

1 **TABLES**

2 **Table S1.** Summary data for sequencing data from the 96 PM samples.

Sample code	Number of raw reads	Number of valid reads	Sample date	Particulate matter type	AQI/day type	Number of OTUs	Good's coverage estimator (%)	Chao1	Shannon
1D	29739	28353	9/16/2014	PM2.5	66/non-haze	167	99.91%	180	3.32
1E	38788	36243	9/16/2014	PM10	66/non-haze	464	99.80%	491	5.09
1F	41724	39440	9/16/2014	TSP	66/non-haze	255	99.94%	259	4.78
2D	37512	35795	9/18/2014	PM2.5	104/light-haze	190	99.89%	253	4.02
2E	39440	36989	9/18/2014	PM10	104/light-haze	243	99.90%	265	4.72
2F	40132	36390	9/18/2014	TSP	104/light-haze	431	99.81%	453	4.12
3D	27666	26432	9/20/2014	PM2.5	173/light-haze	135	99.97%	138	4.27
3E	39074	36580	9/20/2014	PM10	173/light-haze	319	99.87%	347	4.62
3F	35863	33037	9/20/2014	TSP	173/light-haze	434	99.80%	471	5
4D	33053	24588	9/21/2014	PM2.5	116/light-haze	389	99.83%	405	3.66
4E	37783	36840	9/21/2014	PM10	116/light-haze	603	98.70%	814	2.35
4F	34782	25913	9/21/2014	TSP	116/light-haze	1126	98.86%	1257	5.69
5D	38202	36716	9/27/2014	PM2.5	74/non-haze	170	99.93%	179	3.19
5E	39525	35644	9/27/2014	PM10	74/non-haze	1158	98.16%	1423	5.34
5F	43865	42248	9/27/2014	TSP	74/non-haze	632	98.78%	832	2.69
6D	28306	26133	9/29/2014	PM2.5	43/non-haze	230	99.94%	233	4.41
6E	37552	35347	9/29/2014	PM10	43/non-haze	999	98.57%	1190	4.82
6F	35499	32128	9/29/2014	TSP	43/non-haze	679	99.54%	730	5.16
7D	42368	40640	9/30/2014	PM2.5	74/non-haze	200	99.94%	206	4.39

7E	42953	34879	9/30/2014	PM10	74/non-haze	973	99.04%	1115	5.55
7F	44876	34274	9/30/2014	TSP	74/non-haze	1631	96.94%	2124	5.86
8D	32400	30998	10/8/2014	PM2.5	328/heavy-haze	111	99.98%	112	3.4
8E	40839	38431	10/8/2014	PM10	328/heavy-haze	223	99.94%	229	4.24
8F	34743	32294	10/8/2014	TSP	328/heavy-haze	285	99.92%	295	4.35
9D	43713	36782	10/9/2014	PM2.5	352/heavy-haze	314	99.85%	333	3.41
9E	31003	29070	10/9/2014	PM10	352/heavy-haze	216	99.90%	226	3.43
9F	46539	42225	10/9/2014	TSP	352/heavy-haze	327	99.74%	365	3.79
10D	25067	24103	10/12/2014	PM2.5	15/non-haze	186	99.94%	197	3.42
10E	44615	41447	10/12/2014	PM10	15/non-haze	410	99.88%	425	4.87
10F	45518	35780	10/12/2014	TSP	15/non-haze	1,388	97.72%	1733	5.79
11D	33287	30246	10/17/2014	PM2.5	151/light-haze	404	99.88%	422	5.21
11E	34413	31797	10/17/2014	PM10	151/light-haze	632	98.97%	858	4.12
11F	37073	31846	10/17/2014	TSP	151/light-haze	903	98.84%	1175	5.61
12D	39379	37658	10/18/2014	PM2.5	303/heavy-haze	199	99.93%	210	2.76
12E	39843	36393	10/18/2014	PM10	303/heavy-haze	920	98.81%	1074	4.48
12F	35200	22909	10/18/2014	TSP	303/heavy-haze	1485	97.73%	1791	5.9
13D	32629	27077	10/19/2014	PM2.5	211/heavy-haze	512	99.38%	592	4.05
13E	38138	35198	10/19/2014	PM10	211/heavy-haze	523	99.67%	554	4.33
13F	44430	35372	10/19/2014	TSP	211/heavy-haze	1,052	99.00%	1153	5.48
14D	29168	28252	10/20/2014	PM2.5	144/light-haze	221	99.90%	236	2.56
14E	36253	25547	10/20/2014	PM10	144/light-haze	1,245	98.74%	1369	5.92
14F	30005	26327	10/20/2014	TSP	144/light-haze	857	99.12%	974	5.29
15D	32656	30915	10/23/2014	PM2.5	204/heavy-haze	281	99.70%	327	3.45
15E	38909	36174	10/23/2014	PM10	204/heavy-haze	1,138	97.81%	1486	4.54
15F	44687	34823	10/23/2014	TSP	204/heavy-haze	1,424	97.55%	1787	5.35

