



Report of the CIPM President on work accomplished since the 26th CGPM

Wynand Louw, CIPM President

November 2022

A decorative graphic on the right side of the slide, consisting of multiple overlapping, concentric arcs in a rainbow color palette (red, orange, yellow, green, blue, purple, red). The arcs are slightly offset from each other, creating a sense of depth and movement.

Working together to
promote and advance
the global comparability
of measurements



A Tumultuous Period in our History

The CIPM at work, March 2019-October 2022

CIPM current members

111th meeting – June 2022 (hybrid)

111th meeting – Preparatory meeting March 2022 (online)

110th meeting – Session II – October 2021 (online)

110th meeting – Session I – June 2021 (online)

109th meeting – October – 2020 (online)

108th meeting – Session II – October 2019 (in person)

108th meeting – Session I – March 2019 (in person)



| | Initial Election | Last Elected |
|--------------------------------------|------------------|--------------|
| President | | |
| Dr W. Louw (South Africa) | 15 May 2013 | 2018 |
| Secretary | | |
| Dr T. Usuda (Japan) | 1 July 2012 | 2018 |
| Vice-Presidents | | |
| Dr J.K. Olthoff (USA) | 16 November 2018 | 2018 |
| Prof. J. Ullrich (Germany) | 15 May 2013 | 2018 |
| Other CIPM members | | |
| Dr F.V. Bulygin (Russian Federation) | 20 November 2014 | 2018 |
| Dr I. Castelazo (Mexico) | 20 November 2014 | 2018 |
| Dr D. del Campo Maldonado (Spain) | 16 November 2018 | 2018 |
| Dr N. Dimarcq (France) | 16 November 2018 | 2018 |
| Dr Y. Duan (P.R. China) | 8 March 2010 | 2018 |
| Dr H. Laiz (Argentina) | 7 December 2016 | 2018 |
| Prof. T. Liew (Singapore) | 20 November 2014 | 2018 |
| Prof. P. Neyezhnikov (Ukraine) | 16 November 2018 | 2018 |
| Dr S.R. Park (Republic of Korea) | 16 November 2018 | 2018 |
| Dr M.L. Rastello (Italy) | 7 December 2016 | 2018 |
| Dr P. Richard (Switzerland) | 20 November 2014 | 2018 |
| Prof. G. Rietveld (Netherlands) | 20 November 2014 | 2018 |
| Dr M. Sené (UK) | 7 December 2016 | 2018 |
| Dr A. Steele (Canada) | 16 November 2018 | 2018 |



Consultative Committee Presidents

The CIPM appointed and reappointed the Presidents of the Consultative Committees for 4-year terms at Session I of its 108th Meeting in March 2019. The current appointments are as follows:

- Consultative Committee for Acoustics, Ultrasound and Vibration (CCAUV): Dr H. Laiz
- Consultative Committee for Electricity and Magnetism (CEEM): Prof. G. Rietveld
- Consultative Committee for Length (CCL): Dr I.A. Castelazo
- Consultative Committee for Mass and Related Quantities (CCM): Dr P. Richard
- Consultative Committee for Photometry and Radiometry (CCPR): Dr M.L. Rastello
- Consultative Committee for Amount of Substance: Metrology in Chemistry and Biology (CCQM): Dr S.-R. Park
- Consultative Committee for Ionizing Radiation (CCRI): Dr M. Sené
- Consultative Committee for Thermometry (CCT): Dr Y. Duan
- Consultative Committee for Time and Frequency (CCTF): Dr N. Dimarcq
- Consultative Committee for Units (CCU): Dr J. Ullrich



CIPM sub-committees and *ad hoc* groups

BIPM Pension Fund Advisory Board (PFAB)

Chairperson: Dr A. Steele.

Members: Mr T. Grenon [External expert], Dr V. Gressier [Staff representative],
Dr M.J.T. Milton [BIPM Director], Mr P. Moussay [Staff representative],
Dr G. Petit [Staff representative], Dr P. Richard,
Mr F. Rojas Ceballos [Executive Secretary],
Dr T. Usuda, Dr T. Witt [Pensioners' representative].

CIPM Sub-Committee on Finance

Chairperson: Dr P. Richard.

Members: Dr Y. Duan, Dr W. Louw, Dr M.J.T. Milton [BIPM Director],
Dr A. Steele [*ex-officio* member], Dr T. Usuda.

