

AIR QUALITY PROGRESS REPORT 2013

Presentation to Board of Health

Dr. Denis Corr
Clean Air Hamilton
July 10, 2014



Evolution of Air Quality Roles

Major Source Control

Point Sources



Vehicles



Detailed Local information

Municipal Health Impacts



Local/Neighbourhood monitoring



Outreach and Education



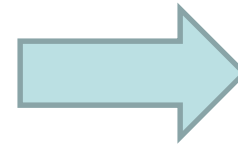
Personal Actions/Responsibility

Control of Emissions and Exposures

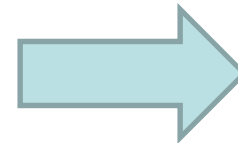


Evolution of Clean Air Hamilton

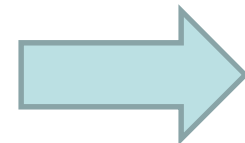
Hamilton Air Quality Initiative



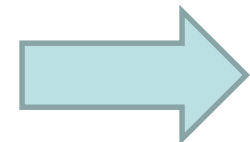
Clean Air Hamilton



Climate Change



Air Quality Task Force



Canada Wide Approach

(Canadian Council of Ministers of the Environment)

Strong similarities to HAQI/Clean Air Hamilton

Air Quality Management System

AQMS

Canada Wide Approach

Mobile Sources

- Advanced transportation technologies
- Vehicle maintenance
- In-use diesel vehicles and engines
- Greening fleets

Canadian Ambient Air Quality Standards (CAAQS)

- CAAQS for PM2.5 and Ozone
- CAAQS for SO2 and NO2
- Stakeholder engagement

Air Zone Management

- Delineation case studies from AB, SK and NS

Base-Level Industrial Emission Requirements (BLIERs)

- Proposed Multi-Sector Air Pollutants Regulations
- Regulations and Codes of Practice
- Process and timelines for comments

Clean Air Hamilton

- Clean Air Hamilton was established as an implementation committee to act on recommendations contained in 1997 HAQI Reports.
- Community-based initiatives are directed at:
 - § Researching air quality and health issues related to air quality.
 - § Developing policies aimed at improving air quality in Hamilton.
 - § Encouraging emission reductions through adoption of best practices.
 - § Educating the public on air quality issues, ways to improve air quality and reduce personal exposures.
- Internationally recognized:
 - § 1500 website hits/week
 - § Inquiries are received regularly from organizations and individuals in Ontario, Canada, the U.S. and from around the world (“gold standard”).

Clean Air Hamilton

- Stakeholders come from across the community:
 - § Citizens of Hamilton,
 - § Ontario MOE, Health Canada, Environment Canada
 - § ArcelorMittal Dofasco, US Steel Canada, Horizon Utilities
 - § Green Venture, McMaster University, Mohawk College, Environment Hamilton
 - § City Staff (Health, Planning & Public Works)
 - § Hamilton Industrial Environmental Assn., Rotek Environmental.

Why is it important?

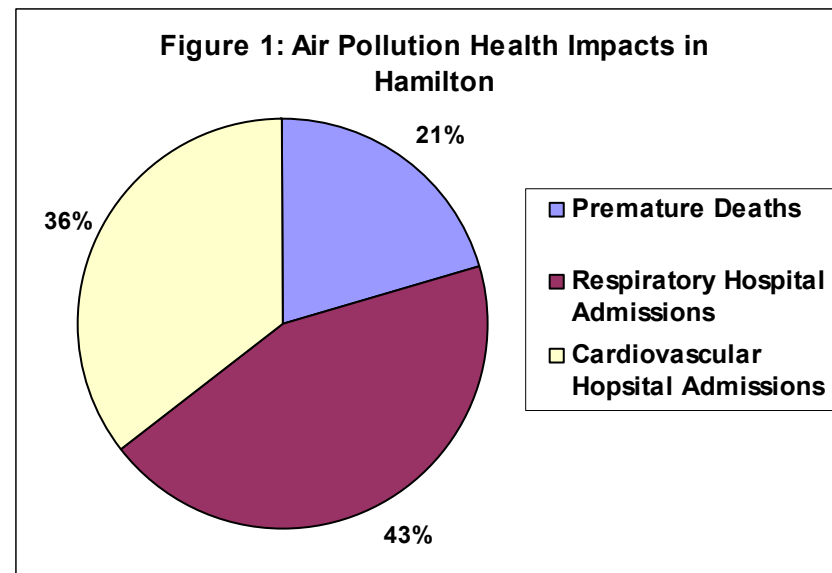
Health Impacts

Hamilton Air Quality and Public Health

SENES Health Assessment Report, 2011

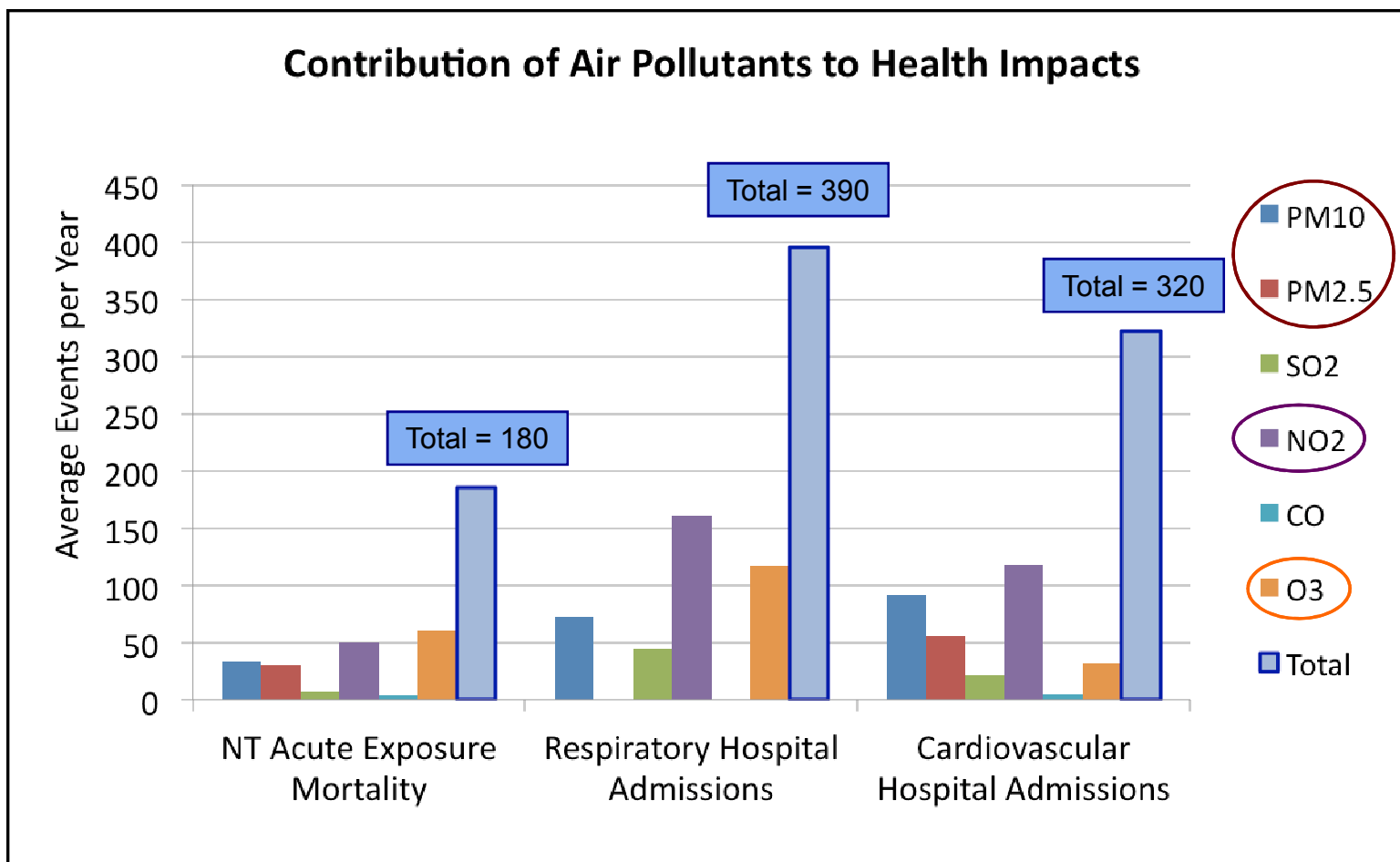
5 Key Air Pollutants have the following health effects outcomes in Hamilton **each year**:

