



Supplementary Materials:

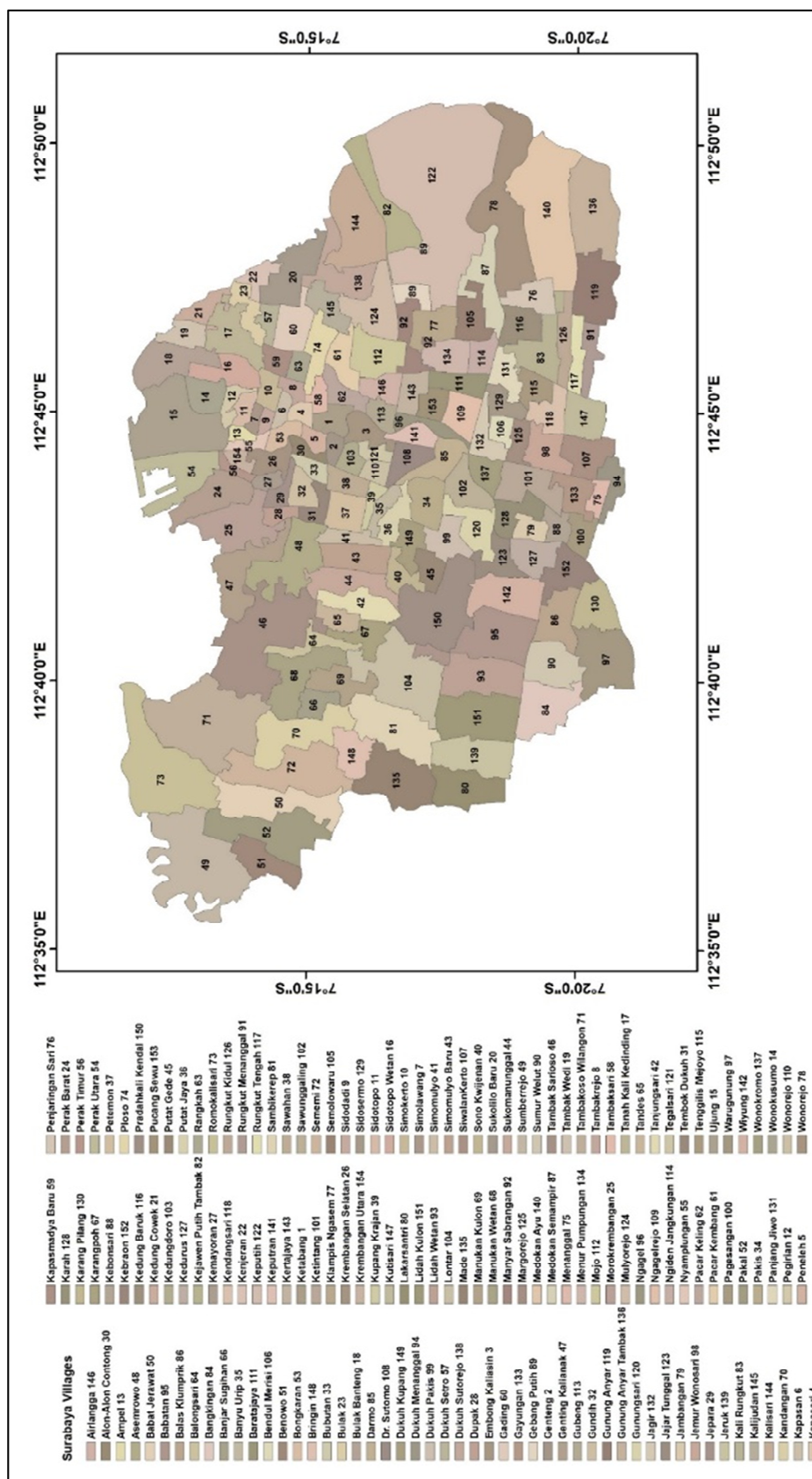
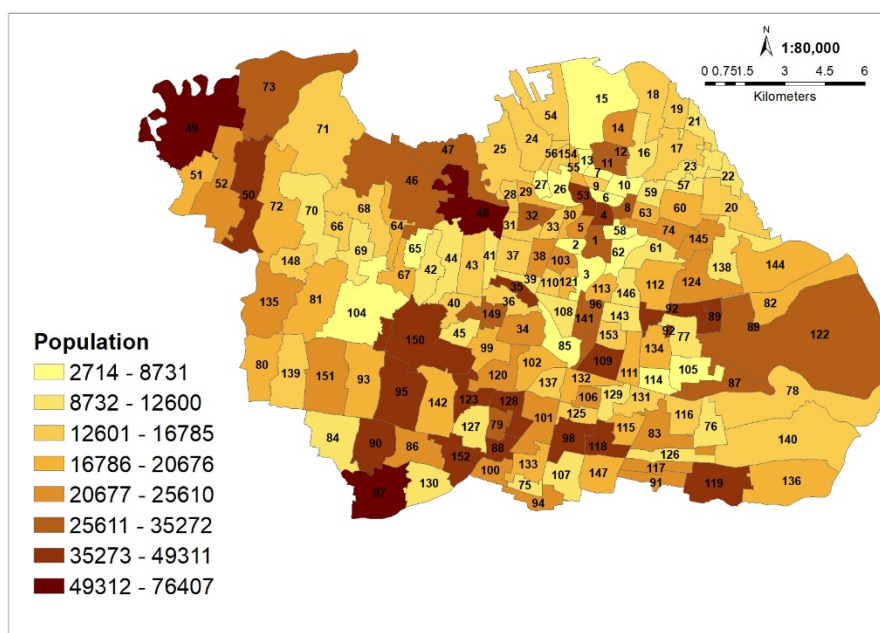
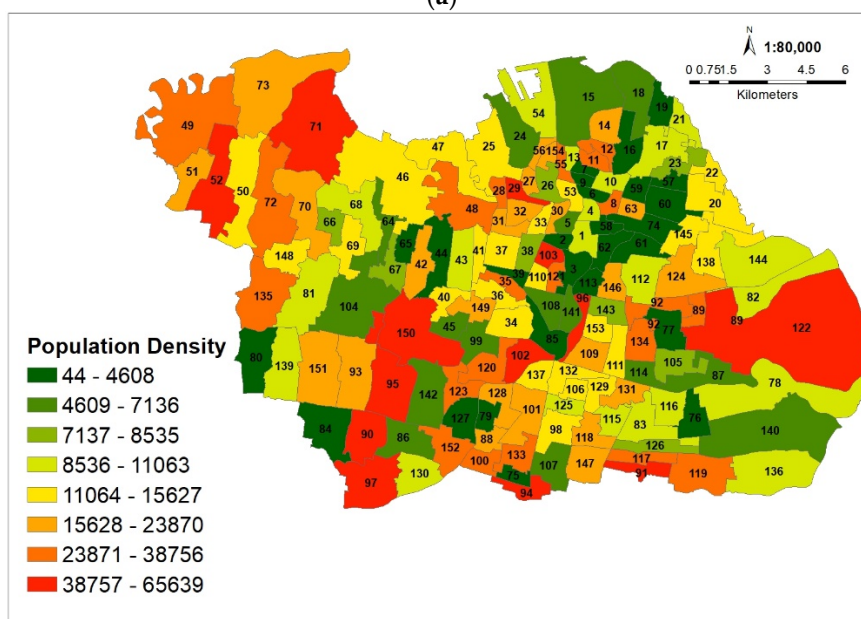


