the 1920s, trichloroethylene has been used as a solvent and degreaser (2). Trichloroethylene may also be referred to as tetrachloroethylene (TCE) (2). There are numerous other synonyms and product names. See MSDS for more information (4).

This substance has been classified by IARC as a group 2A carcinogen (potentially carcinogenic to humans) (3). This determination is based on sufficient evidence from experimental animal studies and limited evidence from human studies (3). The most relevant human studies are those that reported evidence of a low birth rate and foetal loss in well as increased incidence of reproductive system and the lungs in adequately controlled for (3).

The NTP classified trichloroethylene as a non-carcinogen (3).

Additional animal health effects associated with trichloroethylene exposure to some degree (2). Acute exposure may cause damage to the kidneys and liver and myeloma (2). See MSDS for further details (4).

Trichloroethylene has been listed by CAREX Canada as Group A (highest priority) for environmental settings. Identification, assessment, and control of exposure to trichloroethylene and other toxic properties of the substance, the presence of exposure Canada and the feasibility of assessing exposure.

CAREX Canada is a national surveillance project that estimates the number of Canadians exposed to substances associated with cancer in the workplace and community environments. These estimates provide significant support for targeting exposure reduction strategies and cancer prevention programs.

[View Profiles & Estimates ▶](#)



Carcinogen Database

Browse

CARCINOGEN	PROPERTIES/USE	PROFILE	ENVIRONMENTAL ESTIMATE	OCCUPATIONAL ESTIMATE
1,2-Dichloroethane	Industrial Chemicals	▶		▶
1,3-Butadiene	Industrial Chemicals	▶	▶	▶
1,4-Dioxane	Industrial Chemicals	▶		▶
2,3,7,8-Tetrachlorodibenzo-para-dioxin	Industrial Chemicals		▶	
2,4,6-Trichlorophenol			▶	
2,4-D	Pesticides	▶	▶	
2-Nitropropane	Industrial Chemicals	▶		
Acetaldehyde	Industrial Chemicals	▶	▶	▶
Acrylamide	Industrial Chemicals	▶		▶
Acrylonitrile	Industrial Chemicals	▶		▶
Adriamycin	Pharmaceuticals	▶		
Antimony Trioxide	Industrial Chemicals	▶		▶
Antineoplastic Agents	Pharmaceuticals			▶
Arsenic	Metals	▶	▶	▶
Artificial UV Radiation	Radiation	▶		▶
Asbestos	Fibers and Dusts	▶	▶	▶
Benzene	Industrial Chemicals	▶	▶	▶

Carcinogen Profiles

Asbestos

PROFILE

FIBERS AND DUSTS – Known Carcinogen (IARC 1)

CAS No. 1332-21-4



Photo: Wikimedia Commons¹⁾

IARC Monograph Vol. 14, Suppl. 7, 1987 (Group 1)

IARC Monograph Vol. 100C, *in prep.* (Group 1)

[General Information](#)

[Regulations and Guidelines](#)

[Main Uses](#)

[Canadian Production and Trade](#)

[Occupational Exposures](#)

[Environmental Exposures](#)

[Sources](#)

Production and Trade

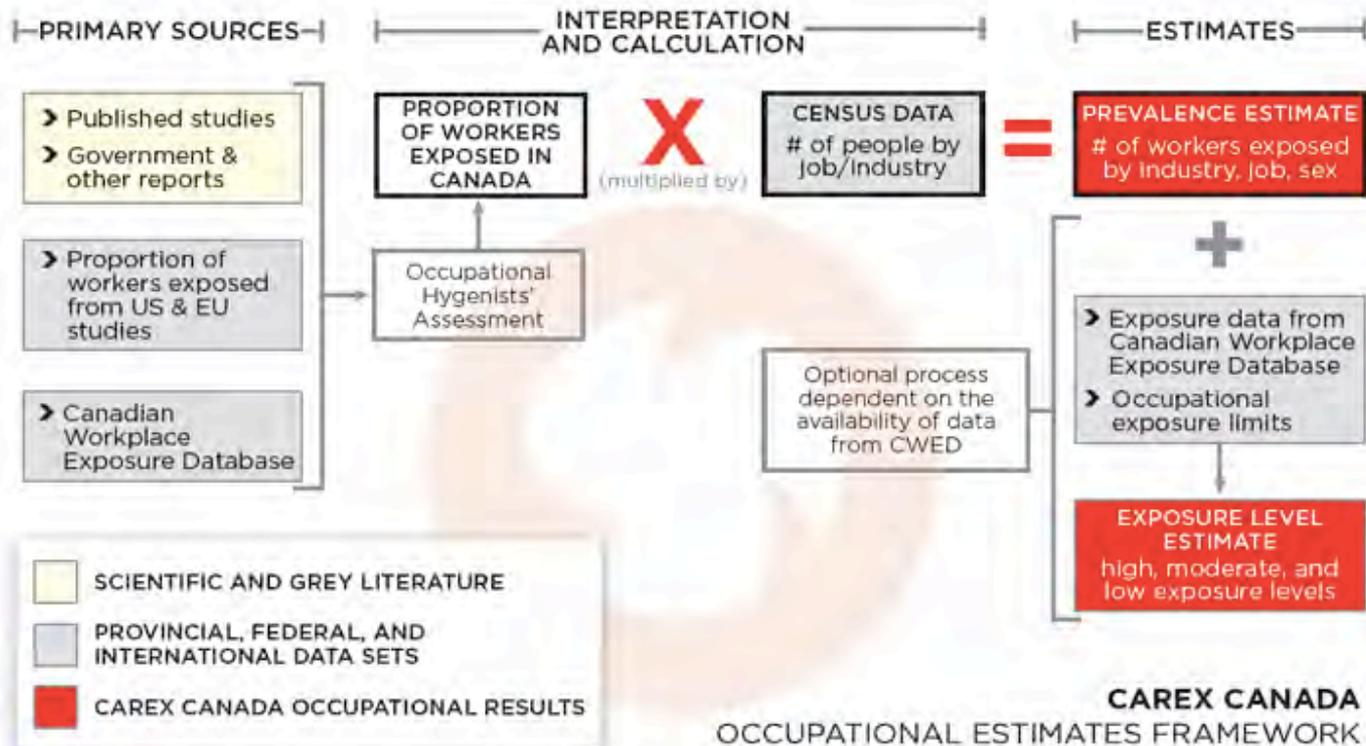
Activity	Quantity
Canadian Production	175,000 t
Export: Mainly to India, Indonesia	135,459 t of 'asbestos'
Import: Mainly from China	22 t of 'asbestos'
Import: Mainly from the US	57 t of 'articles of asbestos-cement'

Estimating exposure

- General approach
 - existing Canadian exposure data
 - census population estimates
 - the best exposure estimation/modelling procedures available
- Techniques varied considerably
 - Agricultural pesticides
 - Occupational
 - Environmental

Occupational Exposure methods

General approach



Diesel Exhaust

804,000 WORKERS (EST.)  **DIESEL ENGINE EXHAUST EXPOSURE IN CANADA**

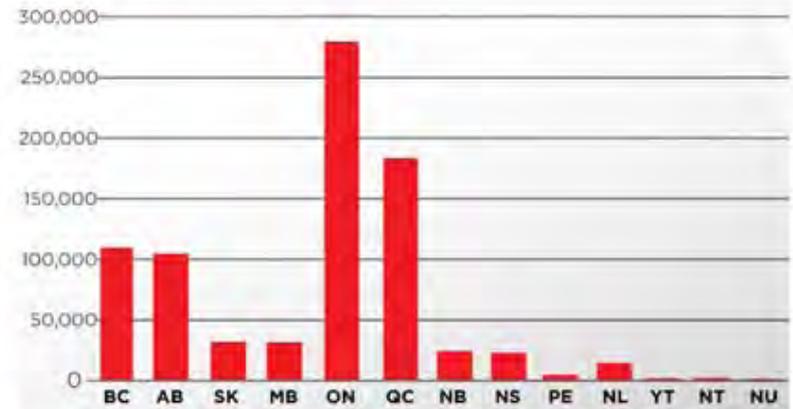
FIVE LARGEST EXPOSURE GROUPS BY INDUSTRY

PROPORTION OF INDUSTRY EXPOSED

Truck transportation	188,000	68%
Auto repair and maintenance	59,000	35%
Public administration (local)	37,000	13%
School and employee bus transportation	36,000	83%
Taxi and limo service	34,000	79%



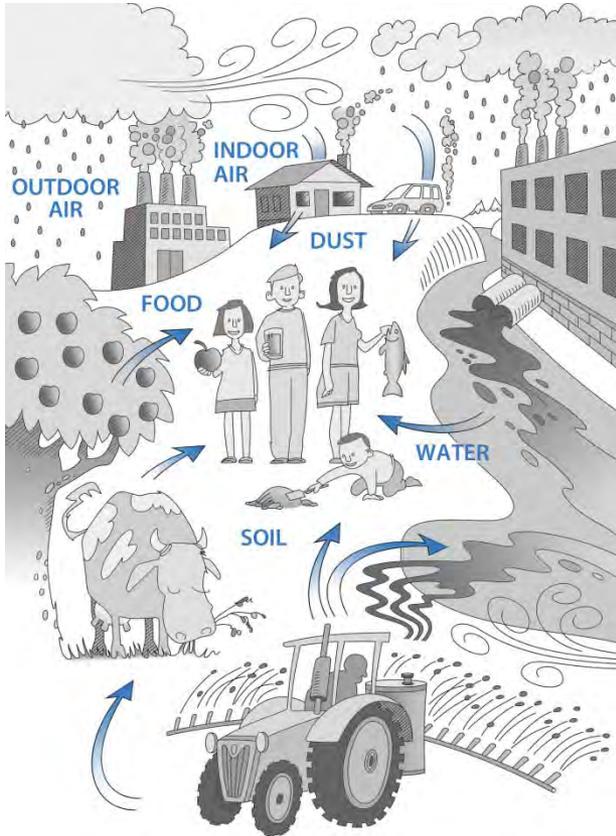
WORKERS EXPOSED TO DIESEL ENGINE EXHAUST BY REGION



Who is at risk? Number exposed in Canada and cancer sites

Known or suspected carcinogen	# Exposed	Confirmed	Suspected
Shift work with potential for circadian disruption	2,800,000		Breast, prostate?
Solar radiation	1,500,000	Skin	
Diesel engine exhaust	804,000	Lung	
Silica (crystalline)	349,000	Lung	Others?
Polycyclic aromatic hydrocarbons (PAHs)	307,000	Lung, skin, bladder	
Benzene	297,000	Acute non-lymphatic leukemia	ALL, multiple myeloma, NHL
Wood dust	293,000	Sinonasal, nasopharynx	
UV radiation (artificial sources)	207,000	Skin, eye	
Lead	202,000		Lung, stomach
Asbestos	152,000	Lung, mesothelioma, larynx, ovary	Pharynx, colon, rectum, stomach

CAREX – Environmental Estimates



Pathway:

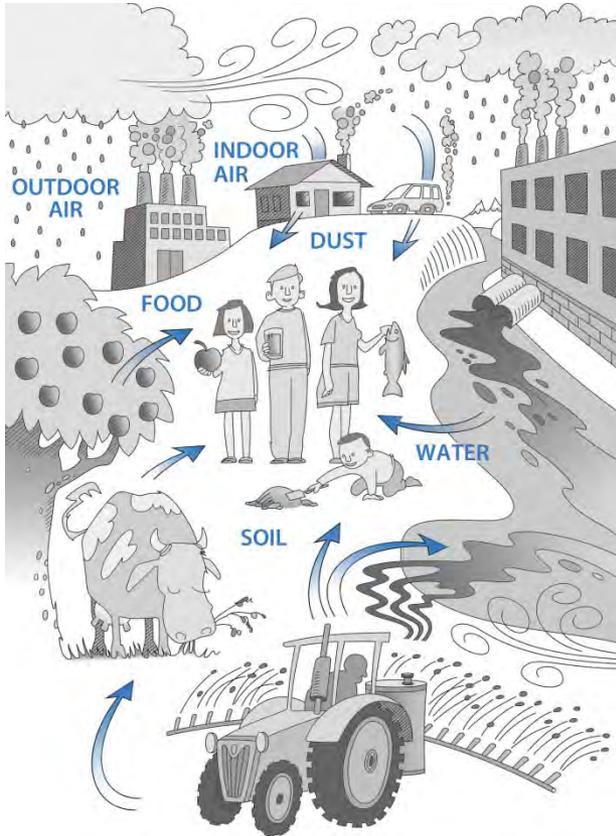
Measured levels:

Outdoor air	0.86	ug/m ³
Indoor air	2.4	ug/m ³
Drinking water	0.5	ug/L
Foods:		
• beef	18.0	ug/kg
• bananas	30.0	ug/kg
• cheese	2.5	ug/kg
Beverages:		
• soft drinks	12.0	ug/L

BUT: what is the priority here?