- > 180 premature deaths
- > 710 respiratory and cardiovascular hospital admissions
- Most current review of scientific literature on air quality and public health.
- Primary focus remains as reduction of human exposures to:
 1. Particulate Material (PM_{10} and $PM_{2.5}$)
 2. Nitrogen Oxides (NO_x)
 3. Ground Level Ozone (O_3)



Hamilton Air Quality and Public Health

SENES Health Assessment Report, 2011



Most health impacts are due to **PM**, **NO₂** and **ozone**

Pyramid of Health Effects

Severity of health Impact

Premature Death

Cardiac/Resp

Hospitalizations

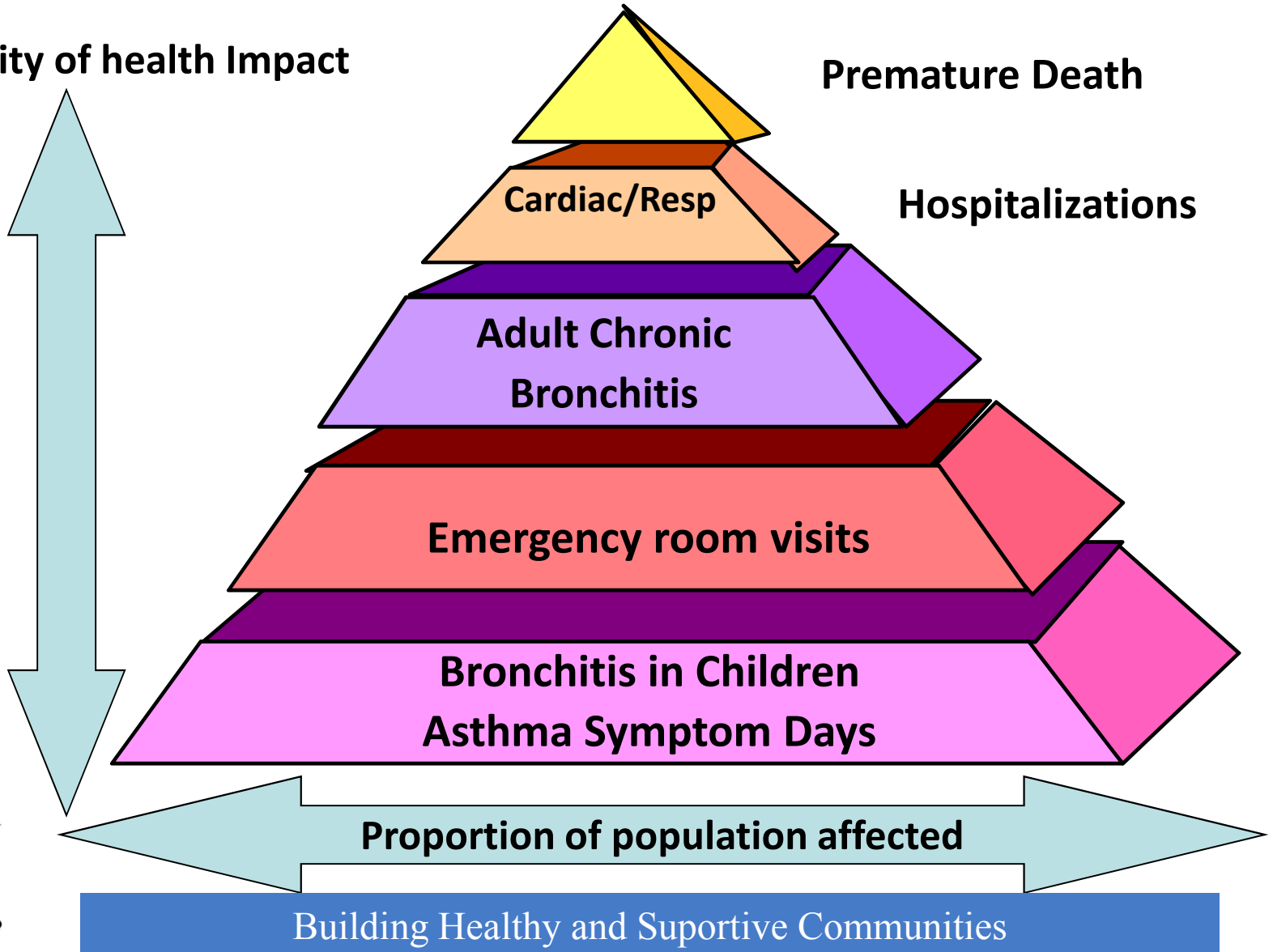
Adult Chronic
Bronchitis

Emergency room visits

Bronchitis in Children
Asthma Symptom Days

Proportion of population affected

Building Healthy and Supportive Communities



Where do these risk numbers
come from?

1952

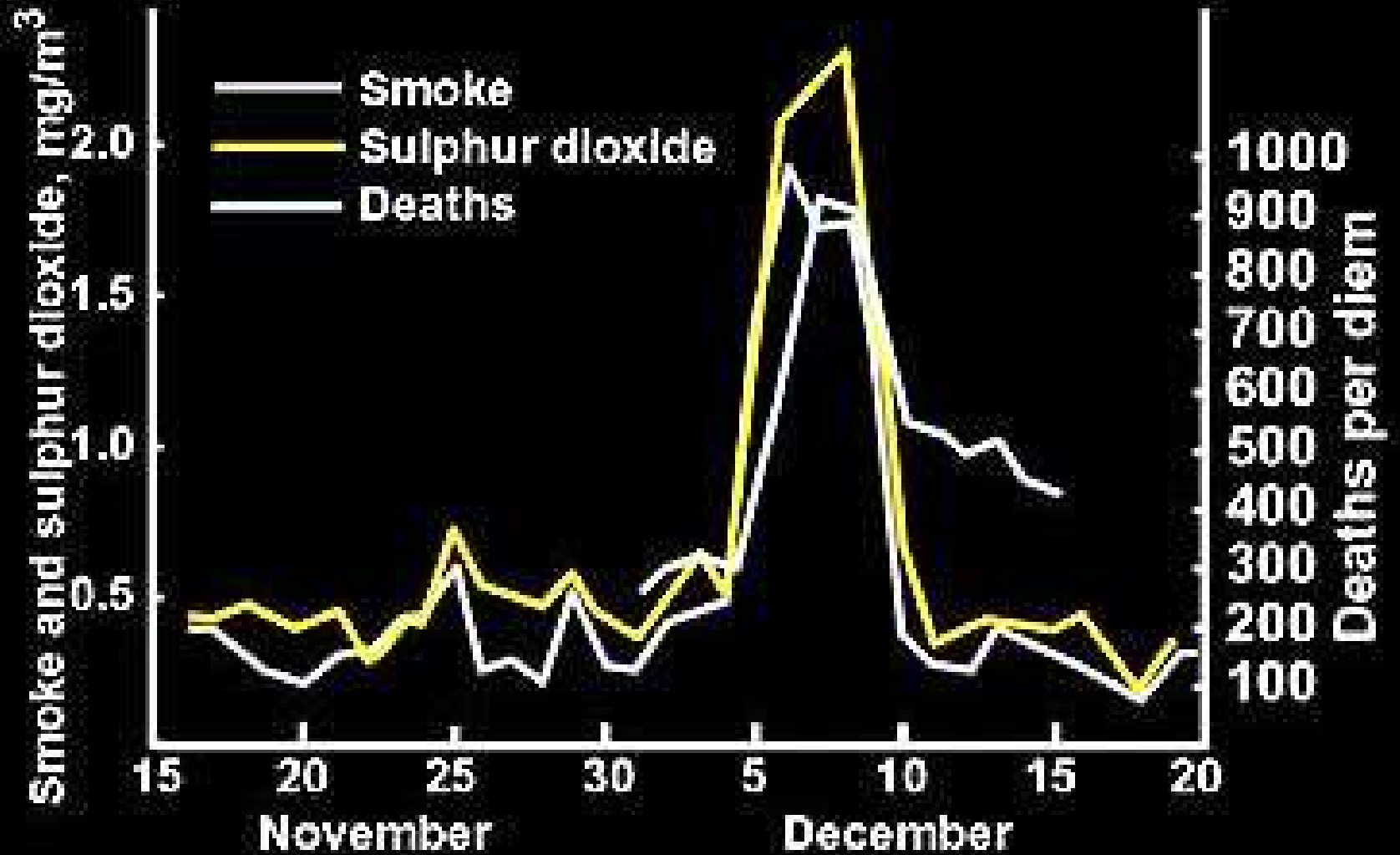
Great Fog, London , England

11,000 deaths



Epidemiology

Greater London, 1952



Deaths from Air Pollution Each Year

Over the past 60 years, epidemiological research has demonstrated adverse health effects from short-term (i.e., day-to-day) fluctuations in ambient levels of air pollution.