Figure S1. Village's Administration of Surabaya as study area.

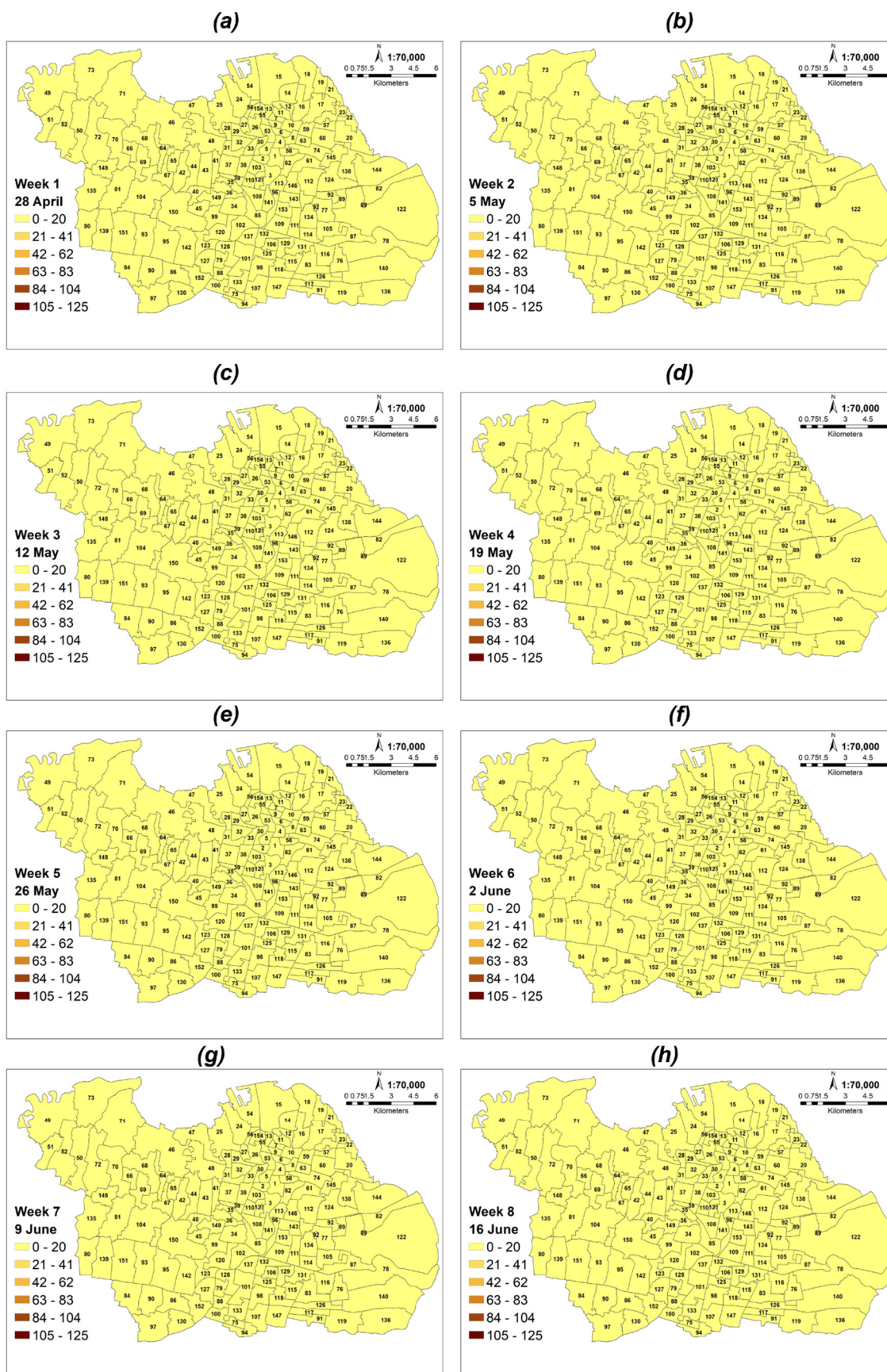


(a)

