



25 March 2025

**ASIA PACIFIC METROLOGY PROGRAMME (APMP)
TECHNICAL COMMITTEE FOR AMOUNT OF SUBSTANCE (TCQM)**

**REPORT TO THE 30TH PLENARY OF THE CONSULTATIVE COMMITTEE FOR AMOUNT OF
SUBSTANCE: METROLOGY IN CHEMISTRY AND BIOLOGY (CCQM)**

Reported by: Dr Tang Lin Teo, APMP TCQM Chair

1 Introduction

In 2024, APMP has 47 full members from 28 economies and 12 associate members from 12 economies. It is chaired by Dr Hyun-min Park from the Korea Research Institute of Standards and Science (KRISS, Republic of Korea).

From 22 to 29 November 2024, metrologists and experts gathered for the 40th Asia Pacific Metrology Programme (APMP) General Assembly and Related Meetings in the National Physical Laboratory (NPL), India. The host venue was especially meaningful. For those who remembered, it was a heart-warming to return to NPL (India), where 47 years ago, the Commonwealth Science Council and NPL (India) co-organised a meeting that eventually led to the formation of APMP to promote collaboration in metrology.

Over 1.5 days (25 & 26 November 2024), the TCQM meetings were held in-person and virtually. It was chaired by Dr Byungjoo Kim from KRISS. The sessions were attended by 71 representatives (44 in-person and 27 online) from 18 metrology institutes in 14 economies. Given the overlapping interests of the TCQM with the objectives of other APMP forum, TCQM members also actively participated in meetings of the Focus Groups (FGs) on Climate Change & Clean Air (CCCA), Food Safety (FS), Clean Water (CW), and APMP-Asia Pacific Accreditation Cooperation (APAC) Joint Proficiency Testing Working Group (PTWG).



Delegates of member and associate member institutes of APMP who attended the 24th TCQM meeting in person at the National Physical Laboratory, India

2 Calibration and Measurement Capabilities (CMCs)

As of early 2024, CMCs in the QM area contributed 40.8 % of the total number published by APMP, and 24.8 % of the total number in the KCDB. Notably, among the 15 service categories, APMP published high numbers of CMCs in Category 1 on high purity chemicals (59%) and Category 11 on food (66%).

In Cycle XXV (2024), the TCQM reviewed 107 CMCs (99 new and 8 modified). The submitting institutes included the National Measurement Institute (NMIA, Australia), National Institute of Metrology (NIM, China), Government Laboratory (GL, Hong Kong, China), National Standardization Agency of Indonesia (SNSU-BSN, Indonesia), National Metrology Institute of Japan (NMIJ, Japan), Health Sciences Authority (HSA, Singapore), National Institute of Metrology, Thailand (NIMT, Thailand) and KRISS.

In Cycle XXVI (2025), the TCQM reviewed 250 CMCs of which 234 (88 new and 146 modified) were eventually submitted to the JCRB. The large number of CMCs reviewed in this cycle was mainly due to mandatory re-review of existing CMCs under Category 4 on gas (GAWG), Category 5 on water (IAWG) and Category 11 on food (OAWG). The submitting institutes included the Chemicals Evaluation and Research Institute (CERI, Japan), National Metrology Institute of Malaysia (NMIM, Malaysia), NMIA, NIM, GL, NPL, NMIJ, KRISS, HSA, and NIMT. The breakdown is as follows:

	EA	GA	IA	OA	NA	IR
New CMCs	3	11	52	11	4	6
Modified CMCs	0	58	34	53	2	0
Total CMCs by group	3	69	86	64	6	6

Institute	New						Modified				Total by institute
	IA	GA	EA	NA	OA	IR	IA	GA	NA	OA	
NMIA					1	6	17			3	27
NIM	21	4		4	4			28	2	18	81
GLHK	12				1		2			7	22
NPLI		4									4
NMIJ	3						1	13		8	25
CERI								6			6
KRISS		1						11		17	29
NMIM		1			1						2
HSA	8				2		4				14
NIMT	8	1	3		2		10				24
Total by area	52	11	3	4	11	6	34	58	2	53	

The TCQM also noted that several economies which are CIPM MRA signatories did not possess any CMC in the QM area as of November 2024. They included Bangladesh, Cambodia, Iran, Malaysia, Mongolia, New Zealand, Pakistan, Philippines, Sri Lanka and Vietnam.