In addition, repeated exposures to ambient air pollution over a prolonged period of time (i.e., years) have been shown to increase the risk among healthy individuals of developing and dying from cardiovascular disease, respiratory disease, and lung cancer. (Public Health Ontario)

Health Effects/Mortality PM2.5

Exposure to PM2.5 over a **few hours to weeks** can trigger cardiovascular disease–related mortality and nonfatal events;

Longer-term exposure (eg, a few years) increases the risk for cardiovascular mortality to an **even greater extent**

Greater risk may include **the elderly, patients with preexisting coronary artery disease, and perhaps those with diabetes**. Recent data suggest that women and obese individuals might also be at higher risk.

Brook et al, Circulation 2010, 121:2331-2378:

80% of mortality is in over 65 year old group
Ontario Medical association 2008

Cost/Benefit Analyses

Environment Canada Multisectoral Air Pollutants Regulations - Net health and environmental benefits will be 15 to 34 times greater than the costs of implementing these new regulations.

Environment Canada 2014

For every \$ of govt funds to reduce air pollution exposures, approx \$50 to \$150 is saved in the health care system

Corr Research 2012

Air Monitoring

Monitoring Air Quality

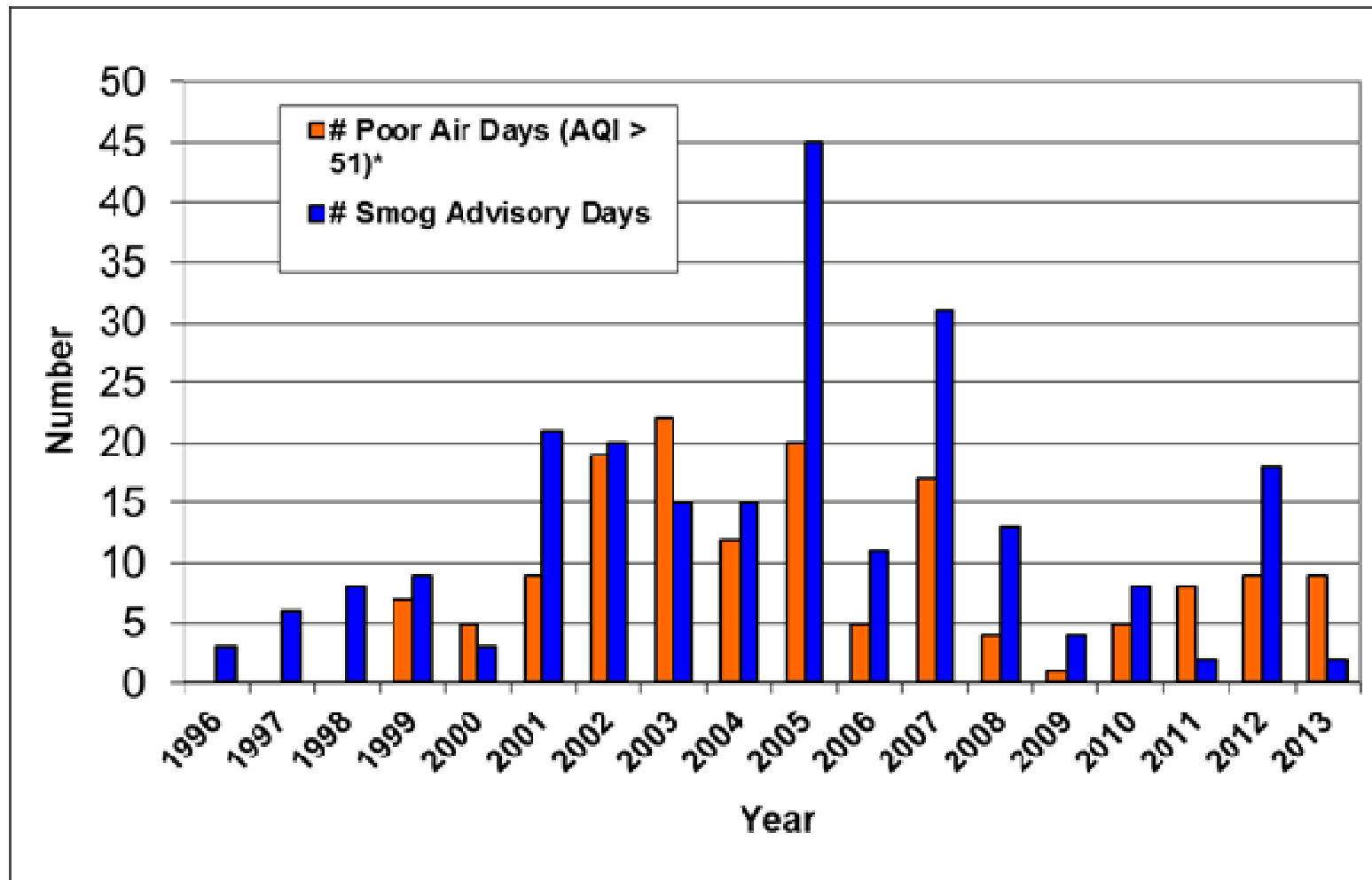
- **Air Monitors** collect outdoor air quality data.
 - Data used to compare levels of air pollutants to standards.
 - Data can be used to identify sources of air pollutants, and
 - Data can be used to evaluate the potential impacts of air emissions on human health.
- **Fixed monitor networks:** two permanent networks in Hamilton.
 1. Ontario Ministry of the Environment's network of three Air Quality Index (AQI) stations (downtown, west end, mountain).
 2. Hamilton Air Monitoring Network (HAMN) of 17 stations in the east end industrial core primarily.
 3. (Temporary) Public Health Services East End AQHI, Sam Manson Park
- **Mobile air monitoring:** uses a van outfitted with air monitors.
 - Can make measurements anywhere in City and can monitor while moving along roads.
 - Can measure what citizens are actually breathing in their locality.
 - Can identify local sources of air emissions.
 - Can be used to make comparisons between neighbourhoods, along streets/highways and at locations with suspected emissions.

