



Kampala Capital City Authority

Air quality management Dr Alex Ndyabakira

30th September 2021

Together we can transform Kampala city

1

Public access to live Kampala city air quality @ <https://www.kcca.go.ug>

The screenshot shows the KCCA website interface. At the top left is the KCCA logo and name. A navigation menu includes: ABOUT US, DIRECTORATES, PROJECTS, TENDERS, SERVICES, CAREERS, OPEN GOV, FAQs, CONTACT US. Below the navigation is a banner with 'ACCESS THE HUB >' and a computer monitor icon. A row of service icons includes: eCite ONLINE PAYMENT, PLAN APPROVALS, BUSINESSES IN THE CITY, VISIT KCCA LIBRARY, KAMPALA AIR QUALITY DATA, VISIT KAMPALA, OUR EVENTS, and TREE/PALM DIRECTORY. Below this are two main content sections: 'Latest News and Adverts' with a banner for 'UGANDA MEET CENTRE' and 'Procurement Notices' listing 'Addendum No. 1 to the Bidding Documents for Kampala City Roads Rehabilitation Roads Project (KCRRP)' dated 22nd, September 2021, and 'Completion of Kawempe Division Offices' dated 4th, August 2021. A 'Contact us' button and a 'GetButton' icon are also visible.

Mission and vision

- The authority administers the capital city on behalf of the central government
- **Vision:** To be a Vibrant, Attractive and Sustainable City
- **Mission:** To Deliver Quality Services to the City
- **Core Values:** Excellence, Integrity, Innovativeness, Teamwork and Client Care



Air quality management

- Conducted with in the general framework of KCCA operations under the DPHE and climate change action plan.
- KCCA headquarters the pollution task force
- The ambient air pollution monitoring in Kampala city has been ongoing since 2019

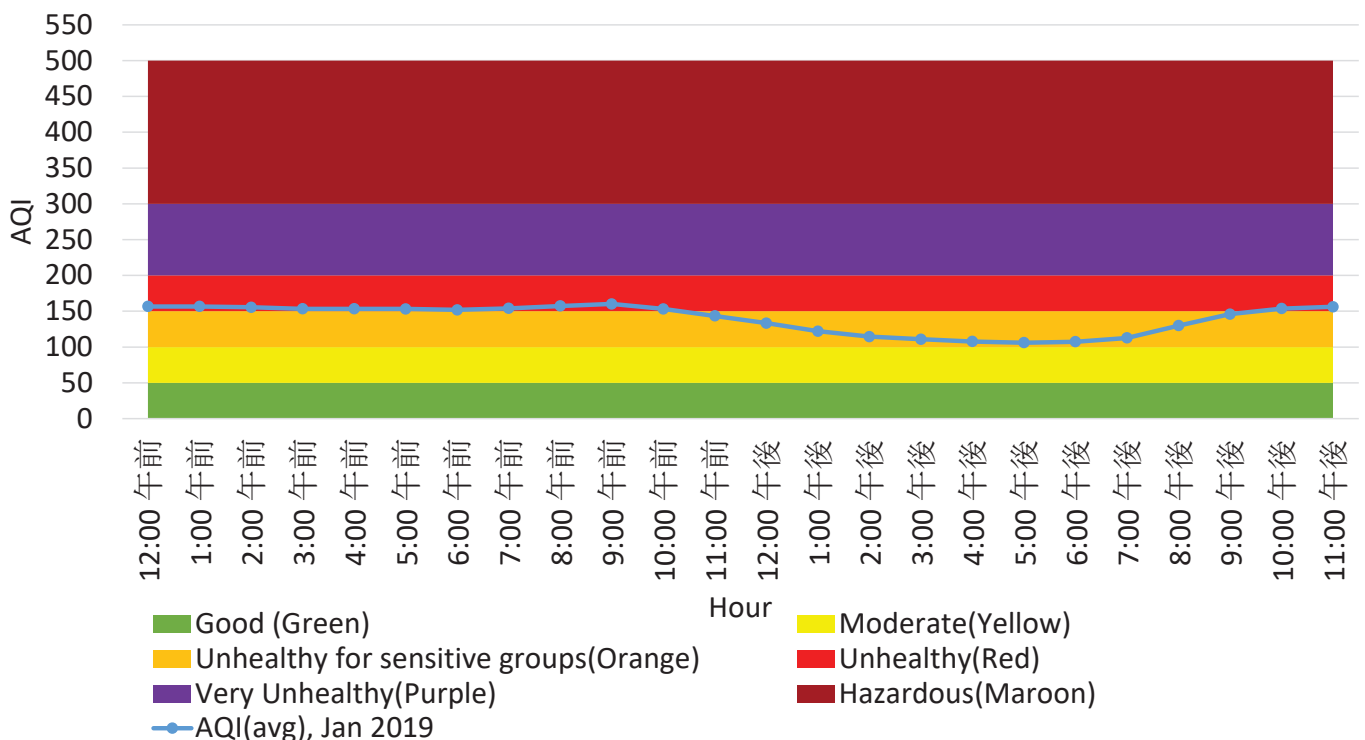


Status of air quality in Kampala city

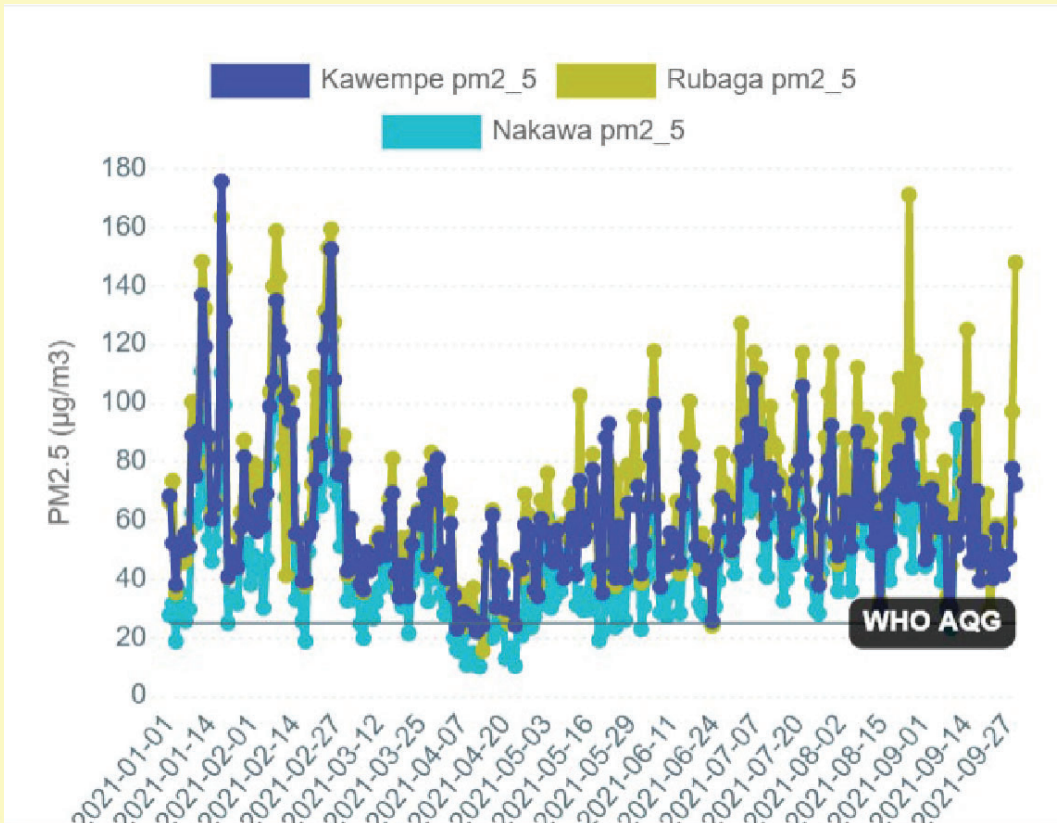


Air quality index, Makindye

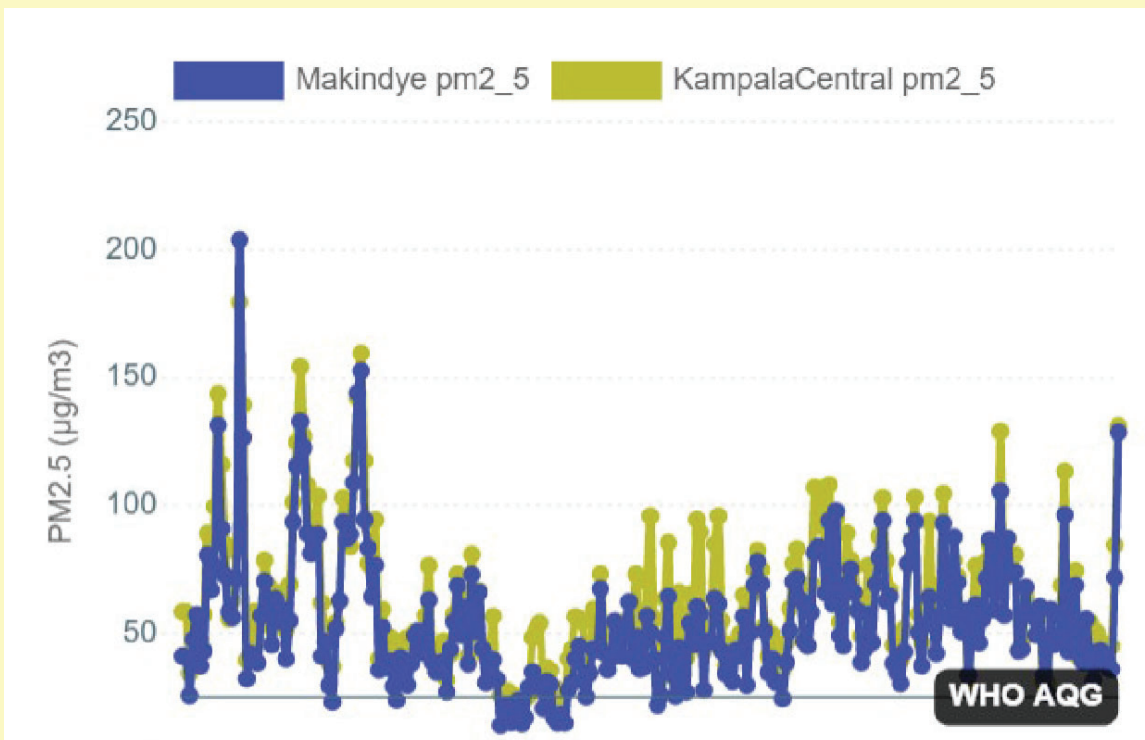
Average hourly Air Quality Index for PM2.5 for January 2019



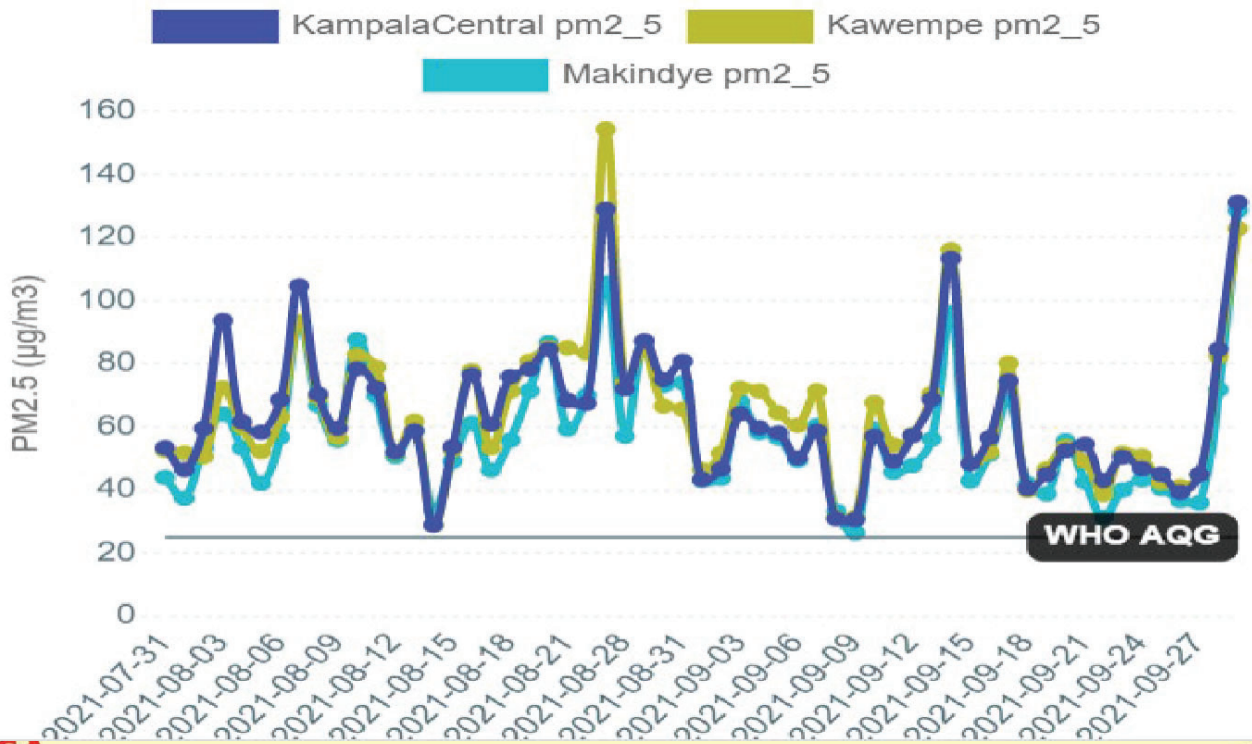
High pollution levels Jan-Sept 2021



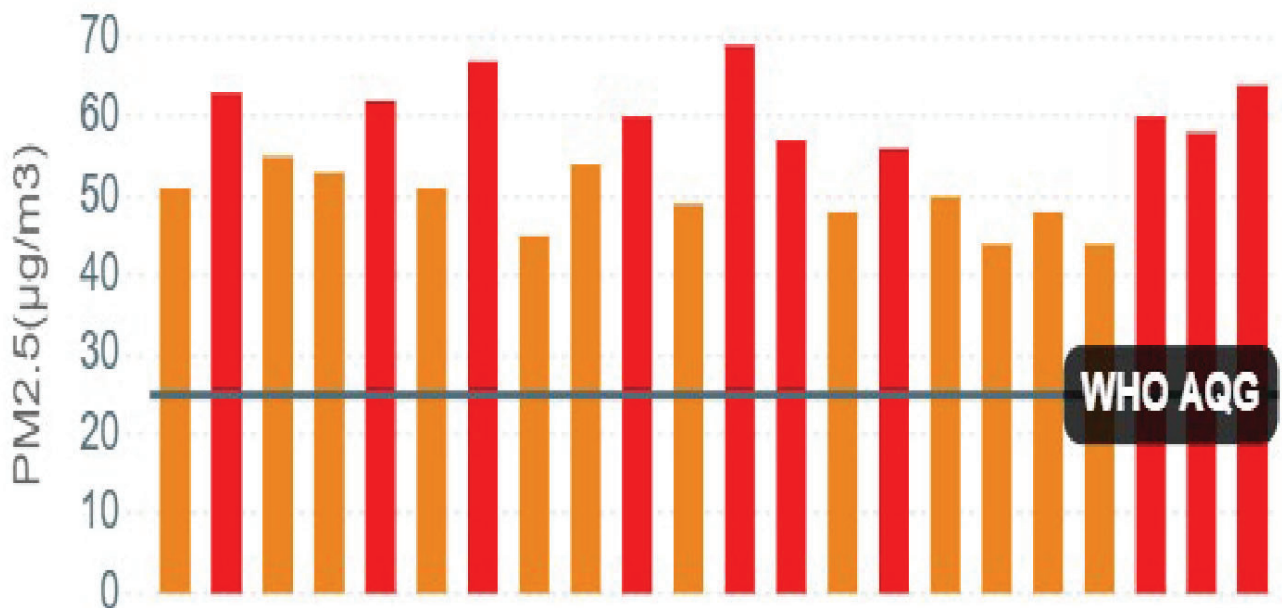
High pollution levels, Jan-Sept 2021



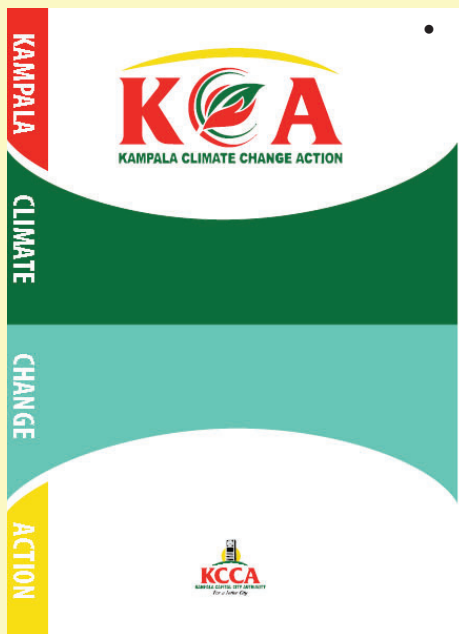
High pollution levels, Aug-Sept 27, 2021



