

Air Pollution on the Move: A Study of PM2.5 Exposure in Urban Delivery Workers

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Air Pollution Crisis

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Thailand: 10 million sought treatment for pollution-related illnesses in 2023

6 March 2024 Share Save

Kelly Ng
BBC News

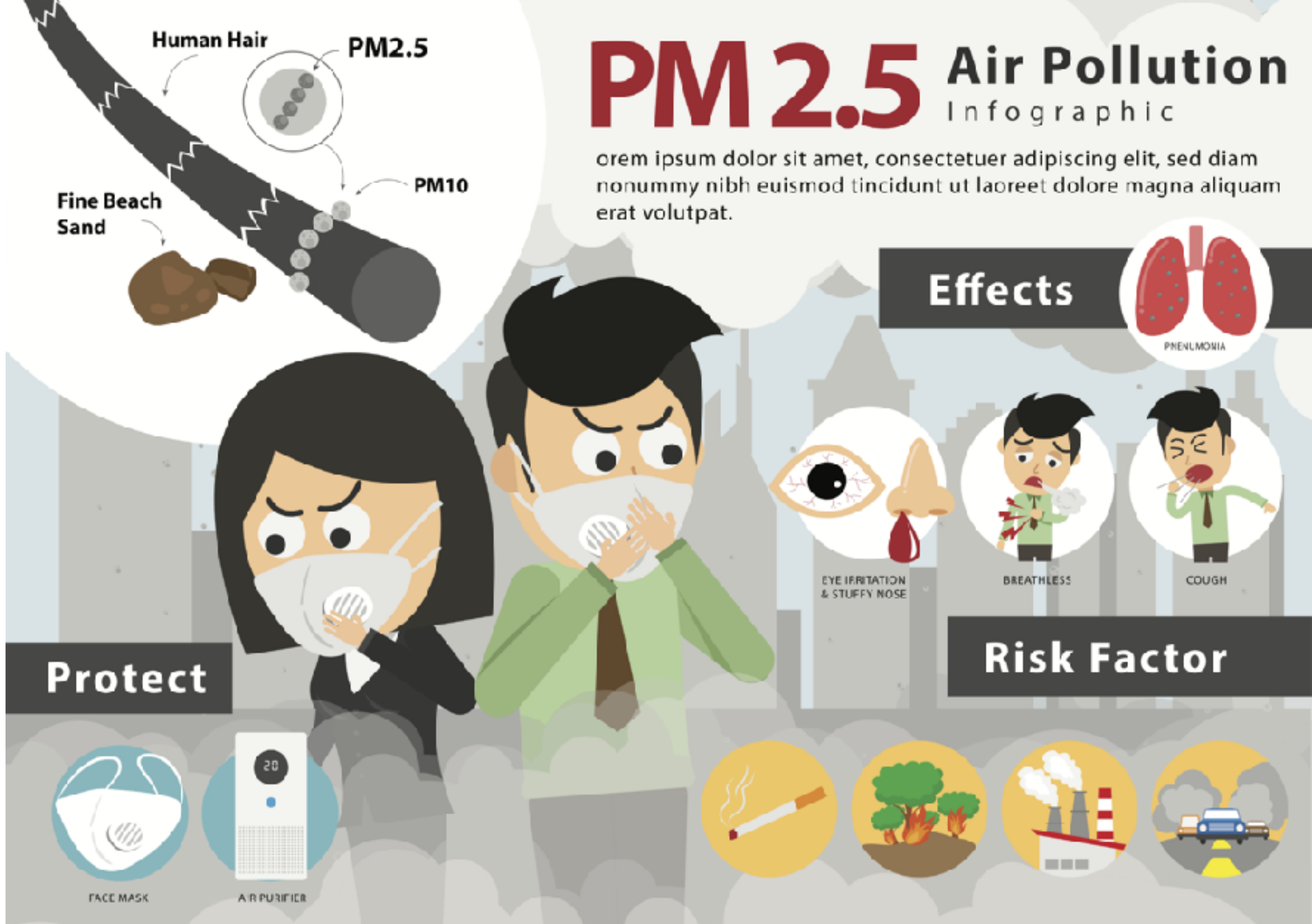


Getty Images

Air pollution turns the view of Bangkok's skyline into shadows

PM 2.5 Air Pollution Infographic

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Protect

