



APMP Focus Group Climate Change and Clean Air

Chair: Sangil LEE (KRISS), Co-chair: Hong LIN (NIM)

History



- 2014
 - Focus areas identified at the 2014 Director's Workshop
- 2015
 - The group members were organized
 - The terms of reference were written down
- 2016
 - The name of the FG Climate Change (CC) was changed to the FG Climate Change and Clean Air (CCCA)
 - The action roadmap (2017 – 2021) for the FG was developed
- 2017
 - The chair was changed from Dr. Jin Seog KIM to Dr. Sangil LEE (KRISS) after APMP 2017
 - Current leadership, Chair: Sangil LEE (KRISS), Co-chair: Hong LIN (NIM)
- 2018
 - FG CCCA Strategy document was developed
 - Implementation plans was developed
- 2019
 - The 4th Workshop for FG CCCA at Indonesia (August)
 - Metrological issues/needs have been identified through survey

Terms of Reference



■ Scope

- metrology for climate change and clean air with respect to direct driving factors (calibration of instruments and sensors related to stack emission, ambient and background measurement)

■ Objectives

- to support national measurement standards related to climate change and clean air (e.g., gas, aerosol, flow, temperature, humidity)
- to exchange information on how to support the acting body for national inventory by NMI (measurable, reportable, verification)
- to share the information of climate change and clean air program in each NMI

Expected Outcomes/Impacts from FG CCCA



- develop metrological capabilities of NMIs in APMP so that NMIs can respond to issues/needs addressed by local/regional stakeholders
- ultimately increase the impact of metrology on the public/society in the APMP region by cooperating with local/regional stakeholders



Environment



Metrology



Measurement



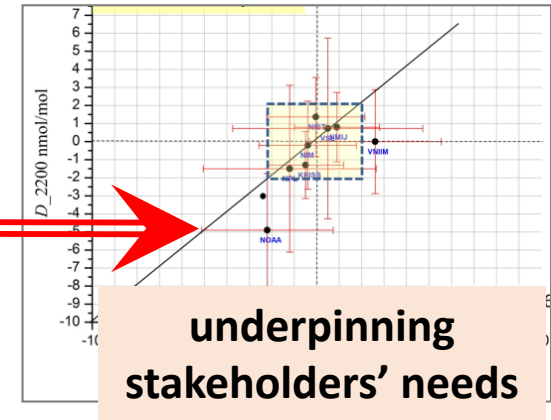
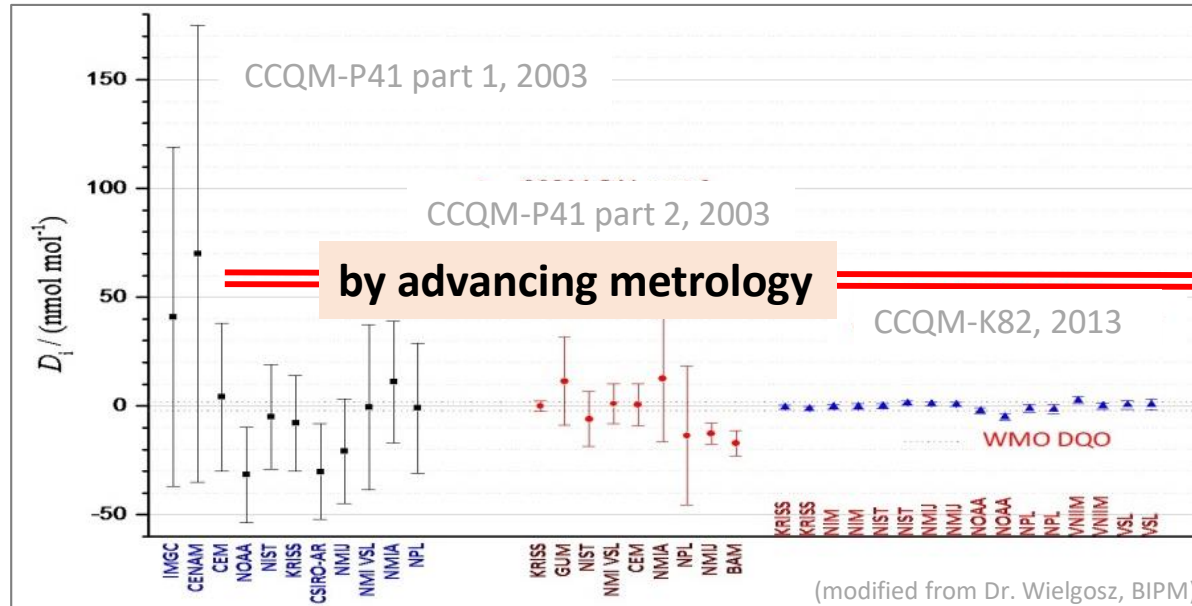
Policy