Average daily pm2.5 levels exceed WHO cut-offs across sites (past 28 days)



The Kampala Climate Change Action Plan



- The “KCCA” Plan?
 - ❖ Is Kampala’s road map to achieving sustainability goals
 - ❖ 3 objectives
 - To mitigate or reduce emissions
 - Enhance resilience to climate impacts
 - Leverage the challenge of climate change to create new business opportunities



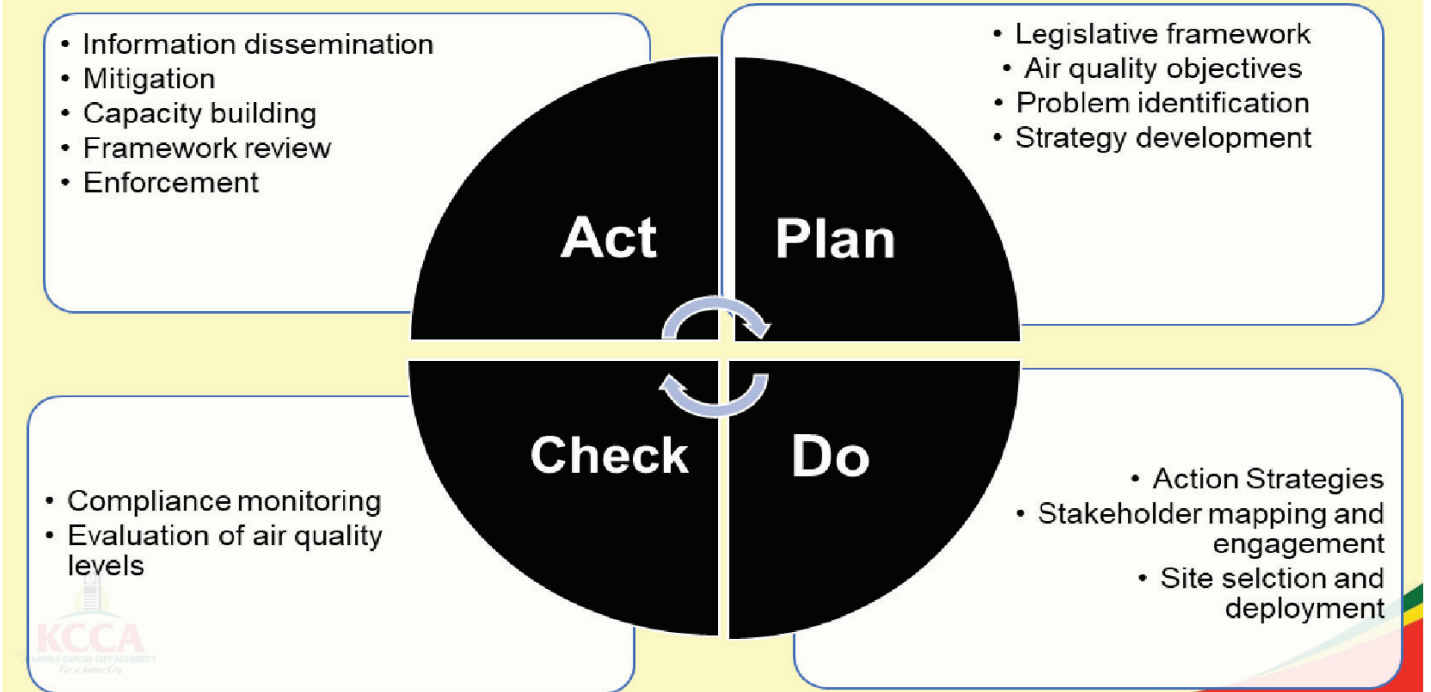
Current air quality management initiatives

- Undertook a preliminary air quality baseline assessment
- Developed an air quality monitoring system with 25 monitors around the City
- Promoted use of improved cook stoves in schools
- Tree planting- Over 10,000 trees have been planted, a pilot tree audit was undertaken and the Kampala Urban Forestry Management Plan is being developed

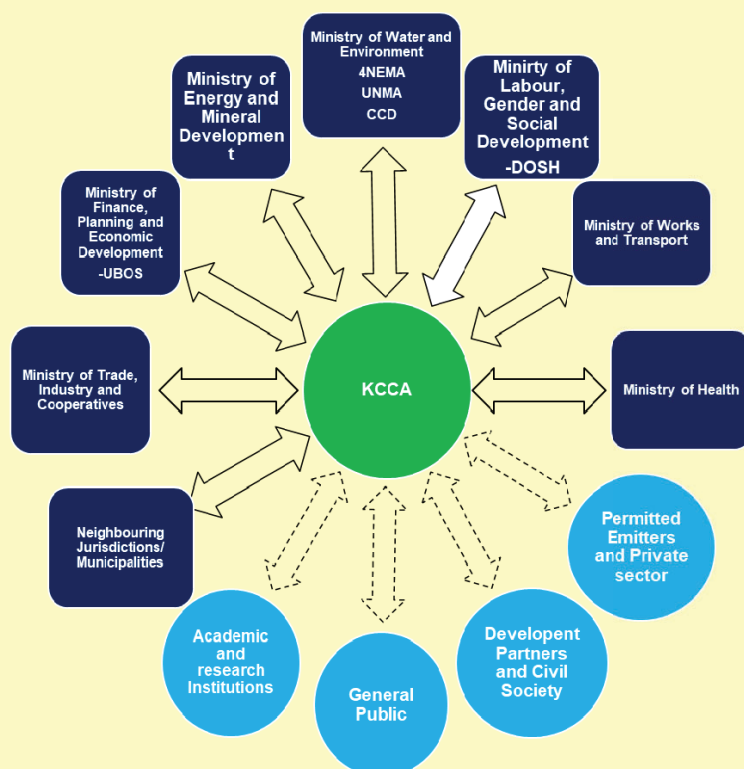


Developed air quality governance framework

- Aim of the framework is to aid the implementation of the Kampala air quality monitoring and management system.



The air quality governance framework takes on a multi-stakeholder approach



Climate change initiatives in mobility

Non Motorized Transport-Namirembe road



Inclusive mobility-Beautification and walk ways



Over 210kms of roads have been constructed thus increasing coverage of tarmac roads to reduce particulate matter from dusty roads and vehicle emissions through increasing connectivity to reduce congestion

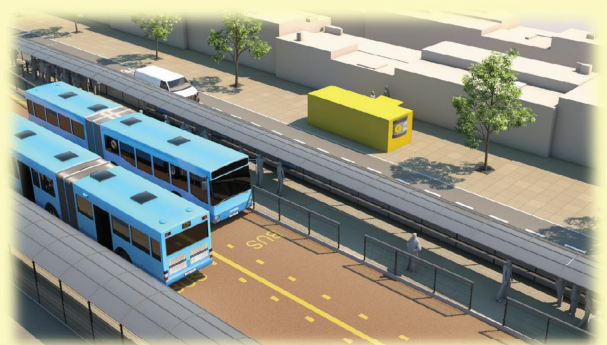
Reducing traffic congestion

- Signalization for efficient traffic flow management
- Traffic control centre for efficient control of traffic flow



Mass transport system

- Proposed rapid transit transport system
- Passenger train service
- More proposed Non Motorized Transport route under construction



E-Mobility Pilot Project



- Through a competitive process, KCCA selected Kampala-based start up Zembo Motorcycle Ltd to pilot this project

Drainage construction



Tobacco Smoking Control

- ❖ **KCCA signed onto the Healthy Cities Initiative The Tobacco Control: Create a Smoke-Free City Project seeks to protect Kampala citizens from the dangers of exposure to tobacco smoke.**
- Increase awareness of the Tobacco Control Act, 2015 and the dangers of/ exposure to tobacco smoking among general population i.e. through media campaign and sensitizations



KCCA Toll Free Line for smoking complaints : 0800 990 000



SMOKING KILLS!

LET'S MAKE KAMPALA SMOKE FREE

DID YOU KNOW THAT TOBACCO SMOKE IS DANGEROUS TO OUR CHILDREN?

Babies and children breathing second-hand smoke are exposed to dangerous chemicals. Tobacco smoke contains poisons that trigger many diseases in children like low birth weight, asthma, ear infections and pneumonia.

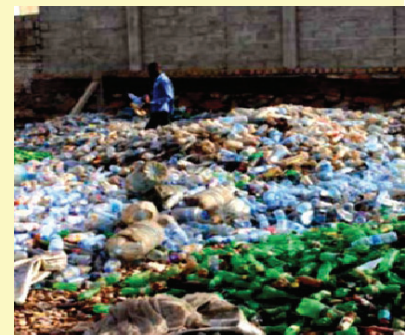


#Cities4Health #SmokeFreeKampala

TOBACCO CONTROL ACT 2015 BANS SMOKING IN PUBLIC PLACES

Waste Management

- ❖ **KCCA efforts towards maximizing waste collection to reduce household burning**
- Garbage collection has increased by over 100% from 30 tons in 2011 to over 1,200 tons a day
- Partnership with 3 private sector operators (concessionaires) to increase efficiency in SWM
- Construction of plastic and organic waste recycling plant to be run in collaboration with various CBOs
- KCCA seeks to partner with the private sector to design, build, finance and operate a new SWM treatment and disposal facility at



Climate change regulations

- Developed the KCCA Urban forest plan,
- Developed the KCCA wetlands management plan
- Developed the KCCA climate change action plan
- Air quality governance framework
- Developing clean air action plan



Partnerships

❖ Partnerships- Kampala Pollution Control Taskforce (PTF)

KCCA partnered with NEMA, NWSC, MWE, UMA & UCPC to tackle pollution through enhancing compliance to environmental regulations and promoting cleaner production

- *Joint inspections*
- *Public- Private Dialogues*
- *Sensitizations*
- *Cleaner production trainings and Assessments*



Upcoming activities to address pollution-

The clean air action plan

- Develop and maintain comprehensive monitoring and reporting infrastructure for all ambient pollutants
- Conduction source apportionment studies
- Develop and implement a communication strategy to raise awareness
- Capacity building for sustainability
- Design and implement strategies for reducing sectoral contributions

Challenges faced during implementation

- i. Limited capital financing to implement all planned interventions
- ii. Inadequate equipment
- iii. Limited space for waste management
- iv. Limited awareness and sensitization
- v. Limited capacity to undertake some of the interventions

Thank you for listening to me





Leveraging low-cost Innovation to close the air quality data gaps in Africa

Deo Okure, Priscah Adrine

Makerere University, AirQo



WHY SHOULD AIR QUALITY MATTER?



WHAT WE (SHOULD) KNOW

- >7 million premature deaths annually
 - Greater Kampala (~4.5),
 - *Would take 8 years from now to wipe whole of Uganda, 6 months for Greater Kampala*
- People in urban centres (cities, towns) are at higher risk
- In Africa, poor air quality kills more people than unsafe water (>170000 premature deaths), and malnutrition (>430000 premature deaths)



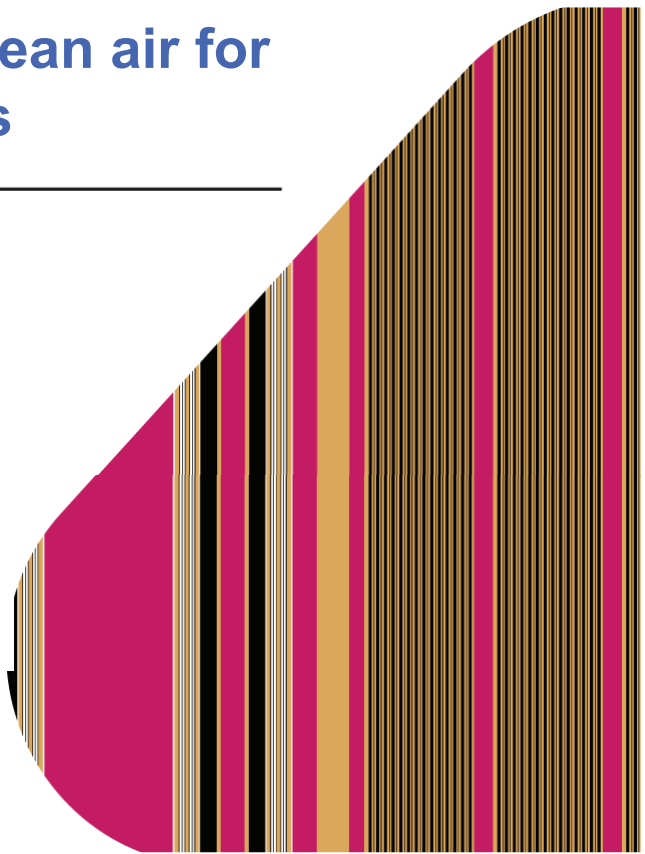
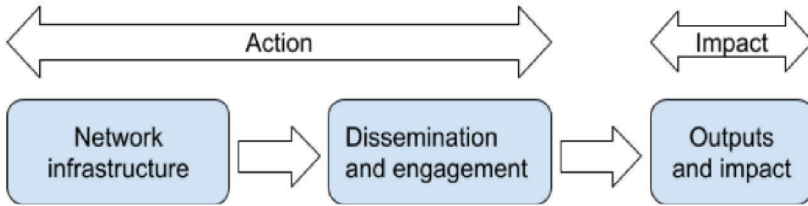
AIR QUALITY IS MULTI-SECTORAL



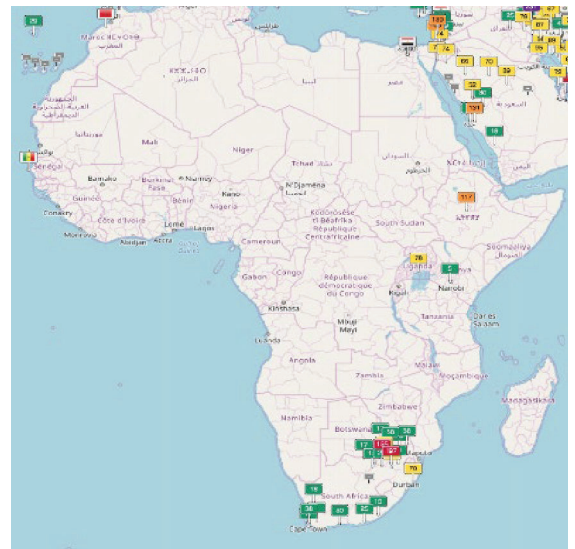
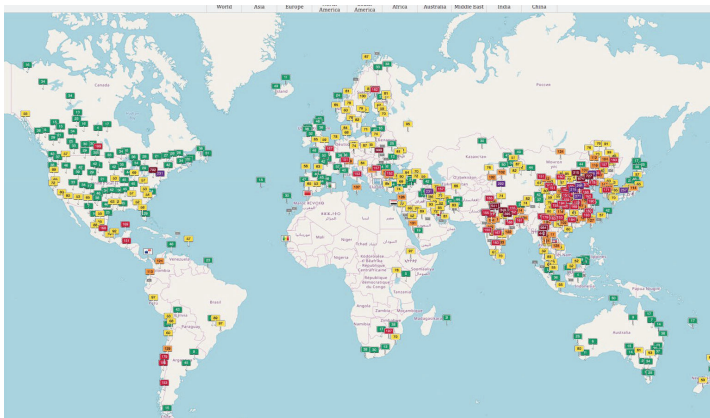


About AirQo: Clean air for all African Cities

Deploying low-cost innovation to fill the data gaps in Africa



AIR QUALITY MONITORING IN THE GLOBAL SOUTH



THE CHALLENGE

- Air Quality data is non-existent for many cities in Africa
- A traditional air quality monitoring station is expensive to set-up and maintain
 - a single station could cost >\$100k
 - Data transmission and hosting still a challenge
- Deliberate policies for air quality management lacking for many African countries



