Climate and Clean Air Conference 2023:
Air quality action week

29 May - 2 June 2023, Bangkok, Thailand

EVENT REPORT

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At a glance

Diverse representation
400 participants from over **50** countries

Learning and networking opportunities
44 sessions **4** receptions across **4** days

Balanced gender representation
49.8% female speakers **50.2%** male speakers*
**For sessions organized by UNEP under 'Air quality action week'*

Technologies and partnerships
11 exhibitors from private, public and NGO sectors

On-site demonstrations
3 site visits in collaboration with local partners

Continued cooperation
1 Memorandum of Agreement signed

Purpose

This Event Report provides information on the event with session highlights focusing on the sessions led by the United Nations Environment Programme under the 'Air Quality Action Week' banner. Additional resources are provided for reference.

Background

Air pollution and climate change are among the most pressing challenges facing our planet today, which are deeply interconnected. These threats sharing common sources: dangerous air pollutants, like black carbon and methane, which are devastating for human health and for the planet.

Air pollution is the greatest environmental threat to human health: it is responsible for about 7 million deaths each year globally, and this number is rising. In Asia and the Pacific region alone, 4 million people die prematurely from air pollution each year, while 4 billion people are exposed to unhealthy levels of air pollution.

Air pollution does not only harm people. Short-lived climate pollutants (SLCPs) are responsible for up to 45% of global warming today, contributing to rising sea levels and more frequent and extreme weather events, which affect lives and livelihoods. SLCPs are tens to thousands of times more potent than carbon dioxide in accelerating climate change.

We cannot clean up our air without working to clean our planet, nor can we tackle climate change without simultaneously addressing air pollution. We cannot clean up our air without working to clean our planet, nor can we tackle climate change without simultaneously addressing air pollution.

Solutions exist: cutting SLCP emissions is regarded as the fastest and most effective way to keep us under 1.5°C. Addressing black carbon and methane in key sectors could reduce projected global warming by 0.5°C by 2050, consequently avoiding millions of premature deaths from air pollution annually, preventing millions of tonnes of annual crop losses, and increasing energy efficiency, among other additional benefits for human and planetary wellbeing.

About the Conference

Against this backdrop, United Nations Environment Programme (UNEP) and the Climate and Clean Air Coalition (CCAC) convened experts and government representatives, development and civil society organizations, private sector and other key stakeholders from the Asia Pacific region and beyond at the **Climate and Clean Air Conference 2023: Air quality action week** on 29 May to 2 June 2023 in Bangkok, Thailand.

The week-long event featured the CCAC Annual Meeting alongside UNEP Asia and the Pacific Office's Air Quality Action Week, highlighting a call for a more integrated approach in addressing air pollution and climate change by developing capacities, strengthening cooperation, facilitating knowledge exchange and identifying new opportunities to combat air pollution and its adverse impacts on public health, development, environment and climate.

"Action-oriented and result-based clean air cooperation has been improved and [numerous] initiatives were developed recently. We expect that these initiatives will further strengthen our cooperation with the relevant regional organizations and better target its common goal in improving existing capacities."
H.E. Bat-Erdene Bat-Ulzii, Minister of Environment and Tourism, Mongolia

"Taking on both air quality and climate change in an integrated manner gives us an impact-edge, the will and the means to act now. We have no time to lose."
Martina Otto, Head of Secretariat, Climate and Clean Air Coalition

"Investing in clean air can yield multiple benefits for health, climate, and overall development. It is imperative that we address air pollution and climate change in an integrated manner."
Dechen Tsering, Director and Representative for Asia and the Pacific, United Nations Environment Programme

"The Regional Action Programme recognizes the clear need for enhanced air quality monitoring and sharing of data and solutions. Implementing these actions requires building effective partnerships and capitalizing on the expertise of countries and institutions."
Armida Salsiah Alisjahbana, Executive Secretary, United Nations Economic and Social Commission for Asia and the Pacific

"ADB has been working strongly in terms of aiming at different areas: climate finance, biodiversity, oceans acidification as well as clean air. We have set out a target of US$ 80 billion cumulative climate financing across these areas for all developing member countries between 2019 and 2030."
Anouj Mehta, Thailand Country Director, Asian Development Bank

Sessions

In collaboration with partners from key sectors, the week-long event showcased a series of plenary and breakout sessions, which highlighted the latest insights, proven solutions and new progress in addressing air pollution and its impact on climate change.

Specifically, the sessions were aimed at promoting:

- Integrated planning and multi-stakeholder cooperation;
- Stories of success and priorities for clean air at cities, national and regional levels, including inter-governmental leadership;
- Scientific underpinnings and best practices to support policy, promote pollution-free economy and increase stakeholder awareness; and
- Technological and industrial solutions for air quality management.

Advancing mitigation through integrated planning on climate and clean air

29 May 2023 | 11:00-12:30 | Conference Room 1

Following a high-level opening session, the first plenary session provided a macro perspective of integrated climate and clean air solutions, including current landscape and recommendations to strengthen country actions.

The panel discussions highlighted the benefits of integrated assessments and planning to drive mitigating measures on climate change and air pollution. However, challenges such as lack of funding and support for air quality improvement initiatives, capacity for translating planning into implementation, and ensuring stakeholder participation, especially private sector in effective implementation, were among the issues raised.

"We need to bring together the different coalitions of actors both within and outside of government to create a strong political economy case for driving change." Eric Zusman, Institute for Global Environmental Strategies

Countries in the Asia Pacific region, such as Bangladesh and the Philippines, are particularly vulnerable to the impacts of both air pollution and climate change. The challenge is the integrated planning and solutions that address both issues simultaneously and make sectoral agencies work together. In Africa, the lack of a common framework or platform specifically addressing air pollution was acknowledged as a hurdle that needs to be addressed.

Master of ceremony
Martina Otto, CCAC Secretariat

Opening remarks
Gita Sabharwal, UN Resident Coordinator, Thailand

Clean Air and Climate Solutions for ASEAN Report
Eric Zusman, Institute for Global Environmental Studies

Moderator
Glynda Bathan-Baterina, Clean Air Asia

Panelists
Cris Malley, Stockholm Environment Institute
Makoto Kato, IFL /OECC, Japan
In Chang Hwang, The Seoul Institute
Masud Iqbal Md. Shameem, Department of Environment, Bangladesh
Ma. Gerarda Asuncion Merilo, Philippines

"Latin America's Ministers of Environment and UNEP have developed a regional action plan. This strategy, focusing on resource mobilization and regional cooperation, covers all 33 Latin American countries, aiming to strengthen regional collaboration in enhancing environmental initiatives." Sergio Sánchez, Environmental Defense Fund.

