Metrology – Its Role in Quality and Safety of Human Life

Dr Barry Inglis

President, CIPM

APMP Symposium on "Metrology - Improving the Quality and Safety of Human Life",
Da Nang, Vietnam, 16 November 2016

Bureau International des Poids et Mesures

Overview

- Influence factors impacting quality of life and safety
- The Global and National Infrastructures - in support of quality of life and safety
- Credible measurement and testing essential for quantification of influence factors
- Metrology and the international measurement system
- Measurement Standards and measurement traceability to SI
- Challenges for Metrology in addressing quality of life and safety issues
- Conclusion

Bureau International des Poids et Mesures

Influence Factors impacting Quality of Life and Safety

- Socio-political – societal structure/objectives, regulation
- Environment – air, water quality
- Food – quantity, quality, safety
- Transport – road, rail, air and sea
- Energy – availability, reliability
- Built environment – housing, sanitation, building codes, regulation
- Health – medical services, pathology, therapeutic application of radiation, drugs
- Work practices – codes of practice, workplace environment

Climate/Natural phenomena:

- Seismic activity – seismic monitoring, prediction
- Extreme weather conditions – meteorology, forecasting
- …….

Bureau International des Poids et Mesures

Interactive Challenges

- Transport vs environment
- Trade, economy – vs environment, quality of life, safety
- Manufacturing, employment vs regulation, environment
- Energy generation/distribution vs environment, health and safety
- National vs multinational interests – energy, water, air quality

Bureau International des Poids et Mesures

Quantification of Influence Factors

To control, monitor, regulate or to take socio-political decisions on influence factors in the interest of maintaining/improving quality of life and safety requires quantification through credible measurement and testing.

Resolution of cross-border disputes, resolution of national vs international interests impacting quality of life and safety requires credible, internationally accepted measurement and testing.

Bureau International des Poids et Mesures

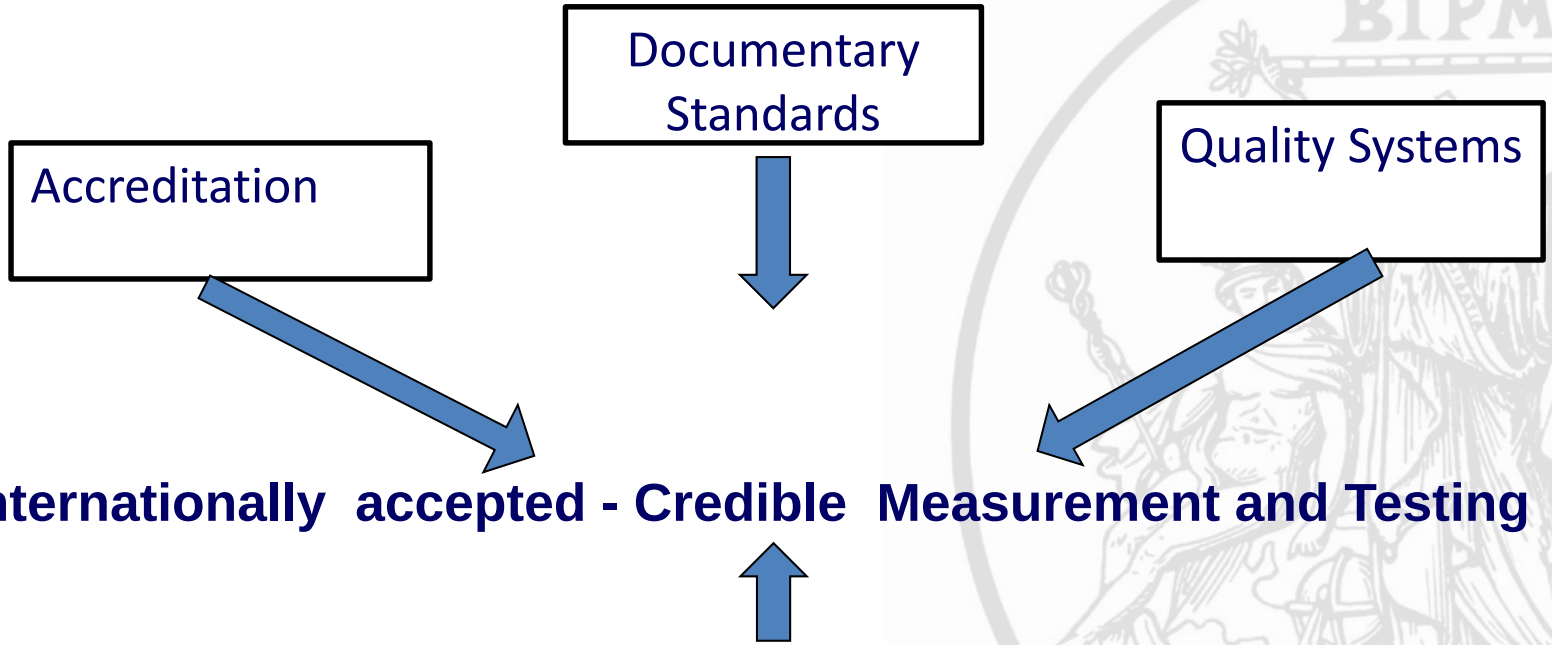
Global and National Infrastructures – in support of Q of L and Safety

- International bodies/agencies ITU, WADA, WHO, WMO, AIEA, IFCC, WTO, UNIDO, CODEX Alimentarius…
- International Agreements, Treaties, Protocols
- Documentary standards writers – ISO, IEC, OIML, PASC…
- Certification Bodies – IAF, PAC,…
- National Regulators eg Legal Metrology Orgs, FDA, FAA…..
- Accreditation Bodies, ILAC, APLAC, ABs,…

Internationally Accepted - Credible Measurement and Testing

Bureau International des Poids et Mesures

Credible measurement and Testing



Basic Metrology

An essential requirement

Bureau International des Poids et Mesures

Metrology – what is it?