How ?



Climate Change

improved accuracy of standards for **global background CH₄** measurement



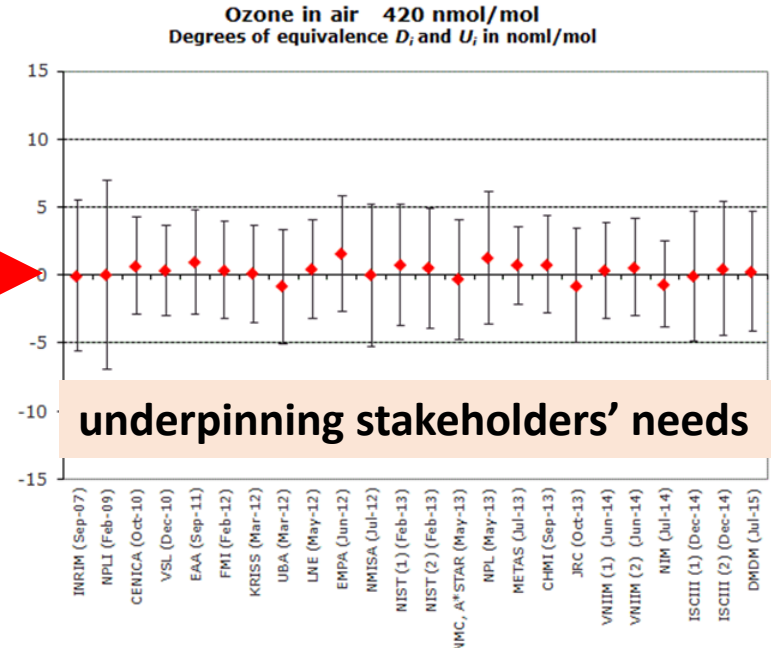
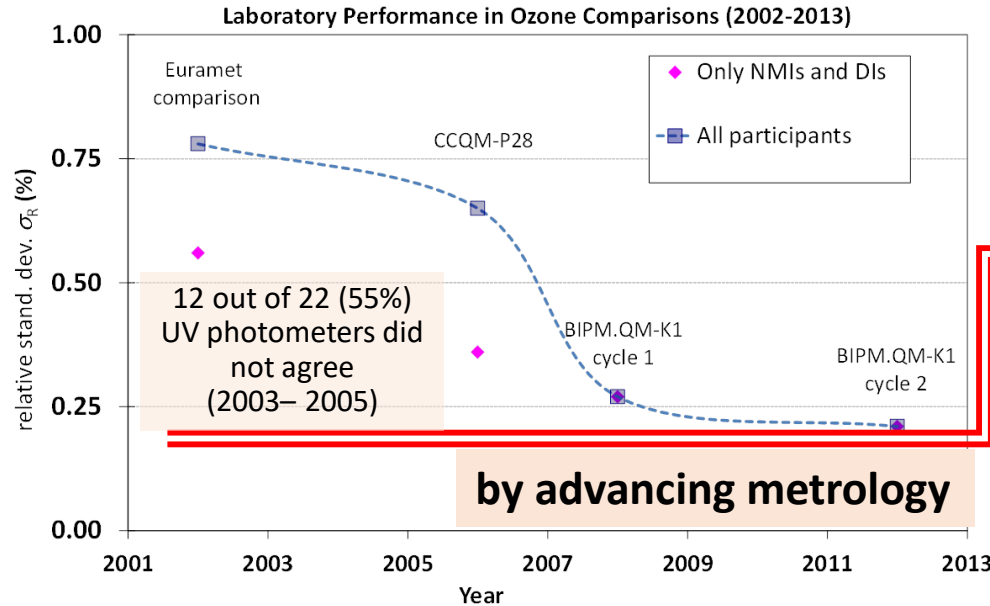
World's Scale for the second most important greenhouse gas is being adjusted in line with the SI (GGMT 2015)

How ?



