COURSE TITLE

TRAINING WORKSHOP ON DATA MANAGEMENT AND INSTRUMENT CALIBRATION IN HRADEC KRALOVE, CZECH REPUBLIC AND IN PAYERNE, DUBENDORF AND ZURICH, SWITZERLAND, FROM 17th JUNE TO 6th July, 2018. FIRST PHASE

DATES

18TH JUNE TO 5TH, 2018

VENUE

HRADEC KRALOVE, CZECH REPUBLIC, PAYERNE, EMPA, METEOSWISS HQ SWITZERLAND

SPONSOR

UNITED NATIONS ENVIRONMENTAL PROGRAM AND WORLD METEOROLOGICAL ORGANISATION

PARTICIPANTS

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INTRODUCTION

Kenya Meteorological Department (KMD), under the auspices of the World Meteorological Organisation (WMO), Global Atmosphere Watch Station (GAW) programme, has national, regional and global mandate of monitoring atmospheric chemical composition including but not limited to Greenhouse Gases (GHGs), environmental background pollutants for Air Quality Assessment & Climate Change detection and attribution over Kenya. The changing of the chemical and physical composition of the earth atmosphere on a global scale has far reaching implications on health, climate change, environmental degradation and the future of human society. KMD operates one Global Atmosphere Watch Station at Mount Kenya and one Regional GAW Station in Nairobi. KMD monitors surface Ozone O_3, total column O_3 and Vertical O_3 in fullfilment of international multilateral agreements and convections like Montreal protocal and Viena convection on behalf of Kenya Government. This measurements require experty which is locally limited in Kenya and Africa. As a developing country, Kenya requires special capacity-building initiatives as a continuous process aimed at strengthening or establishing, relevant organisations, institutions and human resources in order to provide expertise in all areas related to the implementation of the Vienna Convention and the Montreal Protocol.

As support to capacity building initiatives in developing Countries, UNEP announced a call for proposals from developing Countries jointly with developed Countries of the West in the year 2016. A proposal was put forward between KMD and twinning partners from Federal Office of Meteorology and Climatology, MeteoSwiss, the Swiss Federal Laboratory for Materials Testing and Research (Empa), in Switzerland and considered for funding. UNEP made funds available for the implementation of first phase through WMO. The second phase funding is

supposed to facilitate the Swiss experts to travel to Kenya to witness the implementation of the skills gained during the training in Czech Republic and Switzerland.

This report is compiled by the four trainees from KMD, namely, Mr.Constance Okuku, Ms.Rose Lekalesoi, Ms.Annet Nyaga and Mr.Johana Mitei

OBJECTIVES

The main objective of this UNEP/WMO sponsored training was to further enhance the knowledge and skills of KMD GAW personnel in the operation of instruments and data management addressing competencies in measurements, instruments calibrations, analysis and data management of atmospheric composition, documentation with metadata and data submission. Specific objectives addressed training on total ozone, Vertical Ozone profiles (Ozonesonde), surface ozone measurements and calibration, Metadata and instruments history documentations

PROGRAM COVERAGE

The training was conducted for three weeks in Czech Republic and Switzerland on full time basis with lectures, practicals and hands on working. The lectures/training were commencing at 8am to 5pm and many a times beyond. (See copies of training time tables attached)

Training at Solar and UV Observatory, Hradec Kralove, Czech Republic from 18th to 23rd June 2018

The training focused on the Dobson measurement techniques, calibration of the instruments using the standard and mercury lamps tests and the data archiving and analysis. There was also an introduction to Brewer Spectrophotometer.

We were introduced to four different models of the Brewer Spectrophotometer:

1) MKII Model built in 1982, which measures the column ozone and column SO2 in the UV portion of the spectrum. Vertical ozone profile using the Umkehr technique. Known as a single brewer because of having a single monochromator.
2) MKIV Model was built in 1985, have the same measurement capabilities as well as the ability to measure column NO2. Referred to as "dual brewers" because they have two separate modes of operation:
   i) An ozone measurement mode
   ii) A NO2 measurement mode
3) MKIII Model was first introduced in 1992 as a replacement of MKII. Primary advantage it uses double monochromator. Top monochromator used for dispersion of incoming beam and the bottom used to recombining the spectrum to present it to the photomultiplier. This virtually eliminates stray light.

We gained skills and knowledge on standard and mercury lamps tests, measurements and reading of Dobson Spectrophotometer, Data entry, editing, analysis and archiving.

We were also introduced to Brewer Spectrophotometer operation principles, data acquisition system and operation.

