Supporting Information for

Biomass burning sources control ambient particulate matter but traffic and industrial sources control VOCs and secondary pollutant formation during extreme pollution events in Delhi

Arpit Awasthi[1], Baerbel Sinha[1], Haseeb Hakkim[1], Sachin Mishra[1], Varkrishna Mummidivarapu[1], Gurmanjot Singh[1], Sachin D. Ghude[2], Vijay Kumar Soni[3], Narendra Nigam[3], Vinayak Sinha[1], Madhavan N. Rajeevan[4]

[1]Department of Earth and Environmental Sciences, Indian Institute of Science Education and Research Mohali, Sector 81, S.A.S Nagar, Manauli PO, Punjab, 140306, India
[2]Indian Institute of Tropical Meteorology, Pashan, Pune 411 008, Ministry of Earth Sciences, India
[3]India Meteorological Department, New Delhi 110 003, Ministry of Earth Sciences, India
[4]Ministry of Earth Sciences, Government of India, New Delhi 110 003, India

Correspondence to: Baerbel Sinha (bsinha@iisermohali.ac.in)

Table S1: 111 NMVOCs species used in the PMF model, the table lists the major compound identifications and the references supporting such assignments from previous works along with detection limits.

Sr. No	Protonated m/z	Potential contributor	Strong /Weak	Mean (with range) µg/m^3	Sources	References
1	31.014	Formaldehyde CH_2O	Strong	1.063 (0.066-9.464)	Photochemical production, traffic, biomass burning	Hatch et al. 2015, Stockwell et al. 2015, Koss et al. 2018
2	33.030	Methanol CH_4O	Strong	17.285 (3.522-127.853)	Photochemical production, biomass burning, biogenic	Hatch et al. 2015, Stockwell et al. 2015, Koss et al. 2018
3	41.035	Propyne C_3H_4	Strong	9.149 (1.001-96.661)	Traffic, biomass burning	Hatch et al. 2015, Stockwell et al. 2015, Koss et al. 2018, Hakkim et al. 2021
4	42.030	Acetonitrile C_2H_3N	Strong	0.888 (0.208-5.208)	Biomass burning, industries	Hatch et al. 2015, 2017
5	43.051	Propene C_3H_6	Strong	5.117 (0.766-59.931)	Biomass burning, traffic	Hakkim et al. 2021
6	44.018	Isocyanic acid HNCO	Strong	0.145 (0.007-1.231)	Oxidation of amines (secondary formation), biomass burning	Chandra & Sinha, 2016; Wang et al., 2020
7	45.030	Acetaldehyde C_2H_4O	Strong	8.764 (1.432-55.175)	Biogenic, biomass burning, photochemical	Hatch et al. 2015, Stockwell et al. 2015, Koss et al. 2018, Kumar et al.

					production	2021
8	46.025	Formamide CH_4NO	Strong	0.447 (0.004-8.3)	Oxidation of amines (secondary formation)	Yao et al. 2016; Wang et al. 2022
9	47.009	Formic acid CH_2O_2	Strong	1.717 (0.004-31.063)	Oxidation of amines (secondary formation)	Yao et al. 2016; Wang et al. 2022
10	47.0457	Ethanol C_2H_6O	Strong	0.625 (0.052-7.845)	Industrial, Traffic	Bruns et al. 2017; Koss et al. 2018
11	48.048	methoxyamine CH_5NO	Weak	0.011 (0-0.148)	Oxidation of amines (secondary formation)	Yáñez-Serrano et al. 2021
12	49.007	Methanethiol CH_4S	Strong	0.15 (0.002-3.295)	Industrial	Toda et. al. 2010
13	53.035	Vinylacetylene, 1-Buten-3-yne C_4H_4	Strong	0.662 (0.003-10.879)	Biomass burning	Hatch et al. 2015, Stockwell et al. 2015, Koss et al. 2018
14	55.051	1,2-Butadiene, 1-Butyne, 2-Butyne, 1,3 Butadiene C_4H_6	Strong	3.701 (0.418-30.204)	Biomass burning	Koss et al., 2018, Sarkar et al., 2017
15	57.030	Acrolein C_3H_4O	Strong	0.802 (0-8.038)	Biomass burning, waste burning	Kumar et al. 2021
16	57.067	Methyl tert-butyl ether (MTBE) fragment /Butene C_4H_8	Strong	7.293 (0.983-100.664)	Biomass burning, waste burning, traffic	Hakkim et al. 2021
17	59.046	Acetone + Propanal C_3H_6O	Strong	14.603 (2.341-145.458)	Biomass burning, industries, photochemical production	Hatch et al. 2015, Stockwell et al. 2015, Koss et al. 2018, Kumar et al. 2021
18	61.025	Acetic acid+ Glycolaldehyde $C_2H_4O_2$	Strong	16.086 (0.695-170.723)	Photochemical production, biomass burning, industries	Kumar et al. 2021
19	62.997	Vinyl chloride C_2H_3Cl	Weak	0.02 (0.001-0.235)	PVC burning	Hsu et. al. 2022, Fukusaki et. al. 2021
20	67.051	Cyclopentadiene, monoterpene fragment, butanol fragment C_5H_6	Strong	0.781 (0.117-10.93)	Biomass burning	Hatch et al. 2015; Stockwell et al., 2015
21	69.031	Furan C_4H_4O	Strong	0.231 (0.011-3.247)	Biomass burning	Coggon et al., 2019; Hatch et al. 2015; 2017; Koss et al., 2018; Stockwell et al., 2015
22	69.067	Isoprene + 2-methyl-3-butene-2-ol fragment C_5H_8	Strong	2.234 (0.294-17.733)	Biogenic sources, biomass burning	Stockwell et al., 2015; Jordan et al., 2009
23	71.047	Methyl Vinyl Ketone, Methacrolein, Butenal	Strong	1.015 (0.099-4.729)	Biomass burning,	Stockwell et al., 2015; de

		C_4H_6O			photochemical production	Gouw et al., 2007
24	73.026	Methyl glyoxal $C_3H_4O_2$	Strong	0.56 (0.004-8.797)	Oxidation of amines (secondary formation)	Yao et al. 2016; Wang et al. 2022
25	73.062	Butanal, Butanone, MEK C_4H_8O	Strong	2.534 (0.315-43.128)	Biomass burning, biogenic, photochemical production	Hatch et al. 2015, Stockwell et al. 2015, Koss et al. 2018
26	75.042	Hydroxyacetone/ Propanoic acid $C_3H_6O_2$	Strong	1.664 (0.116-14.045)	Biomass burning, biogenic, traffic	Kumar et al. 2021
27	76.037	Nitroethane $C_2H_5NO_2$	Strong	0.036 (0.002-0.308)	Biomass burning	Palm et al. 2020, Harrison et al. 2005
28	79.052	Benzene C_6H_6	Strong	6.07 (0.305-68.694)	Biomass burning, traffic	Hatch et al. 2015, Stockwell et al. 2015, Koss et al. 2018, Hakkim et al. 2021
29	81.031	Cyclopentadienone C_5H_4O	Strong	0.102 (0.001-0.896)	Biomass burning	Hatch et al. 2015, Koss et al. 2018; Nowakowska et al. 2018
30	83.047	Methyl furan C_5H_6O	Strong	0.363 (0.032-3.68)	Biomass burning	Coggon et al., 2019; Hatch et al. 2015; 2017; Koss et al., 2018; Stockwell et al., 2015
31	83.084	Cyclohexene, Hexyne isomers C_6H_{10}	Strong	1.406 (0.345-12.044)	Biomass burning, biogenic, traffic	Stockwell et al., 2015, Koss et al., 2018; Kumar et al., 2021;
32	84.080	Pentanenitrile/ Methylbutanenitrile isomers/ C5-amines C_5H_9N	Strong	0.037 (0-0.495)	Biogenic, biomass burning	Hatch et al. 2015, 2017
33	85.027	Furanone / butenedial $C_4H_4O_2$	Strong	0.466 (0.015-6.719)	Biomass burning, photochemical production	Coggon et al., 2019; Hatch et al. 2015; 2017; Koss et al., 2018; Stockwell et al., 2015
34	85.063	Cyclopentanone C_5H_8O	Strong	0.337 (0.042-1.971)	Biomass burning, traffic	Hatch et al. 2015, Koss et al. 2018; Nowakowska et al. 2018
35	85.094	Cyclohexane, Hexene C_6H_{12}	Strong	0.326 (0.051-4.057)	Biomass burning, Traffic	Fleming et al. 2018, Hakkim et al. 2021
36	87.043	Isomers of C4 carboxylic acid/ester/diketone $C_4H_6O_2$	Strong	1.118 (0.06-8.545)	Biomass burning, photochemical production	Kumar et al. 2021, Hatch et al. 2015, Koss et al. 2018; Nowakowska et al. 2018
37	87.079	Pentanone, methyl-buteneol, Pentanal $C_5H_{10}O$	Strong	0.295 (0.05-1.841)	Biomass burning, biogenic	Hatch et al. 2015, Stockwell et al. 2015, Koss et al. 2018

