# Supplementary Tables

## Supplementary Table 1

Description of sample areas from LCZs 1 to 3 in Lisbon

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Sample areas | Geographic location1 | Altitude (m)2 | Dimensions (m) | Average building area (m2)2 | Average building height (m)2 | Volumetric index (VI)2 | Nº buildings2 | Urban density2 | Z02 | H/W2 | SVF3 |
| LCZ 1-34 | - | 77.1 | - | 3184.2 | 18.64 | 0.3 | 21 | moderate | 1.3 | 0.8 | - |
| C1 | 38º 7’ 38.41’’ N; 9º 1’ 49.09’’ W | 86.4 | 158x120 | 3427.0 | 27.3 | 0.4 | 15 | high | 1.9 | 1 | 0.4 |
| C2 | 38º 7’ 98.75’’ N; 9º 1’ 53.18’’W | 124.2 | 134x53 | 1874.3 | 12.9 | 0.2 | 6 | low | 0.9 | 0.4 | 0.6 |
| C3 | 38º 7’ 75.45’’ N; 9º 1’ 51.19’’ W | 113.1 | 164x91 | 1912.2 | 20.7 | 0.2 | 6 | moderate | 1.6 | 0.7 | 0.7 |

1Geographic coordinates were retrieved from the center point of each sample area.

2For each indicator, the average value for the whole area was calculated. Urban geometry data for Lisbon municipality was produced by Correia (2019).

3Average SVF (planar – Oke 1988) of the whole sample area was calculated in SkyHelios. More information about this calculation can be found on Fröhlich and Mazarakis (2018).

4Average values for all indicators in each LCZ were calculated only for the Lisbon municipality boundaries.

## Supplementary Table 2

Description of sample areas from LCZs 4 to 8 in Lisbon

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Sample areas | Geographic location1 | Altitude (m)2 | Dimensions (m) | Average building area (m2)2 | Average building height (m 2 | Volumetric index (VI)2 | Nº buildings2 | Urban density2 | Z02 | H/W2 | SVF3 |
| LCZ 4-64 | - | 75.7 | - | 1965.7 | 14.3 | 0.2 | 13 | low | 1.1 | 0.5 | --- |
| O1 | 38º 7’ 51.65’’ N; 9º 1’ 45.83’’W | 83.8 | 122x108 | 2282.3 | 14 | 0.2 | 17 | 1.2 | 0.7 | 0.8 |
| O2 | 38º 6’ 98.73’’N; 9º 2’ 20.18’’ W | 17.1 | 109x75 | 2283.2 | 8.6 | 0.3 | 23 | high | 0.4 | 0.3 | 0.8 |
| O3 | 38º 7’ 49.28’’ N; 9º 2’ 09.25’’ W | 81.4 | 108x107 | 1649.6 | 7.3 | 0.2 | 18 | 0.2 | 0.4 | 0.7 |
| LCZ 84 | - | 70.8 | - | 2375.2 | 12.8 | 0.2 | 6 | low | 0.8 | 0.4 | - |
| L1 | 38º 7’ 26.98’’ N; 9º 1’ 40.00’’ W | 76.6 | 121x94 | 2095.8 | 14.3 | 0.2 | 10 | 0.6 | 0.5 | 0.7 |
| L2 | 38º 7’ 71.84’’ N; 9º | 108 | 125x107 | 1562 | 25.1 | 0.1 | 3 | high | 3.1 | 1.1 | 0.8 |
| L3 | 38º 7’ 76.05’’ N; 9º 0’ 98.14’’ W | 16.5 | 150x121 | 3847.4 | 9.8 | 0.4 | 2 | low | 0.2 | 0.3 | 0.8 |

1Geographic coordinates were retrieved from the center point of each sample area.

2For each indicator, the average value for the whole area was calculated. Urban geometry data for Lisbon municipality was produced by Correia (2019).

3Average SVF (planar – Oke 1988) of the whole sample area was calculated in SkyHelios. More information about this calculation can be found on Fröhlich and Mazarakis (2018).

4Average values for all indicators in each LCZ were calculated only for the Lisbon municipality boundaries.