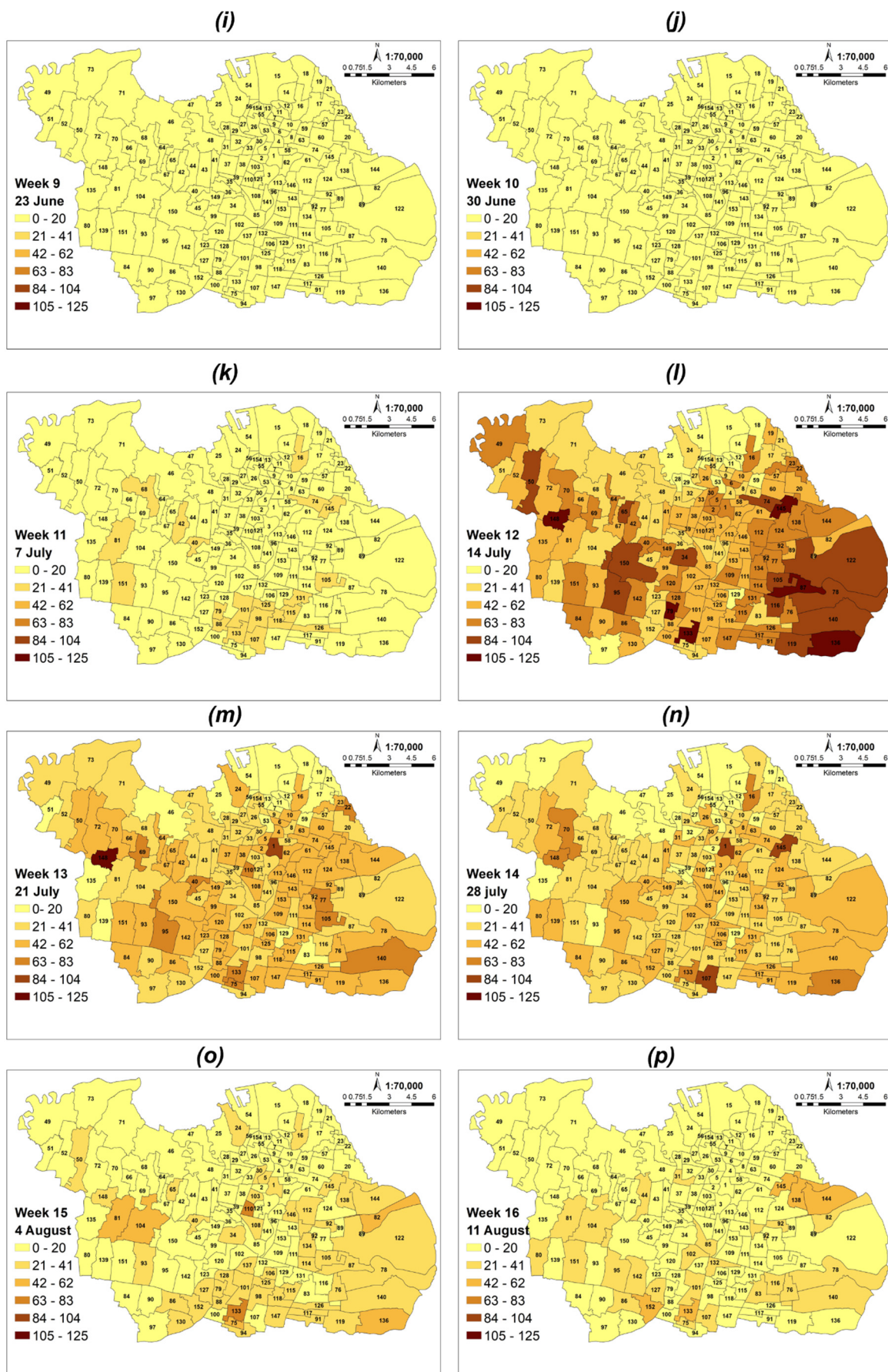


(b)

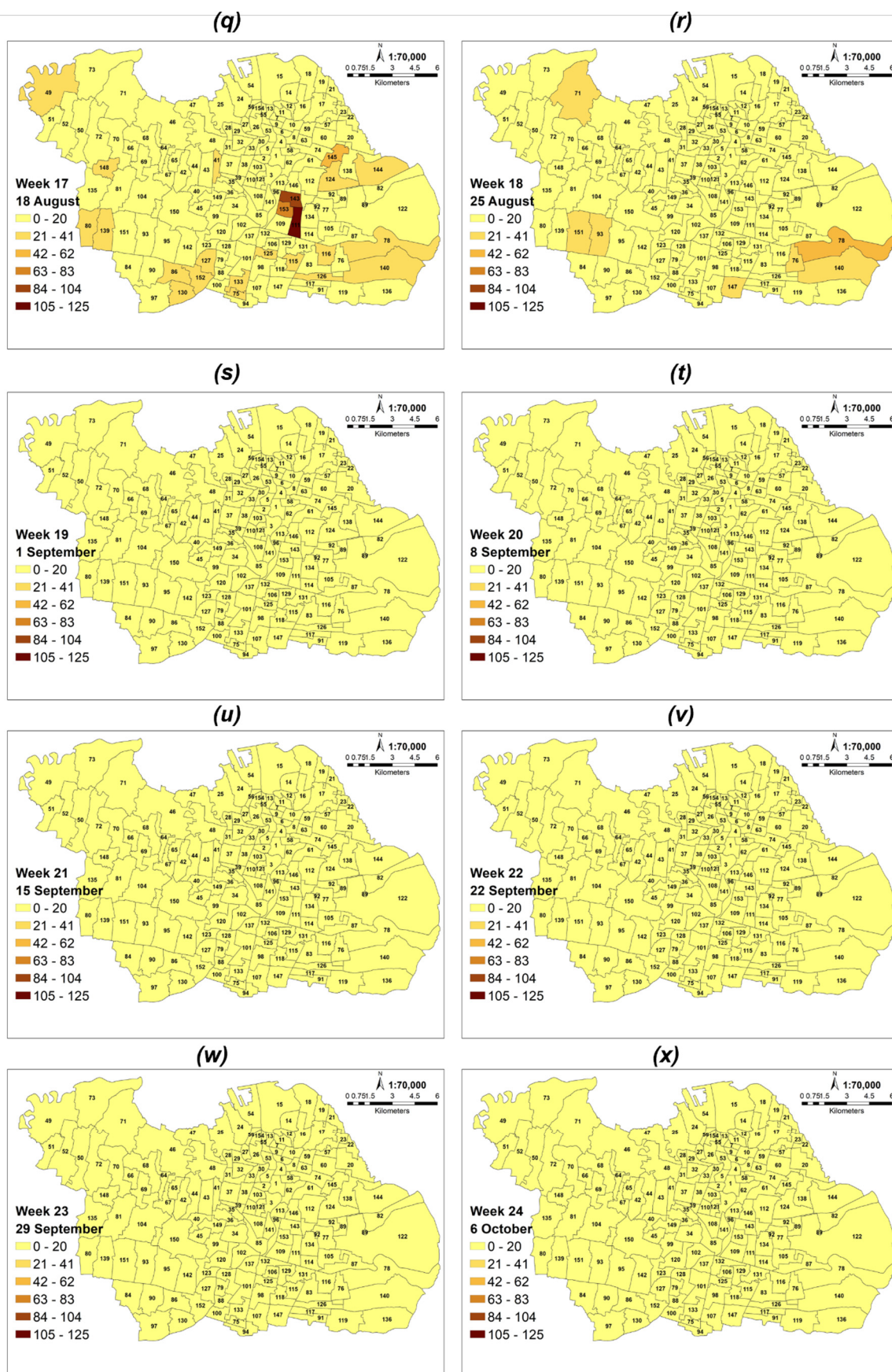
**Figure S2.** Population Distribution of Surabaya on 2020 (a) Population Distribution of Each Village (b) Distribution of Population Density (population/km<sup>2</sup>) of Each Village.

