

# NITROGEN OXIDES

## Community Action to Promote Healthy Environments (CAPHE)

### PROJECT PARTNERS:

Community Action Against Asthma

Community Member-at-Large, Theresa Landrum

Detroit Community-Academic Urban Research Center

Detroit Health Department

Detroit Hispanic Development Corporation

Detroiters Working for Environmental Justice

Green Door Initiative

Healthy Environments Partnership

Michigan Department of Environment, Great Lakes, and Energy (EGLE)

Sierra Club

Southwest Detroit Community Benefits Coalition

Southwest Detroit Environmental Vision

University of Michigan School of Public Health, Michigan Medicine, & Taubman College of Architecture and Urban Planning

University of Michigan-Dearborn

University of Detroit Mercy School of Law

### CONTACT INFORMATION:

Alison E. Walding  
Project Manager  
walison@umich.edu  
734.764.2955

www.caphedetroit.sph.umich.edu



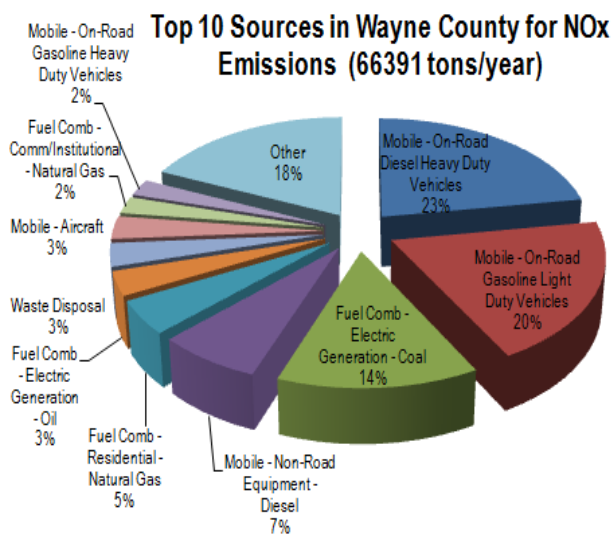
July 2020

### WHAT ARE NITROGEN OXIDES?

Nitrogen oxides are air pollutants that contain oxygen and nitrogen with the chemical abbreviations NO and NO<sub>2</sub>. Together, they are called NO<sub>x</sub>. NO<sub>x</sub> is formed when fossil fuels like oil, gas, and coal are burned at high temperatures. Nitrogen dioxide (NO<sub>2</sub>) is a gas with an irritating odor. It absorbs light and leads to the yellow-brown haze sometimes seen over cities. It is one of the important parts of "smog" which contains ozone, another important pollutant.<sup>1,2</sup>

### WHERE DO NITROGEN OXIDES COME FROM?

Most NO<sub>x</sub> emissions in Detroit and southeast Michigan come from "mobile" sources, including cars, trucks, construction equipment, trains, boats, and aircraft. Other important sources include industrial and residential fuel combustion, including factory boilers, garbage incinerators, and refineries. The manufacturing industry does not account for a large part of NO<sub>x</sub> released in Detroit.<sup>3</sup> Some of the highest levels of NO<sub>x</sub> are found near major roadways, within about 300 feet. In fact, in-vehicle levels can be much higher than levels that are measured at area-wide monitors.<sup>4</sup> However, industrial sources also cause important local impacts.<sup>3</sup>



### HOW DO NITROGEN OXIDES AFFECT YOUR HEALTH?

Studies have shown that NO<sub>x</sub> at even relatively low concentrations is associated with a variety of diseases and emergency room visits. Exposure to NO<sub>x</sub> can worsen heart disease, leading to increased hospital visits and early death.<sup>6</sup> NO<sub>x</sub> also reacts with ammonia, water vapor, and other compounds in the atmosphere to form small particles, including PM<sub>2.5</sub>, which can enter your lungs and cause or worsen lung disease.<sup>4</sup> NO<sub>x</sub> is also associated with:

- Reduced lung function
- Increased lung sickness
- Hospital admissions
- Lung-related emergency room visits
- Poor birth outcomes such as underweight babies<sup>7</sup>

Ongoing research is also being conducted to determine whether NO<sub>x</sub> can cause cancer.

Support for this collaboration was provided R01ES022616 from the National Institute of Environmental Health Sciences, National Institutes of Health, and the Fred A. and Barbara M. Erb Family Foundation. Additional support was provided by grant P30ES017885.

## IS DETROIT'S AIR HEALTHY?

Like most other large metropolitan areas, Detroit meets air quality standards for NO<sub>x</sub>.<sup>9</sup> However, NO<sub>x</sub> remains important because it forms ozone, which is a problem in Detroit.<sup>10</sup> Both the role of NO<sub>x</sub> in forming ozone and its links with other diseases highlight the importance of controlling emissions and reducing exposures. Figure 1 shows the top sources of air pollution in Detroit. People who live or spend time near to these sources of NO<sub>x</sub> may experience higher exposure than the average Detroit resident.

