



## Snapshots of IO Practices

### The Joint Committee for Guides in Metrology (JCGM)

#### Organisation(s): Bureau International des Poids et Mesures (BIPM)

*The Snapshots of IO Practices present examples of specific efforts undertaken by an international organisation to work towards more effective international instruments. They aim to highlight examples of practices within the five focus areas of the Partnership of International Organisations for Effective International Rulemaking (IO Partnership), namely the variety and development of international instruments, their implementation, evaluation, ensuring stakeholder engagement, and co-ordination among IOs. The snapshots are submitted by the secretariats of the relevant international organisations implementing the relevant practice. The practices were compiled by the OECD Secretariat and focal points of the IO Partnership (UNCITRAL, OIE, WHO, ISO, WCO, BIPM, and SIECA), with a brief review to ensure consistency and comparability of the information provided within the snapshots. The inclusion of a practice in these snapshots implies no endorsement or assessment of that practice on the part of the OECD Secretariat or the focal points of the IO Partnership.*

1	Overview of the Practice	Answers	Comments and intersections
1.1	Organisation	International Bureau of Weights and Measures (BIPM)	
1.2	Area of relevance among the IO partnership focus themes (variety of instruments, implementation, stakeholder engagement, evaluation, co-ordination).	Co-ordination (in the development of instruments)	
1.3	Name of the practice	The Joint Committee for Guides in Metrology (JCGM)	
1.4	Name of person(s) completing the template	Andrew Henson Rahima Guliyeva	

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2	Description of the Practice	Answers	Comments and intersections
2.1	Please describe the practice shortly, providing information on its core features.	<p>The Joint Committee for Guides in Metrology (JCGM), chaired by the Director of the BIPM, is composed of broadly-based eight international organisations working in the field of metrology. Its terms of reference are to develop and maintain, at the international level, guidance documents addressing the general metrological needs of science and technology, and to consider arrangements for their dissemination. In particular, the Joint Committee takes responsibility for maintaining and up-dating the <i>International vocabulary of basic and general terms in metrology (VIM)</i> and the <i>Guide to the expression of uncertainty in measurement (GUM)</i> what are in effect these reference documents for the international metrology community, including more than 70 000 calibration and testing laboratories worldwide. The JCGM has taken over responsibility from the ISO Technical Advisory Group 4 (TAG 4), which had developed the GUM and the VIM.</p> <p>The current eight member organisations of the JCGM are:</p> <p>two inter-governmental organisations concerned with metrology:</p> <ol style="list-style-type: none"> <li>1. the BIPM,</li> <li>2. the International Organization of Legal Metrology (OIML),</li> </ol> <p>the two principal international standardisation organisations:</p> <ol style="list-style-type: none"> <li>3. the International Organization for Standardization (ISO),</li> <li>4. the International Electrotechnical Commission (IEC),</li> </ol> <p>three international unions:</p> <ol style="list-style-type: none"> <li>5. the International Union of Pure and Applied Chemistry (IUPAC),</li> <li>6. the International Union of Pure and Applied Physics (IUPAP),</li> <li>7. the International Federation of Clinical Chemistry and Laboratory Medicine (IFCC),</li> </ol> <p>one international accreditation organisation:</p> <ol style="list-style-type: none"> <li>8. the International Laboratory Accreditation Cooperation (ILAC).</li> </ol>	

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2.2	What are the objectives of the practice?	To ensure that the worldwide metrology community uses common and consistent language for measurement, and to ensure appropriate and scientifically correct treatment of measurement uncertainty. This is particularly important for assessing conformity including, for example in a regulatory context.	
2.3	What have been the key results of the practice?	<p>The fundamental reference documents - Guides in Metrology (VIM and GUM) developed by the JCGM, are adopted worldwide. Crucially this allows the worldwide metrology community, regulators and those needing to comply with and enforce regulation amongst them, to use common terminology and to understand how measurement uncertainty can be evaluated (vital for establishing compliance with regulatory limits).</p> <p>Each year there are more than 100 000 downloads of the documents in the GUM suite from the BIPM website. The documents have been translated into many different languages. For example, the VIM, published by the JCGM in English and French, has been translated into a number of other languages, including: <i>Arabic, Catalan, Croatian, Czech, German, Hungarian, Italian, Japanese, Portuguese (Portugal and Brazil), Romanian, Russian, Serbian, Spanish (Spain and Peru), Thai, Turkish, and Ukrainian.</i></p> <p>Electropedia (the International Electrotechnical Vocabulary, also known as the "IEV Online"), produced by the IEC, contains all the terms and definitions in the IEV which is published also as a set of publications in the IEC 60050 series that can be ordered separately from the IEC webstore. Electropedia includes the VIM.</p> <p><a href="https://www.electropedia.org/iev/iev.nsf/6d6bdd8667c378f7c12581fa003d80e7?OpenForm">https://www.electropedia.org/iev/iev.nsf/6d6bdd8667c378f7c12581fa003d80e7?OpenForm</a></p>	

