

Supplementary information for

Spatiotemporal Analysis of Long-term Air Pollution in Two Urban Regions of Vietnam and Potential Source Contributions

Table S1. List of industrial parks in Northern Vietnam

No	Name (abbr)	Lat	Lon	S (ha)	Active year	Filling rate
1	BG_Dinh-Tram	21.243	106.142	127.4	2003	100%
2	BG_Song-Khe-NH	21.245	106.177	158.7	2005	95%
3	BG_Quang-Chau	21.224	106.115	426	2006	90%
4	BG_Van-Trung	21.244	106.134	350.3	2007	85%
5	BG_Viet-Han	21.255	106.144	197.3	2010	70%
6	BG_Hoa-Phu	21.239	105.965	207.4	2011	65%
7	BG_Tan-Hung	21.349	106.293	105.3	2012	60%
8	BG_Chau-Minh-BL-HL	21.271	105.962	105.5	2024	0%
9	BG_Yen-Lu	21.193	106.193	377	2021	5%
10	BK_Thanh-Binh	21.934	105.804	153.8	2007	50%
11	HNa_Dong-VanI	20.667	105.928	138	2002	100%
12	HNa_Dong-VanII	20.659	105.930	263.82	2006	97%
13	HNa_Dong-VanIII	20.635	105.932	523	2019	Updating
14	HNa_Dong-VanIV	20.634	105.886	300	2016	Updating
15	HNa_Hoa-Mac	20.649	106.000	131	2008	>90%
16	HNa_Chau-Son	20.522	105.894	376.9	2010	>85%
17	HNa_Kim-BangI	20.628	105.852	230	2023	10%
18	HNa_Thai-Ha	20.586	106.104	133	2016	~70%
19	HNa_Hoang-Dong	20.629	105.925	100	2005	Updating
20	HNo_Noi-Bai	21.232	105.814	114	1994	100%
21	HNo_Thach-That	21.010	105.634	150.78	2007	100%

No	Name (abrre)	Lat	Lon	S (ha)	Active year	Filling rate
22	HNo_Thang-Long	21.116	105.780	302	1997	100%
23	HNo_Phu-Nghia	20.929	105.671	170.1	2007	100%
24	HNo_Sai-DongB	21.029	105.903	97.11	1996	100%
25	HNo_Sach-Soc-Son	21.240	105.833	303	2021	50%
26	HNo_HANSSIP	20.709	105.915	640	2023	100%
27	HNo_Dai-Tu	21.032	105.924	40	1995	100%
28	HNo_Nam-Thang-Long	21.081	105.763	260.87	1999	100%
29	HNo_Quang-Minh	21.193	105.766	344.4	2004	100%
30	HD_Nam-Sach	20.967	106.372	63	2003	100%
31	HD_Dai-An	20.928	106.258	136	2003	88%
32	HD_Phuc-Dien	20.929	106.193	170	2003	100%
33	HD_Tan-Truong	20.930	106.227	198	2005	94%
34	HD_Dai-An-MR	20.929	106.272	416	2007	74%
35	HD_KTC-An-Phat	20.939	106.288	46.4	2019	61%
36	HD_Lai-Vu	20.982	106.394	212.9	2007	89%
37	HD_Lai-Cach	20.936	106.265	134.55	2008	40%
38	HD_Cong-Hoa	21.124	106.418	700	2007	Updating
39	HD_Phu-Thai	20.967	106.519	56.7	2021	98%
40	HD_CD-LD-VSIP	20.933	106.171	183.96	2008	Updating
41	HP_Deep-CI	20.842	106.764	541	1997	100%
42	HP_Deep-CII	20.799	106.793	377	2016	85%
43	HP_Deep-CIII	20.819	106.784	502	2018	60%
44	HP_VSIP	20.909	106.701	1.6	2010	90%
45	HP_Trang-Due	20.861	106.567	600+	2011	95%
46	HP_An-Duong	20.869	106.584	196	2008	90%
47	HP_Nomura	20.902	106.593	153	1994	100%
48	HP_Nam-Dinh-Vu	20.816	106.812	160	2008	75%
49	HP_MP-Dinh-Vu	20.826	106.771	260	2021	30%
51	HP_Deep-CIV	20.868	106.706	200	2021	Updating

