Clean Air Catalyst

A Global Partnership for Accelerating Clean Air Solutions

Pneumonia Day - Overview of air pollution sources and air quality management in Jakarta

Jakarta, 2 - 4 August 2022

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WORLD RESOURCES INSTITUTE

Vital Strategies

Jakarta
a city of collaboration

OUTLINE

- Air Quality Management and Monitoring (An Overview)
- Main Sources of Air Pollution in Jakarta
- Clean Air Catalyst Approach for Jakarta's Better Air Quality

Air Quality Management and Monitoring (An Overview)

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Is there any differences?

We cannot eat this food,
We cannot drink this water,
But we can inhale this air without any objections.

Dr Ajay Nagpure (AQ Lead WRI India)

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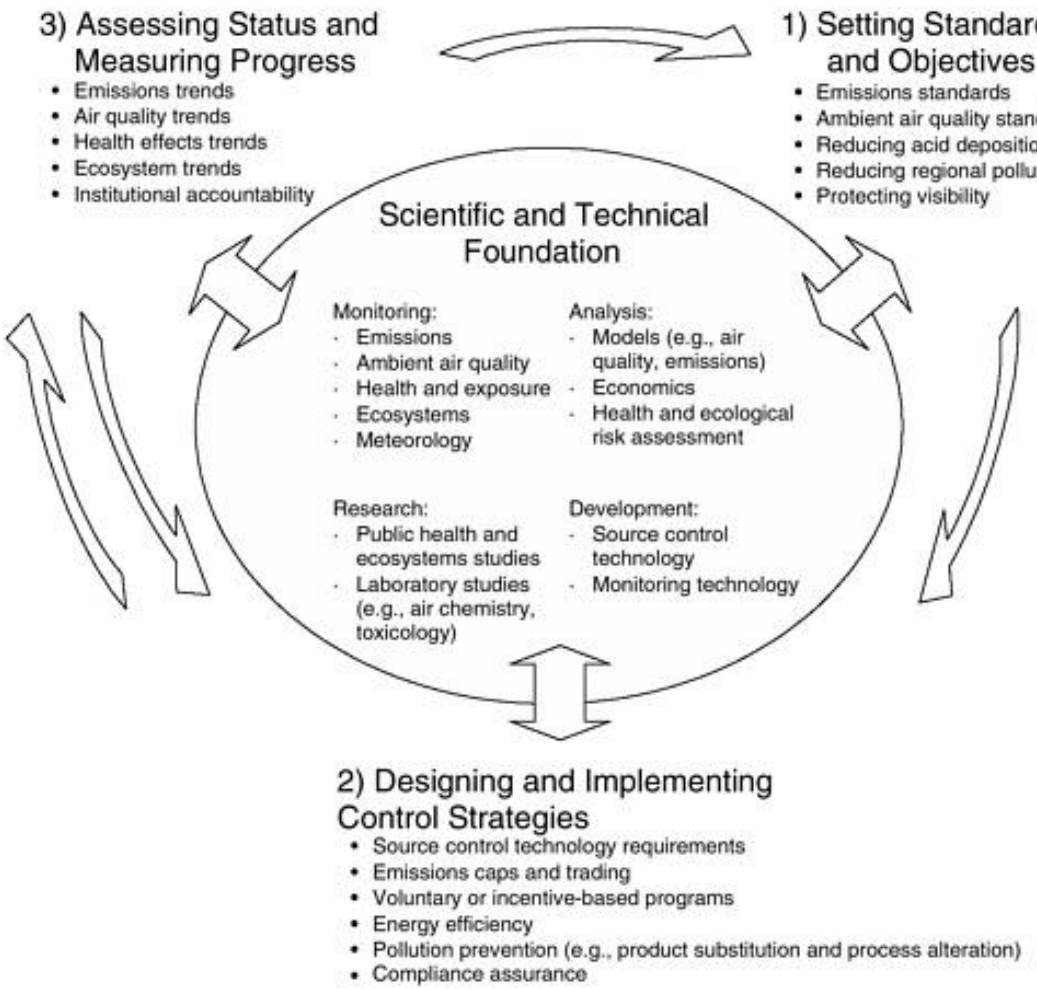
Air Quality Management Principle (Lesson Learned from USA)



