



UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION



Strengthening Metrology for Sustainable Development, Market Access and Innovation

24th Meeting of the Directors of NMIs and Member State Representatives
October 16-17, 2025, Sevres, France



UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION



Agenda

- 1 Introduction**
Why is strengthening metrology critical for sustainable development, market access and innovation?
 - 2 Developing Country Perspective**
What is the impact of weak metrology systems in Developing Countries?
 - 3 UNIDO's Technical Cooperation in Metrology**
How is UNIDO supporting the development of regional and national metrology systems?
 - 4 The Way Forward**
How can we cooperate to achieve universal participation?
-



UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION



Metrology at the Core of Global Challenges

SDGs are **unachievable** without robust and harmonised metrology systems.



Innovation

Climate &
Environment



Metrology



Trade &
Market Access

Health &
Safety



Strong economies have well developed and resourced National Metrology Institutes.



UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION



Metrology's Role in Climate Action



Accurate, reliable data is essential to monitor GHG emissions, energy efficiency, renewable integration, and resource use.



Traceability to SI units ensures climate-related measurements (e.g., CO₂ concentration, energy output of renewables) are trusted globally.



Supports compliance with international frameworks: Paris Agreement, EU Green Deal, Carbon Border Adjustment Mechanism (CBAM).



Enables innovation in green technologies (solar, wind, hydrogen, energy storage) by ensuring performance data is robust and comparable.



Provides tools for adaptation & mitigation: climate monitoring, resilient infrastructure, sustainable agriculture.



Building Trust in Climate Claims

How metrology prevents greenwashing and supports accountability.

Verification of carbon footprints, product environmental declarations, and ESG reporting.

Calibration and accreditation ensure reliable monitoring, reporting, and verification (MRV) systems for emissions.

Strengthens consumer and investor confidence in eco-labels, deforestation-free claims, and circular economy standards.

Reduces trade disputes by harmonizing methods to measure carbon-intensive products (critical for EU CBAM and global markets).

Builds resilience for developing economies to access green finance and meet sustainability certification requirements.



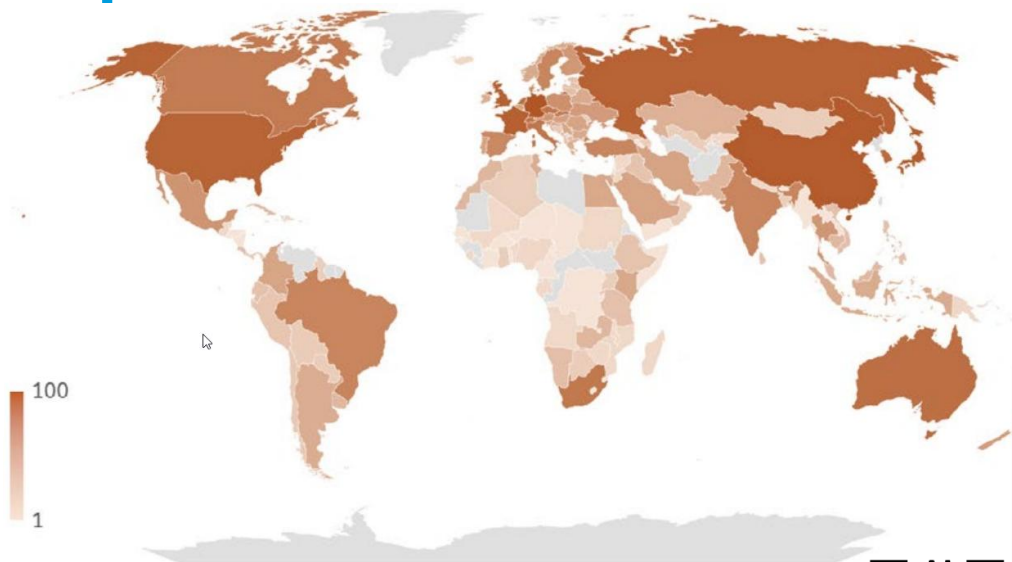
UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION



Quality Infrastructure for Sustainable Development (QI4SD) Index



Bureau
International des
Prototypes et
Mesures



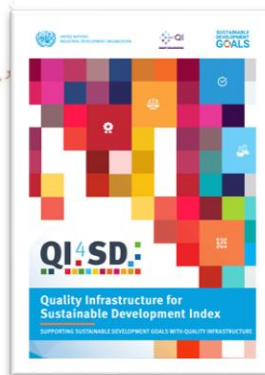
Metrology is the dimension most strongly correlated with the overall QI4SD Index (correlation coefficient 0.89).

Metrology strongly correlates with

- Standardization ($r=0.88$)
- Conformity Assessment ($r=0.86$)

SIDS, LDCs, and LLDCs are at the lowest tier of metrology readiness worldwide.

Currently exploring the possibility to merge the Global Quality Infrastructure Index (GQII) developed by Mesopartner with funding from PTB Germany!



Scan me!



Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Confederation





UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION



Two Metrology Worlds



108 States and Economies
64 Members + 36 Associates

85 Non-Members

98% Global GDP; and

85% World population
represented at the BIPM.