## Supplementary Table 3

Description of sample areas from LCZs 9, A and B in Lisbon

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Sample areas | Geographic location1 | Altitude (m)2 | Dimensions (m) | Average building area (m2)2 | Average building height (m)2 | Volumetric index (VI)2 | Nº buildings2 | Urban density2 | Z02 | H/W2 | SVF3 |
| LCZ 94 | - | 65.8 | - | 913.6 | 8.7 | 0.1 | 6 | low | 0.5 | 0.2 | - |
| SP | 38º 6’ 98.86’’ N; 9º 2’ 11.65’’ W | 29.6 | 108x102 | 1442.5 | 10.4 | 0.1 | 8 | 0.7 | 0.3 | 0.8 |
| LCZ B4 (deciduous) | - |  | - | 717.3 | 8.3 | 0.1 | 2 | - | 0.6 | 0.2 | - |
| SD | 38º 7’ 29.91’’N 9º 1’ 54.09’’ W | 96.9 | 100x93 | 144.2 | 2.4 | 0 | 1 | - | 0 | 0 | 0.7 |

1Geographic coordinates were retrieved from the center point of each sample area.

2For each indicator, the average value for the whole area was calculated. Urban geometry data for Lisbon municipality was produced by Correia (2019).

3Average SVF (planar – Oke 1988) of the whole sample area was calculated in SkyHelios. More information about this calculation can be found on Fröhlich and Mazarakis (2018).

4Average values for all indicators in each LCZ were calculated only for the Lisbon municipality boundaries.

## Supplementary Table 4

Lisbon’s street trees description per sample area incorporated in TC modeling by LCZ in Lisbon

|  |  |
| --- | --- |
| Sample area | Street trees |
|  | **Nº** | **Leaves** | **Species** | **Average height (m)1** |
| C1 | 16 | deciduous | Celtis australis | 22.5 |
| 14 | Liriodendron tulipifera | 25 |
| 24 | Jacaranda mimosifolia | 15 |
| 1 | Ulmus glabra | 22.5 |
| 6 | Celtis occidentalis | 12 |
| 23 | Tipuana tipu | 17.5 |
| C2 | 19 | Fraxinus excelsior | 32.5 |
| C3 | 10 | coniferous | Grevillea robusta | 26.5 |
| 1 | Schefflera arboricola variegata | 4 |
| 5 | deciduous | Koelreuteria paniculata | 6.5 |
| 11 | Lagerstroemia indica |
| 10 | Prunus cerasifera var. pissardii |
| 1 | Robinia pseudoacacia | 12.5 |
| 8 | Celtis australis | 22.5 |
| 1 | Robinia pseudoacacia var. Casque Rouge |
| L1 | 3 | Pyrus sp. | 5.5 |
| 25 | Celtis australis | 22.5 |
| 5 | Brachychiton populneus | 11.5 |
| 2 | Celtis occidentalis | 12 |
| L3 | 42 | Platanus x hybrida | 17.5 |
| O1 | 7 | Cercis siliquastrum | 12.5 |
| O3 | 11 | Melia azedarach | 11.5 |
| 5 | Tilia sp. | 17.5 |
| 9 | Ligustrum lucidum | 4.5 |
| 1 | Non identified | --- |
| SD | 55 | Celtis australis | 22.5 |
| DC | 139 | coniferous | Pinus pinea | 16.5 |
| DD | deciduous | Quercus | 12.5 |

1Average height for each tree species was retrieved from Câmara Municipal de Lisboa (2012, 2019).

## Supplementary Table 5

Wind diagnostic model settings, building layer attributes and tree layer properties included in SkyHelios for TC modeling by LCZ in Lisbon

|  |
| --- |
| **Wind model settings1** |
| **instrument height (m)** | **vertical atmospheric stability (m)** | **Z0** | **displacement height (m)** |
| 10 | 1.1 | 0.1 | 0.0 |
|  |
| **Building layer attributes** |
| **building height** | **transparency** | **albedo** | **emissivity** |
| see Tabs. 1 to 3 | 1.0 | 0.3 | 0.92 |
|  |
| **Tree layer properties** |
| **crown radius (m)** | **trunk length (m)** | **trunk diameter (m)** | **tree type** |
| 5 | 4 | 0.5 | see Supplementary Tab. 4 |
| **crown transparency** | **crown albedo** | **crown emissivity** |  |
| 0.9 | 0.20/0.10 (leaf/coniferous) | 0.98 |  |

**1** Wind model settings refer to the Lisbon’s airport weather station conditions.