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*JGR Atmospheres*

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Supporting Information for

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**Near-Automated Estimate of City Nitrogen Oxides Emissions Applied to**

5

**South and Southeast Asia**

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21 **Table S1:** Annual top-down NO<sub>x</sub> emissions and effective lifetimes, sampling area mean wind  
 22 speeds, and bottom-up NO<sub>x</sub> emissions for cities in South and Southeast Asia

City (Country) <sup>a</sup>	Top-down NO <sub>x</sub> emissions [mol s <sup>-1</sup> ] <sup>b</sup>	NO <sub>x</sub> lifetimes [h] <sup>b,c</sup>	Wind speeds [m s <sup>-1</sup> ] <sup>d</sup>	Bottom-up NO <sub>x</sub> emissions [mol s <sup>-1</sup> ] <sup>e</sup>
1. Karachi (Pakistan)	52.9 ± 18.7	3.1 ± 0.6	5.6 ± 0.1	24.7
2. Kabul (Afghanistan)	18.8 ± 6.1	1.5 ± 0.3	2.8 ± 0	1.8
3. Ahmedabad (India)	21.7 ± 9.2	3.8 ± 0.8	4.3 ± 0.1	19.5
4. Mumbai (India)	45.6 ± 16.5	2.9 ± 0.6	4.2 ± 0.1	45.3
5. Islamabad (Pakistan)	21.7 ± 8.4	2.2 ± 0.5	3.0 ± 0	10.6
6. Lahore (Pakistan)	33.4 ± 11.9	3.0 ± 0.5	3.4 ± 0	14.0
7. Delhi (India)	89.0 ± 31.9	2.5 ± 0.5	4.3 ± 0	54.4
8. Bangalore (India)	15.5 ± 5.0	3.5 ± 0.5	3.7 ± 0	22.9
9. Colombo (Sri Lanka)	20.7 ± 7.6	1.2 ± 0.3	5.7 ± 0.2	10.9
10. Chennai (India)	25.3 ± 13.6	4.9 ± 2.0	5.2 ± 0	27.9
11. Kolkata (India)	42.5 ± 15.8	2.7 ± 0.5	4.1 ± 0	35.1
12. Dhaka (Bangladesh)	124.8 ± 41.1	2.6 ± 0.4	3.8 ± 0	18.2
13. Yangon (Myanmar)	16.1 ± 5.2	2.1 ± 0.3	3.6 ± 0	4.9
14. Bangkok (Thailand)	102.3 ± 55.9	2.5 ± 0.7	4.4 ± 0	104.4
15. Kuala Lumpur (Malaysia)	41.4 ± 22.0	6.3 ± 1.9	3.7 ± 0.1	76.3
16. Singapore	112.1 ± 37.7	2.4 ± 0.4	5.1 ± 0.1	141.1
17. Ho Chi Minh City (Vietnam)	25.2 ± 11.3	4.9 ± 1.4	4.9 ± 0.3	16.4
18. Jakarta (Indonesia)	65.8 ± 32.5	3.3 ± 1.1	4.2 ± 0.2	144.2
19. Manila (Philippines)	40.5 ± 17.4	3.3 ± 0.7	6.1 ± 0.2	62.5