16D	33276	27270	10/30/2014	PM2.5	213/heavy-haze	424	99.65%	459	3.62
16E	33127	26855	10/30/2014	PM10	213/heavy-haze	433	99.26%	539	3.17
16F	30961	21116	10/30/2014	TSP	213/heavy-haze	890	98.76%	1036	4.43
17D	34166	30685	10/31/2014	PM2.5	175/light-haze	246	99.87%	261	3.95
17E	26659	18402	10/31/2014	PM10	175/light-haze	912	99.27%	979	4.98
17F	30291	21497	10/31/2014	TSP	175/light-haze	1050	98.68%	1211	5.56
18D	27519	20526	11/1/2014	PM2.5	31/non-haze	466	99.70%	496	4.02
18E	42531	33617	11/1/2014	PM10	31/non-haze	1072	98.73%	1215	5.17
18F	46526	32583	11/1/2014	TSP	31/non-haze	1369	98.15%	1628	5.83
19D	30009	22339	11/2/2014	PM2.5	48/non-haze	904	99.06%	1017	4.79
19E	28345	21208	11/2/2014	PM10	48/non-haze	1061	98.97%	1182	5.35
19F	34573	23870	11/2/2014	TSP	48/non-haze	1578	97.59%	1879	5.92
20D	33468	32260	11/20/2014	PM2.5	374/heavy-haze	353	99.51%	418	2.62
20E	42908	30080	11/20/2014	PM10	374/heavy-haze	1411	98.52%	1579	5.98
20F	48598	33719	11/20/2014	TSP	374/heavy-haze	1674	97.72%	1960	6.21
21D	14674	33021	11/23/2014	PM2.5	143/light-haze	335	99.85%	365	5.1
21E	29317	32692	11/23/2014	PM10	143/light-haze	452	99.82%	471	5.25
21F	31789	40854	11/23/2014	TSP	143/light-haze	547	99.81%	568	5.38
22D	31216	21563	11/25/2014	PM2.5	250/heavy-haze	413	99.52%	466	3.45
22E	36289	26636	11/25/2014	PM10	250/heavy-haze	1391	98.24%	1628	5.93
22F	39388	25794	11/25/2014	TSP	250/heavy-haze	1654	97.57%	1981	6.08
23D	38361	27450	12/17/2014	PM2.5	138/light-haze	613	99.26%	691	3.74
23E	48934	29970	12/17/2014	PM10	138/light-haze	1566	98.03%	1789	5.92
23F	45283	26005	12/17/2014	TSP	138/light-haze	1970	96.66%	2437	6.21
24D	48508	29454	12/24/2014	PM2.5	37/non-haze	537	99.41%	601	3.7
24E	38498	34945	12/24/2014	PM10	37/non-haze	1339	97.62%	1693	4.85

24F	42479	24642	12/24/2014	TSP	37/non-haze	1427	98.08%	1678	5.58
25D	29598	20772	1/8/2015	PM2.5	186/light-haze	794	98.77%	954	4.02
25E	44952	30880	1/8/2015	PM10	186/light-haze	1786	97.08%	2175	5.76
25F	29222	17782	1/8/2015	TSP	186/light-haze	1906	96.83%	2353	6.21
26D	40022	38526	1/12/2015	PM2.5	251/heavy-haze	697	99.23%	803	4.36
26E	33480	20095	1/12/2015	PM10	251/heavy-haze	1191	97.78%	1526	4.53
26F	40388	27761	1/12/2015	TSP	251/heavy-haze	1801	96.69%	2300	5.96
27D	35654	22830	1/13/2015	PM2.5	304/heavy-haze	485	99.54%	531	4.14
27E	42760	23195	1/13/2015	PM10	304/heavy-haze	1354	97.69%	1702	5.4
27F	32188	18672	1/13/2015	TSP	304/heavy-haze	1323	98.48%	1510	5.68
28D	37799	24539	1/14/2015	PM2.5	355/heavy-haze	562	99.58%	599	4.17
28E	39341	25331	1/14/2015	PM10	355/heavy-haze	1021	98.52%	1203	4.62
28F	62460	34517	1/14/2015	TSP	355/heavy-haze	1556	97.45%	1922	5.67
29D	29759	28832	1/16/2015	PM2.5	164/light-haze	512	99.20%	615	3.31
29E	43350	30878	1/16/2015	PM10	164/light-haze	1092	98.39%	1286	4.57
29F	32926	18291	1/16/2015	TSP	164/light-haze	1151	98.67%	1325	5.2
30D	32503	30865	1/27/2015	PM2.5	109/light-haze	174	99.94%	185	4.45
30E	31847	28673	1/27/2015	PM10	109/light-haze	498	99.79%	525	5.4
30F	36203	31445	1/27/2015	TSP	109/light-haze	874	99.70%	897	5.99
31D	36666	32640	1/28/2015	PM2.5	24/non-haze	155	99.64%	209	0.58
31E	37326	28654	1/28/2015	PM10	24/non-haze	1116	97.70%	1548	4.29
31F	35279	25248	1/28/2015	TSP	24/non-haze	1435	98.15%	1661	5.51
32D	42550	41349	2/1/2015	PM2.5	170/light-haze	473	99.17%	643	3
32E	31436	21605	2/1/2015	PM10	170/light-haze	1142	98.01%	1389	4.76
32F	73429	42943	2/1/2015	TSP	170/light-haze	1555	97.38%	1917	5.76