CIPM Sub-Committee on Strategy

Chairperson: Dr W. Louw.

Members: Dr D. del Campo Maldonado, Mr A. Henson [BIPM Contact],
Dr H. Laiz,
Prof. T. Liew, Prof. P. Neyezhnikov, Dr J.K. Olthoff, Dr M.L. Rastello,
Prof. G. Rietveld, Dr A. Steele, Prof. J. Ullrich.

CIPM Task Group on the Digital SI

Chairperson: Prof. J. Ullrich.

Members: Dr I. Castelazo, Dr Y. Duan, Mr A. Henson [BIPM contact], Dr H. Laiz,
Prof. T. Liew, Dr M.J.T. Milton [BIPM Director], Dr J.K. Olthoff, Dr M. Sené,
Dr A. Steele.

Expert Group: Prof. S.J. Chalk (UNF), Dr D. Nahuel Coppa (INTI), Dr R. Coulon (BIPM),
M. in. Sc F.J. Flamenco Sandoval (CENAM), Prof. A. Forbes (NPL),
Dr B. Hall (MSL), Dr R. Hanisch (NIST), Dr K. Hosaka (NMIJ/AIST),
Dr D. Hutzschenreuter (Convenor, PTB), Prof. Dr C.-S. Kang (KRISS),
Dr J.R. Miles (BIPM), Dr S. Picard (BIPM), Mr R. White (NRC).

CIPM Working Group on Data

Chairperson: Prof. T. Liew.

Members: Dr F.V. Bulygin, Dr I.A. Castelazo, Dr H. Laiz, Dr M.L. Rastello, Dr M. Sené,
Prof. J. Ullrich.

CIPM *ad hoc* Working Group on Conditions of Employment

Chairperson: Dr T. Usuda.

Members: Dr I. Castelazo, Mr P. Imbert [BIPM staff in support],
Mr L. Le Mée [Staff representative], Dr M.J.T. Milton [BIPM Director],
Dr M.L. Rastello, Dr P. Richard, M. F. Rojas Ceballos [BIPM staff in support].



Actions arising from Resolutions taken at the 26th CGPM (2018)



Resolutions 1, 2 and 3 of the 26th CGPM (2018)

- Resolution 1 - On the revision of the International System of Units (SI)
- Resolution 2 - On the definition of time scales
- Resolution 3 - On the objectives of the BIPM

Progress related to these three Resolutions are picked up in the CIPM Strategy, the proposal for the BIPM Work Programme, and in the draft Resolutions to be presented in the coming days.



Resolution 1 of the 26th CGPM (2018)

- On the revision of the International System of Units (SI)

“By this action you will set up a measurement system that will rely entirely on the fundamental constants of nature.

The benefits of this choice can only favour new technologies.”

*Professor Sébastien Candel,
President of the Académie des sciences de Paris and President of
the CGPM for its 26th meeting*



Resolution 2 of the 26th CGPM (2018)

- On the definition of time scales

This Resolution called on all relevant unions and organizations to work towards a common understanding on reference time scales, so as to meet the needs of the current and future user communities, and to work together to improve further the accuracy of the prediction of UT1 - UTC and the method for its dissemination to satisfy the future requirements of users.

We will hear more when Draft Resolution D is presented on Thursday.



CIPM Strategy 2030+ in Response to the Resolutions

The CIPM decided to expand the terms of reference of the CIPM Sub-Committee on Strategy to include advice to the CIPM on the wider strategic directions of metrology as follows:

| Item | Description |
|------|---|
| 1 | Responding to Evolving Needs for Metrology |
| 2 | Addressing key scientific challenges to advance the global measurement system |
| 3 | Strategy for deepening engagement with other international organizations on measurement science issues |
| 4 | Reviewing the strategy for the future membership of the organization Resolution 3 (2018): On the objectives of the BIPM |
| 5 | Modernizing the operations of the organization and Governance (including liaison with the <i>ad hoc</i> SR WG) |



CIPM Strategy development update

#1 - responding to the evolving needs for metrology

A major piece of work that has been undertaken with wide consultation

*Five main evolving needs in metrology were identified, the ‘**Grand Challenges**’ (Climate change and environment, Health and life sciences, Food safety, Energy, Advanced manufacturing) that you will hear more about this week from Prof. Rietveld and Dr del Campo.*

Importantly, two additional cross-cutting horizontal themes were identified.