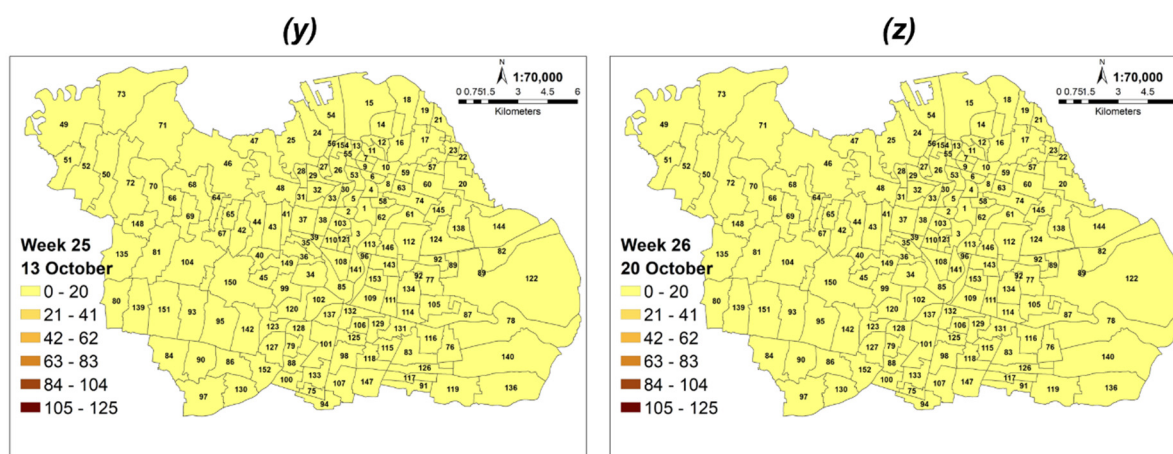






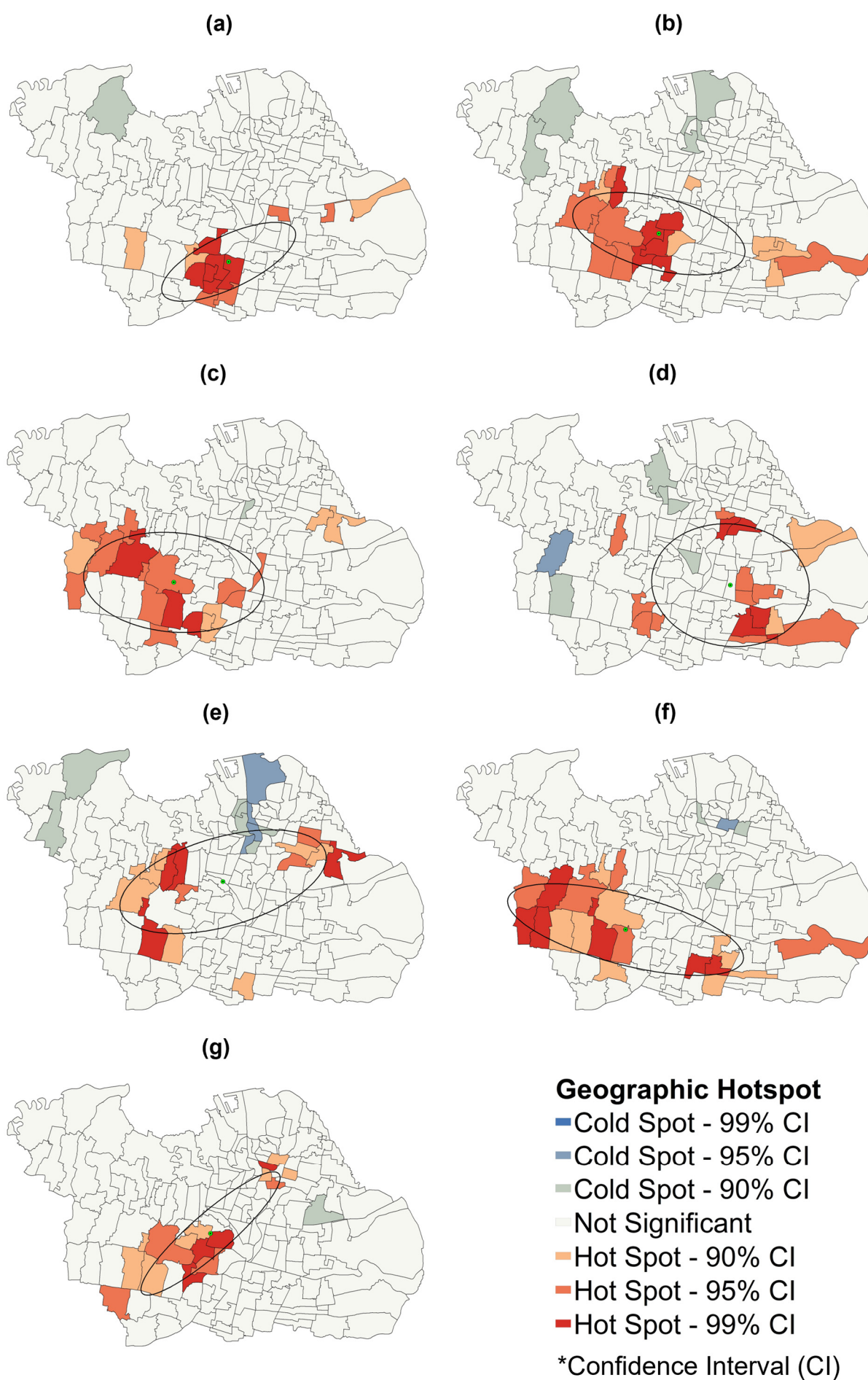


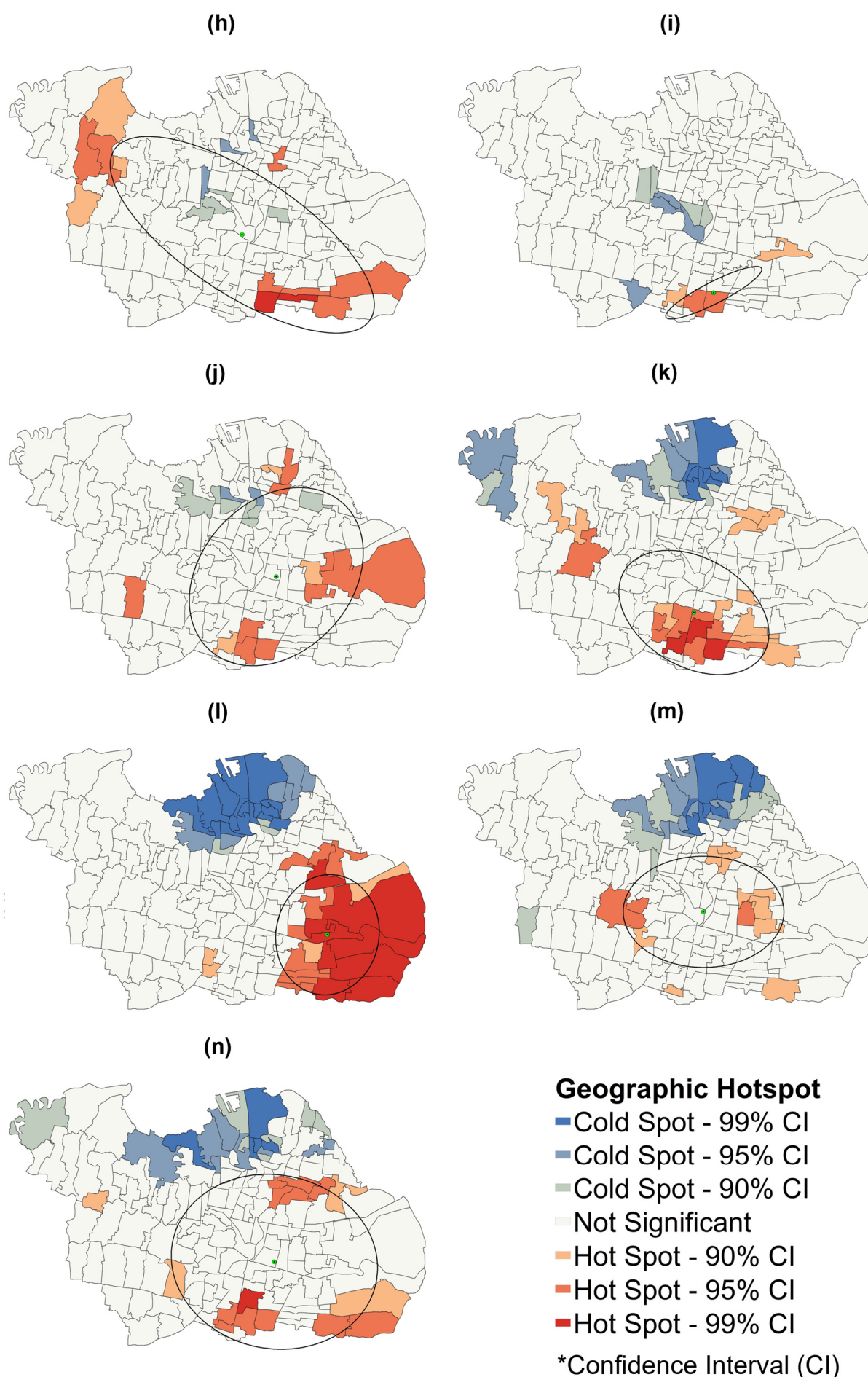




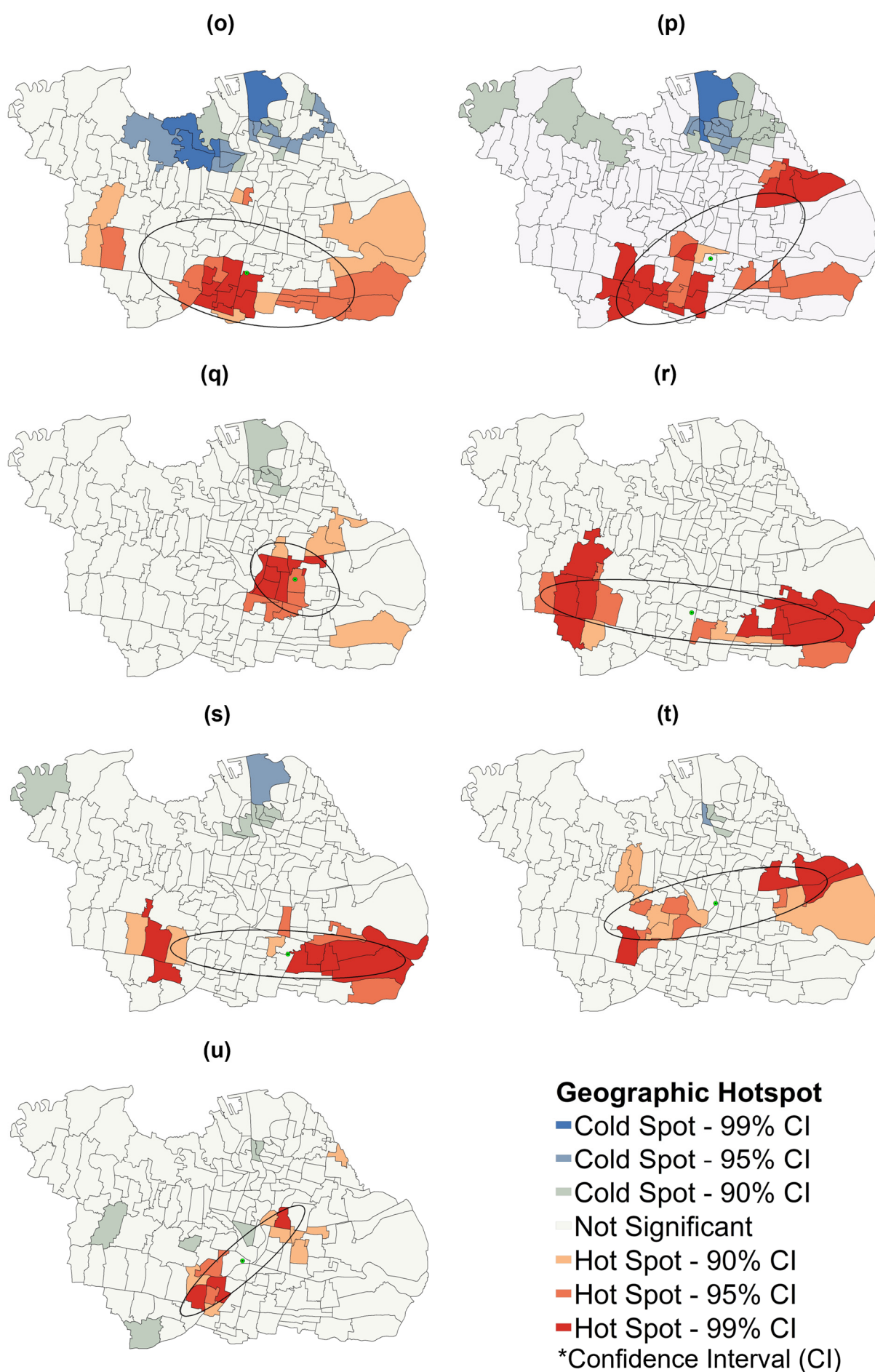
**Figure S3.** The distribution of confirmed COVID-19 cases per 100,000 populations every week in Surabaya. (a) 1<sup>st</sup> Week (28 April 2021 – 4 May 2021); (b) 2<sup>nd</sup> Week (5 May 2021 – 11 May 2021); (c) 3<sup>rd</sup> Week (12 May 2021 – 19 May 2021); (d) 4<sup>th</sup> Week (20 May 2021 – 25 May 2021); (e) 5<sup>th</sup> Week (26 May 2021 – 1 June 2021); (f) 6<sup>th</sup> Week (2 June 2021 – 8 