Air Quality Trends

Annual percentage decreases over time are significant
(1996 to 2013 MOE downtown air monitoring site)

- § Total suspended particulate (TSP) levels, down 55%;
 - § Inhalable particulate matter (PM10), down 32%;
 - § Respirable particulate matter (PM2.5), down 32%;
 - § Nitrogen dioxide (NO₂), down 47%;
 - § Sulphur dioxide (SO₂), down 38%;
 - § Total reduced sulphur odours, down 99%;
 - § Benzene, down 78%;
 - § Polycyclic aromatic hydrocarbon (PAH, measured as benzo[a]pyrene), down 87%; and
- § Deaths due to air pollution decreased from 229 in 2003 to 186 in 2012; a 19% improvement (uncorrected for population increase)

Poor Air Days and Smog Advisory Days

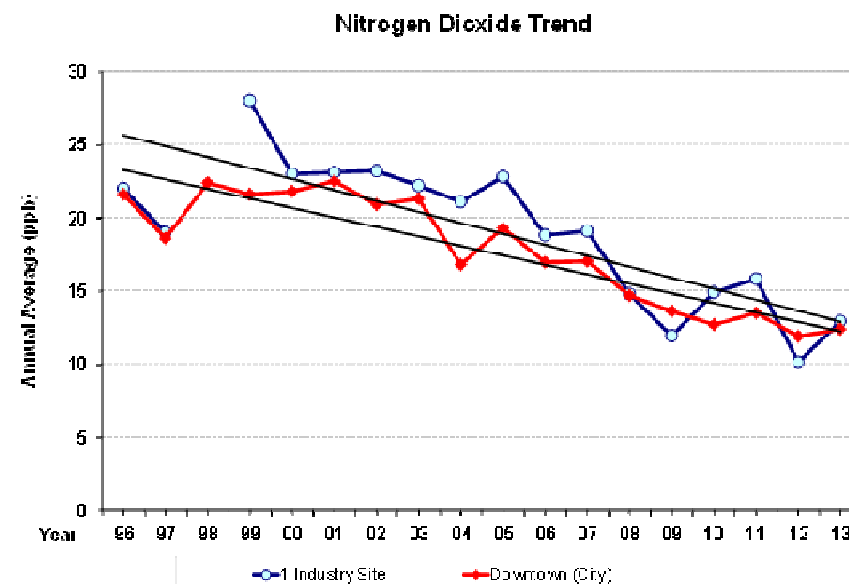
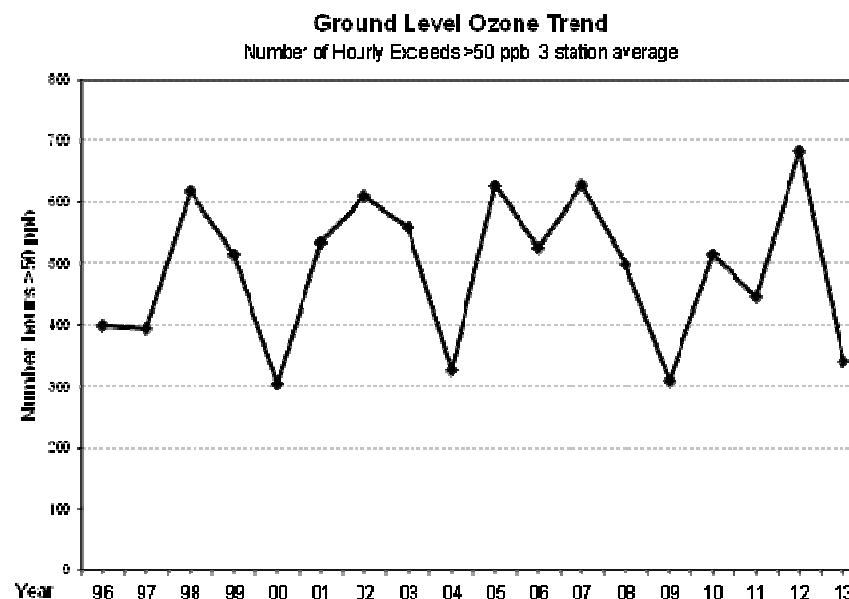
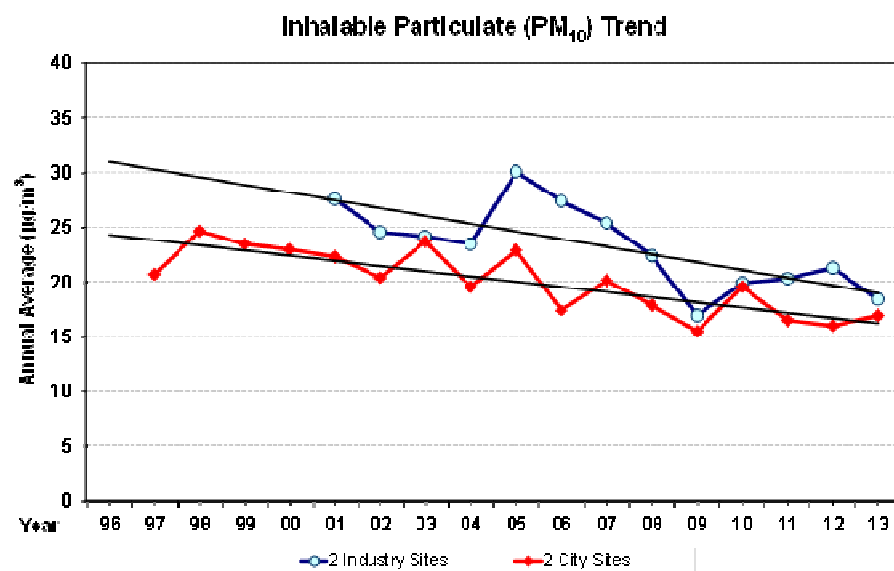


* Data from Downtown Hamilton Air Monitoring Station

Air Quality Trends:

Steady Decreases in Major Air Pollutants over Past Decade

(except ground level ozone)

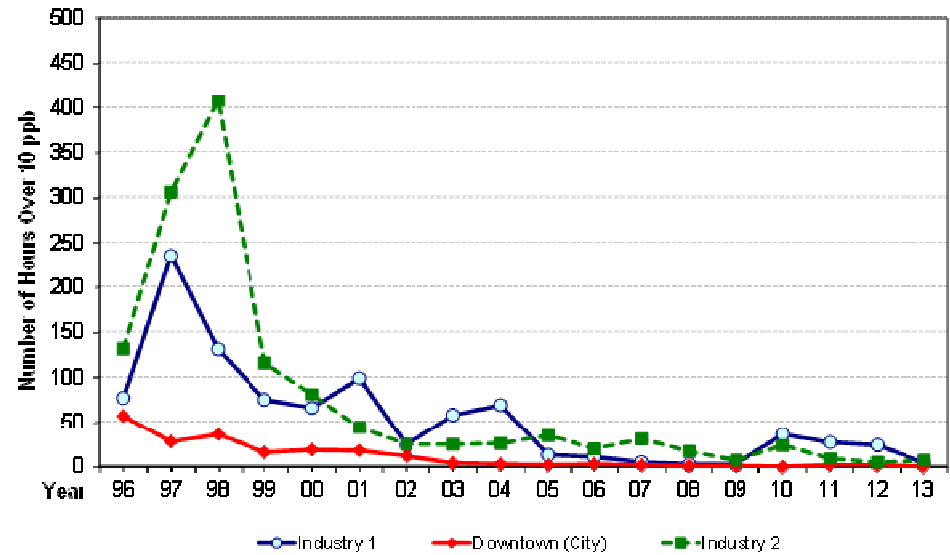


Air Quality Trends:

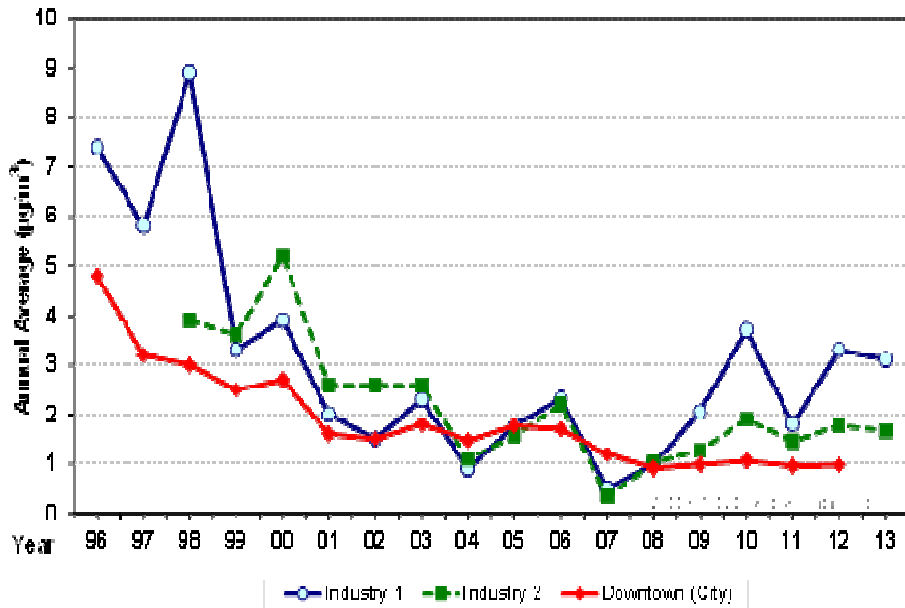
Total Reduced Sulphur, Benzene and Benzo[a]pyrene