Source: https://nap.nationalacademies.org/read/10728/chapter/4

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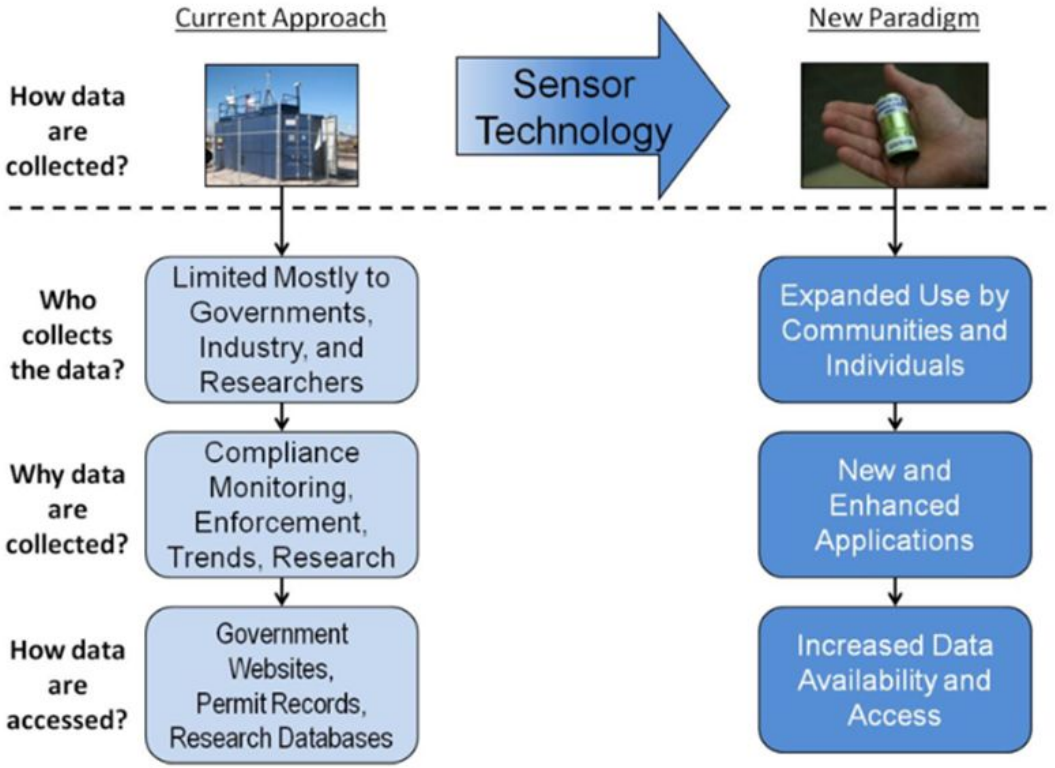
Importance of Measuring Air Quality

Types of Ambient Air Quality Monitoring Station (AAQMS) – real time outdoor monitoring

1 References Grade

- Most accurate.
- Lack the measurement density; low-resolution spatiotemporal air pollutant maps.
- Expensive

2 Sensor Based (Low Cost Sensor)



- Missing data accuracy.
- Providing high-density spatiotemporal pollution data.
- Cheap and easy operation
- Calibration and Co-location is needed

Snyder et al., Changing Paradigm of Air Pollution Monitoring, Env Sci & Technol., 2013

Main Sources of Air Pollution in Jakarta

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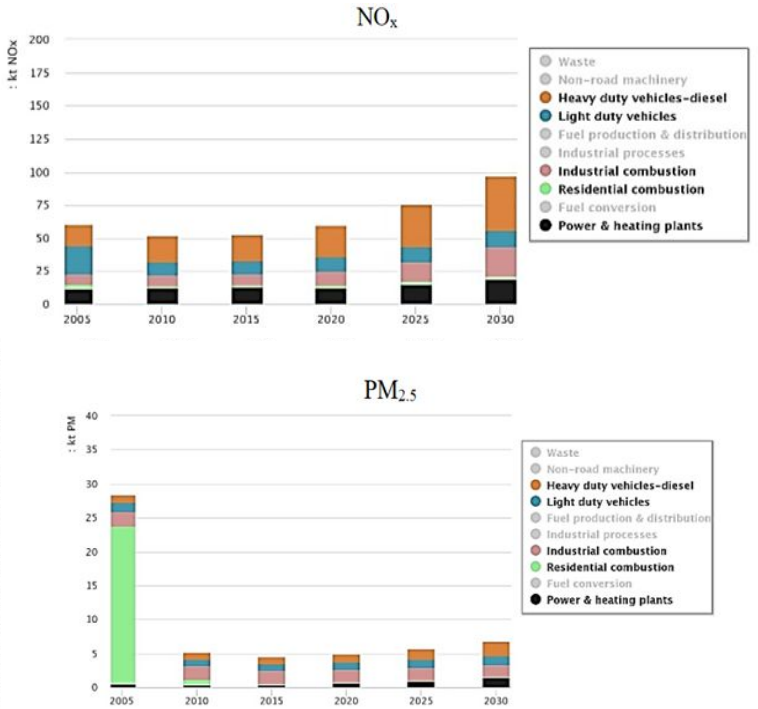
Air Quality Main Sources based on Study Literature in Jakarta

Sector	% contribution											
	SO_x		NO_x		CO		$PM_{2.5}$			PM_{10}	BC	
	A	B	A	B	A	B	A	B	C	A	A	B
Energy Industry	25.17	24	11.54	24	1.76	2	5.69	9	n/a	7.49	2.61	9
Manufacturing	61.96	67	11.49	15	1.25	4	26.81	43	28	33.9	13.31	8
Transportation	11.58	3	72.40	57	96.36	93	67.03	46	46	57.99	84.04	75
Commercial	0.33	NA	0.30	NA	0.03	NA	0.04	NA	5	0.08	0.02	NA
Residential	0.96	6	4.27	4	0.59	1	0.43	2	17	0.54	0.02	8
Biomass burning	NA	NA	NA	NA	NA	NA	NA	NA	5	NA	NA	NA
Construction	NA	NA	NA	NA	NA	NA	NA	NA	1	NA	NA	NA
Road dust	NA	NA	NA	NA	NA	NA	NA	NA	2.5	NA	NA	NA

Sources: (A) Amri, dkk (2020); (B) Lestari, dkk (2020); (C) BreatheEasy, 2017.