5 **Table S2. Environmental factors of 32 sampling dates investigated.**

Date	AQI	PM2.5 ($\mu\text{g}/\text{m}^3$)	PM10 ($\mu\text{g}/\text{m}^3$)	SO ₂ ($\mu\text{g}/\text{m}^3$)	NO ₂ ($\mu\text{g}/\text{m}^3$)	CO ($\mu\text{g}/\text{m}^3$)	Temp (°C)	RH (%)
9/16/2014	66	43	81	6	70	0.7	18	58
9/18/2014	104	78	121	4	55	0.7	20	62
9/20/2014	173	131	204	18	62	1.9	22	69
9/21/2014	116	87	140	19	53	1.7	22	73
9/27/2014	74	99	98	5	61	1	20	60
9/29/2014	43	20	43	10	37	0.6	15	45
9/30/2014	74	53	96	8	59	0.8	14	53
10/8/2014	328	278	348	7	100	2.6	16	84
10/9/2014	352	301	331	9	103	2.3	17	85
10/12/2014	15	8	182	3	41	0.3	13	25
10/17/2014	151	115	176	14	105	1.6	15	56
10/18/2014	303	253	325	29	132	3.2	17	68
10/19/2014	211	160	218	10	68	1.2	16	83
10/20/2014	144	110	107	17	65	1.3	14	59
10/23/2014	204	153	199	16	89	2.2	13	79
10/30/2014	213	162	149	19	104	2	13	69
10/31/2014	175	132	142	6	61	1.8	13	75
11/1/2014	31	10	30	6	30	0.3	12	21
11/2/2014	48	23	48	4	43	0.8	9	36
11/20/2014	374	324	383	12	121	4.6	4	81
11/21/2014	143	109	145	10	76	2.3	4	76
11/25/2014	250	200	242	16	88	3.1	3	85
12/17/2014	138	105	159	65	89	3.1	-1	40
12/24/2014	37	12	23	16	56	0.8	1	33
1/8/2015	186	140	162	34	104	2.9	1	38
1/12/2015	251	206	245	35	74	2.2	-1	57
1/13/2015	304	254	280	46	98	2.9	-1	64
1/14/2015	355	304	318	27	101	3.8	-2	83
1/16/2015	164	125	140	14	34	0.5	-1	30
1/27/2015	109	82	89	11	44	0.7	-3	25
1/28/2015	24	16	22	29	53	10.3	-1	43
2/1/2015	170	129	98	41	82	2.4	-2	35

7 **Table S3. Percent of dominant phyla, orders, and genera.**

Phylum	Percent	Order	Percent	Genus	Percent		
Proteobacteria	38.5%	Pseudomonadales	7.4%	<i>Acinetobacter</i>	3.8%		
				<i>Pseudomonas</i>	2.7%		
				<i>Psychrobacter</i>	0.5%		
				<i>Moraxella</i>	0.2%		
		Burkholderiales	5.6%			<i>Comamonas</i>	1.9%
						<i>Massilia</i>	1.1%
						<i>Achromobacter</i>	0.4%
						<i>Schlegelella</i>	0.4%
						<i>Limnobacter</i>	0.3%
		Rhizobiales	5.0%			<i>Methylobacterium</i>	1.9%
						<i>Ensifer</i>	1.4%
						<i>Rhizobium</i>	0.5%
						<i>Devosia</i>	0.3%
						<i>Aureimonas</i>	0.2%
						<i>Microvirga</i>	0.2%
		Enterobacteriales	4.7%			<i>Shigella</i>	2.2%
						<i>Enterobacter</i>	1.7%
						<i>Pantoea</i>	0.5%
		Rhodobacterales	3.9%			<i>Paracoccus</i>	2.5%
						<i>Rubellimicrobium</i>	1.1%
		Sphingomonadales	3.4%			<i>Sphingomonas</i>	2.5%
						<i>Altererythrobacter</i>	0.3%
		Methylophilales	1.9%			<i>Methylophilus</i>	1.1%
<i>Methylobacillus</i>	0.8%						
Xanthomonadales	1.9%			<i>Silanimonas</i>	1.2%		
Rhodospirillales	1.1%			<i>Roseomonas</i>	0.3%		
				<i>Skermanella</i>	0.2%		
Neisseriales	0.5%			<i>Neisseria</i>	0.5%		
Pasteurellales	0.4%			<i>Haemophilus</i>	0.4%		
Caulobacterales	0.4%			<i>Brevundimonas</i>	0.3%		
Rickettsiales	0.4%			<i>Mitochondria_norank</i>	0.4%		
Rhodocyclales	0.3%			<i>Methyloversatilis</i>	0.2%		
Alteromonadales	0.2%			<i>Shewanella</i>	0.2%		
Firmicutes	26.8%	Bacillales	16.1%	<i>Anoxybacillus</i>	6.6%		
				<i>Staphylococcus</i>	2.5%		
				<i>Bacillus</i>	1.5%		
				<i>Brevibacillus</i>	0.7%		
				<i>Paenibacillus</i>	0.7%		
				<i>Tumebacillus</i>	0.7%		
				<i>Planococcus</i>	0.7%		
				<i>Oxalophagus</i>	0.7%		