- FACE MASK
- AIR PURIFIER

Effects

- EYE IRRITATION & STUFFY NOSE
- BREATHLESS
- COUGH
- PNEUMONIA

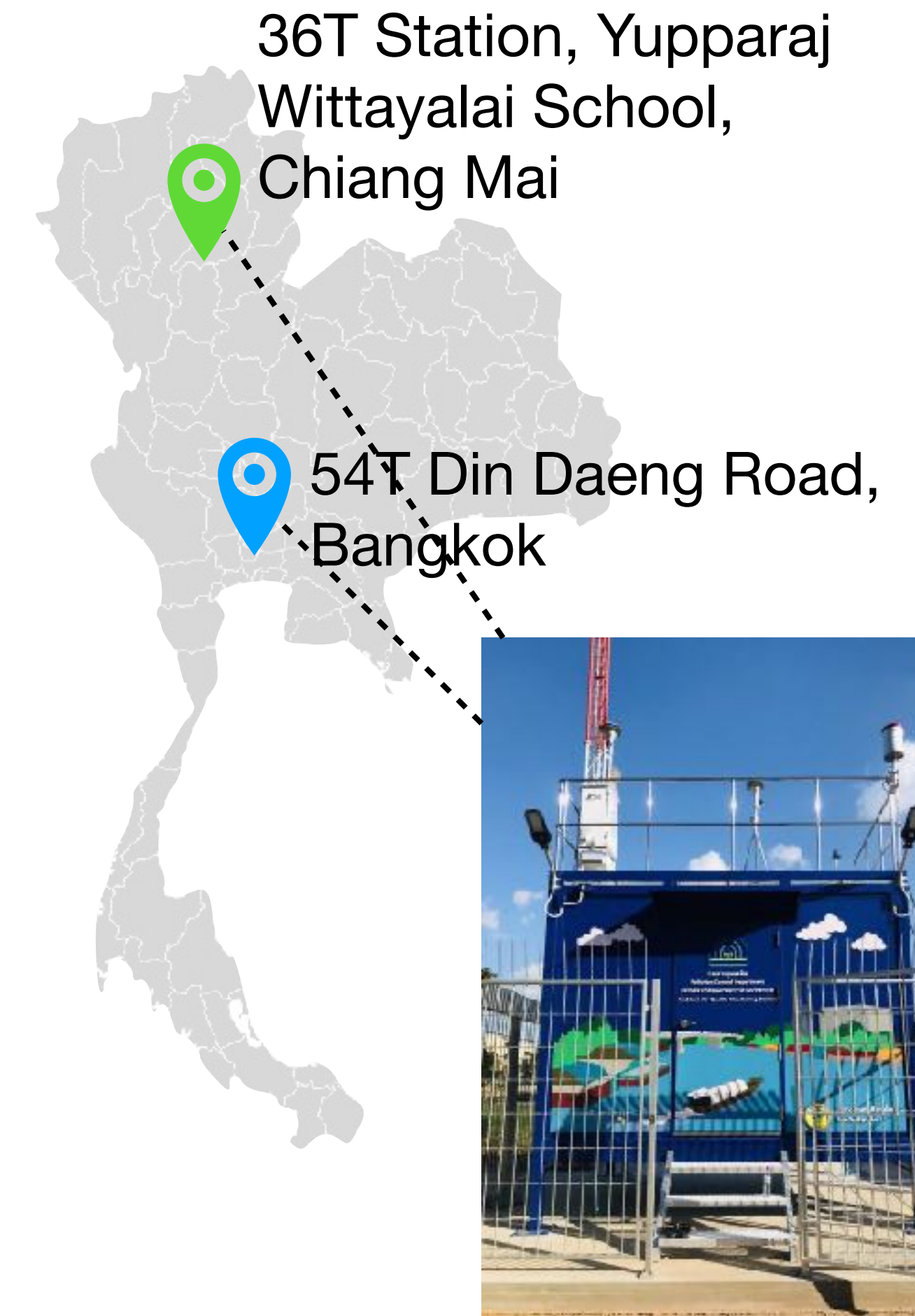
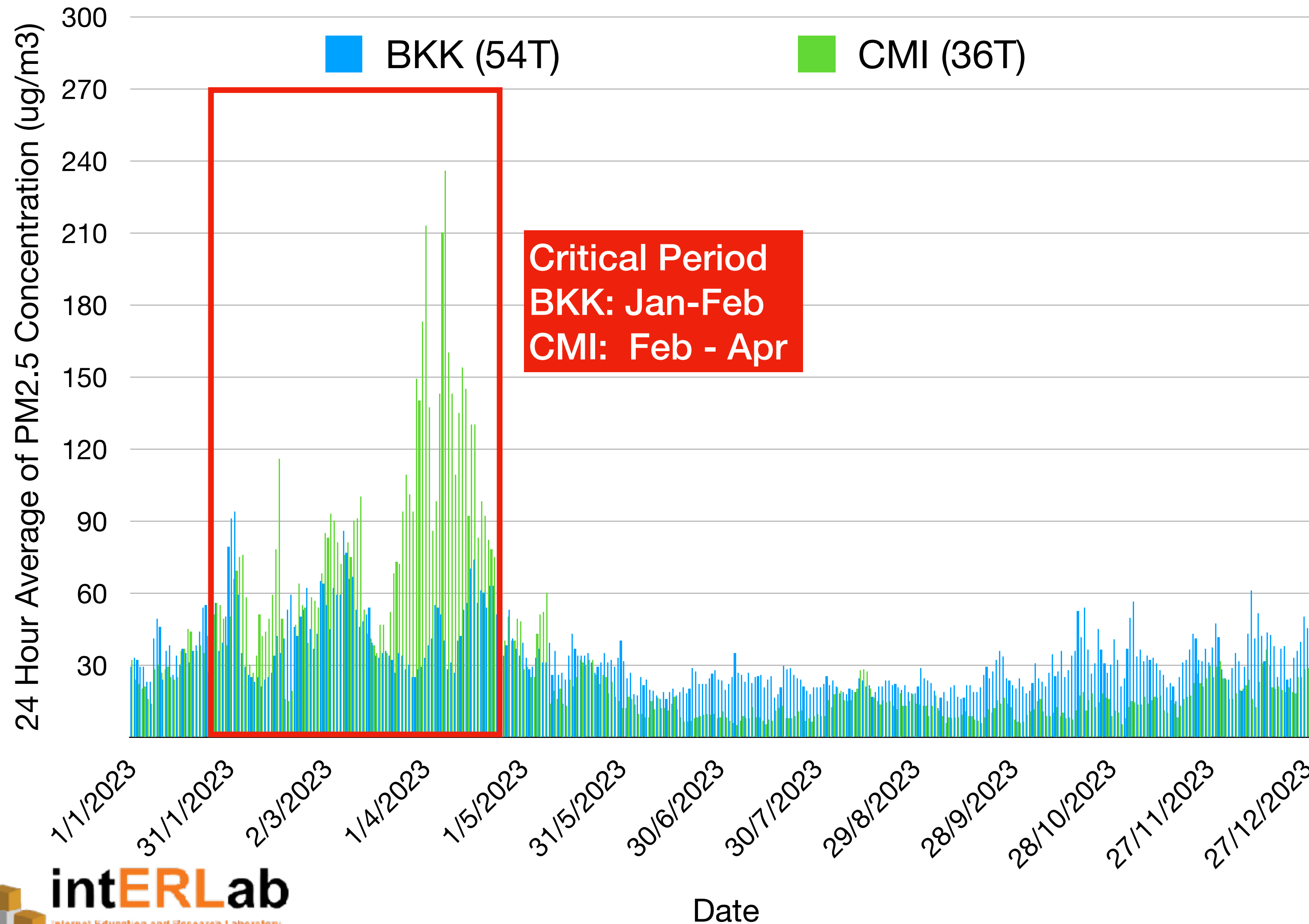
Risk Factor

- SMOKING
- TREES
- INDUSTRIES
- CARS

- **1.3M** sought treatment for pollution-related illnesses in the first 9 weeks of 2023. In 2024, the number rose to **1.6M**.

- Thailand's air pollution is a problem during the dry season - which typically runs from **December to April** every year