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2.4	In what year was the practice introduced?	<p>The JCGM was established in 1997.</p> <p>The GUM was published in 1993, corrected and reprinted in 1995.</p> <p>The first edition of the VIM was published in 1984. The second edition was published in 1993 and the third edition in 2012.</p>	
2.5	Has the practice been updated/reformed since then? If yes, when and how has it evolved over time?	<p>Yes.</p> <p>In 2005, the ILAC officially joined the seven founding international organisations.</p> <p>The JCGM Charter has been agreed in 2009.</p>	
2.6	What do you consider to be the primary strengths of the practice?	<p>The GUM establishes general rules for evaluating and expressing uncertainty in measurement that can be followed at various levels of accuracy and in many fields — from the shop floor to fundamental research. Therefore, the principles of this Guide are intended to be applicable to a broad spectrum of measurements. In the past the GUM was predominantly used in physical metrology. Now the GUM and its Supplements are being applied in chemistry, biology and medicine and such diverse areas as forensic science, legal metrology and astronomy.</p> <p>The VIM is a common reference for scientists and engineers — including physicists, chemists, medical scientists — as well as for both teachers and practitioners involved in planning or performing measurements, irrespective of the level of measurement uncertainty and irrespective of the field of application. It is a reference for governmental and intergovernmental bodies, trade associations, accreditation bodies, regulators, and professional societies. Concepts used in different approaches to describing measurement are presented together. The Vocabulary is more than a collection of terms, and it defines terms and concepts related to metrology.</p>	

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2.7	<p>What do you consider to be the main challenges faced during the implementation of the practice?</p>	<p>Prior to the development and adoption of these guides, the use of metrological vocabulary varied widely both geographically and across sectors and without any consensus. The evaluation of measurement uncertainty, in particular in relation to conformity assessment and regulatory limits, was being addressed with different and inconsistent approaches. Therefore the main challenge was creating the necessary consensus to enable the development and adoption of these common guides.</p>	<p>Intersection with area of IO Partnership on 'Strengthening the implementation of IO instruments' (WG2)</p>
2.8	<p>Does the practice have a formal/normative basis within the organisation or is it conducted informally? Does this basis make the practice mandatory or voluntary? If there is formal basis, please provide the relevant link or documentation.</p>	<p>There is a Charter that describes the JCGM, available at <a href="https://www.bipm.org/en/committees/jc/jcgm">https://www.bipm.org/en/committees/jc/jcgm</a></p> <p>The documents, published as guidance, are widely adopted but are not mandatory. Some countries use the GUM and VIM as standards to be followed mandatorily.</p>	
2.9	<p>At what frequency is the practice applied? i.e. is it conducted once or on an iterative basis?</p>	<p>The JCGM and its Working Groups meet periodically and revised guidance documents are issued as necessary.</p> <p>The third edition of the VIM has been prepared by the JCGM -WG2 and the work on its fourth edition is well advanced.</p> <p>The JCGM-WG1 is producing a series of documents to accompany the GUM. The first four of these documents have been approved and are available for download as PDF files. Printed copies are available for purchase from ISO. The following GUM document is at the stage of final approval by the member organisations of the JCGM:</p> <ul style="list-style-type: none"> <li>• Guide to the expression of uncertainty in measurement - Part 6: Developing and using measurement models. JCGM GUM-6:2020</li> </ul> <p>Further documents are at an earlier stage of development.</p>	