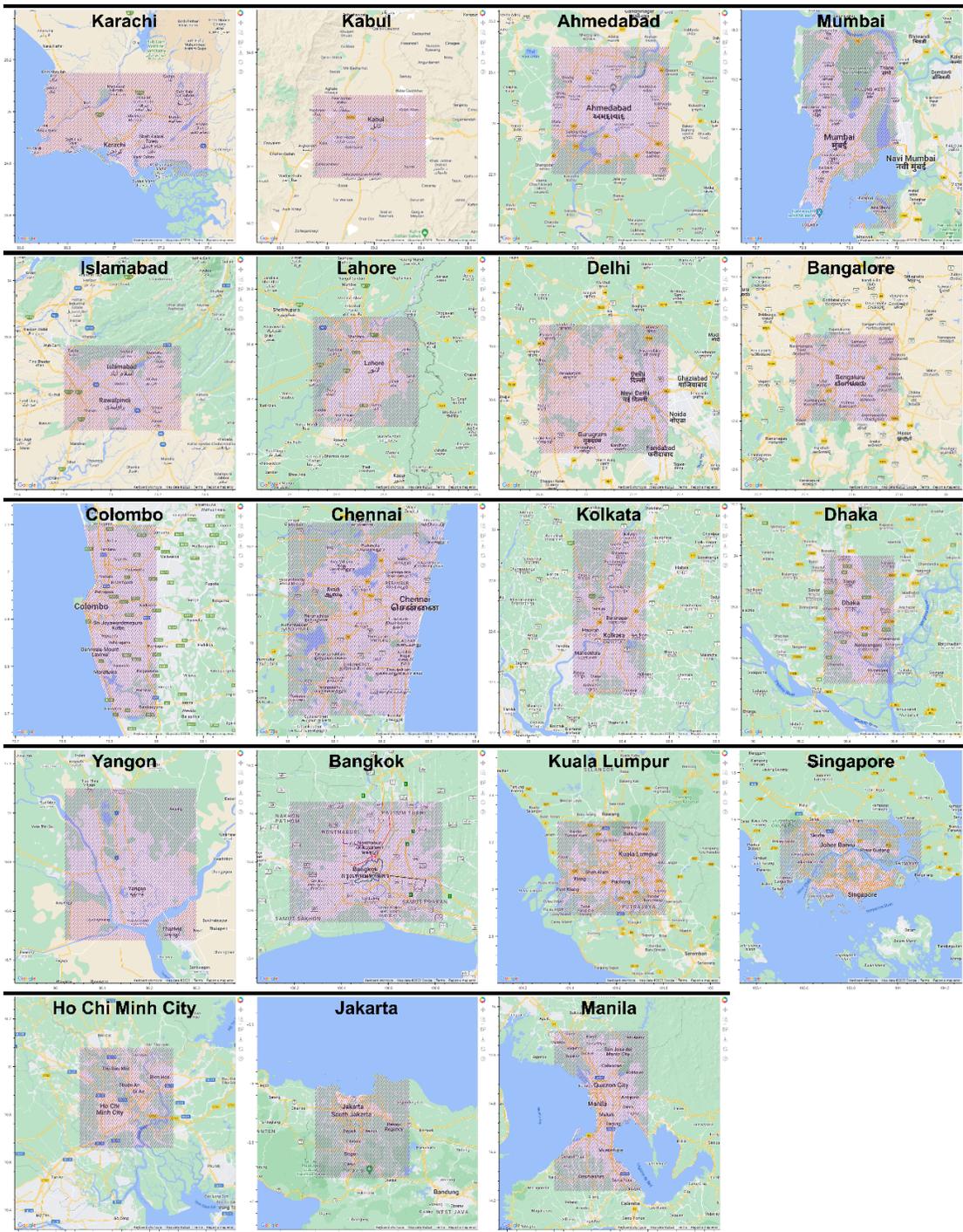
23 <sup>a</sup>Numbered according to labels in Figure 1.

24 <sup>b</sup>Errors in emissions and lifetimes calculated by adding individual errors in quadrature (see Section 2.2 for details).

25 <sup>c</sup>Effective lifetime, as loss is dominated by dispersion.