Yellow: Highest Contributors
Green: Second Highest Contributors



Source: Lestari, dkk (2020)

Main finding:

- Main pollution sources in Jakarta are **transport and industrial sector**.
- **Transportation is the biggest contributor for NOx, CO, PM2.5, PM10, and BC**
- Meanwhile, manufacturing is the biggest contributor for SO2

- Transportation is the biggest contributor (NOx is 57% and CO is 93%).
- SO2 was mostly released from Industrial combustion (67%).
- PM2.5 mostly came from road transportation (46%) and industrial combustion (43%).

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Transboundary Air Pollution from Banten

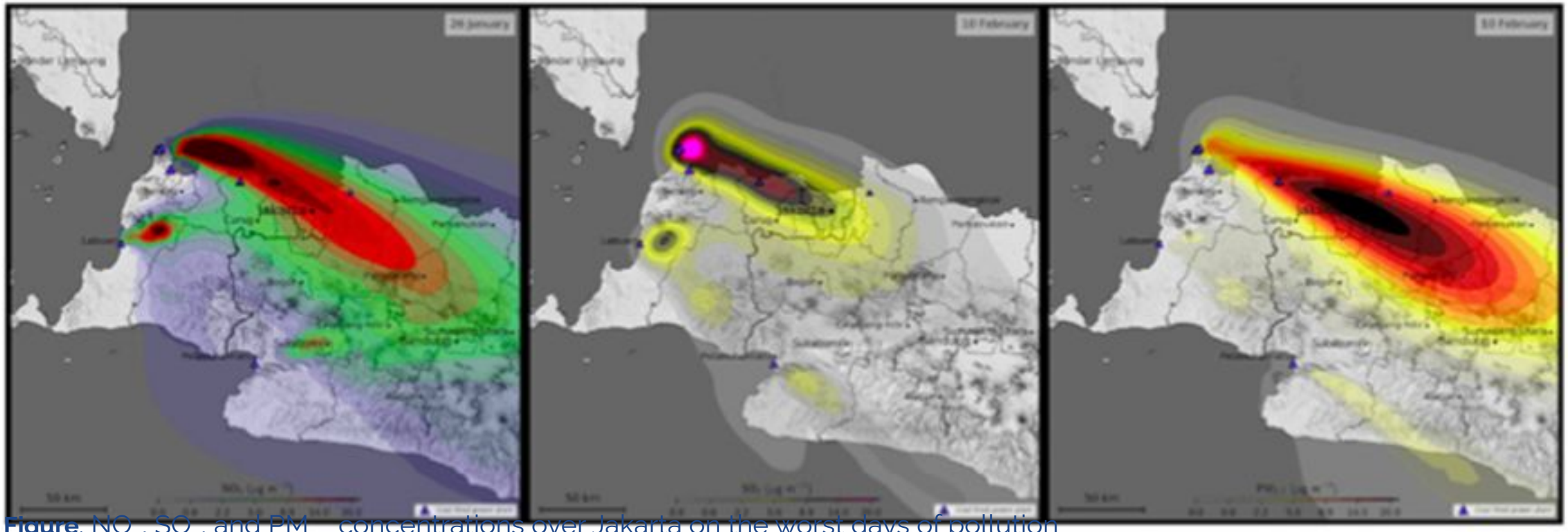

Figure: NO_2, SO_2, and $PM_{2.5}$ concentrations over Jakarta on the worst days of pollution

Main Findings:

During dry season the highest pollutants come from:

- Coal-fired power and industrial plants for SO2
- Transportation sectors for NOx
- Residential and commercial sectors for PM2.5 to the east of Jakarta from West Java.