				<i>Exiguobacterium</i>	0.2%		
				<i>Virgibacillus</i>	0.2%		
				<i>Jeotgalicoccus</i>	0.2%		
		Clostridiales	6.7%			<i>Clostridium</i>	1.1%
						<i>Romboutsia</i>	0.6%
						<i>Ezakiella</i>	0.6%
						<i>Peptoniphilus</i>	0.5%
						<i>Anaerococcus</i>	0.3%
						<i>Mogibacterium</i>	0.2%
						Lactobacillales	3.4%
<i>Lactobacillus</i>	0.7%						
Erysipelotrichales	0.5%			<i>Turicibacter</i>	0.3%		
Actinobacteria	17.2%	Micrococcales	7.9%			<i>Kocuria</i>	1.7%
						<i>Cellulomonas</i>	1.7%
						<i>Arthrobacter</i>	1.0%
						<i>Micrococcus</i>	0.5%
						<i>Ornithinimicrobium</i>	0.4%
						<i>Brachybacterium</i>	0.4%
						<i>Yonghaparkia</i>	0.3%
						<i>Frondehabitans</i>	0.3%
						<i>Ornithinibacter</i>	0.3%
						<i>Microbacterium</i>	0.2%
		Corynebacteriales	2.8%			<i>Corynebacterium</i>	2.2%
						<i>Dietzia</i>	0.3%
		Propionibacteriales	1.9%			<i>Propionibacterium</i>	0.7%
						<i>Nocardioides</i>	0.5%
						<i>Marmoricola</i>	0.3%
Frankiales	1.1%			<i>Blastococcus</i>	0.6%		
Streptomyetales	0.5%			<i>Streptomyces</i>	0.5%		
Streptosporangiales	0.4%			<i>Nocardioopsis</i>	0.3%		
Bacteroidetes	7.7%	Sphingobacteriales	2.2%			<i>Flavisolibacter</i>	0.6%
						<i>Arcticibacter</i>	0.2%
						<i>Sphingobacterium</i>	0.2%
						<i>Taibaiella</i>	0.2%
		Cytophagales	2.0%			<i>Hymenobacter</i>	0.5%
						<i>Algoriphagus</i>	0.4%
						<i>Pontibacter</i>	0.2%
		Bacteroidales	1.9%			<i>Bacteroides</i>	0.8%
Flavobacteriales	1.6%			<i>Flavobacterium</i>	0.8%		
				<i>Chryseobacterium</i>	0.3%		
				<i>Myroides</i>	0.2%		
Deinococcus-Thermus	5.2%	Thermales	4.5%			<i>Thermus</i>	2.5%
						<i>Meiothermus</i>	1.9%

		Deinococcales	0.7%	<i>Deinococcus</i>	0.7%
Cyanobacteria	1.4%	Pleurocapsales	0.7%	<i>Chroococcidiopsis</i>	0.4%
				<i>Gloeocapsopsis</i>	0.2%

9 **Table S4. Information on the dominant bacterial genera (>1%) associated with**
 10 **PM2.5, PM10, and TSP.**

Genus	Percent in PM2.5	Percent in PM10	Percent in TSP
<i>Anoxybacillus</i>	9.5%	7.1%	3.1%
<i>Acinetobacter</i>	5.4%	3.6%	2.4%
<i>Pseudomonas</i>	4.0%	1.3%	2.9%
<i>Sphingomonas</i>	1.6%	2.6%	3.5%
<i>Staphylococcus</i>	3.9%	2.2%	1.6%
<i>Thermus</i>	3.3%	2.9%	1.4%
<i>Paracoccus</i>	1.0%	2.6%	3.8%
<i>Shigella</i>	3.8%	2.0%	0.8%
<i>Corynebacterium</i>	2.1%	2.4%	2.0%
<i>Comamonas</i>	3.0%	2.0%	0.8%
<i>Meiothermus</i>	3.1%	1.8%	0.9%
<i>Methylobacterium</i>	1.9%	1.9%	1.9%
<i>Enterobacter</i>	2.5%	2.3%	0.3%
<i>Kocuria</i>	0.5%	1.8%	2.7%
<i>Cellulomonas</i>	3.5%	0.7%	0.8%
<i>Bacillus</i>	1.7%	1.4%	1.3%
<i>Streptococcus</i>	1.5%	1.4%	1.4%
<i>Ensifer</i>	3.5%	0.4%	0.4%
<i>Silanimonas</i>	1.8%	1.2%	0.5%
<i>Clostridium</i>	0.4%	1.5%	1.5%
<i>Massilia</i>	0.5%	1.6%	1.2%
<i>Rubellimicrobium</i>	0.4%	1.2%	1.7%
<i>Methylophilus</i>	0.9%	0.4%	1.9%
<i>Arthrobacter</i>	0.4%	1.1%	1.5%

