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| **World Meteorological Organization****Commission for Instruments and Methods of Observation** **CIMO Management Group** **Fifteenth Session**Geneva, Switzerland, 26 – 29 March 2018 | **CIMO/MG-15/Doc. 2.6(1)**  |
| Submitted by:Bruce Hartley19.3.2018 |

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# Report on the Evaluation of

# CIMO Testbeds and Lead Centres

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| **Summary and purpose of document**This document provides a review and recommendations on the Evaluation of CIMO Testbeds and Lead Centres to enable the CIMO Management Group to decide whether the standing of each Testbed and Lead Centre should continue.  |

**Action proposed**

 The Meeting is invited to:

* Consider Appendix I to this report.
* If necessary refer to Appendix II to this report.
* Consider and approve the recommendations presented in the Executive Summary.

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**Appendices:** I [Summary of submitted Reports of CIMO Testbeds and Lead Centres](#Summary)

 II [General TB/LC Requirements and Definitions, and References](#General)

**EXECUTIVE SUMMARY**

***Recommendations resulting from the review of the submitted reports from the Testbeds and Lead Centres***

**General: The activity "Developed a twinning activity / special relationship with a companion station/site from a developing country:**

This activity has only been carried out by two of the nine TB/LC an therefore is noted as in general not being a high priority activity. It is therefore recommended that this activity be removed from the document "Form for Regular Reporting of CIMO Testbeds and Lead Centres".

**Lead Centre: Chupungnyeong, Republic Korea**

It is noted that all reports from Lead Centre Chupungnyeong, Republic Korea are published only in the Korean language. It is also noted that Lead Centre Chupungnyeong, Republic Korea has had no reported collaboration with CIMO Expert Teams, or presented any papers or posters at TECO.

It is requested that the Secretariat correspond with Lead Centre Chupungnyeong, Republic Korea and: Encourage the publishing of reports in English as well as Korean; and Strongly encourage collaborations with CIMO Expert Teams noting the ToRs for a Lead Centre, and the publication of results as TECO papers or posters.

It is recommended that the CIMO-MG decide that Lead Centre Chupungnyeong, Republic Korea retain the standing of Lead Centre.

**Lead Centre: Italy**

It is recommended that the CIMO-MG decide that Lead Centre Italy retain the standing of Lead Centre.

**Lead Centre: Lindenberg**

It is recommended that the CIMO-MG decide that Lead Centre Lindenberg retain the standing of Lead Centre.

It is noted that the contact person detail for the Lead Centre Lindenberg have changed. The contact details have already been updated on the appropriate web page.

**Testbed: Boseong, Republic Korea**

It is noted that all reports from Testbed Boseong, Republic Korea are published only in the Korean language. It is also noted that Testbed Boseong, Republic Korea has had no reported collaboration with CIMO Expert Teams, or presented any papers or posters at TECO.

It is requested that the Secretariat correspond with Testbed Boseong, Republic Korea and: Encourage the publishing of reports in English as well as Korean; and Strongly encourage collaborations with CIMO Expert Teams noting the TOR for a Lead Centre, and the publication of results as TECO papers or posters.

It is recommended that the CIMO-MG decide that Testbed Boseong, Republic Korea retain the standing of Testbed.

**Testbed: Hohenpeissenberg**

It is recommended that the CIMO-MG decide that Testbed Hohenpeissenberg retain the standing of Testbed.

**Testbed: Izana**

It is recommended that the CIMO-MG decide that Testbed Izana retain the standing of Testbed.

**Testbed: Lindenberg**

It is recommended that the CIMO-MG decide that Testbed Lindenberg retain the standing of Testbed.

It is noted that the contact person detail for the Testbed Lindenberg have changed. The contact details have already been updated on the appropriate web page.

**Testbed: Payerne**

It is recommended that the CIMO-MG decide that Testbed Payerne retain the standing of Testbed.

**Testbed: Sodankyla**

It is recommended that the CIMO-MG decide that Testbed Sodankyla retain the standing of Testbed.

***Editorial recommendations***

In the document "Form for Regular Reporting of CIMO Testbeds and Lead Centres":

1. Add a statement indicating high level summaries only are required i.e. technical details and examples should not be included.
2. Change the following text:

from "Which capacity building/training activities have been carried out by the Testbed in the last 2 years?"

To "Which inter-organisation capacity building/training activities have been carried out by the Testbed/Lead Centre in the last 2 years?"