No	Name (abbr)	Lat	Lon	S (ha)	Active year	Filling rate
52	HP_Ben-Rung	20.909	106.723	200	2021	Updating
53	HP_Cau-Cuu	20.791	106.518	264	2020	80%
54	HP_Nam-Cau-Kieu	20.910	106.634	263	2008	75%
55	HB_Luong-Son	20.885	105.546	68,5	2005	~95%
56	HB_Yen-Quang	20.987	105.414	200	2021	~40%
58	HB_Mong-Hoa	20.902	105.414	230	2000	~50%
60	HB_Thanh-Ha	20.585	105.683	140	2011	50%
61	HY_Pho-Noi	20.954	106.027	688.94	2003	100%
62	HY_Thang-LongII	20.918	106.069	525.7	2006	70%
63	HY_Det-may-Pho-Noi	20.927	106.065	121.81	2005	100%
64	HY_Yen-My	20.896	106.059	280	2008	100%
65	HY_Yen-MyII	20.877	106.044	313.5	2010	100%
67	HY_Minh-Duc	20.915	106.123	198	2007	100%
68	HY_Minh-Quang	20.921	106.116	150	2008	100%
69	HY_CNS	20.827	106.044	143.08	2021	14%
70	HY_So3	20.838	106.047	159.71	2021	50%
71	LS_Dong-Banh	21.568	106.494	162,13	2021	50%%
72	LS_Huu-Lung	21.493	106.365	560	2025	2%%
73	LS_Na-Duong	21.699	106.976	270	2021	60%
74	PT_Thuy-Van	21.340	105.344	335	2005	~95%
75	PT_Trung-Ha	21.233	105.339	100	2006	~90%
76	PT_Phu-Ninh	21.379	105.339	100	2008	~85%
79	QN_Dong-Mai	21.004	106.835	160	2014	~90%
80	QN_Song-Khoai	20.981	106.807	714	2021	~45%
81	QN_Viet-Hung	21.008	106.995	301	2007	80%
82	QN_Dam-Nha-Mac	20.889	106.821	4988	2014	90%
83	QN_Bac-Tien-Phong	20.895	106.829	5789	2018	Updating
84	TB_Gia-Le	20.504	106.358	42	2004	~90%
86	TB_Lien-Ha-Thai	20.551	106.537	588.84	2022	~30%
87	TB_Thaco	20.646	106.425	194.36	2025	0%
88	TB_VSIP	20.614	106.615	344	2024	5%

No	Name (abbr)	Lat	Lon	S (ha)	Active year	Filling rate
89	TN_Yen-Binh	21.429	105.895	400	2014	~100%
90	TN_Song-CongI	21.481	105.862	195	2005	~95%
91	TN_Song-CongII	21.506	105.844	250	2018	~80%
92	TN_Nam-Pho-Yen	21.354	105.875	120	2016	>90%
93	TN_Diem-Thuy	21.468	105.892	350	2012	~85%
94	TN_Quyet-Thang	21.577	105.793	160	2006	~75%
95	TQ_Long-Binh-An	21.737	105.245	100	2007	90%
96	TQ_Son-Nam	21.529	105.481	150	2014	50%

Information compiled from various sources

<https://bqlkcن.bacgiang.gov.vn/>

<https://izahanam.gov.vn/cac-khu-cong-nghiep-ha-nam>

<https://www.redsunland.vn/>

https://hiza.hanoi.gov.vn/thong-tin-du-lieu/-/view_content/5669775-tong-hop-csdl-moi-truong-khu-cong-nghiep.html

<https://web01.haiduong.gov.vn/Trang/ChiTietTinTuc.aspx?nid=13053>

<https://als.com.vn/danh-sach-cac-khu-cong-nghiep-o-hai-duong>

<https://haiphong.gov.vn/cac-so-ban-nganh/ban-quan-ly-khu-kinh-te-hai-phong-629878>

<https://heza.gov.vn>

<https://ips.hoabinh.gov.vn>

<https://banqlkcن.hungyen.gov.vn/danh-muc-cac-kcn-da-duoc-quy-hoach-tren-dia-ban-tinh-hung-yen-c2611.html>

