Air pollution mitigation assessment to inform Cambodia's first clean air plan

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Organization: Department of Air Quality and Noise Management
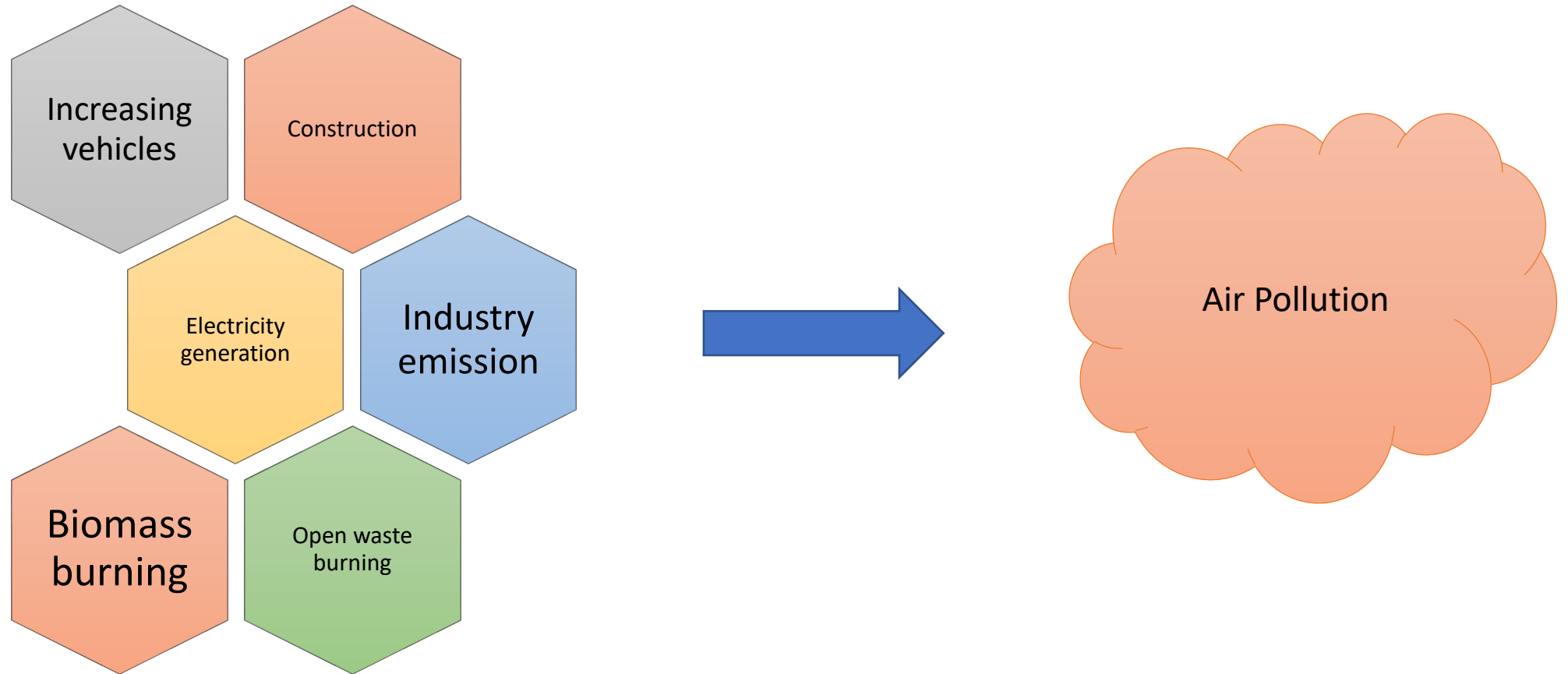
19 March, 2024

Content

1. Introduction

Main Sources of Air Pollution

- Mobile Source: Rapid growth in the use of vehicles, especially older vehicles with the use of low quality fuels (Implemented EURO 4 from 2021). From 1990 to mid-2022, there were a total of 6,678,975 registered motorcycles and cars.

- Stationary Source: Some industries and handicrafts are not yet equipped with air pollution treatment and clean fuel consumption considerations. As of 2023, there are 1,859 industrial plants in operation.

- Construction sites: construction sites, buildings, roads, sewers, bridges, etc. Poor management of air pollutants from the construction site, from the transportation of construction materials and the transportation of raw materials, etc. Statistically, the registered construction area in 2018 was 12,364,768 m2, in 2019 was 23,223,998 m2 and in 2020 was 8,535,476 m2.

- Other Sources: Burning of agricultural waste, forest fires, landfill fires (intentional and unintentional), incineration of residential waste and commercial agriculture. Number of Hotsport for the year 2020 = 28 838, 2021 = 26 339, 2022 = 16 232

1. Introduction (Con't)

Map of Air Quality Monitoring Station
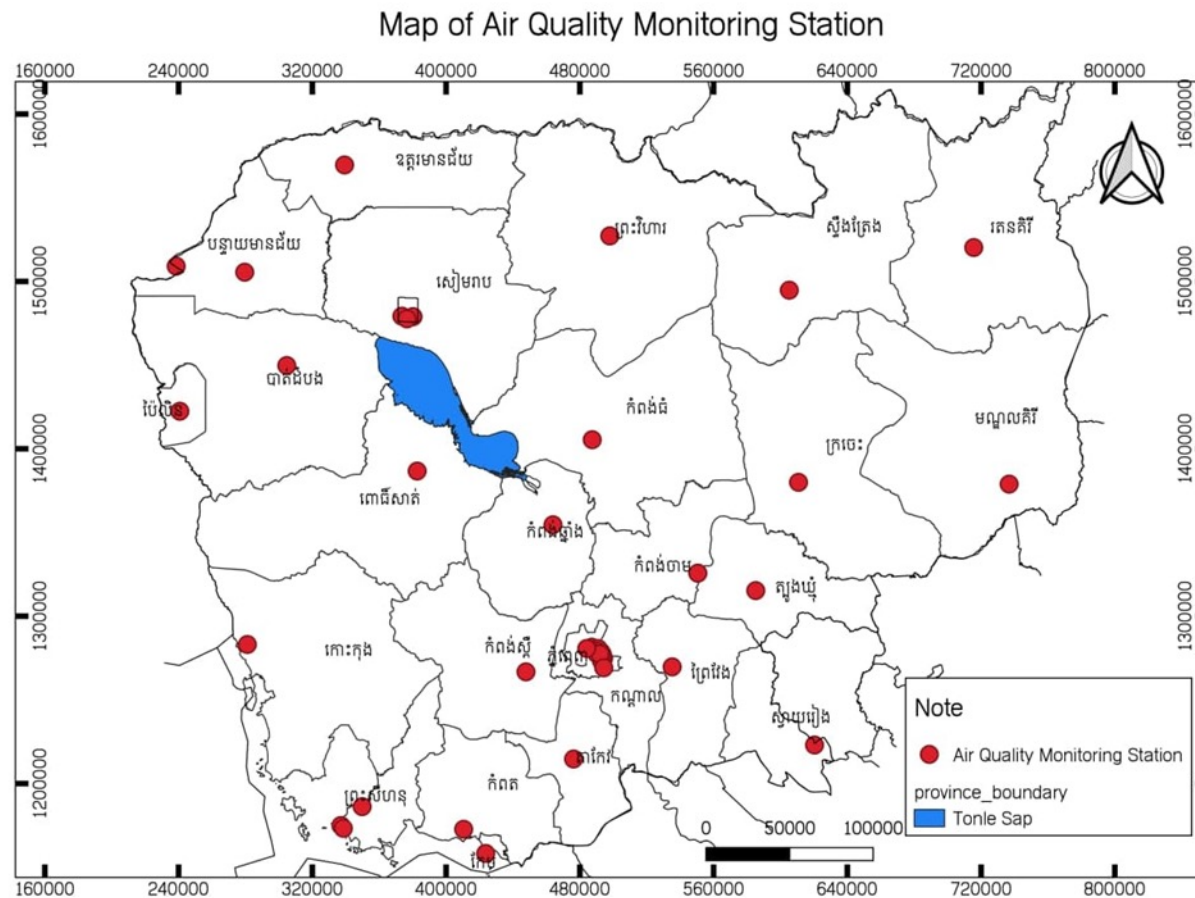
Air Quality Data