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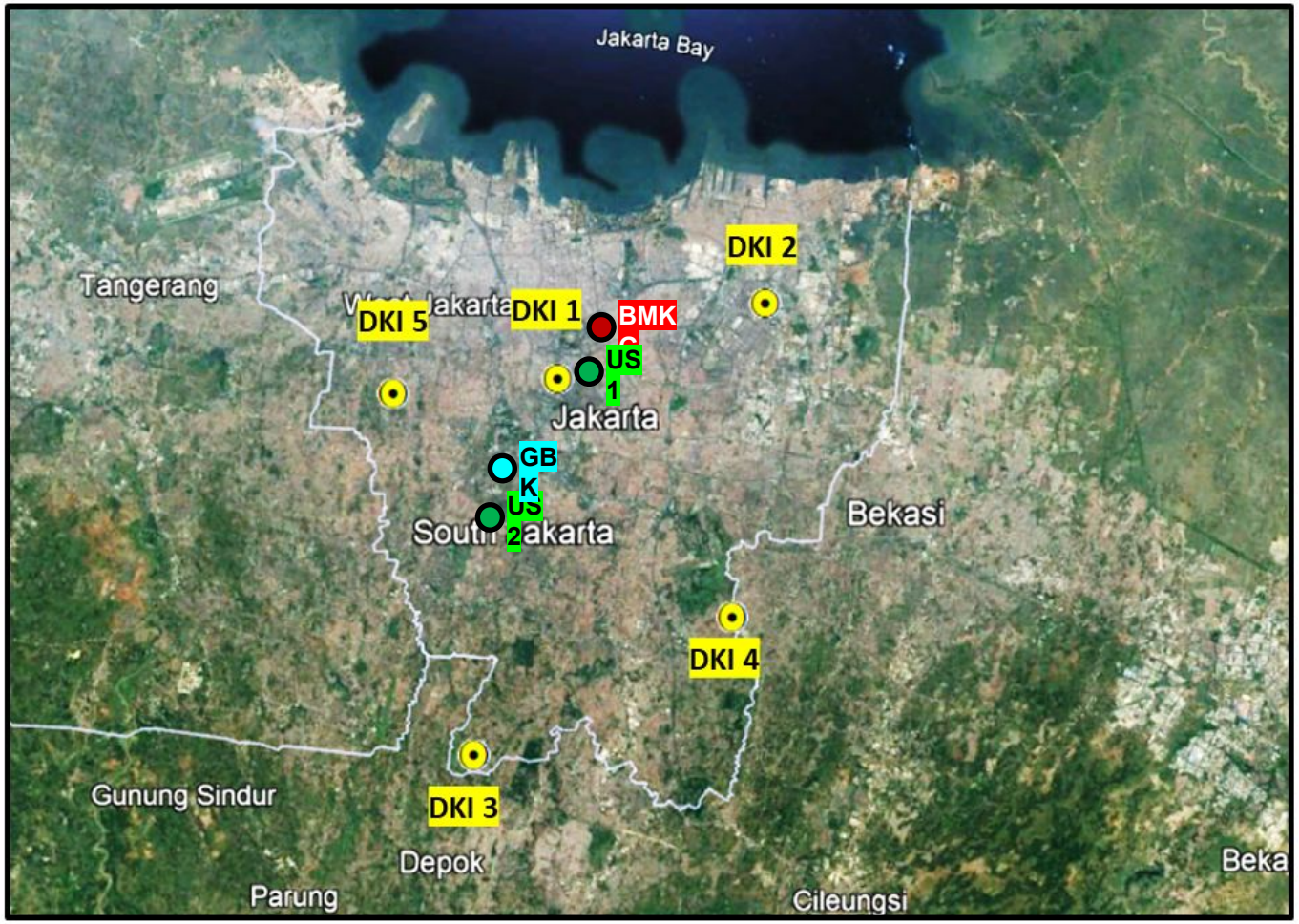
Reference Grade Air Quality Monitoring Station Across Jakarta

ID	Location	Parameter
DKI 1	BUNDARAN HI	PM_{10} $PM_{2.5}$ CO O_3 SO_2 NO_2
DKI 2	KELAPA GADING	
DKI 3	JAGAKARSA	
DKI 4	LUBANG BUAYA	
DKI 5	KEBON JERUK	
BMKG	KEMAYORAN	$PM_{2.5}$
US1	US EMBASSY	
US2	US EMBASSY	
KLHK	GELORA BUNG KARNO	PM_{10} $PM_{2.5}$ CO O_3 SO_2 NO_2



AQ **sensor** monitoring : IQAir (10) and Nafas (+ 40).

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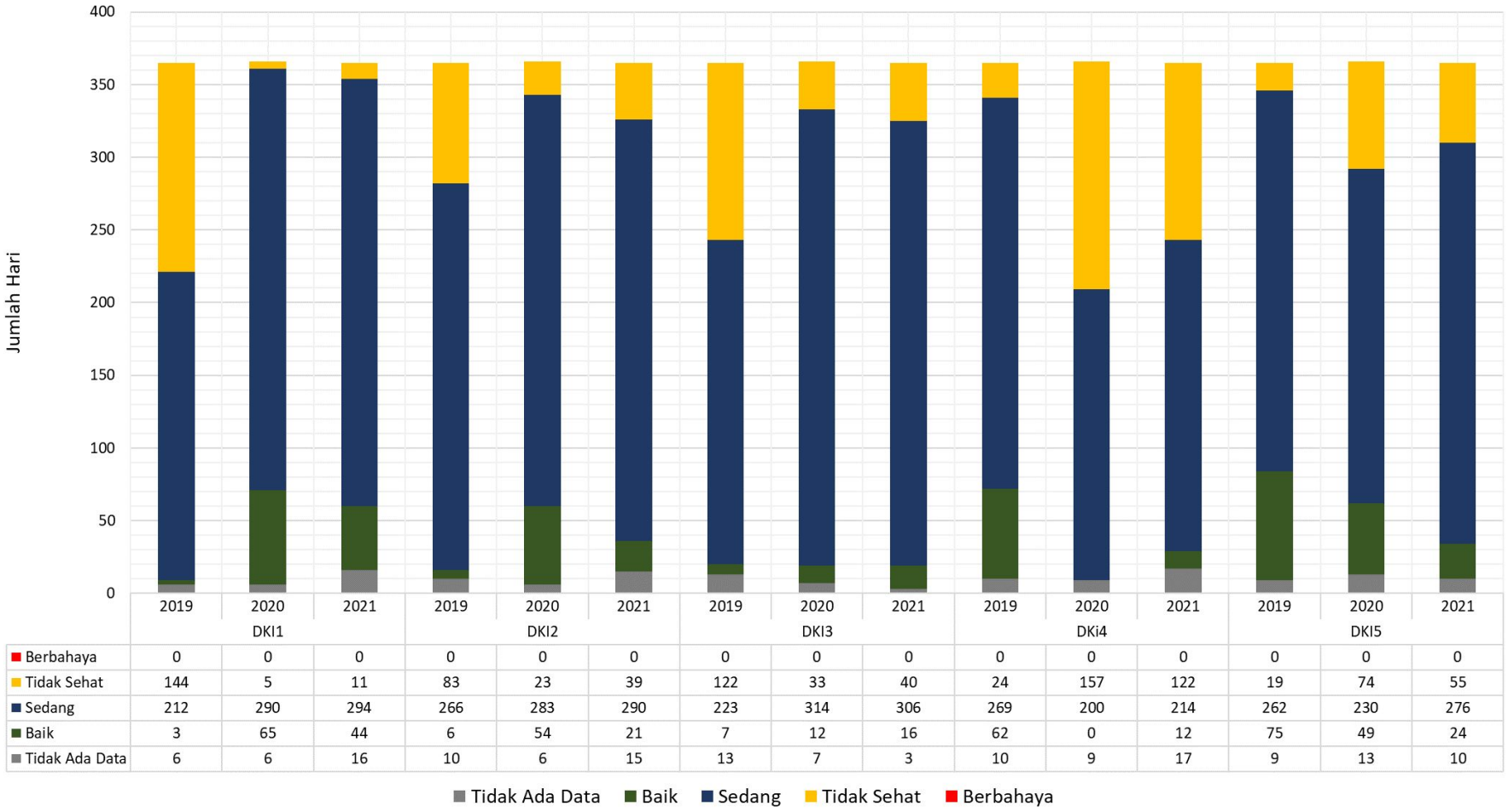
Air Pollutions Standard Index 2019-2021

