STATE OF CONNECTICUT

COUNCIL ON ENVIRONMENTAL QUALITY

DATE: May 15, 2013

TO: Council Members

FROM: Karl Wagener
Executive Director

RE: Indicator of the Month for May 2013 (Agenda Item 4)

I selected this indicator for review because it is one of two that were not complete when the annual report was published. If changes are approved, we can publish an update to the report.

This is our most complex indicator. It condenses levels of six pollutants into a single data point for each year. The intent is to show to the reader whether the total level of air pollution is getting better or worse.

Because of changes in the availability of air monitoring data – some positive, some negative – staff is proposing an overhaul of this indicator. We would maintain its basic structure while making several technical changes.

In brief, the indicator is calculated in this way: for each of the six pollutants, the average level of pollution for the year is reported as a percentage of the relevant air quality standard. Once we have a value for each pollutant, we calculate the average of all the pollutants. The unit is "percentage," though that unit, when applied to the overall average, does not have much meaning. We want the reader to see the trend and not pay much attention to the values.

[Example: If the average level of NO_2 for the year was 20 ppb, and the annual standard is 53 ppb, the index value would be 20÷53=0.38, or **38 percent**. If the average level of small particulates for the year was 6 micrograms/m^3 and the annual standard is 12, the index value would be 6÷12=0.50, or **50 percent**. If those were the only two pollutants we considered, the "CEQ Air Pollution Index" value would be the average of the two, or **44**.]

79 Elm Street, Hartford, CT 06106
Phone: (860) 424-4000 Fax: (860) 424-4070
http://www.ct.gov/ceq

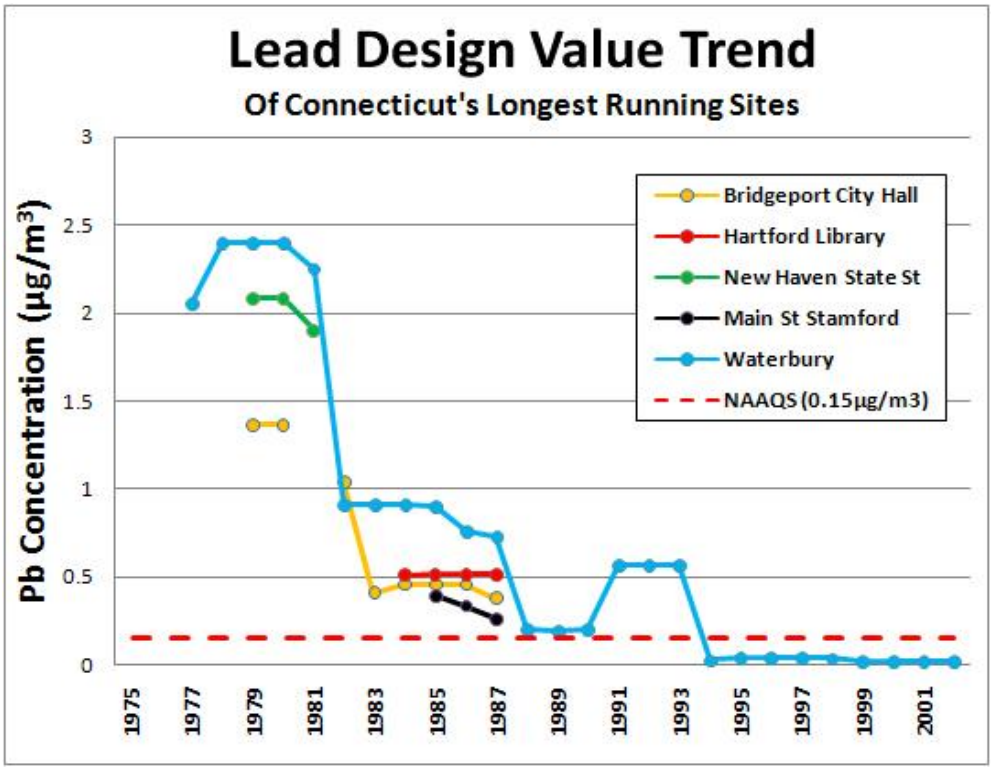
The six pollutants are:

Carbon monoxide
Nitrogen dioxide
Ozone
Particulates
Sulfur Dioxide
Lead

The biggest change that we propose is to remove **lead** from the indicator.

Lead has been reduced to very low levels in Connecticut's air. Connecticut stopped monitoring lead in 2002. For our indicator, we have been using an estimated value of 0.66 percent (i.e., two thirds of one percent of the standard). In 2008, the federal government revised the standard and required states to start monitoring again. Since monitoring began again in Connecticut in 2010 (at one site only), the average monthly level has not exceeded three percent of the new standard.