Annual Average Of PM2.5 in Cambodia, from 2020-2023
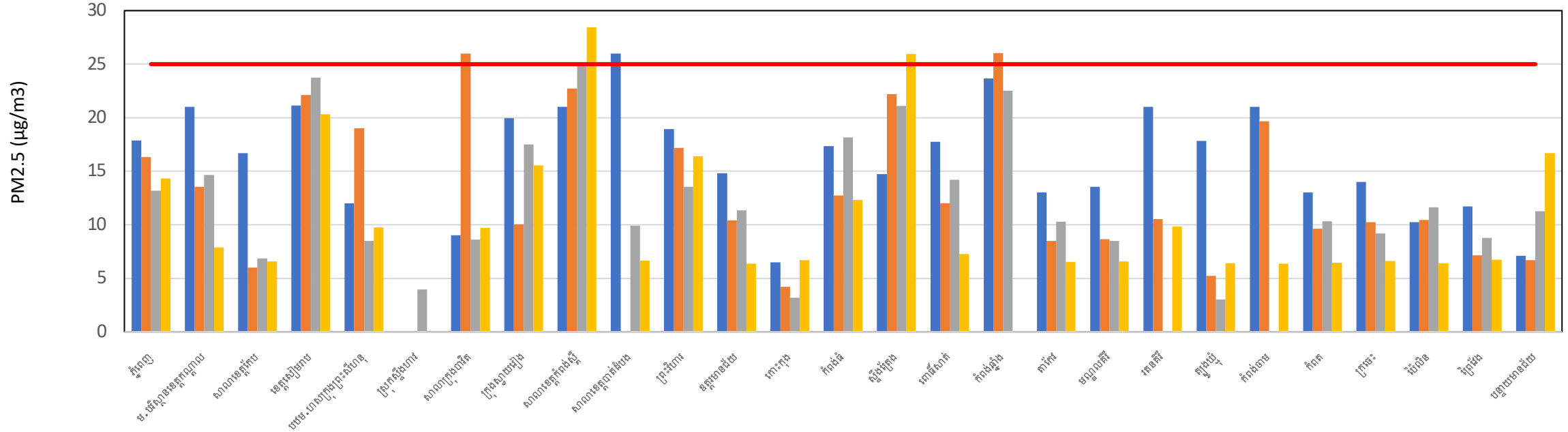
Air Quality Data