12 **Table S5. Information on the dominant bacterial genera (>1%) in non-, light-, and**
 13 **heavy-haze samples.**

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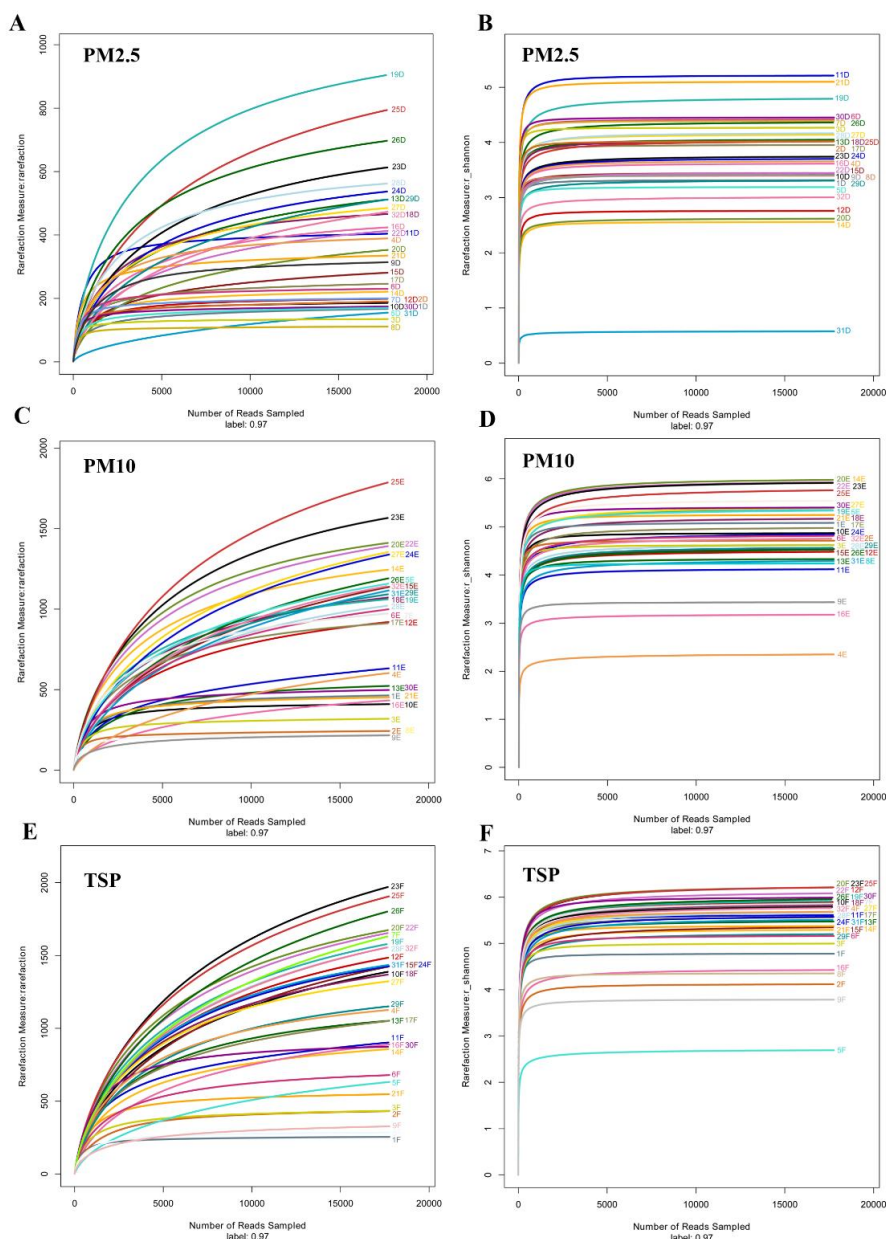
Genus	Percent in non-haze	Percent in light-haze	Percent in heavy-haze
<i>Anoxybacillus</i>	5.66%	6.03%	7.87%
<i>Acinetobacter</i>	3.30%	3.61%	4.40%
<i>Pseudomonas</i>	3.08%	2.23%	3.00%
<i>Sphingomonas</i>	3.47%	2.54%	1.80%
<i>Staphylococcus</i>	3.58%	2.18%	2.09%
<i>Thermus</i>	2.06%	2.25%	3.24%
<i>Paracoccus</i>	2.88%	2.46%	2.15%
<i>Shigella</i>	2.13%	1.55%	2.95%
<i>Corynebacterium</i>	1.96%	2.16%	2.34%
<i>Comamonas</i>	1.47%	2.14%	2.08%
<i>Meiothermus</i>	2.40%	1.09%	2.45%
<i>Methylobacterium</i>	1.88%	2.06%	1.66%
<i>Enterobacter</i>	0.41%	2.87%	1.42%
<i>Kocuria</i>	1.68%	1.97%	1.33%
<i>Cellulomonas</i>	4.12%	0.63%	0.76%
<i>Bacillus</i>	0.86%	1.80%	1.65%
<i>Streptococcus</i>	0.87%	1.45%	1.93%
<i>Ensifer</i>	0.18%	1.82%	2.00%
<i>Silanimonas</i>	1.29%	0.88%	1.35%
<i>Clostridium</i>	0.90%	1.07%	1.42%
<i>Massilia</i>	1.30%	0.90%	1.15%
<i>Rubellimicrobium</i>	1.14%	1.30%	0.80%
<i>Methylophilus</i>	3.20%	0.16%	0.28%
<i>Arthrobacter</i>	0.80%	1.31%	0.73%