Information gathering while accounting for diverse political landscapes was underscored to support political arguments and respond to socio-economic issues. The need for information at regional, national, and local levels was stressed, to overcome implementation hurdles and prioritize actions. Emphasizing the crucial role of data analysis and legislative support, the panel suggested incorporating relevant metrics in decision-making.

Nationally Determined Contributions (NDCs) play a major role in stimulating actions considering a correlation between NDCs and resulting legislation or standards. Examples of minimum performance standards and sector-specific action were discussed. Emphasis was placed on integrated emissions inventories, as well as private sector involvement for a common language to facilitate public-private interaction.

Integrated emissions inventories that consider both greenhouse gas (GHG) emissions and short-lived climate pollutants (SLCPs) may provide a comprehensive understanding of emission sources, drivers and trends, which can guide targeted actions and policy development.

Moreover, the panel called for more finance and South-South technology transfer for accelerated action. Regional initiatives like action plans in Latin America and Asia Pacific are helping drive political and policy changes, while efforts are being made in the African region.

The discussion concluded with a call for strengthened action and mutual support through regional cooperation, and leveraging clear policy priorities to unlock finance. Having a platform for countries to come together to discuss air quality and climate change issues and exchange best practices can facilitate collaboration to address these pressing global challenges simultaneously.

Moderator
Martina Otto, CCAC Secretariat

Panelists
Camila Labarca, National GHG Inventory System, Chile
Sergio Sanchez, Environmental Defense Fund
John Gougnes Tougoulou, CCAC Focal Point for Cameroon
Abdelali Dakkina, CCAC National Expert and Coordinator for Morocco
Selelah Okoth, National Environment Mananagement Authority, Kenya

Gita Sabharwal, UN Resident Coordinator in Thailand during the Opening Remarks

Participants at the first plenary session

Towards achieving clean air for blue skies in Seoul, Incheon and Gyeonggi

29 May 2023 | 14:00-15:15 | Conference Room 3

A World Health Organization update in 2022 reveals that almost the entire global population is exposed to unhealthy levels of air pollution[1], causing preventable diseases and premature deaths. Aside from health hazards, air pollution adversely affects the economy, food and water security, and climate systems, which ultimately hampers efforts for sustainable economic growth, poverty alleviation and climate action.

This problem is particularly evident in the Republic of Korea, where the mean exposure to the population to particulate matter known as PM2.5 is the highest among member states of the Organization of Economic and Cooperation Development. In 2021, the United Nations Environment Programme (UNEP) partnered with the Republic of Korea's Capital Metropolitan Area, which comprises Seoul, Incheon, and Gyeonggi province (SIG), to assess reduction interventions by reviewing the progress in air quality action and improvement at the national and local level from 2005 to 2040.

This session introduced key findings of the air quality assessment report over 15 years (2005-2020) in Seoul, Incheon, and Gyeonggi. By sharing best practices and discussing how to address air pollutants and climate change, many Asian countries and cities could scale solutions to contribute towards cleaner air in the region.

"Polluted air is creating a health emergency and our region is at the epicentre of this crisis, with about 4 million preventable deaths each year from breathing unhealthy air."

Antoinette Taus
UNEP Goodwill Ambassador

Master of ceremony
Antoinette Taus, UNEP Goodwill Ambassador

Welcome remarks
Marlene Nilsson, UNEP

Messages
Deok-hwan Kim, Seoul Metropolitan Government
In-su Kim, Incheon Metropolitan City
Dong-sung Kim, Gyeonggi Provincial Government

Report presentation
Cris Malley, Stockholm Environment Institute

Moderator
Ji-Hyun Lee, UNEP

Reflections from cities and experts
Kyeong Doo Cho, The Incheon Institute
Pornphrom N.S. Vikitsreth, Bangkok Metropolitan Administration
José Edgardo Gomez, Quezon City Government, Philippines
Milag San Jose-Ballesteros, C40
Nguyet Do Van, Live and Learn for Environment and Community
Dang Espita-Casanova, Clean Air Asia
Yeahee Kim, ICLEI East Asia

Closing remarks
Sung-eun Kim, Embassy of Republic of Korea in Thailand

While cities often suffer from the worst air pollution, they are important sources of solutions, which can be scaled up to the national level. Demonstrating health impacts of air pollution at the local level – using municipal level data – creates a powerful argument for taking action. Making this data public is important for raising awareness and stimulating further research.

"The more we make publicly available air quality data, the more we become real active partners in terms of addressing air pollution as well as tackling climate change." Milag San Jose-Ballesteros, C40

Many developing countries and cities, however, currently lack fundamental research to identify sources of emissions and assess impacts of air pollution. Robust and long-term data on air pollution collected under the legal framework was a key success factor in addressing urban air pollution over 15 years in Seoul, Incheon, and Gyeonggi. Generous funding and robust legal framework to support research program development and policymaking are necessary to effectively reducing emissions, concentrations and negative health impacts of air pollution.

"A good idea will remain just that without the finance to make it a reality. Financial backing on air quality is an investment in the future of our city and our nation." Deok-hwan Kim, Director of Air Quality Division of the Seoul Metropolitan Government

Tackling the issue at source is possible at city-level. However, cities face issues such as transboundary air pollution, which presents sources that are not a city's direct jurisdiction. In addition, cities exist within national policy and legislative framework, which might not be responsive to the local context. While there are many similarities, cities - and districts within cities - also have many differences in terms of population, economy, and culture, which should be factored into policy responses.

Technology offers cities important tools, including as a way to enable a data-driven approach and to engage citizens. Engaging citizens in data collection and policy making is important to develop effective and inclusive measures.

Adaptive and transformative leadership is also a key success factor for tackling urban air pollution.

Taking an integrated and coordinated approach to end air pollution is crucial for success. Both vertical and horizontal integration is important to involve all stakeholders and sectors. The success of Seoul Metropolitan Region was not achieved overnight. It is a result of a long-term and coordinated approach, which other countries and cities in the region could learn from.

"The SIG report contains various policy experiences, including trials and errors. It is expected that objective evaluation of these various experiences and expert advice will shorten the time and increase efficiency of air improvement policies in various countries and local governments." In-su Kim, Director General of the Environment Bureau of the Incheon Metropolitan City

Download: Achieving clean air for blue skies in Seoul, Incheon and Gyeonggi

Clean Air Flagship - A CCAC call to action

30 May 2023 | 09:00-10:30 | Conference Room 1

Clean air and climate change actions are strongly interlinked with multiple co-benefits. Actions are happening across different levels of governance, driving towards such goals as:

- Strengthening multi-level governance and capacity for air quality management;
- Encouraging stronger private sector action on air pollution;
- Improving science communication to support policy actions;
- Elevating the air quality agenda through advocacy; and
- Mobilizing finance for the air quality agenda.

At the global level, greater cooperation and collective action is needed to scale and replicate successful clean air initiatives. This includes the need for galvanizing global society towards the clean air agenda and creating a platform for regions and countries to learn from each other.