38	89.058	Isomers of C4-carboxylic acid/ester $C_4H_8O_2$	Strong	1.306 (0.087-17.301)	Industrial solvent	Kamarulzaman et. al. 2019
39	91.053	Monoterpene Fragment C_7H_6	Strong	1.24 (0.058-20.618)	Industrial, Traffic	Kamarulzaman et. al. 2019
40	93.069	Toluene C_7H_8	Strong	18.285 (0.43-321.651)	Biomass burning traffic, chemical production, biogenic	Hatch et al. 2015, Stockwell et al. 2015, Koss et al. 2018, Hakkim et al. 2021
41	95.048	Phenol C_6H_6O	Strong	0.835 (0.069-9.968)	Biomass burning, photochemical production	Hakkim et al., 2021; Koss et al., 2018; Kumar et al., 2021
42	95.084	Monoterpene Fragment C_7H_{10}	Strong	0.826 (0.111-13.348)	Industrial, traffic	Kamarulzaman et. al. 2019
43	97.027	Furfural/ isomers of diketone/carboxylic acid/ester $C_5H_4O_2$	Strong	0.649 (0.026-17.29)	Biomass burning	Kumar et al. 2021, Coggon et al., 2019; Hatch et al. 2015; 2017; Koss et al., 2018; Stockwell et al., 2015
44	97.063	C2 substituted furan, methyl Cyclopentenone C_6H_8O	Strong	0.277 (0.024-2.555)	Biomass burning	Coggon et al., 2019; Hatch et al. 2015; 2017; Koss et al., 2018; Stockwell et al., 2015
45	97.100	Cycloheptene, Alkyl fragment C_7H_{12}	Strong	0.634 (0.104-7.483)	Biomass burning	Stockwell et al., 2015; Koss et al., 2018; Kumar et al., 2021
46	99.043	Furfuryl alcohol, Methyl-furanone $C_5H_6O_2$	Strong	0.599 (0.025-4.61)	Photochemical production, Biomass burning	Coggon et al., 2019; Hatch et al. 2015; 2017; Koss et al., 2018; Stockwell et al., 2015
47	99.079	Cyclohexanone/isomers of C6-aldehyde/ketone $C_6H_{10}O$	Strong	1.033 (0.088-23.49)	Industrial	Gupta et. al. 1979
48	99.116	Methylcyclohexane, Heptene & other hydrocarbons C_7H_{14}	Weak	0.034 (0.002-0.472)	asphalt degassing	Khare et al., 2020
49	101.059	Pentanedione/ isomers of C5-diketone/carboxylic acid/ester/aldehyde $C_5H_8O_2$	Strong	0.777 (0.048-5.073)	Biomass burning	Hatch et al. 2015, Koss et al. 2018; Nowakowska et al. 2018
50	105.069	Styrene C_8H_8	Strong	1.556 (0.13-35.843)	Biomass burning traffic, chemical production	Jordan et al., 2009; Stockwell et al., 2015
51	107.050	Benzaldehyde/ isomers of C7-aldehyde/ ketone C_7H_6O	Strong	0.484 (0.003-4.687)	Biomass burning, photochemical production	Hatch et al. 2015, Stockwell et al. 2015, Koss et al. 2018

52	107.085	Sum of C8-Aromatics C_8H_{10}	Strong	11.214 (0.4-193.065)	Biomass burning, traffic	Hatch et al. 2015, Stockwell et al. 2015, Koss et al. 2018, Hakkim et al. 2021
53	109.064	Methylphenol isomers, Anisole C_7H_8O	Strong	0.24 (0.021-2.61)	Biomass Burning	Hatch et al. 2015
54	109.100	Terpene fragment/Cyclooctadiene C_8H_{12}	Strong	0.511 (0.089-5.681)	Industrial, traffic	Kamarulzaman et. al. 2019
55	111.042	Methylfurfural, Hydroxyphenol $C_6H_6O_2$	Strong	0.208 (0.002-4.11)	Biomass burning, photochemical production	Coggon et al., 2019; Hatch et al. 2015; 2017; Koss et al., 2018; Stockwell et al., 2015
56	111.080	C3-substituted furans, C2-substituted cyclopentene, methyl cyclohexene $C_7H_{10}O$	Strong	0.195 (0.024-1.519)	Biomass burning	Coggon et al., 2019; Hatch et al. 2015; 2017; Koss et al., 2018; Stockwell et al., 2015
57	111.116	Ethenyl cyclohexane C_8H_{14}	Strong	0.434 (0.078-5.193)	Ring-opening products of cyclic alkanes	Wang et. al. 2015
58	113.059	Dimethylbutenedial / C4-substituted aldehyde $C_6H_8O_2$	Strong	0.403 (0.023-2.736)	Oxidation of aromatic compounds, biomass burning	Zaytsev et al., 2019
59	115.039	Hydroxymethyl furanone/ methylepoxybutanedial $C_5H_6O_3$	Strong	0.119 (0.004-1.797)	Photochemical production, Biomass burning	Coggon et al., 2019; Hatch et al. 2015; 2017; Koss et al., 2018; Stockwell et al., 2015
60	115.075	Isomers of C6-diketones/aldehyde/carobo xylic acid/ester $C_6H_{10}O_2$	Strong	0.357 (0.024-2.187)	Oxidation of polyaromatic hydrocarbons	Bruns et al. 2017
61	116.108	C6-amides $C_6H_{13}NO$	Weak	0.035 (0-0.255)	Photooxidation of amines	Yao et al. 2016
62	119.085	Terpene fragment C_9H_{10}	Strong	0.608 (0.062-9.105)	Traffic	Erickson et. al. 2013
63	121.064	Tolualdehyde/ isomers of C8-aldehyde/ketone C_8H_8O	Strong	0.578 (0.048-6.186)	Biomass burning	Hatch et al. 2015, Koss et al. 2018
64	121.101	Sum of C-9 aromatics C_9H_{12}	Strong	5.67 (0.174-125.472)	Traffic, Biomass burning	Hatch et al. 2015, Stockwell et al. 2015, Koss et al. 2018
65	123.044	Hydroxybenzaldehyde/isomers of C7- carboxylic acid/ ester $C_7H_6O_2$	Strong	0.307 (0.009-2.77)	Photochemical production, Biomass burning	Hatch et al. 2015, Koss et al. 2018; Nowakowska et al. 2018
66	123.080	C2-substituted phenol, methyl anisole $C_8H_{10}O$	Strong	0.146 (0.013-1.255)	Oxidation of polyaromatic hydrocarbons	Bruns et al. 2017
67	123.12	Santene, Cyclopentadiene	Strong	0.349	asphalt	Khare et al., 2020,