3 Comparisons and Pilot Studies

Till date, the APMP TCQM has organised a total 15 key comparisons, 27 supplementary comparisons and 37 pilot studies. On-going studies include:

- 2 Key comparisons
APMP.QM-K90 Formaldehyde in nitrogen piloted by NMIJ
APMP.QM-K03.2019 Automotive emission gases piloted by KRISS
- 5 supplementary comparisons
APMP.QM-S02.2023 Oxygen in nitrogen piloted by NMIJ
APMP.QM-S18 Sulphur dioxide in nitrogen piloted by CERI
APMP.QM-S2.2023 Oxygen in nitrogen piloted by NMIJ
APMP.QM-S20 Methane and propane in nitrogen piloted by NIM
APMP.QM-S21 Histamine in fish piloted by GL and HSA
- 2 Pilot studies
APMP.QM-P35 Enumeration of total coliform in drinking water piloted by NIM
APMP.QM-P36 Trace elements in river water piloted by NMIJ

4 Peer Reviews

In 2024, the following institutes underwent peer reviews for the following fields:

- NPL: Ozone and gas analysis
- NIMT: Gas and organic analyses
- NIM: Electrochemical, gas & particle, biological, surface, inorganic, isotope ratio, and organic analyses
- Industrial Technology Development Institute (ITDI, Philippines): Organic and inorganic analyses

According to a resolution made at the Executive Committee and Committee Chairs' meeting, the hard deadline for the extension of the validity of peer review due to the COVID-19 pandemic was end of May 2024. As a result, 7 gas CMCs from the Center for Measurement Standards/Industrial Technology Research Institute (CMS/ITRI, Chinese Taipei) had to be greyed-out until the successful completion of peer review in June 2025.

5 Completed Capability Building and Knowledge Transfer Activities

5.1 Hybrid Joint Workshop of the APMP Climate Change & Clean Air Focus Group (CCCAFG), and TCQM Gas Analysis Working Group in Zhengzhou, China from 20-24 July 2024

The workshop, hosted by NIM in Zhengzhou, allowed APMP metrology institutes such as the National Metrology Centre/Agency for Science, Technology and Research (NMC/A*STAR, Singapore) NMIA, KRISS, NMIJ, NIMT, NMIM, and others to share their achievements in tackling issues related to climate change, greenhouse gas and pollutants. It also garnered the support of the World Meteorological Organisation,

International Bureau of Weights and Measures (BIPM), and metrology institutes from other regional metrology organisations (RMOs).



5.2 Webinar on 20 September 2024 (UTC 04:00 – 07:00) on *Metrology and its Impact to the Clinical Laboratory Community*

In the realm of laboratory medicine, the importance of metrological traceability cannot be overstated. With these considerations in mind, the TCQM organised a webinar to discuss the relevance of metrological services to laboratory medicine. The TCQM was privileged to invite six speakers to share real examples during a 3-hour webinar on 20 September 2024. The webinar was opened by TCQM Chair, Dr Byungjoo Kim from KRISS and hosted by the then TCQM Chair-Elect, Dr Tang Lin Teo from HSA. The topics drew the attention of many colleagues, not only from metrology institutes but also participants from accreditation bodies, standards bodies, research institutions, clinical laboratories, universities, and IVD suppliers. About 100 attendees from 16 economies (Australia, Canada, China, Chinese Taipei, Hong Kong SAR, India, Indonesia, Japan, Philippines, Republic of Korea, Mexico, Singapore, Sri Lanka, Thailand, United Arab Emirates, and Vietnam) joined the webinar.