It depends on how much is inhaled and ingested (ie – intake or dose).

CAREX – Environmental Exposures



INTAKE (DOSE)

Pathway: Inhaled or ingested per day*:

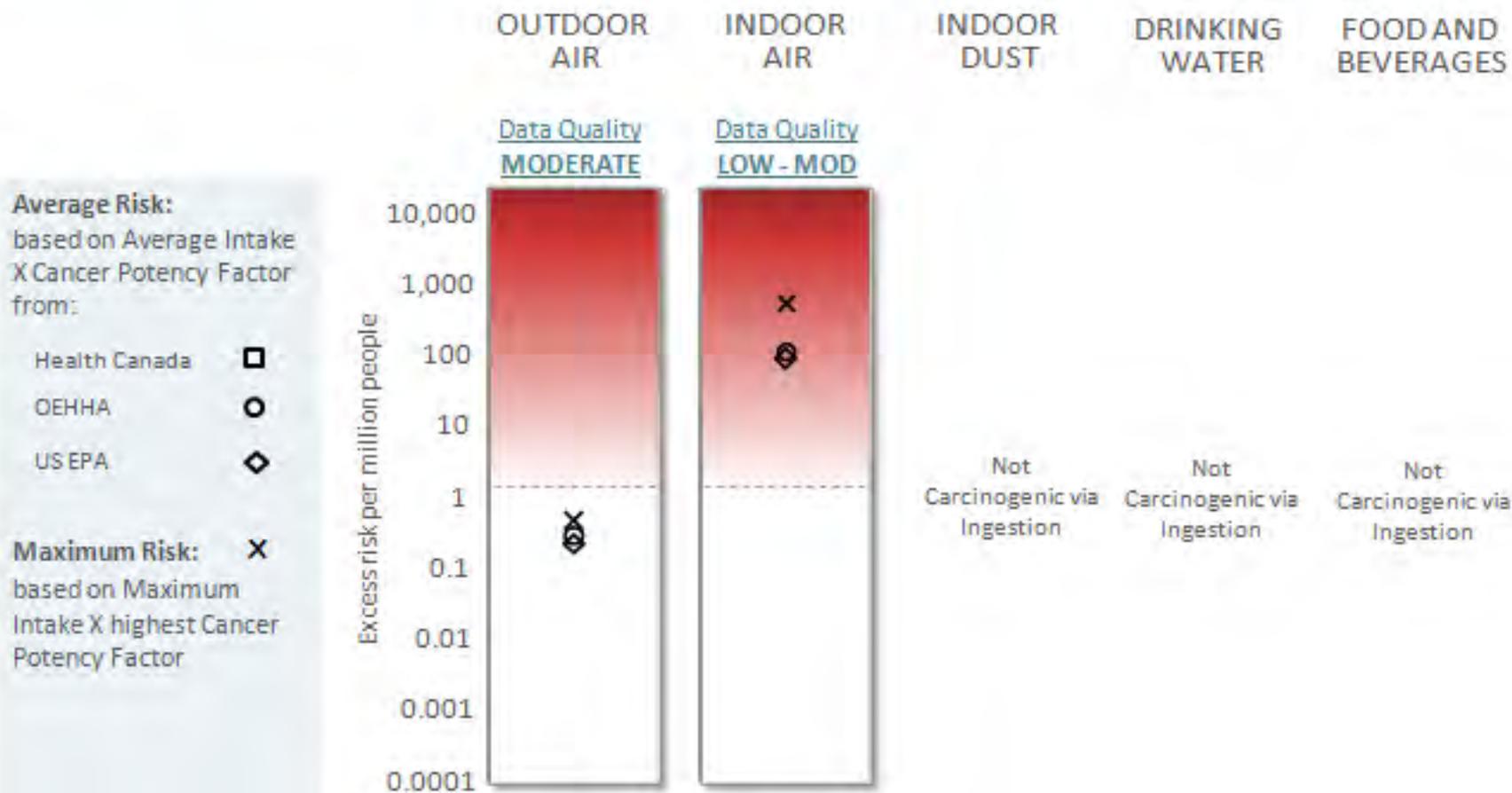
Outdoor air	0.005	mg
Indoor air	0.05	mg
Drinking water	0.0001	mg
Foods:		
• beef	0.0004	mg
• bananas	0.00002	mg
• cheese	0.000004	mg
Beverages:		
• soft drinks	0.002	mg

* Based on standard inhalation and ingestion rates

GAP: guidelines for recommended daily intake exist for only a few substances in a few exposure pathways, some guidelines do not consider cancer...

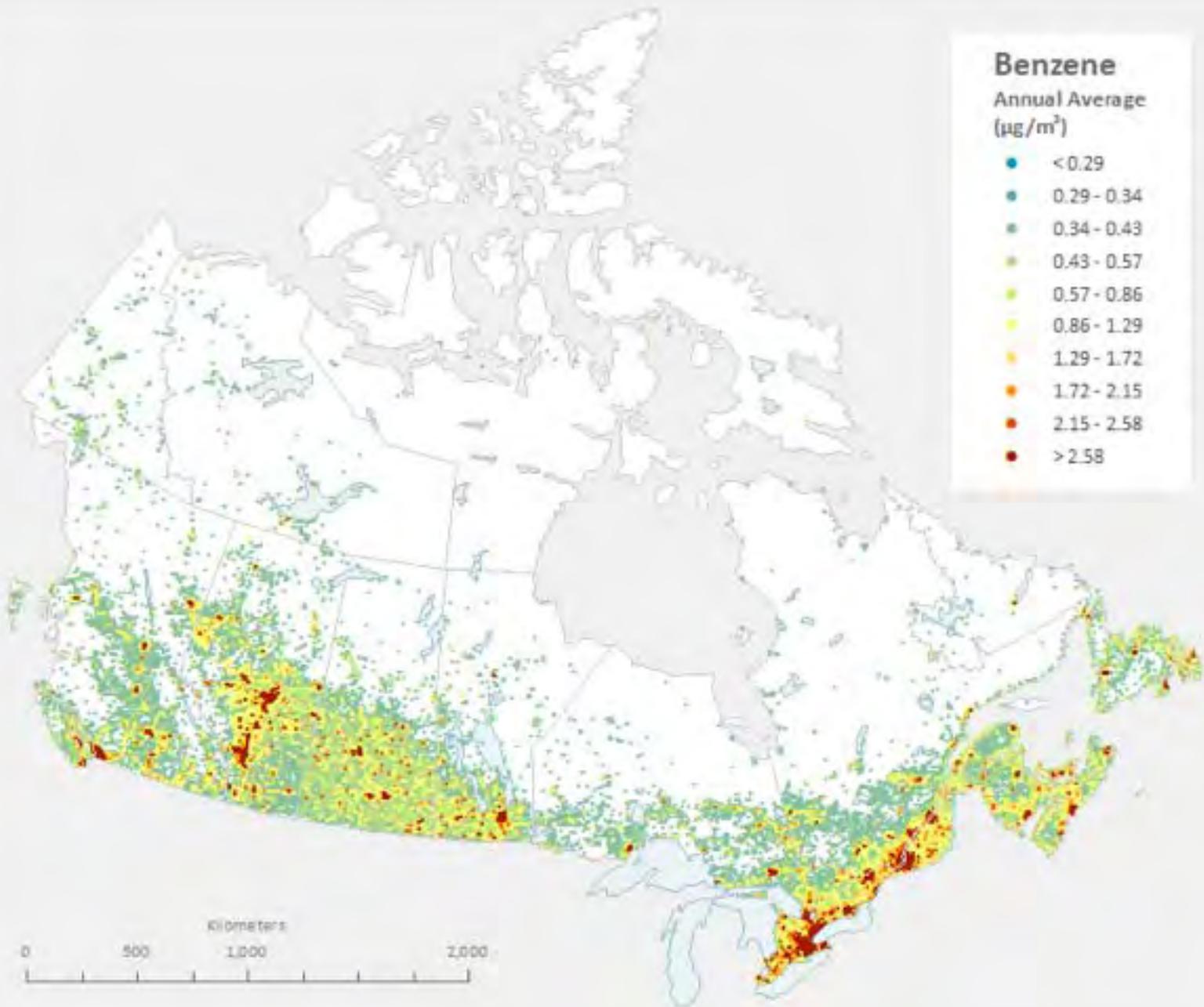
2006 Canadian Potential Lifetime Excess Cancer Risk Estimate - ACETALDEHYDE (assuming measured levels and intake remain constant)

When potential lifetime excess risk is **greater than 1 per million people** in any single pathway, consider identifying ways to reduce the possibility of individual exposure.



Benzene Annual Average ($\mu\text{g}/\text{m}^3$)