1. Change the following text:

from "Which capacity building/training activities have been carried out by the Testbed in the last 2 years?"

To "Which capacity building/training activities have been performed out by the Testbed/Lead Centre in the last 2 years?"

1. Change the following text:

from "Has your testbed developed a twinning activity / special relationship with a companion station/site from a developing country?"

To "Has your Testbed/Lead Centre developed a twinning activity / special relationship with a companion station/site from a developing country?"

1. Change all text "Test Bed" to "Testbed"
2. Change all text "TB/LC" to "Testbed/Lead Centre", or change all text "Testbed/Lead Centre" to "TB/LC".

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**Summary of submitted Reports of CIMO Testbeds and Lead Centres**

The content of this table is a high level summary of the information from all the submitted reports made using the template document "Form for Regular Reporting of CIMO Testbeds and Lead Centres".

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| **Evaluation Criteria** | **LC****Chupungn****yeong, Republic Korea** | **LC****Benedetto Castelli , Italy** | **LC****Lindenberg, Germany** | **TB****Boseong, Republic Korea** | **TB Hohenpeissen****Berg, Germany** | **TB****Izana, Spain** | **TB****Lindenberg, Germany** | **TB****Payerne, Switzerland** | **TB****Sodankyla, Finland** |
| Contact person changed? | No | No | **Yes** | No | No | No | **Yes** | No | No |
| Main activities that TB/LC carried out in the last 2 years for which results are already available | - Intercompare of sunlight shields and hygrometers.- Intercompare of snow depth sensors (ultrasonic, laser and optical types). | 11 x project collaborations.10 x internal projects...On hydrometry, raingauges, snow measurements, precipitation runoff and intensity, corrections, calibration, standardization,smart rainfall systems. | - Implementing and evaluating different observing systems and techniques at Boseong tower- Intercompare of temperature-structure-parameter observations from airborne, tower and scintillometer.- New measurement systems for soil variable measurements (temperature, moisture, heat flux). | - Observing vertical structure of PBL using an UAV.- Analyse local planetary boundary layer (sea-breeze, fog, mountain-valley wind, & inversion.- Improvement and validation of numerical weather forecasting- Improve the system for comparing model and tower data.- Validate numerical weather forecast.- Develop application techniques of flux data. | - International intercompare of 12 ceilometers, CeiLinEx2015.- OH reactivity intercompare.- ACTRIS-2 NOx intercompare.- Intercompare of particle size distributions measured by APS, OPC, SMPS. | 4 x programs (with sub projects) on solar and aerosol modelling and tests.- Design, development and testing of new low-cost zenith-looking multi narrow- band radiometer for AOD.  | - Uncertainty assessment of integrated water vapour from GNSS.- Assessment of IR Doppler wind lidar in different scanning modes.- Photometers & spectroradiometer assessment for retrieval of AOD and PWV. | - Radiosonde dual flight intercompare.- Tracking Raman lidar calibration changes.- Method for temperature from rotational Raman.- Assimilate Raman lidar water vapour in model.- Integrated European 90 ceilometer network.- Validate PBL height algorithm.- Ceilometer cloud cover validation.- Ozone trends as a function of daytime.- Radar wind profilers & fence clutter panels.- Intercompare of Direct Normal solar Irradiance radiometers and evaluate algorithm. | - Finnish Meteorological Institute has made most of its data freely available to the public.- O3 and CFH soundings.- Columnar measurements of greenhouse gases from balloon-borne and ground based instruments. |
| Main activities that TB/LC carried out in the last 2 years for which results will soon be available | - Annual & seasonal analysis of observed parameters (temperature, humidity, wind direction and wind speed) at Chupungnyeong and Gochang. | - Reconciling Precipitation with Runoff.- Wind-induced undercatch of precipitation gauges   | - Capabilities & improvements of microwave scintillometer.- Determination of cloud cover and type using radiation sensors, ceilometers, cloud radar, Nubiscope & sky camera.- Determination of boundary layer radiative flux & net radiation using tethered balloons & radiosondes.- Determination of nocturnal AOD & PWV using moon photometry. | - Study on the local weather observation using a rotary Unmanned Aerial Vehicle.- Analysis of local phenomenon at a coastal area using the tall tower. | - NO3 reactivity measurements.- ACSM intercompare at SIRTA Paris.- CIMS OH reactivity at MOHP.- Topography influence of the boundary layer at high altitudes.- Analysis of zero gases for trace VOCs.- Scattering properties of aerosol particles at 28 sites (ACTRIS).- Strategy for CO2 data baseline levels & application to mountain stations. | - Develop & test low-cost zenith-looking multi- narrow band radiometer for AOD.- Intercompare of international data sets.- Developed methodologies and validation techniques. | - Analysis of laser ceilometer intercompare.- Evaluation of cloud radar.- Algorithm for multiple ceilometer cloud.- Vaisala RS41 radiosonde Radiation error characterization.- Stratospheric hygrometer calibration.- Test network collaboration of remote sensing instruments. | - Validation of operational Raman lidar for tropospheric temperature.- Automatic calibration of ALC suited for network.- Performance evaluation of the radiometers for solar energy sector.- SPICE final report. | - SPICE final report. |
| Which guidance documents/standard procedures were developed during the last 2 years (reference/web-link) | - Intercompare of sunlight shields and hygrometers.- Intercompare of snow depth sensors.**Both in Korean**. | - Proposed European standard on “Hydrometry...". CEN TC318. | **None** | **None** | - GAW Report of Expert Meeting on Nitrogen Oxides | **None** | - CIMO guide, chapter 5.2.2. “Wind profiler radars" | **None** | **None** |