Clean Air

improved accuracy of standards for global ambient ozone measurement



(modified from Dr. Wielgosz, BIPM)

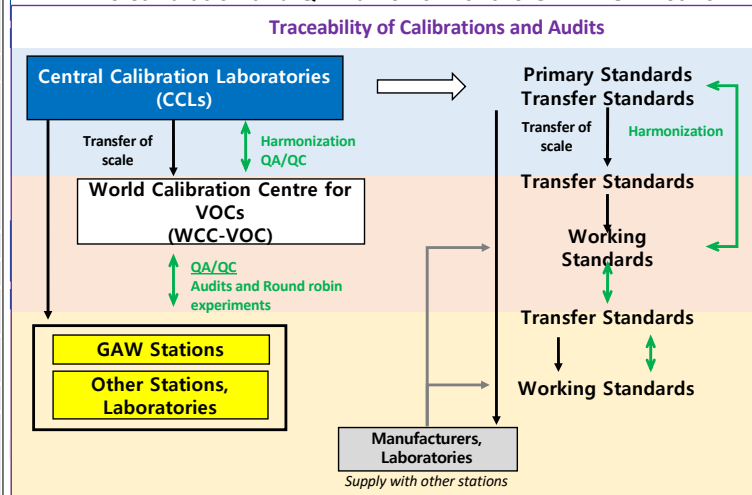
Responds to Stakeholders' Needs by Advancing Metrology



Variable	Quality Assurance/ Science Activity Centre (QA/SAC)	Central Calibration Laboratory (CCL)	World Calibration Centre (WCC)	Regional Calibration Centre (RCC)	World Data Centre (WDC)
CO ₂	JMA (Asia, South-West Pacific)	NOAA-ESRL	NOAA-ESRL (round robin) Empa (audits)		JMA
CO ₂ Isotopes		MPI-BGC			JMA
CH ₄	Empa (Americas, Europe, Africa) JMA (Asia, South-West Pacific)	NOAA-ESRL	Empa (Americas, Europe, Africa) JMA (Asia, South-West Pacific)		JMA
N ₂ O	UBA	NOAA-ESRL	KIT/IMK-IFU		JMA
SF ₆		NOAA-ESRL	KMA		JMA
CFCs, HCFCs, HFCs					JMA
Surface Ozone	Empa	NIST	Empa	OCBA(South America)	NILU
CO	Empa	NOAA-ESRL	Empa		JMA
VOCs	UBA	NPL (Ethane, Propane, n-butane, n-pentane, Acetylene, Toluene, Benzene, Isoprene) NIST (monoterpenes) KRISS (DMS)	KIT/IMK-IFU		NILU
NO _x	UBA	NPL (NO)	FZJ(IEK-8) (NO)		NILU

KRISS, NPL, NIST act as Central Calibration Laboratories for WMO-GAW (global stakeholder)

The calibration and QA framework of the GAW-VOC network



(modified from Dr. Wielgosz, BIPM)

and Clean Air

NMI's Status on Gas Metrology



- **Group I:** highly active in CIPM comparisons with CMCs (coordinated comparisons)

transfer technical
knowledge/share
information

- **Group II:** less active in CIPM/APMP comparisons with limited or no CMCs

transfer technical
knowledge/share
information

- **Group III:** no activities in CIPM/APMP comparisons with no CMCs

Action Roadmap



- Goals
 - to extend the capabilities of measurement/calibration of NMIs in Group II/III for disseminating measurement standards in the region
 - NMIs in Group II and III become able to respond to needs/issues addressed by local regional stakeholders to mitigate climate change and air pollution
- Actions for 5-years (at APMP 2016 and revised at APMP 2018)
 - **Action I:** provide education and technical supports (2017 – 2019)
 - **Action II:** provide artefacts to NMIs in Group II or III (2018 – 2021)
 - **Action III:** provide verification results to NMIs in Group II or III (2018 – 2021)