Average of PM2.5 in Phnom Penh from 2017-2023
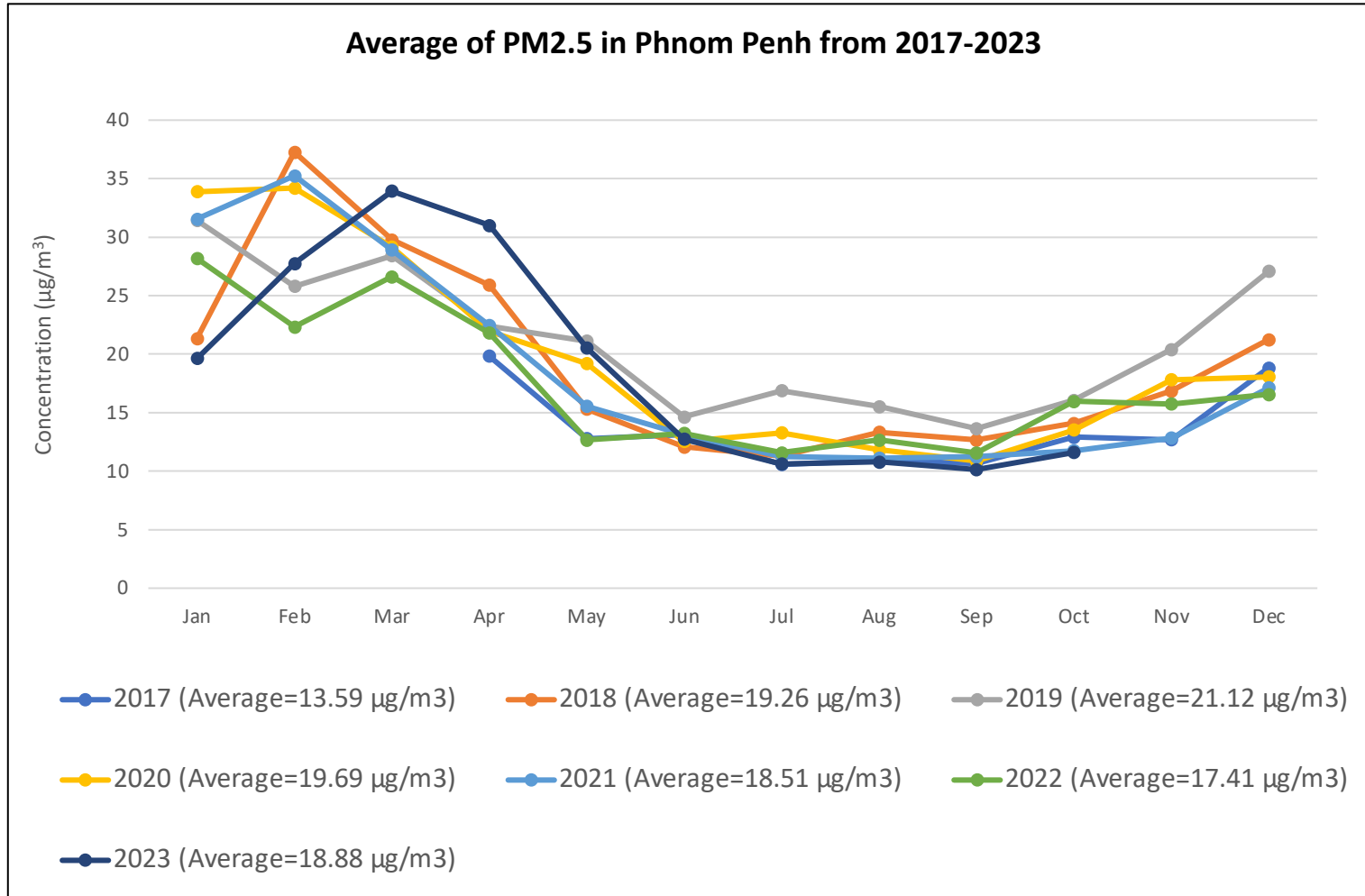
- 2017> Data Valid=254 days (69.5%)
  - Average = 13.12 ± 5.8 µg/m3
  - Exceeded 50 µg/m3=0 days
- 2018> Data Valid=353 days (96.7%)
  - Average = 19.12 ± 9.9 µg/m3
  - Exceeded 50 µg/m3=5 days (1.41%)
- 2019> Data Valid=338 days (92.6%)
  - Average = 21.3 ± 8.3 µg/m3
  - Exceeded 50 µg/m3=1 days (0.3%)
- 2020> Data Valid=353 days (96.7%)
  - Average = 19.73 ± 10.3 µg/m3
  - Exceeded 50 µg/m3=5 days (1.4%)
- 2021> Data Valid=362 days (99.2%)
  - Average = 18.43 ± 10.4 µg/m3
  - Exceeded 50 µg/m3=2 days (0.5%)
- 2022> Data Valid=362 days (99.2%)
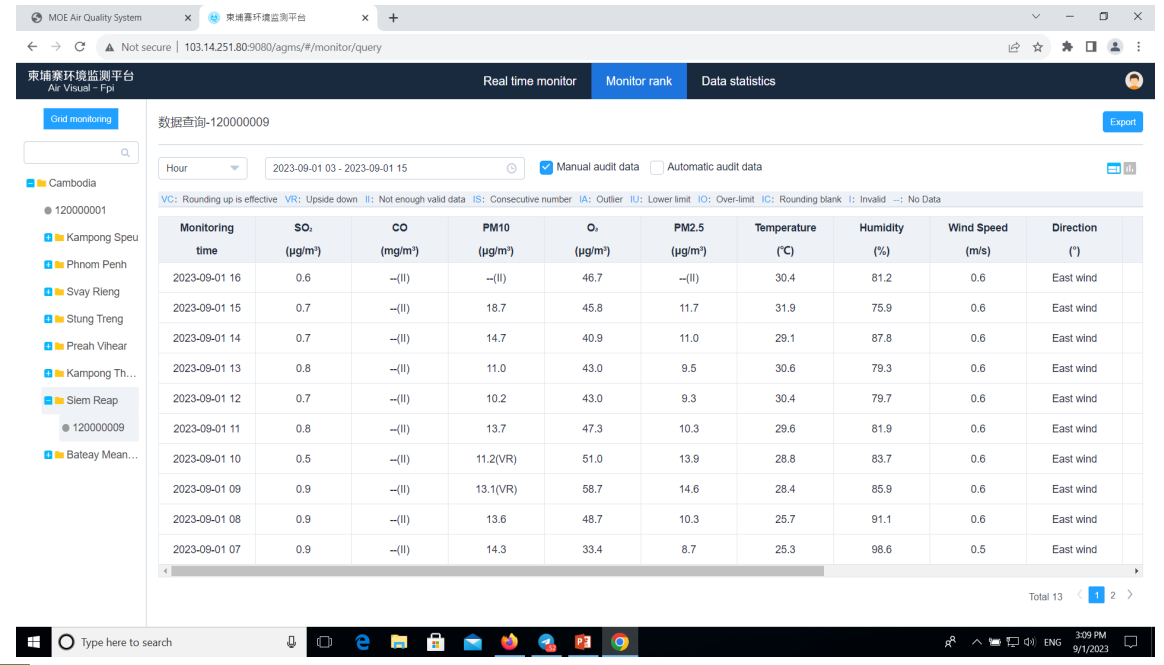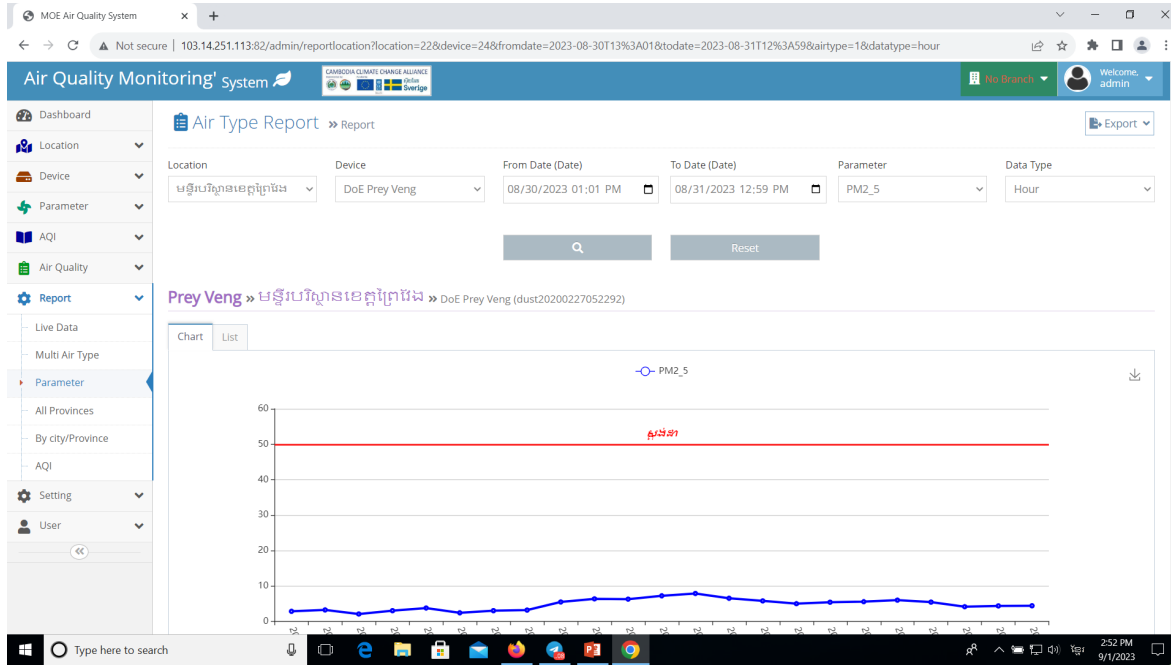 - Average = 17.40 ± 8.25 µg/m3
  - Exceeded 50 µg/m3=0 days