The title and invited speakers of the presentations included:

- Importance of Metrological Traceability and CRMs for Laboratory Medicine by Dr Tony Badrick, President, Asia Pacific Federation for Clinical Biochemistry and Laboratory Medicine / CEO, Royal College of Pathologists of Australasia
- Certified Reference Material for Clinical Measurement (connecting with requirements of ISO 17034 and guidelines in ISO 33405:2024) by Dr Mark Lewin, NMIA
- Importance of Commutability of Clinical Certified Reference Materials by Dr Liqing Wu, NIM
- Beyond Measurements: Development of the National Standard Reference Data – Korean Health Index by Dr Ji-Seon Jeong, KRISS

- Organising Accuracy-Based External Quality Assessment (EQA) Programmes and its Impact on Regulation by Dr Qinde Liu, HSA
- Ensuring Accurate Diagnosis: How NIMT Standardises Clinical Measurements in Thailand by Dr Jintana Nammoonnoy, NIMT

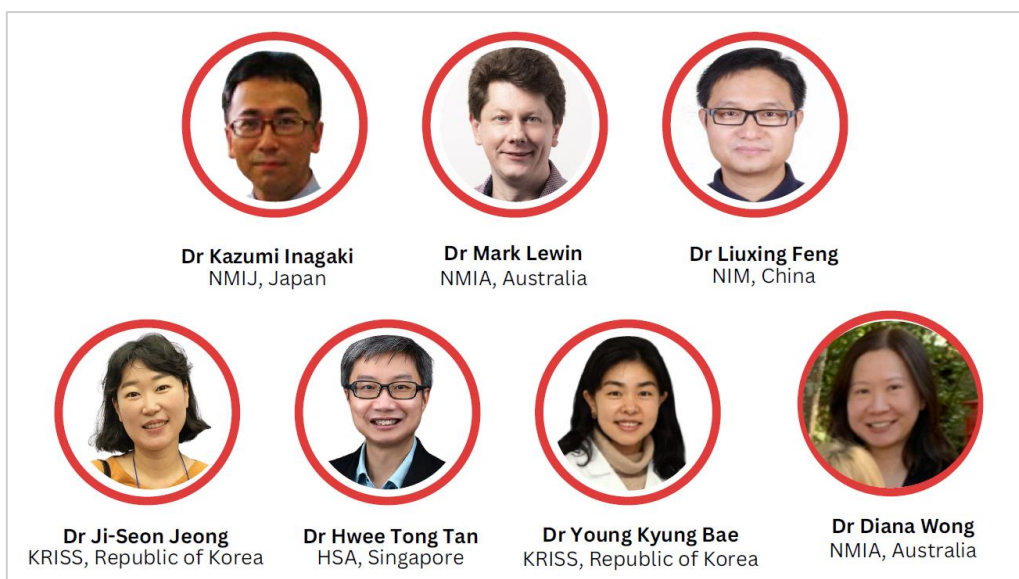


5.3 Hybrid workshop on 23 November 2024 hosted by NPL in New Delhi on *High Accuracy Measurement Methods for Clinical Markers*

The workshop explored two key areas in laboratory medicine: the strategic value of new capabilities and their practical application in the field of laboratory medicine. Participants gained a thorough understanding of metrological traceability across different clinical markers, including small organic molecules, elements, and proteins - a fundamental aspect that ensures reliable and comparable test results across laboratories. The session covered essential measurement techniques, highlighting both best practices and measurement uncertainty.

The title and invited speakers of the presentations included:

- The Challenges of Vitamin D Metabolite Analysis by LC-MS/MS by Dr Mark Lewin, NMIA
- Elements and Biomarkers Measurement (ICP-MS) for Aging Population by Dr Liuxing Feng, NIM
- Accuracy Assessment of Measurements in Dried Blood Spot Sampling for Metabolic Diseases Screening by Dr Ji-Seon Jeong, KRISS
- NMIJ's Activities for the Reliable Analysis of Organic Pollutants in Biological Samples by Dr Kazumi Inagaki, NMIJ
- Certification of Albumin in Calibration Solution and Measurement of Urine Albumin using LC-IDMS/MS by Dr Hwee Tong Tan, HSA