US EPA air quality monitoring station in Washington DC

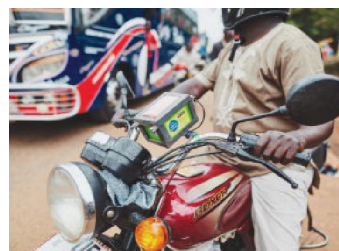
www.airqo.net



THE NETWORK



KCCA Nakawa

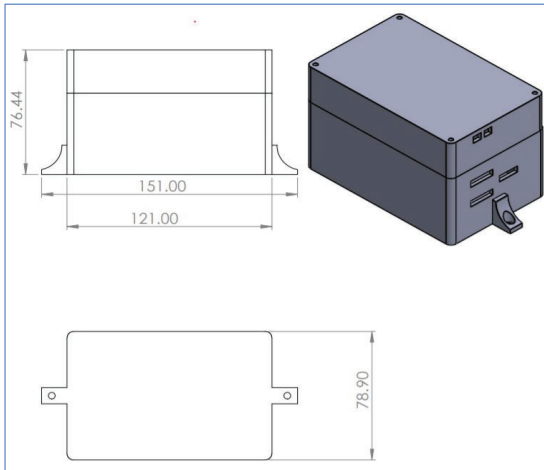


NEMA regional offices Mbarara

www.airqo.net



The AirQo Monitor

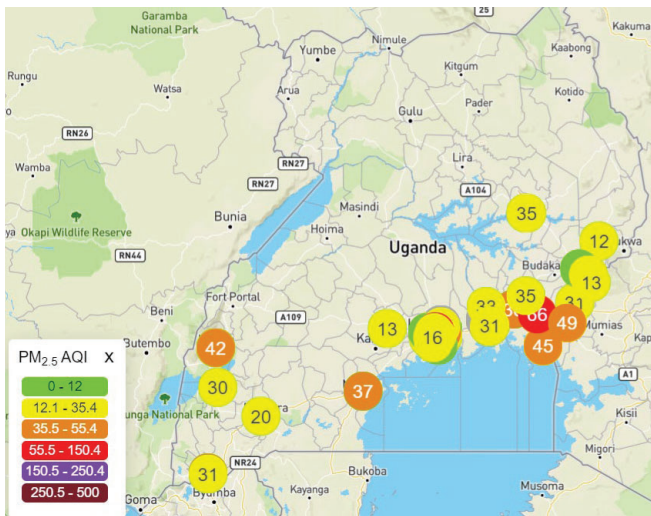


- Particulate Matter PM2.5 & PM10, measurement based on light scattering technology
- Mains and/or solar power supply
- Data transmission: cellular communication, 2G
- Other parameters: Location, temperature, Humidity, voltage levels.
- Deployment: Static or mobile objects
- Designed to withstand unique environment conditions in African cities (dust, rain, etc)

www.airqo.net

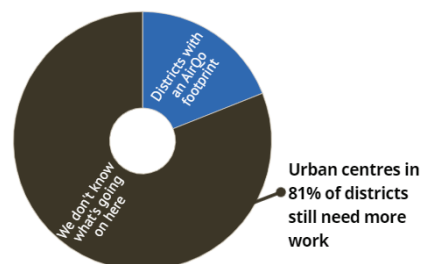


OVER 100 MONITORS DEPLOYED IN UGANDA



- Over 70 Low-cost monitors deployed in Greater Kampala
- Some air quality data present in about 23 metropolitan urban areas in Uganda

MONITORING FOOTPRINT: MORE WORK TO BE DONE



www.airqo.net





DISSEMINATION AND ENGAGEMENT

“Empowering decision makers and citizens with access to air quality data in their local area”



PUBLIC ENGAGEMENT



Visas U.S. Citizen Services Our Relationship Business Education & Culture Embassy News & Events

Home | Embassy | U.S. Embassy Kampala | Air Quality Monitoring at U.S. Embassy Kampala

The U.S. State Department, in partnership with the U.S. Environmental Protection Agency, places air quality monitors on some embassies and consulates around the world.

Start a health habit. Check the Air Quality Index everyday. The U.S. Embassy's air quality monitor measures PM 2.5 particulates as an indication of the air quality on the Embassy compound located in Kampala. Pollutants such as particle pollution are linked to a number of significant health effects – and those effects are likely to be more severe for sensitive populations, including people with heart or lung disease, children, and older adults. This monitor is a resource for the health of the American community.

Measuring air quality in one location, at the US Embassy does not tell the whole story of air quality in Kampala and Uganda. We are delighted to partner with Makerere University through AirQo who have taken the initiative to expand on this work with their growing network of sensors in Kampala and other urban areas in Uganda. Visit www.airqo.net/ for additional air quality data.

Current Conditions
observed at
Oct 7, 2020 5:00 AM (LT)

155 AQI
Unhealthy
PM2.5

Health Message
Everyone may begin to experience health effects when AQI values are between 151 and 200. Members of sensitive groups may experience more serious health effects.

Note: Values above 300 are considered beyond the AQI. Follow recommendations for the Hazardous category. Additional information on reducing exposure to extremely high levels of particle pollution is available [here](#).

Follow us on Twitter

Nationwide Air Quality Analysis

Check Nationwide air quality analysis by **airqo**

Start a health habit. Check air quality around you everyday. Visit AirQo

Learn More

U.S. air-quality monitoring protects people worldwide | ShareAmerica

Additional Resources

Graph of Last 24 Hours Data
[#karpalairquality](#)

#AIRQUALITYAWARENESSWEEK

What are the main causes of air pollution in Kampala?

Ugandan scientists collaborate with U.S. scientists to find out the main drivers of air pollution in Kampala City. Here is what they found out.

TUE May 4
11:00 AM - 12:00 PM

facebook **LIVE**
@U.S.EMBASSYKAMPALA

Panelists

- Ashere Ffona, PhD, Research Associate, Johns Hopkins University
- Sam Mwanza, Air Quality Scientist, AQIC, Kampala
- David Henshaw, Professor, Department of Natural Resources
- Annalee M'Kangya, PhD, U.S. Air Quality
- Gabriel Oduka, Founder, AirQo Central Africa
- Michael P. Swanger, Director, University of Colorado Boulder

AirQo @AirQoProject - Apr 17

Earlier today we officially launched the **#AirQoCommunityChampions** program that seeks to bring together members of the community within Kawempe division who will act as technology partners in air quality monitoring in Kampala.

AirQo @AirQoProject - Apr 17

The program is a collaboration between AirQo, The University of Birmingham and other partners under the Digital Air Quality – East Africa. Through this program, we seek to collaboratively work with community members in advocating for behavioural change at the grassroots level.

PUBLIC ENGAGEMENT



EMPOWERING DECISION MAKERS (DEMO)

<https://platform.airqo.net/dashboard>

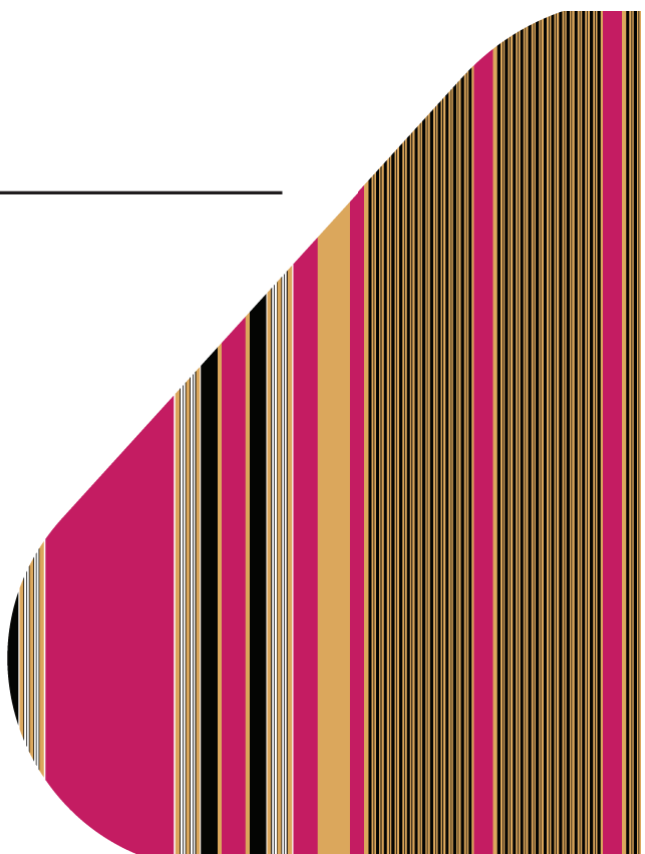
<https://platform.airqo.net/dashboard>



COLLABORATION



OPPORTUNITIES AND NEXT STEPS



- Improving monitoring resolution
 - More monitoring devices needed for Uganda
- Increasing monitoring scope
 - Additional parameters
- Data quality infrastructure
 - Reference monitors for calibration



- Policies
 - Development and implementation of deliberate policy initiatives (Green mobility, cleaner energy, etc.)
- Capacity building
 - Enhanced institutional capacity for air quality management
- Awareness infrastructure
- Action plan implementation
 - Action plan for cities and urban centres





@AirQoProject
@OkureDo
dokure@airqo.net

<https://www.airqo.africa>



THANK
YOU

Information of Activated Carbon Fiber(ACF) Air Purification Unit

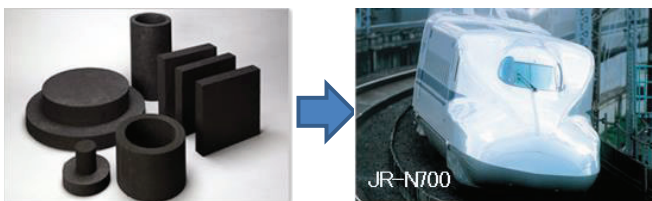
September 2021

Masaaki Yoshikawa
Osaka Gas co., Ltd.



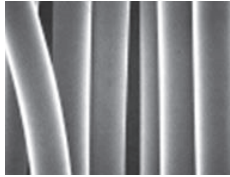
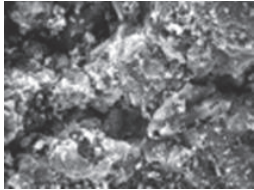
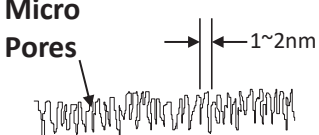
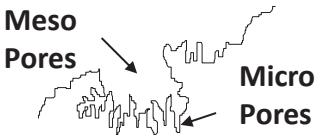
yoshikaw@osakagas.co.jp

Company Profile

Osaka Gas group companies produce various carbon materials, such as Carbon Fibers(CF), Activated Carbon(AC), and Activated Carbon Fibers(ACF).



Information of ACF

	Activated Carbon Fiber (ACF)	Granular Activated Carbon (GAC)
Appearance		
SEM Image (× 1,000)		
Image of Pore structure	 <p>Micro Pores → 1~2nm</p>	 <p>Meso Pores → Micro Pores</p>

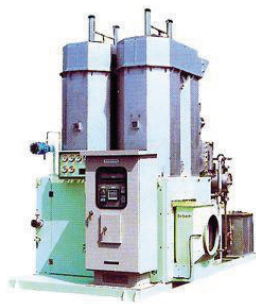
On the surface of the thin carbon fiber of 10 ~ 20 μm diameters, 1 ~ 2nm Micro Pores are uniformly formed, and adsorption rate is over 10 times faster than the conventional GACs.

Information of ACF

Examples of ACF application



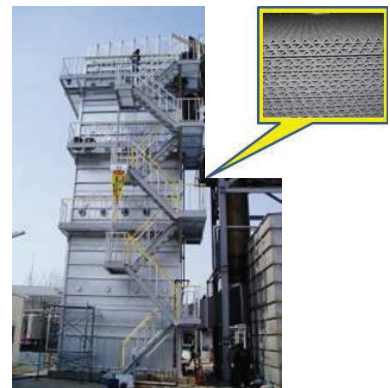
Water Purifiers



Solvent Recovery System



Air Cleaning Filters



NOx & SOx removal

Information of ACF Air Purification Unit



Activated
Carbon
Fibers
(ACF)



ACF Unit



ACF Air Purification Units
at the roadside
(Jakarta, Indonesia , 2018)



Energy Free: ACF use no electric power but use natural wind only.

High Efficiency: ACF can remove 80% of NO₂ in the atmosphere.

High durability: ACF can be washable and recyclable in the long term.

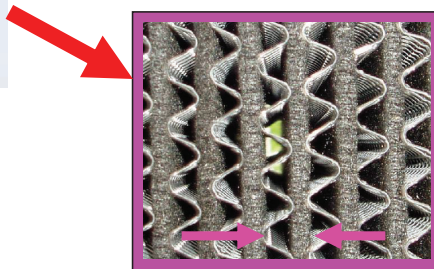
Information of ACF Air Purification Unit

Energy Free: ACF use no electric power but use natural wind only.

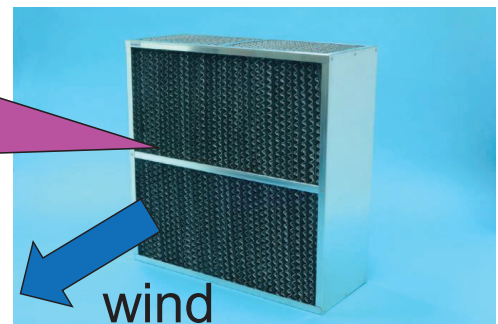


ACF Felt

Natural Wind Passing Structure of ACF Unit



Slit Structure



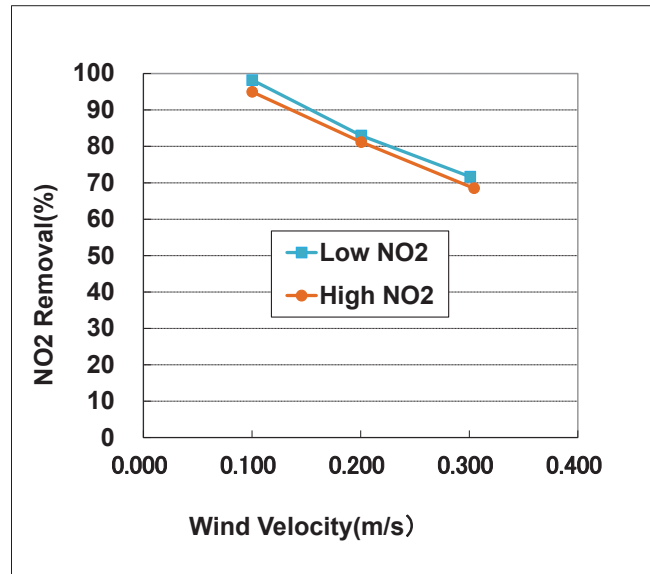
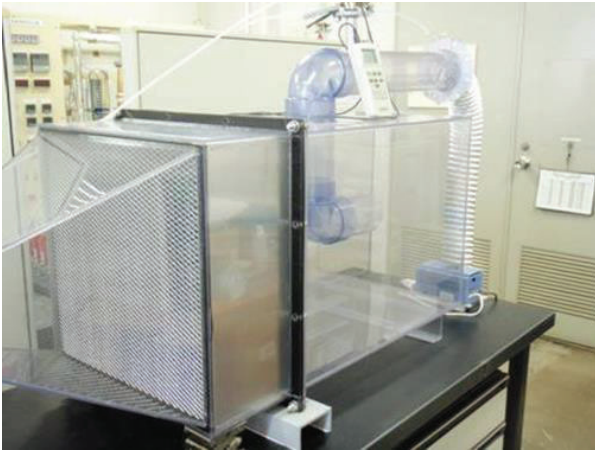
ACF Unit

Standard size: 500 x 500 x 200 mm
Standard weight: 3.5kg

ACF Unit is made as “**Slit Structure**” which has a clearance of 8 mm between ACF Felt. This structure shows very low pressure drop and it can pass through natural wind over ACF as parallel flow.

Information of ACF Air Purification Unit

High Efficiency: ACF can remove 80% of NO₂ in the atmosphere.

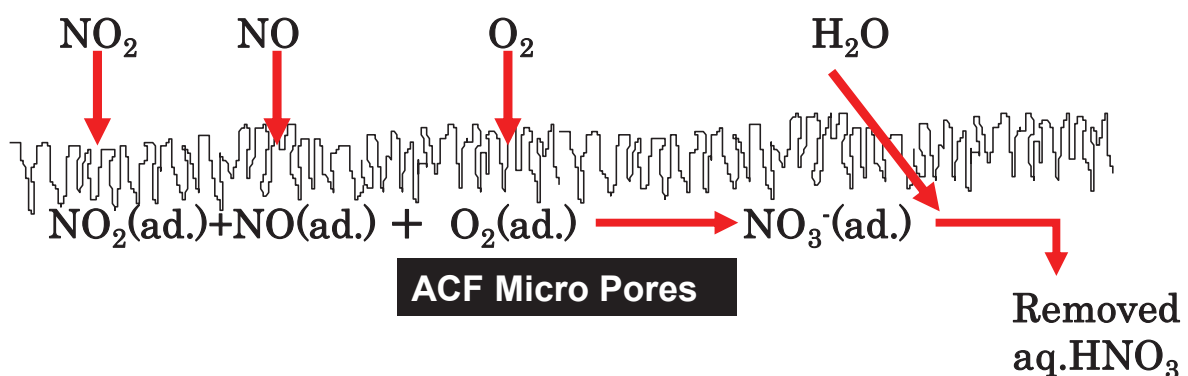


Low=0.1ppm
High=1ppm

Test result of ACF Unit at the laboratory

Information of ACF Air Purification Unit

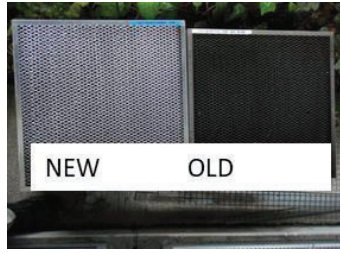
High durability: ACF can be washable and recyclable in the long term.