PANDORA
(Remote sensing Air Quality Monitoring)

Maintenance

Every 2 months

- Every 6 months as schedule
- As required

Data Processing

ក្រសួងបរិស្ថាន

Ministry of Environment

សេចក្តីជូនដំណឹង

ស្តីពី លទ្ធផលសន្ទស្សន៍គុណភាពខ្យល់(AQI)នៅក្នុងរាជធានីភ្នំពេញ និងតាមបណ្តាខេត្តត្រីម៉ោង ៧ព្រឹក ថ្ងៃទី១ ខែកញ្ញា ឆ្នាំ២០២៣

Announcement

The result of Air Quality Index in Phnom Penh and provinces on 1 September 2023 at 7AM

ទីតាំងឧបករណ៍តាមដានគុណភាពខ្យល់ (GRI and OCEANUS) Location of Air Quality Monitoring Equipment (GRI and OCEANUS)	សន្ទស្សន៍គុណភាពខ្យល់ (AQI)	ការវាយតម្លៃ	ការពិពណ៌នា
រាជធានីភ្នំពេញ Phnom Penh City	9	ល្អណាស់	គុណភាពខ្យល់ល្អណាស់។ សមស្របសម្រាប់សកម្មភាពខាងក្រៅផ្សេ និងទេសចរណ៍។
សាលាខេត្តត្បូងឃ្មុំ The Tbong Khmom Provincial Hall	5	ល្អណាស់	គុណភាពខ្យល់ល្អណាស់។ សមស្របសម្រាប់សកម្មភាពខាងក្រៅផ្សេ និងទេសចរណ៍។
មន្ទីរបរិស្ថានខេត្តមណ្ឌលគីរី The Mondulkiri Environmental Department	4	ល្អណាស់	គុណភាពខ្យល់ល្អណាស់។ សមស្របសម្រាប់សកម្មភាពខាងក្រៅផ្សេ និងទេសចរណ៍។
មន្ទីរបរិស្ថានខេត្តបាត់ដំបង The Battambang Environmental Department	11	ល្អណាស់	គុណភាពខ្យល់ល្អណាស់។ សមស្របសម្រាប់សកម្មភាពខាងក្រៅផ្សេ និងទេសចរណ៍។
សាលាខេត្តបាត់ដំបង The Battambang Provincial Hall	4	ល្អណាស់	គុណភាពខ្យល់ល្អណាស់។ សមស្របសម្រាប់សកម្មភាពខាងក្រៅផ្សេ និងទេសចរណ៍។
សួនច្បារអង្គមូលមាងឯងករាជ្យខេត្តតាកែវ The Garden of Takeo Province	12	ល្អណាស់	គុណភាពខ្យល់ល្អណាស់។ សមស្របសម្រាប់សកម្មភាពខាងក្រៅផ្សេ និងទេសចរណ៍។
មន្ទីរបរិស្ថានខេត្តកំពត The Kompot Environmental Department	7	ល្អណាស់	គុណភាពខ្យល់ល្អណាស់។ សមស្របសម្រាប់សកម្មភាពខាងក្រៅផ្សេ និងទេសចរណ៍។
សាលាខេត្តកែប The Kep Provincial Hall	18	ល្អណាស់	គុណភាពខ្យល់ល្អណាស់។ សមស្របសម្រាប់សកម្មភាពខាងក្រៅផ្សេ និងទេសចរណ៍។
មន្ទីរបរិស្ថានខេត្តព្រៃវែង The Prey Veng Environmental Department	15	ល្អណាស់	គុណភាពខ្យល់ល្អណាស់។ សមស្របសម្រាប់សកម្មភាពខាងក្រៅផ្សេ និងទេសចរណ៍។

សន្ទស្សន៍គុណភាពខ្យល់កម្ពុជា (AQI)

ការវាយតម្លៃ	សន្ទស្សន៍គុណភាពខ្យល់ (AQI)	ពណ៌ (Color)	ការពិពណ៌នា
ល្អណាស់	0 – 50	ខៀវ	គុណភាពខ្យល់ល្អណាស់។ សមស្របសម្រាប់សកម្មភាពខាងក្រៅផ្សេ និងទេសចរណ៍។
ល្អ	51 – 100	បៃតង	គុណភាពខ្យល់ល្អ។ អាចធ្វើសកម្មភាពទៅខាងក្រៅ និងការធ្វើដំណើរដូចធម្មតា។ បុគ្គលដែលមានប្រតិកម្មាលនឹងប្រើតិចចួចតូវកាត់បន្ថយពេលវេលាសម្រាប់សកម្មភាពខាងក្រៅ។
ធម្យម (ការបំពុលកម្រិតស្រាល)	101 – 150	លឿង	**មនុស្សទូទៅ:** អាចធ្វើសកម្មភាពក្រៅផ្ទះធម្មតា។ **អ្នកដែលមានសុខភាពទន់ខ្សោយ:** ប្រសិនបើមានរោគសញ្ញាដូងដួងថាន ការក្អក ការដកដង្ហើមពិបាក លោកហៅកែនេះ សូមកាត់បន្ថយរយៈពេលនៃសកម្មភាពខាងក្រៅរបស់អ្នក។
បង្គួរ (ការបំពុលមធ្យម)	151 – 200	ទឹកក្រូច	**មនុស្សទូទៅ:** គួរតែតាមដានសុខភាពប្រសិនបើមានរោគសញ្ញាដូងដួងថាន ជាការក្អក ការពិបាកដកដង្ហើម លោកហៅកែ សូមកាត់បន្ថយរយៈពេលនៃសកម្មភាពខាងក្រៅរបស់អ្នក។ ឬ ប្រើប្រាស់ឧបករណ៍ការពារផ្ទុដង្ហើមប្រសិនបើចាំបាច់។ **អ្នកដែលមានសុខភាពទន់ខ្សោយ:** គួរកាត់បន្ថយរយៈពេលនៃសកម្មភាពខាងក្រៅរបស់អ្នក។ ឬ ប្រើប្រាស់ឧបករណ៍ការពារផ្ទុដង្ហើមប្រសិនបើចាំបាច់។ ប្រសិនបើមានស្ថានភាពសុខភាពដូចជាការក្អក ការពិបាកដកដង្ហើម ឈឺក្បាល ឈឺក្បាល ចង្អក់បេះដូងលេខុសប្រក្រតី ក្លួតចង្អួ អស់កម្លាំ នោះគួរតែពិគ្រោះជាមួយវេជ្ជបណ្ឌិត។
ខ្ពស់ (ការបំពុលខ្លាំង)	201 – 300	ក្រហម	មនុស្សគ្រប់ឆ្នាំគួរតែជៀសវាងសកម្មភាពខាងក្រៅ; ជៀសវាងកន់បន់ដែលមានការបំពុលខ្យល់ខ្ពស់ ប្រើប្រាស់ឧបករណ៍ការពារផ្ទុដង្ហើមប្រសិនបើចាំបាច់ ប្រសិនបើមានរោគសញ្ញាសុខភាពនោះ គួរតែពិគ្រោះជាមួយវេជ្ជបណ្ឌិត។
ខ្ពស់ខ្លាំង (ការបំពុលធ្ងន់ធ្ងរ)	300-500	ស្វាយ	ការព្រមានអំពីស្ថានភាពអាសន្នចំពោះសុខភាព។ សូម្បីតែមនុស្សដែលមានសុខភាពល្អនឹងពិបាកការស្បើក្រៅក្នុងក៏ឃុំឆ្លងពេលនេះ។ គេអាចមានការលោកខ្លាំង និងវាគសញ្ញាជាច្រើនទៀត។ ដូច្នេះមនុស្សទាំងអស់គួរតែជៀសវាងសកម្មភាពចេញទៅខាងក្រៅ។