Master of ceremony
Martina Otto, CCAC Secretariat

Welcome
Pornphrom N.S. Vikitsreth, BMA

The Clean Air Flagship
Nathan Borgford-Parnell, CCAC

Moderator
Sean Maguire, Clean Air Fund

Panelists
Rob Wing, US Department of State

At country level, the discussions underscored the effectiveness of national clean air strategies and standards, as illustrated by Cambodia's Clean Air Plan. This plan includes regulations, control measures, and capacity building to tackle air quality challenges. In addition, the role of local governments and cities in fostering innovation and initiative was equally underscored. Cooperation among local governments and capacity building at the local level were identified as critical for tackling air quality challenges.

"Building capacity for national and city-level authority to independently handle climate and clean air actions could take years, even decades. Nevertheless, it is essential that every stakeholder, at every level, moves in the same direction," stated José Edgardo Gomez, Jr., Quezon City Government, Philippines

Sangmin Nam, UNESCAP
Thiv Sophearith, Ministry of Environment Cambodia
Aisha Mohamed Abdullah Al Abdooli, Green Development and Environment Affairs UAE
José Edgardo Gomez, Jr., Quezon City Government, Philippines
Beatriz Cardenas, WRI
Mousumi Bhat, SEMI

Closing remarks
Martina Otto, CCAC Secretariat

Clean air success stories

30 May 2023 | 11:00-12:30 | Conference Room 1

Air pollution is a transboundary issue, requiring cooperation among countries at multiple levels for collaborative efforts to deliver results. Financial interventions are key as well as sharing technology, information and expertise to increase national action at country levels.

“Inclusive approaches for shared governance in cities are important to address issues related to air pollution. A country is defined by local governance and not just federal governance.” Milag San Jose Ballestros, C40

Cities like Bangkok have shown readiness to move towards phasing out the conventional fuel vehicles for electric vehicles, although there is still lack of critical information and technical expertise and management techniques to roll out the transition.

Some cities in Asia like Jakarta pose characteristic problems where daily fluctuations in population (e.g. influx for work and outflux), cause huge traffic problems, which are difficult to be addressed solely based on vehicle to road network ratios.

Master of ceremony
Martina Otto, CCAC Secretariat

Opening remarks
Renée Gift, UNEP

Moderator
Philippe Brunet, Switzerland

Panelists
Siwaporn Rungsiyanon, Pollution Control Department, Thailand
Silvana Tarigan, Bureau of DKI Jakarta, Indonesia
Milag San Jose-Ballesteros, C40
Heather Adair-Rohani, WHO
Cayssa Peres Marcones, Ministry of Environment and Climate Change, Brazil
Fred Onyai, SLCP Planning and Implementation Expert, Uganda

Changing behavioural patterns is a huge challenge in Uganda and other parts of Africa, for example, concerning shifting to using cleaner cooking equipment at the household/local level, due to cost implications.

There are examples from other regions from where lessons and best practices can be gleaned. Previous regional efforts like the Male Declaration in South Asia can be revived as well as replicated throughout Asia.

Regional monitoring systems and the information produced must be shared among nations to inform policy formulation. This means substantial investments integrating regional monitoring systems as well as mainstreaming the information into policy making processes. Data improvement to generate credible Air Quality data is crucial and improvements in institutional capacity building for data analysis must be made. And finally, new sources of funds must be secured to revive already existing regional mechanisms land support scaling up initiatives.

Moderator
Kevin Hicks, SEI

Panelists
Bert Fabian, UNEP
Ram Lal Verma, Male Declaration
Stela Drucioc, Ministry of Environment, Moldova
Bidya Banmali Pradhan, ICIMOD
Renée Gift, UNEP

Closing remarks
Martina Otto, CCAC Secretariat

Regional action in Asia

30 May 2023 | 14:00-15:15 | Meeting Room F

Countries across the region are working together to take action. Until recently, however, no mechanism existed across the Asia Pacific region to coordinate action. To bridge this gap, the Regional Action Programme on Air Pollution (RAPAP) was adopted at the Seventh Session of the Ministerial Conference on Environment and Development in Asia and the Pacific in response to the regional and transboundary challenges posed by air pollution.

The High-Level Forum on Clean Air in Ulaanbaatar in March 2023 set the foundation for implementing the Regional Action Programme and the RAPAP represents a significant milestone in promoting regional cooperation on air pollution. The development of RAPRAP was consultative, involving inputs from 6 sub-regional and thematic consultations and 9 inter-governmental consultations. The Programme covers a wide scope of actions, including identifying technical and financial resources to accelerate action.

It focuses on 5 areas, including air quality management, capacity building, best practices exchange, monitoring and data sharing, and commitment to long term multilateral cooperation. Several measures were presented to operationalize RAPAP, including working groups on data and air quality standards and building foundation of knowledge and expertise.

Discussions focused on having a standardized approach around air quality management in the region. There was a general consensus that knowledge exchange and sharing of best practices is vital in addressing air quality issues. But while the participants acknowledge the benefits of having comparable data and sharing experiences and lessons learned, there was a recognition that countries have different priorities and levels of development, and that certain issues or approaches get more traction depending on the context.

Capacity gaps were also highlighted by most speakers, including the capacities of policymakers to use data to develop better policies, and the capacities of technical specialists and scientists to gather and analyze data. It is important to note that only few countries have the instruments to manage transboundary air pollution. Although progress has been made, more legislation and more public participation will be needed.

Opening remarks
Sangmin Nam, UNESCAP
Dechen Tsering, United Nations Environment Programme

Regional Action Programme on Air Pollution
Curt Garrigan, UNESCAP

Moderator
Martina Otto, CCAC Secretariat

Panelists
Jatinder Singh Kamyotra, Male Declaration
Dr. Nasir Hassan, World Health Organization
Glynda Mathan-Baterina, Clean Air Asia
evy Rinda Nugraini, Ministry of Environment and Forestry, Indonesia
Beatriz Cardenas, WRI
Bhushan Tuladhar, fhi360

EANET Regional Awareness Workshop in 2023 - A focus on Volatile Organic Compounds (VOCs) and Low-Cost Sensors (LCS)

30 May 2023 | 14:00-17:00 | UNCC Theatre

“Air pollutants carry across borders. Solutions need to cross borders. Data sharing and collaboration are key. That’s why alliances such as EANET are so important."
Marlene Nilsson, United Nations Environment Programme

Over the past 20 years, the EANET has facilitated collaboration among East Asian countries to address both acid deposition and air pollution. It has implemented a comprehensive monitoring program, sharing and analyzing data to understand sources, trends, and impacts of air pollution. EANET has provided training and support for capacity building, enabling effective management of acid deposition issues. The network has played a significant role in policy development, offering recommendations, and promoting regional cooperation to mitigate the adverse effects of air pollution. Since 2021, EANET has launched its Project Fund, allowing to develop projects with partners outside of its network. In 2023, among the 8 projects launched under this mechanism, two are related to Volatile Organic Compounds (VOCs), and Low Cost Sensors (LCS).