		& other hydrocarbons C_9H_{14}		(0.063-3.73)	degassing	Kılıç et al., 2018
68	124.039	Nitrobenzene $C_6H_5NO_2$	Strong	0.054 (0.004-0.871)	Traffic	Palm et al. 2020, Harrison et al. 2005
69	125.060	Guaiacol/ isomers of C7-carboxylic acid/ester $C_7H_8O_2$	Strong	0.162 (0.01-2.15)	Biomass burning	Hatch et al. 2015, Koss et al. 2018; Nowakowska et al. 2018
70	125.133	Nonyne, nondiene C_9H_{16}	Strong	0.157 (0.033-1.702)	asphalt degassing	Khare et al., 2020, Kılıç et al., 2018
71	127.039	Hydroxymethyl furfural $C_6H_6O_3$	Strong	0.116 (0.004-2.045)	biomass burning	Koss et al., 2018
72	127.075	Isomers of C7-carboxylic acid/ester/ aldehdyde/ketone $C_7H_{10}O_2$	Strong	0.226 (0.014-1.5)	Oxidation of aromatic compounds, biomass burning	Zaytesv et al., 2019
73	129.070	Naphthalene $C_{10}H_8$	Strong	1.043 (0.099-12.618)	Traffic, biomass burning	Hakkim et al., 2021; Koss et al., 2018; Kumar et al., 2021
74	129.092	Isomers of C9-acetaldehyde/ ketone/ Carboxylic acid/ester $C_7H_{12}O_2$	Strong	0.176 (0.01-1.274)	Oxidation of polyaromatic hydrocarbons	Bruns et al. 2017, Lignell et al. 2013
75	133.065	Methyl benzofuran C_9H_8O	Strong	0.078 (0.007-0.617)	Biomass Burning	Hatch et al. 2015
76	133.102	Ethyl styrene, tetrahydronaphthalene $C_{10}H_{12}$	Strong	0.457 (0.044-7.886)	Traffic	Yáñez-Serrano et al. 2021
77	135.080	Isomers of C9-acetaldehyde/ ketone $C_9H_{10}O$	Strong	0.172 (0.007-1.367)	Traffic	Knighton et. al. 2007
78	135.118	P-cymene, C4-substituted benzene, C2-substituted xylene $C_{10}H_{14}$	Strong	2.509 (0.091-71.697)	Traffic	Hakkim et al. 2021
79	137.133	Sum of Monoterpenes (MT) $C_{10}H_{16}$	Strong	2.66 (0.167-127.676)	Industrial, biogenic, biomass burning, traffic	Guenther et al., 2006; Kamarulzaman et. al. 2019 Koss et al., 2018; Kumar et al., 2021
80	138.056	Nitrotoluene/ salicylamide $C_7H_7NO_2$	Weak	0.036 (0.001-0.707)	Oxidation of toluene	Ramasamy et al., 2019
81	143.086	Methyl naphthalene $C_{11}H_{10}$	Strong	0.19 (0.015-2.848)	Biomass Burning, Traffic	Hatch et al. 2015; Yáñez-Serrano et al. 2021
82	143.108	Isomers of C8-aldehyde/ketone/carboxylic acid /ester $C_8H_{14}O_2$	Strong	0.153 (0.022-0.942)	Oxidation of polyaromatic hydrocarbons	Bruns et al. 2017
83	145.051	Organic acids/ levoglucosan fragment $C_6H_8O_4$	Strong	0.068 (0.002-1.626)	Biomass Burning	Hatch et al. 2015, Koss et al. 2018; Nowakowska et al. 2018

84	145.102	C2-substituted indene $C_{11}H_{12}$	Weak	0.062 (0.007-0.814)	Asphalt degassing	Khare et al., 2020
85	145.123	Isomer of C8-carboxylic acid/ C8-ester $C_8H_{16}O_2$	Strong	0.072 (0.003-0.96)	Oxidation of polyaromatic hydrocarbons	Bruns et al. 2017, Mochizuki et al. 2019
86	146.977	Isomers of Dichlorobenzene $C_6H_4Cl_2$	Strong	0.352 (0.009-5.79)	Industrial pesticides	Graus et al. 2010, Yáñez-Serrano et al. 2021
87	147.118	Cyclopentylbenzene & other hydrocarbons $C_{11}H_{14}$	Strong	0.318 (0.038-4.599)	asphalt degassing	Khare et al., 2020
88	149.024	Phthalic anhydride/Benzofurandione $C_8H_4O_3$	Strong	0.195 (0.003-4.508)	Oxidation of polyaromatic hydrocarbons	Bruns et al. 2017
89	149.096	Isomers of C10-aldehyde/ ketone $C_{10}H_{12}O$	Strong	0.094 (0.008-1.25)	asphalt degassing	Khare et al., 2020
90	153.092	Isomers of C9- carboxylic acid/ester $C_9H_{12}O_2$	Strong	0.102 (0.01-1.413)	Oxidation of monoterpenes	Gkatzelis et al. 2018
91	153.128	Isomers of C10-aldehyde/ ketone $C_{10}H_{16}O$	Strong	0.31 (0.021-7.93)	Oxidation of monoterpenes	Camredon et al.: 2010
92	154.052	Nitrobenzyl alcohol/Nitrocresols, methyl-nitrophenol $C_7H_7NO_3$	Strong	0.077 (0.003-0.577)	Oxidation of toluene	Ramasamy et al., 2019
93	155.108	Isomers of C9-ketone/ C9-carboxylic acid/ C9-ester $C_9H_{14}O_2$	Strong	0.104 (0.008-0.759)	Oxidation of monoterpenes	Camredon et al.: 2010, Gkatzelis et al. 2018
94	155.144	Isomers of C10-aldehyde/ketone $C_{10}H_{18}O$	Strong	0.092 (0.008-1.238)	asphalt degassing	Khare et al., 2020
95	157.099	C2-substituted naphthalene $C_{12}H_{12}$	Strong	0.144 (0.017-1.209)	asphalt degassing	Khare et al., 2020, Kılıç et al., 2018
96	157.122	C9-ester/C9-organic acid $C_9H_{16}O_2$	Strong	0.109 (0.012-1.035)	Oxidation of monoterpenes	Lignell et al. 2013; Camredon et al. 2010
97	159.140	C9-organic acid $C_9H_{18}O_2$	Weak	0.056 (0.002-0.559)	Oxidation of monoterpenes	Mochizuki et al. 2019
98	161.134	Cyclohexylbenzene, butyl styrene, cyclopentylmethylbenzene $C_{12}H_{16}$	Strong	0.161 (0.016-2.527)	asphalt degassing	Khare et al., 2020 Kılıç et al., 2018
99	175.150	Trimethyltetralin/ ionene $C_{13}H_{18}$	Strong	0.086 (0.007-1.677)	asphalt degassing	Khare et al., 2020
100	177.056	Formylcinnamic acid / hydroxy-methyl-coumarin $C_{10}H_8O_3$	Strong	0.105 (0.006-0.852)	asphalt degassing	Xing et al. 2023
101	177.165	C7-substituted benzene, $C_{13}H_{20}$	Strong	0.13 (0.013-2.594)	asphalt degassing	Khare et al., 2020
102	179.181	C3-substituted adamantane $C_{13}H_{22}$	Weak	0.06 (0.006-0.878)	asphalt degassing	Khare et al., 2020