| IOM reports / peer-reviewed publications were published in the last 2 years (reference/web-link) | **None** | 2 x journals14 x papers | 2 x | 3 x in Korean | 8 x | 13 x | 6 x | 12 x | 13 x |
| Titles of IOM report(s) presently being developed by your Testbed/Lead Centre(draft/review/ready) | None | None | None | None | 3 x draft4 x final | None | None | None | None |
| Collaborated with one or more CIMO Expert Teams in developing guidance material(If yes - which) | **None** | ET-II (chair)ET-OISTWMO no8. Guide editorial board | CIMO ET-ORSTCBS ET-SBO | **None** | - TT IPET-OSDE - WMO Lidar Qualification Working Group | ET-NRST  | CIMO ET-ORST (B.1)CBS ET-SBO  | ET-IIET-OISTGRUAN activities | **None** |
| Which capacity building/training activities have been carried out by the Testbed in the last 2 years | **None** | 3 x seminar | **None** | **None** | 2 x training2 x visits1 x lecture | 1 x training | 1 x training | 1 x training | *Question incorrectly answered* |
| Developed a twinning activity / special relationship with a companion station/site from a developing country(If yes - which) | **No** | **No** | **No** | **No** | **No** | Tamanrasset-Algeria  | **No** | Kenyan Meteorological Service (KMD) at Nairobi | **No** |
| Testbed/Lead Centre making an oral/poster presentation at this year’s TECO(If yes - title/author) | **None** | 1 x TBD | Likely | Yes**, Characteristics of vertical profiles observed from a tall tower in Korea, Park, Y.S., et al.** | UnknownForm response has the paper from last TECO (Madrid) | Yes, Aerosols and water vapor remote sensing instruments activities carried out at Izaña CIMO Testbed, E. Cuevas, et al | Likely | SPICE final report; Roulet, Y.A | Likely |
| Any recent changes in your Test Bed/Lead Centre’s capabilities(please specify) | No | No | No | - Electric wiring and intranet communication expanded to support more instruments. | - Became official ICOS station.- Routine Lidar operations within EARLINET.- Routine calibration of DWD ceilometer.- Routine ACSM measurements. | - Integrating sphere for solar and lunar photometer calibration & test.- Three triple photometers for aerosol and water vapour measurement using sun, sky and lunar. | No | No | - Equip 24m tower with flux measurement, radiometers, scatterometer & hyperspectral camera.- X-band satellite receiver, S-band up/downlink. |
| Any recent changes in your Test Bed/Lead Centre’s infrastructure(please specify) | No | - Laboratory calibration for non-catching rain gauges.- Wind tunnel access at University of Genoa to test wind effects on rain gauges. | Building activities to improve the infrastructure for radiation and boundary layer measurements  | - Additional temperature sensors and anemometers  at 11 levels.- Infrared gas analyser at 140m. | - Hardware upgrade of the AERONET sun photometer.- New TEOM, total aerosol mass.- New MAAP, total soot mass. | - Enlarged the photometer calibration platform from 8 to 20 units. | - New set up to measure the radiation error of radiosondes.- Refurbished calibration set up for FLASH-B optical balloon borne hygrometer. | None | None |
| Any recent changes in your staffing(if yes - new staff competencies ok) | 2 x operation managers**Competency not stated.** | None | Yes – several and competency checked and maintained. | 4 x**Competency not stated.** | 6 x temporary staff became permanent.5 x new temporary staff. | None | Yes – several and competency checked and maintained. | None | None |
| Plans for the next two years | - Intercompare of precipitation gauges  - Field experiments for new instruments | - Develop correction methodologies for wind-induced errors on precipitation measurements.-Continue the ongoing international collaboration - Intercompare of non-catching type instruments of new technologies.  | - Continued studies for detection of cloud cover & base from sensors.- Continued studies for capabilities of microwave scintillometer. - Turbulence & parameters from IR Doppler lidar.- Window and windowless infrared radiometers.- Vertical radiative flux & net radiation profiles using radiosondes. | - Improve the observing system of the Boseong tower- Radiosonde and UAV intercompare with tower.- Add the remote-sensing instruments for validating a single column model.- Add additional PBL ground based sensors. | - Tests and validation of new ceilometers with depolarization  - Metrology for Nitrogen Dioxide - ACTRIS-2 OVOC Intercompare.  | - Several new algorithm implementation.- Deliver free on-line software to compute AOD, AE, PWV from spectrometers- Establish permanent traceability for sunphotometer | - Host next WMO-CIMO Intercompare of high-quality radiosondes.- Assessment & intercompare of moon radiometer for AOD & PWV.- Test ground based remote sensing thermodynamic profilers.- Characterize the quality and uncertainty of Doppler lidar wind. | - Develop Payerne as a GRUAN site- Reinforcement of the lidar related activities- Operational assimilation of Raman lidar.- Implement auto-sonde. | - Build a measurement raft to host flux measurement devices.- Host international campaigns.• Participate in GAW, GCW, GRUAN, TCCON and ICOS networks. |
| Able to continue in the role of a Testbed/ Lead Centre during the coming two years | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Other activities of special interest | None | None | None | - UAV and radiosonde observations compared to tower | - AERONET station  - GAW-PFR station  - EARLINET station  - ICOS station  - NDACC station - Dobson Calibration Centre for WMO RA VI   | - Strong links and synergies with GAW & SDS-WAS. - Collaborate with GOA-UVa for tender “Lunar spectral irradiance measurements and modelling for absolute calibration of EO optical sensors”.  | None | None | An INTERACT station (International Network for Terrestrial Research and Monitoring in the Arctic) |
| Date of report | 15 Feb 2018 | 15 Feb 2018 | 14 Mar 2018 | 15 Feb 2018 | 29 Jan 2018 | 15 Feb 2018 | 14 Mar 2018 | 22 Feb 2018 | 15 Feb 2018 |