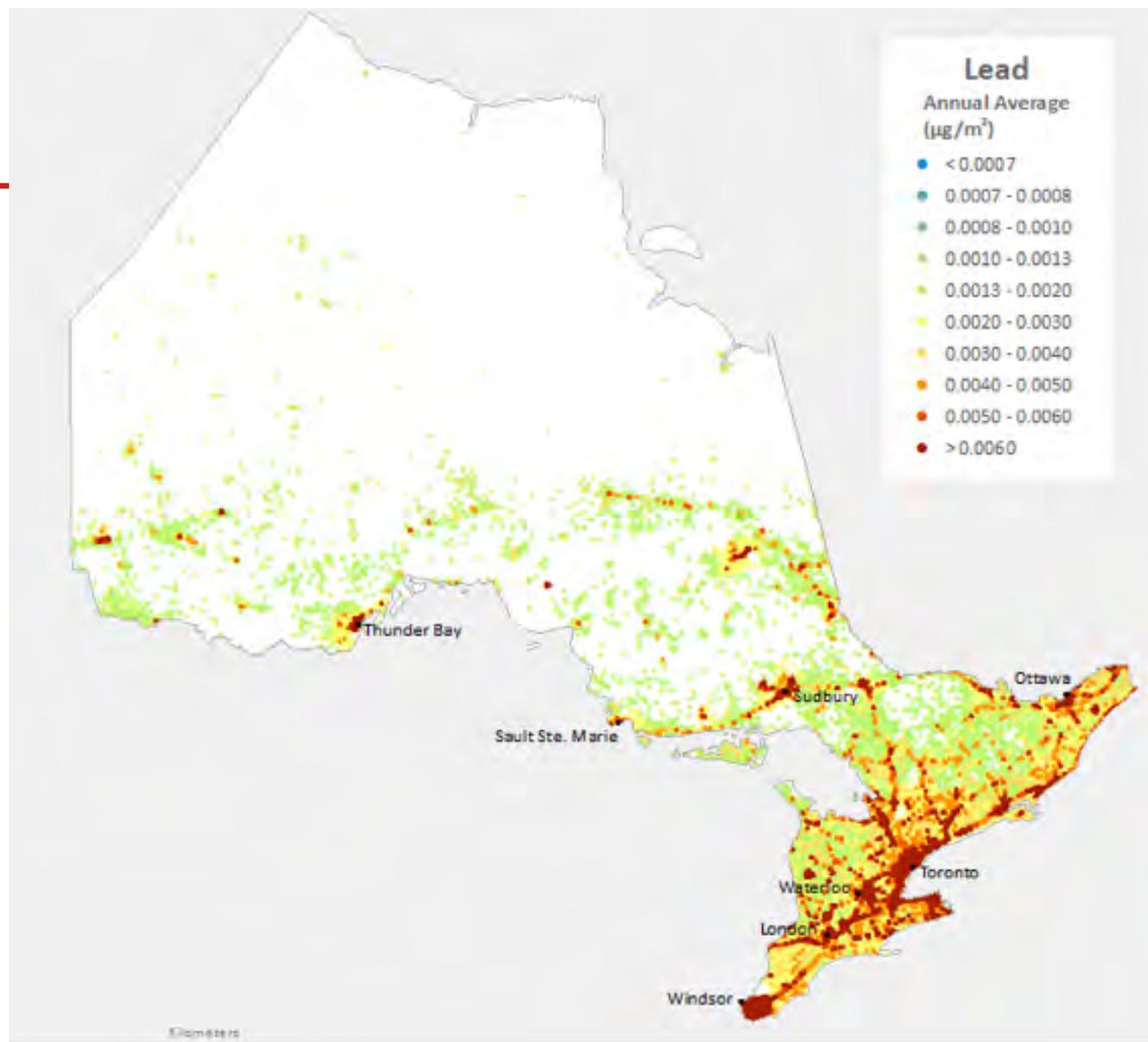
- < 0.29
- 0.29 - 0.34
- 0.34 - 0.43
- 0.43 - 0.57
- 0.57 - 0.86
- 0.86 - 1.29
- 1.29 - 1.72
- 1.72 - 2.15
- 2.15 - 2.58
- > 2.58



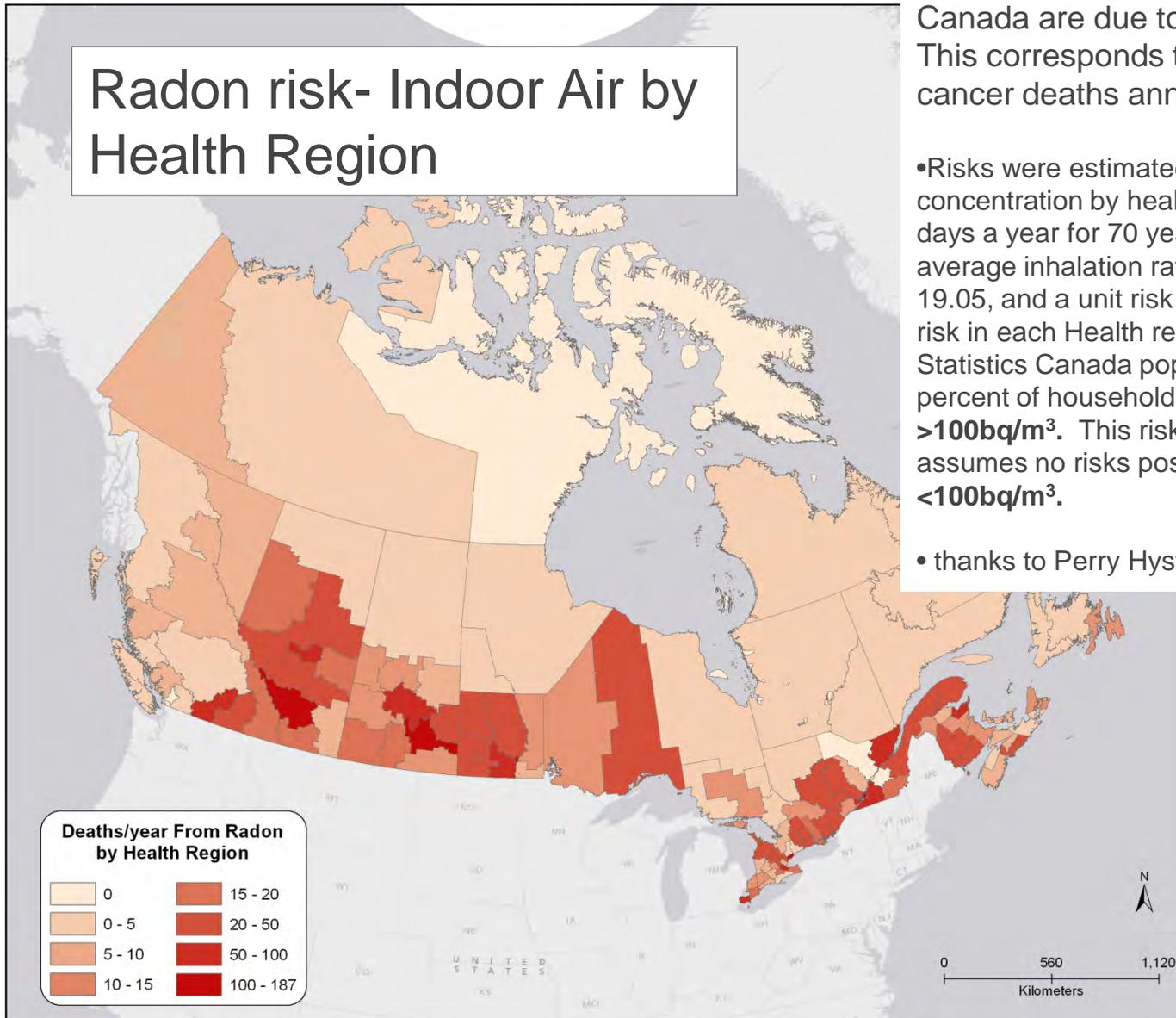
Lead

Annual Average
($\mu\text{g}/\text{m}^3$)

- < 0.0007
- 0.0007 - 0.0008
- 0.0008 - 0.0010
- 0.0010 - 0.0013
- 0.0013 - 0.0020
- 0.0020 - 0.0030
- 0.0030 - 0.0040
- 0.0040 - 0.0050
- 0.0050 - 0.0060
- > 0.0060



Radon risk- Indoor Air by Health Region



It is estimated that 3,300 deaths/year in Canada are due to radon exposures. This corresponds to ~16% of the lung cancer deaths annually in Canada.

- Risks were estimated using the average radon concentration by health region, exposure 365 days a year for 70 years, a life stage weighted average inhalation rate per day indoors of 19.05, and a unit risk of $1.8e-11$. Populations at risk in each Health region were estimated using Statistics Canada population estimates and the percent of household radon measurements $>100\text{Bq/m}^3$. This risk estimate therefore assumes no risks posed by radon exposures $<100\text{Bq/m}^3$.

- thanks to Perry Hystad, Alejandro Cerventes

Lifetime Excess Cancer Risk by Substance – Outdoor Air

Average Risk:

based on average intake X cancer potency or unit risk factor from:

- Health Canada
- CA OEHHA
- US EPA

Maximum Risk:

based on maximum intake X highest cancer potency factor or unit risk factor

IARC 1 - KNOWN CARCINOGENS

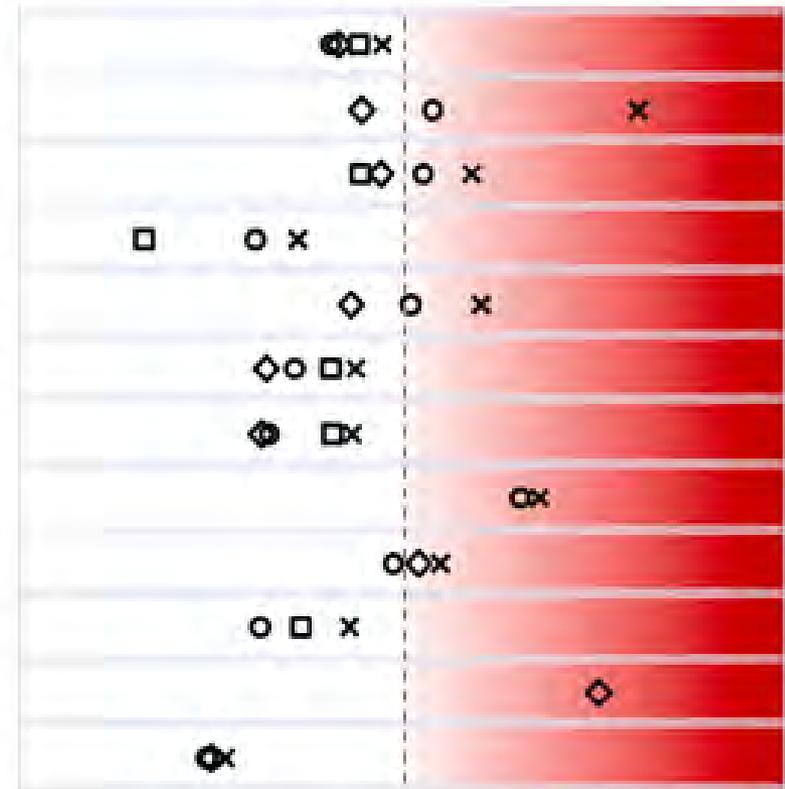
Substance	Health Canada	CA OEHHA	US EPA	Maximum Risk	IARC 1 - KNOWN CARCINOGENS	DATA QUALITY
Arsenic and arsenic compounds					M	M
Asbestos					VL	VL
Benzene					H	H
Benzo[a]pyrene					M	M
1,3-Butadiene					H	H
Cadmium and cadmium compounds					M	M
Chromium (hexavalent)*					L	L
Diesel engine exhaust**					VL	VL
Formaldehyde					M	M
Nickel and nickel compounds					M	M
Radon					M	M
2,3,7,8-Tetrachlorodibenzo-para-dioxin					M	M

DATA QUALITY

LIFETIME EXCESS RISK PER MILLION

PEOPLE

0.0001 0.001 0.01 0.1 1 10 100 1,000 10,000



Lifetime Excess Cancer Risk by Substance – Indoor Air

Average Risk:

based on average intake X cancer potency or unit risk factor from:

Health Canada □

CA OEHHA ○

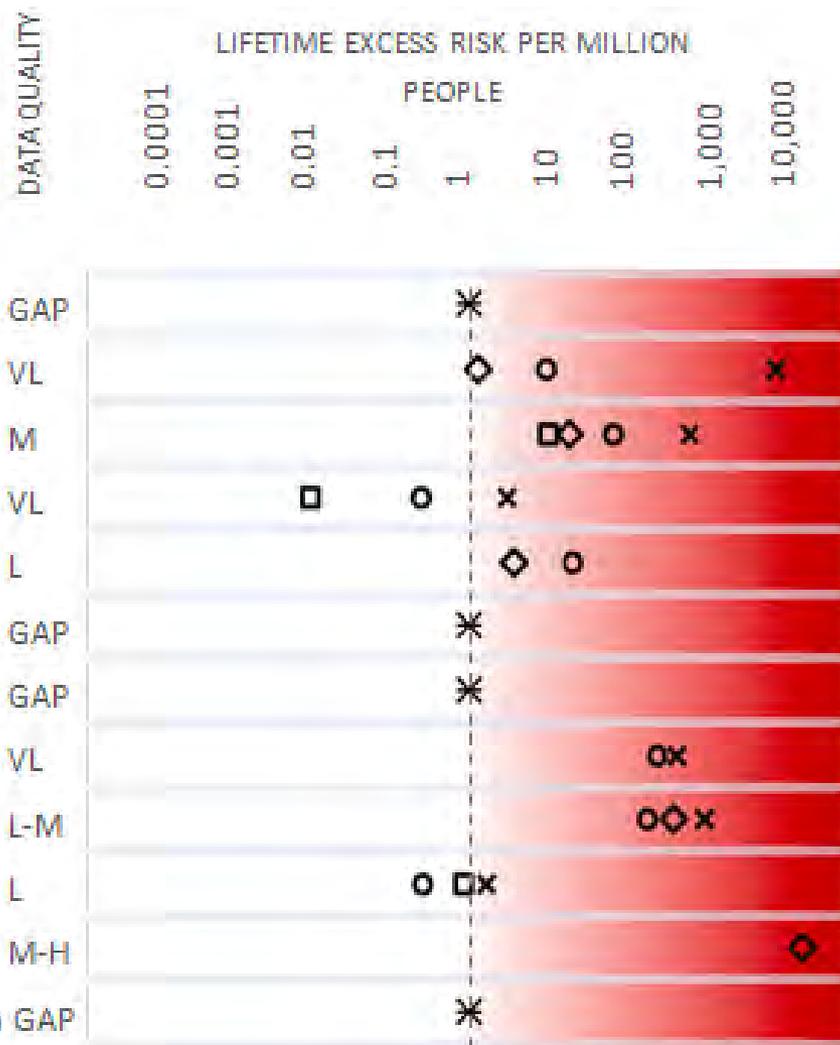
US EPA ◇

Maximum Risk:

based on maximum intake X highest cancer potency factor or unit risk factor X

IARC 1 - KNOWN CARCINOGENS

Substance	Data Quality
Arsenic and arsenic compounds	GAP
Asbestos	VL
Benzene	M
Benzo[a]pyrene	VL
1,3-Butadiene	L
Cadmium and cadmium compounds	GAP
Chromium (hexavalent)	GAP
Diesel engine exhaust*	VL
Formaldehyde	L-M
Nickel and nickel compounds	L
Radon	M-H
2,3,7,8-Tetrachlorodibenzo-para-dioxin	GAP





CAREX Emissions Mapping Project

Mapping Sources and Concentrations of Known and Suspected Carcinogens

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About Us

We have ranked different geographic regions in Canada based on total emissions of known and suspected carcinogens to air (in toxic equivalents) for 2006. Use these rankings to compare total emissions across regions, and to explore which sources contribute most in each region in terms of total amount or toxic equivalent amounts.

Ranks are based on emission amounts reported to the National Pollutant Release Inventory by large companies, and our own estimates of emissions from residential oil, gas and wood heating, passenger cars and heavy duty vehicles, trains, airplanes taking off and landing, and hazardous waste incinerators.

[A short tutorial on our ranking files.](#)

Download and view CAREX's Ranking Files:

Then click on any ranked feature to see a full list of substances emitted, estimates of emission levels, a link to a printable report, and more...

MAJOR CITIES



PROVINCES



HEALTH REGIONS



WATERSHEDS



[Ranking Reports](#) available in text form

PLEASE NOTE: A high rank does not necessarily indicate a high health risk. Visit the CAREX environmental estimates for more information on actual measured levels and potential health risk for different substances.

Ranking Method Overview:

1A. Estimate total emissions for each substance:
(when data are available)

Emissions reported to the **NPRI**

+

Activity Data

x

Emission Factors

Estimates for transportation and residential heating*

=

Total annual emissions for a substance (kilograms)

1B. Convert to total toxic

Total annual

Human

Total annual



- Home
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- Pesticides
- More Google Earth Files
- Resources and Tutorials
- Am I Exposed?
- About Us

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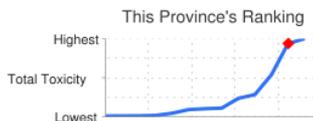
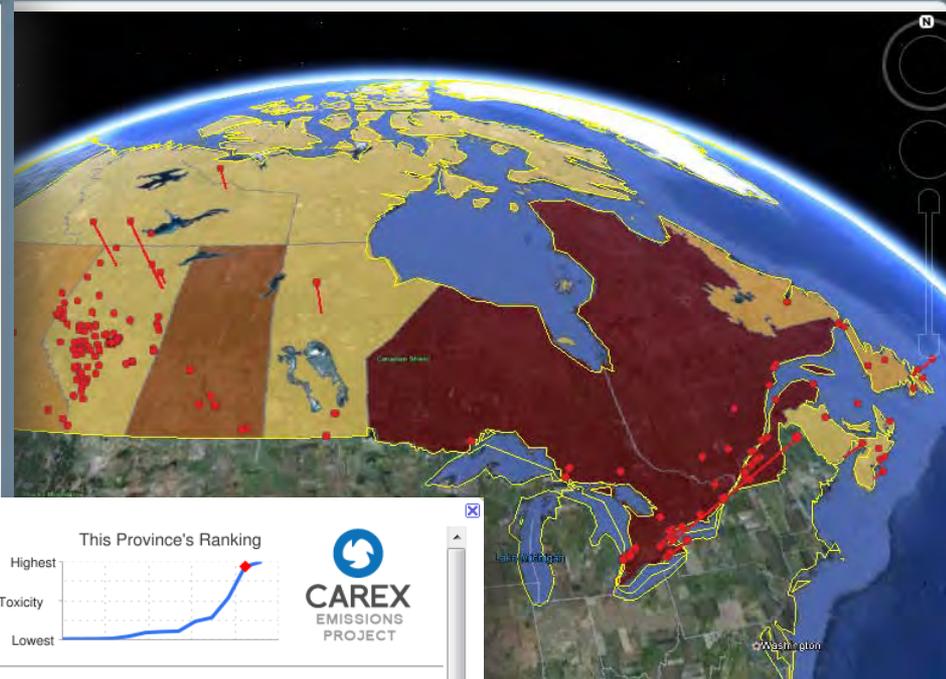


[Ranking Reports](#) available in

PLEASE NOTE: A high rank does not necessarily indicate a high health risk. Visit information on actual measured levels and potential health risk for different substances.

Ranking Method Overview:

- 1A. Estimate total emissions for each substance: (when data are available) Emissions reported to the **NPRI** + [Activity Data](#) = Estimates for **resident**
- 1B. Convert to total toxic equivalents



Ontario

[PDF Summary Report](#)

These rankings are based on emissions to air reported to the National Pollutant Release Inventory in 2006 and our best estimates of emissions from motor vehicles, trains, airplanes taking off and landing, hazardous waste incinerators, and residential heating (oil, gas, and wood). Other sources of these known or suspected carcinogens may exist, and other pollutants not listed here may be emitted from these sources.

NOTE: A high rank does not necessarily indicate a high health risk. Visit the main CAREX environmental estimates for more information on actual measured levels and potential health risk for different substances.

SUBSTANCE	ANNUAL AMOUNT (Kg) <i>Click for Sources</i>	TOXICITY FACTOR	TOXIC EQUIVALENT (Kg) <i>Compared to Benzene</i>	SUBSTANCE RANK	# PROVINCES WITH SUBSTANCE
Acetaldehyde	3,511,239	0.017	59,691	1st	13
Arsenic	32,030	2600	83,278,776	1st	13
Benzene	12,197,400	1	12,197,400	1st	13
Benzo[a]anthracene	823	54	44,448	3rd	13
Benzo[a]pyrene	1,021	6400	6,531,537	3rd	13
Benzo[b]fluoranthene	2,038	130	264,945	3rd	13
Benzo[k]fluoranthene	387	NO TF	No TQ	3rd	13
Butadiene	1,407,087	0.54	759,827	1st	13
Cadmium	14,077	28	394,152	2nd	13
Chloroform	< 0.5	1.6	< 0.5	4th	5
Chromium	7,546	130	294	1st	13
Chrysene	2,982	5.1	15,206	3rd	13
Dichloromethane	102,141	0.2	20,428	1st	7

Benzene

NATIONAL FILES

- Measured Values [National Air Pollution Surveillance \(NAPS\)](#)
- Industrial Emissions [To Air](#), [To Water](#), [To Land](#)
- Other Sources [Airports](#), [Incinerators](#), [Tailings](#), [Wastewater](#)

ene

Annual Amount (kg)

11,169,817

939

694,194

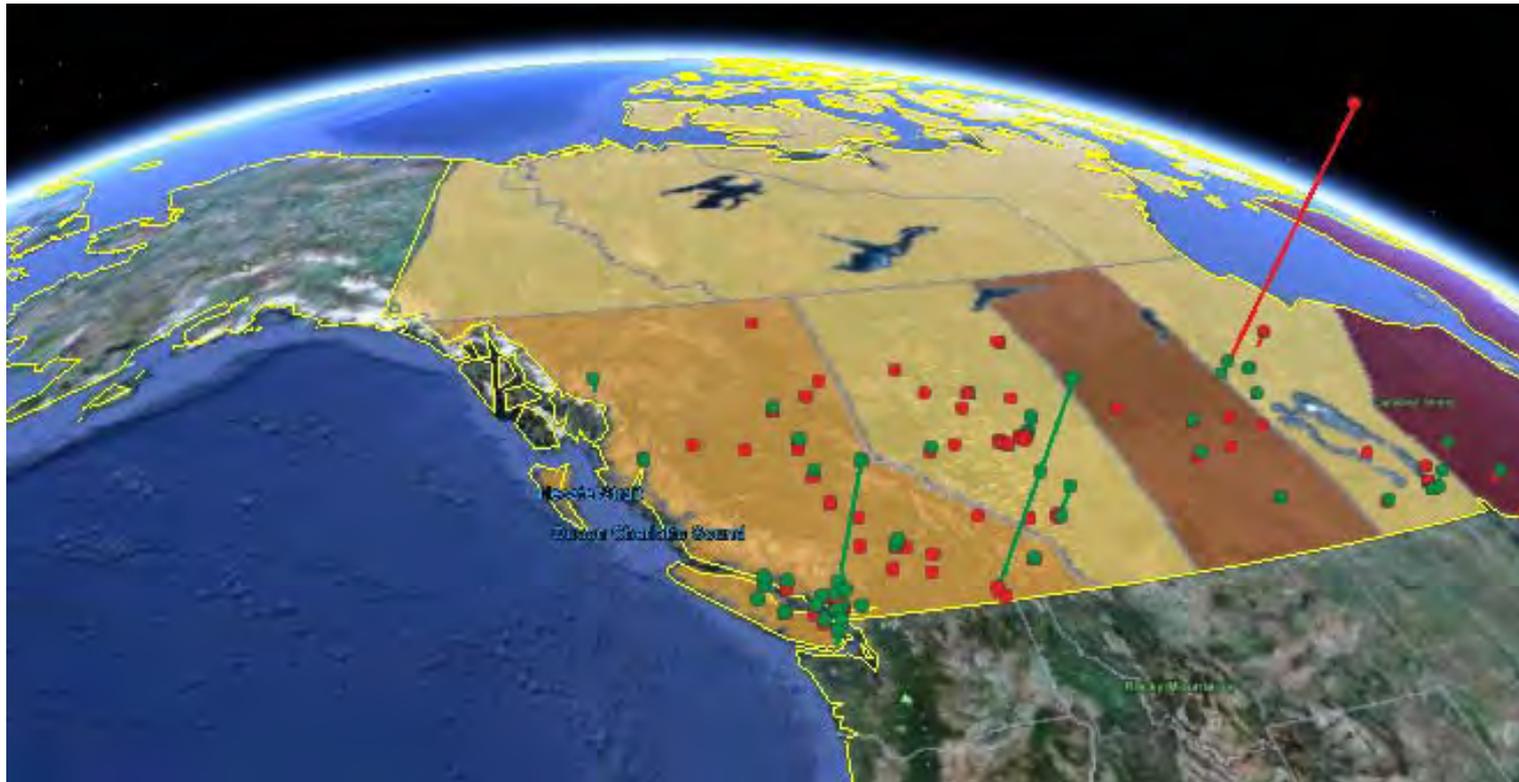
No Emission Factor

317,123

< 0.5

15,328

EMP Example – Lead emissions in soil and air



COMMON EXPOSURE PATHWAYS:



Exposure occurs only when a substance is present in the air you breathe; the food, dust, and soil you eat; and the water and beverages you drink.