ទំព័រ១

Posting in Group telegram (MoE + All Relevant PDoE) & MoE's Facebook Page & LCD Screen

Related Policies and Regulations

- **Law on Environmental Protection and Natural Resource Management, 1996.**

Under Chapter IV (Environmental Protection) of EPNRM, Article 13 prescribing: The prevention, reduction and control of airspace, water and land pollution, noise and vibration disturbances and as well as wastes, hazardous and toxic substances.

- **Sub-Decree #42 on Air Pollution Control and Noise Disturbance (2000)**

  ➢ Aim to protect the environment quality and public health from air pollutants and noise disturbance through monitoring, prevention and mitigation activities.

  ➢ Applies to all mobile and stationary sources of air and noise pollution.

  ➢ Set the emission standard for stationary sources

  ➢ Prohibit the emission of air pollutants and sound into the atmosphere that exceed standard

  ➢ The emission of pollutants and noise from stationary source into the atmosphere shall be asked for a permission from the Ministry of Environment

Related Policies and Regulations (Cont')

▪ **Circular #01 on Measures to Prevent and Reduce Ambient Air Pollution (Jan. 2020)**

Was developed to support the government goal on reducing air pollution in Cambodia for reflecting the recent increase of the Particulate Matter (PM10 and PM2.5) in urban areas of the country. It contained 7 measures, including;

➢ The Administration of Construction Sites focuses on reinforcing the management of dust or particulate matter into the air.

➢ The Quality Management of High Sulfur Content on Fuel focuses on promoting the implementation of sulfur standard level which contained in fuel for compliance with EURO standard (EURO III, IV, V).

➢ The Administration of Air Pollutants from Vehicles focuses on promoting the implementation of the emission standard on air pollutants from vehicles for compliance with EURO standard (EURO III, IV, V).

➢ The Administration of Air Pollutants Emission from Production Sites focuses on promoting the technical installation of smoke and dust filters

Related Policies and Regulations (Cont')

- **Circular #01 on Measures to Prevent and Reduce Ambient Air Pollution (Jan. 2020)**

  - ➢ The Administration of the Open-Field Waste Burning focuses on preventing and avoiding of all kinds of forest clearing, burning of garbage, burning solid waste in the open spaces, landfill and public squares and educating people to stop burning garbage, solid wastes, grasses, stalks and other agricultural wastes.

  - ➢ The Improving Management and Improving the Urban Environment focuses on carrying out an environmental sanitation programs in the public areas and regularly clean the streets and expanding the green areas in building city and other surrounding areas that are under construction.

  - ➢ The Establishment of Air Pollution Monitoring and Forecasting System focuses on installing the equipment for air quality monitoring in provincial and capital

EURO Standard for Sulfur Contained in Fuel

Types of Standard	Types of Fuel	Sulfur Content Contained in Fuel	Date of implementation
Type 3 (EURO III)	Petroleum	Less than 150 PPM (<150 ppm)	From 1st January 2020
	Diesel	Less than 350 PPM (<350 ppm)	
Type 4 (EURO IV)	Petroleum and Diesel	Less than 50 PPM (<50 ppm)	From 1st January 2021
Type5 (EURO V)	Petroleum and Diesel	Less than 10 PPM (<10 ppm)	From 1st January 2024

Circular 01 on the Measures to Prevent and Reduce Ambient Air Pollution

EURO Standard for Vehicle Emission

Types of Standard	Types of Fuel	The level of air pollutants allow to release from Vehicles	Date of implementation
Type 4 (EURO IV)	Petroleum	- CO ≤1.0 gram per kilometer (≤1.0g/km) - HC≤0.1 gram per kilometer (≤0.1g/km) - NOx≤0.08 gram per kilometer (≤0.08g/km)	From 1st January 2022
	Diesel	- CO ≤0.5 gram per kilometer (≤0.5g/km) - HC+ NOx ≤0.3 gram per kilometer (≤0.3g/km) - NOx≤ 0.25 gram per kilometer (≤0.25g/km) - PM≤ 0.025 gram per kilometer (≤0.025g/km)	
Type 5 (EURO V)	Petroleum	- CO ≤1.0 gram per kilometer (≤1.0g/km) - HC≤0.1 gram per kilometer (≤0.1g/km) - NOx≤0.06 gram per kilometer (≤0.06g/km) - PM≤ 0.005 gram per kilometer (≤0.005g/km)	From 1st January 2027
	Diesel	- CO ≤0.5 gram per kilometer (≤0.5g/km) - HC+ NOx ≤0.23 gram per kilometer (≤0.23g/km) - NOx≤ 0.18 gram per kilometer (≤0.18g/km) - PM≤ 0.005 gram per kilometer (≤0.005g/km)	

Circular 01 on the Measures to Prevent and Reduce Ambient Air Pollution

Related Policies and Regulations (Cont')

Other document

- Cambodia Climate Change Strategic Plan (CCCSP) 2014-2023

  Sector: Residential

  ➢Promote and installing fuel efficiency stove in rural areas.