- **Digital transformation**
- So called ‘**new**’ **metrology** (Systems metrology, imbedded traceability, artificial intelligence, industry 4.0, etc.)

For each, actions by the CIPM and BIPM Headquarters are proposed to promote and enhance international cooperation in these areas. We will revisit this topic when we present Draft Resolution A



CIPM Strategy development update #1: First outcomes

Note: the present CIPM vertical structures (CCs) are not optimal to effectively address the new, horizontal challenges that require a multidisciplinary approach

⇒ CIPM proposal for addressing the Grand Challenges:

- To create appropriate forums to shape and coordinate the metrology community's response to the identified grand challenges with the objective to coordinate new possibilities for metrology to have an impact on global cross-cutting measurement challenges.
- To start to develop a new vision for the work of the BIPM that builds on this report and should be consulted upon with the global metrology community before the 28th meeting of the CGPM, which is expected to be in 2026.

*The CIPM decided to establish a **Sectorial Task Group on Climate Change and Environment***



Digital Transformation

30 March 2022

Joint Statement of Intent

On the digital transformation in the international scientific and quality infrastructure

Recognising that

- governments, industry, academia, and civil society have been working toward comprehensive digital transformation for many years, and, in so doing, are increasingly
 - establishing systems to collect, aggregate, analyse and interpret digital data;
 - introducing networked sensor systems for diverse scientific and industrial applications;
 - sharing data at local, national, regional, and international scales;
- the scientific community has made significant progress in establishing reliable foundations for digital data interchange and management, including the FAIR principles for data management and stewardship;
- the organisations of the international quality infrastructure (metrology, accreditation, standardization, and conformity assessment) have a critical role working together to ensure sustainable economic development;
- the International System of Units (SI) plays a particular role in the international quality infrastructure providing confidence in the accuracy and global comparability of measurements needed for international trade, manufacturing, human health and safety, protection of the environment, global climate studies, and scientific research;
- maintaining this confidence in the accuracy and global comparability of measurements will require the creation and adoption of a full digital representation of the SI, including robust, unambiguous, and machine-actionable digital representations of units of measurement and of measurement results and uncertainties;
- progress on global challenges such as this requires the participation of, and critical thinking from, diverse communities;
- successfully effecting such a comprehensive digital transformation for metrology and ensuring its benefits are fully realised will require the active participation of a wide range of stakeholders, particularly other members of the International Quality System;

We the undersigned undertake to support in a way appropriate to each organisation the development, implementation, and promotion of the SI Digital Framework as part of a wider digital transformation of the international scientific and quality infrastructure.



BIPM



CODATA



IMEKO



ILAC

Joint Statement 2022

“We the undersigned undertake to support in a way appropriate to each organisation the development, implementation, and promotion of the SI Digital Framework as part of a wider digital transformation of the international scientific and quality infrastructure.”



CIE



ISO



OIML



IEC



CIPM Strategy development update

#2 - addressing key scientific challenges to advance the global measurement system

The key scientific challenges to advance the global measurement system were identified and are articulated in terms of current and future actions to better realize the SI.

There are two that could be described as the key scientific challenges for the SI:

- redefinition of the second – this is the subject of Draft Resolution E*
- redefinition of the candela – the current definition meets current needs; this remains a challenge for the future*

Alongside the scientific challenges, we can see evidence of progress, for example the need to extend the range of prefixes in the SI, which is addressed in Draft Resolution C.



CIPM Strategy development update

#3 - strategy for deepening engagement with other international organizations on measurement science issues

The CIPM concluded that the strategy for engagement with other IOs is mature and the CIPM oversight provides good governance.

- The BIPM International Liaison and Communication Department was strengthened to maintain the relationships and interactions.*
- CIPM members were assigned to each strategic liaison to assist the staff with the strategic interactions, and the liaison arrangements are being put into practice. I will return to the recent liaison initiatives later.*



CIPM Strategy development update

#3 - International and technical liaisons

In the past four years the CIPM and the BIPM staff continued to interact with other international organizations for whom metrology matters

The BIPM formalized its existing liaisons through agreements, arrangements, or memorandums of understanding with the following international organizations:

- *International Union of Pure and Applied Chemistry (IUPAC)*
- *International Telecommunication Union (ITU)*
- *Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO)*
- *Committee on Data of the International Science Council (CODATA)*
- *International Federation of Clinical Chemistry and Laboratory Medicine (IFCC)*



CIPM Strategy development update

#3 - International and technical liaisons



OIML

A Joint Task Group between the BIPM and the OIML was set up with the aim of having a “single voice for metrology” and to foster enhanced cooperation between the two organizations. The Task Group met a number of times. The group consists of the CIPM President, BIPM Director, OIML President and the OIML Director.