NO_x Removal Mechanism over ACF

The mechanism of NO₂/NO removal over ACF consists of adsorption and oxidation of NO₂/NO into NO₃⁻. This reaction will be regenerated by the water washing that removes aq.HNO₃ from ACF.

Information of ACF Air Purification Unit



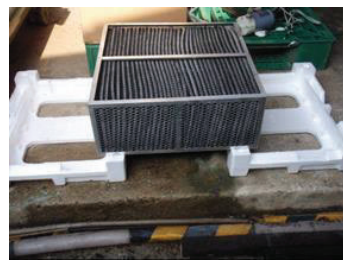
3 years after construction



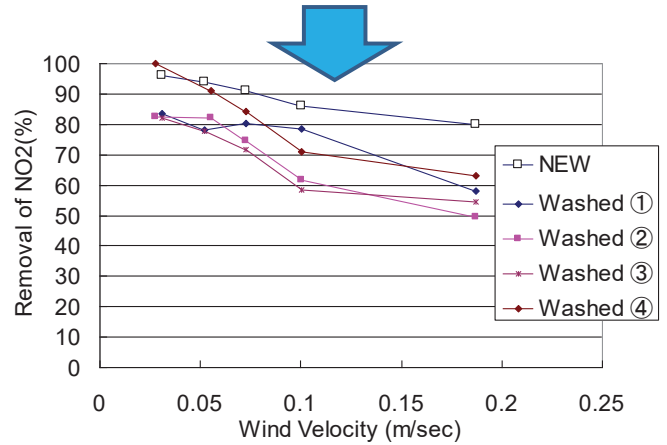
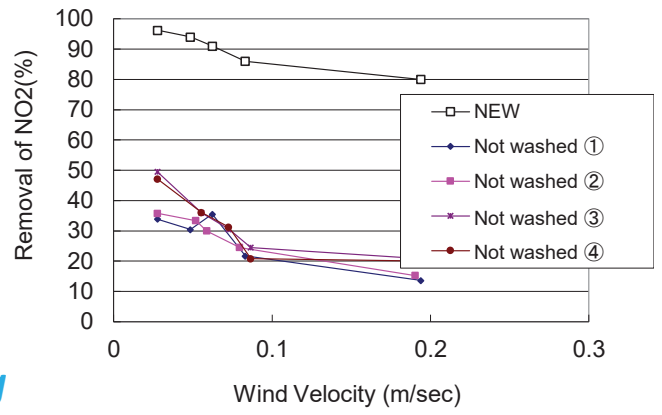
Washing



Washing 8 min.



Drying 8 days



Regeneration test by washing of ACF after 3 years

Application of ACF in Japan

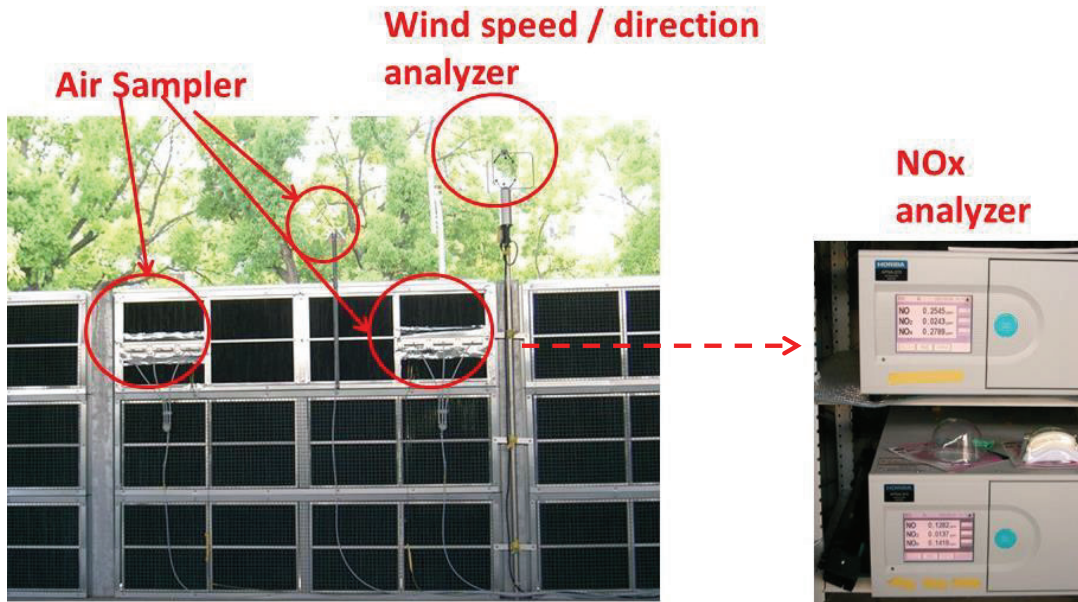


The national road No.43 in Osaka prefecture (2007).

h=2.2m, L=37m

Application of ACF in Japan

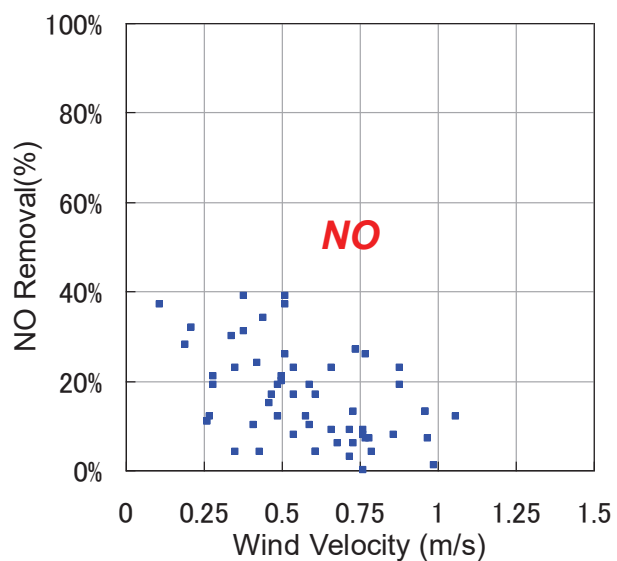
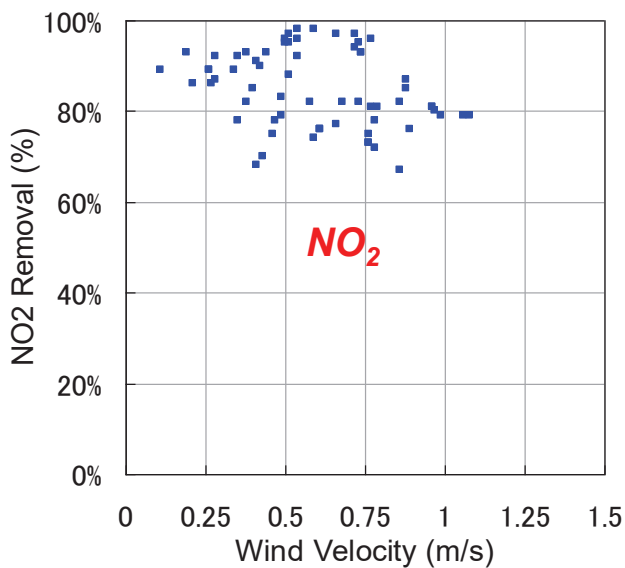
NOx measurements were taken at the ACF inlet (Upwind) and outlet (Downwind) determined by wind analyzer. NOx concentration in both side were measured simultaneously to determine the NOx removal.



11

Application of ACF in Japan

Average removal rate NO₂=84%, NO=19%



12

Application of ACF in Japan

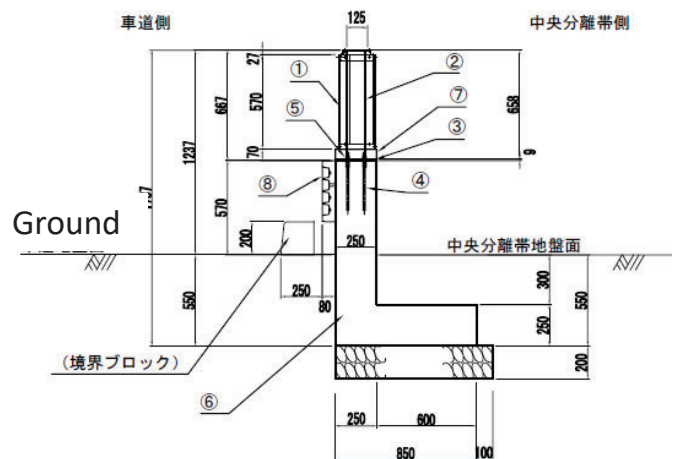


The national road No.43 in Osaka prefecture (2008).

$h=1.2\text{m}$, $L=220\text{m}$

13

Application of ACF in Japan

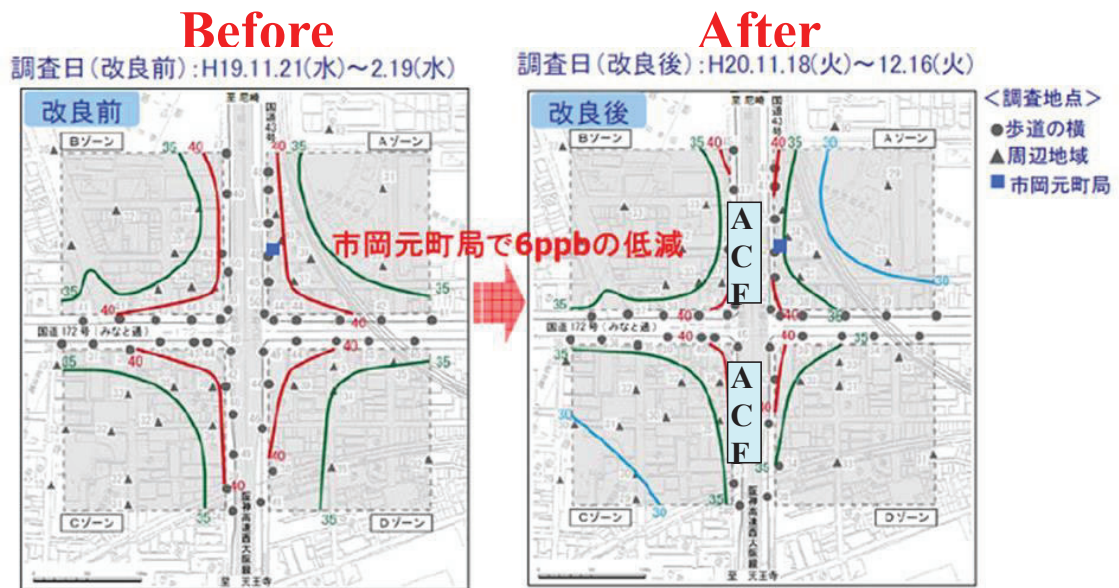


ACF was installed on a concrete foundation for the safety of wind loads and traffic accident.

14

Application of ACF in Japan

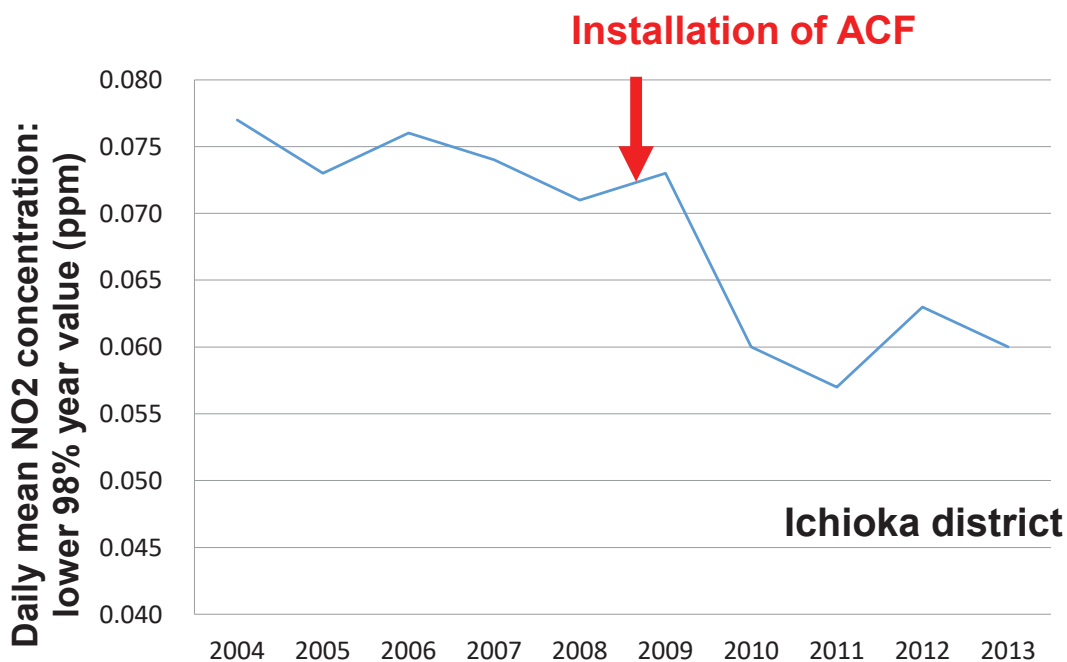
About 2~6ppb of the NOx was reduced, which was equal to the reduction of traffic volume as 2000 large automobiles per day. This reduction is equal to 10~20 years of the effect of the automobile emission regulation in Japan.



Effect of ACF and Intersection Improvement on the NOx concentration in national road No.43, Osaka

15

Application of ACF in Japan



The transition of NOx by observation station

16

Application of ACF in Jakarta, Indonesia



**JICA COLLABORATION PROGRAM WITH THE PRIVATE SECTOR
FOR DISSEMINATING JAPANESE TECHNOLOGY**
ACF AIR PURIFICATION UNIT IN REPUBLIC INDONESIA

June 2018 ~ May 2020



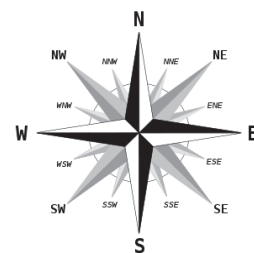
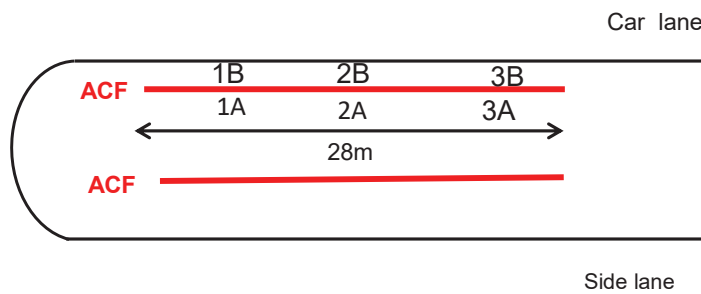
100 ACF units were installed at the National road in Jakarta. Total length = 50m.

Completion: 13 Sept. 2018

Application of ACF in Jakarta, Indonesia



NOx measurements in Jakarta



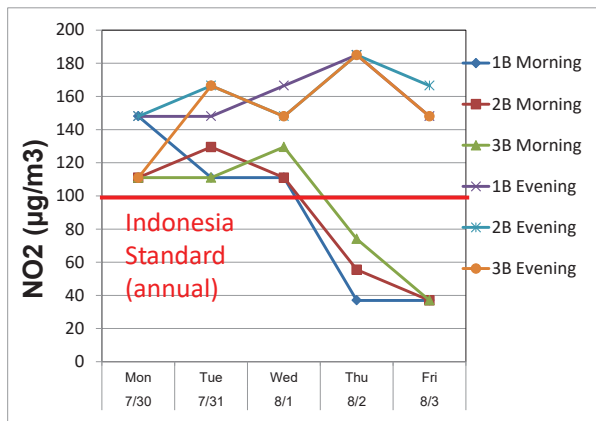
Measurement tool
GASTEC GSP-300-FT2
*sampling air for 30min.