Comparisons of 'Downtown' site and 'Industry' sites

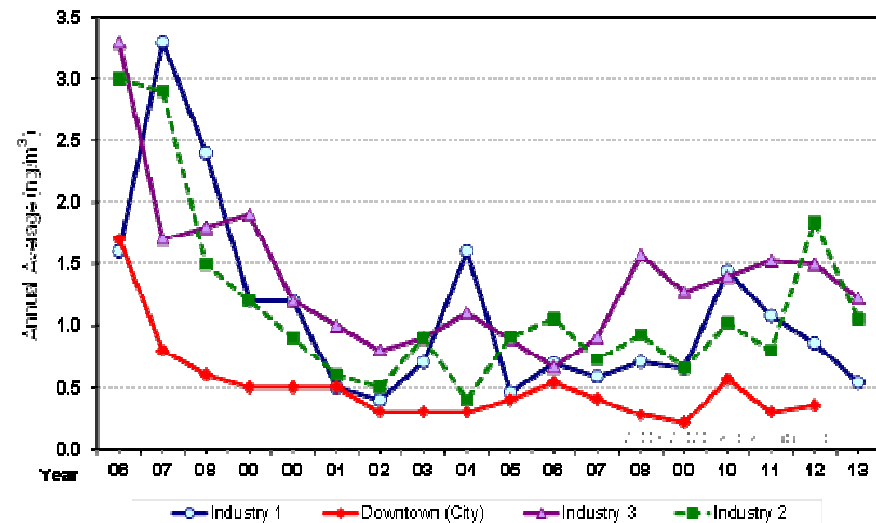
Total Reduced Sulphur Trend
Hours Over 10 ppb Odour Threshold