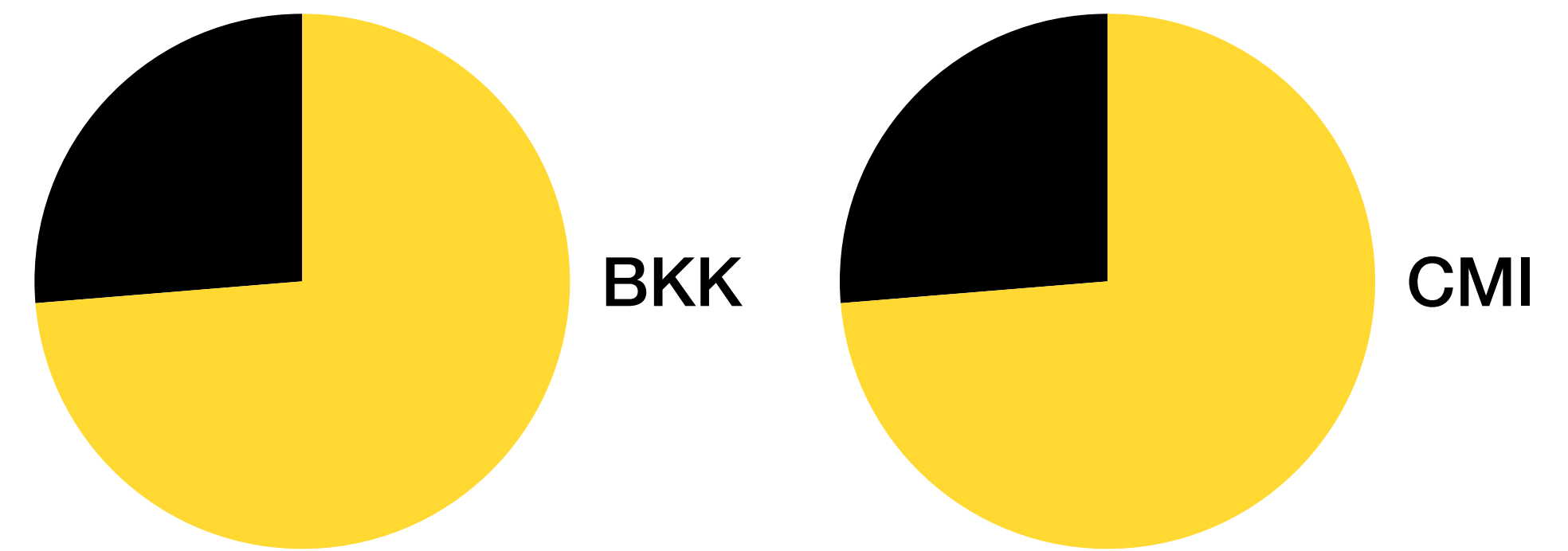
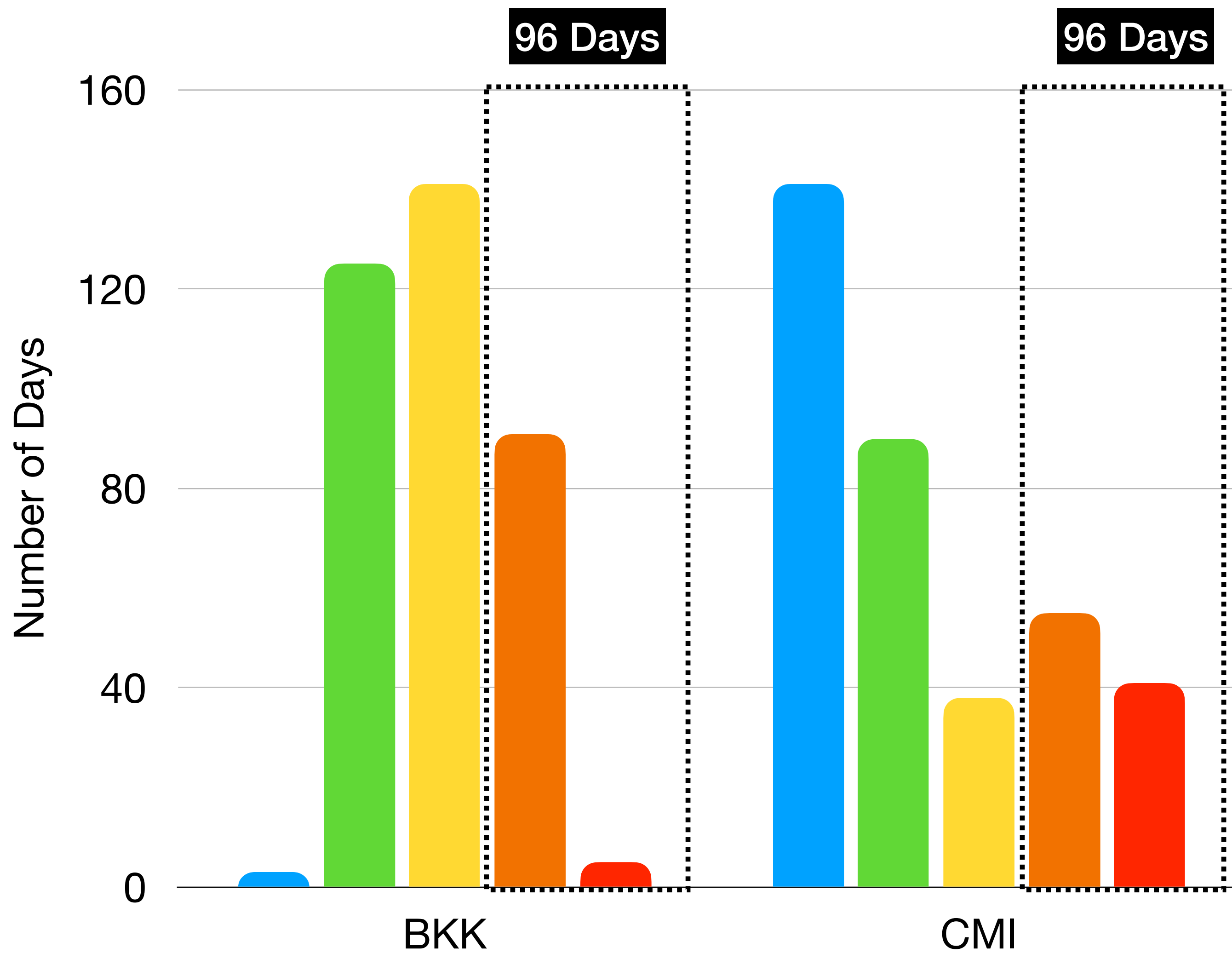
Daily Average PM2.5 Concentration Throughout 2023



Data taken from reference stations owned by Pollution Control Department of Thailand



Number of Days in 2023 Considered as Unhealthy (BKK vs CMI)



Reference Air Quality Index

PM2.5 (ug/m3) Average 24 Hours	Color	Meaning
0-15.0	Blue	Excellent
15.1-25.0	Green	Satisfactory
25.1-37.5	Yellow	Moderate
37.6-75	Orange	Unhealthy
75.1 Above	Red	Very Unhealthy

OK

Unhealthy

Source: Pollution Control Department Thailand

Air Quality Data for Frontline Workers



Long Working Hours facing air pollution



Lack of Medical Checkup



Close to air pollution's source

Vulnerable Groups

- Motorcycle riders (e.g., Food Delivery, Ride Sharing, Parcel Delivery)
- Construction Workers
- Street Food vendors

<https://thai.news/news/thailand/bma-and-environment-minister-unite-to-combat-bangkoks-persistent-air-pollution-crisis>

SEA-HAZEMON: Real-Time Haze Monitoring and Forest Fire Detection Information Centric Networks



REAL TIME DATA COLLECTION

- Understanding of PM2.5 plume movement
- Formation + Disappearance of plume
- Prediction of PM2.5 concentrations