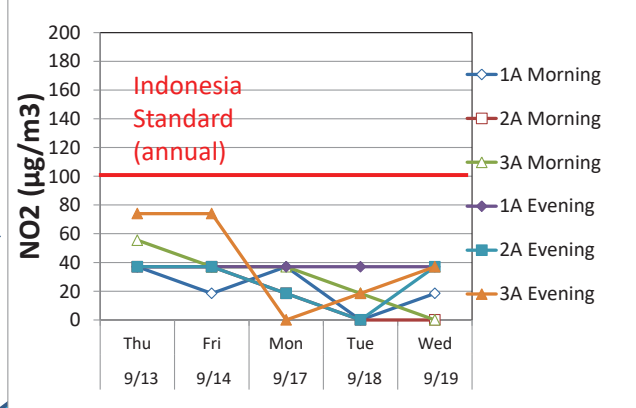
1B~3B: Before ACF

1A~3A: After ACF

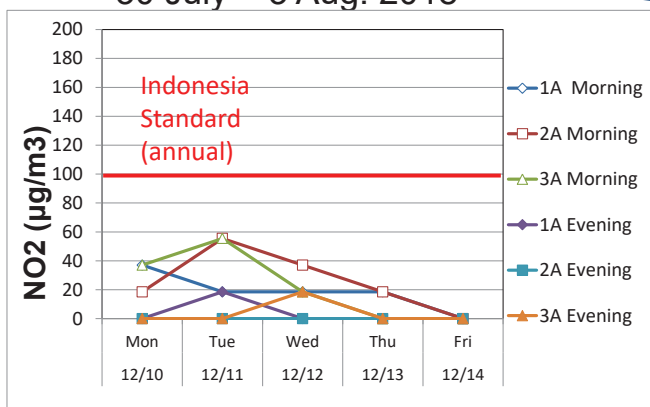
Application of ACF in Jakarta, Indonesia



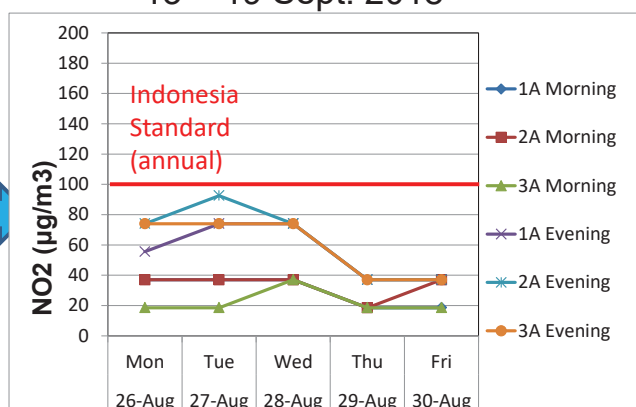
Before Construction of ACF
30 July ~ 3 Aug. 2018



1st) After Construction of ACF
13 ~ 19 Sept. 2018



2nd) After Construction of ACF
10 ~ 14 Dec. 2018



4th) After Construction of ACF
26 ~ 30 Aug. 2019

ACF information



NIPPON KOEI

Summary:

- 1) ACF was developed in Japan, and widely used in air/water cleaning application.
- 2) ACF Air Purification Units was certified for highly effective removal of air pollution in Japan and Indonesia.
- 3) ACF has high durability by proper water washing or natural rain washing. ACF has been utilized more than 10 years on national road in Japan.



Introduction to HORIBA's Analyzers

Leo YASUKAWA
HORIBA, Ltd.
International Sales Department

2021/9/30

HORIBA © 2021 HORIBA, Ltd. All rights reserved.

For This Workshop Use Only

Agenda

1. Corporate Profile
2. Introduction to Air Quality Monitoring System (AQMS)
3. Local Problems & Ideas to Consider
4. Introduction to HORIBA's PX-375

HORIBA © 2021 HORIBA, Ltd. All rights reserved.

2

Agenda

1. Corporate Profile
2. Introduction to Air Quality Monitoring System (AQMS)
3. Local Problems & Ideas to Consider
4. Introduction to HORIBA's PX-375

Corporate Profile

■ Head Office	Kyoto, Japan
■ Founded	October 17, 1945
■ Incorporated	January 26, 1953
■ Net Sales	187.1 BJPY (FY2020)
■ Employees	8,269 (FY2020)
■ Business	Manufacturing, sales, services of analysis and measurement equipment



Founder
Dr. Masao Horiba



Motto "Joy and Fun"

Work that occupies most of the time in our lives should be more fulfilling to be able to enjoy our lives even more. Taking on new challenges and having pride in our work leads us to "Joy and Fun."



Chairman & Group CEO
Atsushi Horiba

HORIBA's Global Air Quality Monitoring System (AQMS) Records

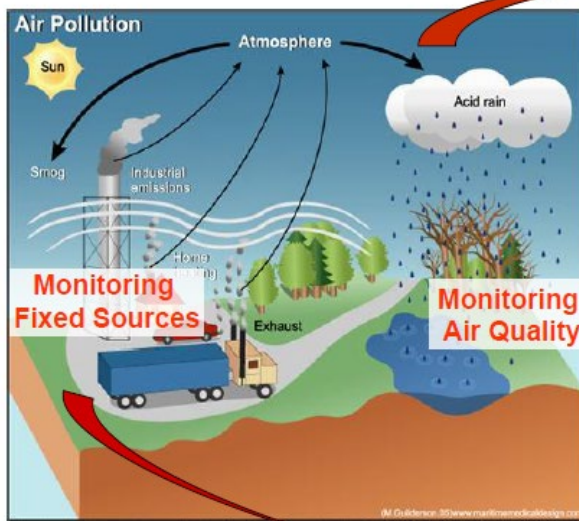
~more than 40 years of experience in air pollution monitoring~



Agenda

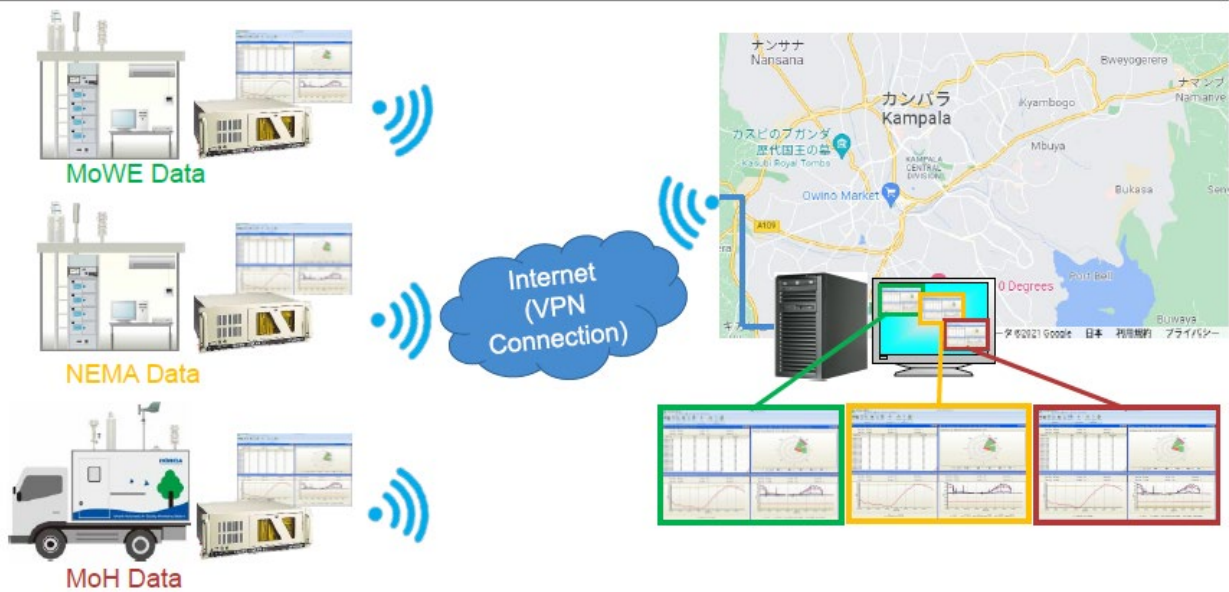
1. Corporate Profile
2. Introduction to Air Quality Monitoring System (AQMS)
3. Local Problems & Ideas to Consider
4. Introduction to HORIBA's PX-375

2 Types of Monitoring Air Pollution

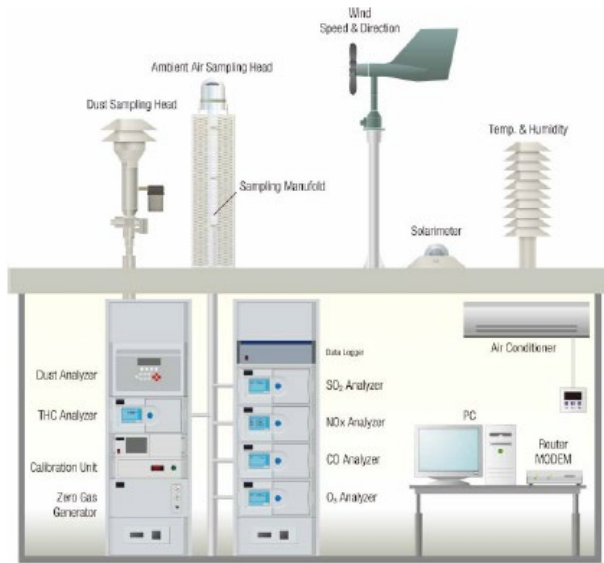


Air pollution is the presence in the air of any substance that can affect our health or the health of plants and animals and causes damage to property and to our environment. This is an example of two of the most common types of air pollution.

Overview Example of AQMS Operation



Configuration of Air Quality Monitoring System (AQMS)



2 Types of Stations



Easy Operation and maintenance

Why Monitors Pollutants?

CO	Interferes with the transportation of blood oxygen
NO _x (NO, NO ₂)	Acid rain, Photochemical oxidant, Effect on function of the respiratory system. One of the causes of oxidizing smog
SO _x (SO ₂)	Acid rain phenomenon, Effect on forests and lakes, Effect on function of the respiratory system
HC (THC, CH ₄)	One of the causes of oxidizing smog
SPM (PM ₁₀ , PM _{2.5})	Effect on function of the respiratory system
O _x (O ₃)	Oxidizing smog, Irritation of mucosal tunics, Effect on function of the respiratory system

Measurement Principle for Air Pollution

Environmental Quality Standards in Japan

Reference: <http://www.env.go.jp/en/air/qa/qa.html>

Element	Principle			
CO	*NDIR			
NO _x	*CLD		Colorimetry	
SO ₂	*UVF		Conductometric Method	
Photochemical Oxidants	Ultraviolet Absorption Spectrometry	*CLD	Coulometry	Absorption Spectrophotometry
Suspended Particulate Matter	Beta Ray Attenuation	Light Scattering	Weight Concentration Measuring Method	Piezoelectric Microbalance Method

CO₂, THC, NH₃ and H₂S measurement are also possible

*NDIR=Non Dispersive Infra-Red Absorption, CLD=Chemi-Luminescence Detection, UVF=Ultra-Violet Fluorescence

Examples of Global Certifications & Verifications:

TUV (EU), DIN (Germany), US-EPA (US), MCERTS (UK), JIS (Japan), MEP (China), KS (Korea), GOST (Russia) etc.

Example of Monitoring Network

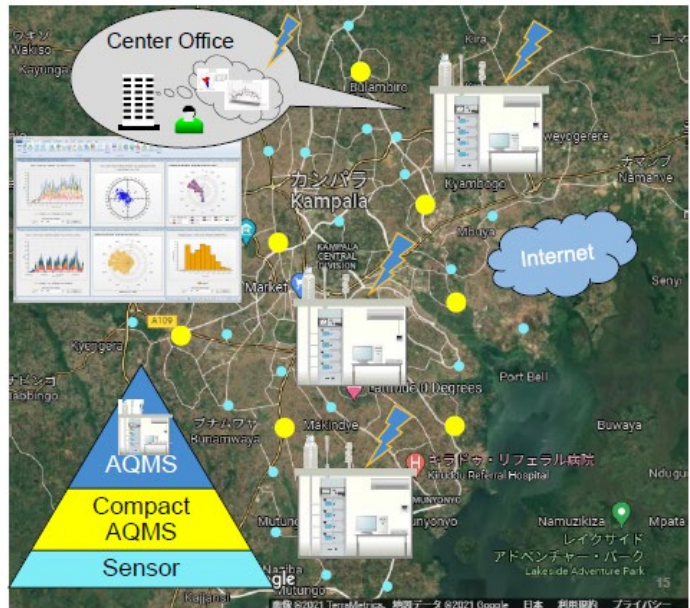
Ambient Monitor

- NO/NO₂/NO_x, SO₂, CO, O₃, CO₂, PM (10, 2.5, 1.0 etc.)



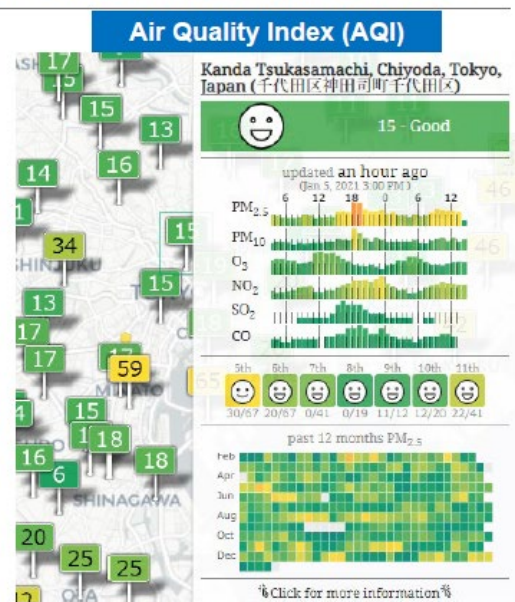
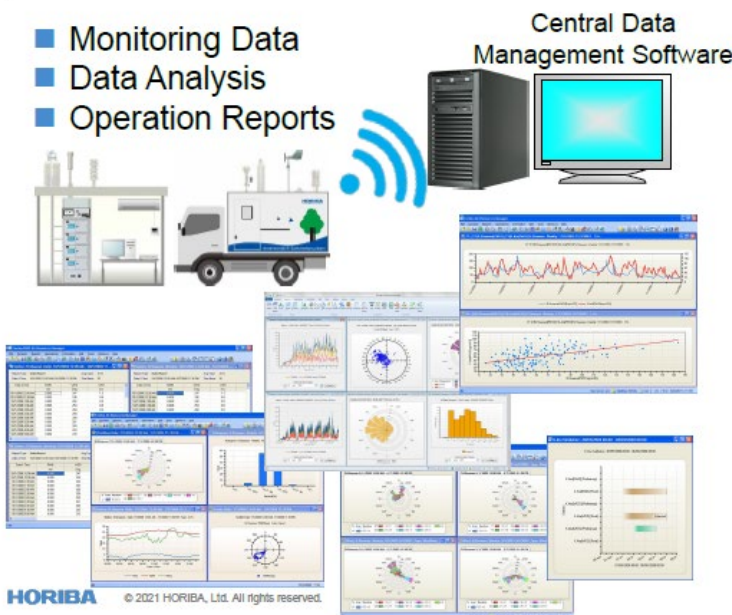
Meteorological Monitor

- Temperature
- Relative humidity
- Precipitation
- Ambient pressure
- Wind direction
- Wind speed



Monitoring Data Communication Overview at Office

- Monitoring Data
- Data Analysis
- Operation Reports



Importance of Operation & Maintenance (O&M)

On-site Monitoring

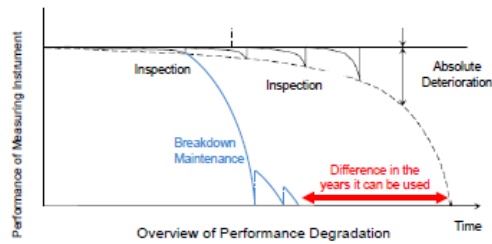
1. What are the contents of O&M?

- Calibration and Replacement of Consumables / Spare Parts
 - Purchase calibration gas & calibrate once a week using
 - Purchase and replace consumables / spare parts (Monthly / Semi-annually / Annually etc.)



【Performance Degradation】

- Important to carry out regular maintenance and not repairing after breakdown
→ There will be a difference in the number of years that it can be used



Importance of Operation & Maintenance (O&M)

On-site Monitoring

1. What are the contents of O&M?

- Calibration and Replacement of Consumables / Spare Parts
 - Purchase calibration gas & calibrate once a week using
 - Purchase and replace consumables / spare parts (Monthly / Semi-annually / Annually etc.)

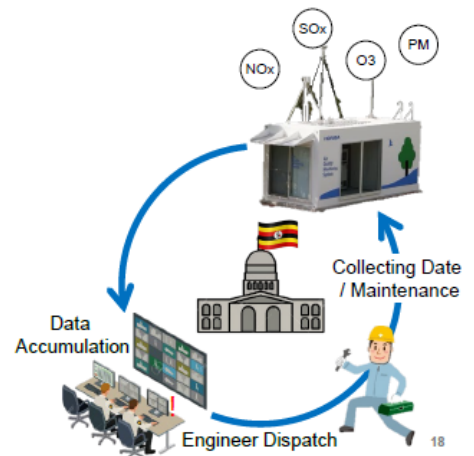


2. Who carries out O&M?

- Educated and Trained Engineers
→ in order to do so, an organization for O&M needs to be established (Best to be taken care of by people near the site)

3. How to collect data?

- Data accumulation from each station via the network (ideal)
- A person in charge goes to the actual station and collects the data (initial stage)



Importance of Lab Analysis



Every country has their own Federal Reference Method (FRM).
On-site Monitoring can support this with the help of **Lab Analysis**.