The two organizations collaborate in many ways:

- World Metrology Day, including the new initiative towards gaining recognition by UNESCO
- Joint development of documents (Notably the “*National Metrology Systems - Developing the institutional and legislative framework*”)
- Liaison activities
- Representation
- Operational and institutional matters
- Capacity building



CIPM Strategy development update

| Item | Description | Status | Outputs |
|------|--|--------------------------------|--|
| 1 | Responding to Evolving Needs for Metrology | Consultation | Draft report to discuss with CCs and NMIs; draft Resolution |
| 2 | Addressing key scientific challenges to advance the global measurement system | Consultation | Discussion document and reports from CCTF and CCU, four draft Resolutions |
| 3 | Strategy for deepening engagement with other international organizations on measurement science issues | Completed and actions continue | Several MOUs concluded and procedures in place |
| 4 | Reviewing the strategy for the future membership of the organization | Consultation | Draft Resolution to request a mandate from the CGPM |
| 5 | Modernizing the operations of the organization and Governance (including liaison with the <i>ad hoc</i> SR WG) | Ongoing | CIPM RoP, Code of Conduct, several policies and procedures on hybrid meetings, decisions by correspondence, etc. |



CIPM Strategy development update

#4 - reviewing the strategy for future membership of the organization

Current Situation:

64 Member States

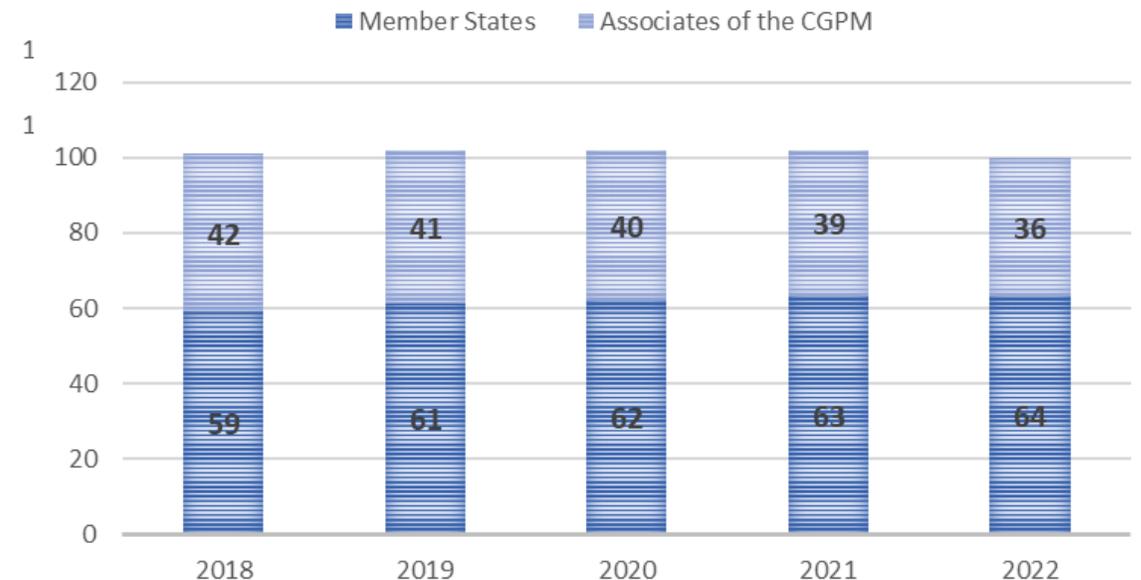
New Member State (and date of accession):

– Morocco 24 May 2019

Member States that acceded to the Metre Convention from Associate status (and date of accession):

– Ecuador 6 August 2019
– Belarus 13 January 2020
– Estonia 19 January 2021
– Costa Rica 5 September 2022