ANALYSIS



Affordable large scale data collection

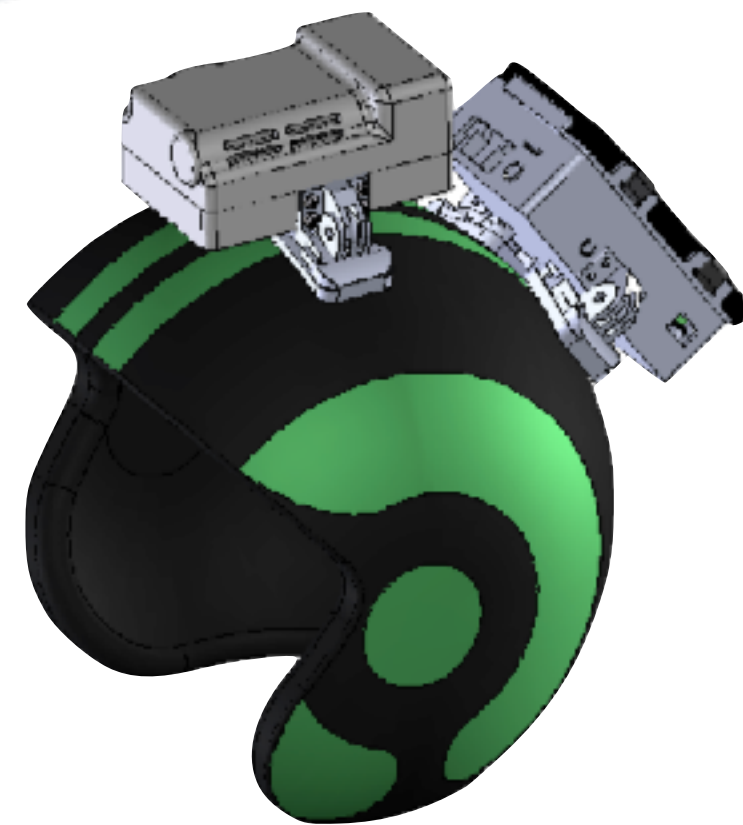


Design of Hazemon Mobile Node

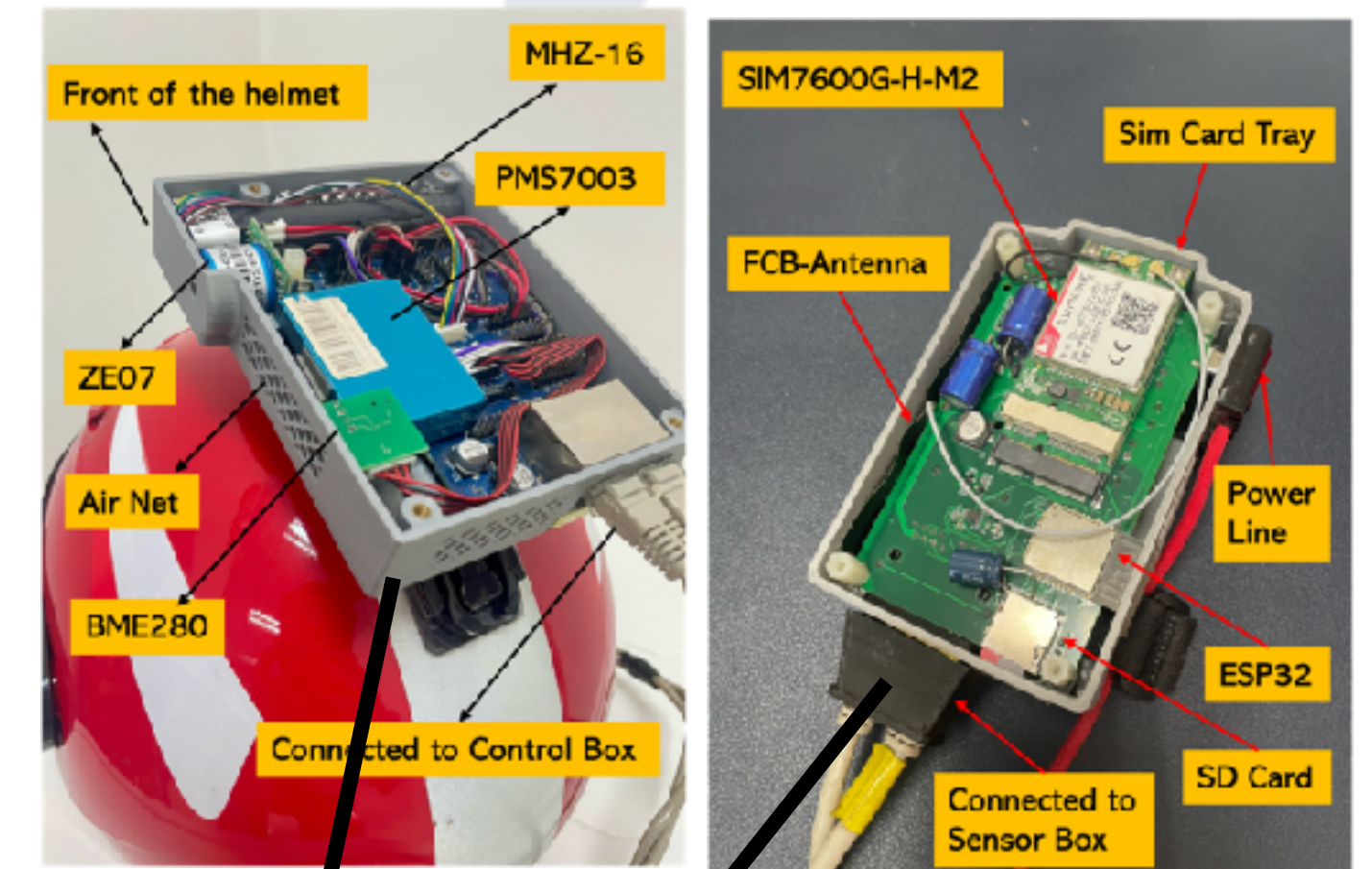
Initial Design ●
May 2023



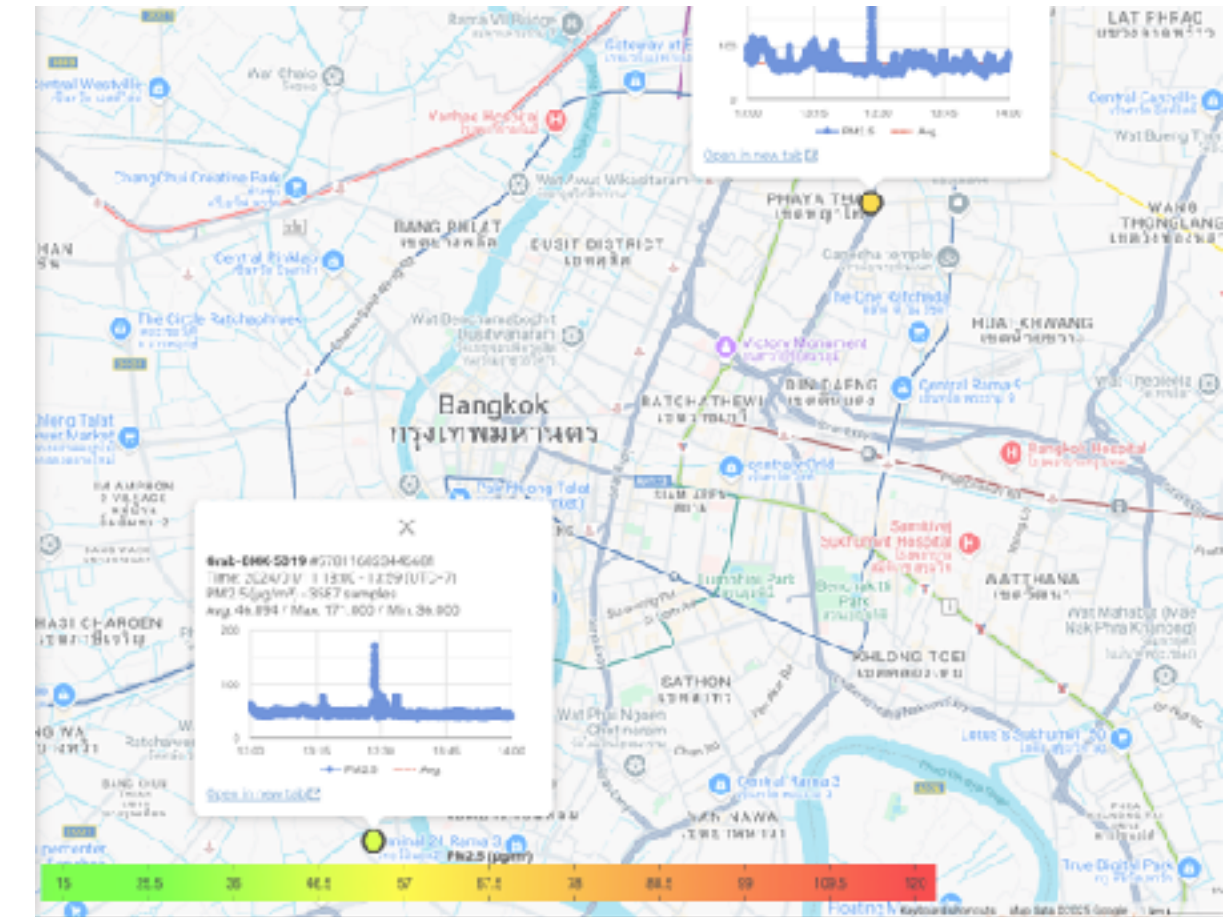