103	183.121	Bibenzyl $C_{14}H_{14}$	Weak	0.029 (0.004-0.2)	asphalt degassing	Khare et al., 2020
104	185.121	cis-Pinonic acid / C10-ester $C_{10}H_{16}O_3$	Weak	0.054 (0.007-1.571)	Oxidation of monoterpenes	Camredon et al. 2010, Khare et. al. 2020
105	187.148	C4-substituted dihydroazulene, benzyl cycloheptene $C_{14}H_{18}$	Weak	0.039 (0.005-0.306)	asphalt degassing	Khare et al. 2020, Loubet et al. 2022
106	189.165	C4-substituted dihydronaphthalene, cyclopentylpropylbenzene $C_{14}H_{20}$	Weak	0.053 (0.006-0.818)	asphalt degassing	Khare et al., 2020
107	191.181	C8-substituted benzene $C_{14}H_{22}$	Weak	0.068 (0.007-0.892)	asphalt degassing	Khare et al., 2020
108	195.138	Myrtenyl acetate/C12-organic acid/C12-ester $C_{12}H_{18}O_2$	Weak	0.029 (0.003-0.766)	Oxidation of biomass burning	Haeri, 2023
109	217.195	C6-substituted dihydronaphthalene $C_{16}H_{24}$	Weak	0.026 (0.003-0.307)	asphalt degassing	Khare et al., 2020
110	233.228	C11-substituted benzene $C_{17}H_{28}$	Weak	0.023 (0.002-0.215)	asphalt degassing	Khare et al., 2020, Xu et al. 2022
111	247.243	C12-substituted benzene $C_{18}H_{30}$	Weak	0.022 (0.002-0.158)	asphalt degassing	Khare et al., 2020

Table S2: List of Constraints incorporated in the PMF model

Sr. No.	Factor	Element	Type
1	Biogenic	m/z 42.030	Pull Down Maximally
2	Biogenic	m/z 93.069	Pull Down Maximally
3	Biogenic	m/z 107.085	Pull Down Maximally
4	Biogenic	m/z 121.101	Pull Down Maximally
5	Biogenic	10/16/2022 11:00:00 PM	Pull Down Maximally
6	Biogenic	10/17/2022 1:00:00 AM	Pull Down Maximally
7	Biogenic	10/17/2022 12:00:00 AM	Pull Down Maximally
8	Biogenic	10/17/2022 2:00:00 AM	Pull Down Maximally
9	Biogenic	10/16/2022 10:00:00 PM	Pull Down Maximally
10	Biogenic	10/16/2022 9:00:00 PM	Pull Down Maximally

11	Biogenic	10/21/2022 10:00:00 PM	Pull Down Maximally
12	Biogenic	10/21/2022 11:00:00 PM	Pull Down Maximally
13	Biogenic	10/22/2022 12:00:00 AM	Pull Down Maximally
14	Biogenic	10/21/2022 9:00:00 PM	Pull Down Maximally
15	Biogenic	10/21/2022 8:00:00 PM	Pull Down Maximally
16	Biogenic	10/22/2022 6:00:00 PM	Pull Down Maximally
17	Biogenic	10/23/2022 7:00:00 PM	Pull Down Maximally
18	Biogenic	10/26/2022 11:00:00 PM	Pull Down Maximally
19	Photochemical	m/z 42.030	Pull Down Maximally
20	Photochemical	m/z 93.069	Pull Down Maximally
21	Photochemical	m/z 107.085	Pull Down Maximally
22	Photochemical	m/z 121.101	Pull Down Maximally
23	Photochemical	9/20/2022 2:00:00 AM	Pull Down Maximally
24	Photochemical	9/20/2022 11:00:00 PM	Pull Down Maximally
25	Photochemical	9/22/2022 1:00:00 AM	Pull Down Maximally
26	Photochemical	9/23/2022 10:00:00 PM	Pull Down Maximally
27	Photochemical	9/24/2022 1:00:00 AM	Pull Down Maximally
28	Photochemical	10/4/2022 2:00:00 AM	Pull Down Maximally
29	Photochemical	10/4/2022 4:00:00 AM	Pull Down Maximally
30	Cooking	10/17/2022 8:00:00 PM	Pull Up Maximally
31	Solvents	11/8/2022 4:00:00 AM	Pull Up Maximally
32	Road Construction	10/17/2022 9:00:00 PM	Pull Up Maximally
33	Petrol 4-Wheeler	10/18/2022 11:00:00 PM	Pull Up Maximally
34	Paddy	11/12/2022 1:00:00 AM	Pull Up Maximally
35	Paddy	11/12/2022 12:00:00 AM	Pull Up Maximally
36	Heating & Waste Disposal	11/19/2022 11:00:00 PM	Pull Up Maximally
37	Petrol 2-Wheeler	10/17/2022 9:00:00 PM	Pull Up Maximally
38	Industrial	10/16/2022 11:00:00 PM	Pull Up Maximally
39	CNG	10/16/2022 7:00:00 PM	Pull Up Maximally

Table S3: Contains the SOA yields for 53 compounds to calculate the SOAP

Sr. No.	m/z	SOAP	References
1	31.014	0.7	Derwent et. al. 2010
2	33.030	0.3	Derwent et. al. 2010
3	53.035	0.1	Derwent et. al. 2010
4	55.051	0.6	Derwent et. al. 2010
5	61.025	30.6	Xiong et. al. 2020
6	67.051	11.5	Hakkim et al. 2021
7	71.047	0.3	Derwent et. al. 2010
8	73.026	0.1	Derwent et. al. 2010
9	79.052	29.4	Hakkim et al. 2021
10	83.047	42.3	Hakkim et al. 2021, Xiong et. al. 2020
11	83.084	82.2	Hakkim et al. 2021
12	87.043	0.6	Derwent et. al. 2010
13	95.084	145.6	Chan et. al. 2009, Kılıç et. al. 2018, Hakkim et al. 2021, Xiong et. al. 2020
14	99.043	41.2	Hakkim et al. 2021
15	121.101	1	Xiong et. al. 2020
16	137.133	0.1	Derwent et. al. 2010
17	44.018	100	Chan et. al. 2009, Kılıç et. al. 2018, Hakkim et al. 2021, Xiong et. al. 2020
18	47.046	278.4	Kılıç et. al. 2018, Hakkim et al. 2021, Khare et. al. 2020
19	49.007	188.2	Hakkim et al. 2021

20	62.997	188.2	Kılıç et. al. 2018
21	85.099	83.5	Kılıç et. al. 2018, Hakkim et al. 2021, Xiong et. al. 2020
22	87.079	188.2	Kılıç et. al. 2018
23	91.053	69.4	Chan et. al. 2009, Kılıç et. al. 2018, Hakkim et al. 2021, Xiong et. al. 2020
24	97.100	229.4	Kılıç et. al. 2018
25	111.080	188.2	Kılıç et. al. 2018
26	115.039	75.3	Chan et. al. 2009, Kılıç et. al. 2018, Hakkim et al. 2021, Xiong et. al. 2020
27	119.085	117.6	Kılıç et. al. 2018
28	123.044	200	Yee et. al. 2013
29	125.060	185	Chan et. al. 2009, Kılıç et. al. 2018, Hakkim et al. 2021, Khare et. al. 2020
30	127.075	129.4	Kılıç et. al. 2018, Khare et. al. 2020
31	133.065	86.3	Kılıç et. al. 2018, Hakkim et al. 2021, Khare et. al. 2020
32	133.102	176.5	Xiong et. al. 2020
33	138.056	221.6	Chan et. al. 2009, Kılıç et. al. 2018, Khare et. al. 2020
34	145.051	88.2	Khare et. al. 2020
35	145.123	9.4	Xiong et. al. 2020
36	147.118	102.9	Kılıç et. al. 2018, Khare et. al. 2020

37	149.096	70.6	Khare et. al. 2020
38	153.128	2.5	Khare et. al. 2020
39	155.144	0.9	Khare et. al. 2020
40	157.099	176.5	Chan et. al. 2009, Khare et. al. 2020
41	161.134	114.7	Kılıç et. al. 2018, Khare et. al. 2020
42	175.150	147.1	Khare et. al. 2020
43	177.056	170.6	Khare et. al. 2020
44	177.165	147.1	Khare et. al. 2020
45	179.181	4.6	Khare et. al. 2020
46	183.121	288.2	Khare et. al. 2020
47	185.121	35.3	Witkowski et. al. 2017
48	187.148	194.1	Khare et. al. 2020
49	189.165	194.1	Khare et. al. 2020
50	191.181	194.1	Khare et. al. 2020
51	217.195	252.9	Khare et. al. 2020
52	233.228	276.5	Khare et. al. 2020
53	247.243	305.9	Khare et. al. 2020

Table S4: Correlation table (R) for the 11 factors with independent tracer species.