Main Findings:

- No "dangerous" day during the period 2019-2020
- "Unhealthy" days in 2029 days were higher than in 2020 and 2021, except for the results of monitoring at SPKU DKI4
- Highest number of days in the "medium" level shown in 2020. It is related to social restrictions due to COVID-19.



	2019	2020	2021	2019	2020	2021	2019	2020	2021	2019	2020	2021	2019	2020	2021
	DKI1			DKI2			DKI3			DKi4			DKI5		
Berbahaya	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tidak Sehat	144	5	11	83	23	39	122	33	40	24	157	122	19	74	55
Sedang	212	290	294	266	283	290	223	314	306	269	200	214	262	230	276
Baik	3	65	44	6	54	21	7	12	16	62	0	12	75	49	24
Tidak Ada Data	6	6	16	10	6	15	13	7	3	10	9	17	9	13	10

The calculation of Air Pollutions Standard Index refers to Regulation of Minister Environment and Forestry

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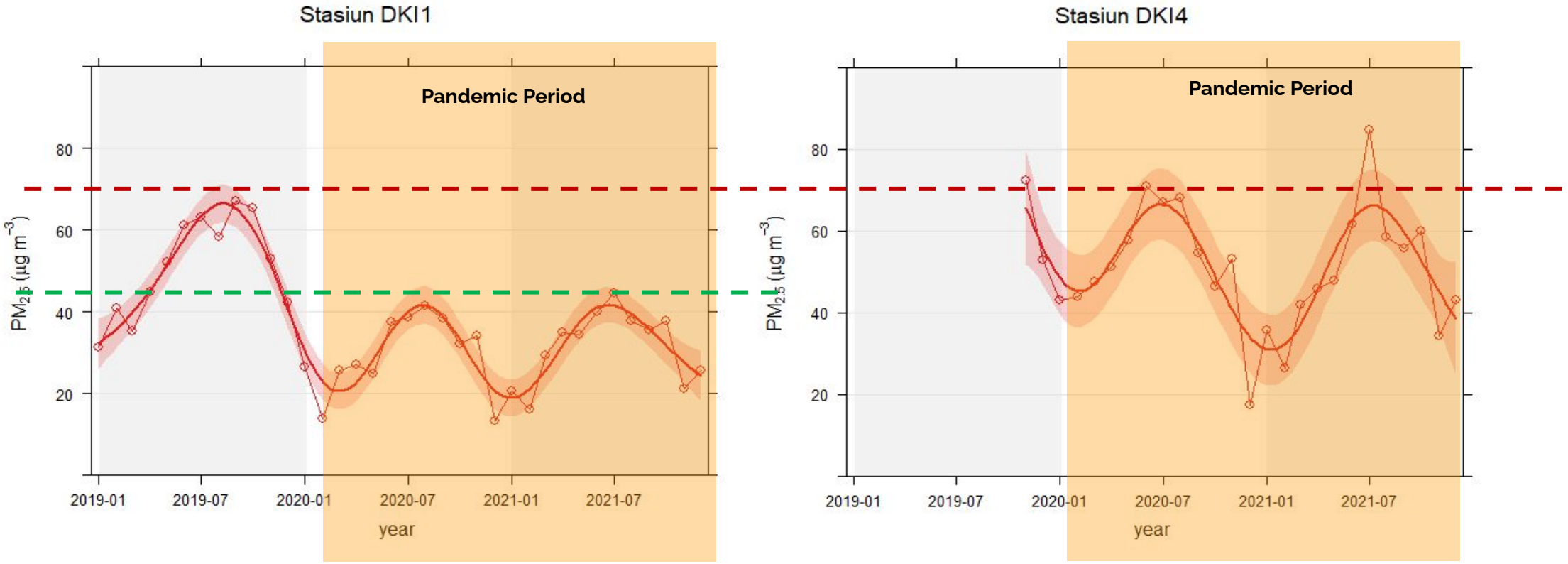
Air Quality Jakarta During COVID-19 Pandemic