Volatile Organic Compounds (VOCs) are a large group of organic chemicals that include any compound of carbon (excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate)[2]. VOCs are emitted from a variety of sources, including motor vehicles, chemical manufacturing facilities, refineries, factories, consumer and commercial products, and natural sources (such as trees). VOCs contribute to the formation of secondary pollutants including ozone and fine particulate matter, thereby playing a significant role in air pollution, and contributing to a variety of harmful health effects.

Trends' analysis of air pollutants in Asia from 1950-2015 show that all air pollutants significantly increased over time. While some pollutants have started to decrease or stagnate in recent years such as sulfur dioxide (SO2), oxides of Nitrogen (NOx), Carbon monoxide (CO), and particulate matter. VOCs, on the other hand, continued to increase. Only three countries in the EANET region, namely Japan, Republic of Korea, and Thailand have ambient guidelines for VOCs. More work needs to be conducted on VOC monitoring, reporting, analyzing and regulations in the region. This is why the project Promoting VOCs related Capacity Building in the EANET, supported by the Ministry of the Environment, Japan (MOEJ) has been developed, and launched in 2023. Planned to last three years, the project is the fruit of cooperation between the MOEJ, the Network Center for the EANET, and different government and research institutes from China, Japan, Mongolia, and the Philippines, also including experts from the Republic of Korea and Thailand. Challenges of this project will be to work in countries with economic disparities, large differences in environmental standards, as well as diverse geographical and meteorological conditions.

In Thailand, the National Ambient Air Quality Standards include VOCs, and these are the first in the ASEAN region to include it. These standards have been developed thanks to technical cooperation with the government of Japan on addressing VOC pollution. The primary focus on VOCs in Thailand is due to their health impacts and contribution to particulate matter (PM2.5). As of 1 June 2023, Thailand has implemented a revision of its air quality standards[3], specifically focusing on the PM 2.5 standard. The revision aligns with the new guidelines set by

Opening remarks
Marlene Nilsson, UNEP

Introductory presentation
Prof. Meng Fan, Deputy Director General for EANET, ACAP

General Lecture
Dr. Meihua Zhu, ACAP

Moderator
Bert Fabian, EANET Secretariat

Panelists
Prof. Meng Fan, ACAP
Prof. Hong Li, CRAES, China
Dr. Kessinee Unapumnak, PCD, Thailand
Jundy T. Del Socorro, DENR, Philippines

General Lecture
Dr. Akie Yuba, Researcher, ACAP

Panelists
Prof. Kim Oanh, AIT
Dr. Le Ngoc Cau, MONRE, Viet Nam
Karine Légér, Airparif
Dang Espita-Casanova, Clean Air Asia
Closing session
Dr. Shiro Hatakeyama, ACAP

the World Health Organization (WHO). By adopting the WHO guidelines, Thailand is prioritizing public health and taking proactive measures to improve air quality management.

In China, VOCs emission standards are in place and 157 cities have VOCs automatic monitoring capabilities[4], however VOCs are not yet included in the Chinese National Ambient Air Quality. It was highlighted that research and assessment on VOCs contribution to air quality and their impacts on health need to be strengthened.

The Philippines faces issues with ozone and VOCs, and little work has been done so far to address VOCs, still excluded from the Clean Air Act. The need to identify and understand the main sources of VOCs was highlighted, including the necessary development of VOC Air Quality Guideline Values and Air Quality Index. Emission inventories indicated that VOCs contribute significantly, mainly from the transport sector. The switch from Euro 4 to Euro 5 standards is expected to help mitigate VOC emissions in the Philippines.

During the question-and-answer session, it was noted that in Thailand, the Pollution Control Department (PCD) is responsible for monitoring VOCs in communities, and that emissions primarily come from industrial sites, such as the petrochemical area in Rayong province. A participant inquired about the Thai alert system. Improving the delay for VOC measurements and action was discussed, with the current system relying on a 24-hour average sampling period, conducted once a month. Real-time concentration measurement is not currently available. Emergency response efforts utilize continuous analyzers placed near industrial and mangrove areas. The PCD monitoring station includes public and private sector data. The AIR4THAI mobile application combines PCD and Bangkok Metropolitan Administration (BMA) data, while other provinces rely on PCD data only. Private sector data is sourced exclusively from official channels.
Low-cost sensor (LCS) technology can be defined as a monitoring system for Particle matter (PM) or specific gases using various kinds of sensors[5]. Generally, LCS are small sensors, portable, relatively cheaper than the reference-level equipment, and require lower electric consumption. LCS technology has been remarkably developed in the recent years and is now widely used to inform citizens on the atmospheric environment through data communication networks, or via mobile apps such as AQAir or A4Thai in Thailand, for example. However, limitations remain related to the variable performance of LCS, the lack of calibration, standardization and quality assurance and control. According to the American Environmental Protection Agency (US EPA) LCS data do not meet the U.S. National Ambient Air Quality Standards (NAAQS) requirements[6], but they are useful for non-regulatory, supplemental, and informational monitoring applications.

Advantages and challenges of using Low-Cost Sensors (LCS) for air quality monitoring were presented and discussed by experts from the academia, government, NGOs and public-private sector representatives. The advantages highlighted include the small and lightweight nature of LCS, their ability to operate without a power supply (using solar power), and their user-friendly interface, making them suitable for citizen science initiatives. However, concerns were raised about the accuracy of the data produced by LCS, emphasizing the need for complementing traditional sensors with LCS data. Maintenance and calibration issues were also mentioned, which could increase the overall cost of using low-cost sensors. Nevertheless, the panel expressed optimism that LCS technology would improve over time and could be calibrated easily with the help of AI.

With the goal to strengthen monitoring capacities of PM2.5 and Ozone (Surface Ozone) in Asia, the EANET has launched in 2023, as part of its Project Fund Activities, the Hybrid Air Quality Monitoring Network (HAQMN) project for practitioners to consider how they can wisely select and use reliable LCS to be integrated with reference-level sensors for enhanced air quality monitoring. By the end of the project, guidelines will be developed to help government officials replicate this integration in their own country.

In Viet Nam, as part of the HAQMN project led by EANET, ACAP and in collaboration with ADB, the 3-year project will allow to expand the coverage of the monitoring network by integrating LCS to the existing network, develop guidelines and policies and share reliable data. A mobile application combining air pollution and weather data will also be developed. Over the duration of the project, until December 2024, five LCS are planned to be deployed in the city of Hao Binh, 76 Km from Hanoi, and five in Hanoi.