  ➢Promote using bio-gas for cooking in rural areas

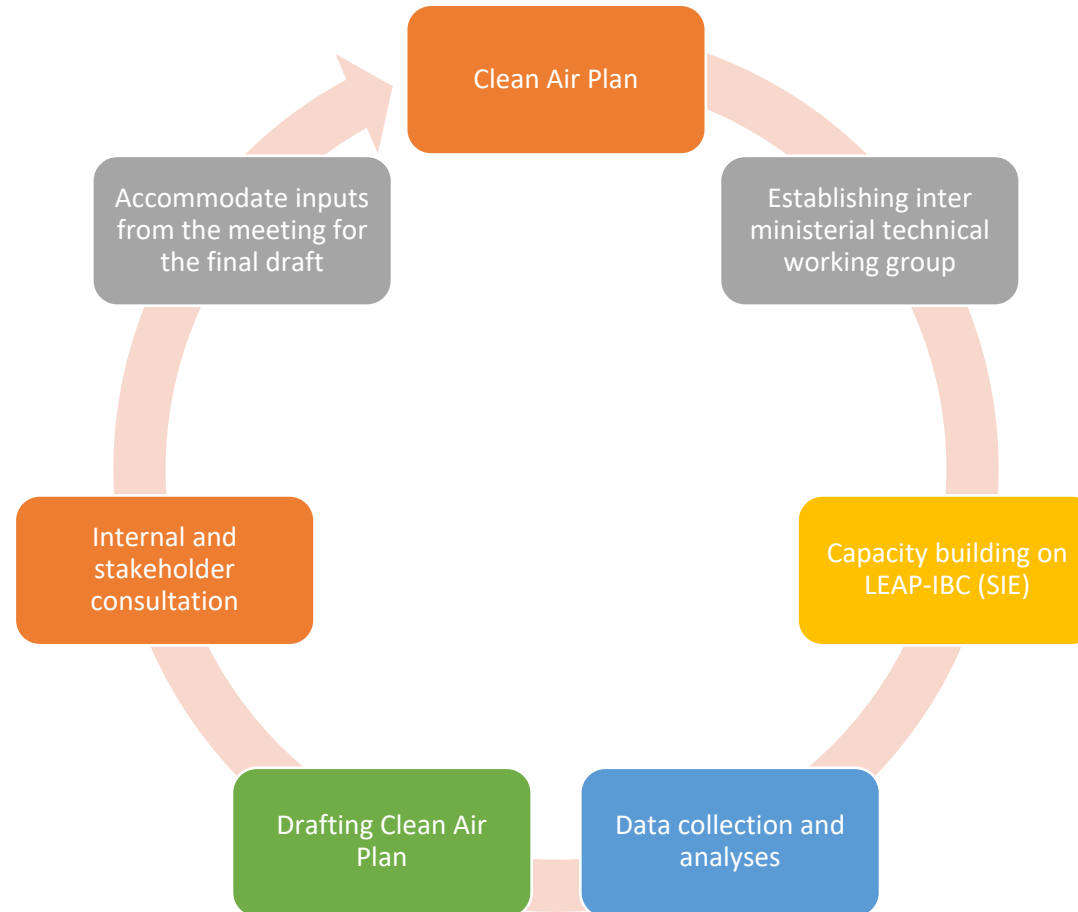 Sector: Charcoal Making

  ➢Improve efficiency of charcoal production

  Sector: Transport

  ➢Freight transport implementing Euro IV standards
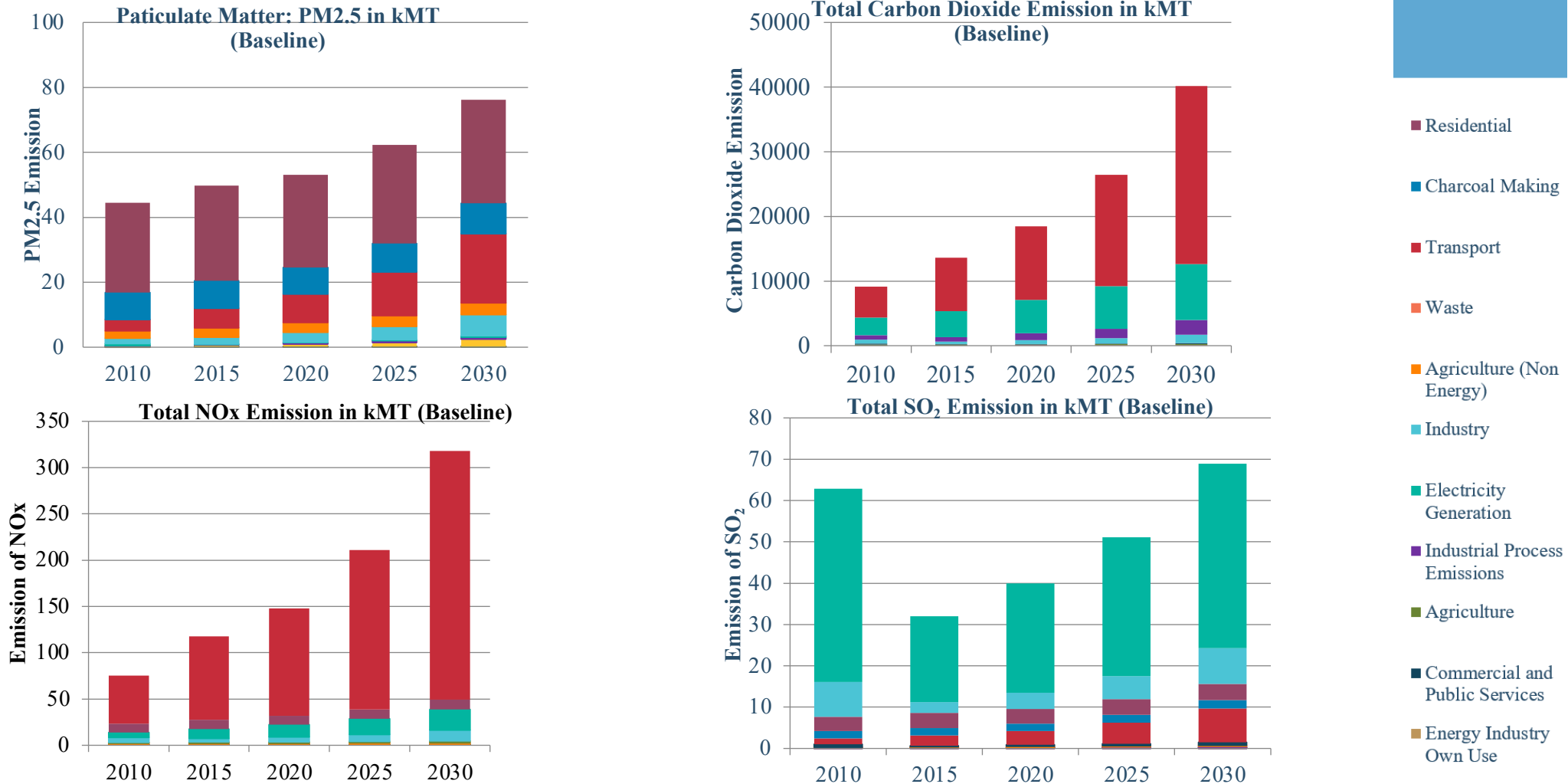
  ➢Passenger transport, all buses implementing Euro IV

2. Clean Air Plan of Cambodia (Objectives)

- To develop an integrated analysis of air pollutants, greenhouse gases and short-lived climate pollutants to identify the major sources sectors of air pollutants currently, and how they are likely to change in the future.