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2.10	Is this practice applied systematically, (for example, with respect to every normative instrument, according to specific criteria or on an <i>ad hoc</i> basis)?	Yes, broadly.	Intersection with area of IO Partnership on 'Strengthening the implementation of IO instruments' (WG2)
2.11	Please provide specific details or examples to illustrate the practice (including supporting links and documents).	<p>The GUM and accompanying documents are available at <a href="https://www.bipm.org/en/publications/guides/#gum">https://www.bipm.org/en/publications/guides/#gum</a></p> <p>The VIM is available at <a href="https://www.bipm.org/en/publications/guides/#vim">https://www.bipm.org/en/publications/guides/#vim</a>.</p> <p>In addition, these guides are also published as ISO guides at:  <a href="https://www.iso.org/standard/50461.html">https://www.iso.org/standard/50461.html</a>  <a href="https://www.iso.org/standard/50462.html">https://www.iso.org/standard/50462.html</a>  <a href="https://www.iso.org/standard/50463.html">https://www.iso.org/standard/50463.html</a>  <a href="https://www.iso.org/standard/46383.html">https://www.iso.org/standard/46383.html</a>  <a href="https://www.iso.org/standard/50465.html">https://www.iso.org/standard/50465.html</a>  <a href="https://www.iso.org/standard/45324.html">https://www.iso.org/standard/45324.html</a></p>	
<b>3</b>	<b>Design of the Practice</b>	<b>Answers</b>	<b>Comments and intersections</b>
3.1	Who designed the practice (for example, was it developed internally, in collaboration with other organisations, etc?)	<p>The practice was developed in collaboration with other organisations.</p> <p>In 1977, prompted by concerns raised from the one of the leading National Metrology Institutes (NMI), and recognising the lack of international consensus on the expression of uncertainty in measurement, the world's highest authority in metrology, the International Committee for Weights and Measures (CIPM), requested the BIPM to address the problem in conjunction with the national standards laboratories and to make a recommendation.</p> <p>The BIPM prepared a detailed questionnaire covering the issues involved and distributed it to 32 national metrology laboratories known to have an interest in the subject (and, for information, to five international organisations). By early 1979 responses were received from 21 laboratories.</p>	

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		<p>Almost all believed that it was important to arrive at an internationally accepted procedure for expressing measurement uncertainty and for combining individual uncertainty components into a single total uncertainty. However, a consensus was not apparent on the method to be used. The BIPM subsequently convened a meeting for the purpose of arriving at a uniform and generally acceptable procedure for the specification of uncertainty. This Working Group on the Statement of Uncertainties developed Recommendation INC-1 (1980), Expression of Experimental Uncertainties. The CIPM approved the Recommendation 1 (CI-1981) in 1981 and reaffirmed it in 1986. The CIPM Recommendation is the only recommendation concerning the expression of uncertainty in measurement adopted by an intergovernmental organisation.</p> <p>From these origins the current Joint Committee, the JCGM, became the body responsible for the GUM and VIM.</p>	
3.2	Which stakeholders were engaged with in the design of the practice?	International organisations including international scientific unions, national metrology institutes and national standardisation bodies.	Intersection with area of IO Partnership on 'Ensuring effective stakeholder engagement' (WG3)
3.3	How long did it take to design the practice?	<p>Around four years (1977-1981) to produce the first guidance.</p> <p>Almost 20 years (1977-1997) to evolve and establish the JCGM in its (broadly) current format.</p>	
3.4	What resources were needed to design the practice initially (i.e., staff, budget etc.)?	Staff, budget to attend the meetings and draft concept guidance.	

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3.5	What challenges were encountered during the design of the practice and how were they overcome?	See replies to 2.7 and 3.1  The lack of international consensus was the main challenge. It was overcome by consultation of relevant stakeholders and developing recommendations.	
3.6	Has the practice been tested before implementation (i.e. pilot phase)? If yes, please describe.	The consensus nature of the activities are such that a pilot phase was not necessary, noting however that guidance documents have been revised a number of times.	Intersection with area of IO Partnership on 'Strengthening the implementation of IO instruments' (WG2)
<b>4</b>	<b>Implementation of the Practice</b>		<b>Comments and intersections</b>
4.1	Which units are responsible for implementing the practice within your IO?	The work is undertaken by two Working Groups – the Working Group 1 (JCGM/WG1) addresses the GUM and Working Group 2 (JCGM/WG2) addresses the VIM.  The JCGM is chaired by the Director of the BIPM. The Executive Secretary of the JCGM and Executive Secretary of the JCGM/WG 2 is provided by the International Liaison and Communication Department. The Executive Secretary of the JCGM/WG 1 is provided by a BIPM scientific department.	Intersection with area of IO Partnership on 'Strengthening the implementation of IO instruments' (WG2)
4.2	Are IO members involved in implementing the practice? If so, how?	Yes, IO members refer/use the VIM and GUM in their national practices, or through the adoption of international standards referencing the VIM and GUM.	Intersection with area of IO Partnership on 'Strengthening the implementation of IO instruments' (WG2)
4.3	Are external actors beyond the organisation or its membership involved in implementing the practice? If so, how?	Yes, for example accredited laboratories worldwide comply with ISO/IEC 17025 which makes reference to the VIM and GUM. Thus, the reach is wider than 62 Member States and 40 Associate States and Economies.	Intersection with area of IO Partnership on 'Strengthening the implementation of IO instruments' (WG2)