5.4 Workshop on TCQM Strategy on Public Health on 23 November 2024 hosted by NPL in New Delhi

The session discussed TCQM’s longer term strategy on public health. It was kick-started by the energetic sharing of the vision for the future by APMP’s young metrologist, Dr Diana Wong from NMIA who shared her views on the focus of biological metrology and public health. This sharing smoothly inducted the workshop into deeper discussions on TCQM’s strategy on public health led by Dr Byungjoo Kim and Dr Tang Lin Teo. This focus was driven by the 39th APMP General Assembly in late 2023 which also displayed a strategic shift from COVID-19 to broader public health initiatives, aligning with UN Sustainable Development Goals 3 (Good Health and Well-Being), 6 (Clean Water and Sanitation), and 13 (Climate Action). This TCQM strategy encompassed the identification of technical capabilities needed to serve diverse stakeholders across six main groups: regulatory bodies, public healthcare institutions, private sector entities (including hospitals and manufacturers), research institutions, regional associations [Asia Pacific Economic Cooperation (APEC), Asia-Pacific Legal Metrology Forum (APLMF), Asia-Pacific Federation for Clinical Biochemistry and Laboratory Medicine (APFCB)], and internal stakeholders like BIPM and other RMOs.

The TCQM agreed that the Asia-Pacific region faces common and significant public health challenges, including chronic diseases (cardiovascular, cancers, respiratory diseases, and diabetes), environmental concerns, and emerging threats. These challenges are complicated by issues such as antibiotic resistance, environmental contaminants (heavy metals, per- and polyfluoroalkyl substances, microplastics), and food safety concerns. Technical limitations, such as suboptimal reference materials, can impact patient care quality. The region also sees increasing demand for advanced molecular tools for food authentication and traceability, while grappling with severe air pollution issues highlighted by the World Health Organisation.

To ensure the relevancy of technical capabilities developed, TCQM recognised the need to engage its stakeholders from various bodies, organisations and sectors as depicted in the diagram below.



It was with the topics in mind that TCQM therefore initiated the increment of bio-metrology activities to drive advancement in topics related to the Asia-Pacific region. Dr Young-Kyoung Bae from KRISS led the discussions and shared KRISS’s plans to advance greater collaborations among APMP member institutes with existing programme and others who are keen to start developing technical capabilities in the field.

The TCQM opined that horizon scans would be useful but should be forward looking so that these continue to remain relevant for a long time. In the bioanalysis area, the development of nucleic acid capabilities was deemed to be a good start for developing metrology institutes. In the analysis area, the lack of capabilities to address measurement of stack emissions, PM2.5 particles, volatile organic compounds for breath disease diagnosis were raised. In the organic analysis area, the TCQM proposed greater emphasis on nutritional contents in food and biopharmaceuticals.

6 New Capability Building and Knowledge Transfer Activities

Between 2025 to 2026, several member institute of the TCQM have initiated capability building trainings and an exciting collaboration with the Southeast Asia Section of AOAC International. These include:

- 3-day training on genetically modified organism (GMO) measurement using PCR to be hosted by NIM between July to October 2025
- 2-week training on production (including purity assays) of certified reference materials for organic calibrators to be hosted by NIM between June 2025 to March 2026
- 2-week training on the production of certified reference materials for inorganic elements in solid matrices to be hosted by HSA between January to March 2026
- 1-day (in addition to usual annual meetings) AOAC Southeast Asia-APMP joint workshop on chemical and bio-metrology to support accurate measurement for food safety to be coordinated by NIM, HSA, NIMT and AOAC SEA in October 2025

Eligible APMP member/associate member institutes from developing economies will be receiving full or partial financial support from APMP for the trainings/activities. APMP experts will receive travel sponsorships and/or honorarium to attend or conduct the trainings/activities.

7 Collaborations with Other APMP Forums

7.1 APMP Focus Groups

Member institutes of TCQM participate actively in APMP's FGCW, FGFS, FGCCCA, and more recently with the Medical Metrology forum. Experts from TCQM also support the FGs by contributing to talks and organising workshops that bring together stakeholders from the area to better understand the metrological services they require. The Chair of FGFS, Prof Hongmei Li from NIM relinquished her leadership role to Dr Kihwan Choi from KRISS after the 40th APMP General Assembly. He joined Dr Richard Shin from HSA and Dr Hong Lin from NIM who chaired the FGCW and FGCCCA, respectively.