Decrease in Monthly Trend

Monthly Trend shows similar trend to DKI1 before Pandemic

Main Findings:

- Significant decrease (~33%) in SPKU DKI1 which is roadside station (transportation dominant source)
- No significant decrease in SPKU DKI4 which is non-roadside station (non-transportation dominant source)

Clean Air Catalyst Approach for Jakarta's Better Air Quality

PROGRAM OVERVIEW

Clean Air Catalyst (CAC) is a 5-year flagship program launched by The U.S. Agency for International Development (USAID) and a global partnership of organizations led by World Resources Institute (WRI) and Vital Strategies in Indonesia.

We aim to advance locally tailored, self-reliant solutions for clean air, climate and improved human health in cities.

WHERE WE WORK

Clean Air Catalyst will work at least in two pilot cities over the next 5 years, including:

INDORE, INDIA

JAKARTA, INDONESIA

NAIROBI, KENYA

PROGRAM PARTNERS

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MAP-AQ

Internews

CLIMATE & CLEAN AIR COALITION TO REDUCE SHORT-LIVED CLIMATE POLLUTANTS

COLUMBIA CLIMATE SCHOOL

Clean Air Toolbox for Cities

EDF ENVIRONMENTAL DEFENSE FUND

Clean Air Catalyst

How Clean Air Catalyst Will Contribute to Improving Jakarta's Air Quality

	01 Expand Source Awareness	02 Identify Most Effective Action	03 Build Strategic Coalition
Issues & Opportunity	Growing interest in addressing root causes of poor AQ in Jakarta – but still some open questions about sectors, and local versus transboundary sources.	Growing public awareness of air quality and Grand Design for Air Quality creates enabling environment for new solutions.	Interest from various communities on AQ issues. Support from local and international partners.
Our Approach			
Expected Results	**Targeted research builds improved knowledge** about air pollution sources that can guide and build public support for effective clean air action	**Analytical methods identify innovative solutions** that address root causes of pollution and generate development co-benefits in key sectors.	**Successful and sustained collaboration** in implementing clean air solutions with clear local benefits.

Achieve Jakarta's goal to reduce emissions and air pollution

and

Improve public health and quality of life due to air quality improvements

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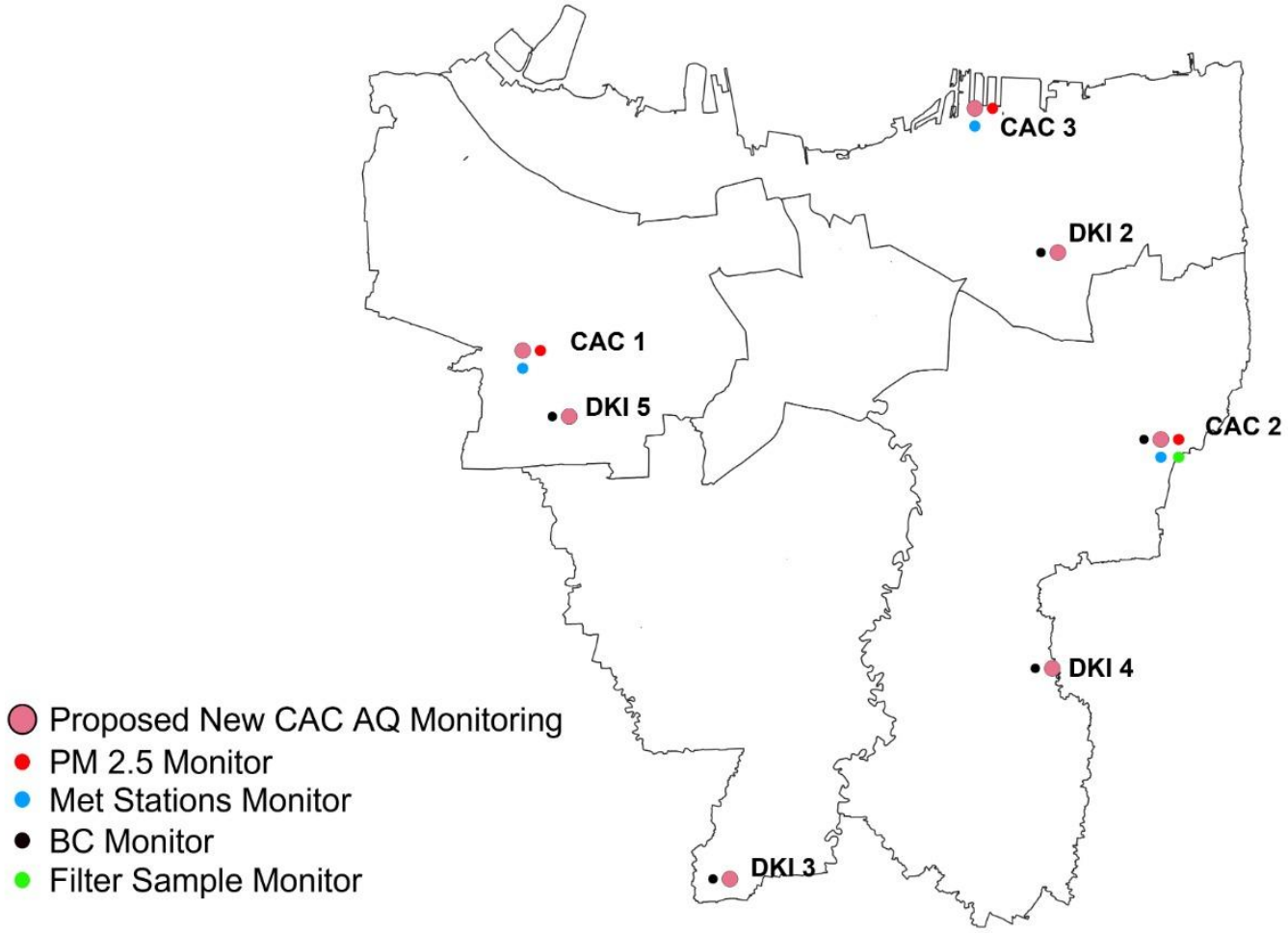
Clean Air Catalyst Action to Monitor Air Quality