<http://bqlkcن.phutho.gov.vn>

<https://www.qeza.gov.vn/dskcn/vi/>

<https://bqlkktkcن.thaibinh.gov.vn/>

https://bqlkktkcن.thaibinh.gov.vn/upload/80597/20171027/d0d18c899d6d2b480402be729bba30e781-bc-bqlkcن_sign.pdf

<https://bqlkcن.thainguyen.gov.vn/cac-khu-cong-nghiep>

<https://bqlkcن.tuyenquang.gov.vn/>

Table S2. List of industrial parks in Southern Vietnam

No	Name (abbr)	Lat	Lon	S (ha)	Active year	Filling rate
1	HCM_Dong-Nam	10.966	106.623	342	2008	90%
2	HCM_Vinh-Loc	10.822	106.592	207	1997	95%
3	HCM_Vinh-Loc3	10.828	106.591	210	2010	60%
4	HCM_Tan-Binh	10.808	106.611	178	1997	100%
5	HCM_Tan-Tao	10.734	106.586	343.9	1996	97%
6	HCM_Tan-Phu-Trung	10.921	106.544	542	2003	100%
7	HCM_An-Ha	10.820	106.515	159	2008	70%
8	HCM_Hiep-Phuoc	10.631	106.756	1686	1996	85%
9	HCM_Tan-Thoi-Hiep	10.882	106.637	200	1999	100%
10	HCM_Tay-Bac-Cu-Chi	10.983	106.485	208	1997	96%
11	HCM_Le-Minh-Xuan	10.742	106.543	700	1997	100%
12	HCM_Le-Minh-XuanII	10.756	106.556	319	2012	70%
13	HCM_Linh-TrungI	10.868	106.768	62	1995	100%
14	HCM_Linh-TrungII	10.889	106.721	62.5	2000	100%
15	HCM_Binh-Chieu	10.884	106.733	27.3	2000	90%
16	HCM_Tan-Thuan	10.756	106.738	300	1991	60%
17	HCM_Phong-Phu	10.697	106.633	148	2010	70%
18	HCM_Cat-LaiII	10.763	106.778	137	2003	100%
19	HCM_Cong-nghe-cao	10.827	106.798	913	2002	99%
20	LA_Cau-Tram	10.631	106.591	77,82	2008	100%
21	LA_Long-Hau	10.635	106.718	136,11	2006	95%
22	LA_Tan-Duc	10.788	106.478	545,69	2005	100%
23	LA_Xuyen-A	10.882	106.522	302,45	2004	85%
24	LA_Phuc-Long	10.625	106.512	78,96	2003	100%
25	LA_Vinh-Loc-2	10.641	106.518	561,5	2007	80%
26	LA_Nhut-Chanh	10.620	106.478	122,75	2006	90%
27	LA_Thinh-Phat	10.756	106.434	74	2005	100%
28	LA_Tan-Kim	10.637	106.664	104,1	2005	85%
29	LA_Dong-Nam-A	10.642	106.659	605	2016	Updating
30	LA_Duc-Hoai-HP	10.796	106.501	204,2	2003	95%

No	Name (abbr)	Lat	Lon	S (ha)	Active year	Filling rate
31	LA_Thuan-Dao	10.621	106.493	300	2003-2012	100%
32	LA_Cau-Cang-Phuoc-Dong	10.488	106.644	83,2	2007	85%
33	LA_Thai-Hoa	10.924	106.473	100,27	2008	80%
34	LA_Duc-HoaIII-Anh-Hong	10.932	106.450	44,87	2009	75%
35	LA_Duc-HoaIII-SLICO	10.931	106.461	295,66	2011	65%
36	LA_An-Nhut-Tan	10.573	106.510	120	2012	60%
37	LA_Tan-Do	10.799	106.491	209,1	2013	85%
38	LA_Phu-An-Thanh	10.682	106.457	352,57	2014	75%
39	LA_Hai-Son	10.800	106.481	338	2015	80%
40	LA_DNN-Tan-Phu	10.900	106.350	262	2016	70%
41	LA_Nam-Thuan	10.838	106.505	341,42	2017	65%
42	LA_Viet-Phat	10.722	106.323	1.213,7	2018	60%
43	LA_Huu-Thanh	10.779	106.449	524	2019	10%
44	DNa_Amata	10.942	106.892	513	1994	91%
45	DNa_Bien-HoaI	10.916	106.867	335	2000	100%
46	DNa_Bien-HoaII	10.926	106.875	395	1995	100%
47	DNa_Long-Binh	10.939	106.891	43.26	2007	100%
48	DNa_Loteco	10.929	106.888	100	1996	100%
49	DNa_Tam-Phuoc	10.867	106.941	323	2003	100%
50	DNa_Long-Thanh	10.828	106.932	487	2003	49%
51	DNa_An-Phuoc	10.849	106.959	201	2012	97%
52	DNa_Go-Dau	10.639	107.036	182	2004	100%
53	DNa_Nhon-TrachI	10.741	106.926	448	1997	100%
54	DNa_Nhon-TrachII	10.725	106.924	331	1997	100%
55	DNa_Nhon-TrachIII	10.710	106.943	1035	1997	95%
56	DNa_Nhon-TrachV	10.706	106.923	298	2003	100%
57	DNa_Nhon-TrachVI	10.699	106.946	314	2004	100%
58	DNa_Nhon-Trach-LK	10.717	106.920	108	2006	85%
59	DNa_Nhon-Trach-NP	10.721	106.913	183	2005	100%