This chart from the DEEP website shows lead levels through 2001:



There are two reasons to delete lead from our index: 1) The post-2009 data, collected at only one site, are not comparable to the historical data, and 2) the value will probably always be a small constant value in our calculations that will suppress or mask actual changes in levels of other pollutants.

The argument in favor of keeping lead is that the removal of lead from our air was real, and the chart in our report showing the decline in air pollution from the 1980s to the present reflects the reduction in lead. However, if we want the indicator to be a dynamic indicator that shows year-to-year changes, we should remove lead and, in the text, discuss the fact that lead has been vanquished.

The other changes that we propose:

-- For **particles**, switch from PM_{10} to $PM_{2.5}$. The subscript refers to the particle size (in microns). The scientific consensus is that the smaller particles (2.5 microns and smaller) are more injurious. The federal government revoked the annual standard for PM_{10} in 2006. There *is* an annual standard for $PM_{2.5}$, so this should be a simple transition, in theory. The hitch is that $PM_{2.5}$ was not monitored before 2000. To arrive at estimates for pre-2000 levels of $PM_{2.5}$, we calculated a ratio between PM_{10} and $PM_{2.5}$ levels for the years when they were both collected. We can apply that ratio to the pre-2000 annual PM_{10} data and derive a reasonable estimate of pre-2000 annual $PM_{2.5}$ levels (but, regrettably, not prior to 1988, when PM_{10} started to be reported.).

-- For **carbon monoxide**, switch from DEEP data to EPA data. This is not important in itself, as all values are from the DEEP-operated monitors. The wrinkle is that DEEP used to provide us with *yearly* maximum values, and the EPA data will give us the annual average of *daily* maximums. Because we already were adjusting the DEEP data by a factor to approximate the average daily maximum data, the new approach yields similar values and will be superior.

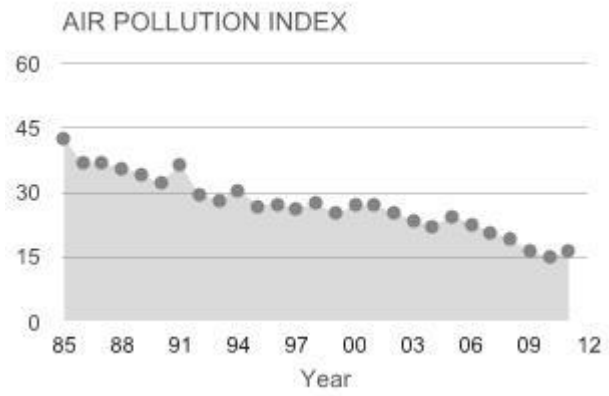
Important: For carbon monoxide and ozone, we use averages of *daily maximum* values, rather than averages of *all* monitored values, because there are no annual standards for these two pollutants; the harm is from short-term exposure, and we use the appropriate short-term standard.

-- For **ozone**, switch from 1-hour monitored values to 8-hour values. The federal government revoked the 1-hour standard in 1997, and DEEP no longer reports the data in the same way, which makes our switch almost mandatory. The ratio of 1-hour values to 8-hour values has been fairly steady, so there should be no distortion of the historical trend when we switch all previous years to the 8-hour value.

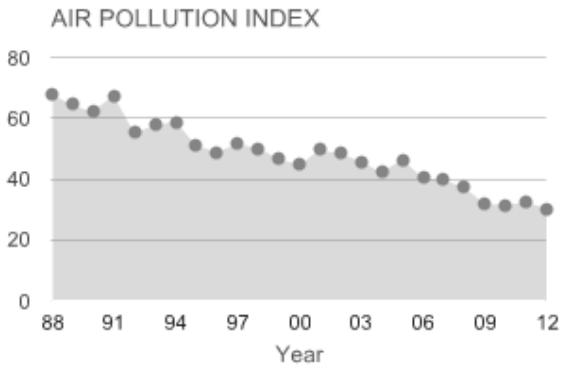
This leaves only **nitrogen dioxide** (NO_2) and **sulfur dioxide** (SO_2) unchanged. But oh, no! The EPA has decided to revoke the annual standard for SO_2! (This is only bad for the indicator-makers; the newer standard based on short-term exposures is more protective of health.) However, the revocation has not yet taken effect, so we are not proposing a change this year. (Maybe next year.)

At the meeting, we can discuss any of these points and answer questions.

This is the summary chart from last year's report (without changes):



Below is the chart using all of the changes discussed in this memo and updated with 2012 data. Because the new chart is "unleaded," the year-to-year differences are more pronounced. Other than that, the trends are quite consistent. Note that the new index values are consistently higher (though proportional). Note also that the graph below begins at 1988 rather than 1985; we cannot obtain good particulate data for the years before 1988. I think depicting a trend across 25 years is more than adequate for most of our readers.



79 Elm Street, Hartford, CT 06106
Phone: (860) 424-4000 Fax: (860) 424-4070
http://www.ct.gov/ceq