Agenda

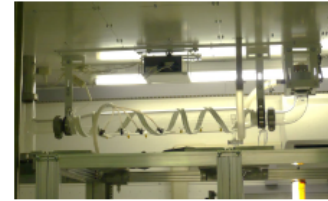
1. Corporate Profile
2. Introduction to Air Quality Monitoring System (AQMS)
- 3. Local Problems & Ideas to Consider**
4. Introduction to HORIBA's PX-375

Ideas to Prevent Problems -1

High Temperature & High Humidity

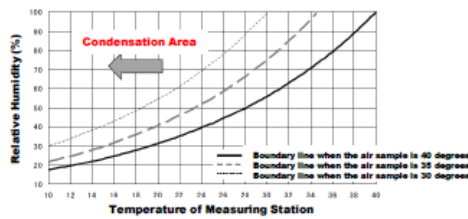
Problem:

Errors due to water drops

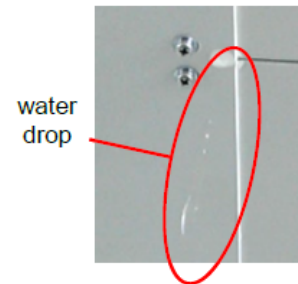


Possible Solutions:

- Set the room temperature considering the temperature difference outside
- Cover the cooler to prevent air from directly hitting the analyzer



Reference: Ministry of the Environment Government of Japan



Ideas to Prevent Problems -2

Bugs

Problems:

Bugs crawling into cooler's outdoor unit, drain, gas sampling inlet, gas exhaust port etc.



Ideas to Prevent Problems -2

Bugs

Problems:

Bugs crawling into cooler's outdoor unit, drain, gas sampling inlet, gas exhaust port etc.

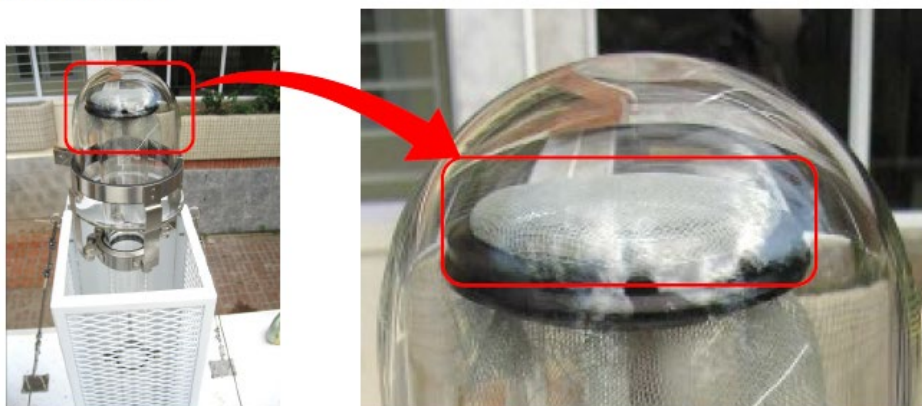


Ideas to Prevent Problems -2

Bugs

Possible Solutions:

- Cover holes with stockings/rubber seal
- Spray insecticides



Ideas to Prevent Problems -3

Problem:

Exposure to water

Possible Solutions:

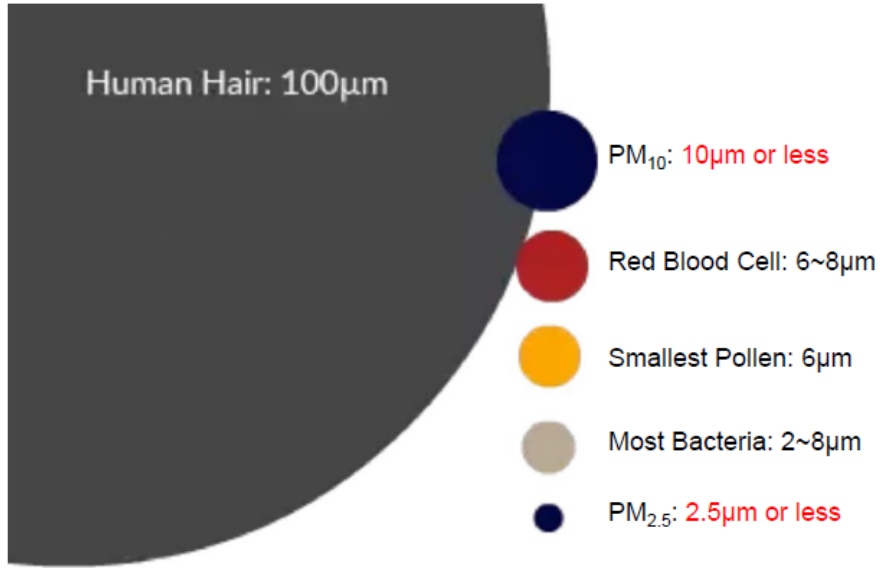
- Seal gap
- Install higher than the ground



Agenda

1. Corporate Profile
2. Introduction to Air Quality Monitoring System (AQMS)
3. Local Problems & Ideas to Consider
- 4. Introduction to HORIBA's PX-375**

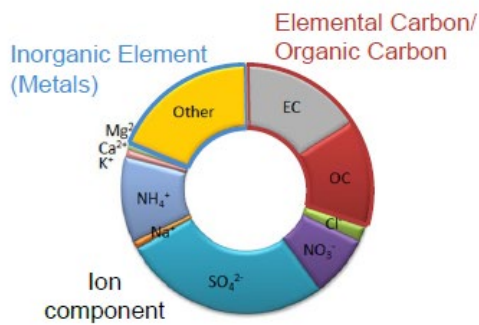
What is Particulate Matter (PM) ?



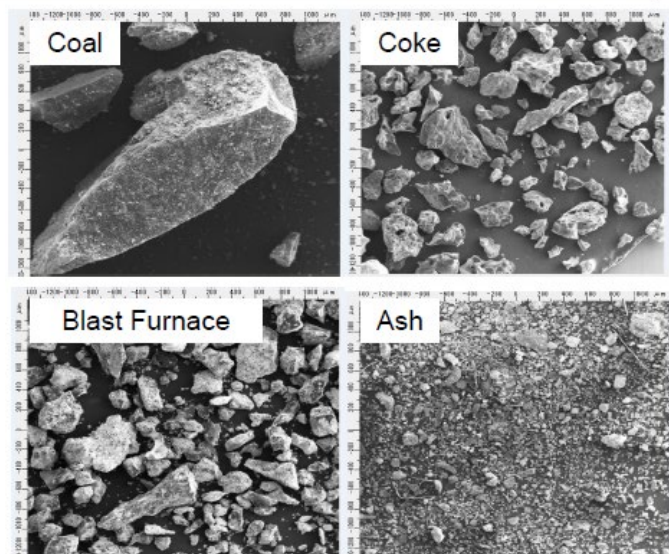
Reference: <https://www.quora.com/Which-is-greater-PM10-or-PM2.5-Why>

Why Monitor Metals?

1. Hazardous to human health
2. Trace elements to identify contamination sources



Reference : Ministry of the Environment Government of Japan



HORIBA, Ltd Imaging cathode luminescence, Voltage :7kV, Spot size :8

Lab Analysis Method

Component	Conventional Analysis Method
Ion Component	Ion Chromatography
Inorganic Element (Metals)	ICP-MS (or XRF)
Polycyclic Aromatic Hydrocarbon	*HPLC or GC-MS
Elemental Carbon, Organic Carbon	Thermal/Optical Method



Sampling



Sample Preparation



Analysis

1. High cost
2. Long time for analysis (2 weeks)
3. Difficulty in capturing rapid outbreaks
4. Bias in results due to human errors

*HPLC: High Performance Liquid Chromatography

On-site Monitoring

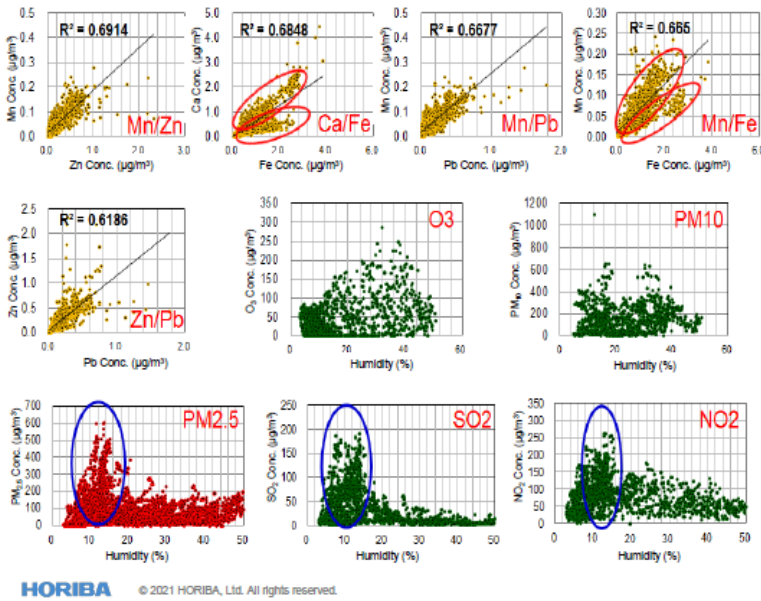
- Continuous Ambient PM and Metal Monitor (PX-375)
 1. Analysis of PM mass concentration and elemental concentration for metals
 2. Monitor trends (interval of 60 minutes)
 3. Sampling and analysis completed all on site
 4. Sample on the PTFE filter can also be used for manual analysis comparison

Detectable Elements																					
H																	He				
Li	Be															B	C	N	O	F	Ne
Na	Mg															Al	Si	P	S	Cl	Ar
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr				
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe				
Cs	Ba		Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn				
Fr	Ra		Rf	Ha	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Uut	Fl	Uup	Lv	Uus	Uno				
		lanthanoid		La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu			
		actinoid		Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr			

* ○—Standard parameters, calibrated by standard calibration materials.
 * For measurement of element concentration calibration by standard calibration materials is needed.
 * Please contact separately about elements, marked as non-detectable.



Example of Data Utilization



Chemical Mass Balance (CMB)

Element	Sea Salt	Soil	Road Dust	Brake Dust	Tire wear	Steel Manufacture	Oil Combustion	Waste Incineration	Open Burning
Na	✓							✓	
Al		✓	✓						
K								✓	✓
Ca		✓	✓			✓			
Sc		✓	✓						
Ti		✓	✓	✓		✓			
V							✓		
Cr						✓		✓	
Mn						✓			
Fe			✓	✓		✓			
Co									
Ni						✓	✓		
Cu				✓		✓		✓	
Zn					✓	✓			
Sb				✓				✓	

Additional Information

Contact

- Mr. Leo YASUKAWA
 HORIBA, Ltd. (https://www.horiba.com/en_en/)
 International Sales Dept.
 Process & Environmental Systems – Tokyo
 Email: leo.yasukawa@horiba.com

Support

- HORIBA FRANCE S.A.S. (<https://www.horiba.com/fra/>)

Omoshiro-okashiku
Joy and Fun



Terima kasih
謝謝
Gracias
Σας ευχαριστώ πάρα πολύ
Danke
Tack ska du ha
Grazie
THANK YOU
धन्यवाद
شُكْرًا
बольшое спасибо
Obrigado
Cảm ơn
Merci
감사합니다
ありがとうございました
Dziękuję



WHO WE ARE



„BODAWERK is a Ugandan social enterprise developing proprietary technology for the sectors energy, transportation and agriculture. Our solutions are powered by renewable energy and proprietary electronics and software. We have developed a disruptive technology ecosystem around the battery accelerating the transition to renewable energy.“



Jakob Hornbach, CEO&CFO
INDUSTRIAL ENG.



Daniel C. Otim, CTO
COMPUTER SCIENCES &
ELECTRONICS ENG.

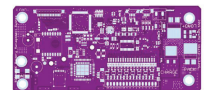


Janos S. Bisasso, COO
MECHANICAL ENG.

Ben L. Koriang, CCO
AERONAUTICAL ENG.

- Diverse engineering backgrounds paired with
- > 4 years on the ground experience
- and combined over 45 years of SSA experience
- Local battery production know-how and capacity
- Various applications are ready for roll-out or in the pipeline
- Organizational structure and digital processes set-up for growth

Electronics & software



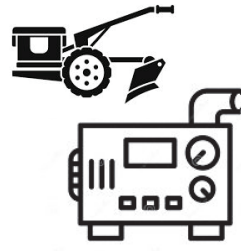
Battery production



Application development

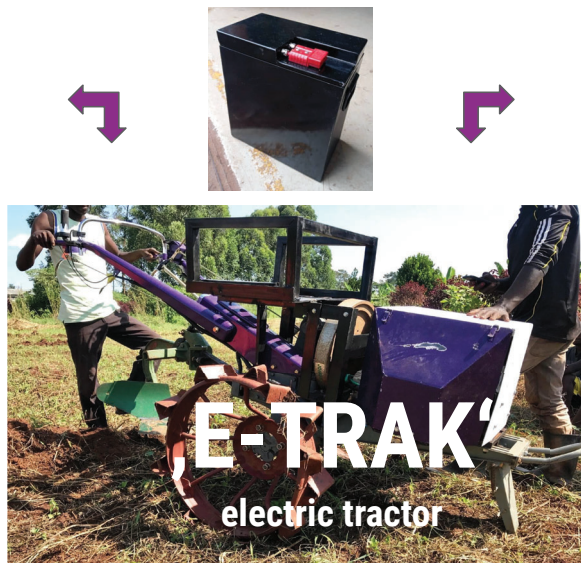


But **who** contributes **how much**?

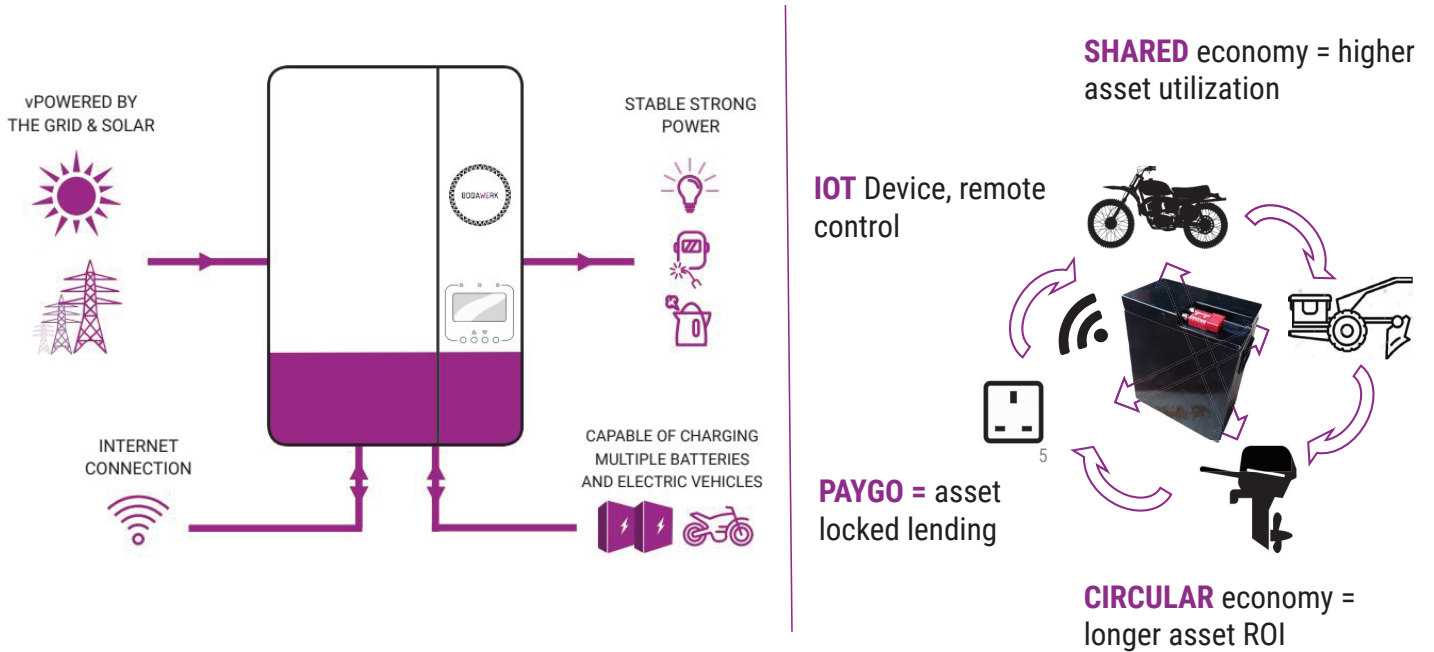


	Cook stove	Motorcycle	Generator	Outboard engine
Fossil Fuel Consumption	1 - 1.5kg coal per day	3-5l of petrol for 100km per day	2l of petrol or diesel per h for 8h a day	50l of petrol per nightly fishing trip
CO2 Equivalent	2.5 - 3.6kg of X1	6.9 - 11.5 kg X5	36.8 kg X15	115 kg X50