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4.4	Which resources are needed to implement the practice (for example, staff and budget)?	Staff, budget (for example, for translation of guides into national languages).  Laboratories complying with the GUM will need to allocate resources for necessary measurement uncertainty evaluation.	Intersection with area of IO Partnership on 'Strengthening the implementation of IO instruments' (WG2)
<b>5</b>	<b>Outputs and Evaluation of the Practice</b>	<b>Answers</b>	<b>Comments and intersections</b>
5.1	Has the practice been evaluated or reviewed?	The validity and relevance of the guides are evaluated on an ongoing basis by the metrology community leading to the periodic revision, where necessary.  The publication of the guides is subjected to formal approval by the member organisations of the JCGM. The approval is not automatic, the organisations consult with their members and there was a case in which the revision of the one of the guides was rejected.	Intersection with area of IO Partnership on 'Developing a greater culture of evaluation of IO rules and standards' (WG4)
5.2	If yes, who carried out the evaluation (please specify whether it was done internally or externally)	The evaluation is carried out by the metrology community including NMIs and notably via ILAC by more than 70 000 calibration and testing laboratories worldwide.	Intersection with area of IO Partnership on 'Developing a greater culture of evaluation of IO rules and standards' (WG4)
5.3	If yes, please describe the evaluation methodology? (for example, were any quantitative or qualitative indicators/criteria used to measure/assess the outcomes of the practice?).	The members of the eight international organisations forming the JCGM represent the major constituency involved in the day-to-day use of guides. Consequently there is a feedback mechanism regarding the ongoing effectiveness of the guides. When there is a consensus within the metrology community that a revision or extension is needed for either the VIM or GUM the JCGM decides whether or not a new mandate shall be set and take a formal revision using qualitative indicators as the evaluation methodology.	Intersection with area of IO Partnership on 'Developing a greater culture of evaluation of IO rules and standards' (WG4)

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5.4	If yes, what were the conclusions of the evaluation, and has the practice evolved subsequently? If possible, please attach related documents or provide a link.	The JCGM adopts decisions on the review and revision of the guides (VIM and GUM), where necessary. As a result of such evaluation the new versions of the guides (or also the Annexes in the case of the GUM) are developed.	Intersection with area of IO Partnership on 'Developing a greater culture of evaluation of IO rules and standards' (WG4)
6	<b>Additional comments and information</b>	<b>Answers</b>	<b>Comments and open questions</b>
6.1	Is there any more information or documentation that would be valuable to share in relation to the practice (for example, links, reports, meeting minutes, supporting documents)?	<a href="https://www.bipm.org/en/committees/jc/jcgm/wg/jcgm-wg1-gum">https://www.bipm.org/en/committees/jc/jcgm/wg/jcgm-wg1-gum</a> <a href="https://www.bipm.org/en/committees/jc/jcgm/wg/jcgm-wg2-vim">https://www.bipm.org/en/committees/jc/jcgm/wg/jcgm-wg2-vim</a>	
<b>Sources</b>			
<a href="https://www.bipm.org/en/committees/jc/jcgm/">https://www.bipm.org/en/committees/jc/jcgm/</a> <a href="https://www.bipm.org/en/committees/ci/cipm/older-meeting-reports">https://www.bipm.org/en/committees/ci/cipm/older-meeting-reports</a> , Proceedings of the 70 <sup>th</sup> meeting of the CIPM <a href="https://www.iso.org/sites/JCGM/JCGM-introduction.htm">https://www.iso.org/sites/JCGM/JCGM-introduction.htm</a> <a href="https://www.iso.org/sites/JCGM/GUM-introduction.htm">https://www.iso.org/sites/JCGM/GUM-introduction.htm</a> <a href="https://www.iso.org/sites/JCGM/VIM-introduction.htm">https://www.iso.org/sites/JCGM/VIM-introduction.htm</a> <a href="https://www.iso.org/obp/ui/#iso:std:iso-iec:guide:98:-3:ed-1:v2:en">https://www.iso.org/obp/ui/#iso:std:iso-iec:guide:98:-3:ed-1:v2:en</a>			