In the Philippines, the NGO Clean Air Asia led in the past years two projects in partnership with the Environment Management Bureau of the Philippines to deploy LCS in Manila and Quezon City, using LCS collocated with conventional sensors. The goal of these projects is to cover areas where there were coverage gaps, including residential and vulnerable areas (such as schools and hospitals). In Quezon City, the City Government supported the deployment of 40 sensors to fill this gap. In the case of the Manila pilot project, a sensor-specific correction factor, developed in close relation with the Academia, was used to adjust the data from the LCS and the comparison of the quality of the data with the data from the traditional sensors showed satisfactory results. Key takeaways from this experience were to focus first on the quality of the data, over the quantity of data sets. LCS need to be locally calibrated, integrated and collocated with conventional sensors, and require resource allocation, operation and maintenance, performance monitoring, and QA/QC.

In France, the NGO Airparif is working closely with the government and private sector to inform the public and the media on the quality of the air in Paris region. In 2023, Airparif launched the 4th edition of its Airlab Microsensors challenge, in collaboration with the French Embassy in Thailand, and as part of the French-Thai Innovation year. The goal of the challenge is to test LCS sensors to provide guidance to users through independent tests, with the objective to evaluate the performance of microsensors based on different pollutants, category of use, and in different environments. So far, 59 solutions and 33 companies are participating in the challenge and the review will be led by an independent panel of international experts.

During the question-and-answer session, the panel emphasized that LCS are not meant to replace traditional sensors but rather to enhance coverage and provide better information. A rich dataset generated by LCS was seen as valuable for policymakers, if collocated with other traditional sensors.

Other topics discussed included the associated costs beyond the initial purchase, such as data storage and IT knowledge. The price range of LCS was mentioned to generally be between $100 and $1000 per unit, with some studies highlighting a relationship between data quality and price. Data-as-a-service subscriptions were mentioned as a sustainable option to finance LCS deployments, with technology providers loaning sensor units and offering yearly subscriptions for data access, while maintenance would be the responsibility of the city or local authorities.

The panel emphasized the need to work on standards, calibration, and common metrics for LCS. While LCS can be suitable for identifying hotspots in cities or understanding illegal industrial releases, their use for regulatory purposes would require high-tech calibration and would no longer be considered low cost. In summary, the panel discussion recognized the advantages of LCS in terms of their portability and accessibility, and powerful awareness raising tools, while acknowledging the need to address data accuracy, calibration, and integration with existing monitoring networks to ensure their reliability for various purposes.

Watch the online recordings here
Session recordings

Read more about session highlights
EANET News

Mini symposium and networking reception: AIT-UNEP collaboration on pollution action and circular economy

30 May 2023 | 17:00-19:00 | UNCC Theatre

Almost one-third of the world's population lives in the East Asian region. Due to rapid economic growth and industrialization, many countries in this region are facing a serious threat from pollutions emitted to air and released to land and water. AIT has forged a partnership with United Nations Environment Programme (UNEP) to implement various projects aiming to improve the health of planet and people. The partnership between AIT and UNEP has been strengthened in 4 topics, namely air pollution, waste, sustainable consumption and production, and chemicals management, which showcases the work being done on several occasions.

The mini symposium was organized to inform international and national stakeholders the way the collaboration has progressed, demonstrating milestones in tackling pollution and promoting circular economy.

Moderator
Mick Saito, United Nations Environment Programme

Opening remarks
Mushtaq Memon, United Nations Environment Programme

Speakers
Guilberto Borongan, Asian Institute of Technology
Ekbordin Winijkul, Asian Institute of Technology
Young Ran Hur, United Nations Environment Programme

China's 10-year path toward cleaner air: An Asian perspective

31 May 2023 | 09:00-10:30 | Meeting Room F

The session themed on China's 10-Year Path Toward Cleaner Air was organized by Clean Air Asia (CAA), which brought together representatives from government agencies, research institutions and NGOs to engage in a dialogue between multi-stakeholders. The session aimed to inspire more countries and cites in Asia to move toward cleaner air and low carbon development and identify opportunities for collaboration.

The key areas discussed include: How can China move toward a cleaner future? How will developing Asian countries improve air quality and reduce GHGs while developing economy? How countries in this region can learn from experiences and lessons learned of each other and identify a path of its own?

At the session, Clean Air Asia presented its report "China's 10 year path towards cleaner air - an Asian perspective" which is a special issue of the "China Air" series reports, documenting China's efforts in air pollution control in the past decade, and witnessed China's new journey towards coordinated control of carbon and air pollution.

The special issue presents China's progress and achievements in the field of air quality management and climate change mitigation in the past through an indicator atlas and identifies gaps and future improvement directions by comparing with typical countries in Asia, Europe, and America.

Keynote speech
Prof. Kebin Tsinghua University

Report findings
Dr. Wei Wan, Clean Air Asia China Office

Panelists
Prof. Kebin, Tsinghua University
Dr. Wei Wan, Clean Air Asia
Shaojun Zhang, Tsinghua University
Yongbin Fan, China Cement Association
Zhe Liu, Shiner Renewable Energy
Weihao Zhang, Clean Air Asia

Closing remarks
Dr. Fu Lu, Clean Air Asia

Science Policy Dialogue: Cost of inaction

31 May 2023 | 11:00-12:30 | Conference Room 1

Air pollution is expensive. From the human tragedy of premature death and lifelong disease, to increased expenditure on healthcare, lost productivity and environmental damage, the costs of air pollution impact everyone, everywhere. While progress is being made globally to tackle the air pollution crisis, future population growth, urbanization and economic development in many countries will likely offset reductions and lead to additional exposure. Further action is therefore urgently required to reduce air pollution and its associated costs. However, in a world in which all governments face budgetary pressures and competing priorities, proposals for new mitigation measures must be backed up by strong investment cases that can make the case for taking further action.

Air pollution mitigation assessments help governments identify 'best buy' policy solutions through quantifying the costs and benefits that would result from taking different mitigation actions. These can help identify the most cost-effective and impactful policy options and new opportunities to realize co-benefits that go beyond health. Furthermore, when the costs and benefits of taking action are compared with a 'business as usual' scenario - in which no new actions are taken - it can highlight that doing nothing on air pollution can be more costly than taking action. Highlighting the 'costs of inaction' in this way can help governments make informed decisions, strengthen investment cases to attract funding, and communicate positive arguments around taking cost-effective action to improve air quality.

Country presentations delivered by Thailand, Cambodia and Indonesia provided the current air pollution situation in each country. Speakers emphasized the need for implementing multiple solutions and consequently assessing their effectiveness. The presentations revealed significant costs of inaction, further highlighting the urgent need for action.

The multi-faceted issue was unpacked through a discussion with experts from the government and academia, with an aim of supporting policymaking based on assessment findings. Speakers and participants reiterate the pressing need for enhanced data collection to effectively inform policies and policymakers.