Formal comparisons (KCs, SCs, PSs) are out of the scope of this focus group (they are run under TCQM)

Implementation



- **Action I:** provides education and technical supports (2017 – 2019)
 - Workshop
 - shared information of climate change and air quality in each NMI (1 day workshop during APMP 2016/2017/2018)
 - increase activities/involvements of scientists especially from TCFF (flow), TCT (temperature) through 1 day workshop from 2019
 - invite stakeholders (e.g., environmental protection agency) in Group II and III NMIs (from 2019)
 - Education
 - KRISS Global Metrology Academy (GMA): education for gas analysis (June 2018)
 - APMP Gas Analysis Workshop: tutorials for gas metrology (Nov 2018)
 - continuously provide education and tutorials (including BIPM Capacity Building & Knowledge Transfer; **BIPM-FTIR Operating System**)
 - Technical supports (to transfer technical knowledge)
 - onsite training: experienced scientists/engineers from Group I NMIs visit Group II NMIs (from 2019)
 - scientists/engineers from Group II NMIs: visit Group I NMIs (at a hosting NMI)

Implementation



- **Action II:** provides artefacts to NMIs in Group II and III (2018 – 2021)
 - to evaluate preparation system/procedures of reference gas mixtures (from 2019)
- **Action III:** provides verification results to NMIs in Group II and III (2018 – 2021)
 - to evaluate both preparation system/procedures and analytical system (from 2019)

Implementation



- Implementation plans for **Action II and III** (from 2019)
 - FG strategic plan will be developed in a written form how the action plans will be implemented
 - a survey to identify needs or issues in Group II or III with respect to developing or advancing metrology
 - match a NMI in Group I with NMIs in Group II or III for identified needs/issues
 - sharing costs for Action II and III
 - NMIs in Group I cover all costs
 - NMIs in Group II or III cover all costs
 - sharing costs (e.g., shipping costs for artefacts or travel costs for technical training)
 - face-to-face technical discussions will be accommodated during both Gas Analysis and FG workshops (from 2019)

Outlook



- monitor the effectiveness of implementations of the action plans
 - face-to-face discussions during workshops to transfer technical knowledge effectively
- increase engagement of scientists from TCFF and TCT
 - through annual workshop
- develop a similar action roadmap for other fields (e.g., TCFF, TCT)
- get stakeholders in Group II & III exposed to metrology (e.g., gas, fluid flow etc.)
 - through annual workshop, or special workshop (if necessary)



metrology



measurement



policy



environment

Updates since APMP 2018



- Developed FG CCCA strategic document
 - Circulated to FG CCCA members and DEC Chair
 - Incorporated into TCQM strategy document
- Needs/Issues in metrology (TCQM, TCFF, TCF) were identified by distributing a survey to group II and III
 - TCQM (gas analysis): BSN, NIMT, NMIM, A*STAR/NMC and ITDI responded
 - TCFF: BSN responded
 - TCT: BSN responded

Updates since APMP 2018



■ Implementations

• TCQM (gas analysis)

- Technical education (Action I)

- BSN: calibration procedure of ozone analyzers (by KRISS during workshop 2019), PT for clean air measurement (to be determined)
- NIMT: preparation of GHG reference gas mixture (by KRISS during workshop 2019), ammonia (to be determined), VOCs (by NIM during workshop 2019)
- NMIM: preparation of GHG reference gas mixture (by KRISS during workshop 2019)
- A*STAR/NMC: preparation of GHG reference gas mixture (by KRISS during workshop 2019), automobile (by NMISA during workshop 2019)

- Technical training (Action I)