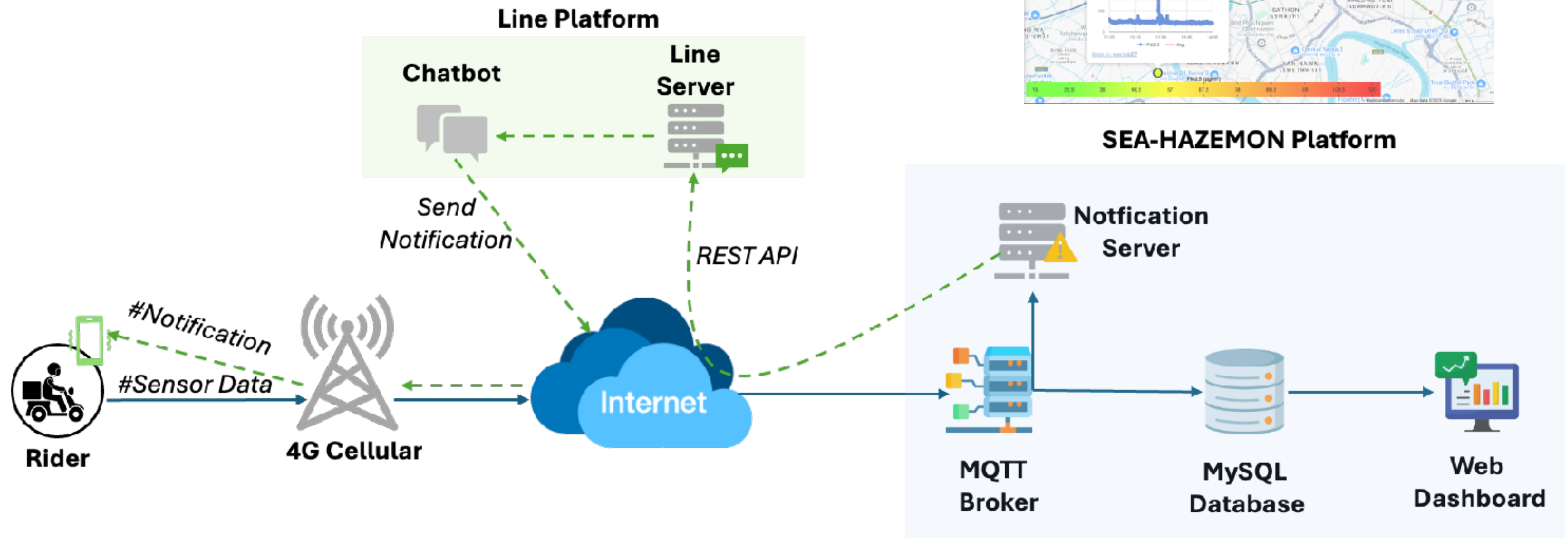
Revised Design ●
July 2023



Final Design ●
September 2023



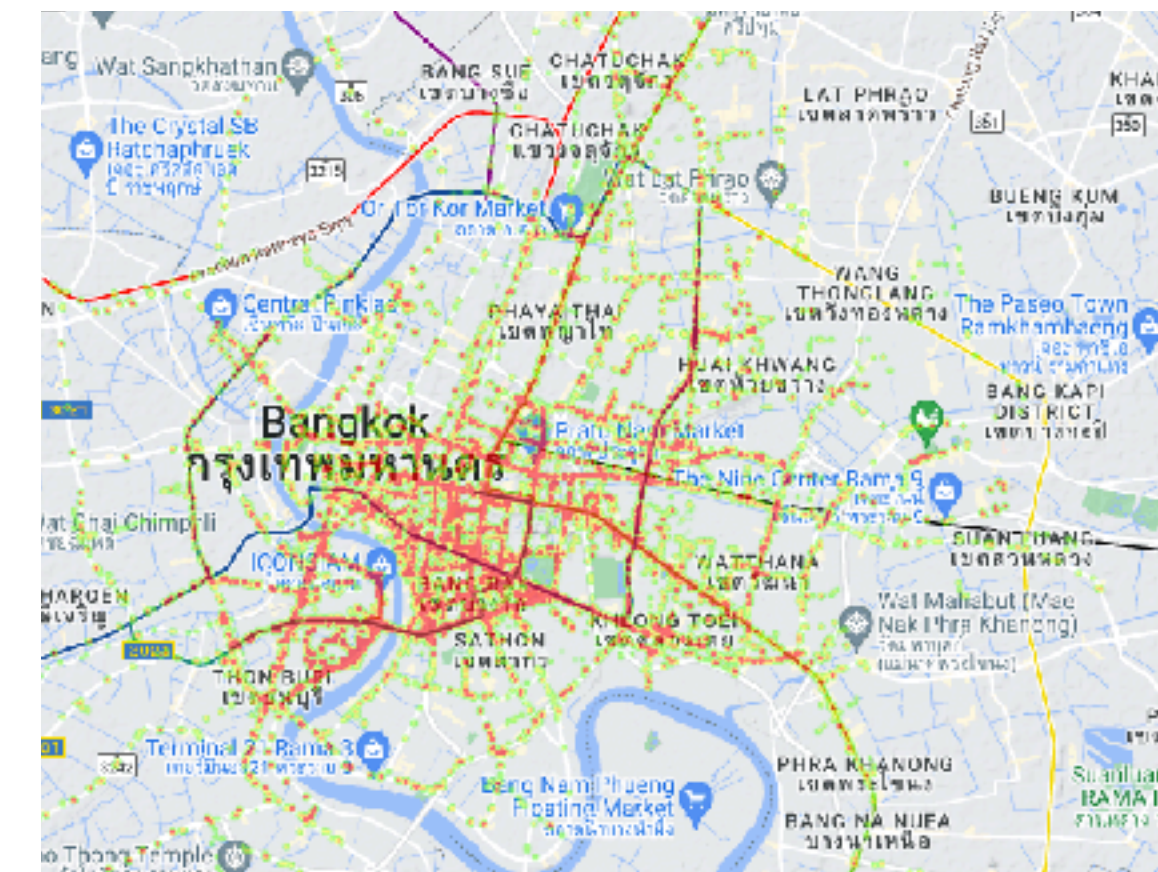
Mobiel-HazeMon: Tracking Air Pollution on the Move