June 2021); (g) 7<sup>th</sup> Week (9 June 2021 – 15 June 2021); (h) 8<sup>th</sup> Week (16 June 2021 – 22 June 2021); (i) 9<sup>th</sup> Week (23 June 2021 – 29 June 2021); (j) 10<sup>th</sup> Week (30 June 2021 – 6 July 2021); (k) 11<sup>th</sup> Week (7 July 2021 – 13 July 2021); (l) 12<sup>th</sup> Week (14 July 2021 – 20 July 2021); (m) Week 13 (21 July 2021 – 27 July 2021); (n) Week 14 (28 July 2021 – 3 August 2021); (o) 15<sup>th</sup> Week (4 August 2021 – 10 August 2021); (p) 16<sup>th</sup> Week (11 August 2021 – 17 August 2021); (q) 17<sup>th</sup> Week (18 August 2021 – 24 August 2021); (r) 18<sup>th</sup> Week (25 August 2021 – 31 August 2021); (s) 19<sup>th</sup> Week (1 September 2021 – 7 September 2021); (t) 20<sup>th</sup> Week (8 September 2021 – 14 September 2021); (u) 21<sup>st</sup> Week (15 September 2021 – 21 September 2021); (v) 22<sup>nd</sup> Week (22 September 2021 – 28 September 2021); (w) 23<sup>rd</sup> Week (29 September 2021 – 5 October 2021); (x) 24<sup>th</sup> Week (4 October 2021 – 12 October 2021); (y) 25<sup>th</sup> Week (13 October 2021 – 19 October 2021); (z) 26<sup>th</sup> Week (20 October 2021 – 26 October 2021).