Main Points:

- CAC will measure Black Carbon (Short-Lived Climate Pollutant) to address Air Quality and having co-benefits to climate change
- PM2.5 and meteorology sensor measurement is added



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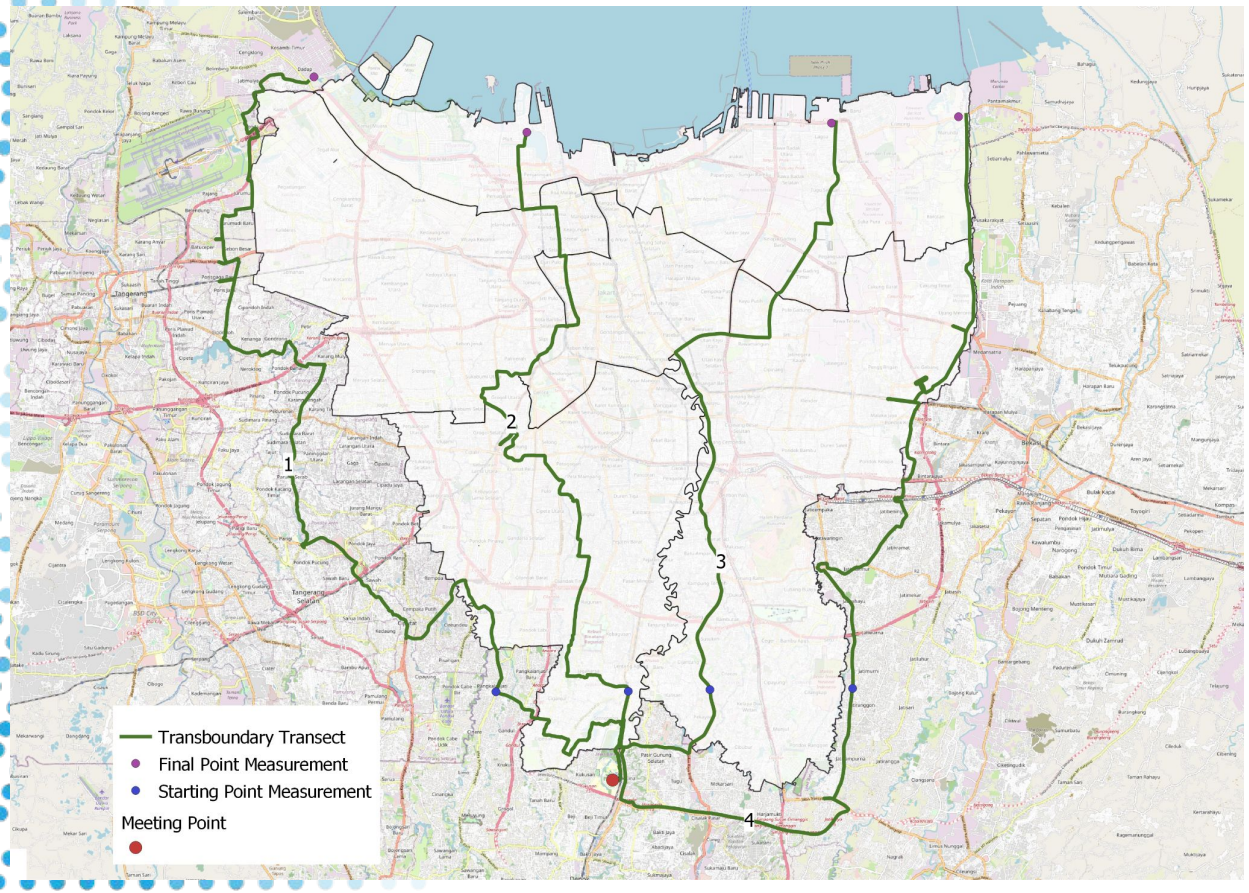
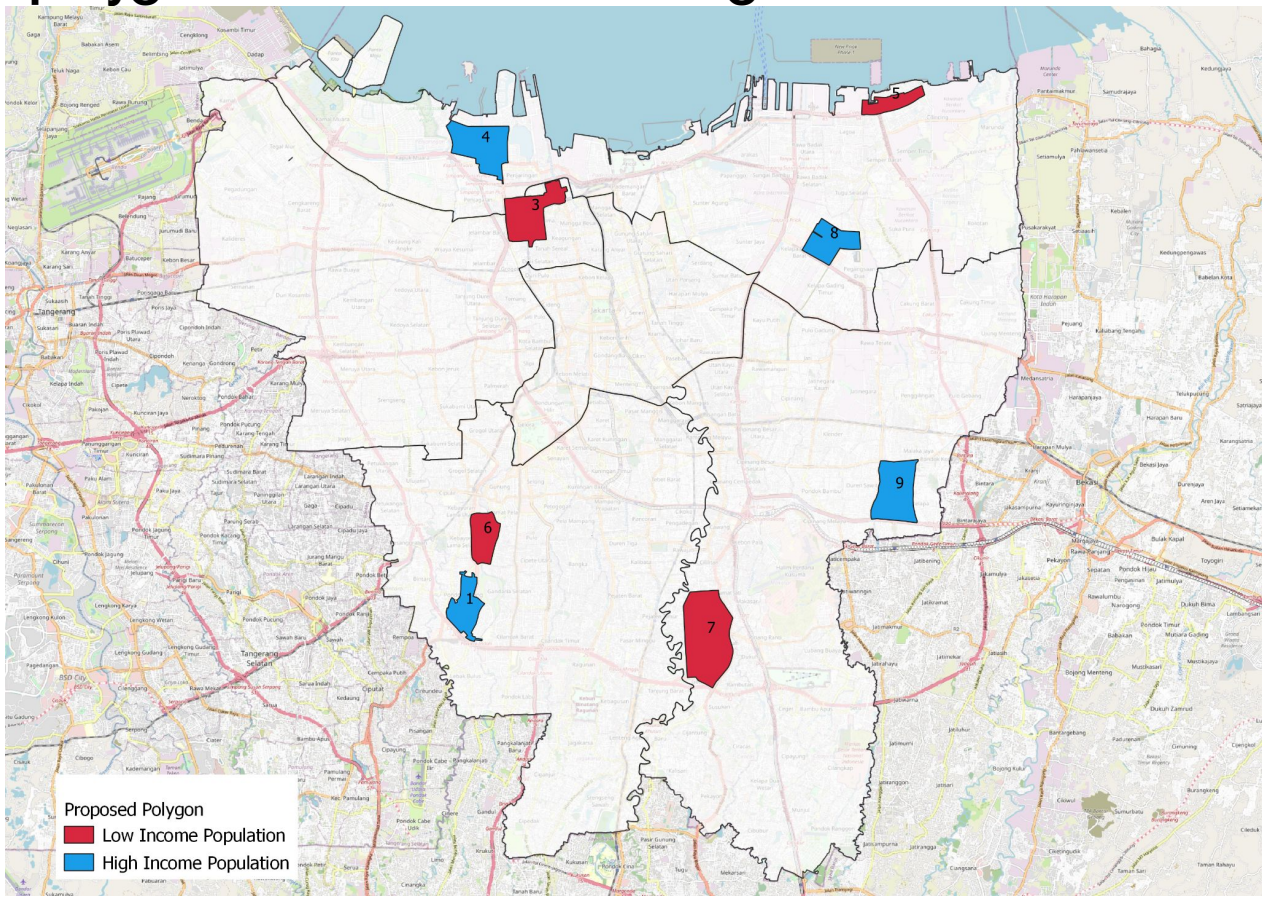
Clean Air Catalyst Approach to Monitor Air Quality

To Identify Transboundary pollutants and exposure in high-low income area

4 transects of mobile monitoring



8 polygons of mobile monitoring



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Thank You

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Information Ecosystem Analysis (IEA): A Snapshot

The researchers conducted a survey of 210 respondents, 7 group for FGD, and in-depth interviews with 17 key informant.

- Majority **(97%)** of the respondents perceive **vehicle exhaust** as the main contributor of air pollution.
- Respondents who live in **North Jakarta show a higher negative sentiment** towards Jakarta's air quality than those living elsewhere in the city.
- Respondents believe that the **local government (46.7%)** and the **central government (17.6%)** are the parties most responsible for reducing air pollution in Jakarta. However, some **(19.5%) also believe that individuals hold more responsibilities** than the central government.
- The type of information that respondents reported needing most relates to the impact of air pollution on **health (63.3%)** and notifications when air pollution level were high (45.7%).
- **Scientists/experts (73.8%),** health workers (48.1%) and NGO activists (32.4%) are the **most trusted sources** of information on air quality while celebrities/influencers (56.7%), government officials (30.5%), and religious leaders (24.8%) are considered untrusted sources of information on air pollution.