

## Annual Average Nitrogen Dioxide Concentrations in Air

### HIGHLIGHTS :

- **Nitrogen dioxide can adversely affect health.**
- **In 2013, the highest concentrations of NO<sub>2</sub> occurred in Auckland, Christchurch and Hamilton.**
- **The average NO<sub>2</sub> concentrations at busy local road sites were greater than those at urban and state highway sites**



Source: <http://ourauckland.aucklandcouncil.govt.nz/articles/news/2015/10/keeping-auckland-s-air-clean/>

### Nitrogen dioxide can adversely affect health

Nitrogen dioxide (NO<sub>2</sub>) is a gas. It is not usually released directly into the air. NO<sub>2</sub> forms when nitrogen oxide (NO) and other nitrogen oxides (NO<sub>x</sub>) react with other chemicals in the air. In New Zealand, road motor vehicles are the main human-made source of nitrogen oxides (72%) (Ministry for the Environment, 2016; Statistics New Zealand, 2015b).

The main health effect of NO<sub>2</sub> is on the respiratory system. Inhalation of NO<sub>2</sub> by children increases their risk of respiratory infection and may lead to poorer lung function in later life. The NO<sub>2</sub> concentration in the air is also associated with the increases in mortality and hospital admissions for respiratory diseases. NO<sub>2</sub> can decrease the lungs' defences against bacteria, thus making them more susceptible to infections. It can also aggravate asthma (Ministry for the Environment, 2016). Young children, asthmatics and adults with heart and respiratory disorders are especially vulnerable to NO<sub>2</sub>. (Ministry for the Environment, 2016).

WHO recommends a 40µg/m<sup>3</sup> guideline of annual average NO<sub>2</sub> concentration to protect the public from the health effects of gases (World Health Organisation, 2006).

### In 2013, the highest concentrations of NO<sub>2</sub> occurred in Auckland, Christchurch and Hamilton

In 2013, 97 percent (118/122) of monitoring sites were 'likely'\* to be within the NO<sub>2</sub> guideline. Those sites that were 'likely' to have exceeded the guideline were close to busy local roads and state highways in major urban centres (Statistics New Zealand, 2015a).

There were four monitored sites where the WHO annual NO<sub>2</sub> guideline was likely to be exceeded in 2013. Those sites were in:

- Auckland (46.5µg/m<sup>3</sup>) – a state highway site at the central motor way conjunction in Auckland
- Auckland (46µg/m<sup>3</sup>) – a state highway site near the intersection of Kirkbride Road and George Bolt Memorial Drive on the way to Auckland airport
- Christchurch (41.6µg/m<sup>3</sup>) – a local road site on Riccarton Road in Christchurch
- Hamilton (41.4µg/m<sup>3</sup>) – a state highway site at the intersection of Greenwood Street and Killarney Road in Hamilton

(New Zealand Transport Agency, 2015).

Note\*: The NZTA monitoring network uses a screening method, which provides a good indication of NO<sub>2</sub> concentrations. However, the results cannot be compared directly to WHO long-term guidelines and do not definitively say a site exceeded the guideline (New Zealand Transport Agency, 2015).

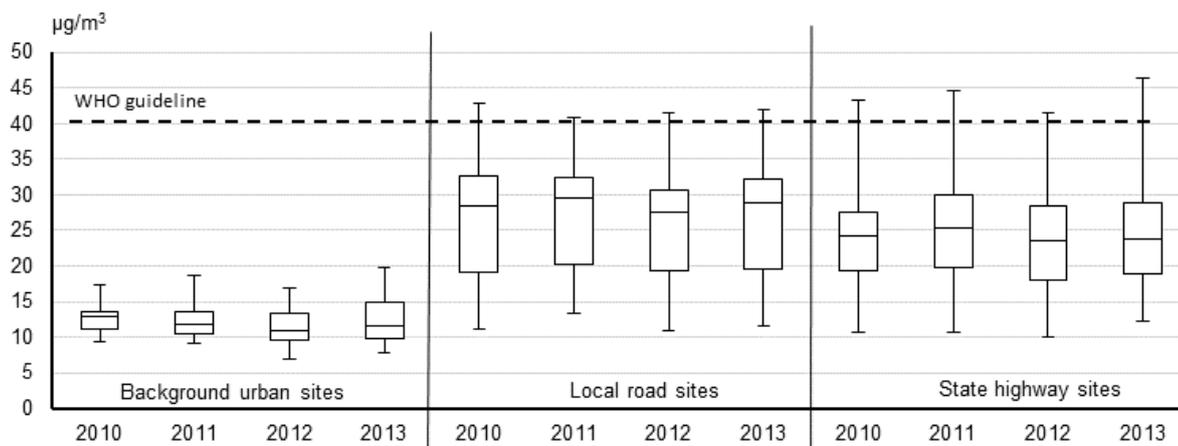
**The average NO<sub>2</sub> concentrations at busy local road sites were greater than those at urban and state highway sites**