The resource Persons were Dr Martin Stanek and Dr Ladislav Metelka

Training at Meteoswiss, Payerne, Switzerland 25th to 27th 2018

We received intensive training and knowledge on Electro-chemical concentration cell ECC seasoning as a 7 day preflight procedure. We also went through Standard

Operations Procedures SOPs on the day of launch. We learned vertical O_3 profile data download from the computer, processing, analysis, and transmission to twinning partners at Meteoswiss, Payerne and archiving.

We were also introduced to various ECC solutions used in the Southern Hemisphere additional data Ozonesonde SHADOZ, the new Vaisala Radiosondes to be introduced in Nairobi by end of the year, 2018.

We had a session of R statistical program to analyze both the vertical profile and surface O_3 data.

The resource persons were Dr Christian Felix, Mr. Gonzague Romanens and Dr Rana

Training at Empa, Switzerland 28th July to 2nd July 2018

Here, we gained intensive knowledge, experience and competence in Calibration of TEI49i O_3 analyzer and Picarro, CO_2, CH_4 and H_2O analyzer calibrations using various gas standards, checking for gas leaks and replacement of Swagelok and sealing to ensure no gas leaks. We performed various standard operations procedure as quality control and format for submission of data. We were introduced to various world, regional and national standard references, traceability of O_3 and CO_2 and CO, within the WMO GAW observations context.

We also learned how to handle high pressure cylinders by first flushing out the ambient air from the regulator at about 100bar and then release slowly the regulator gauge to ensure that all ambient air is released, Plumbing of sample tubing and leak tests, Raw data processing, flagging, cleaning editing and submission to World Data centers. Data repositories, downloading and visualization from WDCs. We were also

introduced to surface O_3 data quality control and analysis using R statistical tool. We were also introduced to calculating standard gases life spans.

The resource person were Dr Christoph Zellweger and Dr Martin Steinbacher

Training at Meteoswiss, Zurich, Switzerland 3rd July to 5th July 2018

During the three days at Meteoswiss, Zurich, we were extensively taken through the Observation System Capability Analysis and Review tool OSCAR of WMO. We did practical work by editing the Metadata information on Kenyan stations. We employed the statistical tool R and excel to compare the already available Metadata in OSCAR and in the Kenyan synoptic station data.

We looked at the frame work of WMO Integrated Global Observing System (WIGOS) and its contributions to data availability.

We also continued with further statistical programming sessions in R with more emphasis on data analysis.

The resource persons were Dr Joerg Klausen and Ms. Nina Horat

BENEFITS

- Acquired skills, knowledge and experience on Dobson and Brewer spectrophotometer readings and measurements, standard and mercury lamps tests. Dobson data processing and editing
- Through this training, we gained sound scientific knowledge on better performance of the vertical ozone profile measurements, data archiving and carrying out of statistical analysis on the data as quality control tool.
- Practical exposure to air quality laboratories at EMPA, equipment and machines used in atmospheric air quality data collection.
- An opportunity to interact with scientists from excellent centers of research with vast experience in atmospheric Chemistry, Meteorology and research.

CONCLUSION

Continued training, induction and attachment of KMD personnel at advanced centers in chemical measurements are key to success and sustainability of GAW operations in Kenya and the region. The knowledge and skills gained in the training will improve staff work performance at KMD besides being shared with colleagues and students at WMO Regional Training Center, Institute of Meteorological Training and Research IMTR, Nairobi. The knowledge gained during this training will be practiced on daily basis by performing measurements of total column O3, vertical O3 profile, doing standard and mercury lamps tests frequently, monitoring surface O3 measurement, checking gas cylinders leaks, doing data quality control, analysis and submission to various world data centres appropriately.

RECOMMENDATIONS,

- There is need to train more personnel in GAW observations relevant to Montreal protocol and Vienna conventions in Kenya.
- KMD should be facilitated to be able to collect more data on chemical composition of the atmosphere for local and regional assessments of air quality.
- GAW trained staff should be given sufficient time to practice, share skills and knowledge whenever deemed appropriate to transfer one from GAW division to another division in the Department. This will ensure smooth transfer of skills and GAW knowledge.
- Establishment of more chemical measurement stations in the Country is overarching and should be considered on priority basis. This will ensure that there is more information and knowledge on AQ status especially in urban centers and densely populated areas.

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3. Solar and UV Radiation Observatory in Hradec Kralove, Czech, Empa and Meteoswiss for material and technical training.
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