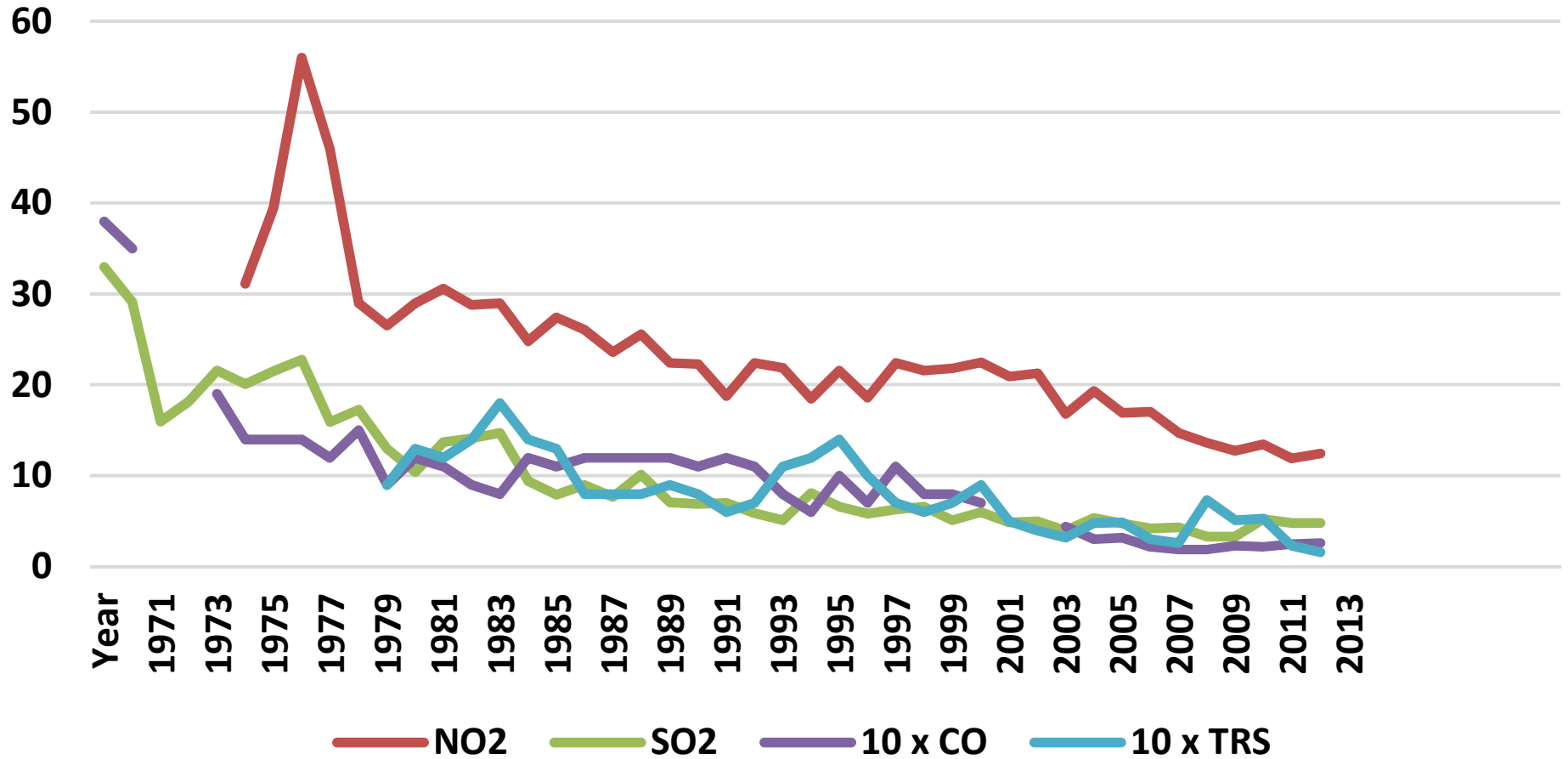
Benzene Trend



Benzo(a)pyrene Trend



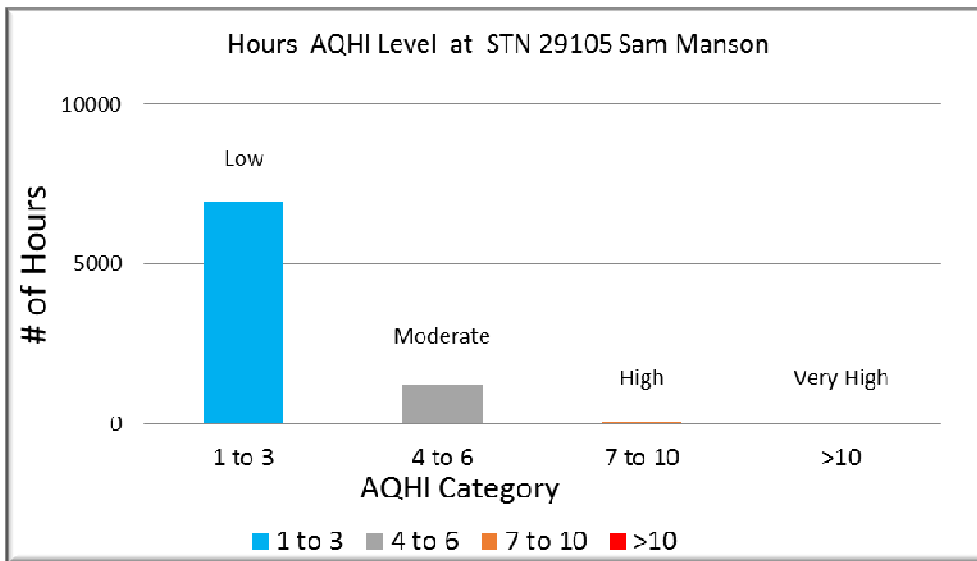
Long Term Trends 1970 - 2013



Enhanced Monitoring

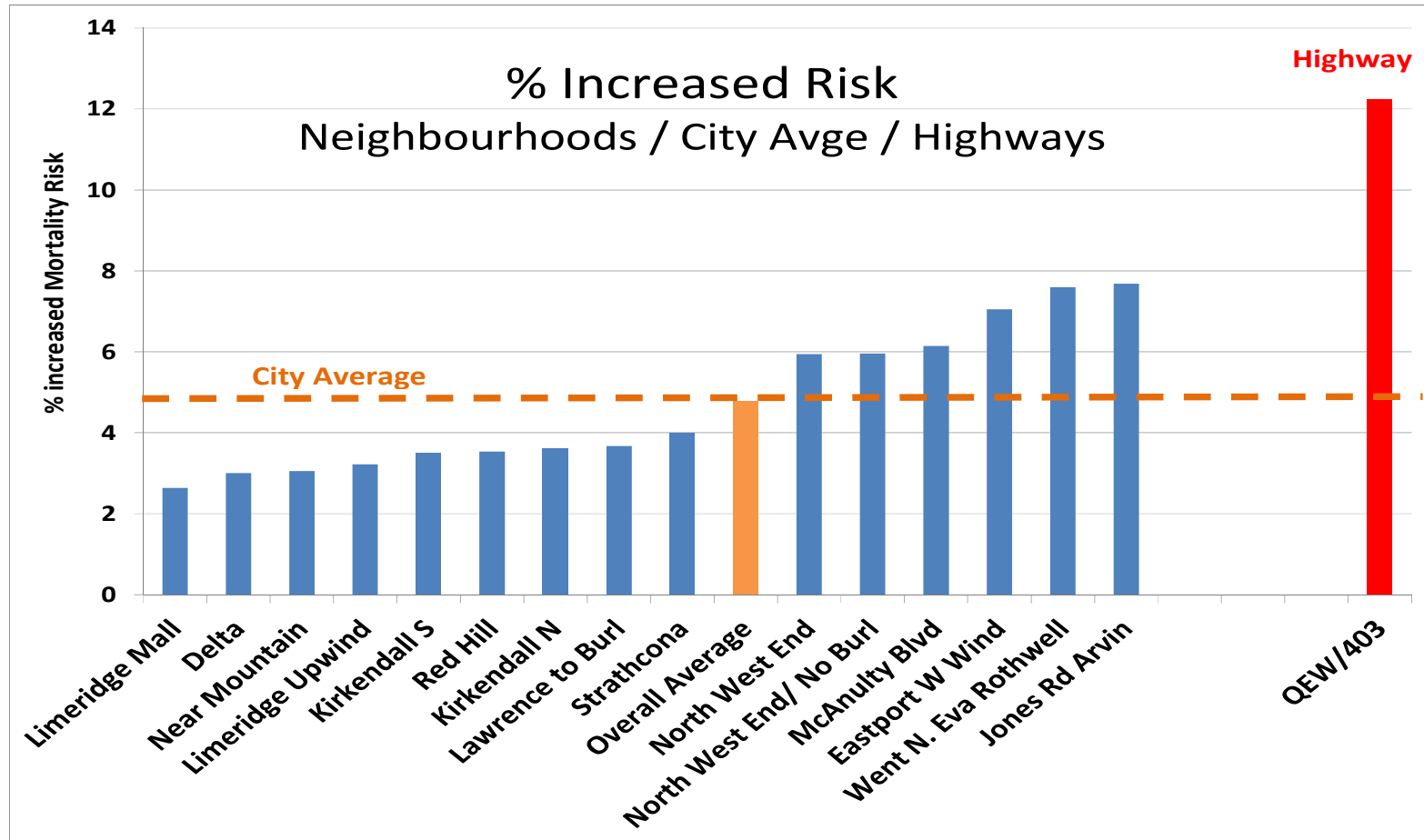
East End Air Monitor

- Pilot at Sam Manson Park
- Looking at air pollutants and AQHI.
- AQHI values were low.
- Comparisons with the three MOE stations in the City determined that the Hamilton East/Sam Manson site had the lowest PM2.5 and SO2 concentrations.



Mobile Air Monitoring: Neighbourhoods Study

Air quality measurements were performed in 15 neighbourhoods and along QEW and Hwy. 403; 26 neighbourhoods requested measurements.








Mobile air monitoring data was converted into % increased risk of mortality using SENES report values.

Outreach and Education

AQI (Air Quality Index) vs. AQHI (Air Quality Health Index)

The **AQI** is an air pollution scale developed by the Ontario MOE while the **AQHI** is a health-driven metric developed by Health Canada.

AQI Scale:
based on highest single air parameter.

Air Quality Index (AQI) Categories		
AQI Ranges and Categories		Colour
0-15 Very Good		
16-31 Good		
32-49 Moderate		
50-99 Poor		
100+ Very Poor		

Air pollution impacts increase uniformly, not in 'steps'.

AQHI conveys continuous nature of impacts better than AQI.

AQHI Scale:
based on three air parameters.



AQHI - Air Quality Health Index

- In 2011, Public Health Services and Clean Air Hamilton worked with the Government of Canada to bring the daily AQHI to Hamilton.
- Health messages are directed at two distinct populations – the “at risk” population and the “general” population.
- Since 2011, PHS has worked with both the public and at-risk populations in Hamilton to provide AQHI education and promotion.
- In 2013, AQHI outreach focused on the “at risk” population with pre-existing respiratory conditions.
- PHS worked with health professionals in the City of Hamilton including those at the Firestone Clinic, North Hamilton Community Health Centre and Hamilton Family Health to promote AQI awareness and up-take among at-risk patients.

Mobile Air Monitoring Fresh Air Kids

Van outfitted with a range
of real-time monitors for:

CO
NO
NO₂
PM₁₀, PM_{2.5}, PM₁
SO₂

A GPS system



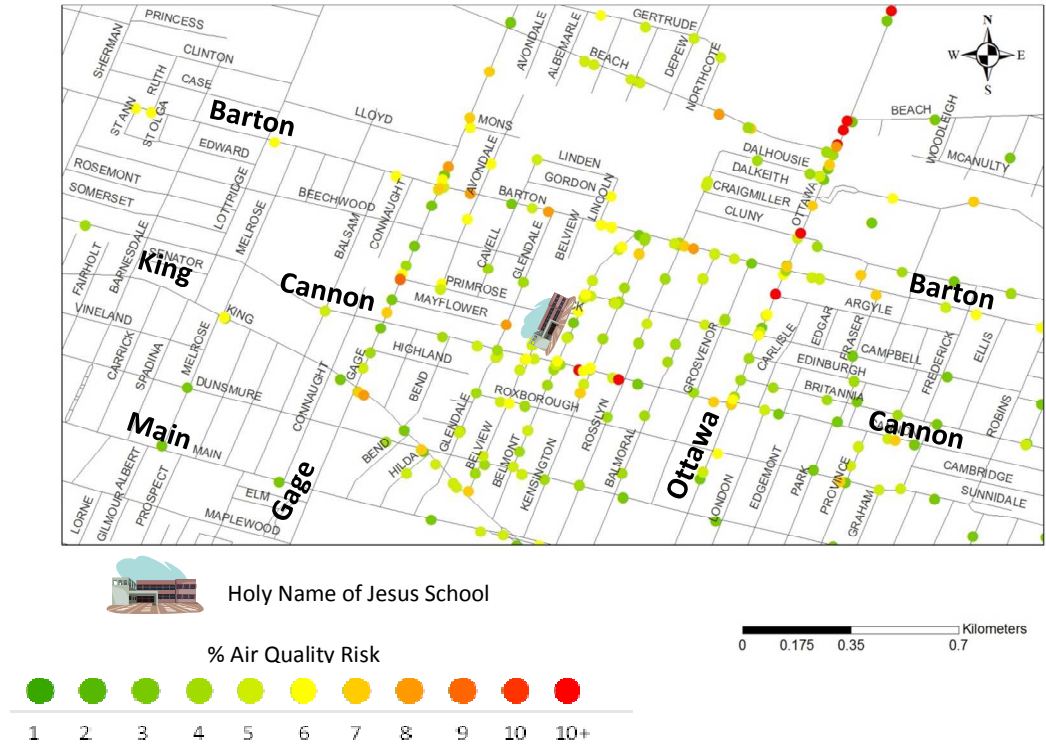
Neighbourhood of Holy Name of Jesus School, Hamilton



0 0.175 0.35 0.7 Kilometers

Best Air Quality Ways To Get To Holy Name of Jesus School

Air Pollution Measurements, Neighbourhood of Holy Name of Jesus School, Hamilton



You will need two different coloured pens.