Pollutants released to air, land, and water may travel through different pathways before coming into contact with a person.

The physical characteristics of a substance affect how long it stays in the environment, how far it travels, and whether or not it can transfer between air, water, and soil, or be taken up by plants.

Find out which known or suspected carcinogens on the CAREX priority list are present in which exposure pathways:

Substances by exposure pathway

Find out more about some of the factors that affect exposure levels via:

[Outdoor air](#)
[Indoor air](#)
[Indoor dust](#)
[Soil](#)
[Drink](#)
[Foods](#)
[Absorption](#)

TUTORIAL VIDEOS:

- [How To Read the Ranking Files](#)
- [How to Read the Pesticides Files * In Progress](#)
- [How to Add More Google Earth Files](#)
- [Google Earth Basics: Navigating](#)
- [Google Earth Basics: Searching](#)

* Exposure can occur through the skin but this pathway is rarely important in

MANUALS:

- [CAREX Manual of Google Earth Basics](#)
 - [System Requirements](#)
 - [Navigating in Google Earth](#)
 - [Searching in Google Earth](#)
 - [Adding and Saving files in Google Earth](#)
 - [Adding placemarks, polygons, and paths](#)
- [CAREX Manual of Geocoding and Creating Google Earth files \[for Excel 2007\] OR \[for Excel 2003\]](#)
 - [An Overview of Excel Basics](#)
 - [Adding your own data directly to Google Earth](#)
 - [Converting data in a spreadsheet to a Google Earth file](#)
- [Download tools, data, and exercises* to work through Geocoding Manual](#)
** Updated Nov 28/2011 – Download new version now*

CAREX EMISSIONS MAPPING PROJECT

ESTIMATING EMISSIONS OF KNOWN AND SUSPECTED CARCINOGENS TO OUTDOOR AIR

METHODS FOR:

AIRPLANES TAKING OFF AND LANDING	
HAZARDOUS WASTE INCINERATORS	
RESIDENTIAL HEATING (GAS, OIL, WOOD)	
TRAINS	
LIGHT AND HEAVY DUTY VEHICLES	

Prepared by:
 Eleanor Setton, PhD
 Anders Erickson, PhD candidate
 CAREX Canada - UNIVERSITY OF VICTORIA SITE

November 2011

[Emissions and Measured Levels by Substance](#) | [Mines and Contaminated Sites](#) | [Other Links](#)

Other useful and interesting maps and Google Earth files are available from other websites. Check back regularly as we add to the list.

Canada Lands

The [Canada Lands in Google Earth](#) site is maintained by Natural Resources Canada and contains the location, administrative boundaries, and parcel data of the geopolitical Aboriginal Reserve Lands.

Commission for Environmental Cooperation

The CEC's [Taking Stock Online](#) tools allow you to explore information on pollution America. Create customized queries and download your results in a variety of form Google Earth and Google Maps.

National Pollutant Release Inventory

The [NPRI](#) is Canada's legislated and publicly accessible inventory of pollutant releases (to air, water, and land), disposals, and transfers for recycling. The website provides resources for accessing, analyzing, and interpreting information on pollutant releases and transfers in Canada.

Canadian Wind Energy Atlas

The [Atlas](#) provides wind direction information for any latitude/longitude in Canada.

Contact us to organize a training session:

info@carexcanada.ca



CANADIAN PARTNERSHIP
 AGAINST CANCER

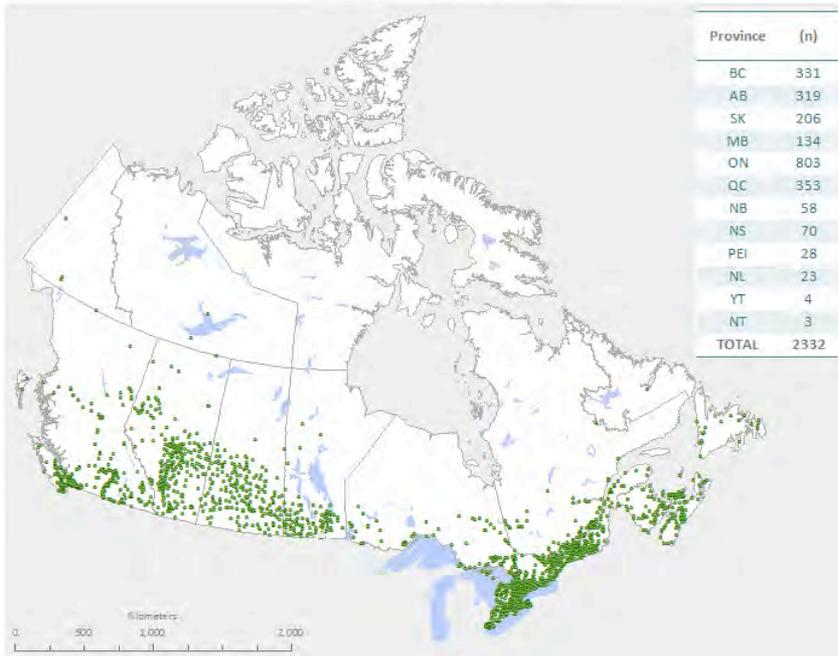


PARTENARIAT CANADIEN
 CONTRE LE CANCER



Golf Course Exposure?

Distribution of Golf Courses in Canada



Housing Density Surrounding Golf Courses

Province	Golf Courses (n)	Low (0-2 houses)	Low-Medium (3-5 houses)	Medium-High (6-20 houses)	High (>20 houses)
BC	331	189 (57%)	63 (19%)	40 (12%)	39 (12%)
AB	319	216 (68%)	51 (16%)	25 (8%)	27 (8%)
SK	206	154 (75%)	44 (21%)	6 (3%)	2 (1%)
MB	134	88 (66%)	28 (21%)	14 (10%)	4 (3%)
ON	803	393 (49%)	257 (32%)	104 (13%)	49 (6%)
QC	353	171 (48%)	97 (27%)	43 (12%)	42 (12%)
NB	58	18 (31%)	34 (59%)	6 (10%)	0
NS	70	35 (50%)	30 (43%)	5 (7%)	0
PE	28	23 (82%)	3 (11%)	2 (7%)	0
NL	23	14 (61%)	5 (22%)	3 (13%)	1 (4%)
NU	0	--	--	--	--
NT	3	3 (100%)	0	0	0
YT	4	4 (100%)	0	0	0
CANADA	2332	1308	612	248	164
%		56	26	10	7

Knowledge Translation: Data Product tailoring

- Dobbins et al: content tailoring most effective for KT (2009)
- Iterative process of data product generation



Carcinogen Profile

Benzene



Benzene is an air pollutant released during the burning of coal and oil. It is also found in cigarette smoke, gas service station emissions and vehicle exhaust. Benzene is considered a "non-threshold toxicant," meaning that adverse effects may occur at any level of exposure.

General Information

Benzene, an aromatic hydrocarbon, is a clear, usually colourless liquid with a gasoline-like odour. Benzene occurs naturally as a constituent of crude oil and has been synthesized from coal since 1849 and from petroleum sources since 1941. Trace amounts of benzene are produced from the incomplete combustion of organic materials. Benzene may also be referred to as benzol or coal naphtha.

Uses and Alternatives

Canadian industries involved in the use and production of benzene include oil and gas, transportation, petroleum, chemical manufacturing, and steel manufacturing.

Benzene

INDUSTRIAL CHEMICALS – Known Carcinogen (IARC 1)

CAS No. 71-43-2



[General Information](#)
[Regulations and Guidelines](#)
[Main Uses](#)
[Canadian Production and Trade](#)
[Occupational Exposures](#)
[Environmental Exposures](#)
[Sources](#)

Photo: Benzene^[1]
IARC Monograph Vol. 29, Suppl. 7, 1987
IARC Monograph Vol. 100F, in prep (Group 1)

General Information

Benzene, an aromatic hydrocarbon, is a clear, usually colourless liquid with a gasoline-like odour.^[2] Benzene occurs naturally as a constituent of crude oil and has been synthesized from coal since 1849 and from petroleum sources since 1941.^[2] Trace amounts of benzene are produced from the incomplete combustion of organic materials.^[3]

Benzene may also be referred to as, benzol or coal naphtha.^[4] There are numerous other synonyms and product names; see HSDB for more information.^[5]

For more detailed information

Visit our website:

- Explore profiles, estimates and tools
- Use online tutorials, download links to presentations

Sign up for our e-Bulletin:

- Find out about upcoming webinars:
- Get the latest updates on data and tools

Discuss ways that CAREX data/tools can be used in your work:

- Email us at info@carexcanada.ca

EXTRA SLIDES

Tools for viewing exposure estimates

Tools

We have developed additional tools to help users explore the data used for our estimates and indicators, and to facilitate access to a wide range of spatial data about known and suspected carcinogens in outdoor environments.



eRISK

eRISK is a Microsoft Access tool that allows you to:

- explore the data used to produce the indicators of potential lifetime excess cancer risk for environmental exposures, and
- use your own local data to see how the risk indicators might differ from the national levels.

Please contact info@carexcanada.ca to request the eRISK application and training manual. You will need MS Access 2007 or 2010 installed on your computer to use the eRISK tool.



**EMISSIONS
MAPPING
PROJECT**

The **Emissions Mapping Project** provides a wide range of files that can be easily downloaded and displayed with Google Earth, and allow you to:

- see how watersheds, provinces, health regions and major cities rank according to total toxicity of emissions to air,
- see how different sources contribute to the rankings, and
- see information on sources and levels of known and suspected carcinogens in outdoor environments.

We have also developed tutorials to help you use Google Earth and our files, and a manual showing you how to create your own Google Earth files using simple spreadsheets. Visit the Emissions Mapping Project to get started now:

[Launch EMP Tool](#)

The Emissions Mapping Project (EMP) was developed with additional funding from the Canadian Institutes for Health Research.

CAREX – Environmental Estimates

By using standard inhalation and ingestion rates, we can compare different exposure pathways...