No	Name (abbr)	Lat	Lon	S (ha)	Active year	Filling rate
60	DNa_Song-May	10.981	106.954	473	1998	90%
61	DNa_Bau-Xeo	10.957	107.026	500	2006	98%
62	DNa_Giang-Dien	10.903	106.989	529	2008	70%
63	DNa_Ong-Keo	10.639	106.837	823	2008	90%
64	DNa_Ho-Nai	10.950	106.939	497	2000	41%
65	DNa_Tam-An	10.826	106.914	201	2010	80%
66	DNa_Phuoc-Binh	10.686	107.101	190	2012	90%
67	DNa_Long-Duc	10.845	106.983	300	2009	90%
68	DNa_Cam-My	10.771	107.178	150	2017	80%
69	DNa_Det-may-Nhon-Trach	10.699	106.931	176	2003	97%
70	DNa_Long-Khanh	10.964	107.233	264	2008	91%
71	BD_VSIPI	10.931	106.719	500	1996	100%
72	BD_Viet-HuongI	10.944	106.712	36	1996	100%
73	BD_Dong-AnI	10.900	106.729	138	1997	100%
74	BD_Song-ThanI	10.889	106.748	178	1995	100%
75	BD_Song-ThanII	10.918	106.743	279	1996	100%
76	BD_Tan-Dong-HiepB	10.925	106.784	52.8	2000	100%
77	BD_Tan-Dong-HiepA	10.911	106.777	169	2001	85%
78	BD_Det-may-Binh-An	10.894	106.820	26	2003	96%
79	BD_Binh-Duong	10.870	106.755	17	2003	96%
80	BRVT_Phu-MyI	10.591	107.039	945	1998	95%
81	BRVT_My-XuanA	10.645	107.032	300	2002	100%
82	BRVT_My-XuanA2	10.632	107.040	422	2003	96%
83	BRVT_Dong-Xuyen	10.404	107.111	161	1996	100%
84	BRVT_My-XuanB1-Conac	10.636	107.066	227	2012	98%
85	BRVT_My-XuanB1-TH	10.649	107.073	200	2006	70%
86	BRVT_My-XuanB1-DD	10.646	107.062	146	2006	45%
87	BRVT_Cai-Mep	10.555	107.045	670	2002	70%
88	BRVT_Chau-Duc	10.591	107.170	1556	2008	40%
89	BRVT_Da-Bac	10.578	107.285	295	2015	95%

No	Name (abbr)	Lat	Lon	S (ha)	Active year	Filling rate
90	BRVT_Dat-Do	10.518	107.307	496	2009	60%
91	BRVT_Long-Son	10.463	107.057	850	2008	60%
92	BRVT_Phú-MyIII	10.530	107.064	1050	2007	60%
93	BRVT_Phú-MyII	10.573	107.043	621	2006	77%
94	BT_Giao-Long	10.300	106.399	101	2006	100%
95	BT_An-Hiep	10.270	106.284	68.5	2007	100%
96	BT_Giao-LongII	10.294	106.414	67	2012	100%
97	TG_My-Tho	10.359	106.361	79.14	1997	100%
98	TG_Tan-Huong	10.485	106.359	197.02	2006	100%
99	TG_Long-Giang	10.467	106.314	540	2007	83%
100	TG_Dau-khi- Soai-Rap	10.422	106.761	285.38	2021	13%