"Metrology is the science of measurement and its application - Metrology includes all theoretical and practical aspects of measurement, whatever the measurement uncertainty and field of application".

VIM 3rd Edition, JCGM 200:2008

Metrology, more than just measurement!

Bureau International des Poids et Mesures

The Global System - underpinning metrology

- The Metre Convention, BIPM
- The “Systeme International” SI of units
- Metrology Institutes in member States and Associates (NMIs)
- Regional Metrology Organisations (RMOs), APMP, EURAMET, ……

Bureau International des Poids et Mesures

Measurement Standards

- Metrology Institutes in Member States / Associates and BIPM realise SI units, both base and derived, through the scientific development and maintenance of *measurement standards,* reference materials and primary methods

- International comparisons are undertaken by the metrology institutes to gain recognition and comparability of *measurement standards.*

- Metrology Institutes in Member States / Associates provide the domestic interface for Regional and Global Metrology

Bureau International des Poids et Mesures

Measurement traceability to SI

• Measurement in terms of the SI provides the basis for internationally accepted credible and reproducible measurement, achieved through measurement standards and primary methods to provide traceability to the SI system of units.

• BIPM, NMIs and the RMOs play a critical role in realising the SI units and undertaking international comparisons to ensure uniformity and degree of equivalence within the Global system

Bureau International des Poids et Mesures

BIPM – What is it?

The International Bureau for Weights and Measures (BIPM):

Created under the Metre Convention (Treaty), signed by 17 foundation signatory States 20 May 1875, as a “scientific and permanent” international Bureau.

Currently : 58 States parties to the Convention and 41 Associates .

Bureau International des Poids et Mesures

BIPM – What is its mission?

Mission of BIPM:

To work with the NMIs of its Member States, the RMOs and strategic partners worldwide and to use its international and impartial status to promote and advance the global comparability of measurement for:

- Scientific discovery and innovation
- Industrial manufacturing and international trade
- Sustaining the quality of life and the global environment

Bureau International des Poids et Mesures

Activities and challenges of particular relevance to Quality of life and Safety

Bureau International des Poids et Mesures

BIPM

* Deliver effective benefits to the international community that only it can deliver
* Collaboration with other IGOs and other international bodies: ISO, IEC, WHO, WMO, OIML, WADA, CODEX Alimentarius, IFCC, AIEA….
* Undertakes research in and maintains standards for therapeutic applications of ionising radiation, Ozone, gas mixtures ….
* Maintenance and development of the Mutual Recognition Arrangement (MRA)
* Oversees a program of international Key Comparisons in support of the MRA.
* BIPM Capacity Building and Knowledge Transfer Program

Bureau International des Poids et Mesures

NMIs

* Develop and maintain measurement standards to meet national needs
* Anticipate future needs for measurement standards – long lead times for development
* Maintain international credibility through participation in key and supplementary comparisons supported by an appropriate level of R&D
* Ensure international equivalence of national standards
* Provide effective dissemination of measurement standards nationally
* Ensure appropriate analytical services and traceability for food, water, air quality
* Engage effectively with other elements of the global/national infrastructure

Bureau International des Poids et Mesures

RMOs

* Oversee Regional traceability to the SI through key and supplementary comparisons

* Provide an effective interface to the international system through active participation in the Joint Committee of Regional Bodies and BIPM (JCRB)

* Assist developing NMIs to realise their potential. In particular assist in their development of analytical capabilities for food, water and air quality.

* Assist developing NMIs to establish effective food ‘testing at source’ capability

Bureau International des Poids et Mesures

Some Grand Challenges for Metrology

- Support a more complex and demanding Global infrastructure
- Metrology in chemistry, traceability to SI for biology and medicine, move away from arbitrary "international units"
- Metrology in climate change and the "carbon economy"
- Metrology in nano-structures
- Metrology for the environment and 'quality of life'

Bureau International des Poids et Mesures

Conclusion

- Measurement in terms of the SI provides the basis for credible and reproducible measurement
- BIPM, NMIs and the RMOs play a critical role in realising the SI units and ensuring uniformity within the Global system through international comparison
- Importance of the role of metrology is destined to increase in relation to emerging technologies, health, environment and quality of life
- Metrology has an ongoing challenge to anticipate future measurement needs in support of Trade, Energy and Quality of Life.
- Metrology plays an essential role in informing and quantifying decisions impacting Quality of Life and Safety. It is essential but not sufficient - need to engage with the rest of the infrastructure!

Bureau International des Poids et Mesures

Thank You

Bureau International Des Poids et Mesures (BIPM)

pm.org