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16 **Table S6. Permutation test of Canonical correspondence analysis.**

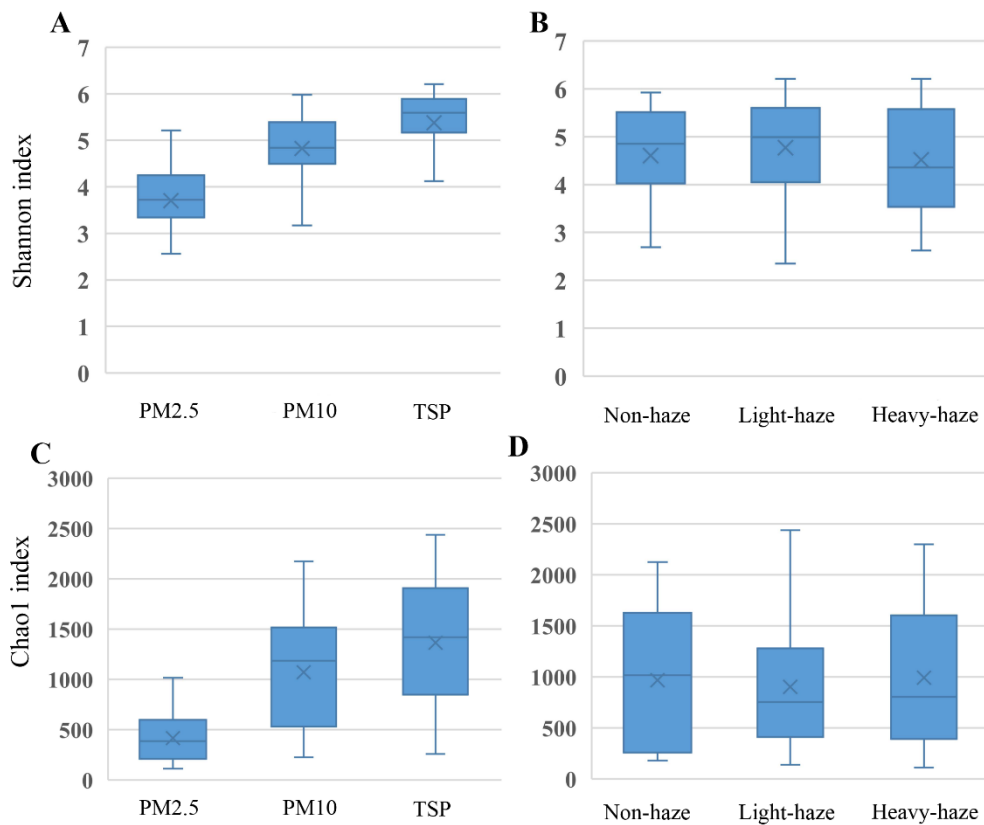
	CCA1	CCA2	r ²	Pr(>r)
PM2.5	-0.01603	0.99987	0.0280	0.288
PM10	-0.29290	0.95614	0.1028	0.006
SO ₂	0.99003	-0.14088	0.2855	0.001
NO ₂	-0.74160	-0.67084	0.0081	0.681
CO	0.99694	0.07819	0.0910	0.019
Temp	-0.98966	0.14343	0.7174	0.001
RH	-0.98068	0.19561	0.1209	0.003

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 20 Fig. S1 The rarefaction curves and Shannon index curves of PM samples.(A) Rarefaction curves of
 21 PM2.5 samples; (B) Shannon index curves of PM2.5 samples; (C) Rarefaction curves of PM10 samples;
 22 (D) Shannon index curves of PM10 samples; (E) Rarefaction curves of TSP samples; (F) Shannon index
 23 curves of TSP samples.