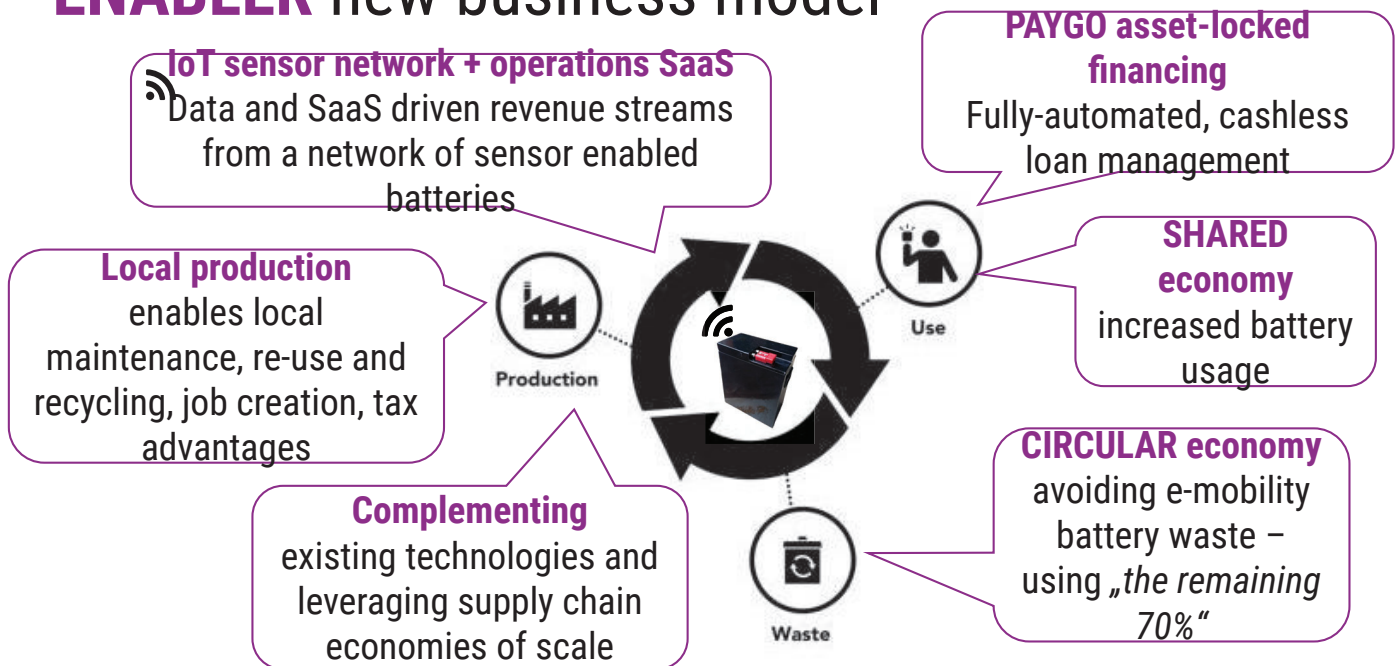
How do **we** solve the problem?



How does the ecosystem work?



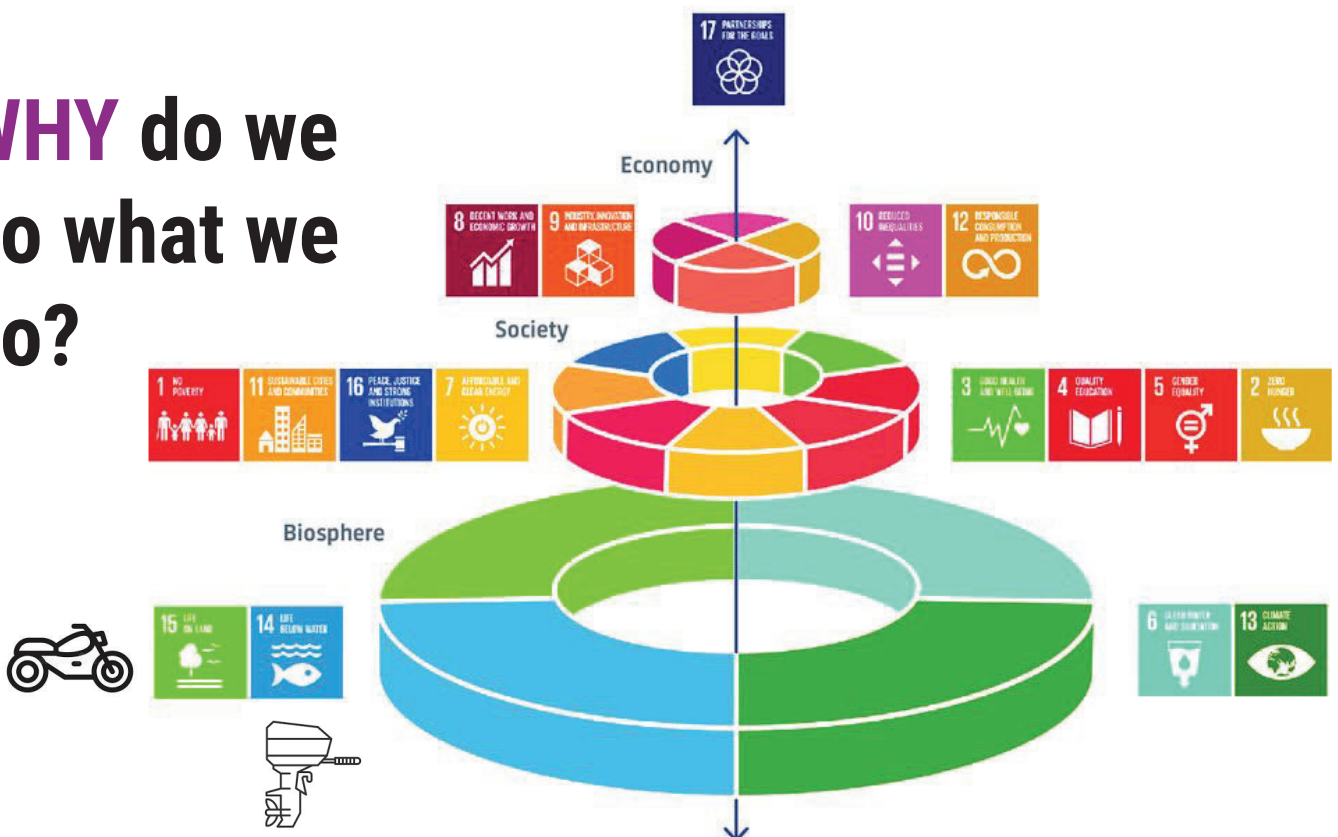
ENABLER new business model



How does the **business** work?

		MOTORCYCLE	GENERATOR	OUTBOARD MOTOR
TCO Electric	energy	4 kWh	10 kWh	20 kWh
	maintenance	10%	10%	10%
	Cost per week	8 \$	20 \$	40 \$
TCO Petrol	Fuel	3-5 l	10-15 l	50 l
	Oil & maintenance	100%	100%	100%
	Cost per week	30 \$	125 \$	400 \$

WHY do we do what we do?



Appendix-6
Main Q&A in Business Matching
for Urban Water Supply Sector

Appendix-6

Main Question and Answer in Business Matching Workshop (Urban Water Supply Sector)

Booth 1 : Yokogawa Solution Service (SCADA, WLMS)

(Red : Answer by Yokogawa Solution)

1 . Questioner : NWSC Kampala Water - Principal Quality Control Officer - Mr Enos Malambala

1) What is the recommended distance between individual pressure sensors that communicate with SCADA?

=> There is no recommended distance.

Even if the distance between SCADA and the sensors is very far, it is not a problem.

However, mobile communication must be available without problems.

2) In a network with intermittent supply, how useful would be this technology?

=>The system transmits the measurement data accumulated in the flow meters installed at each DMA to WLMS once a day via mobile communication.

So even if the local mobile communication network is an INTERMITTENT supply, WLMS can be used without any problem.

SCADA and RTU send the stored data of flow and pressure measurements in 1 second cycles at the rate of once a day.

WLMS is a tool that analyses this data and uses it to reduce leakage.

So it doesn't matter if the constant mobile communication situation is a bit intermittent.

2 . Questioner : NWSC Kampala Water – NRW Section – Mr Godfrey Arinaitwe

1) How much does it cost to install Yokogawa's SCADA and Water Loss Management System?

=>The cost depends on the size of the project.

Naturally, as the number of monitoring points increases, so does the cost.

The cost of installation also depends on the competence of the local construction company.

Booth 2 : Kane Kogyo (PSV System)

NWSC Kampala Water – NRW Section – Mr Godfrey Arinaitwe

(Red : Answer by Kane Kogyo)

Question: Can PSV be used in the current situation and location where many pipes burst?

What is the operating principle and installation effect of PSV?

⇒ Explained the features of PSV and the effect of installation. (Illustrated explanation of the pressure distribution function by PSV and the operation mechanism inside the valve)

Additional answer: If the pipes are aging and more than 100 pipes burst every month and there is an elevation difference, we suggest installing a pressure reducing valve or using a PSV with a pressure reducing function.

⇒ NWSC answer: PSV seems to be very useful in the Kampala metropolitan area.

In addition, two NWSC staff members asked questions on the day, but we could not respond due to poor voice.

Booth 3 : Tokyo Keiki (Ultrasonic Flow Meter)

Questioner : NWSC Staff (name could not be confirmed)

Question : Calibration cost of flow meter

Answer : answered the regular price

Booth 4 : Goodman (Water Leak Detector)

Questioner : NWSC Staff (name could not be confirmed)

Q1. Can the polyethylene pipe be identified by the leak detection device D305?

A. You can find if there is water in the pipe. If the pipe is buried for 1 m or more, the sorting function may be difficult to distinguish from multiple piping cables. There is no problem in the case of single burial. In addition, it has good performance on dry soil, and electromagnetic waves tend to diffuse on wet ground, so it is recommended to use it in a dry state as much as possible.

Q2. What is the price of "Tomezokun", a waterproof tape for resin pipes?

A. Approximately \$ 2 for a 25m roll.

Q3. Can "Tomezou-kun" be used for pipe replacement?

A. It can be used. However, the withstand voltage is up to 2 bar. Most of the usual PVC pipes are 1 bar or less, so Tomezou demonstrates his excellent ability and receives repeat orders in the JICA projects.

Booth 5 : Fuji Tecom (Water Leak Detector, Pipe Locator)

No person entered

Booth 6 : Mitsubishi Chemical Aqua Solutions (On-site Water Treatment, Remote Monitoring System)

(Red color: answer by Mitsubishi Chemical)

Questioner : NWSC (name could not be confirmed)

Q1. Maintenance frequency of the membranes

→ Since the membranes are automatically backwashed, it will last for more than 5 years, depending on the water quality.

Maintenance is performed by selecting a partner engineering company locally, but support is also provided remotely from Japan.

It has continued to be operated in Kenya and Vietnam without any problems.

Q2. Drainage rate

→ Depending on the water quality, the drainage rate is 3-5%.

Q3. Please explain the flow of water for membrane treatment and the flow of water for cleaning.

→ Briefly explained that only clean water can pass through the holes on the surface of the membrane.

Q4. Is it possible to treat water with algae from Lake Victoria?

→ It can be treated by combining chemical dosing + pretreatment, and it seems that the immersion membrane is more appropriate as the membrane.

Q5. Is it possible to treat around 40,000 to 100,000 m³ / day?

→ Possible, detailed design is possible if the raw water quality and installation upper limit are informed.

Appendix-7.1

Action Plans Urban Water Supply

Action Plan for Urban Water Supply

Group 1: NRW reduction and improvement of O&M and implementation regime

PROPOSED ACTION PLAN FOR NRW REDUCTION

Non-Revenue Water (NRW) has remained one of the biggest challenges in National Water and Sewerage Corporation (NWSC) and Kampala Water (KW) has the biggest contribution. Despite the numerous interventions carried in the previous years to reduce NRW, Kampala Water's NRW has remained relatively high ranging between 32% - 40.6%.

	FY	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
System Input Volume (million m ³)		66.3	75.8	76.5	79.8	81.3	85.5
Water Sales (million m ³)		45.2	47.7	48.8	52.2	49.2	50.8
NRW (%)		31.8	37.1	36.2	34.6	39.5	40.6

Short term (5 Years) and long term (10 Years) interventions for NRW (Physical Losses) Reduction

#	FOCUS AREAS	Activities and Requirements	
		Short Term (NRW <33%)	Long Term (NRW <30%)
1.	Creation of District Metered Areas that can assist in monitoring the impact of activities related to reduction of NRW.	Creation of 50 priority DMAs – Bulk Meters, Valves, Data Loggers,	Creation of 200 priority DMAs – Bulk Meters, Valves, Data Loggers,
2.	Prioritized replacement of aged and Vandalized/defective customer meters to accurately measure the billed consumption.	100,000 DN15 customer meters to be replaced/repared (New Meters and Repair Spares) ; Meter Test Bench	400,000 DN15 customer meters to be replaced/repared (New Meters and Repair Spares); Meter Test Bench
3.	Procurement of leak detection equipment to improve on our active leakage control activities.	Leak Correlators – 12; Leak Noise Correlating Loggers – 100; Leak Detection Equipment -4;	Need for replacement
4.	Creation and monitoring of pressure-managed areas in places that are faced with excessive pressures, as a means of reducing occurrence of network failures. Installation of PCVs	Creation of 30 priority Pressure Managed Areas – Bulk Meters, Valves, Data Loggers, PRVs, PSVs	Creation of 100 priority Pressure Managed Areas – Bulk Meters, Valves, Data Loggers, PRVs, PSVs
5.	Introduction of telemetric systems for flow and pressure controls within the distribution network.	Consideration for Reservoirs, Boosters and Primary Network. (20 Points)	Consideration for Reservoirs, Boosters and Primary Network. (50 Points)
6.	Reinstatement of Automated Meter Reading (AMR) system	750 Large Accounts to be Monitored Remotely	1,500 Large Accounts to be Monitored

Action Plan for Urban Water Supply

Group 1: NRW reduction and improvement of O&M and implementation regime

	for better monitoring of large consumer accounts.	(Meters, AMR System, Spares Lithium Batteries)	Remotely (Meters, AMR System, Spares Lithium Batteries)
7.	Prioritized network renewal and replacement campaign for aged pipe sections that have experienced frequent failures.	Prioritize 10km of Aged Network	Prioritize 100km of Aged Network
8.	Renewal and reinstatement of critical network fixtures.	Replacement of 1,200 Network Fixtures (Air valves, FHs, Washouts, Control Valves, etc, data loggers, protection	Replacement of 3,000 Network Fixtures (Air valves, FHs, Washouts, Control Valves, etc, data loggers, protection
9.		Water	

Action Plan for Urban Water Supply

Group 2: Improvement of Kampala Water Supply (WTP, PPP)

No	Theme	Discussion Points	Action Points
1	Historical and Current Situation and Issue of Kampala Water region (Lake Victoria water quality, Pumping equipment and Network distribution challenges)	Deterioration of water quality in Lake Victoria are mainly due to algae (Gaba WTP).	Need to have partnership with JICA and study how to treat the poor quality water economically
		Three times increase in chemical cost to solve the water quality (Increase use of the amount of coagulant).	Need to change the Chemical and Technology to Chlorine Dioxide and use of Oxidation
		Dosing of chemical in Gaba WTP are done manually.	Need to have Automated dozers like Stream current detectors
		Water quality at Katosi WTP might deteriorate in the future.	Need to have Intentional Catchment Protection plan with all stakeholders involved
		Challenge with distribution network (diameter of pipe is small, no network in some areas, aging of existing pipes)	Need to expand distribution Network with modern technologies like PSVs introduced. Investment fund required.
		No big difference in water consumption per capita even with the newly commissioned Katosi WTP due to poor distribution network.	Expand the network where growth of the city is going in the West, East and North of Kampala
		Capacity building for servicing, maintaining and calibrating of water quality Lab equipment as the cost for outsourcing for calibration is high.	Need to train and certify the NWSC staff that can do this work across all the over 70 Laboratories in NWSC
		Trainings and refreshment courses are needed on new methods for water quality monitoring and plant operations and maintenance to match new requirements	Make use of the Vocational Skill training Facilities with increased scope of trainings offered and trainers
		Skills gap in operating and maintaining SCADA systems.	Train the key staff locally using Nakawa VIT facility or training from abroad in YOKOGAWA
		Trainings for water treatment methods for groundwater due to the high iron concentration.	Strengthen the VEI training and capacity building
		VSDf hasn't been able to expand the scope (branding, chemical training, mechanical operations,)	Expand the number of trainers and scope of trainings
2	Investment requirement for new expansion, upgrade, replacement	Difficulties in optimizing the water quality treatment due to the lack of installation of bulk flow meter for raw water and WTP.	Ensure all installed raw water meters work well and train staff to do proper O&M
		There is necessity for the replacement of aging pumps and installation of new pipes at Gaba and Boosters in Kampala	Replace at least 4No Gaba 3 and 2No in Gaba 2 High lift pumps and fittings with new and energy saving technology like VFDs. A number of booster pumps in Kampala need upgrading and pipe resizing to match the current and future water demand.
		The necessity for the installation of remote monitoring sensors in the Boosters and reservoirs to obtain real time data and optimization of human resources as most time is wasted on the road.	Install online water quality monitoring sensors across KW distribution network and link them on existing SCADA at Gaba Install online remote Reservoir levels and booster operations monitoring sensors for SCADA operations.
		There are 4 types of laboratories (Type A, B, C, D) with the needs to upgrade laboratories Type C and Type D.	Invest more funds and upgrade the Labs for improved water quality monitoring across the country