- To identify mitigation measures in existing plans and strategies that will be effective at reducing air pollution emissions while simultaneously mitigating greenhouse gas emissions.

- To identify additional mitigation measures that could be taken to further reduce air pollution emissions.

- To quantify the multiple benefits of the identified mitigation measures for improving air quality and mitigating climate change.

- To identify possible ways to further mainstream action on air and climate pollutants into existing planning processes.

- To prioritize action and pave the way for coordinated air quality management.

2. Clean Air Plan of Cambodia (Methodology)

3. Results (Emission sources)

Paticulate Matter: PM2.5 in kMT (Baseline)

Total Carbon Dioxide Emission in kMT (Baseline)

Total NOx Emission in kMT (Baseline)

Total SO$_2$ Emission in kMT (Baseline)

Legend:
- Residential
- Charcoal Making
- Transport
- Waste
- Agriculture (Non Energy)
- Industry
- Electricity Generation
- Industrial Process Emissions
- Agriculture
- Commercial and Public Services
- Energy Industry Own Use

3. Results (Emission scenario)

- In general, the largest sources of air pollutants and short-lived climate pollutants in the Cambodia are the transport (CO2, NOx), industry, residential (PM10, PM2.5, CO) and waste sectors, and electricity generation (CO2, SO2), industrial process emissions (CO2) and charcoal making (CO, PM2.5, PM10).

Baseline: (kMT), Summary

	Organic Carbon	Black Carbon	PM$_{2.5}$	PM$_{10}$	Ammonia	Sulfur-Dioxide	Nitrogen-Oxide	Non-Methane Volatile Organic Compounds	Methane	Carbon Monoxide	Carbon Dioxide
2010	19.57	6.08	44.47	53.43	136.14	62.85	75.09	307.26	341.03	912.72	9,161.76
2015	21.96	7.24	49.75	61.52	122.80	31.99	117.83	419.74	297.52	1,162.85	13,608.08
2020	23.39	8.03	53.07	68.43	111.78	39.96	148.09	533.25	252.86	1,415.72	18,444.59
2025	27.24	9.97	62.23	82.23	107.54	51.10	210.83	729.88	226.22	1,871.11	26,438.60
2030	33.01	13.09	76.24	105.39	109.45	68.91	317.83	1,067.88	209.91	2,639.30	40,150.82

3. Results (Emission reduction)
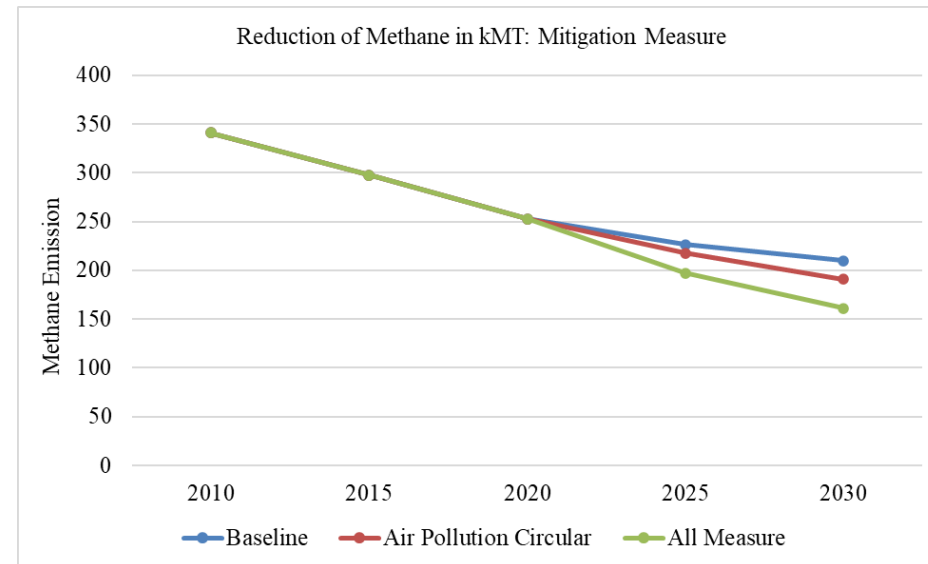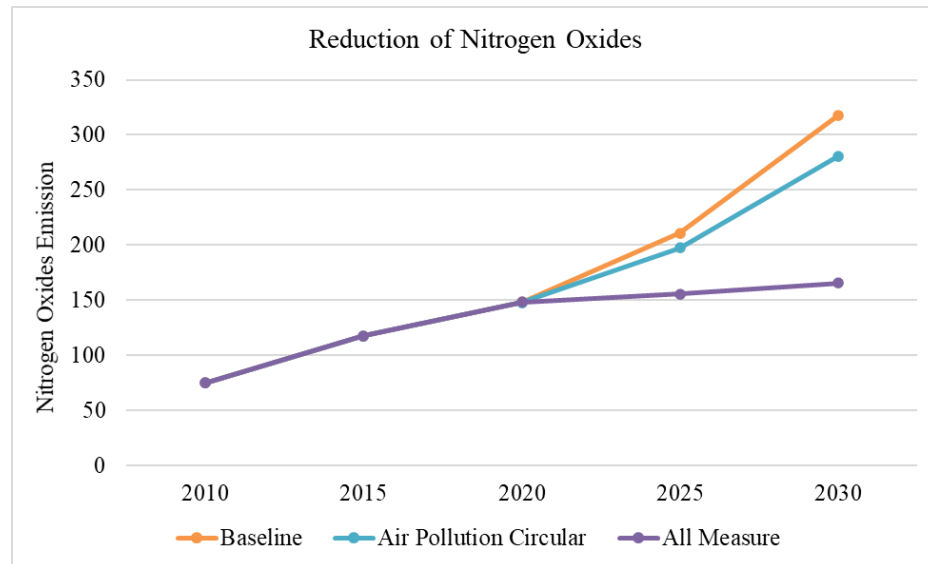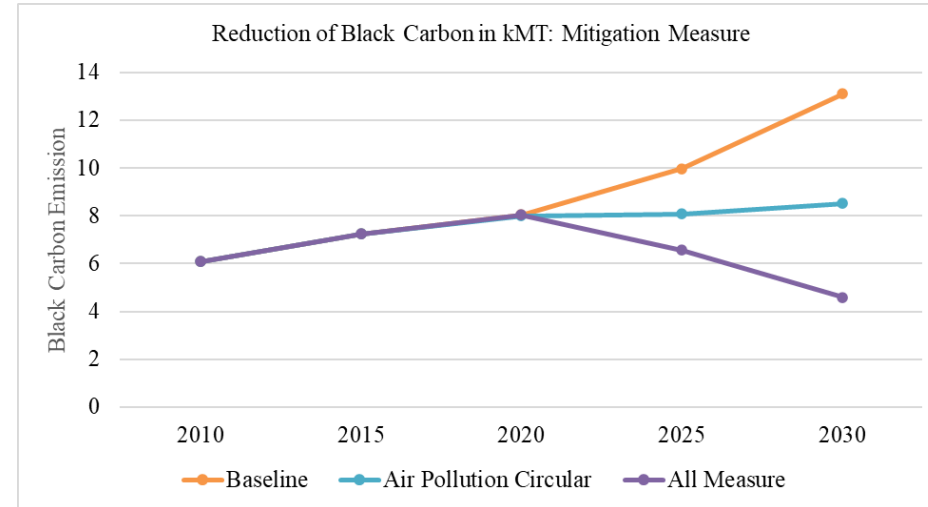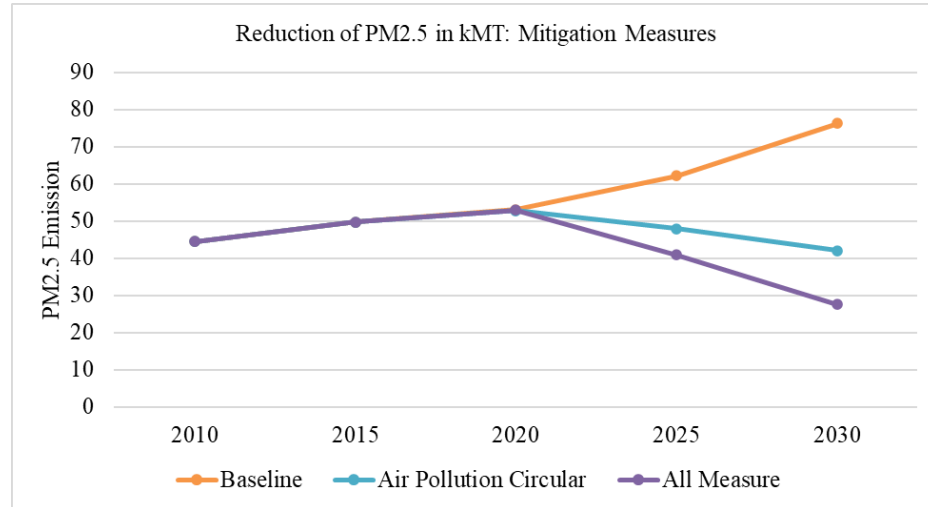
3. Results (Health benefit)