BUT, we also want to compare substances:

Benzene:

	MEASURED	INTAKE	CANCER POTENCY	LIFETIME EXCESS RISK
Outdoor air	0.86 ug/m ³	0.005 mg	0.1	6.7 per million
Indoor air	2.40 ug/m ³	0.05 mg	0.1	65.0 per million

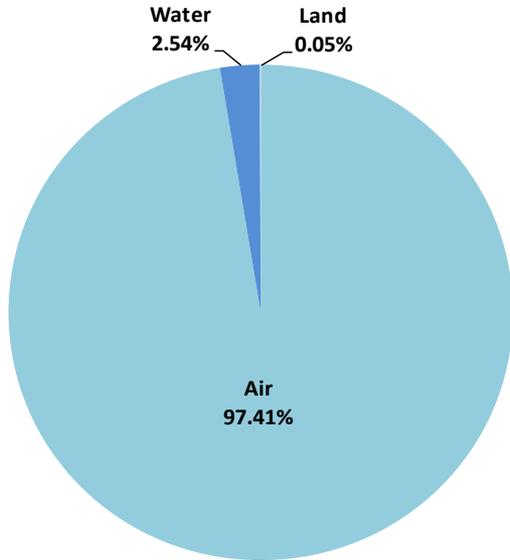
Acetaldehyde:

Outdoor air	0.97 ug/m ³	0.005 mg	0.01	0.7 per million
Indoor air	20.00 ug/m ³	0.380 mg	0.01	54.0 per million

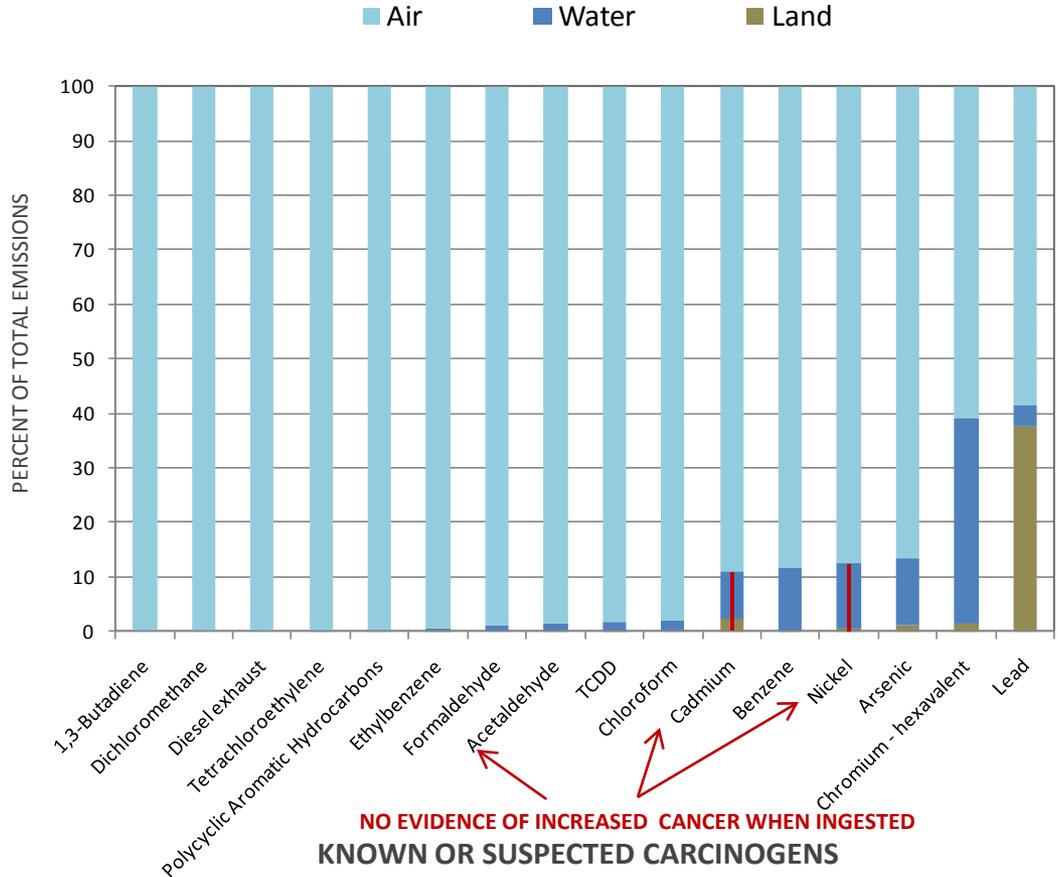
It depends on the toxicity/potency of the substance

Emissions Mapping Project - Overview

TOTAL EMISSIONS OF ALL SUBSTANCES REPORTED TO THE NPRI IN 2006

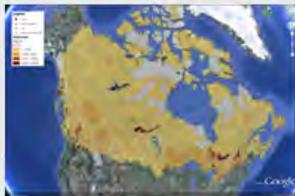


TOTAL EMISSIONS OF SELECTED SUBSTANCES REPORTED TO THE NPRI IN 2006



Emissions Mapping Project - Overview

PROVINCES



HEALTH REGIONS



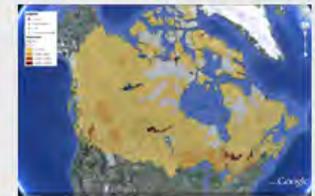
WATERSHEDS



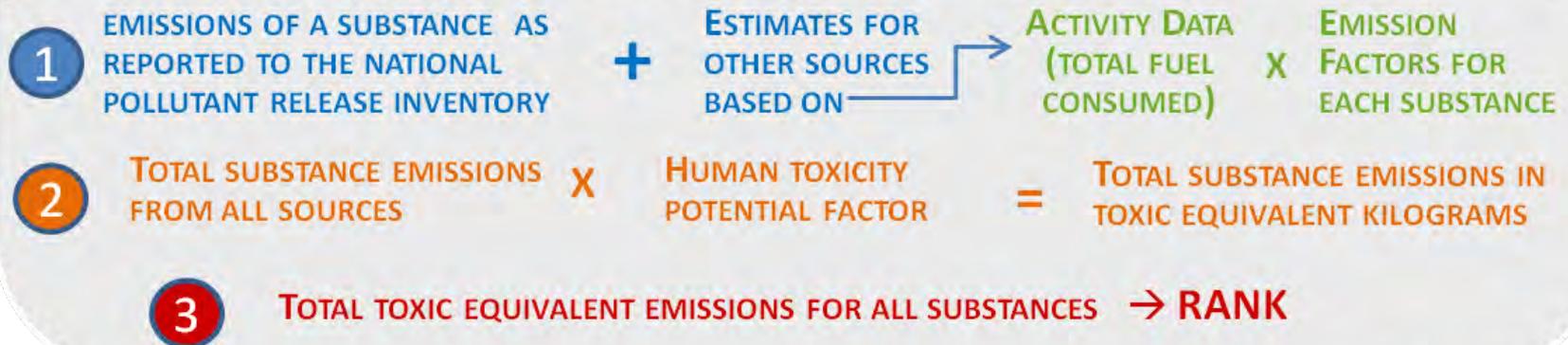
MAJOR CITIES



ABORIGINAL COMMUNITIES



RANKS ARE BASED ON THE TOTAL EMISSIONS REPORTED BY LARGE INDUSTRIES, AND OUR OWN ESTIMATES FOR RESIDENTIAL OIL, GAS AND WOOD HEATING, PASSENGER CARS AND HEAVY DUTY VEHICLES, TRAINS, AIRPLANES TAKING OFF AND LANDING, AND HAZARDOUS WASTE INCINERATORS.

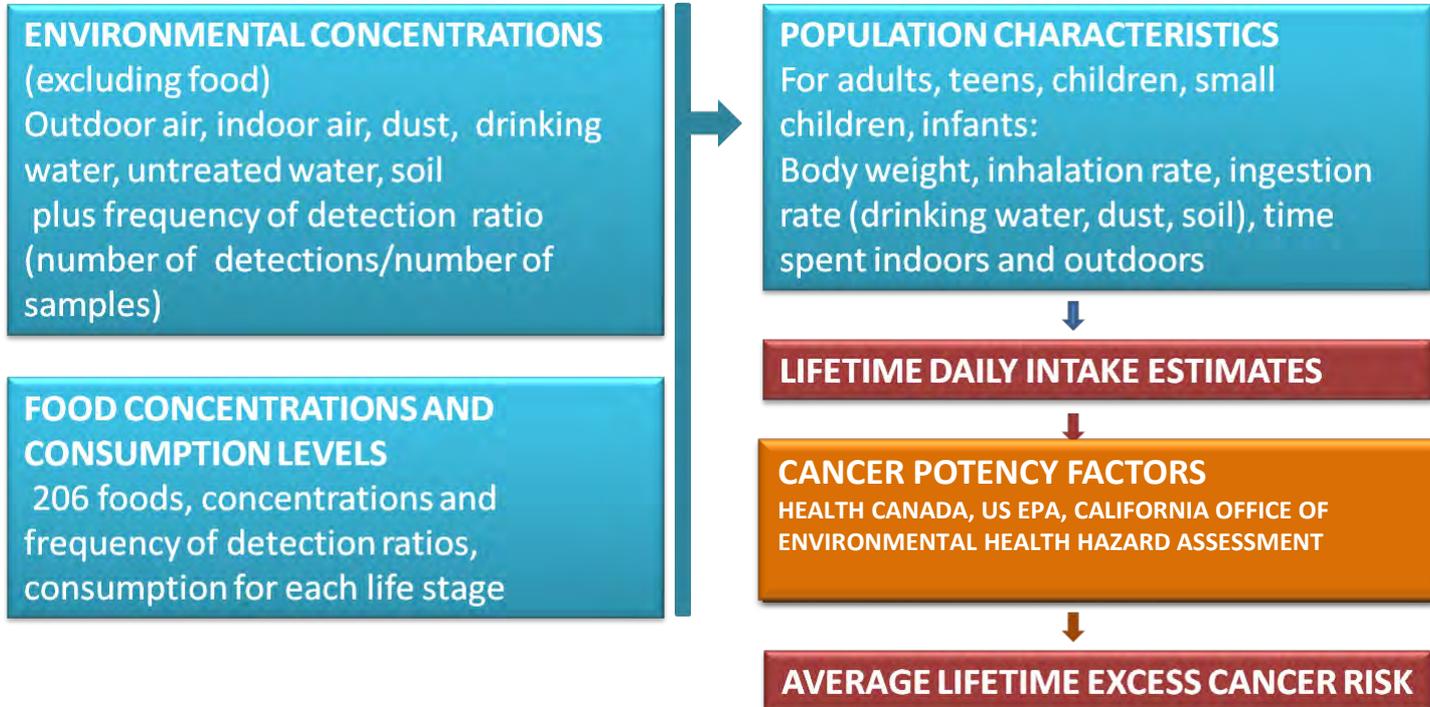


SCROLL DOWN FOR A BRIEF OVERVIEW OF THE RANKING METHODS

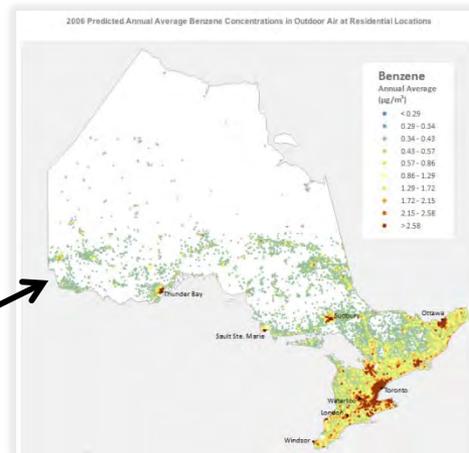
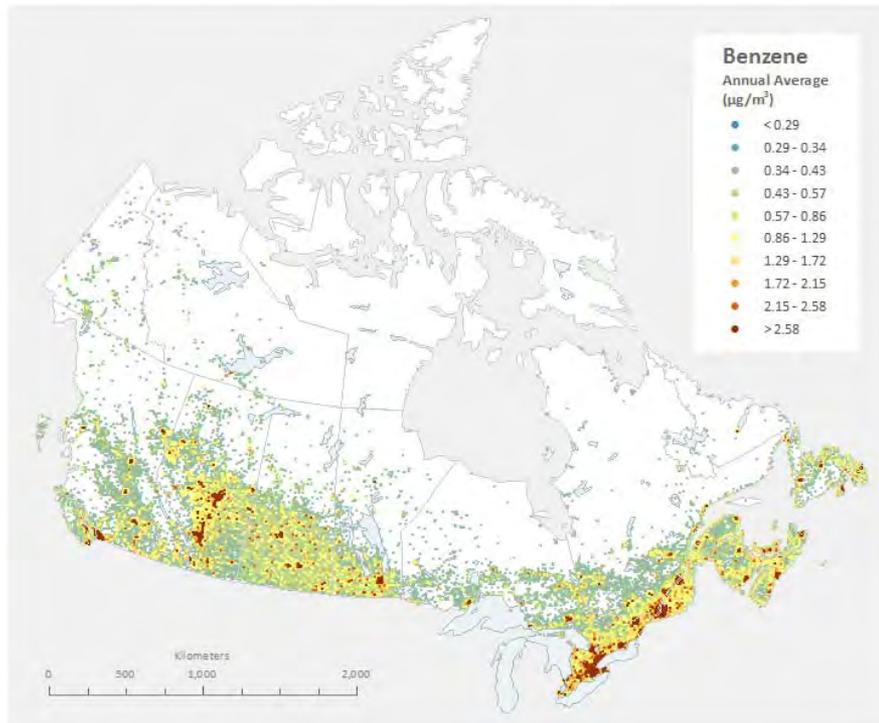
DOWNLOAD THE METHODS REPORT FOR FULL DETAILS