From 2010 to 2013, at least 95 percent of monitoring sites were 'likely' to be within the WHO's annual guideline for NO<sub>2</sub> concentrations (40µg/m<sup>3</sup>) (Statistics New Zealand, 2015a).

Generally speaking, the average concentrations of NO<sub>2</sub> at urban background sites were much lower than those at busy local road and state highway sites. The average concentrations at busy local road sites were greater than those at state highway sites (Figure 1).

At the six regions where the state highway annual average NO<sub>2</sub> concentrations were reported, the NO<sub>2</sub> annual average showed an increase trend from 2007 to 2013. Those six regions included Hamilton, Auckland, Christchurch, Wellington, Dunedin and Napier. (Figure 2)

**Figure 1: Annual average NO<sub>2</sub> concentrations, 2010-2013**

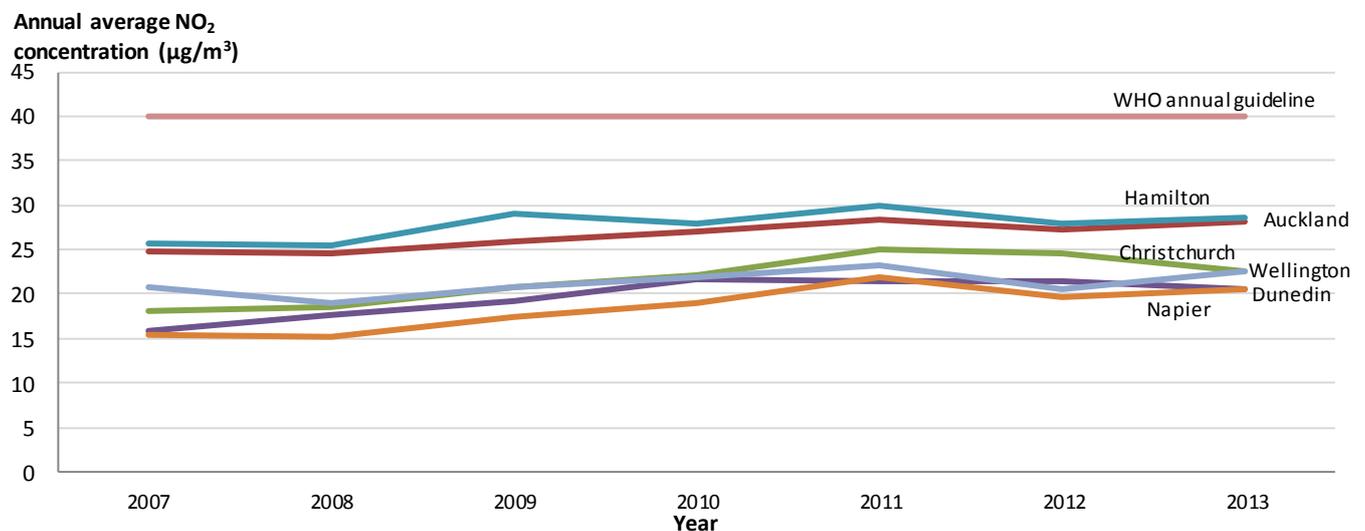


Source: New Zealand Transport Agency, 2015.

Note: the definitions of different sites are:

- State highways (which are located within 100 metres of the highway being monitored)
- Busy local roads (which are located within 50 metres of the road being monitored)
- Urban background sites (which are located more than 100 metres from a state highway and more than 50 metres from a busy road).

**Figure 2: Annual average NO<sub>2</sub> concentrations at state highway sites at six regions, 2007-2013**



Source: Ministry for Environment & Statistics New Zealand, 2015.

#### References:

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For more information, please  
contact Fei Xu on  
[f.xu@massey.ac.nz](mailto:f.xu@massey.ac.nz)