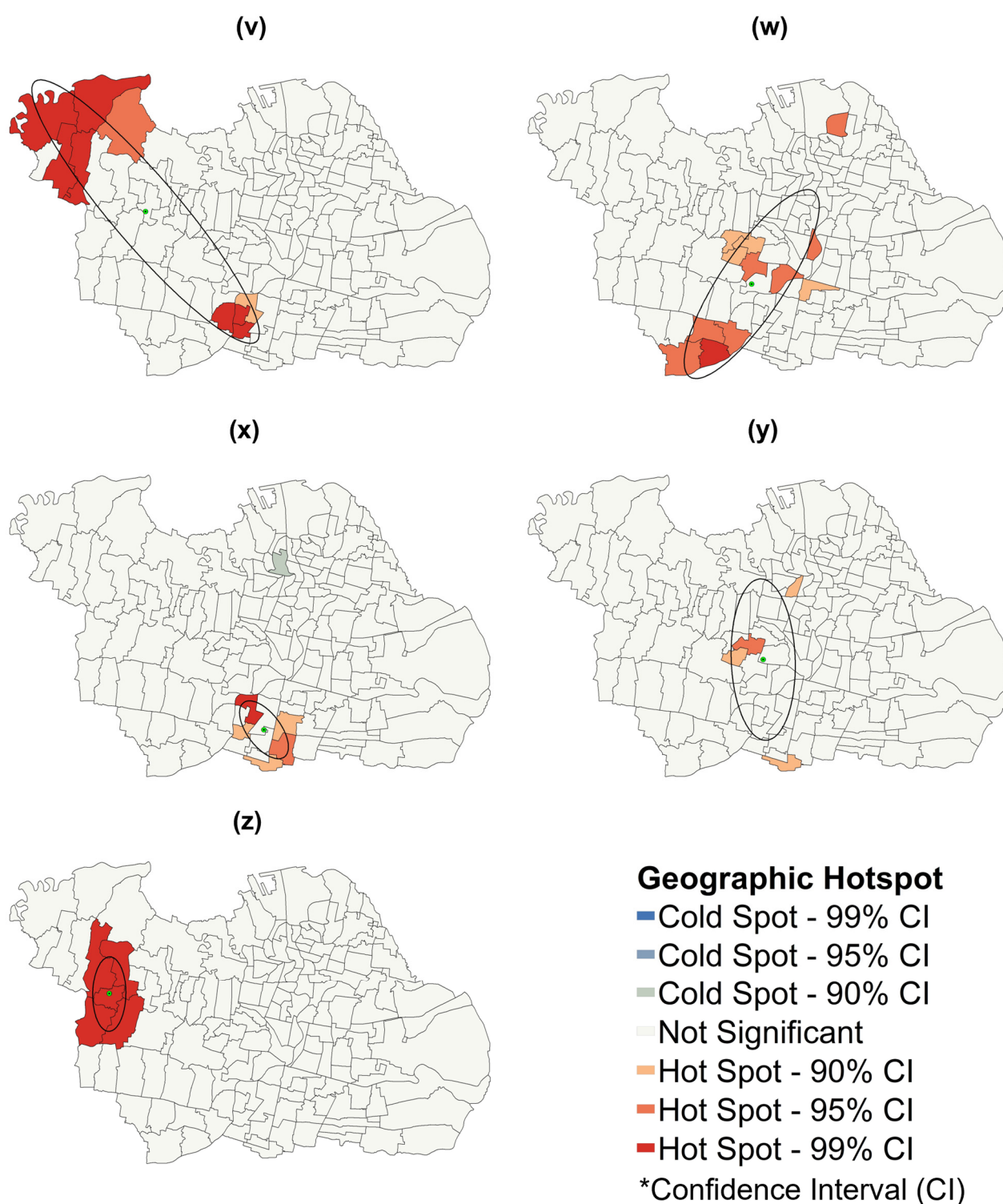








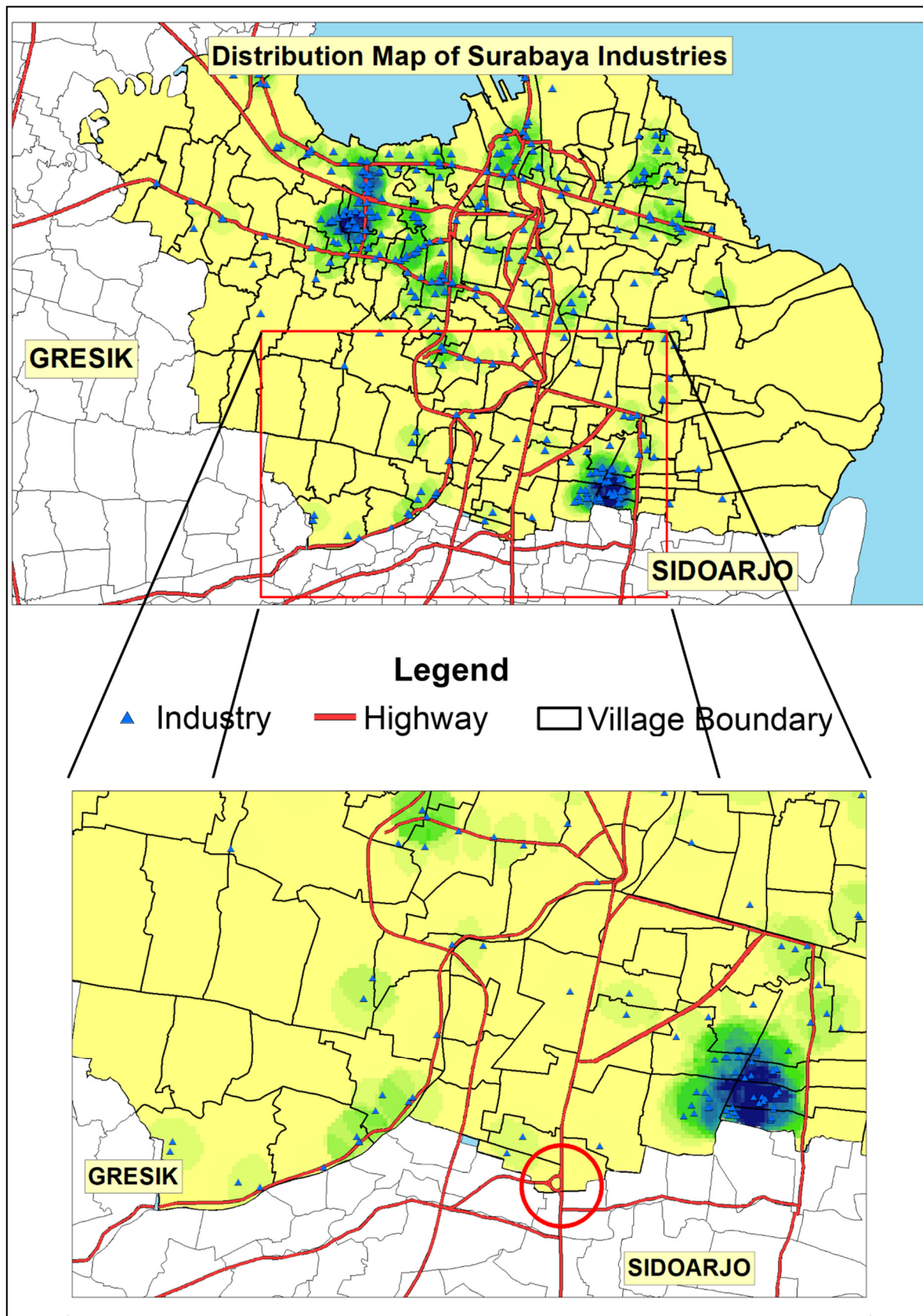




**Figure S4.** The clustering map of Covid-19 incidence along with its orientation and shift directions. (a) 1<sup>st</sup> Week (28 April 2021 – 4 May 2021); (b) 2<sup>nd</sup> Week (5 May 2021 – 11 May 2021); (c) 3<sup>rd</sup> Week (12 May 2021 – 19 May 2021); (d) 4<sup>th</sup> Week (20 May 2021 – 25 May 2021); (e) 5<sup>th</sup> Week (26 May 2021 – 1 June 2021); (f) 6<sup>th</sup> Week (2 June 2021 – 8 June 2021); (g) 7<sup>th</sup> Week (9 June 2021 – 15 June 2021); (h) 8<sup>th</sup> Week (16 June 2021 – 22 June 2021); (i) 9<sup>th</sup> Week (23 June 2021 – 29 June 2021); (j) 10<sup>th</sup> Week (30 June 2021 – 6 July 2021); (k) 11<sup>th</sup> Week (7 July 2021 – 13 July 2021); (l) 12<sup>th</sup> Week (14 July 2021 – 20 July 2021); (m) Week 13 (21 July 2021 – 27 July 2021); (n) Week 14 (28 July 2021 – 3 August 2021); (o) 15<sup>th</sup> Week (4 August 2021 – 10 August 2021); (p) 16<sup>th</sup> Week (11 August 2021 – 17 August 2021); (q) 17<sup>th</sup> Week (18 August 2021 – 24 August 2021); (r) 18<sup>th</sup> Week (25 August 2021 – 31 August 2021); (s) 19<sup>th</sup> Week (1 September 2021 – 7 September 2021); (t) 20<sup>th</sup> Week (8 September 2021 – 14 September 2021);



(u) 21<sup>st</sup> Week (15 September 2021 – 21 September 2021); (v) 22<sup>nd</sup> Week (22 September 2021 – 28 September 2021); (w) 23<sup>rd</sup> Week (29 September 2021 – 5 October 2021); (x) 24<sup>th</sup> Week (4 October 2021 – 12 October 2021); (y) 25<sup>th</sup> Week (13 October 2021 – 19 October 2021); (z) 26<sup>th</sup> Week (20 October 2021 – 26 October 2021).



**Figure S5.** Distribution map of Surabaya Industries. The red circle (bottom) is called the Gerbangkertosusilo area. It is the entrance area to the Surabaya and the surrounding area, includes Gresik–Bangkalan–Mojokerto–Surabaya–Sidoarjo–Lamongan.

**Table S1.** Location of Weighted Mean Center (WMC).

Week	Date	Coordinat X (m)	Coordinat Y (m)	WMC (Village)