"Capitalizing on learning involve leveraging the influence of science to advance political agenda, identifying context-specific sensitivities and opportunities, and acknowledging the role of cultural, political aspects, and development level in differentiating key enablers." Zbigniew Klimont, International Institute for Applied Systems Analysis

Based on these insights, several recommendations were put forth. These recommendations include promoting collaboration across sectors, considering transboundary issues, and quantifying the costs of inaction to inform policymaking. Overall, the session provided valuable insights into the challenges posed by air pollution and the costs of inaction. It emphasized the need for collaborative efforts and evidence-based policymaking to address this pressing issue effectively.

Opening remarks
Cristina Zucca, UNEP
Mushtaq Memon, UNEP

Framing presentation
Zbigniew Klimont, International Institute for Applied Systems Analysis

Country presentations
Siwaporn Rungsiyanon, Thailand
Puji Lestari, Indonesia
Chandath Him, Cambodia

Moderator
Prof. Young Sunwoo, IUAPPA/ Konkuk University

Discussion
Dr. Rashid Hussein, WHO
Zbigniew Klimont, IIASA
Alin Halimatussadiah, University of Indonesia
Ploy Pattanun Achakulwisut, SEI

Interventions
Vanhna Phanphongsa, Lao PRD
Dr. Nasir Hassan, WHO

Zbigniew Klimont
International Institute for Applied Systems Analysis
Framing presentation

Strengthening ambient air quality legislation

31 May 2023 | 15:45-17:00 | Meeting Room G

Countries are taking bold actions to improve the quality of the air we breathe. According to UNEP's review of policies to reduce air pollution[7], more than a quarter of countries have an air quality management strategy, and most countries have legal instruments containing ambient air quality standards. This finding presents a positive progress since air quality standards, embedded in legislation, are the foundation for robust national air quality governance.[8]

The World Health Organization (WHO)'s air quality guidelines provide a scientific and authoritative starting point for establishing and improving national air quality standards, acknowledging that governments should consider their national circumstances when developing their own standards. This must also be accompanied by supporting mechanisms to ensure effective implementation.

Currently, however, there is a lack of global alignment and common legal framework on air quality.[9] But there is a growing recognition of the important role of international and regional cooperation to address air pollution.

UNEP's First Global Assessment of Air Pollution Legislation (GAAPL) examines how ambient air quality standards are embedded in domestic legal regimes and secured within domestic systems of air quality governance. To operationalise AQS, robust institutional and governance structures are needed. The GAAPL outlines a model system of domestic air quality governance that emphasizes the importance of science, accountability, policy coordination, inclusiveness, transparency and participation and establishes findings on the successes and challenges that exist in the effective management of air quality in 194 countries worldwide. Building on these findings, UNEP has developed a Guide on Ambient Air Quality Legislation.

Opening remarks
Soraya Smaoun, UNEP

Presentation
Renée Gift, UNEP

Moderator
Beatriz Cardenas, WRI

Panelists
Dr. Nasir Hassan, WHO Regional Office for South-East Asia
Siwaporn Rungsiyanon, Pollution Control Department, Thailand
Chandath Him, Ministry of Environment, Cambodia
Nevy Rinda Nugraini, Ministry of Environment and Forestry, Indonesia
Jundy del Socorro, Department of Environment and Natural Resources, Philippines
Sumit Sharma, UNEP

The Guide is designed to assist national lawmakers and policymakers in developing or improving ambient air quality legislation, with the aim of promoting national systems of air quality governance that prioritize public health outcomes. The Guide contains a checklist and explains how AAQS embedded in legislation are the centerpiece of wider legal, regulatory and policy frameworks for delivering improvements in air quality.

This session primarily introduced the components of a robust air quality governance system and facilitated sharing of latest developments by countries on their respective air quality legislation, including challenges faced during implementation.

In Thailand, raising awareness and stimulating action on air pollution has proven more effective when framing the issue in terms of health implications rather than climate change. Although, local health impact needs more evidence, the issue of air pollution has been an immediate and visible issue in recent years among the general public. Thailand's AAQS has recently underwent a review and revision process, which involved the civil society and private sector. The latest AAQS is a milestone for the country, which is also on the way to revising its Air Quality Index.

Indonesia presented its approach to managing air quality, including a comprehensive overview of relevant laws and measures. Indonesia's Blue Sky program is composed of various elements such as local regulation, human resources, planning, implementation, stakeholder involvement, publication and innovation. Currently, Indonesia is also exploring ways to address transboundary air pollution at provincial level.

Every three years, the Philippines conducts emissions inventories and update its AAQS for PM2.5 – the last update was done in 2020 in consultation with key agencies and stakeholders. Due to its archipelagic geography, the Philippines faced challenges on monitoring and governance of air pollution issues. Outsourcing the monitoring capacity to a private sector was one way to address challenges faced by the government.

In 2000, Cambodia introduced Sub-Decree No. 42 on Air Pollution and Noise Disturbance. Due to increasing pollution levels and more pollution sources linked to more vibrant economic activities, the sub-decree was revised based on the new WHO Guidelines. The revised sub-decree provides a comprehensive framework for air pollution control, setting new emissions standards, defining monitoring requirements, and strengthening enforcement for non-compliance. In addition, the policy also aims foster the adoption of greener technologies, allowing a transition to less polluting industries.

Although standards and legislation have long existed in India, one challenge that was raised was its effective implementation. In 2019, India launched a National Clean Air Program, but lacked legislative backing. India's monitoring network has expanded rapidly, but needs additional capacity. UNEP's country office is working together with the government on implementing real-time monitoring system to ensure more reliable data and support enforcement in real time.

Air pollution is a collective problem impacted by decisions and behaviours at different policy levels and sectors. Thus, regulatory alignment across wide-ranging policy areas is critical to achieving AAQS in practice. In particular, health and environment should work closely together. Legislative regimes should explicitly set out the regulatory consequences if AAQS are not met. And finally, It is important to involve all stakeholders in the development of new legislation and standards, including particularly the societal groups who are most likely to be negatively affected. Overall, AAQS and legislation should be continuously reviewed and updated to remain relevant.

Can hydrogen be a solution for a circular, low-carbon and pollution-free economy?

29 May 2023 | 11:00-12:30 | Conference Room 1

The use of hydrogen, although considered cutting-edge, is not new. Many sectors, including the fertilizing industry and refineries, have been using hydrogen for the past 200 years. The innovation today relies in the new applications of hydrogen to decarbonize highly polluting sectors, such as the energy and transport sectors, and specifically of so-called "green hydrogen". Green hydrogen is produced through renewable energies and/ or with a low carbon footprint, as opposed to grey hydrogen.