Tracer Species	Cooking	Solvents	Road Construction	Biogenic	Petrol 4-Wheeler	Paddy	Heating & Waste Burning	Petrol 2-Wheeler	Industrial	Photo-chemical	CNG
WS	-0.4	-0.2	-0.1	0.1	-0.3	-0.2	-0.2	-0.2	-0.3	0.0	-0.2
WD	0.1	-0.1	0.2	0.1	0.0	0.1	0.2	0.1	-0.1	0.1	0.1
CO_2	0.2	0.2	0.1	-0.3	**0.7**	0.4	0.4	**0.7**	**0.8**	-0.1	0.3
N_2O	0.0	0.0	-0.1	-0.1	0.2	0.0	0.1	0.2	0.4	-0.1	0.2
CH_4	0.2	0.3	0.0	-0.3	**0.6**	0.4	0.3	**0.6**	**0.8**	-0.1	0.3
PM_{10}	0.3	0.2	0.1	-0.2	0.4	**0.7**	**0.7**	0.5	0.5	0.0	0.3
$PM_{2.5}$	0.3	0.2	0.1	-0.3	0.3	**0.7**	**0.6**	0.4	0.5	0.0	0.2
CO	0.3	0.3	0.1	-0.2	**0.7**	0.5	0.5	**0.6**	**0.7**	-0.1	0.4
NO	0.1	0.2	0.0	-0.2	**0.8**	0.3	0.4	0.5	**0.7**	-0.1	0.3
NO_2	0.1	0.1	0.1	-0.2	0.3	0.3	**0.7**	0.4	0.2	0.0	0.2
NO_x	0.1	0.2	0.0	-0.2	**0.8**	0.3	0.5	**0.6**	**0.7**	-0.1	0.3
O_3	0.1	-0.1	0.3	0.5	-0.2	0.0	-0.1	-0.2	-0.3	0.4	-0.2
SO_2	0.0	-0.1	-0.2	-0.1	0.2	0.3	0.4	0.2	0.2	0.0	0.2
AT	0.2	-0.1	0.2	**0.7**	-0.2	-0.3	**-0.6**	-0.3	-0.4	0.3	0.1
RH	-0.1	0.1	-0.2	-0.5	0.0	-0.2	-0.4	-0.1	0.2	-0.4	-0.1
PAR	0.2	-0.2	0.2	**0.7**	-0.2	-0.1	-0.2	-0.3	-0.3	0.3	-0.2
VC	-0.2	-0.2	0.1	**0.6**	-0.3	-0.2	-0.3	-0.3	-0.4	0.2	-0.2
FC	0.4	0.3	0.2	-0.3	0.3	**0.8**	**0.6**	0.5	0.4	0.3	0.3

AT: Ambient Temperature, RH: Relative Humidity, PAR: Photosynthetic active radiation, VC: Ventilation Coefficient,

FC: Daily Fire Count

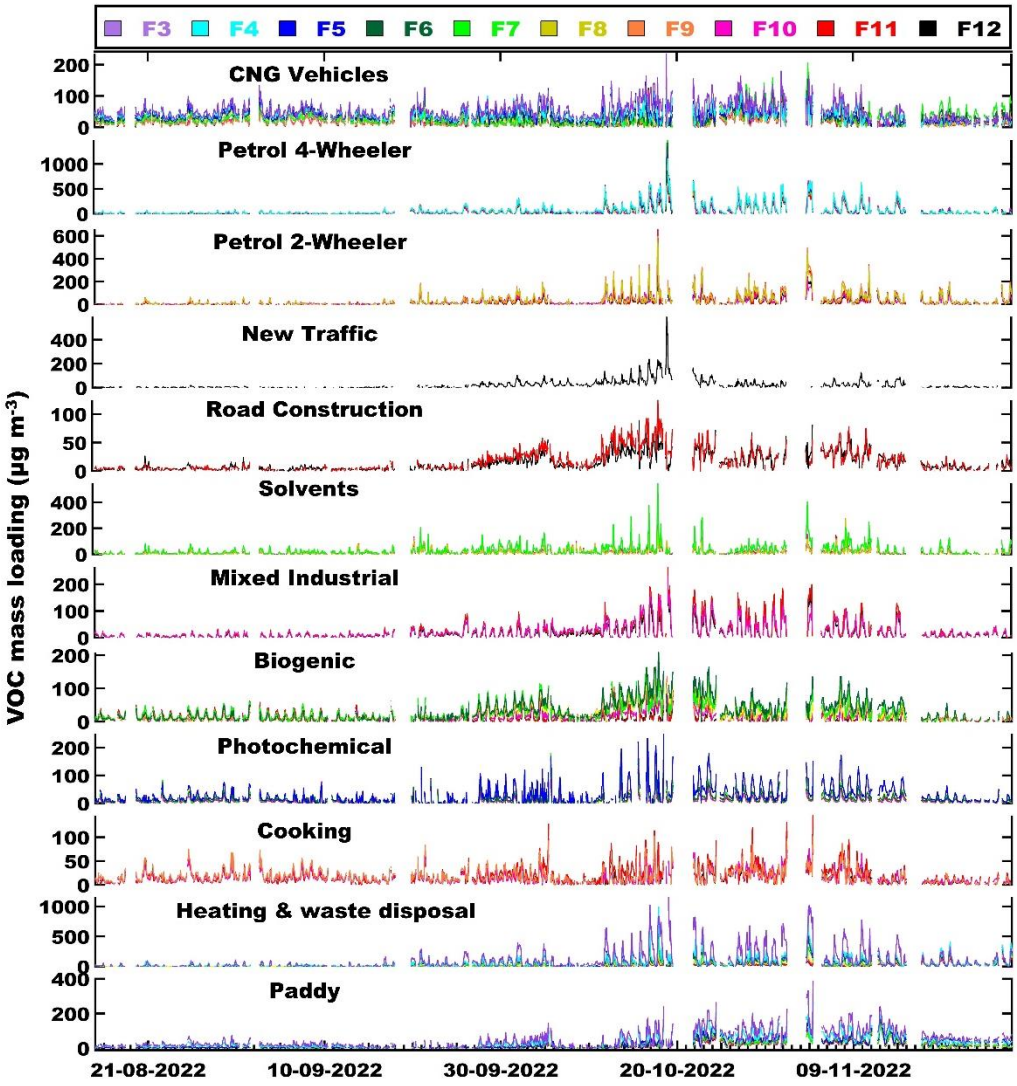

Figure S1(a): Evolution of the factor contribution time series when the number of factors is increased from 3 to 12