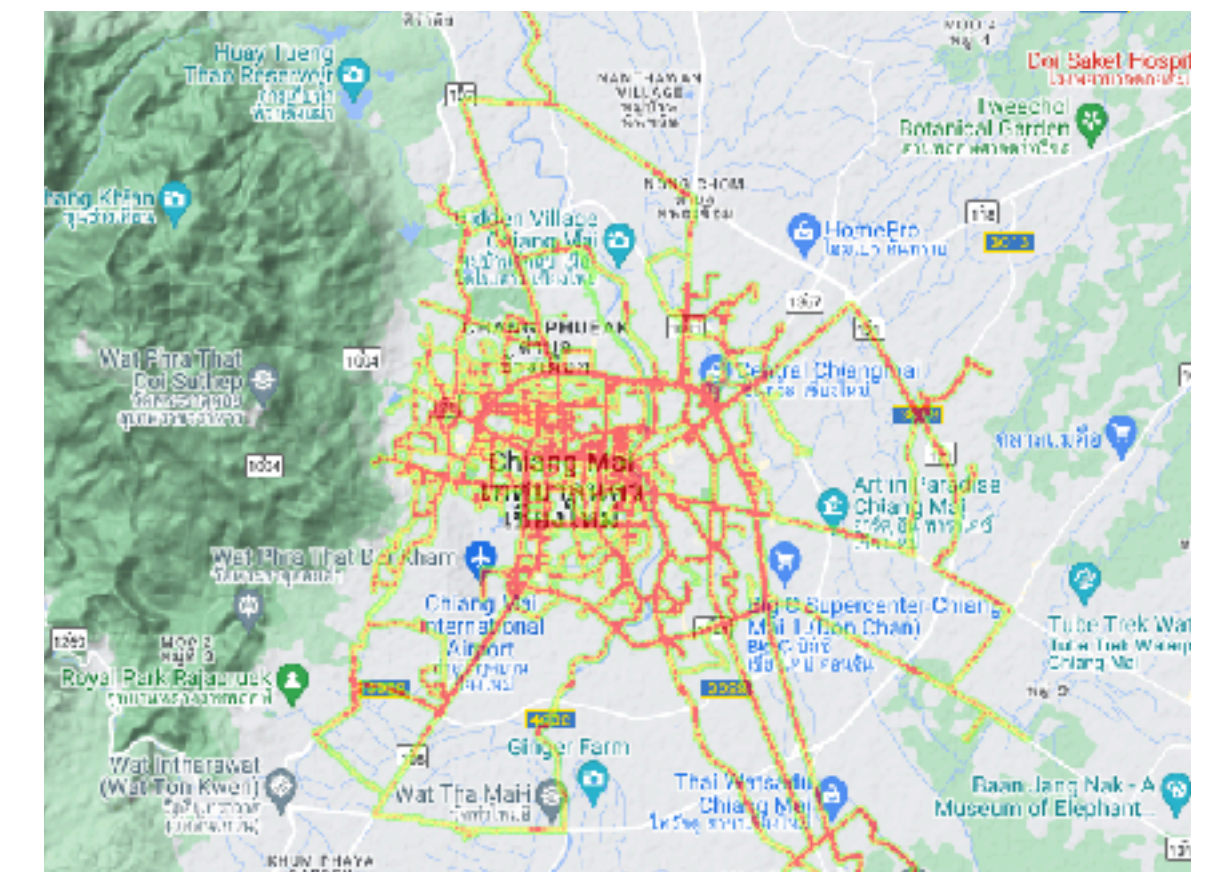
SEA-HAZEMON Platform

Measurement Campaign

Spatial Distribution of PM2.5



BKK rider (1 Working Day)

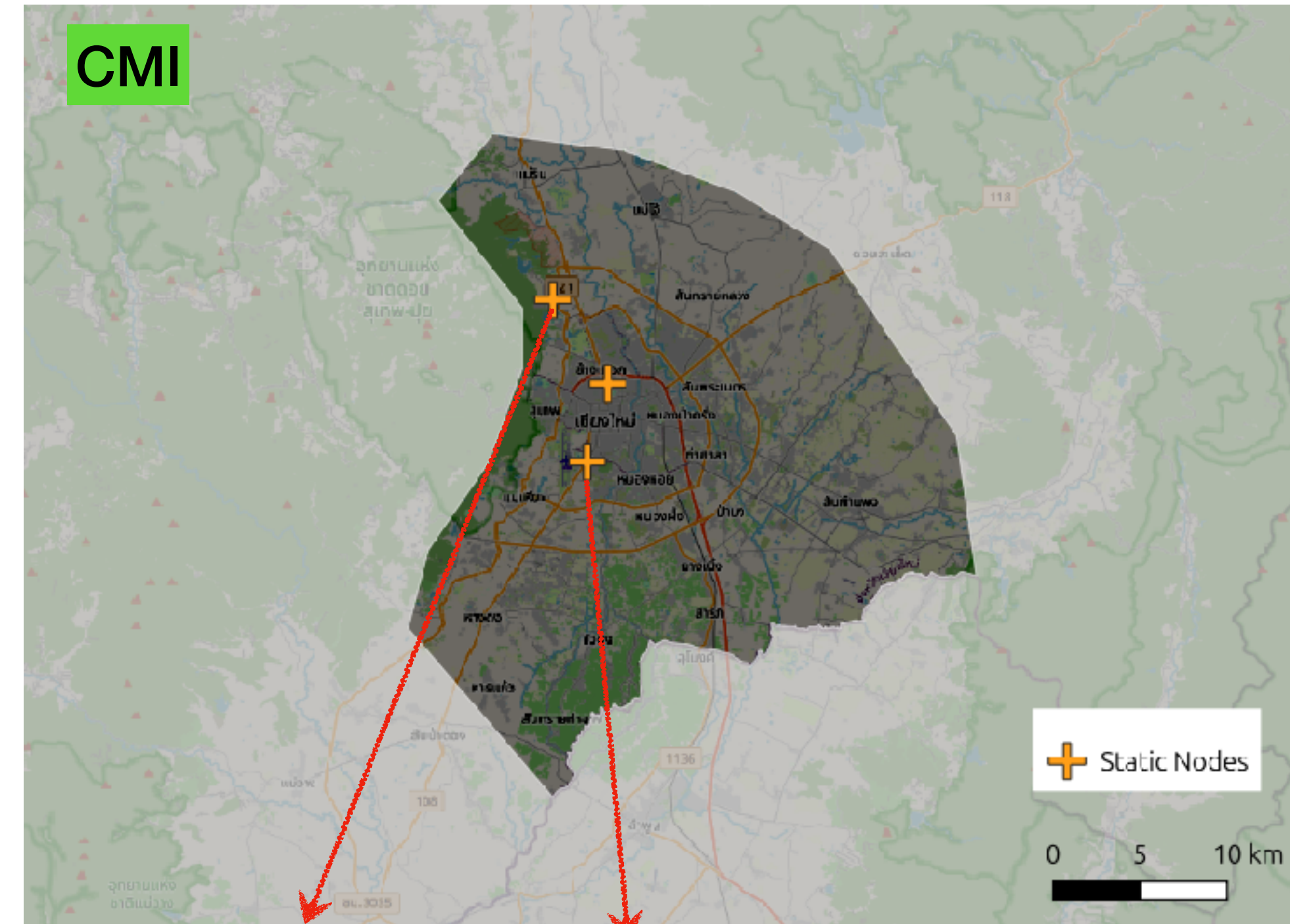
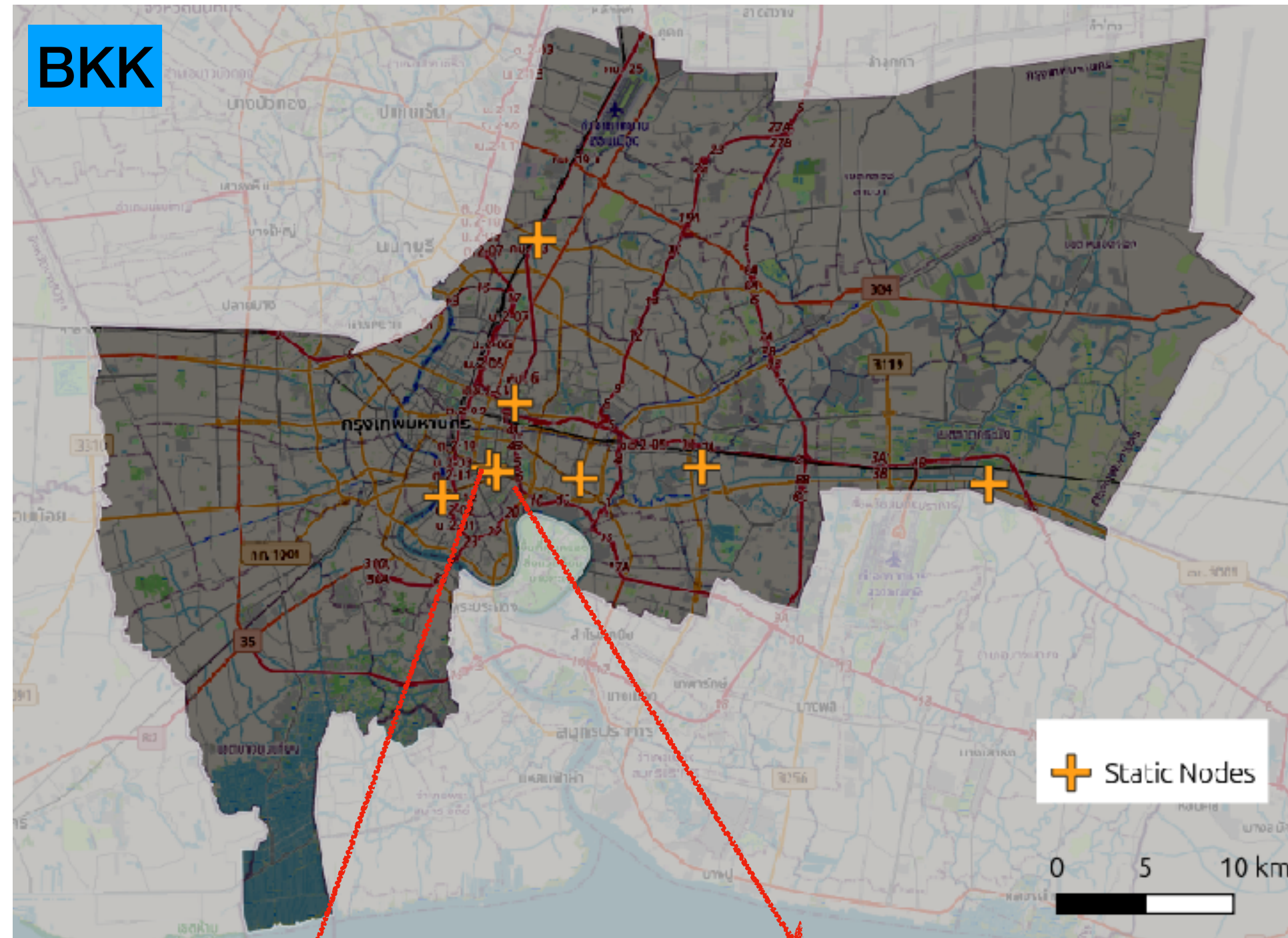