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**General TB/LC Requirements and Definitions, and References**

**Other General TB/LC Requirements and Definitions:**

* Promote collaboration between CIMO and relevant National Meteorological and Hydrological Services (NMHS)
* Testing, development and standardization of meteorological instruments and their performance for the benefit of all WMO Members.
* Utilize and build on both existing state-of-the-art facilities and specific expertise
* Significant contribution towards developing guidance for WMO Members, and their impact on the WMO observing systems.
* **Testbeds** are centres with experimental facilities to assess the capabilities of various ground-based remote-sensing and in situ observations
* **Lead Centres** are centres of excellence in testing of instruments’ performance including in laboratory facilities, and instrument intercomparisons, resulting in standardization of instruments’ performance, instrument interoperability compatibility within WIGOS.
* **Ongoing**: It is expected that TB and LC will regularly produce IOM reports and develop guidance to be incorporated in the Guide to Instruments and Methods of Observation (WMO-No. 8).
* **Reporting**: CIMO Testbeds and Lead Centre must provide at least one report every two years to the CIMO-MG (normally for March 2016, 2018, etc.).

**References:**

* [http://www.wmo.int/pages/prog/www/IMOP/Testbeds-and-LC](http://www.wmo.int/pages/prog/www/IMOP/Testbeds-and-LC.html)
* Letter: OBS/IMO/Testbeds-Lead Centres GENEVA, 3 February 2016, Submission of proposals for the Establishment of Testbeds and Lead Centres, to be nominated by the president of the Commission for Instruments and Methods of Observation (CIMO)
* Form for Regular Reporting of CIMO Testbeds and Lead Centres (TB&LC\_Reporting-2018.docx)
* Form for Submission of New CIMO Testbeds and Lead Centres (TB&LC\_Proposal-2018.docx)

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