With reference to *Review of Methods for NO to $NO_2$ Conversion in Plumes at Short Ranges,* Jenkin Method was adopted in this assessment to determine $NO_2$ concentration based on the cumulative annual average NOx concentration.

Jenkin Equation 2004:

$$[NO_2] = \frac{([NOx] + [Ox] + \frac{J}{k}) - \sqrt{([NOx] + [Ox] + \frac{J}{k})^2 - 4[NOx][Ox]}}{2}$$

Where:

$[NO_2]$: Concentration of $NO_2$

[NOx]: Concentration of NOx

[Ox]: Sum of concentration of $NO_2$ and $O_3$

J: Photolysis rate of $NO_2$ and $O_3$

k: Rate coefficient for oxidation of NO by $O_3$

The predicted annual average $NO_2$ concentration was estimated with empirical relationship derived using the latest available 5 years, including Years 2017, 2018, 2019, 2020 and 2021, of data from EPD's air quality monitoring stations (AQMS). Monitoring data at Tung Chung general station, Tuen Mun general station and Mong Kok roadside station were adopted as input for the curve fitting to calculate the J/k and Ox value and obtain the cumulative $NO_2$.

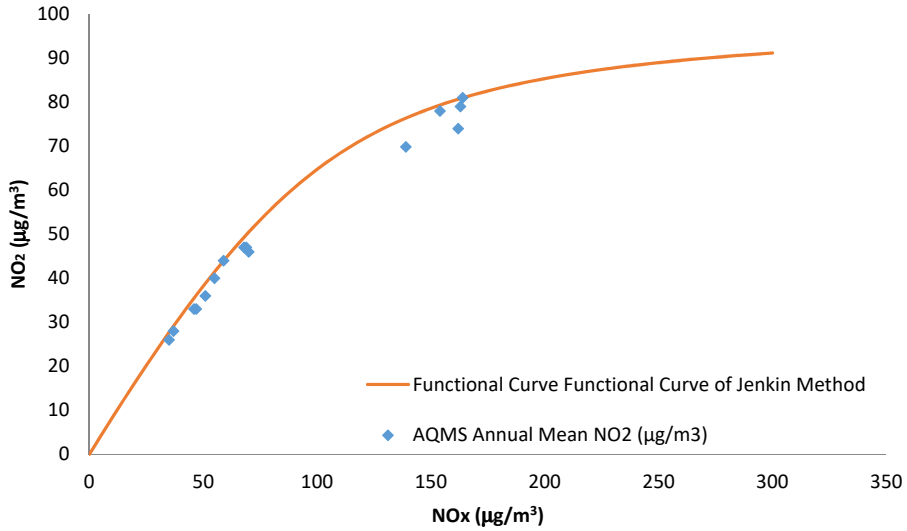
Annual $NO_2$ vs. NOx monitoring data from selected AQMS was plotted in the form of scatter plot. The relationship of the selected annual $NO_2$ and NOx monitoring data was described by a fitted curve with reference to the formula presented in Jenkin (2004a) and Environment Agency UK (2007).

With the adoption of values for J/k of 18.9 $\mu g/m^3$ and Ox of 99.4 $\mu g/m^3$, the fitted curve defined by Jenkin Method could cover the upper bounds of data points. J/k and Ox adopted in this assessment have been optimised to obtain the fitted curve. The annual $NO_2$ concentrations were determined from the fitted curve using the total NOx concentrations.

Reference:

Environment Agency UK, 2007. Review of methods for NO to $NO_2$ conversion in plumes at short range.

Jenkin, M. E., 2004. Analysis of sources and partitioning of oxidant in the UK – Part 1: The NOx-dependence of annual mean concentrations of nitrogen dioxide and ozone. Atmospheric Environment, 38, 5117-5129.




| | | |
|---|---|---|
| Ox | 99.4 | $\mu g/m^3$ |
| J/k | 18.9 | $\mu g/m^3$ |

where J = $NO_2$ Photolysis Rate

k = Rate Coefficient for Oxidation NO by $O_3$

| Year | Station | AQMS Annual Mean NOx ($\mu g/m^3$) | AQMS Annual Mean $NO_2$ ($\mu g/m^3$) | Calculated $NO_2$ using the Functional Curve of Jenkin Method ($\mu g/m^3$) |
|---|---|---|---|---|
| 2017 | Tuen Mun | 70 | 46 | 50 |
| 2018 | Tuen Mun | 68 | 47 | 49 |
| 2019 | Tuen Mun | 69 | 47 | 50 |
| 2020 | Tuen Mun | 55 | 40 | 41 |
| 2021 | Tuen Mun | 59 | 44 | 44 |
| 2017 | Mong Kok | 164 | 81 | 81 |
| 2018 | Mong Kok | 163 | 79 | 81 |
| 2019 | Mong Kok | 154 | 78 | 79 |
| 2020 | Mong Kok | 162 | 74 | 81 |
| 2021 | Mong Kok | 139 | 70 | 76 |
| 2017 | Tung Chung | 51 | 36 | 39 |
| 2018 | Tung Chung | 47 | 33 | 36 |
| 2019 | Tung Chung | 46 | 33 | 36 |
| 2020 | Tung Chung | 37 | 28 | 29 |
| 2021 | Tung Chung | 35 | 26 | 28 |