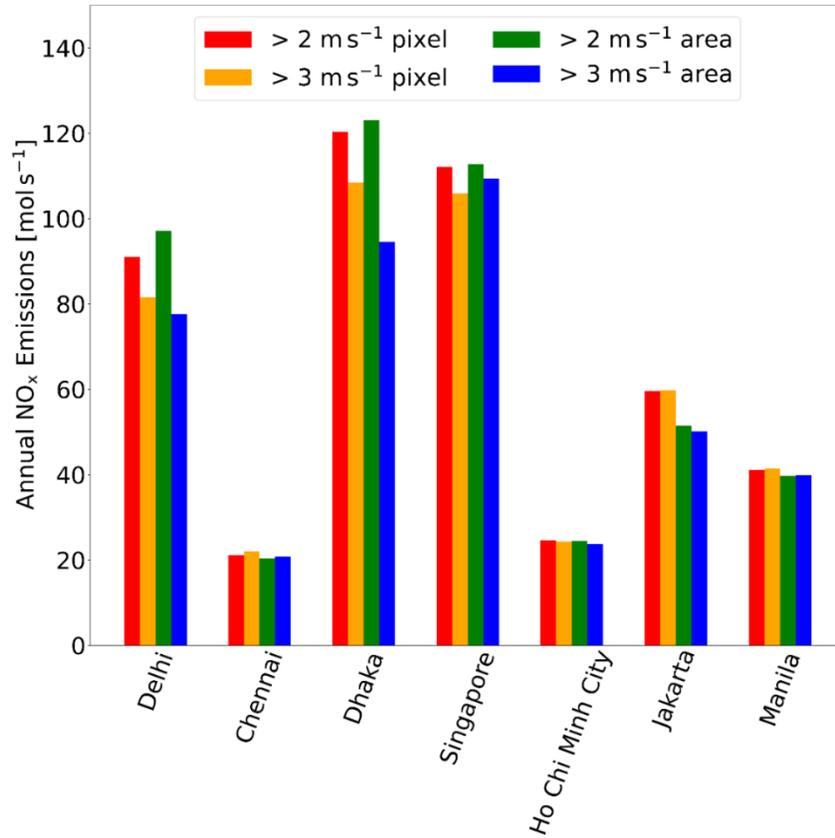
26 <sup>d</sup>Calculated using ERA5 reanalysis midday hourly wind fields (see Section 2.2 for details).

27 <sup>e</sup>HTAP version 3 anthropogenic emissions inventory 24-h emission rates (see Section 2.3 for details).



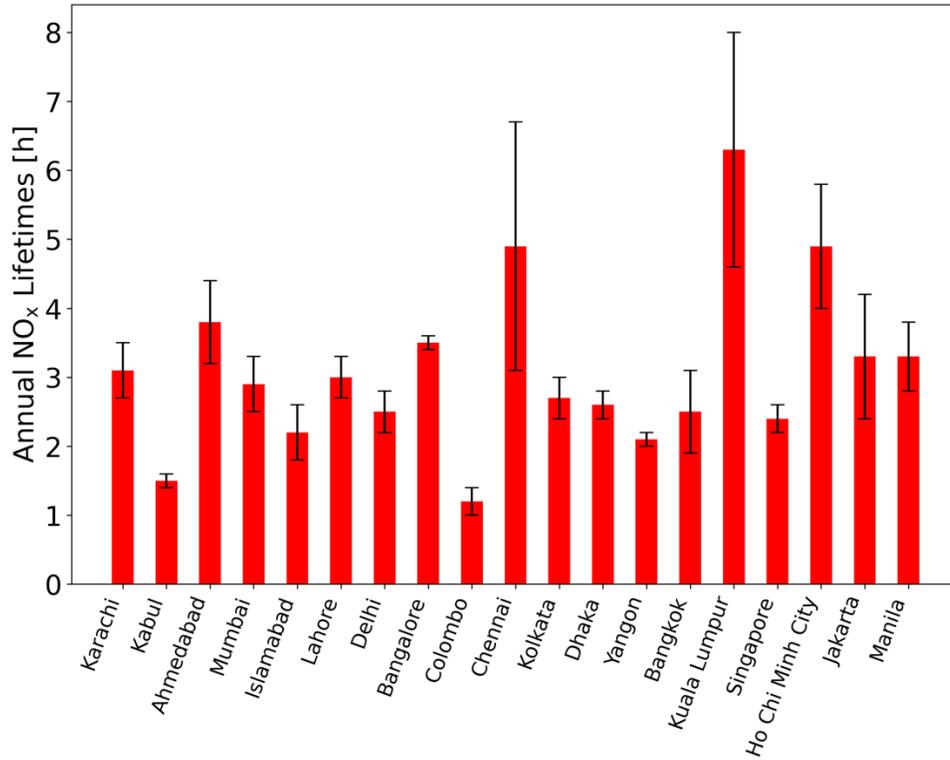
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29 **Figure S1.** Sampling areas of bottom-up emissions for target cities in South and Southeast Asia.  
 30 Hatching identifies the sampling extent for each city. City and sampling boundaries are determined  
 31 using the Database of Global Administrative Areas (GADM) (<https://gadm.org/>; last accessed 17  
 32 March 2023) and Google Maps for all cities and the Humanitarian Data Exchange  
 33 (<https://data.humdata.org/>; last accessed 17 March 2023) to map Laguna de Bay bordering Manila.  
 34 Background maps are from © Google Maps, 2023.