"Hydrogen is where the solar technology was 20 years back. I believe it will not take 20 more years for hydrogen technology to develop." Sumit Sharma, United Nations Environment Programme

Hydrogen energy is seen as an alternative energy source that could support the transition towards low-carbon and pollution-free energy. Several countries have started this energy transition, including India and the Republic of Korea, with the Asia Pacific region claiming a significant share of global hydrogen demand.

Some challenges that hinder efficient transition to hydrogen energy include a lack of international global policy frameworks and standardization, lack of infrastructure throughout the value chain, cost of hydrogen energy as compared to existing energy sources, and low awareness and understanding on the environmental impact of the hydrogen life cycle.

Moderator
Antoinette Taus, UNEP Goodwill Ambassador

Panelists
Dina Azhgaliyeva, Asian Development Bank Institute
Rajan Ratna, UN Economic and Social Commission for Asia and the Pacific
Sumit Sharma, United Nations Environment Programme
Visarn Lilavivat, ENTEC

Moderator
Young Ran Hur, United Nations Environment Programme

Panelists
Nicolas Leong, Wartsila Ltd.
Amalia Pizarro, International Energy Agency
Anuraag Nallapaneni, WRI India
Meng Yuan, Aalborg University

Global overview on a circular hydrogen economy
Kimmo Pekari, Embassy of Finland in Thailand

“The transition to hydrogen energy requires collaboration, partnerships and cooperation across the value chain. At present, there is no one-single player who can do all these things required to extract, distribute, and use hydrogen energy.” Nicolas Leong

To fully hasten the transition, key recommendations include the creation of hydrogen hubs and the implementation of regulations and standards to facilitate an accelerated research and development ecosystem. These efforts would ensure outcome-oriented research projects executed within specified time frames through collaboration between industry and academia.

In the Republic of Korea, the early adoption of hydrogen for transportation (public buses) is already up and running. The conversion of gas pipelines to transport hydrogen is in progress at a national level. In Thailand, green and bio hydrogen in the future could replace coal, oil and gas. Bio hydrogen is produced from waste, to biogas, transformed in a reformer, to finally become hydrogen.

The global hydrogen market size is expected to reach $10trillion by 2050[10] and hopes are high for strong economic development and job creation in countries with the capacities to produce and export hydrogen. In South and West Asia, there is great potential for countries producing solar energy, such as India and Bangladesh, among others, to become green hydrogen producers and exporters. Alongside the de-carbonization, the in-situ production of hydrogen in India could answer to the huge energy demand of the country, with low production costs, no transport and reduced energy dependency.

However, before becoming competitive by 2050, the green hydrogen market’s expansion is limited by the high cost of production, the lack of infrastructures (transport, storage) and scarce number of experts, leading to many uncertainties, including safety. Investments and capacity building are needed to level the ambitions to fill the energy gap in Asia. Hydrogen should be used in high priority in the chemicals, refinery, international shipping and steel sectors for it to be cost effective.

At the international level, a common definition of “green hydrogen” remains necessary, and one of the challenges consists in converting gray hydrogen to green hydrogen and agreeing in standards and certifications to qualify it. Policy support is key to develop standards and incentives to support hydrogen production. International cooperation needs to be strengthened to support countries in the development of national strategies on the use of green hydrogen, and maintain the supply chain, drive costs down and guarantee safety.

Overall, the discussions outlined the challenges and opportunities surrounding hydrogen, with the Republic of Korea and India taking proactive measures to harness its potential. These countries are committed to overcoming hurdles, promoting hydrogen usage, and fostering collaborations to establish a robust hydrogen ecosystem.

Air Quality Management: Technological and industrial solutions

1 June 2023 | 11:00-12:30 | Meeting Room H

Promising actions and innovative technology and industry solutions are on the rise to address air pollution and its detrimental impacts to health and the environmental. Engagement of the industry and private sector will be critical for innovation and transformative action. This will help shift public and private investments towards less polluting practices in high impact sectors, such as waste management, the residential sector, energy, industry, and agriculture, and to reduce the economic burden of air pollution and its associated deaths and illnesses, and thus move towards sustainable development.

Cost-effective solutions to address air pollution exist and have been identified to address the major sources of air pollution. While contribution of each source may vary depending on location, fossil fuel emissions from coal burning for power and heat, transport, industrial furnaces, brick kilns, agriculture, domestic solid fuel heating, and the unregulated burning of waste are considered the main sources of air pollution. In Asia Pacific, report Air Pollution in Asia Pacific: Science Based Solutions by UNEP and CCAC have identified 25 policy and technological solutions to address the five key sectors contributing to air pollution in Asia Pacific.[11]

This session, sponsored by the Ministry of Environment of the Republic of Korea and co-organized by the Thailand Environment Institute, shared existing innovative technology and industrial solutions that can help address air pollution from key sectors in the region. Invited speakers introduced their experience in each sector, such as emissions inventory, emissions remote sensing, transport, agriculture, and private sector engagement in the region, followed by questions and answers.

Master of ceremony
Antoinette Taus, UNEP Goodwill Ambassador

Opening remarks
Yeon-Jae Park, Ministry of Environment, Republic of Korea
Cristina Zucca, UNEP

Moderator
Antoinette Taus, UNEP

Panelists
Yunseo Park, NAIR
Jeonghun Kim, NIER
Dr. Akarin Suwannarat, Energy Absolute
Dr. Jeeranuch Sakkhamduang, Thailand Environment Institute
Ittipol Pawarmart, Pollution Control Department, Thailand
Bhushan Tuladhar, fhi360

“The national organizations of the Republic of Korea, such as NAIR and NIER, related to science-based measurement of emissions highlighted that the government side is needed to push forward to adopt the cutting-edge technologies and industrial methods to reduce air pollution and greenhouse gas emissions, because one of the success factors for the Republic of Korea to improve air quality was carrying on data-driven and science-based policies and measures over the past decades.

Private sector actors such as Energy Absolute emphasized the public-private cooperation to address air pollution in terms of driving clean energy and sustainable transport solutions to accelerate transformation and encourage industry player.

Thailand Environment Institute highlighted the serious threat and impacts of open burning in Thailand, followed by introducing the possible opportunities to change the agriculture sector pollution.

“We should encourage private sector engagement and support green jobs to connect the opportunities to marginalized communities.” Bhushan Tuladhar, fhi360

Speakers recognized and agreed that the engagement of the industry and private sector is critical for innovation and transformative action in improving air quality and combating climate change.

Site visits

(1) E-mobility in partnership with Energy Absolute

The transition towards e-mobility is an essential measure to combat greenhouse gas emissions and air pollution. As a global leader in low and zero emission mobility programs, UNEP has partnered with Thailand's National Energy Technology Center (ENTEC) to promote electric mobility in the country. The electrification of public and private transport in Bangkok has been gaining momentum, presenting an opportunity to drive the transition towards clean and sustainable urban transportation with the added advantages of electrified 2 and 3 wheelers, buses, and ferries. On 2 June 2023, a total of 40 delegates experienced cleaner and greener mobility by riding battery-powered electric ferry and bus, manufactured and operated by the Energy Absolute, a Thai renewable energy company. This unique opportunity showcased the potential for a cleaner and more sustainable city through electrified public transport.