CMI rider (1 Working Day)



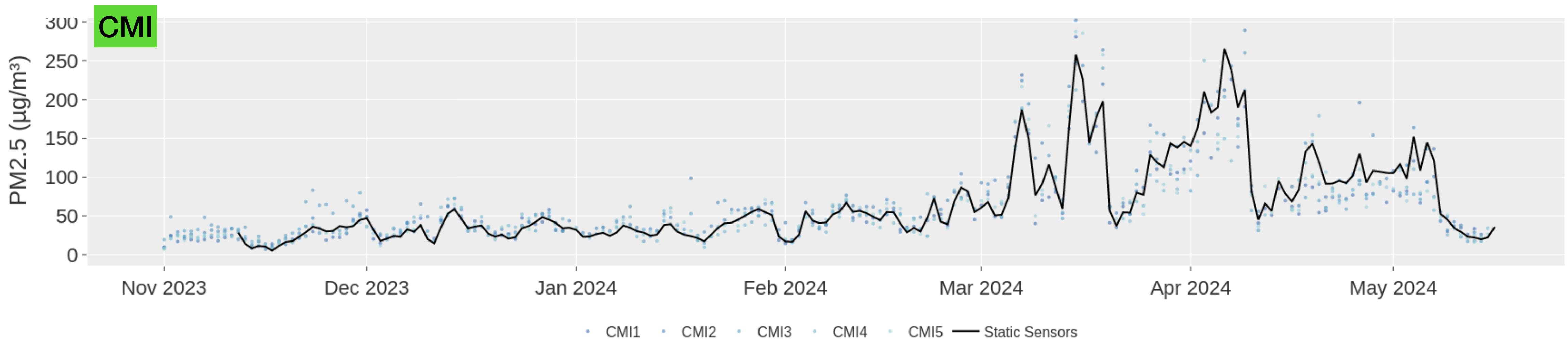
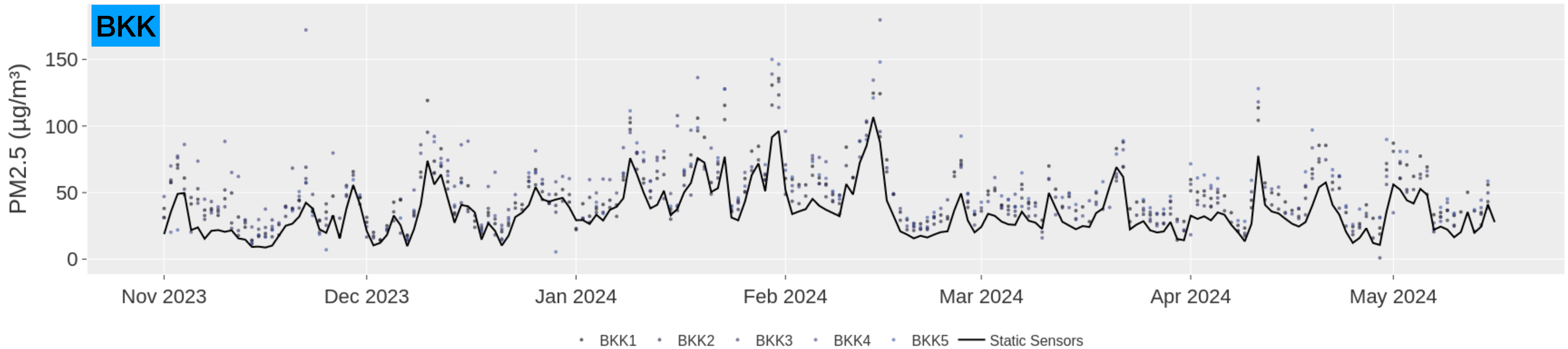
- Measuring Daily Exposure Over a 7-Month Period (Nov 2023 - May 2024)
- Investigating Potential Adverse Effects of Long-Term Exposure and Health Risks to Riders 10 Grab Volunteers in Bangkok (BKK) and Chiang Mai (CMI)