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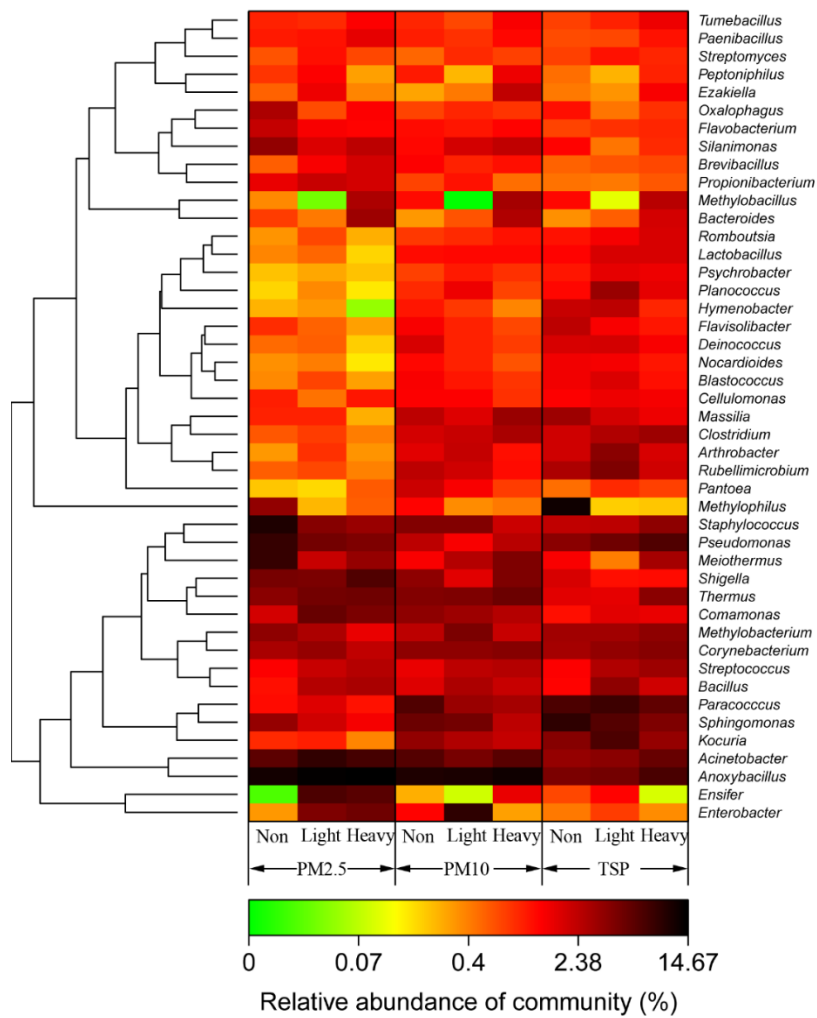
Fig. S2 Statistical comparisons of Chao1 and Shannon index among three PM fractions (PM2.5, PM10, TSP) and three haze levels (non-, light-, and heavy-haze). (A) Differences of Shannon index among three PM samples; (B) Difference of Shannon index among three haze-level samples; (C) Difference of Chao1 index among three PM samples; (D) Difference of Chao1 index among three haze-level samples.

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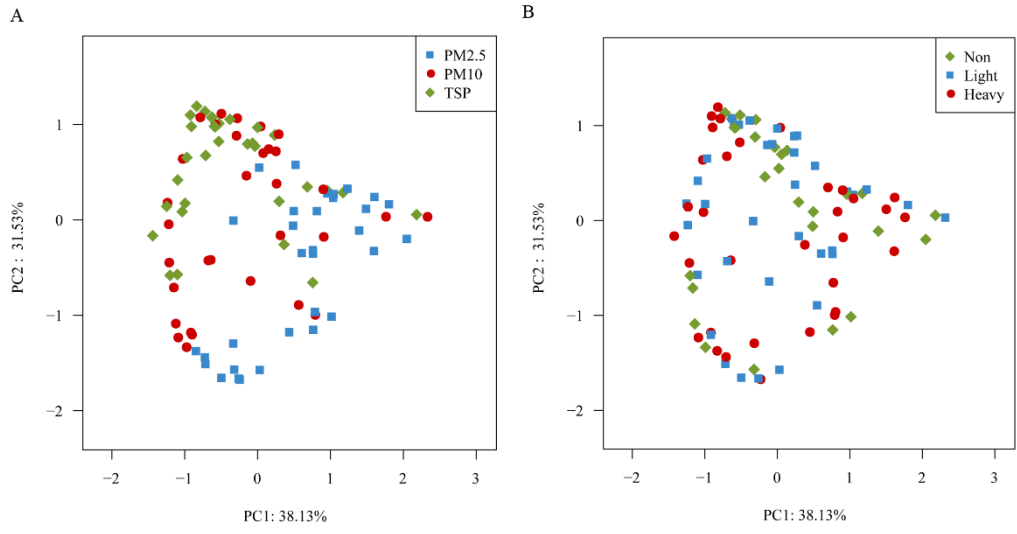