- BSN: preparation/uncertainty evaluation of reference gas mixtures at $1000 \mu\text{mol mol}^{-1}$, automobile (by NMISA during workshop 2019), SO_2 (by NMII during/after the workshop 2019), NO_x (next year)
- ITDI: general gas metrology especially for emission testing (by NIM after the workshop 2019)
- NIMT: metrological traceability of particulate matter (by KRISS during/after the workshop 2019), calibration of ozone analyzer (by KRISS during/after the workshop 2019)
- NMIM: evaluation of the current preparation and analytical system for gas analysis (by KRISS in 2019)

Updates since APMP 2018



■ Implementations

- TCQM (gas analysis)
 - Providing artefacts (Action II)
 - BSN: automobile (KRISS), SO₂ purity analysis (NMIJ), purity analysis NO_x (NMIJ?), SO₂ (KRISS), NO_x (KRISS)
 - A*STRAR: automobile (KRISS), SO₂ (KRISS), NO_x (KRISS), BTEX (CERI?), NMHCs (NIM)
 - Verification (Action III)
 - BSN: SO₂ (CERI?), NO_x (CERI?), automobile (KRISS)
 - A*STRAR: pure CO₂ isotope (?)
- TCFF
 - Technical education/training (Action I)
 - BSN: wind speed (by KRISS during/after workshop 2019), rainfall precipitation, low pressure gas flowmeter (by KRISS during/after workshop 2019), liquid flowmeter, microflow buoy detection
- TCT
 - Technical education (Action I)
 - BSN: Low frost point humidity, moisture measurement, humidity measurement using spectroscopy, atmospheric temperature measurement, thermodynamic temperature, water triple point development, FTIR traceability

The 4th Workshop of FG CCCA

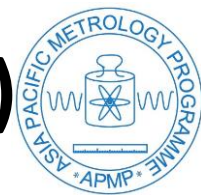


about 35 participants from National Metrology Institutes
about 55 participants from regional/local stakeholders

The 4 th workshop of Focus Group of Climate Change and Clean Air			
Day 1 (5 th Aug 2019)			
S/N (tentative time)	Tentative program/Title	Speaker	Remark
8:30 – 9:10	Registration starts		
9:10 – 9:20	Opening Speech	Prof. Bambang Prasetya (Chairman of BSN)	
9:20 – 9:30	Host's Welcome address	Ir. Hastori, MAFIS (Deputy of SNSU - BSN)	
9:30 – 9:40	Opening and Welcome address	Dr. Sangil LEE (KRISS), TCQM	
9:40 – 10:10	Source of air pollution	Dr. Fuu Ming Kai (NCM/A*STAR), TCQM	
10:10 – 10:40	Wind speed measurement and calibration, low pressure gas flowmeter calibration, stack flow measurements for GHG and air pollutants emissions	Dr. Woong KANG (KRISS), TCFF	
10:40 – 11:20	Coffee Break		
11:20 – 11:50	Establishment of metrological traceability in the measurement of airborne particulate matter	Dr. Jinsang JUNG (KRISS), TCQM	
11:50 – 12:20	Ozone measurement and calibration	Dr. Sangil LEE (KRISS), TCQM	
12:20 – 13:30	Lunch		
13:30 – 14:00	Humidity effect on environment monitoring of VOCs and preparing VOCs reference gas mixtures	Dr. Bi Zhe (NIM), TCQM	
14:00 – 14:30	Preparation of greenhouse gas primary reference gas mixtures	Dr. Jeongsoon LEE (KRISS), TCQM	
14:30 – 15:00	Preparation of automotive reference gas mixtures	Dr. James Tshilongo (NMISA)	
15:00 – 15:30	Overview of Air Pollutant Measurement in the Ministry of Environment and Forestry of Indonesia	Dr. Darsul Chaniago, M.M., M.E. (The Ministry of Environment and Forestry)	
15:30 – 16:00	Coffee break		
16:00 – 16:30	Updates of Atmospheric Air Measurement in Relation to Indonesian Climate Change Monitoring	Arika Indri Dyah Utami (Indonesian Meteorology, Climatology, and Geophysical Agency)	
16:30 – 17:00	Discussion on the survey	Dr. Sangil LEE	



Onsite Technical Training on NIMT (Thailand)



Training topics: Metrological traceability/calibration of particulate matter ($PM_{10}/PM_{2.5}$) and ozone measurement by KRISS