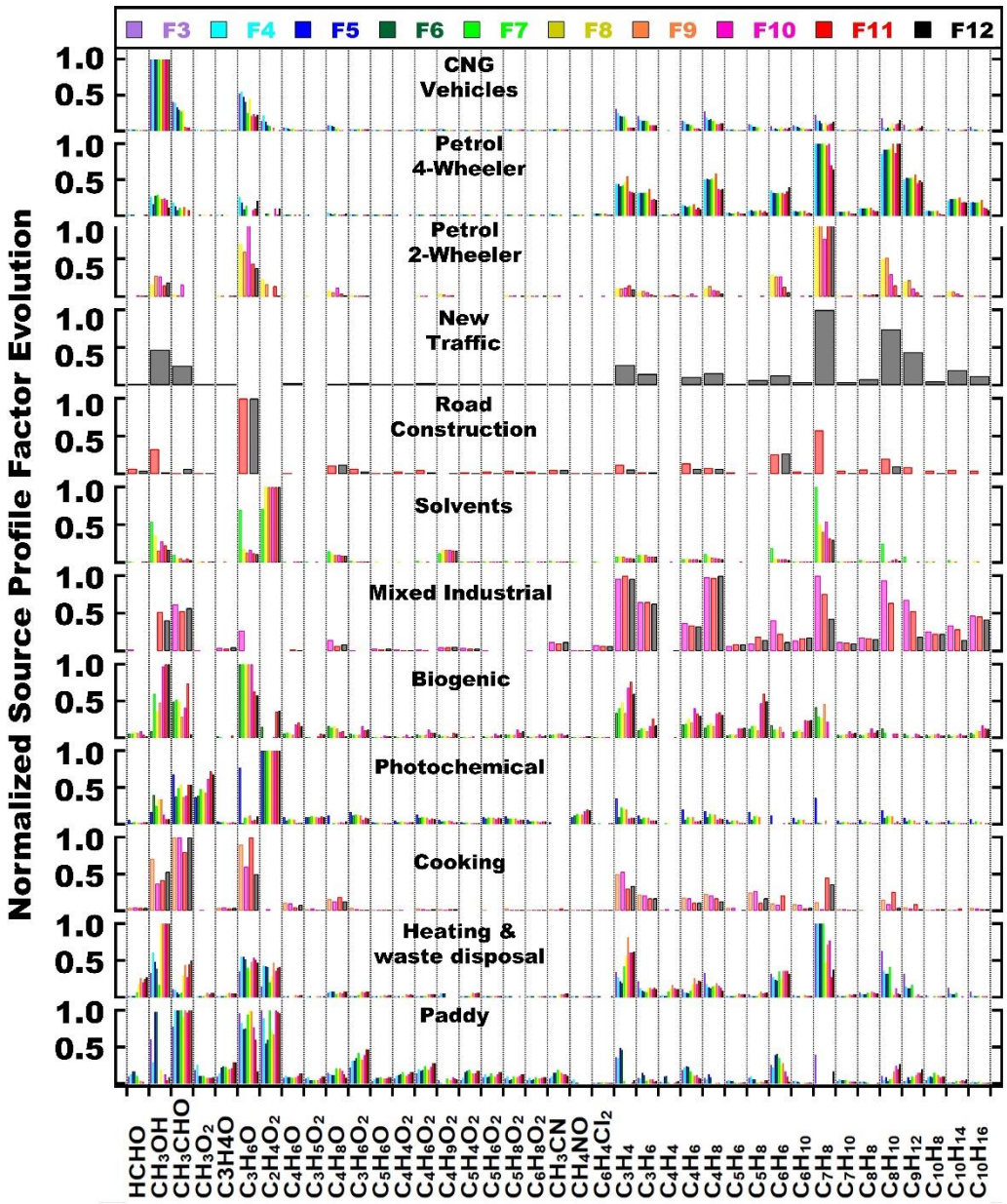

Figure S1(b): Evolution of the normalized PMF factor profile when the number of factors is increased from 3 to 12

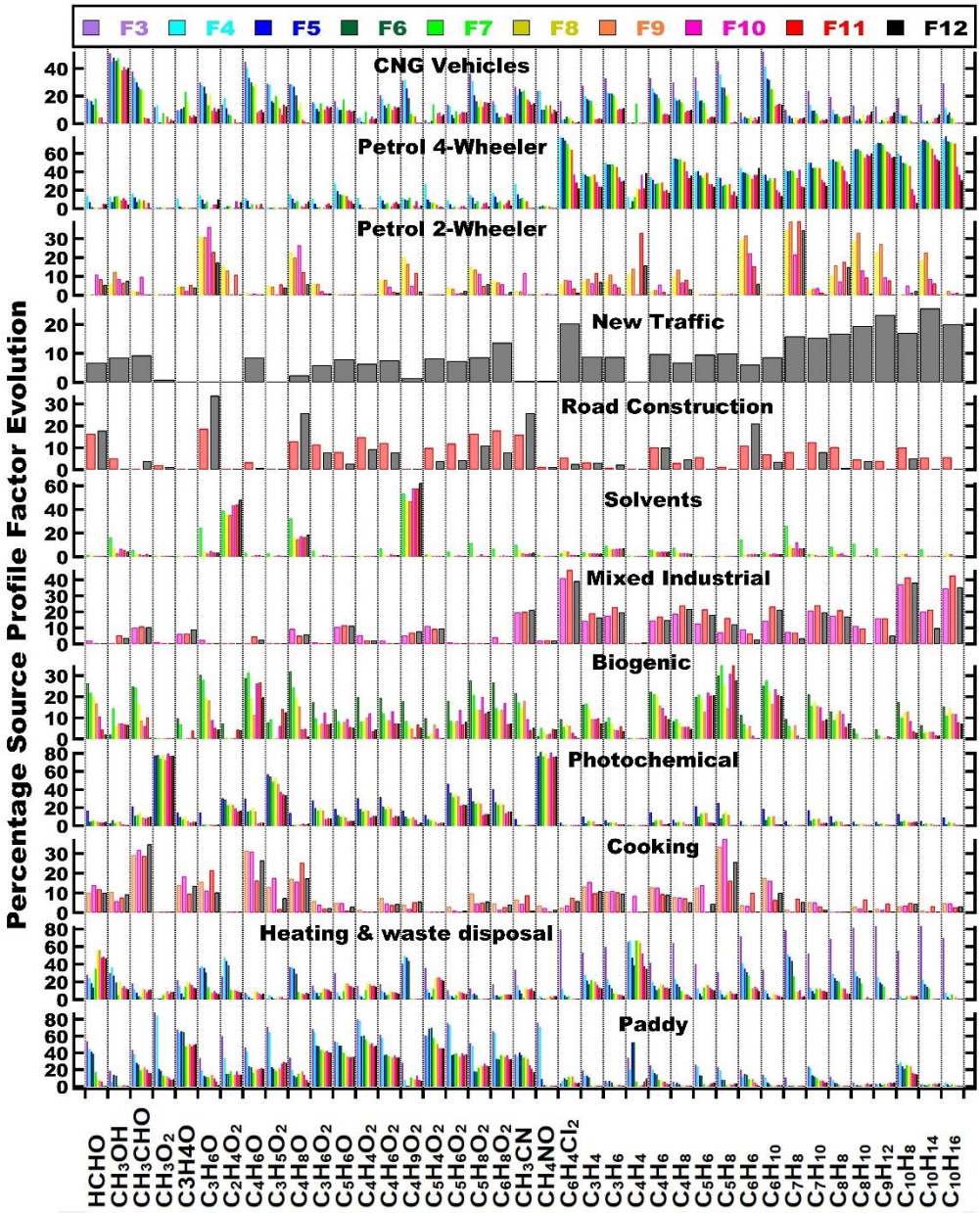

Figure S1(c): Evolution of the percentage of the mass explained by different sources when the number of factors is increased from 3 to 12