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35 Fig. S3 A heatmap diagram showing the distribution of the dominant bacterial genera in three PM
 36 fractions (PM2.5, PM10, and TSP) and three haze levels (non-, light-, and heavy-haze). A tree was
 37 constructed based on Bray-Curtis distance among bacterial genera.

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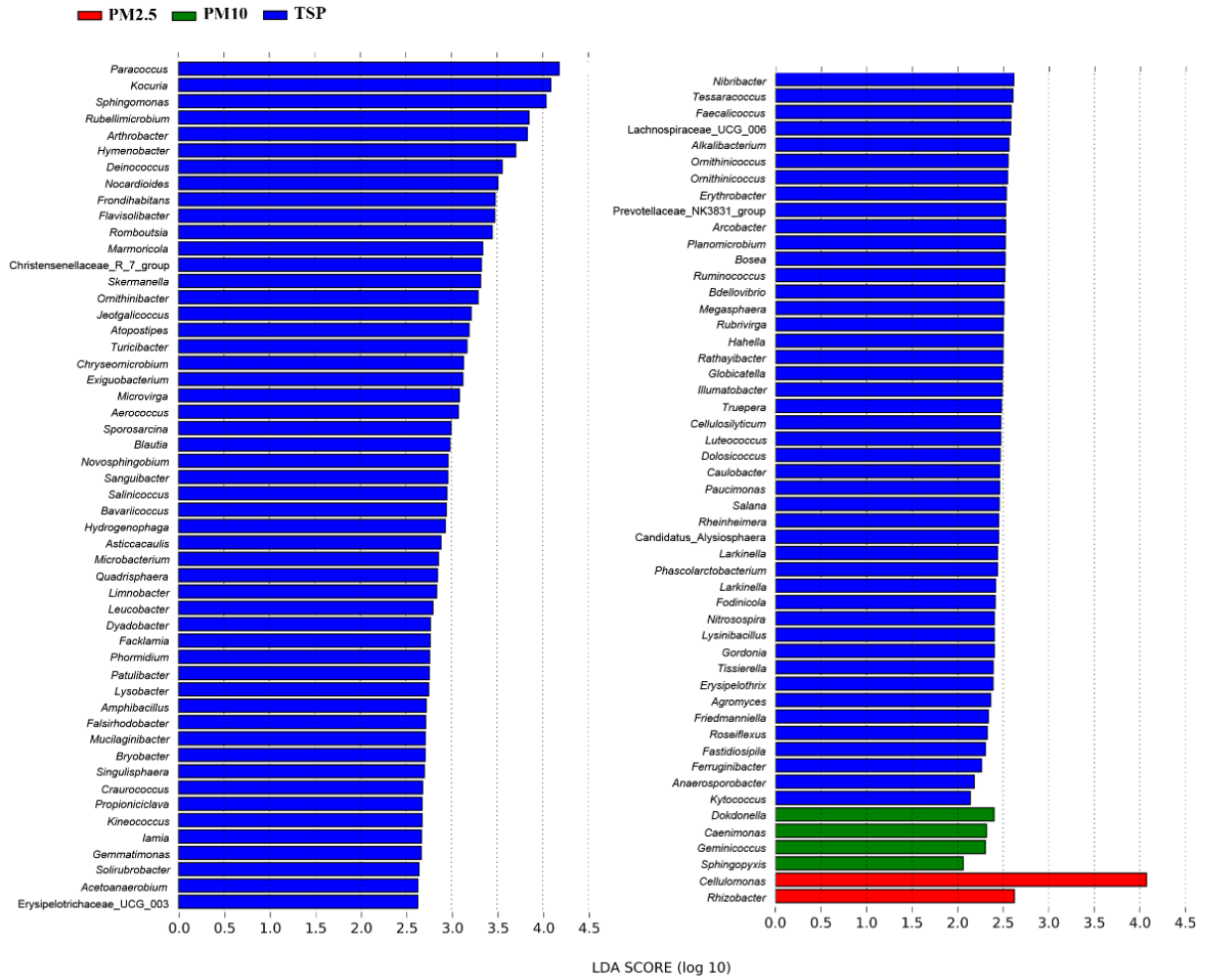
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41 Fig. S4 Principal co-ordinates analysis based on Bray-Curtis distance in three PM fractions (A) and
 42 three haze levels (B).

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45 Fig. S5 LEfSe analysis illustrating differentially abundant bacterial taxa among different PM-fraction
 46 samples.

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