Study Area



Using static Hazemon nodes deployed in Bangkok and Chiang Mai as a baseline

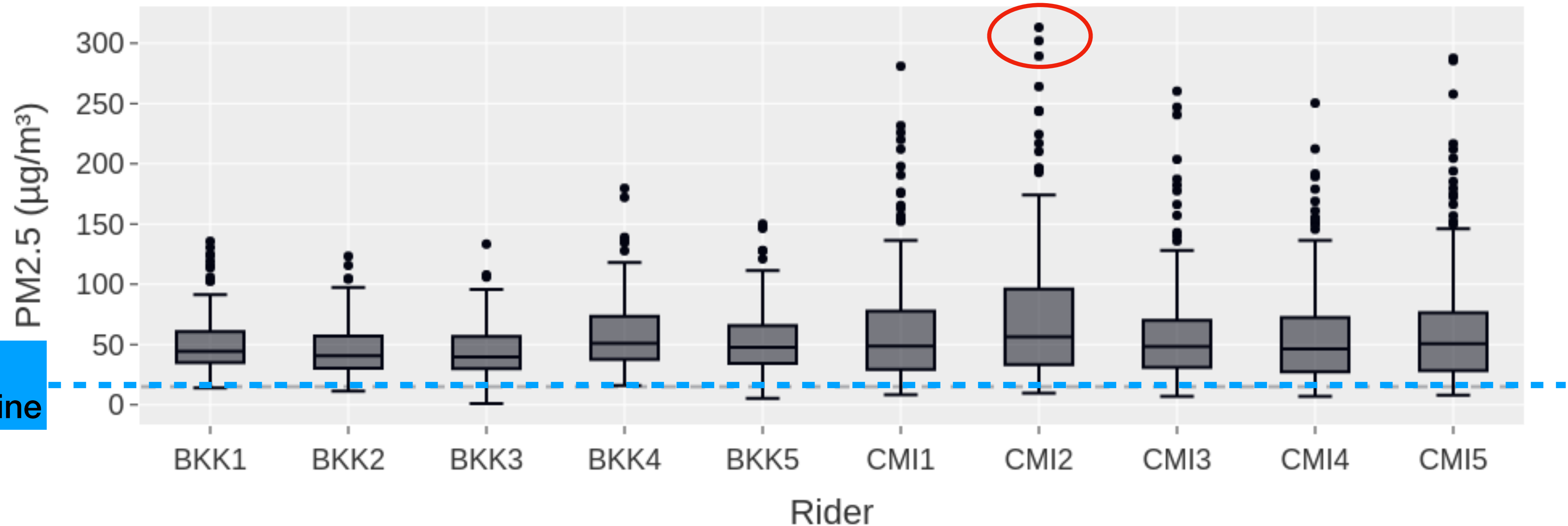
Average Daily Variation in PM2.5 Concentrations



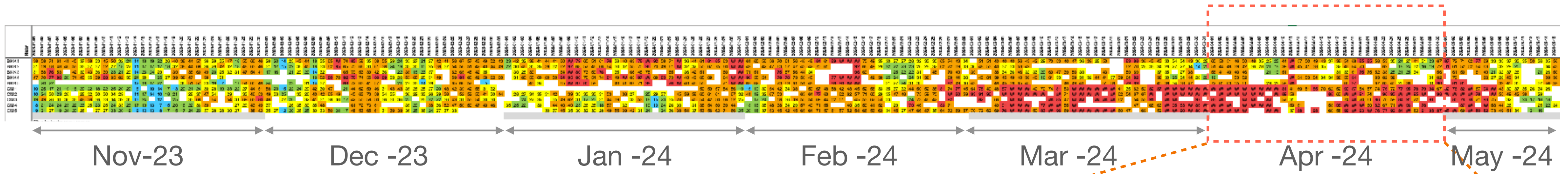
Distribution of PM2.5 Exposure (Daily Average)

Peak: 313.2 ug/m³ (20 times over the guideline)

15 ug/m³
USEPA's guideline



Number of Days Considered as Unhealthy (BKK vs CMI)



Rider	Ratio (%)					Day Off	Work Days	Bad Days	Ratio (%)
	0-15	15.1-25	25.1-37.5	37.5-75	>75				
BKK1	2	13	47	107	25	3	194	132	68.04
BKK2	3	25	49	87	9	21	173	96	55.49
BKK3	2	22	35	69	8	54	136	77	56.62
BKK4	0	10	26	83	30	43	149	113	75.84
BKK5	5	11	20	61	21	78	118	82	69.49
CMI1	7	26	25	62	47	5	167	109	65.27
CMI2	4	8	41	58	50	27	161	108	67.08
CMI3	3	20	35	59	30	42	147	89	60.54
CMI4	5	24	29	50	34	44	142	84	59.15
CMI5	6	25	36	61	45	19	173	106	61.27

	2024-04-01	2024-04-02	2024-04-03	2024-04-04	2024-04-05	2024-04-06	2024-04-07	2024-04-08	2024-04-09	2024-04-10	2024-04-11	2024-04-12	2024-04-13	2024-04-14	2024-04-15	2024-04-16	2024-04-17	2024-04-18	2024-04-19	2024-04-20	2024-04-21	2024-04-22	2024-04-23	2024-04-24	2024-04-25	2024-04-26	2024-04-27	2024-04-28	2024-04-29	2024-04-30
BKK1	60	50	51	46	50	48	35	25	23	44	##	57	50	49	43	37	38	54	68	85	85	58	53	35	24	27	41	31	23	67
BKK2	51	44	48	39	42	36	28	21	18	39	##	45	41	38	35		32	46	64	73		62		18	24	32	16	19	72	
BKK3	56	41	40	40	46			21	19	51							31	33	61	75	75	52	38	25	21	25	34		56	
BKK4	18			53	52						##	54	53	54	34	34	38	55	84			63	62	39					31	62
BKK5	72	61	63	55	61			29	28	59	##							66	97			67	63	40	26	38		31	90	
CMI1	121	133	157	125	176	212	226	175	191	81	41	60	51	85	70	62	52	90	87	54	57	74	76	72	77	95	78	79	94	67
CMI2		174	196	193	210	313	244		289	89	56					88	63	144	146	91	74		96	93	104	196	95	154		98
CMI3	83	102			136	204		166		57	31							74	101	70	61	86	70	59	84	91	72		91	
CMI4	135	146	250		155	150	121	169			50	51				58	96	119	155	179	60	82	67	71	102	96		78		
CMI5	111	134	205	194	144			152	212		37	88		98		60	58	99	103	93	107	76	77	92	84	110	62	91	93	87

Key Takeaways

- Outdoor workers face **extremely high pollution exposure**, exceeding safe limits.
- The **mitigation strategy** urgently needs to be developed. One example could be taking a few hours or days off for rehabilitation.
- **A Health Risk Assessment** is crucial, along with medical checkups for vulnerable groups.
- **Reported air quality data** from static stations may not fully reflect actual conditions in the city.
- **Low-cost sensors** can enhance fine-grained measurements, though some variation from standard equipment is expected.



Thank You

Q & A