1	28 April 2021 – 4 May 2021	690491.505	9191371.709	Ketintang
2	5 May 2021 – 11 May 2021	689363.660	9193374.052	Dukuh Pakis
3	12 May 2021 – 19 May 2021	686970.804	9193297.146	Pradahkali Kendal
4	20 May 2021 – 25 May 2021	694193.433	9193105.752	Baratajaya
5	26 May 2021 – 1 June 2021	690289.795	9195714.877	Banyu Urip
6	2 June 2021 – 8 June 2021	687118.472	9192483.670	Wiyung
7	9 June 2021 – 15 June 2021	689446.500	9194591.563	Dukuh Kupang
8	16 June 2021 – 22 June 2021	691448.149	9193282.331	Darmo
9	23 June 2021 – 29 June 2021	692959.379	9189365.370	Kutisari
10	30 June 2021 – 6 July 2021	693748.499	9193659.268	Pucang Sewu
11	7 July 2021 – 13 July 2021	691619.805	9191239.394	Margorejo
12	14 July 2021 – 20 July 2021	697205.301	9192097.089	Medokan Semampir
13	21 July 2021 – 27 July 2021	692271.624	9193645.441	Darmo
14	28 July 2021 – 3 August 2021	693622.804	9192651.546	Ngagelrejo
15	4 August 2021 – 10 August 2021	691793.009	9190756.498	Jemur Wonoasri
16	11 August 2021 – 17 August 2021	692674.419	9191722.292	Bendul Merisi
17	18 August 2021 – 24 August 2021	695039.162	9193606.229	Menur Pumpungan
18	25 August 2021 – 31 August 2021	691228.659	9191270.241	Ketintang
19	1 September 2021 – 7 September 2021	694389.574	9190909.745	Tenggilis Mejoyo
20	8 September 2021 – 14 September 2021	692841.732	9194333.037	Keputran
21	15 September 2021 – 21 September 2021	691338.223	9192912.292	Sawunggaling
22	22 September 2021 – 28 September 2021	683675.753	9196653.623	Manukan Kulon



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23	29 September 2021 – 5 October 2021	688798.646	9192411.546	Gunungsari
24	4 October 2021 – 12 October 2021	690597.087	9189792.971	Ketintang
25	13 October 2021 – 19 October 2021	689467.776	9193904.644	Pakis
26	20 October 2021 – 26 October 2021	681552.383	9196934.499	Bringin

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