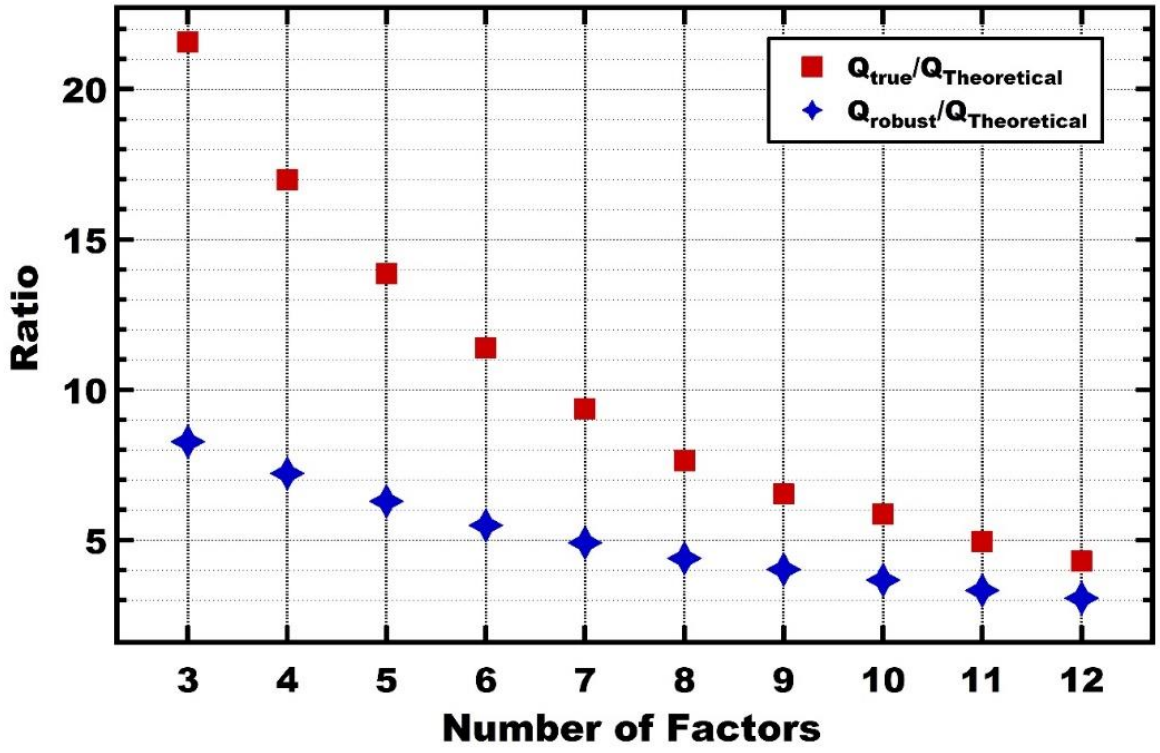

Figure S2: Change in the $Q_{true}/Q_{theoretical}$ ratio and $Q_{robust}/Q_{theoretical}$ when the number of factors is increased from 3 to 12

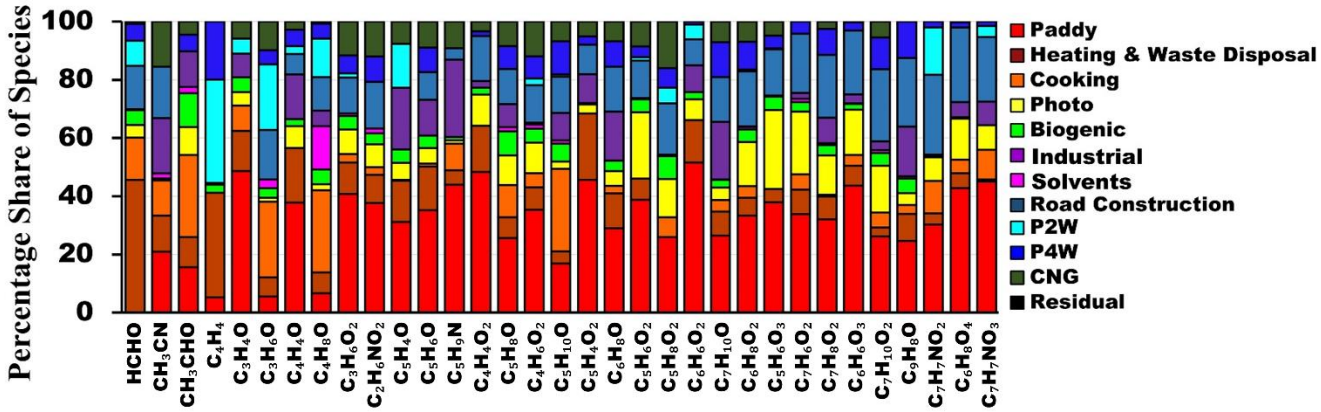

Figure S3(a): represents the share of species with the highest percentages in paddy residue burning, residential heating and waste disposal and solid fuel-based cooking factors

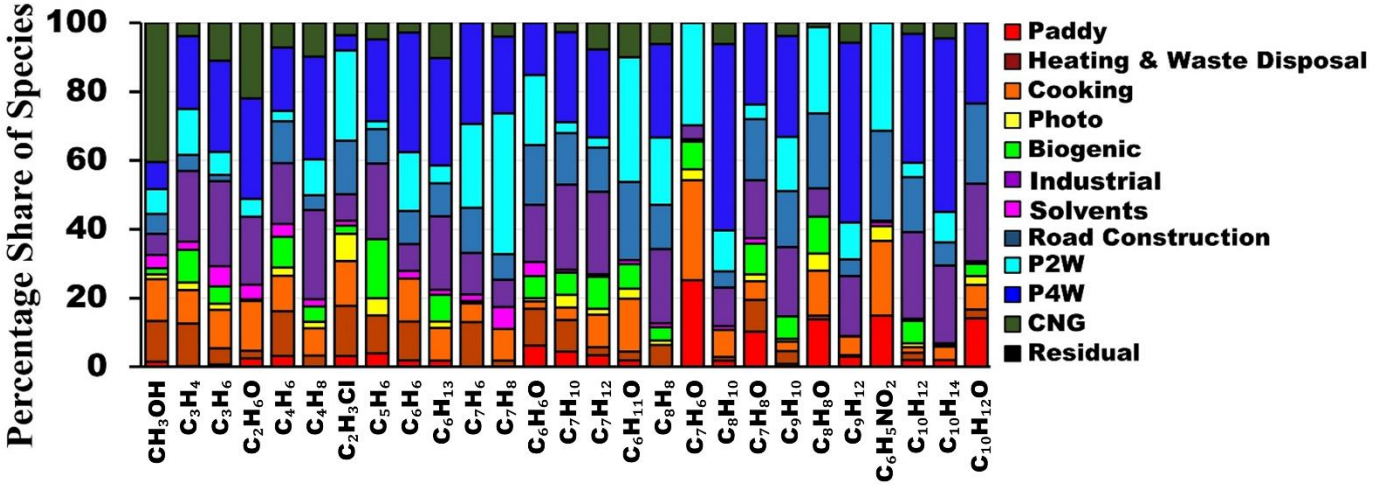

Figure S3(b): represents the share of species with the highest percentages in CNG, petrol 2-wheeler, petrol 4-wheeler factors.