What is the better way to go to school from your home to breathe better air with lower AQHI values? Draw on the map using one colour.

What is the not so good way to go to school from your home to breathe better air with lower AQHI values? Draw on the map using the other colour.

Label the colours, the one which is better and the one which is not so good.

What can you do to help make the air quality better?

What can you do to breathe less air pollution?

Totally Transit - School Kids and Older Adults

60 schools, 2,400 students since
2007, 70 older adults (2013).

Air Quality Task Force

Air Quality Task Force

- Request by Board of Health to look at and recommend “actions that can be taken by the City to reduce air pollution in Hamilton”.
- The AQTF responded with an Action Plan in 2013.
- 10 Recommendations in the areas of air modelling and monitoring, planning, education and outreach, green infrastructure, and updating of municipal by-laws aimed at decreasing particulate matter in the environment.
- The full AQTF Action Plan approved by the Board of Health can be found in
<http://www.cleanair.hamilton.ca/downloads/AQTF%20Action%20Plan.pdf> .
- The 10 recommendations-are expected to work synergistically to achieve air pollution reductions in the City of Hamilton.

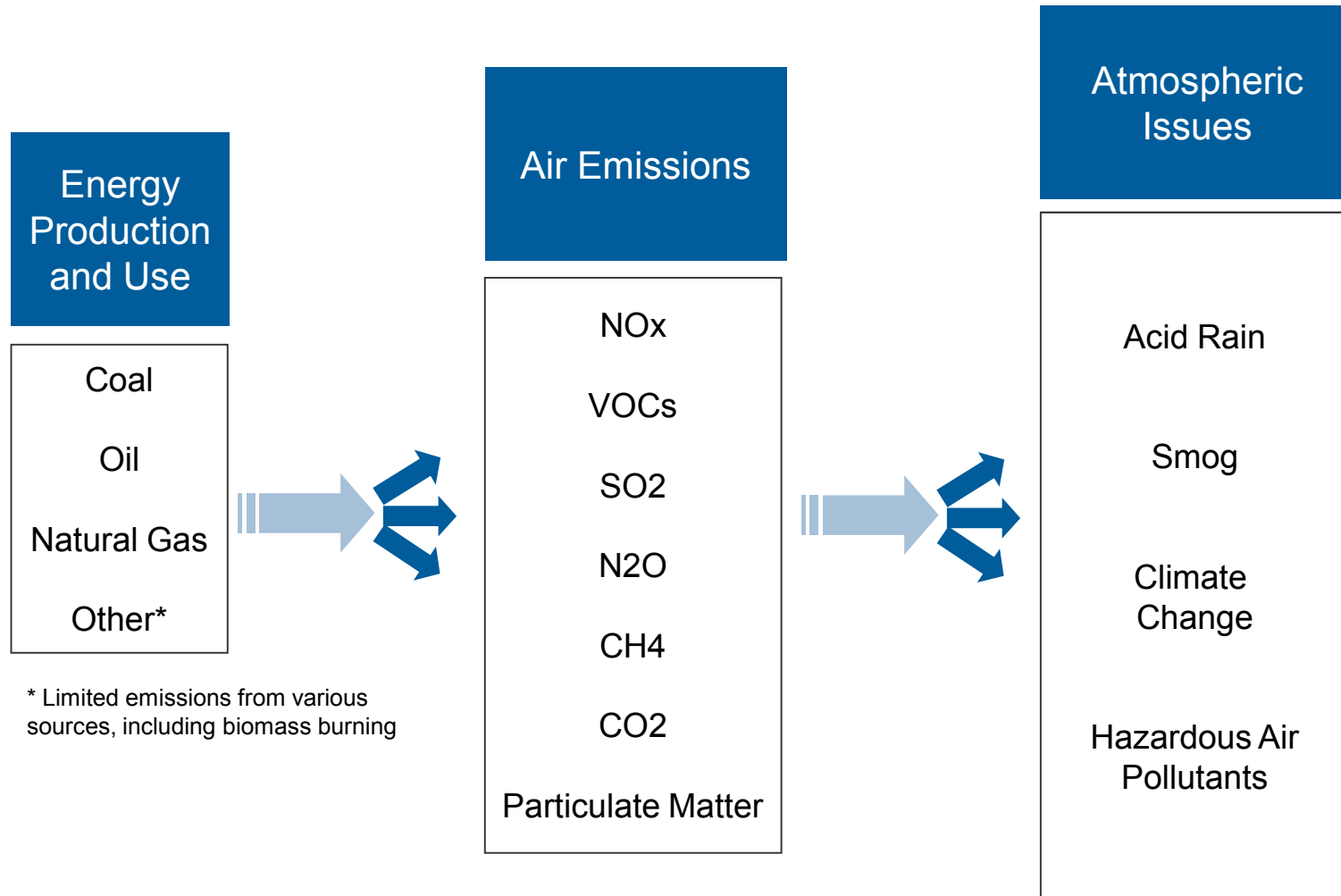
Air Quality Task Force

- Air modelling and monitoring:
 - Airshed Model
 - Strengthen Air Monitoring - Neighbourhood, Mobile, Air Monitors
- Planning, education and outreach:
 - Develop appropriate air quality land use guidelines for new and redevelopment neighbourhoods.
 - Provide individuals with tools to minimize their personal exposure.
 - Expand the Air Quality Outreach within Hamilton schools.
 - Promote programs that encourage community-based environmental monitoring.
 - Develop and conduct PM control workshops.
- Green infrastructure:
 - Promote Green Infrastructure.
- Updating of municipal by-laws:
 - Revision, updating and enforcement of existing bylaws to address PM
 - Improve street cleaning.

2013/2014 Activities

- Upwind Downwind 2014 Built Environment - Foundation for Cleaner Air
 - 166 attendees, 140 for free public talk.
- Fresh Air Kids School Monitoring
 - 3 Schools in 2013, more in 2014, partnership with MOE Best in Science program.
- Totally Transit - School Kids and Older Adults
 - 60 schools, 2,400 students since 2007, 70 older adults (2013).
- Climate Change Group
 - Support Community Climate Change Plan.
- Pedal for Pollution - Cycling Air Monitoring
 - Monitoring air along cycling routes.
- AQHI Mapping