Information compiled from various sources

<https://hepza.hochiminhcity.gov.vn>

<https://teamkcn.com/danh-sach-khu-cong-nghiep-o-tinh-long-an-d456779/>

<https://www.minhhungsikico.vn/vi/blog/danh-sach-khu-cong-nghiep-binh-duong-91.html>

<https://ittpa.baria-vungtau.gov.vn/>

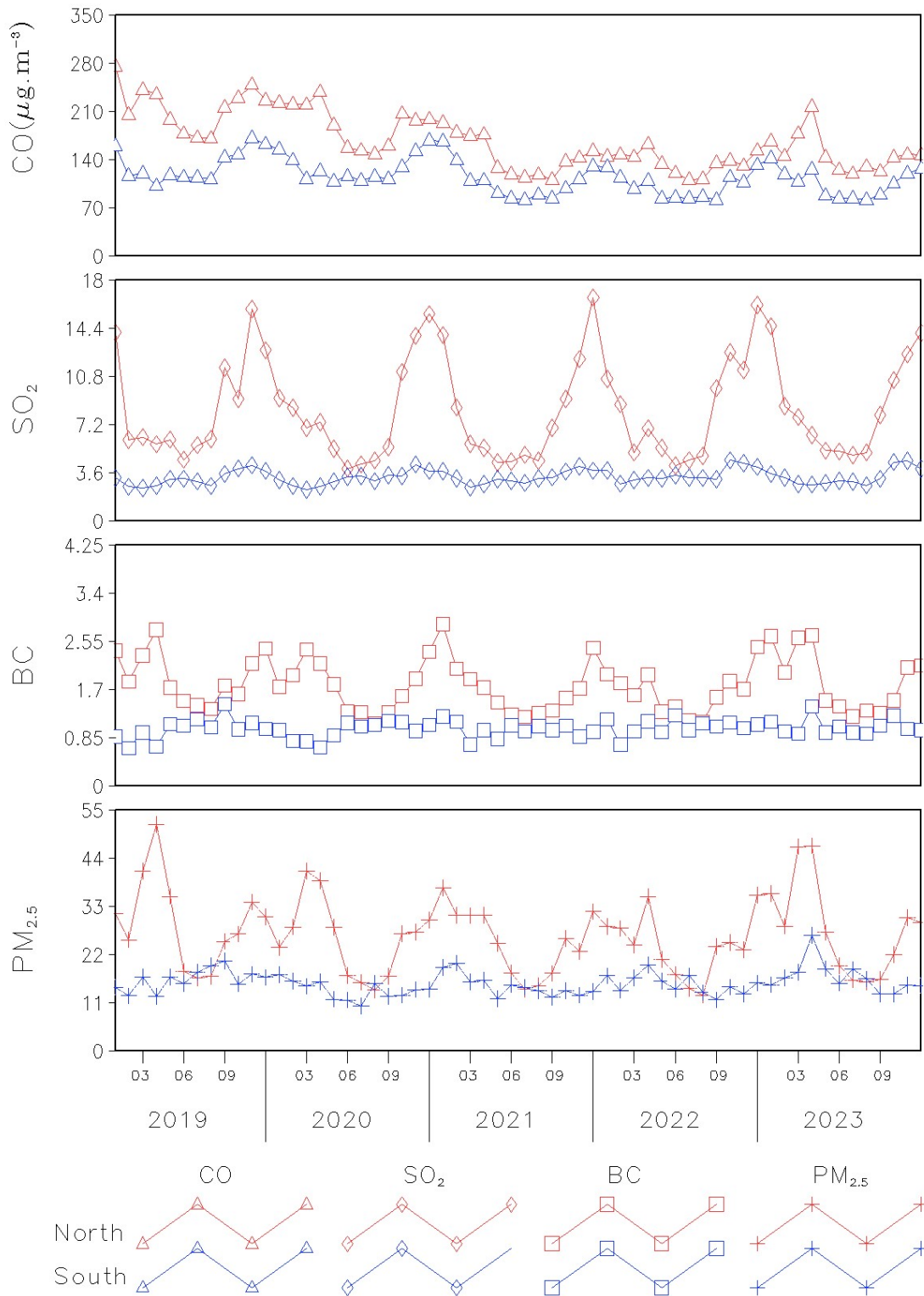


Figure S1. Monthly value of pollutants over the period (2019-2023) in North and South regions of Vietnam.