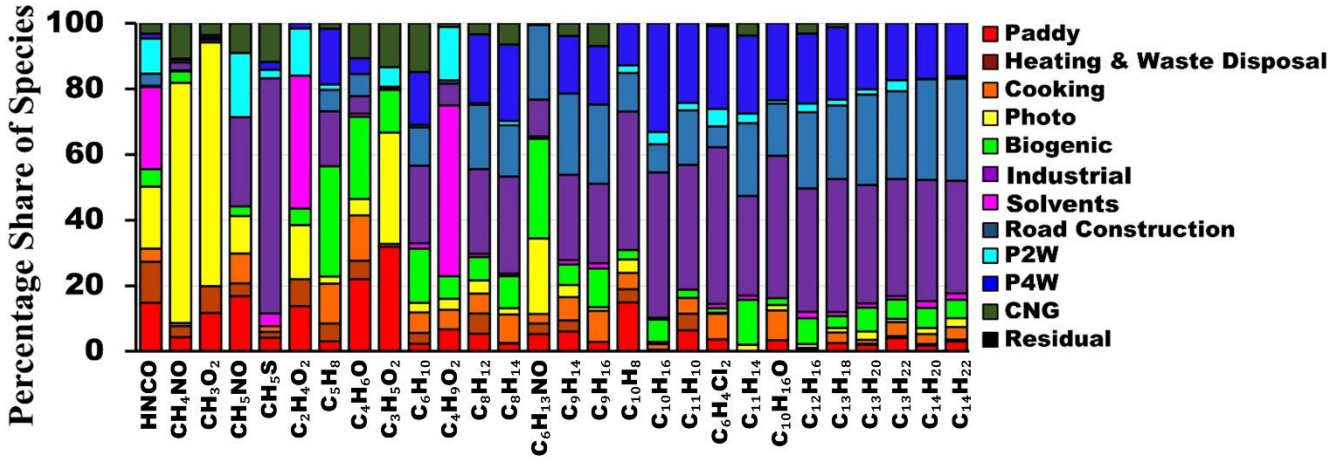

Figure S3(c): represents the share of species with the highest percentages in biogenic, photochemistry, solvents, and industrial factors.

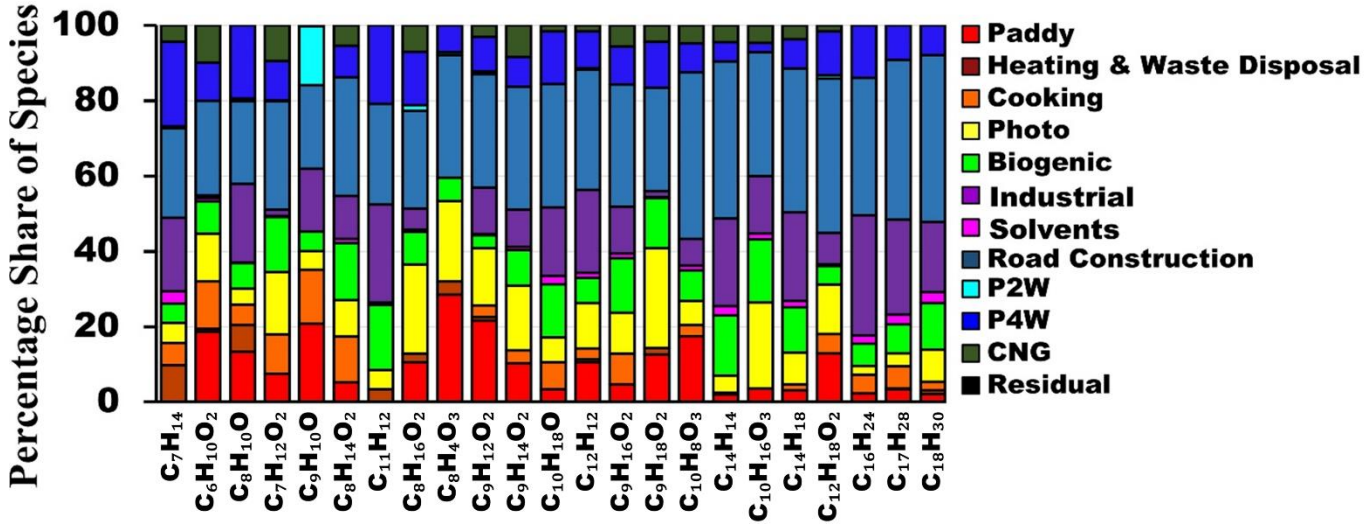

Figure S3(d): represents the share of species with the highest percentages in road construction factors.

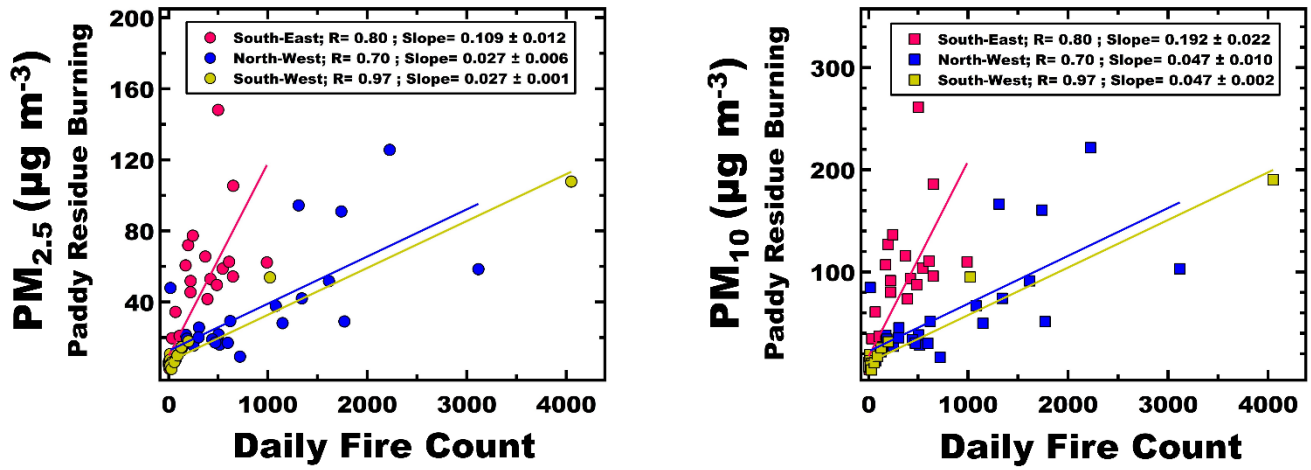

Figure S4: represents the $PM_{2.5}$ and PM_{10} mass loadings from the paddy residue burning factor at the receptor site influenced by the 24-hour averaged fire count in three fetch regions (SE, NW, SW).

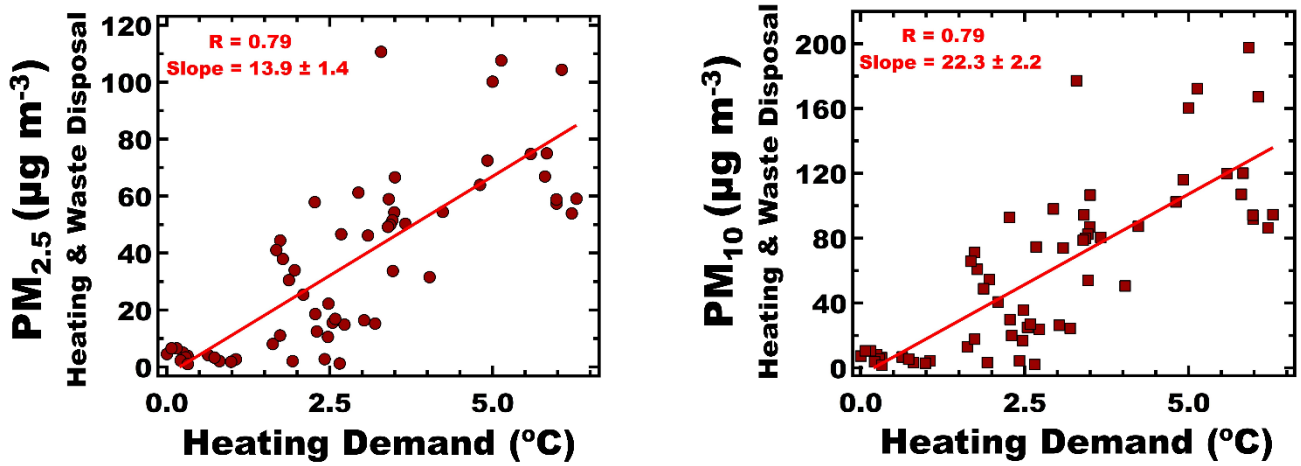

Figure S5: represents the $PM_{2.5}$ and PM_{10} mass loadings at the receptor site with 24-hour averaged heating demand

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