Group 2: Improvement of Kampala Water Supply (WTP, PPP)

No	Theme	Discussion Points	Action Points
		The needs for upgrade of O&M workshops machines and tools	Upgrade the Gaba workshop machines to match the quantity and size of machines with modern technology on the market. Regional workshop machines should also be considered for similar upgrade.
		Green technologies and equipment such as solar energy are needed to reduce the energy consumption.	Explore the use of solar street lighting for Gaba Plants complex and KW Reservoirs and Booster stations
3	Staff Capacity Development	Methods on maximizing the capacity of current staff.	Need to retrain and skill the existing staff with an aim of multiskilling them for increased staff productivity. Make use of VSDF and specialized training abroad.
		Funding is needed for the proper equipping of training centers already established.	Install training prototypes, equipment and tools to expand the scope of trainings offered in the established VSDF in Gaba and across the regions
		Increased number of teachers and trainers needed for the vocational training centers.	Select and conduct Training of Trainers to equip the VSDFs with sufficient trainers in the various skills needed by NWSC staff. Collaboration with other training institutions in country and abroad is also necessary to strengthen this aspect.
4	Commercial Revenue	Increase number of Prepaid PSP to reduce exploitation at general PSP by controller.	More Investment funds needed from partners
		The challenge of getting spare parts to repair the faulty prepaid PSP.	Explore partnerships with local manufactures or NWSC workshops to avail the needed spares
		Installation of Prepaid PSP not only for pro-poor but also for other group of large customers.	Need for Funds to fast track local manufacturing of prepaid meters by NWSC. PPP option would be best if opportunities come up
		Arrears remains a challenge for NWSC	Fast track use of prepaid meters

**Action Plan for Urban Water Supply
Group 3: Urban Water Supply in Local Areas outside Kampala**

Group 3: Urban Water Supply in Local Areas outside Kampala

1. General Situation

Technical

Issue	Town	Status	Action Plan
Water treatment capacity	Tororo	Insufficient currently at 51,000m ³ /d	Need to upgrade the WTP
	Soroti	Insufficient currently at 6,870m ³ /d	Need to upgrade the WTP
Water Quality	Tororo	Poor due silt accumulation in river Malaba	Construction of debris sieve
	Soroti	WQ is ok and disinfection is usually done	
Water supply, pressure, NRW	Tororo	1) Rarely achieves even half way the tank of 4800 m ³ /day 2) Challenge of old pipes leading to high NRW 3) Old meters causing inaccurate measurements 4) Leaking reservoirs	1) A lot of work to be done at the WTP to build the levels 2) Replace of old AC and GI pipes 3) Replacement and servicing of meters 4) Need to replace the reservoirs
	Soroti	Water supply ok.	
GIS mapping, asset management, customer service (ledger)	Tororo and Soroti	1) This was done using AutoCAD. 2) There is lack of comprehensive asset management database	There is need for mapping using GIS software
Financial situation in each region	Tororo and Soroti	No break even situation	Minimize operational cost where applicable
Understanding on future investment (grant fund) trend by central government		Unpredictable gov't support for example SCAP100	Need for financial support

Action Plan for Urban Water Supply
Group 3: Urban Water Supply in Local Areas outside Kampala

2. Best Practice for regional area development

Issue	Town	Status	Action Plan
Any specific activity by donor, NGO (infrastructure, PPP, village etc.)	Tororo	1) Ongoing Majenje project under GOU 2) Production well of 5m ³ /day 3) Others under NWSC	Follow up team on ground to build capacity
	Soroti	ATWATSAN project to increase supply	Follow up team
Low cost treatment or network development	Tororo	Nothing	1) Use of polymer 2) Ensure most use of peak hours
	Soroti	Currently conventional WTP and no low cost method so far	Ensure most use of peak hours
Financial flow (internal subsidy) from capital city, government	Tororo and Soroti	Through GOU to NWSC	Involvement of government.

Action Plan for Urban Water Supply
Group 3: Urban Water Supply in Local Areas outside Kampala

3. Infrastructure Development

Issue	Town	Status	Action Plan
Finding reliable water source	Tororo	Sufficient water source Seasonal river	1) Improve the capacity of raw water pumps 2) Adjustment of intake valves
	Soroti	Sufficient water source	Protection of the catchment area
Low cost treatment or network development	Tororo	Use of polymer	Need to apply new technologies
	Soroti	Currently conventional WTP and no low cost method so far	Need to apply new technologies
Optimization of distribution (e.g. pumping to high land area)	Tororo and Soroti	There is optimization since both town pump to the elevated reservoirs, then by gravity	Installation of more booster stations
How to serve for remote area	Tororo Soroti	1) Solar paneled system 2) Borehole drilling	Installation of more boreholes
Public standpipe (ordinal, prepaid)	Tororo and Soroti	Postpaid PSPs available	Installation of prepaid meters
Any possibility of introducing PPP	Tororo and Soroti	Applicable to Headquarters administrative	

4. How to reduce NRW in small towns

Issue	Town	Status	Action Plan
Countermeasure for water theft	Tororo and Soroti	1) Aged pipelines 2) Old meters	1) Replacement of old pipes 2) Meter replacement and servicing 3) Stakeholder and judiciary engagement
Reduction of arrears (water tariff setting appropriate?)	Tororo and Soroti	Water Tariff setting not appropriate	Monthly follow up of customers.

Action Plan for Urban Water Supply
Group 3: Urban Water Supply in Local Areas outside Kampala

5. Investment requirement

Issue	Town	Status	Action Plan
New water source	Tororo	Current water source is ok	Bore holes to supply the rural areas
	Soroti	Current water source is ok	Bore holes to supply the rural areas
Expansion of facilities (WTP, network)	Tororo	Current facilities insufficient	1) There is need for a parallel system 2) Need for another set of clarifiers 3) Need for new reservoirs Better treatment process
	Soroti	Current facilities insufficient	Need for a Bulk transfer
New technologies	Tororo	Old	Need for new technologies
	Soroti	Old	Need for new technologies

6. Capacity Building

Issue	Town	Status	Action Plan
How to increase new staff for rapidly expanding area	Tororo and Soroti	Use of temporary, graduate and support staffs	1) Absorption of temporary and support staffs 2) Training of more graduate trainees
How to train the new staff (vocational training center etc.)	Tororo and Soroti		NWSC has several training centres,

Appendix-7.2

Action Plans Air Pollution

Data Collection Survey for Urban Environmental Sector (Urban Water Supply and Air Pollution)

Public-Private Joint Ideathon (Air Pollution)

JICA Survey Team
1st October, 2021



Japan International
Cooperation Agency

NIPPON KOEI

INTERNATIONAL CONSULTING ENGINEERS

1

Outline of the Discussion

◆ Purpose:

To discuss and come up with ideas on how to improve air quality by reducing air pollution in Uganda.

◆ Overall Workflow

Grouping and Participation in Teams Link (See Program)



Self-introduction and Division of Roles



Discussion on 4 Topics (each 40 minutes)



Presentation on each Group (15 minutes x 3 Groups)

2

Grouping

Group 1	Group 2	Group 3
Mr. Mafumbo Julius (MoWE)	Mr. Mununuzi Nathan (MoWE)	Mr. Ndibirema Dadinoh (MoWE)
Ms. Nsereko Patience (NEMA)	Ms. Kutesakwe Jennifer (NEMA)	Mr. John Okatch (NEMA)
Mr. Dickson Wandera (MoH)	Mr. Moses Kabangi Mwigo (MoH)	Mr. Fred Mulabya (MoH)
Mr. Bob Omoda Amodan (MoH)	Mr. Charles Mutemo (MoWT)	Ms. Atino Juliet (MoWT)
Ms. Winifred Anna Adoch Gena (MoWT)	Mr. Alex Ndayabakira (KCCA)	Mr. Birimumaso David (MoEMD)
Ms. Priscah Adrine (AirQo)	Mr. Deo Okure (AirQo)	Mr. Kyalimpa Joseph (UMA)
Mr. Jakob Hornbach (Bodawek)	Mr. Ben Lokeris Koriang (Bodawerk)	Mr. Janos Bisasso (Bodawerk)

✘ Participants whose name is not listed here, please choose a group to join.
✘ Online participants from Japan are free to enter and exit each Teams link.

3

Discussion Topics (each 40 minutes)

(1) 11:00-11:40

Laws, Regulations and Standards about Air pollution

(2) 11:40-12:20

Air Quality Monitoring

(3) 12:20-13:00

Air Quality Control and Measure

(4) 14:00-14:40

Future Roles and Efforts of each Organization

✘ 14:40-15:00

Free Discussion and Preparation of Presentation

4

Requests in Discussion and Presentation

- 1) For online participants, please connect at least one laptop to Teams in each group.
- 2) Please discuss about **priority issues** and **action plans** for solution on each topic.
- 3) Please work together with the participants in the group to prepare the presentation materials **by 15:00**.
- 4) The format of group discussions and presentations (PowerPoint) is free. (**1-2 slides / topic is desirable**)
- 5) Regarding the division of roles, it's better to decide on **a facilitator, a recorder, and a presentator** etc.
- 6) If you have any questions, please feel free to ask JICA Survey Team.

Group 1

Jakob, Bob, Priscah, Winfred, Dickson, and furtunate.

Laws, regulations and standards

Priority issues	Action points
Regulations and standards are on a draft level	Finalize R&S and disseminate to all key stakeholders with a special focus on multi-language support
Current efforts have not been inclusive of all key stakeholders	Include all key stakeholders in future discussions about air quality
NEMA is overall responsible, but the implementation cuts across many different stakeholders	Build capacity of all implementing partners (e.g. government, funding partners, private sector)

Air quality monitoring

Priority issues	Action points
Data is not shared to all stake holders and the analysis of data is not trivial	<ul style="list-style-type: none"> • Support data-driven decision making with user-friendly, interpreted and analysed data. • Bridging the gap between raw data and informed decision making.
Coverage and resolution of air quality sensing network is insufficient	<ul style="list-style-type: none"> • Drive innovation for low cost equipment • Eventually start a pilot of mobile sensing by putting measuring equipment on vehicles, motorcycles etc. • Eventually install equipment in district head offices
Low capacity of district environment officers in air quality monitoring	Involve such key officers and build capacity

Air quality control and measure

Priority issues	Action points
Insufficient awareness and know how-how of control and measure process and benefits	<ul style="list-style-type: none"> • Train partners on how to attract climate change funds • Develop DO's and DON'Ts to protect air quality,
Lack of 'green belts' in cities	City planning should include air quality goals e.g. establishment of parks
Laws, standards and regulations are not followed and systems for enforcement is lacking	<ul style="list-style-type: none"> • Implement and follow-up of laws through development and funding of enforcement plans • Early involvement of high-level politicians to ensure project support
Lack of affordable alternatives	Government and private sector could co-operate in order to develop innovative, affordable alternatives
Poor sighting of landfills and general waste management planning	Improve waste management including location and composition of landfills
Traffic jam is a major contributor to emissions in Kampala	Fly-overs and reduction of absolute number of cars entering the city through adequate measurements
Lack of counter measure projects e.g. air purification filters	Counter measure projects can be implemented after a successful cost-benefit analysis for the equipment used

Future Roles and Efforts

Stakeholders	Future roles and efforts
KCCA	Promote sustainable travel, electric buses, reduce congestions through policy, improve boda and matatu based transport systems, enforce rules, install more monitoring equipment in Kampala and conduct trend studies, control traffic management and taxi parking
MoWT	Policy, regulations and standards for monitoring and reporting of air quality, vehicle inspection with adequate emission testing equipment, indoor air quality monitoring, private sector co-operations to electrify vehicles, implement mass transport systems
MoH	Reduce on the spread of diseases related to air pollution-awareness creation, formulation of guidelines and policies on air pollution, continuous surveillance of diseases, proper management of medical waste to reduce on air pollution
AirQo	Expand monitoring network, start manufacturing indoor air quality sensing equipment designed for the African market, increase the priority of mobile sensing approaches, support customers of the generated data in the analysis, interpretation and deriving action points from it.
BODAWERK	Innovate and develop technical solutions that are tailor-made to the Ugandan or East African market that can avoid, measure or reduce air pollution. Special focus is given to the transport sector with electric mobility solutions and the energy sector to drive rural electrification with emission free technology.

Thank you

Group 2

LAWS, REGULATIONS

- Establish a law and a policy on air pollution.

National Environment act -2019, putting more focus on implementing laws. Expedite the regulations of air quality management, review the Public health act of 2000 that concerns air pollution. Review and strengthen the existing, laws and standards

- Every relevant sector to develop guidelines and standards for air pollution control.
- Ensure uptake, create awareness through media, print or electronics.
- Implement the set guidelines and standards
- strengthen co ordinations and collaboration for the buy in by the different stakeholders, line MDAS, academia
- Enforcement of the standards for all, Increasing on the accessibility to the air monitoring data to inspectors

AIR QUALITY MONITORING

- Establish national wide air quality monitoring stations and data base and link it to a central repository .
- Increase access to air quality data.
- Facilitate different sectors and Agencies to carry out monitoring concerning air pollution from their sectors.
- National wide capacity building.
- Provide air quality monitoring gadgets for inspectors

AIR QUALITY CONTROL AND MEASURE

- Strengthen the annual environmental audit process to target air pollution control.
- we need to integrate air pollution control activities in different sector work plans and budgets
- Enforce installation air monitoring equipments in different entities/facilities eg. industries
- Involvement of the Private sector in development and uptake of technology for air pollution control.

FUTURE ROLES AND EFFORTS OF EACH ORGANIZATION

organization	future roles and efforts
MoWT	develop policies in regards to emissions by the transport sector, and regulate over sight in the management of the laws and standards concerning water and environment pollution
MoWE	policy development, the minister passes the regulations into law and standards
MoH	development of guidelines towards air pollution control. reviewing of the public health act to address air pollution in the healyh sector,* Capacity building for the
NEMA	1.Develop standards 2. undertake nation wide monitoring, facilitate the air quality data monitoring and information sharing 3. Regulation and control air pollution.
Urban authorities	monitoring, development and implementation of air management action plans, enforcement of what other Agencies have developed
courts of law	Distribute resolution including the application of the penaults to those against the law.
MoED	use of alternative sources of energy,empowering the private sector to come up with new technologies to reduce air pollution, interpolation of different issues in the cirriculum
Academia	Research to inform policy

GROUP 3

Laws, regulations and standards about air pollution

- Uganda Constitution of 1995, article 39
- Energy policy of Uganda 2002
- Air quality policy 2005
- National Environmental Act 2019
 - Air quality regulations of 2021 (draft)

Air Quality Monitoring

Existing standards guiding air quality monitoring are being defined and planned for by public stakeholders NEMA KCCA Air Qo

Gaps:

Limited Equipment and capacity for monitoring

Limited area of data collection (point probe vs. continuous measurement)

Opportunity:

Sharing responsibility for monitoring activities between public and private sector

Air quality control and measure

Shift into clean energy generation and productive use (at grid and consumer scale)

Gaps:

Public knowledge

Enforcement of guidelines

Opportunity:

Continuous monitoring and periodic evaluation (like audits)

Public sensitisation on impact of air quality management

Future Roles and Efforts of each organisation

UMA - Promote PPP's, improving education, promoting self assessment, supporting implementation of environmental management systems, conduct ideation

MoWT - finalise emission sector, mandatory vehicle inspection, build partnerships for AQ, wholesome infrastructure development

MoEMD - specification of systems, carbon tax, cleaner fuels, mass transport systems

NEMA - compliance and monitoring, formulate National air quality policy guidelines

Bodawerk - battery based productive use ecosystem development and manufacture, piloting future solutions in partnership with public sector