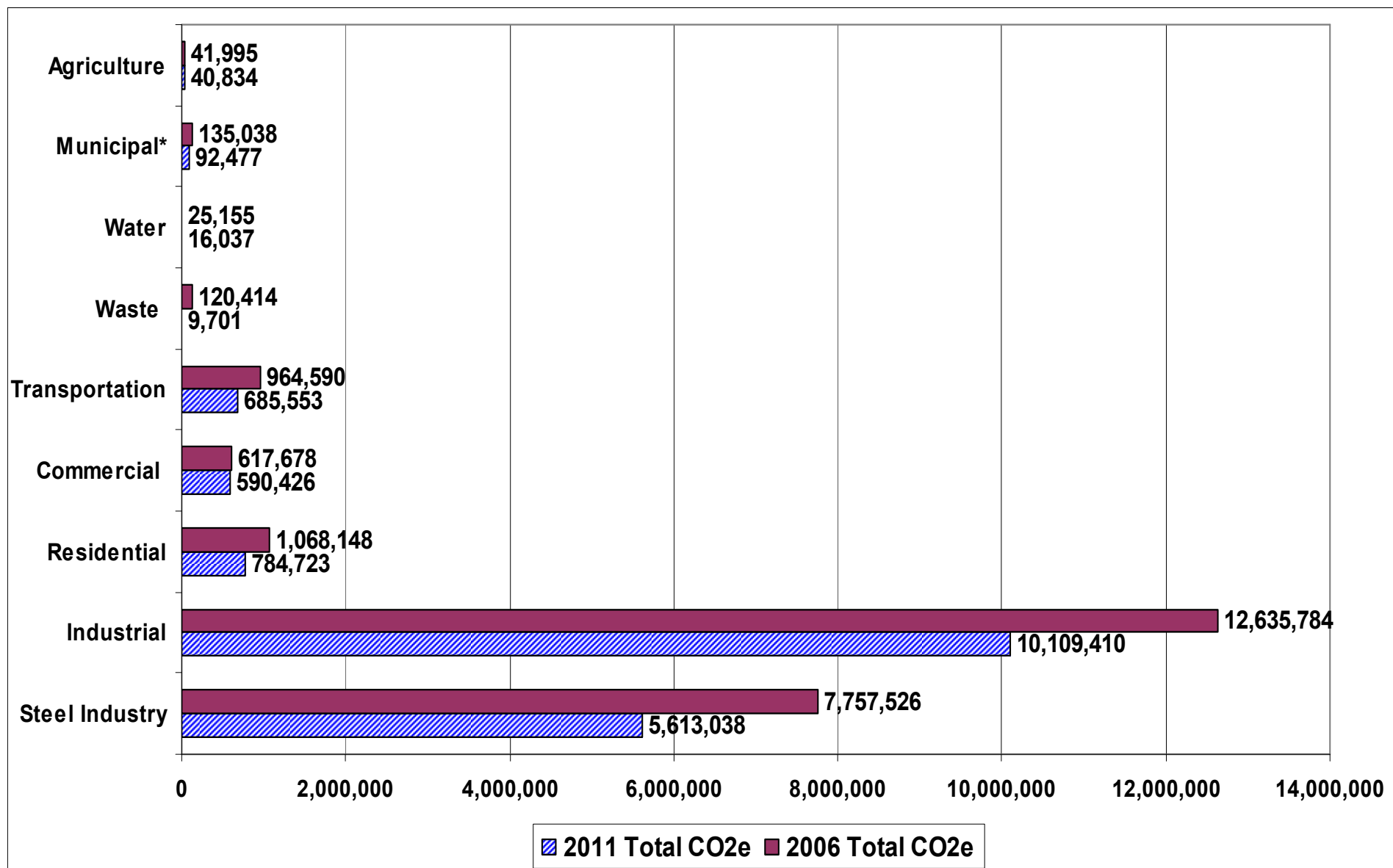
Air Quality & Climate Change



Source: Pollution Probe, 2003

Hamilton is 75 metres (245 ft) above sea level

Community GHG Emissions Changes 2006-2011

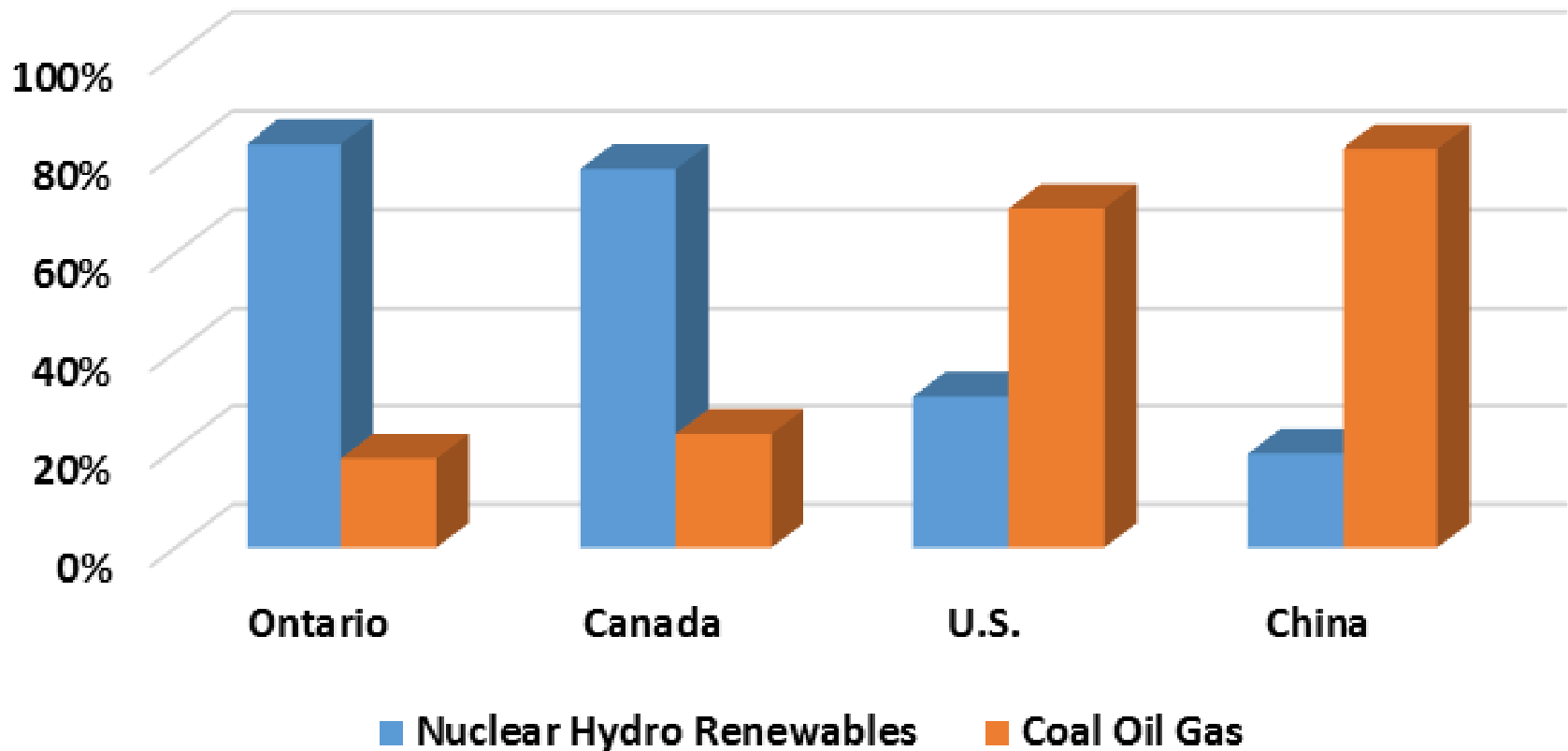


Community GHG Emissions % Changes 2006-2011

- Agriculture = - 3%
- Municipal = - 20% (City Actions alone) - 31.5% (Provincial Energy Mixture included)
- Water = - 36.5% (Methane capture, energy upgrades)
- Waste = - 92% (Methane capture)
- Transportation = - 29%
- Commercial = - 4% (Energy)
- Residential = - 26.5% (Energy Demand and switch)
- Industrial = - 20% (Energy Demand, Downturn)
- Steel (NPRI) = - 28% (Shut down)

- **Total Emission Reductions = - 23.1%**

Electricity Generation Ontario, Canada, U.S, China



Recommendations to City

- 1.Undertake the recommendations identified by the Air Quality Task Force in the areas of air modelling and monitoring, planning, education and outreach, green infrastructure, and updating of municipal by-laws aimed at decreasing particulate matter in the environment.
- 2.Work with local industries and the Ministry of the Environment and Climate Change to control both point sources and area sources of air particulate pollution, particularly road dusts, as well as reducing NOx, SO₂, benzene and B(a)P emissions, from stationary and mobile sources.
- 3.Continue to support and encourage Hamiltonians to reduce their transportation-based emissions through the use of transportation alternatives including public transit, bicycles, walking, hybrid vehicles, etc. and in supportive policies such as complete streets and transportation demand management.

Recommendations to City

4. Continue to support the expansion of air monitoring efforts to capture new emission sources currently not covered. The information from an expanded air monitoring network will further enhance the capabilities of decision-makers at all levels in the development of policies and initiatives to reduce local emissions within the community and thereby the exposures of citizens.
5. Continue to encourage the reduction of greenhouse gas emissions in Hamilton and consider the implications and risks of climate change to improve the quality of life in Hamilton through climate adaptation policies and planning.
6. Begin to examine and measure the benefits and costs associated with green infrastructure in Hamilton with the intent of providing policy and program incentives.
7. Consider a Local Improvement Charge approach to reducing residential emissions.



On behalf of ***Clean Air Hamilton***