CAREX eRisk – Inputs example



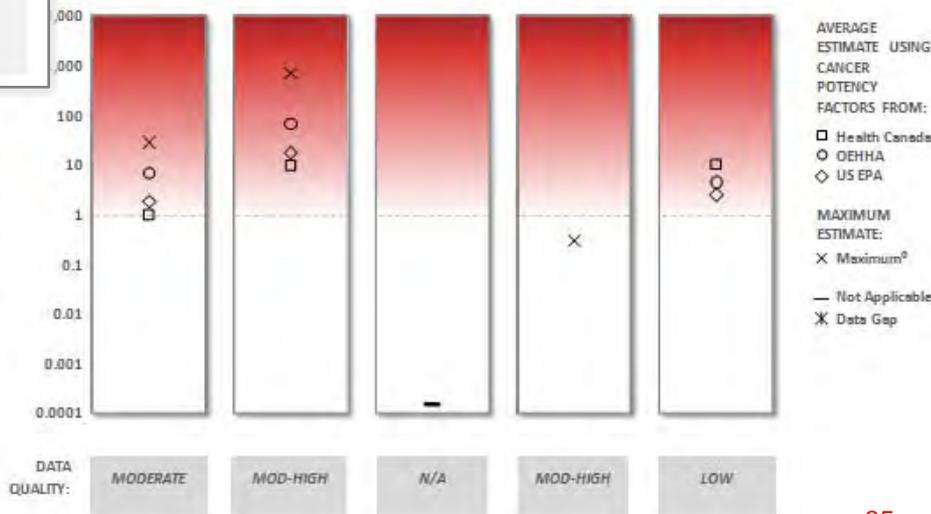
2006 Predicted Annual Average Benzene Concentrations in Outdoor Air at Residential Locations



CAREX eRisk – National estimate - benzene

Benzene

POTENTIAL LIFETIME EXCESS CANCER per million people



^o (highest intake x highest cancer potency factor)

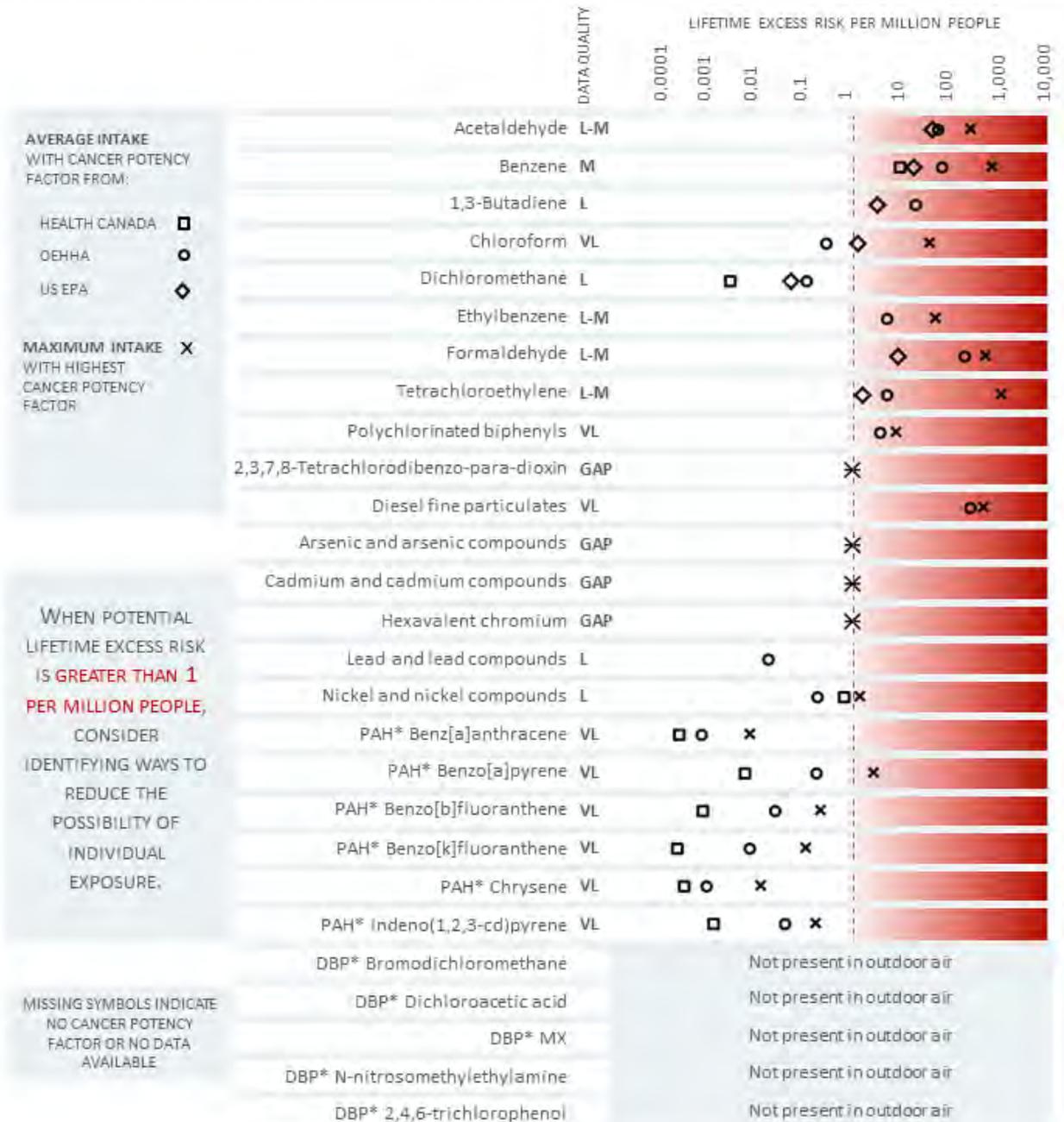
Indoor Air

Data:

Published literature and government reports

Regional Variation:

Expect variation among homes, but not regionally



Emissions Mapping Project

Watershed rank demo

LEGEND

WATERSHEDS

- Highest
- Least
- Not Ranked

SOURCES

Substance: Acetaldehyde

Source	Annual Amount (kg)	# Watersheds with Substance
Roads	58304.973	529
Residential Wood Burning	4738.781	490
Residential Oil and Gas	Not Expected	529
Rail	32.033	482
Industrial Emitters	< 0.0005	489
Source Not Present	1969.774	482
	62455	530
See info	NR	+
See info	14th	100

Watershed ID: 02C04
Vermilion (Dn.)
Reported Population: 143923
Printable Summary Report

This Watershed's Ranking

Highest Total Toxicity Lowest

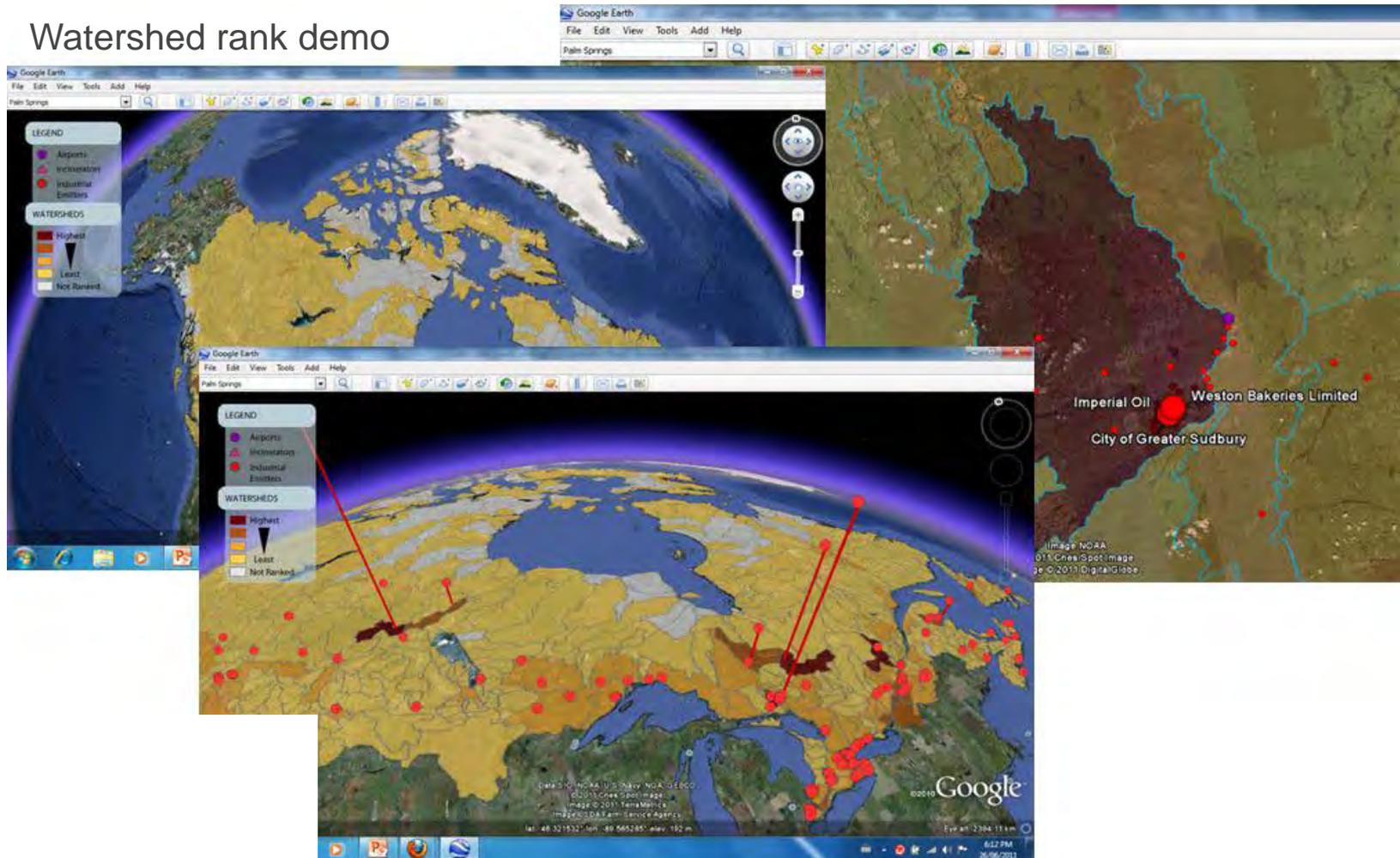
CAREX EMISSIONS PROJECT

These rankings are based on emissions reported to the National Pollutant Release Inventory in 2006 and our best estimates of emissions from motor vehicles, trains, airplanes taking off and landing, hazardous waste incinerators, and residential heating (oil, gas, and wood). Other sources of these known or suspected carcinogens may exist, and other pollutants not listed here may be emitted from these sources.