MEMBER STATES AND ASSOCIATES
(STATES AND ECONOMIES)



CIPM Strategy development update

#4 - reviewing the strategy for future membership of the organization

Current Situation:

36 Associate States

New Associate of the CGPM (and date of becoming an Associate):

- Cambodia 1 January 2021

Reinstated as an Associate of the CGPM (and date of reinstatement):

- Zimbabwe 8 February 2022

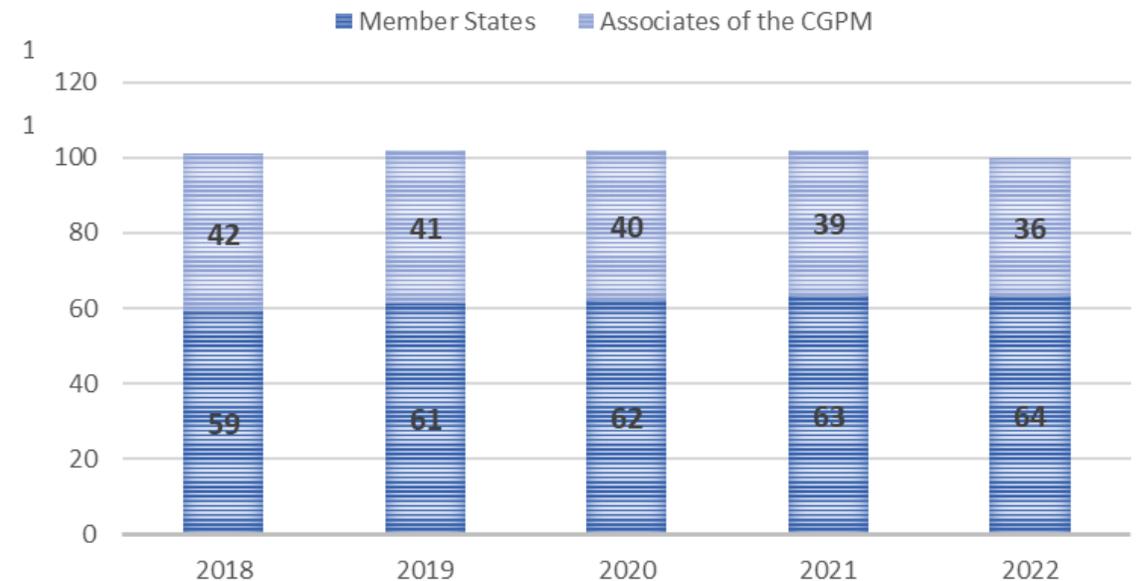
Excluded Associates of the CGPM (and date of exclusion):

- Cuba 1 January 2022
- Sudan 1 January 2022

Withdrawn as an Associate of the CGPM (and date of withdrawal):

- Seychelles 1 January 2022

MEMBER STATES AND ASSOCIATES
(STATES AND ECONOMIES)



CIPM Strategy development update

#4 - reviewing the strategy for future membership of the organization

- *In the past two decades or so, participation in the activities of the BIPM has grown significantly.*
- *States with emerging metrology systems, often having very limited capabilities and resources, find the present options to participate are not appropriate for their needs (recalling that ‘Associate State’ status is focused around CIPM MRA participation).*
- *Time to examine the current application of Article III of the Metre Convention and report to the CGPM at its 28th meeting on how this Article might be applied in order to facilitate lasting and universal adherence to the Convention.*
- *Resolution F “**On universal adherence to the Metre Convention**”,*



CIPM Strategy development update

#5 - modernizing the operations of the organization

The CIPM has continued with its comprehensive review of governance since the 26th CGPM.

- *The CIPM approved the CIPM Rules of Procedure and the CIPM Code of Conduct.*
- *The CIPM is seeking a mandate from the 27th CGPM to continue developing the By-Laws for presentation and approval at the 28th CGPM (2026).*

The Member States will be consulted extensively during further preparation of the By-Laws to ensure that they are included at all stages of the development process.