7.2 APMP-APAC Joint Proficiency Testing Working Group

It also works closely with the APMP-APAC PTWG which organises proficiency testing (PT) programmes for testing and calibration laboratories accredited by the APAC. The APAC has a long-standing Memorandum of Understanding signed with the APMP since 2013.

There is an on-going PT programme on Toxic Elements in Cosmetic Cream organised by HSA. Six new PT programmes comprising pesticides residue in water, adulterants in slimming pill, GMO in soybean, pesticides in botanicals, toxic elements in seafood and SARS-CoV-2 in wastewater had been proposed by several members of the TCQM at the meeting on 24 November 2024. The APAC provides financial support for up to two PT programmes a year to the coordinating institute to defray expenses such as courier charges.

One notable development was the introduction of APMP TCQM case studies held in parallel with the APAC PT programmes using the same PT samples. It was an initiative that ensured that metrology institutes from developing economies distinguished themselves from commercial testing laboratories. These case studies would provide structured learning experiences, enabling developing metrology institutes to gain metrological expertise before participating in any case study.

The APMP Co-convenor for the PTWG is Dr Tang Lin Teo and the APAC Co-convenor is Prof Ping He from China National Accreditation Service for Conformity Assessment (China). Dr Teo will relinquish her role after a 3-year term to Ms Dyah Styarini from SNSU-BSN after the 41st APMP General Assembly in November 2025.

7.3 Metrology – Enabling Developing Economies in Asia (MEDEA) 3.0

Coordinated by Dr Charun Yafa of NIMT, the MEDEA 3.0 programme and funded by the German government through Physikalisch-Technische Bundesanstalt (PTB) has organised trainings covering ICP-MS analysis of water elements and pH measurement using glass electrodes. These training programmes were pivotal in building capabilities of developing metrology institutes across the Asia-Pacific region. As funding for the MEDEA programme would end in March 2025, the 40th APMP General Assembly agreed to nearly doubled the budget for its Developing Economies Committee, in order to continue supporting the capability building activities of APMP member institutes in developing economies.

8 Collaborations with Other Regional Bodies

The TCQM supported the APMP Public Health Initiative titled “Standardisation of Measurement of Clinical Markers for Non-Communicable Diseases (NCDs)” which will be organised in 2025. Proposed by HSA and supported by APMP members and associate members, including NIM, NMIJ, KRIS, NIMT, and the National Institute of Standards and Technology (NIST, United States of America), this initiative aims to enhance clinical testing accuracy through an accuracy-based External Quality Assessment (EQA) Programme for clinical laboratories and in-vitro diagnostic (IVD) device manufacturers. The EQA Programme will provide human sera and urine samples for analysis, allowing the participants to benchmark performance against metrologically traceable reference values, identify areas for improvement, and strengthen quality control to support healthcare. As this EQA Programme is accuracy-based, the reference value for each analyte will be metrologically traceable and accompanied by an associated measurement uncertainty. The reference values will be derived from metrology institutes’ primary reference measurement procedures. The institutes providing reference values for all or a sub-set of analytes include HSA, NIM, NMIJ, KRIS, NIMT, and NIST.

Following the 40th APMP General Assembly in November 2024, the APMP Executive Committee approved funding of US\$65,500 to HSA for the initiative. This will cover the purchase of EQA Programme samples and international shipping costs to other reference value providers and EQA Programme co-coordinators in 11 APMP economies (including

Singapore). The initiative is also supported by APAC, APLMF, and the Inter-American Metrology System (SIM).

Additionally, a hybrid workshop with the theme “Capability Building on Measurement of Clinical Markers for NCDs in the APEC Region”, will be held in Singapore on 22–23 April 2025, organised by HSA and funded by APEC. Invited Speakers for the workshop will equip participants with technical skills and knowledge in clinical marker measurement, covering accreditation for clinical laboratories, regulatory standards for IVD manufacturers, metrological traceability, method validation, and measurement accuracy. Study tours will provide firsthand insights into clinical and chemical metrology laboratories.