## WHO IS MOST LIKELY TO BE AFFECTED?

Many houses, apartments, and schools are located near major highways, railroads, or airports.<sup>4</sup> Detroit has about 80 public schools within 500 feet of major highways. People living near major roads and children attending these schools are more likely to be people of color or to be economically disadvantaged.<sup>11</sup> This puts them in danger of higher exposure to NO<sub>x</sub>.

In addition, some people are more susceptible to the adverse effects NO<sub>x</sub> exposure – in other words, at any given level of exposure, they have more serious health effects. People who are more likely to experience worse health effects from NO<sub>x</sub> include: young children, those over age 65, and people with existing lung diseases like asthma.<sup>6</sup>

## HOW TO REDUCE AND AVOID EXPOSURE TO NITROGEN OXIDES

There are many steps that can be taken to reduce exposure to NO<sub>x</sub>:

- Avoid being near highways during peak driving hours.
- Carpool, bicycle, walk or use public transportation to reduce the volume of traffic in the city.
- Keep cars in good repair. NO<sub>x</sub> emissions may increase if your car's "service engine" indicator is lit. Newer cars emit less NO<sub>x</sub> and so are less polluting than older cars.
- Join a community organization working to reduce pollution in Detroit (see [caphedetroit.sph.umich.edu](http://caphedetroit.sph.umich.edu) for a list of organizations).
- Encourage local officials to implement strategies that limit exposure to NO<sub>x</sub> and other pollutants.
- Encourage regional and national policy and decision makers to enact and enforce legislation that promotes clean air. These actions can reduce exposure to NO<sub>x</sub> and improve health for all people.



## REFERENCES

1. U.S. Environmental Protection Agency, Nitrogen Dioxide, Basic Information, <http://www.epa.gov/oaqps001/nitrogenoxides/>, accessed 8/11/14.
2. U.S. Environmental Protection Agency, Smog – Who Does it Hurt?, <http://www.epa.gov/airnow/health/smog.pdf>, accessed 8/11/14.
3. U.S. Environmental Protection Agency, Nitrogen Oxides, Air Emissions Sources, [http://www.epa.gov/cgi-bin/broker\\_service=data&\\_debug=0&\\_program=dataprog.national\\_1.sas&polchoice=NOX](http://www.epa.gov/cgi-bin/broker_service=data&_debug=0&_program=dataprog.national_1.sas&polchoice=NOX), accessed 12/18/14.
4. U.S. Environmental Protection Agency, Nitrogen Dioxide, Health, <http://www.epa.gov/airquality/nitrogenoxides/health.html>, accessed 8/11/14.
5. U.S. Environmental Protection Agency, 2011 National Emissions Inventory, <http://www.epa.gov/ttn/chief/net/2011inventory.html>, accessed 7/7/14.
6. U.S. Environmental Protection Agency, Integrated science assessment for oxides of nitrogen, health criteria, <http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=194645>, accessed 10/21/14.
7. Le, H., Batterman, S., Wirth, J.J., et al., 2012. Air pollutant exposure and preterm and term small-for-gestational-age births in Detroit, Michigan: Long-term trends and associations, *Environment International* 44: 7-17.
8. The Agency for Toxic Substances and Disease Registry. Nitrogen Oxide ToxicFAQs. <http://www.atsdr.cdc.gov/toxfaqs/tfacts175.pdf>, accessed 12/18/14.
9. Michigan Department of Environmental Quality, 2013, Michigan 2012 annual air quality report, Lansing, MI: 15-16.
10. U.S. Environmental Protection Agency, Detroit river-western Lake Erie basin indicator project, [http://www.epa.gov/med/grosseille\\_site/indicators/](http://www.epa.gov/med/grosseille_site/indicators/), accessed 8/11/14.
11. Boehmer, Tegan K. et al., Residential Proximity to Major Highways -United States, Centers for Disease Control and Prevention, <http://www.cdc.gov/mmwr/preview/mmwrhtml/su6203a8.htm>, accessed 10/21/14.

## ABOUT COMMUNITY ACTION TO PROMOTE HEALTHY ENVIRONMENTS

CAPHE uses a community-based participatory research approach in which partners are involved in all phases of the work. This includes defining the research problem, designing and implementing the study, interpreting and distributing the results, deciding how results will be applied and applying the results to create a public health action plan to improve health in Detroit. CAPHE builds on 20 years of community-academic research partnerships. Representatives from each of these organizations comprise the CAPHE Steering Committee. This structure promotes collaboration and shared decision making at all levels of the CAPHE project, to assure that Detroit residents and leadership have a significant voice in identifying and creating solutions to promote clean air for Detroit's residents.