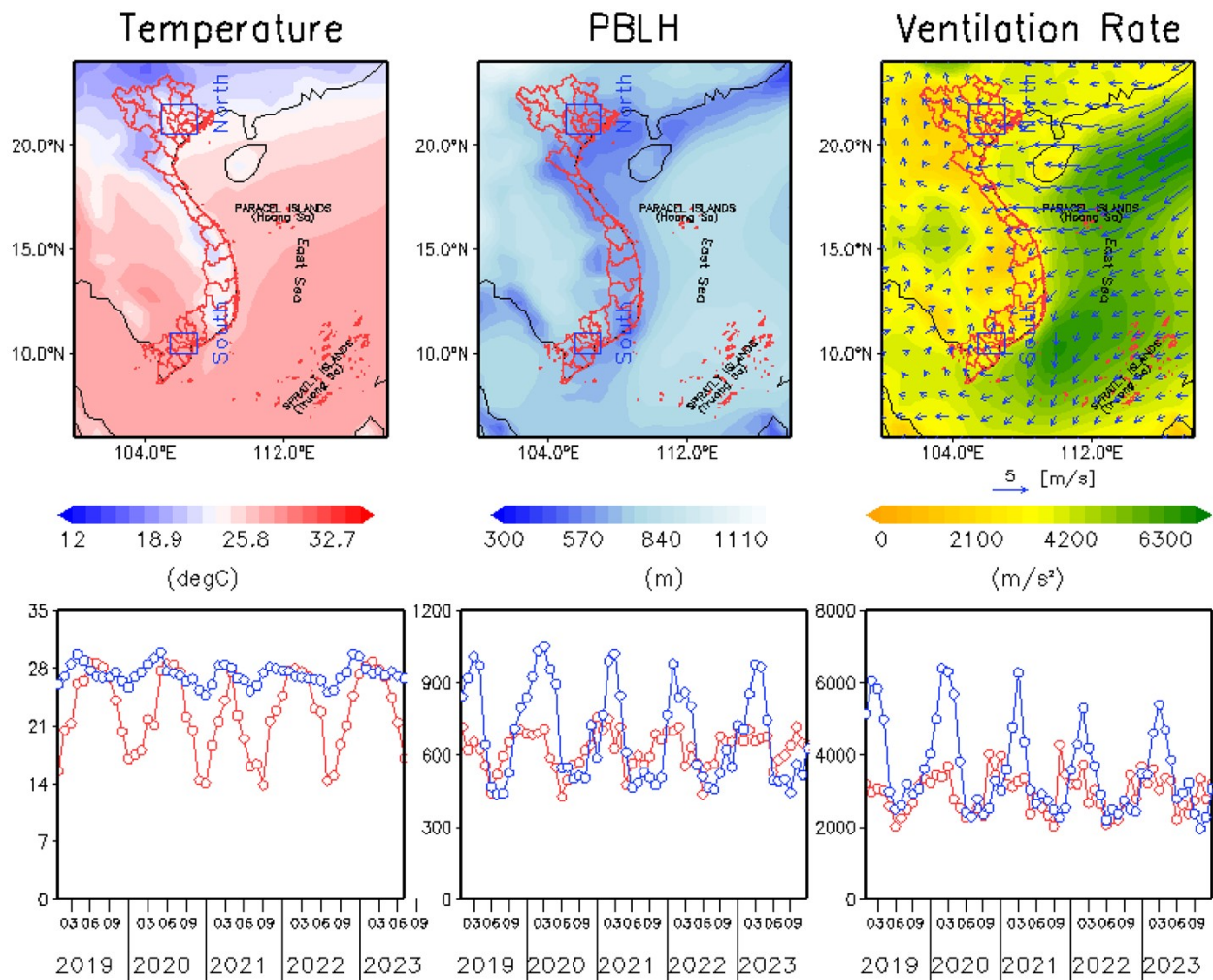


Figure S2. Spatial distribution and time series of wind speed, planetary boundary layer height, and ventilation rate in Vietnam and average over two regions of Vietnam over period of 2019-2023.