

Introduction to the BIPM's Capacity Building and Knowledge Transfer (CB&KT) Programme

The global metrology system, coordinated by the BIPM, provides the basis for the recognition of measurement standards and measurement results world-wide. It underpins industry and global trade as well as being a key enabler for science and innovation and sound decision making in the delivery of healthcare, the supply of food and the protection of the global environment.

Consequently, participation in the activities of the BIPM has expanded in recent years and now covers some 100 states and economies, covering some 96 % of the world's GDP. All of the advanced metrology nations and economies already participate, as do an increasing number of Member States and Associates with emerging metrology systems. As a result, any future potential participants will have emerging metrology systems. The BIPM has therefore begun to focus more effectively on the particular needs of countries and economies with emerging metrology systems (CEEMS), and more widely on capacity building and knowledge transfer.

The aim of the BIPM CB&KT programme is to increase the effectiveness with which Member States and Associates engage in the world-wide coordinated metrological system.

Effective engagement by CEEMS not only helps them realise the benefits of participation more easily and quickly, it helps all of the other participants too, including the advanced metrology nations. Operating the world-wide coordinated system of metrology has many elements, a major one being the CIPM Mutual Recognition Arrangement (CIPM MRA). The CIPM MRA is supported by scientific comparisons of measurement standards, peer review of the quality management systems operated by the participants, and peer review of the claimed calibration and measurement capabilities. This is a complex and resource intensive process that ensures the veracity and international recognition of measurement results, and which underpin much wider aspects of the measurement infrastructure, such as the laboratory accreditation process. For those CEEMS that are newly engaged in the world-wide metrology community and have just signed the CIPM MRA but have not yet gained any experience in its operation, the learning curve is long and difficult. Experience shows that these new participant National Metrology Institutes (NMIs) and Designated Institutes (DIs) tend to learn by trial and error, often needing a number of attempts and several years to effectively engage. By helping these inexperienced participant NMIs and DIs to achieve 'right first time' submissions into the process everybody benefits. The newcomers optimize their success rates and reduce the time needed to achieve international recognition of their capability. High-quality submissions also minimize the burden on the wider community that conducts the peer reviews.

The need for support is not limited to those just beginning their engagement. There are a number of NMIs and DIs that effectively participate in the CIPM MRA, but that have not yet taken the next step of significantly contributing to the operation of the system by, for example, chairing committees and

working groups or by leading comparisons. Consequently the burden of leadership still falls disproportionately on a few leading NMIs. Improving the knowledge and confidence of experts from these mid-range laboratories increases the potential leadership pool within the Regional Metrology Organizations, a pre-requisite for a more balanced sharing of the global workload.

There are also specific needs for capability and comparability that are specific to developing countries, and which also impact on the countries that they export to. Even exporting basic commodities such as agricultural crops brings major measurement challenges. For example The Food and Agriculture Organization has estimated that 25 % of the world's crops are affected by mycotoxins each year, with annual losses of around 1 billion metric tons of foods and food products. Economic losses occur because of: 1) yield loss due to diseases induced by toxigenic fungi; 2) reduced crop value resulting from mycotoxin contamination; 3) losses in animal productivity from mycotoxin-related health problems; and 4) human health costs. Not surprisingly the advanced nations place tough regulatory limits on mycotoxins, so exporters need testing programmes with reliable and internationally accepted measurement results.

These are just examples of areas where metrological capacity building is needed, there are many more.

Responding to the growing need for support by the BIPM, and to ensure the BIPM remains of interest and relevance across the full range of its participants, a draft capacity building programme was proposed to the Member States at the 25th General Conference on Weights and Measures (CGPM) in late 2014. This proposal included training by, and secondments to, the BIPM; actions to increase BIPM leverage with the wider Quality Infrastructure in the CBKT arena; and the possibility of scientific projects of specific interest to developing countries. Due to external budgetary constraints this initiative did not achieve the necessary full consensus and was not therefore funded. However the aims and value of the initiative drew wide support. Consequently, [Resolution 4 of the 25th CGPM \(2014\)](#), which addresses the BIPM budget, and which calls for additional voluntary support for specific BIPM mission-related activities, was modified by the CGPM with the additional wording *'...particularly those that facilitate participation in the activities of the BIPM by those countries without well-developed metrology infrastructure.'*

Following the 25th CGPM, and influenced by the discussions that took place there, the CIPM encouraged the BIPM to develop a new less formal – sponsor supported – concept that has become the BIPM Capacity Building and Knowledge Transfer Programme (CB&KT).

The programme is operated flexibly allowing sponsors, in consultation with BIPM, to decide which types of action they wish to support; whether they wish to focus on supporting particular regions; the amount and type of support; and the timing. A selection of topics that are of interest are given below, but the programme can easily accommodate new ideas provided they align with the objectives of the BIPM CB&KT Programme.

Focused training opportunities at the BIPM

- *Visits/training for staff from new/inexperienced Member States and Associates to aid their engagement in the international system;*
- *Visits/training for new/inexperienced chairs and potential chairs of RMO Technical Committees (TCs)/Working Groups (WGs) with the aim of improving the efficiency and effectiveness of the CIPM MRA;*
- *Visits/training for staff from NMIs that have participated in comparisons but have not yet piloted them, with the aim of encouraging them to become future pilot laboratories;*
- *Visits/training for staff from NMIs that are in the process of developing Calibration and Measurement Capabilities (CMCs) for the first time;*
- *Visits by RMO secretariat staff.*

Opportunities could also, where appropriate, be linked with time spent with the RMO secretariat and/or at the sponsor NMI, and the International Bureau of Legal Metrology (BIML).

Engagement with the Global QI capacity building community

- *Enhanced BIPM engagement in the DCMAS Network (network of International Organizations that liaise regarding their capacity building activities);*
- *Enhanced engagement with potential Member States and Associates;*
- *Promoting 'awareness raising' and providing information for decision makers;*
- *Specific engagement with states immediately after they first become involved with the BIPM as Member States or Associates;*
- *Metrology school activities and placements.*

Comparisons of particular interest to Member States that are developing countries

- *Additional BIPM relevant scientific/technical project(s) of interest to developing countries, including visiting scientists (although such projects would require significant donated funding).*

The elaboration of various elements of the CB&KT will be carried out in collaboration with the Regional Metrology Organizations. They, for example, are best placed to identify the next generation of leaders within their technical committees and working groups. They are also well placed to put their authority behind requests for support from sponsors, and to identify experts to help deliver training.