CIPM Strategy development update

CGPM 2022

Five resolutions to improve the system and advance the SI

CGPM requested to mandate the CIPM to develop proposals and to consult on broader participation

Consultation with CCs and stakeholders on Strategy reports

CIPM 2022-2026

CIPM consults with Member States and the community on popular new vision/mission, model for broader participation, investigate best practice for IOs

Concludes and presents *Strategy 2030+* to the community in 2025 at occasion of the 150th year celebration of the Metre Convention

CGPM 2026

Draft Resolutions presented to Member States:

- modernizing the organization, new vision/mission
- structures,
- funding models,
- broader participation

for full implementation



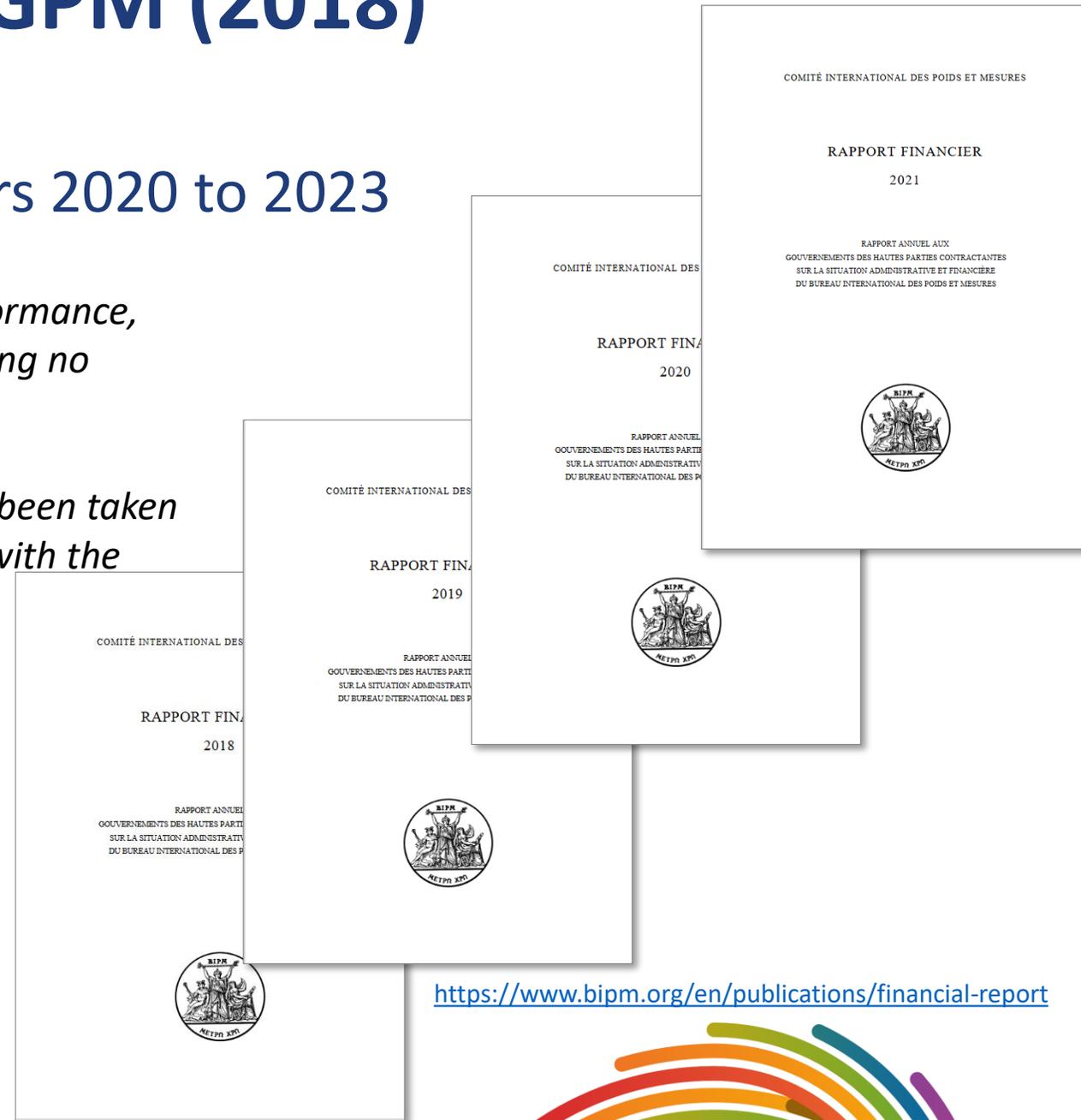
Resolution 4 of the 26th CGPM (2018)

On the dotation of the BIPM for the years 2020 to 2023

The CIPM has overseen the BIPM's budgets and financial performance, and successive Audit Reports for the years 2018-2021 containing no substantive qualifications.