- The full implementation of Cambodia's Clean Air Plan was estimated to reduce population-weighted PM2.5 concentrations by 4 µg m-3 in 2030 compared to the baseline scenario, a 17% reduction in total population-weighted PM2.5 concentrations in 2030 compared to the baseline scenario.

- This reduction in PM2.5 concentrations across Cambodia would avoid almost 900 (878) premature deaths per year, 15% of the total health burden from air pollution, and 57% of the health burden caused by emissions from Cambodia itself.
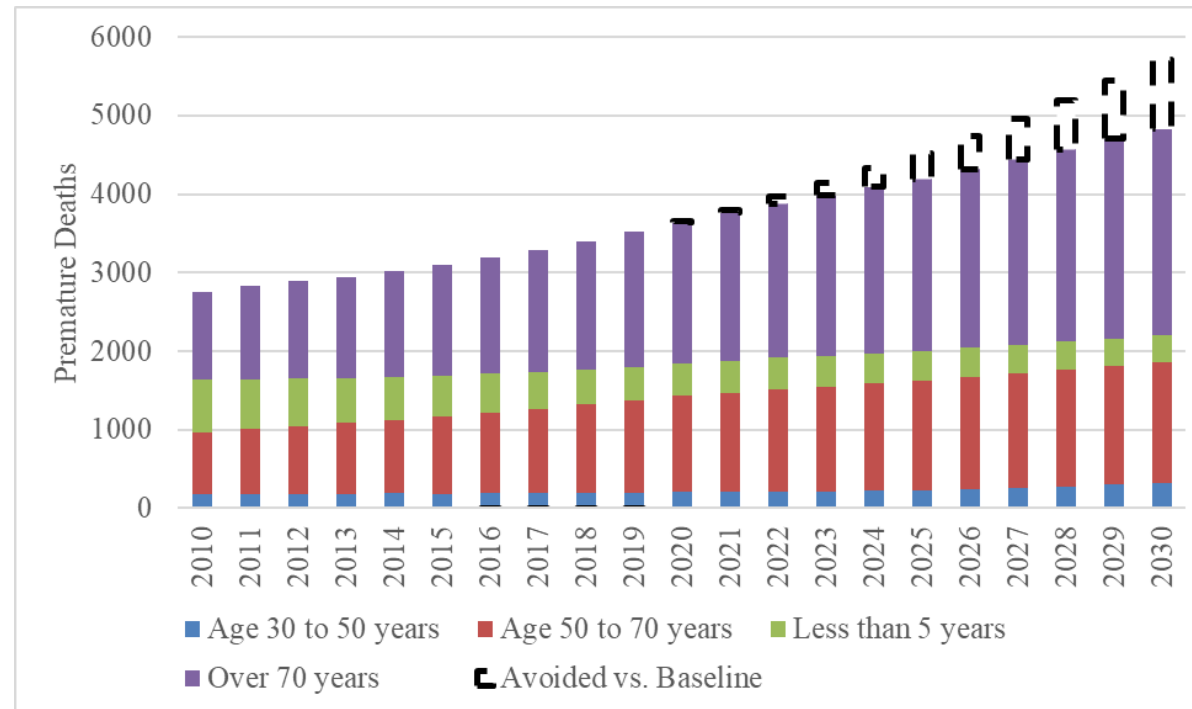
4. Challenges

- Limited data on pollutant sources, emissions and levels of air quality to subsequently identify measures to mitigate concentrations. Therefore, international default data in air pollution emission factors were employed in the absence of certain local data.

- Lack of human resources and technical expertise within the government with regards to air quality management.

- Difficulty in securing commitment from stakeholders in developing and implementing new actions for the Plan. Formulation of new actions without support may also lead to an absence of ownership by the lead stakeholders. This would hinder the Plan from being adopted and implemented.

Thank you so much for your attention