# NO2 absorption indicator

**Aim:** To define and indicator for Tygron’s platform (serious game) that measures how much NO2 is absorbed by vegetation compared with NO2 emitted by motor traffic as follows:

So, the challenge is to use the information below to calculate the proportion of NO2 emitted by cars that is absorbed by urban green and to express it on a formula that I could apply on excel (Tygron’s indicators use excel for calculations).

**Information we have:**

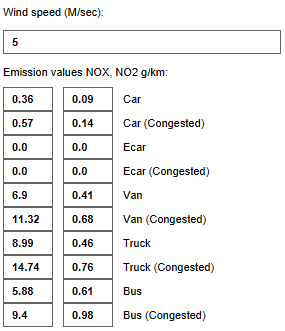
**NO2 emissions calculated by Tygron as follows[[1]](#footnote-1):**

The emission numbers (E) for both NOx and NO2 are computed as:

**E = N \* [(1-FS)\*((1-(fm+fz+fb))\*El + fm \* Em + fz \* Ez + fb \* Eb) + FS \* ((1-(fm + fz + fb)) \* El,d + Fm \* Em,d + fz \* Ez,d+fb\*Eb,d)]\*1000/(24\*3600)**

where:

* N = traffic intensity [units per day]
* fm = fraction vans [-]
* fz = fraction trucks [-]
* fb = fraction busses [-]
* El = emission value cars [g/km]
* Em = emission value vans [g/km]
* Ez = emission value trucks [g/km]
* Eb = emission value busses [g/km]
* FS = fraction congested traffic [-]
* E\*,d = emission factor per class (cars, vans, trucks or busses) if congested



The weighted fraction direct emitted NO2 [-] is computed as:

**fNO2 = ENO2/ENOx**

where:

* ENO2 = emission number NOs [μg/m/s]

The delution factor, θ, is computed till a distance of 30m with:

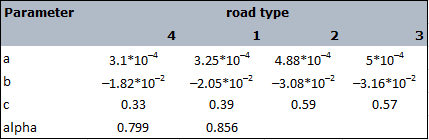
**θ = a \* S^2 + b \* S + c**

And from 30-60m (for road-type 1 and 4 only):

**θ = alpha \* S^-0.747**

where:

* S is the calculation distance
* a, b, c and alpha are parameters depend on road-type:

[](https://support.tygron.com/wiki/File:NO2_overlay_02.PNG)

To compute the annual average traffic contribution to NOX, Cb,jm[NOX] [μg/m3], the following formula from SRM1 is applied:

**Cb,jm[NOx] = Fk \* ENOx \* θ \* Fb \* Fmeteo**

where:

* Fk = calibration factor [-] (default = 0.62]
* ENOx = emission number NOx [μg/m/s]
* θ = delution factor [-]
* Fb = tree factor (default = XX)
* Fmeteo = 5/windspeed. Default value for windspeed is 5 m/s

To compute the annual average traffic contribution to NO2, Cb,jm[NO2] [μg/m3], the following formula from SRM1 is applied:

**Cb,jm[NO2]= fNO2 \* Cb,jm[NOx] + (B\*Ca,jm[O3]\*Cb,jm[NOx]\*(1-fNO2))/(Cb,jm[NOx]\*(1-Fno2)+K)**

where:

* Cb,jm[NOX] = annual average traffic contribution to NOx concentration [μg/m3]
* Cb,jm[O3] = annual average concentration ozon [μg/m3] (default = 42)
* fNO2 = weighted fraction direct emitted NO2 [-]
* B = parameter (default 0.6)
* K = parameter for conversion NO to NO2 (default = 100 μg/m3)

The annual average concentrations of NO2 [μg/m3] are calculated as follows:

**Cjm[NO2] = Ca,jm[NO2] + Cb,jm[NO2]**

where:

* Cjm[NO2] = annual average concentration [μg/m3]
* Ca,jm[NO2] = annual average background-concentration (default = 0 [μg/m3], can be adjusted via the overlay attributes)
* Cb,jm[NO2] = annual average traffic contribution to NO2 concentration [μg/m3]

Isolate Cb,jm[NOx] from the next formula:

Simplifiquem termes:

Recuperant els termes originals:

**Green elements that are in contact with a predefined amount of NO2 concentrations.**

We can calculate the surface of green which is in contact with, for instance, concentrations higher than 1 ug/m3. We can also define a deposition rate for different types of vegetation: trees, agriculture, lawn areas, green roofs…

**Capacity of vegetation to remove NO2 from air.**

I found one reference that estimates (if I’m not wrong) a deposition rate of 0,05 mm/sec. <https://pubs.acs.org/doi/10.1021/es300826w>

1. <https://support.tygron.com/wiki/Traffic_NO2_(Overlay)> [↑](#footnote-ref-1)