This visit included a tour of Energy Absolute's facilities, an electric ferry ride, a presentation on its sustainable transportation initiatives, and a discussion on the role of electric mobility in achieving climate and clean air goals.

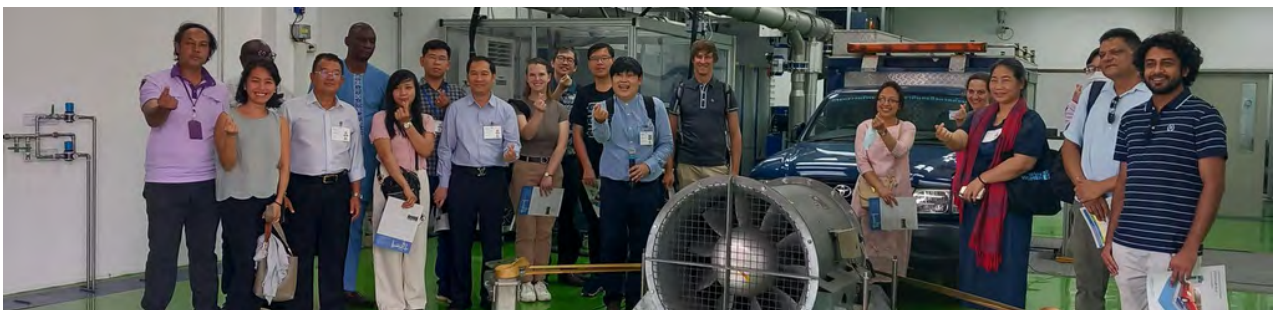
Participants aboard an electric ferry operated by Energy Absolute along the Chao Phraya River in Bangkok, Thailand on 2 July 2023 from 09:00 to 11:30

(2) Air Pollution and Automotive Emissions Model Laboratories in partnership with the Environmental Research and Training Center (ERTC) and the Automotive Emissions Laboratory (EAL)

This site visit brought around 20 participants to two (2) centres in Pathum Thani, Thailand to learn more about the country's research and development efforts on air pollution.

Environmental Research and Training Center (ERTC)
The ERTC hosts research and monitoring laboratories including Dioxin and Volatile Organic Compound (VOC) laboratories, as well as an Air Pollution Model Laboratory.

Automotive Emissions Laboratory (AEL)
Founded by the Pollution Control Department (PCD), the Automotive Emissions Laboratory's responsibilities include setting standards for vehicle emissions control; setting new vehicle standards and implement in-use vehicle emissions control measures; improving air pollution measurement; inspecting and certifying new motor vehicle emission standards issued by the Thai Industrial Standards Institute among others.



Participants at the Automotive Emissions Laboratory, managed by the Pollution of Control Department under the Ministry of Natural Resources and Environment of Thailand on 2 July 2023 from 08:30 to 14:30

(3) Food Bank in partnership with the Scholars of Sustenance (SOS) Foundation

The site visit started at SOS Thailand headquarters, which is the first food rescue foundation in Thailand established in 2016. Their mission is to reduce food waste and improve food equity by redistributing surplus food to communities in need in Bangkok, Phuket, Hua Hin, Chiang Mai and other places in the country. SOS Thailand has rescued about 5.5 million kgs of surplus food, served 23 million meals to 1,000+ communities, and reduced 13,987 tons of C02 creation. The session included learning about SOS Thailand's relationship with Global Food Banking, current programming, vision, impact, and reach. At end of the site visits, participants had an opportunity to participate in the distribution process in a community and learn about the human-centered impact of the food bank model.

Participants during the orientation session at the SOS Thailand headquarters, followed by a community visit on 2 July 2023 from 12:30 to 18:30

Key messages

Political will, planning and partnerships are essential to drive action at and across national and local levels;

Cities are at the center of actions related to climate and clean air, requiring partners to work closely with cities

Growing scientific evidence backed by robust data and effective technologies is critical to inform policies and foster multi-stakeholder cooperation;

Legal instruments are necessary to support enforcement and facilitate knowledge-exchange

Unlocking finance by tapping into existing opportunities helps address financial gaps to scale solutions for air pollution and climate change.

Recordings

Day 1 plenary sessions | 29 May 2023:
https://www.youtube.com/live/Cuxv4OUXFZ4?feature=share

Day 2 plenary sessions | 30 May 2023:
https://www.youtube.com/live/0_MXPvgwnFc?feature=share

Day 3 plenary sessions | 31May 2023:
https://www.youtube.com/live/away_698etg?feature=share

Day 4 plenary sessions | 1 June 2023:
https://www.youtube.com/live/7kxL007bt9Y?feature=share

News

Gyeonggi-Seoul-Incheon-UNEP Announce Joint Report on Air Quality Improvement Results
read more

Vietnam participates in the 2023 East Asia Acid Deposition Monitoring Network (EANET) Regional Awareness Workshop: focus on Volatile Organic Compounds (VOCs) and Cost Sensors low (LCS)
read more

EA supports "ENTEC-UNEP" to drive clean energy for a sustainable environment: Climate and Clean Air Conference 2023: Air quality action week read more

Notes

[1] https://www.who.int/news/item/04-04-2022-billions-of-people-still-breathe-unhealthy-air-new-who-data
[2] https://www.eanet.asia/wp-content/uploads/2023/06/1-general-lecture-session-of-VOC_Meihua-ZHU.pdf
[3] https://www.thaipbsworld.com/thailands-new-air-quality-standard-to-take-effect-on-june-1st/
[4] https://www.eanet.asia/wp-content/uploads/2023/06/4-VOC-China-Hong-LI.pdf
[5] https://www.eanet.asia/wp-content/uploads/2023/06/6-General-Lecture-LCS-Dr.Yuba_.pdf
[6] https://www.eanet.asia/wp-content/uploads/2022/08/Dr.-Alison-Simcox-Low-cost-sensors-LCS-for-monitoring-air-quality.pdf
[7] https://www.unep.org/resources/report/actions-air-quality-global-summary-policies-and-programmes-reduce-air-pollution
[8] https://www.unep.org/resources/report/regulating-air-quality-first-global-assessment-air-pollution-legislation
[9] https://www.unep.org/resources/report/regulating-air-quality-first-global-assessment-air-pollution-legislation
[10] https://www.goldmansachs.com/intelligence/pages/gs-research/green-hydrogen/report.pdf
[11] https://wedocs.unep.org/handle/20.500.11822/26861