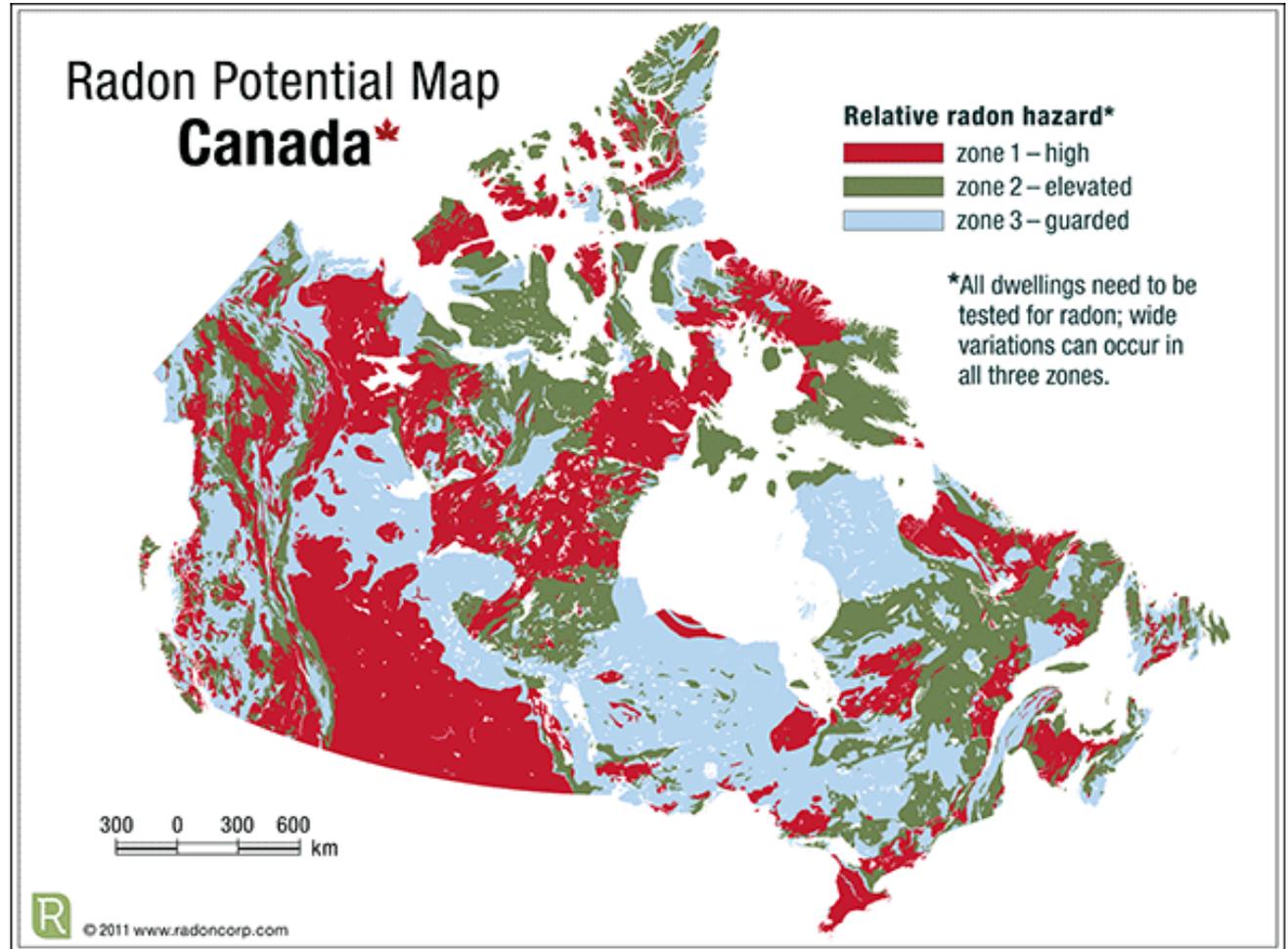
Substance	ANNUAL AMOUNT (kg)	TOXICITY FACTOR	TOXIC EQUIVALENT (kg)	SUBSTANCE RANK	# WATERSHEDS WITH SUBSTANCE
Acetaldehyde	65045	0.02	1105	17th	529
Arsenic	25187	2000	8546781	2nd	490
Benzene	481928	1	481928	124th	529
Benz[a]anthracene	1	54	54	272nd	482
Benz[a]pyrene	1	6400	6400	271st	489
Benz[b]fluoranthene	3	130	390	268th	482
Benz[e]fluoranthene	< 0.5	NO TOX	No TOX	269th	482
Butadiene	48820	0.54	26383	125th	529
Cadmium	3231	25	80765	5th	530
Chlorobenzene	See info	3.8	See info	NR	1
Chrysene	203	135	See info	140th	105
Crysotile	3	5.4	16	260th	482
Dibenz[a,h]anthracene	See info	9.2	See info	NR	17
Ethylbenzene	102235	NO TOX	No TOX	126th	512
Formaldehyde	123347	3.02	2354	138th	529
Hexachlorobenzene	20	133	2654	75th	529
Substance Not Listed	1	100	100	273rd	482

Emissions Mapping Project

Watershed rank demo



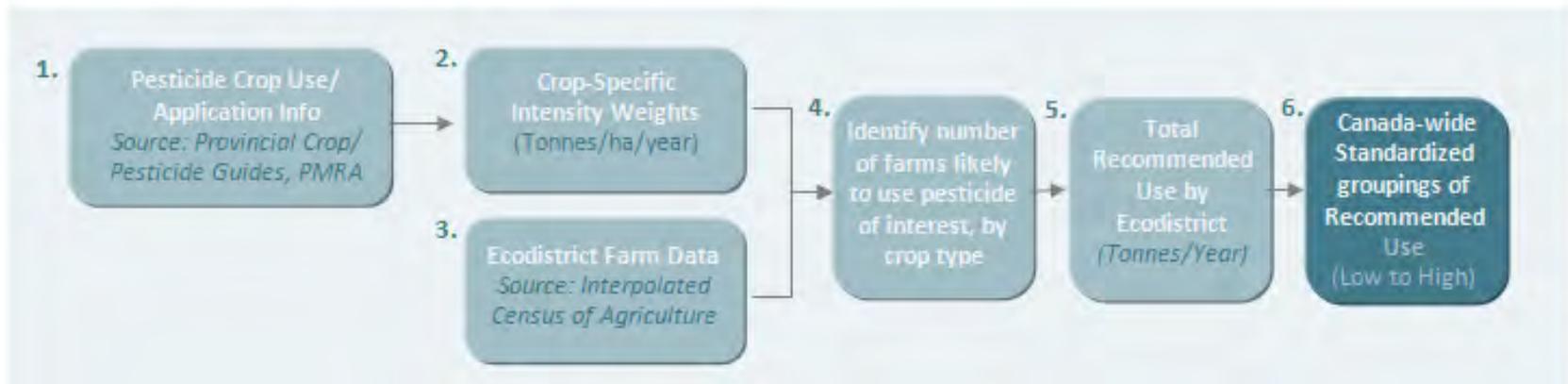
Radon: unique approach



Pesticides

Method

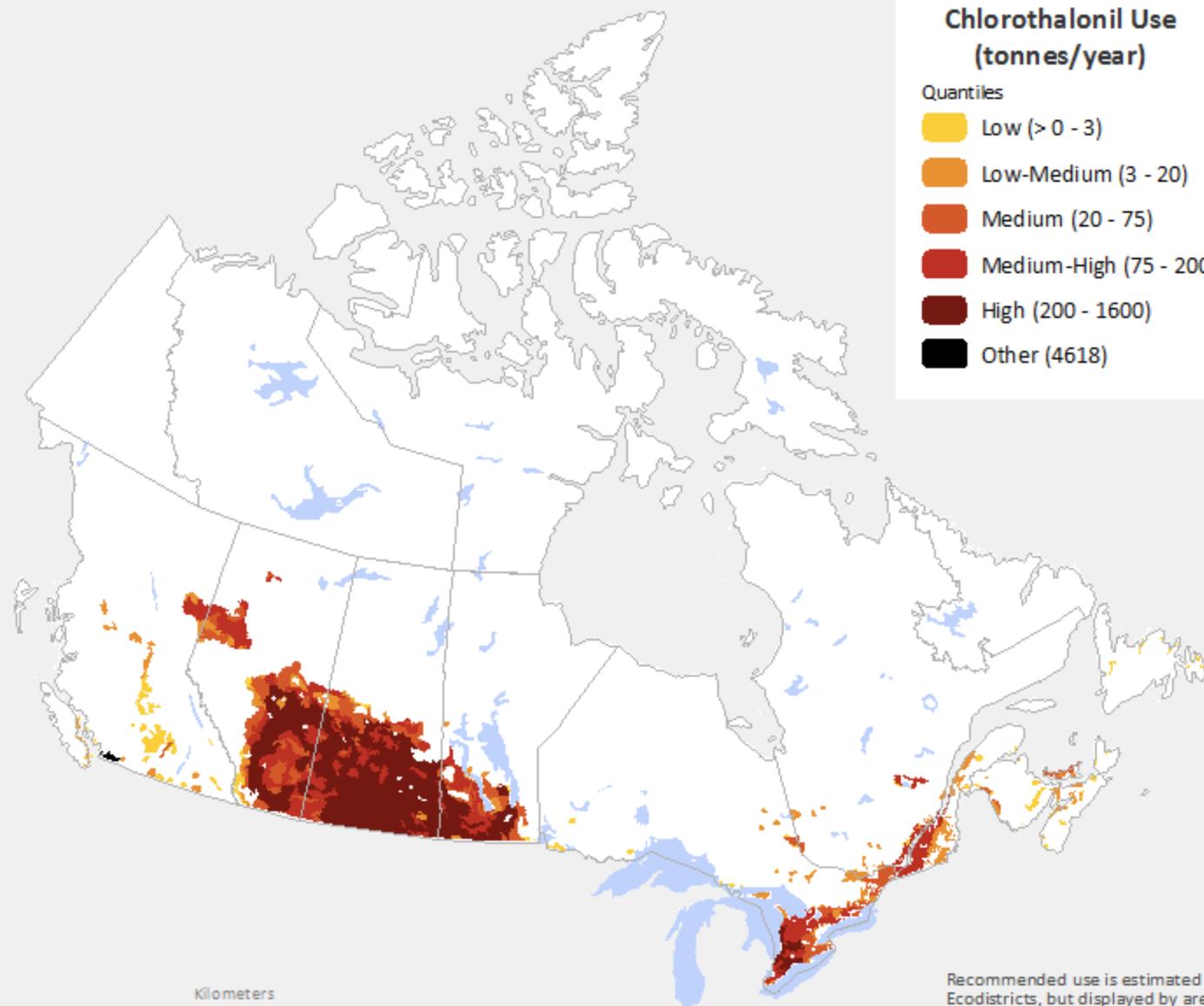
Recommended Annual Agricultural Use Estimates



Recommended Chlorothalonil Use (tonnes/year)

Quantiles

- Low (> 0 - 3)
- Low-Medium (3 - 20)
- Medium (20 - 75)
- Medium-High (75 - 200)
- High (200 - 1600)
- Other (4618)



Kilometers
0 500 1,000 2,000

Recommended use is estimated for Ecodistricts, but displayed by areas where agriculture is most likely to occur within each region. Please see provincial maps for greater detail.

Recommended Chlorothalonil Use (tonnes/year)

Quantiles



 Ecodistrict

Recommended use is estimated for Ecodistricts, but displayed by areas where agriculture is most likely to occur within each region.

*Ecodistricts of chlorothalonil-use with no estimate of location.