The BIPM has remained within budget and further steps have been taken to address future financial challenges associated particularly with the BIPM Pension and Provident Fund.

The Chair of the CIPM Sub-Committee on Finance and the BIPM Director will report further.



<https://www.bipm.org/en/publications/financial-report>



Resolution 5 of the 26th CGPM (2018)

On the financial arrears of Member States and the process of exclusion

- the CIPM shall implement Article 6 paragraph 8 of the Annexed Regulations,
- the CIPM shall address the situation where historical practice has resulted in the accumulation of arrears,

I am pleased to report that this topic has been fully addressed.



CIPM Consultative Committees

The CIPM Consultative Committees (CCs)

Notwithstanding the extraordinary circumstances during the Covid-19 pandemic, the CCs continued with their important tasks. Meetings were held online, and the comparison of capabilities continued. The highlights will be reported by the CC Presidents during the week.

CCM: Regarding the redefinition of the kilogram, the first key comparison of realization experiments CCM.M-K8 was completed in 2019. Mass dissemination from the Consensus Value of the kilogram came into force on 1 February 2021 and the CMCs of 31 NMIs were adjusted in the KCDB.

The CCRI Radionuclide Therapy and Quantitative Imaging Working Group (CCRI-RTWG) was formed to bring together metrologists and stakeholders from the medical community to address measurement issues in the rapidly developing fields of radionuclide therapy and quantitative nuclear imaging.

CCTF prepared two Draft Resolutions: D - On the use and future development of UTC and E - On the future redefinition of the second



CIPM Consultative Committees

*The CCL updated the *Mise en Pratique* document for the metre to include the Si lattice as a secondary representation of the metre.*

The introduction of the revised SI on 20 May 2019 led to a step change of about 1 part in 10^7 for quantities related to voltage and of 2 parts in 10^8 for quantities related to resistance. The CCEM had published guidelines for use by NMIs and their customers on how to deal with these changes.

The CCAUV formalized a liaison between the joint WG ISO/TC 12 (Quantities and units) and IEC TC 25 (Quantities and units, and their letter symbols). This is the consequence of the strong collaboration between CCAUV and ISO/TC12 and IEC TC25, for the revision of the ISO 80000 series in 2018-2019.

The CCT reported work to improve fever screening on a global basis during the COVID-19 pandemic and strong engagement with the meteorological community to improve traceability of the “Essential Climate Variables” such as air temperature and humidity.



CIPM Consultative Committees

The CCU prepared Draft Resolution C “On the extension of the range of SI prefixes” to take into account the needs of data science to express large quantities of digital information.

*The CCQM held 196 meetings and workshops online from March 2020 to October 2022, including two Plenary sessions. From 2019 to 2022, **50** new CCQM Comparisons were initiated and **47** Comparison reports were published.*

The CCPR reported on collaboration with the WMO to ensure the traceability of irradiance measurements to the SI. A joint workshop “Metrology for climate action” was held in September 2022. Work towards a future redefinition of the candela was also reported and “Key Scientific questions of the SI unit of luminous intensity, the candela” was presented to the 25th CCU (2021).



Other notable CIPM initiatives or actions



Metrology in the Fight against Covid-19

The CIPM initiated a repository of the activities of the NMIs in the fight against the pandemic.

To date 65 reports on activities and projects, as well as national summaries, were received.



Metrology in the fight against Covid-19



The CIPM President has asked NMIs to share examples of how their work is supporting the fight against the pandemic – for example by applying expertise in measurement science to assist with the development of personal protection equipment, medical devices, certified reference materials or have joined efforts to find a vaccine.

The responses received from the NMIs are listed in these pages.



Concluding remarks

- *The organization was strengthened during very demanding circumstances*
- *The Headquarters staff, the Consultative Committee members and the RMOs continued with our main purpose –**advancing the global measurement system***
- *CIPM members 2018-2022 dealt with several practical and sensitive issues from the past*
- *Substantial progress was made towards the modernization of the Organization*
- *The Draft Resolutions presented to this Conference aim to take the Organization to 2030 and beyond as a major player in the international Quality Infrastructure, **and representative of all nations around the world***





The Team of
2018-2022
wishes you
well!