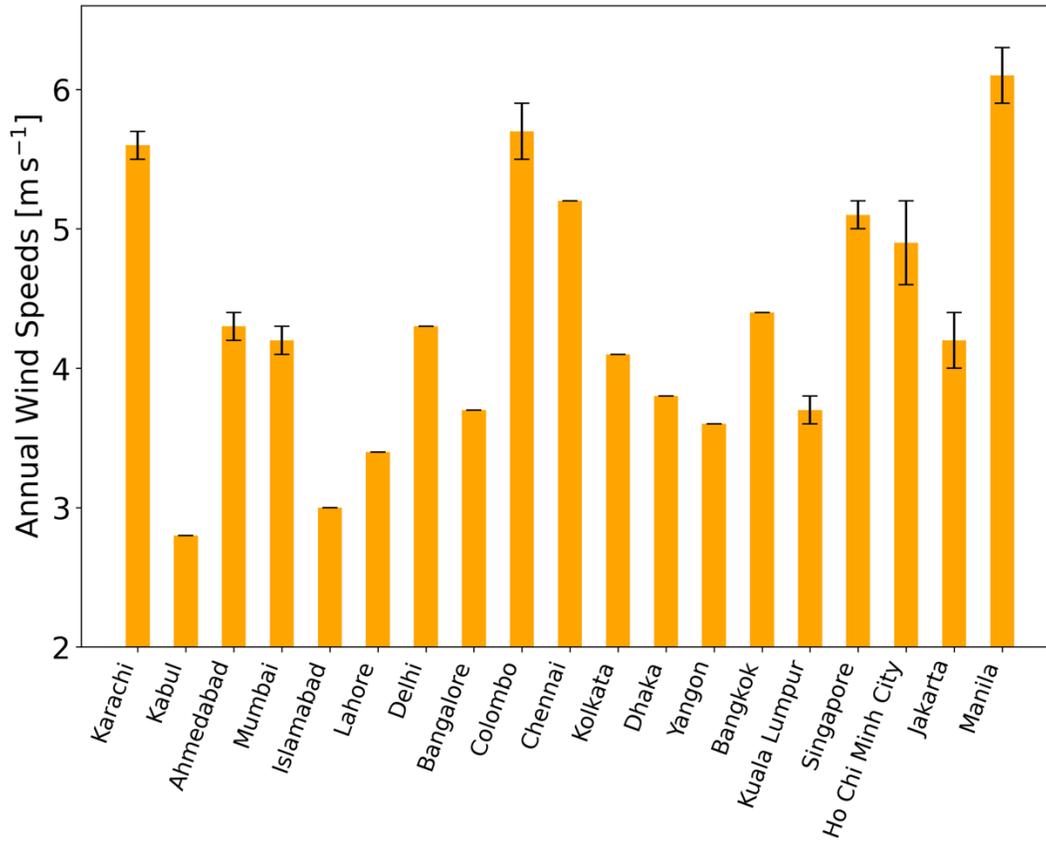
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36 **Figure S2.** Sensitivity of annual top-down NO<sub>x</sub> emissions to wind speed selection. Wind speeds  
 37 tested are individual pixels with speeds > 2 m s<sup>-1</sup> (red) and > 3 m s<sup>-1</sup> (yellow), and sampling area  
 38 (1.5° downwind, 0.75° upwind, ±0.75° across-wind) mean speeds > 2 m s<sup>-1</sup> (green) and > 3 m s<sup>-1</sup>  
 39 (blue). Only cities with successful EMG fits for all wind speed selections are shown.



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41 **Figure S3.** Annual effective NO<sub>x</sub> lifetimes from all successful EMG fits for target cities in South  
 42 and Southeast Asia. Red bars are the means of NO<sub>2</sub> lifetimes and black error lines are the standard  
 43 deviations from all successful EMG fits.



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45 **Figure S4.** Annual mean wind speeds for target cities in South and Southeast Asia. Yellow bars  
 46 are the sampling area mean wind speeds and black error lines are the standard deviations from all  
 47 successful annual EMG fits.