Other abbreviations found in the picture which are not previously mentioned in the texts of this report are NATA, NCCL, NUH and CGH which refer to the National Association of Testing Authorities, National Centre for Clinical Laboratories, National University Hospital and Changi General Hospital, respectively.

9 Leadership Transition and Re-organisation

Dr Byungjoo Kim who steered the TCQM through the COVID-19 pandemic years after the 37th APMP General Assembly relinquished his chairmanship for the TCQM after the 40th APMP General Assembly in New Delhi. For his dedication and hard work towards the APMP TCQM, Dr Kim received the APMP Technical Award from the APMP Chairperson together with other Technical Committee Chairs and Executive Committee Members who completed serving their 3 or 4-year term.

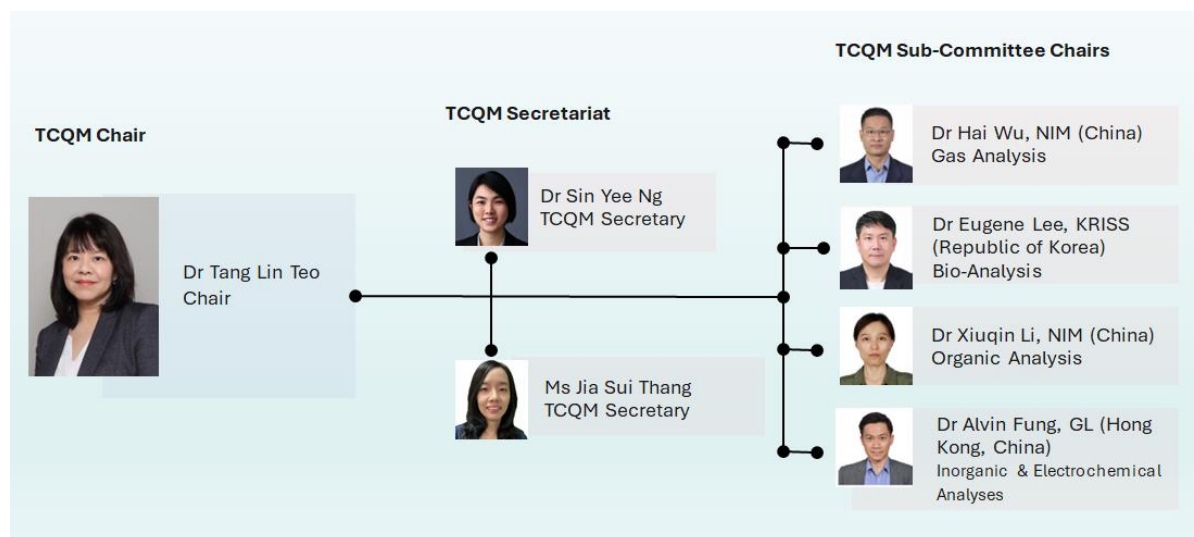


Dr Byungjoo Kim is on the right side of the photograph.

After the 40th APMP General Assembly, Dr Teo took for the reins from Dr Kim to chair the TCQM.

In consultation with the TCQM, Dr Teo introduced the new organisational structure for TC with the formation of four sub-committees chaired by various experts as follows:

- Gas analysis: Dr Hai Wu from NIM
- Bio-analysis: Dr Eugene Lee from KRISS
- Organic analysis: Dr Xiuqin Li from NIM
- Inorganic analysis: Dr Alvin Fung from GL



The reorganisation would overcome constraints of progressing capability building of our member institutes as 1 workshop and 1 TC meeting per year for most areas is insufficient. The sub-committees are expected to bring together institutes with common interests/needs to discuss long term plans, technical issues or gaps in a comparison/study in greater depth, CMC issues, thereby improving the outcomes of the discussions.

10 Up-coming APMP Meetings

The 2025 APMP Mid-Year Meetings are scheduled for June 2025 in Chinese Taipei, hosted by CMS/ITRI.

The 41st APMP General Assembly and Related Meetings are scheduled for November 2025 in Incheon, Republic of Korea, hosted by KRISS.