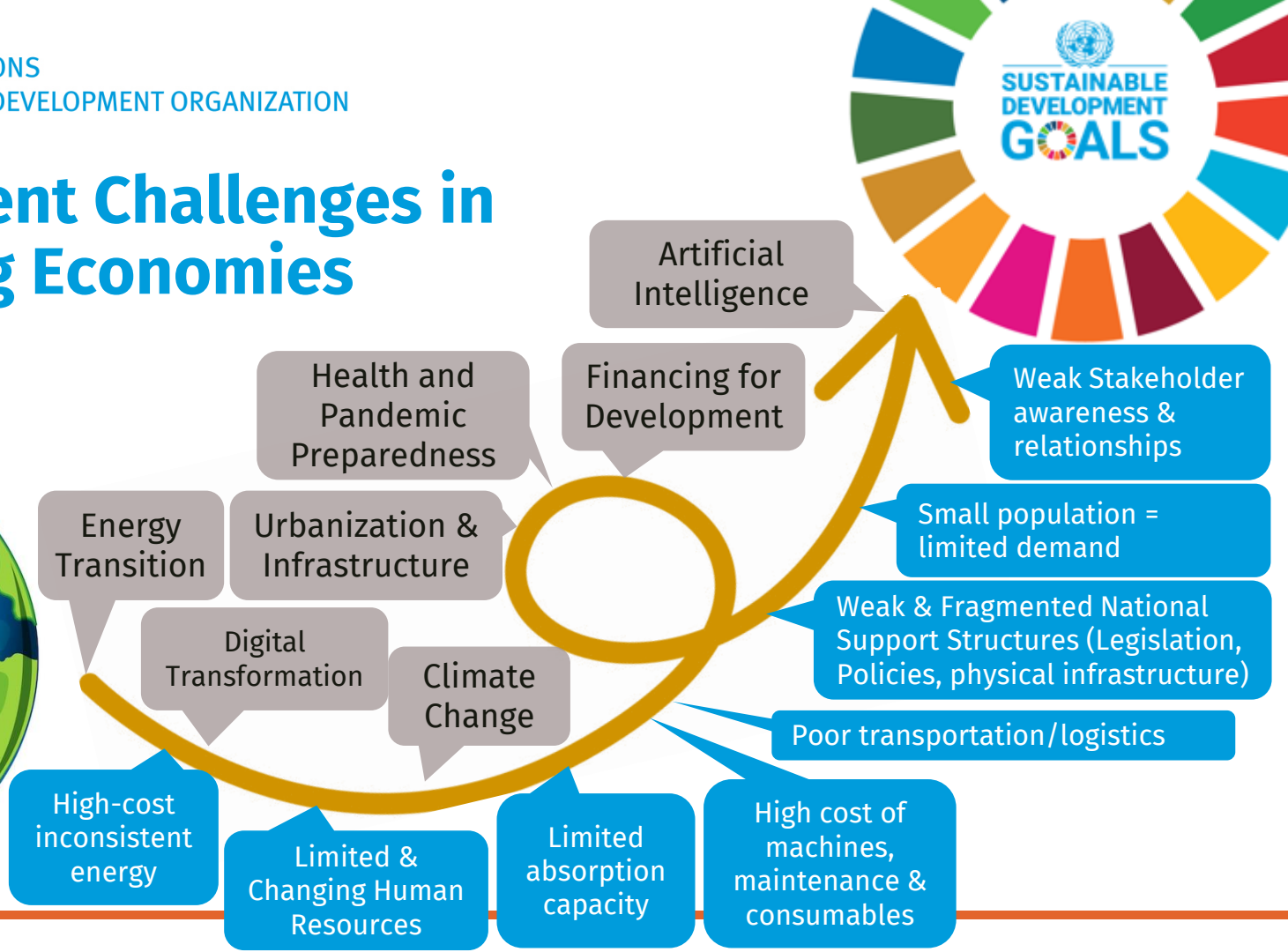
Impact in Non-Member Countries

- Higher costs to local industry to access calibrations from overseas and demonstrate compliance.
- Increased risk of export rejections.
- Increased risk of fraud.
- Exclusion from global value chains.
- Limited innovation.
- Increased health and safety risks related to diagnostics, dosing and conformity assessment of imported products.



UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

Development Challenges in Developing Economies





Case Study: Role of Metrology in Innovation for Kava in the Pacific



Kava (*Piper methysticum*) is a **traditional root crop** central to Pacific **cultural, social, and ceremonial life**.

Major export commodity for Vanuatu, Fiji, Tonga, Samoa, **supporting thousands of smallholder farmers**.

Global demand is increasing for beverages, nutraceuticals, and pharmaceutical applications.

Challenges

Quality assurance gaps: variability in kavalactone content, particle size, and extraction processes.

Safety concerns: contamination with non-noble varieties or residues undermines market trust.

Trade barriers: lack of internationally recognized testing/calibration contributes to **rejections in EU, US, Australia, NZ**.

Innovation bottleneck: without accurate and traceable chemical and physical measurement, R&D for new products stalls.

Critical Role of Metrology

Analytical chemistry traceability: calibration of chromatography, spectroscopy, and mass spectrometry for kavalactone profiling.

Food safety measurements: accredited labs to test for heavy metals, pesticides, microbial contamination and compliance with standards.

Process improvement: standardized measurement of moisture, particle size, and extraction yields to enable scaling into high-value products.



UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION



UNIDO's Vision



Fair and sustainable supply chains

UNIDO will focus on five six key dimensions: value addition, standard compliance, skills development, resource efficiency, supporting regional integration and sustainable investment.

Ending hunger through innovation and local value addition

UNIDO will increase its work focused on expanding and adding value to agricultural processing in developing economies to improve incomes.

Renewable and clean energy and climate action

UNIDO will support Member States in achieving low greenhouse gas emissions and climate-resilient industrial development.



UNIDO's Technical Cooperation Portfolio

UNIDO is supporting **80+ countries** to strengthen their national and regional Quality Infrastructure.

Policy, Legislative and Regulatory Framework	Institutional Strengthening	Quality Promotions	Knowledge Products
• National Quality Policies • Metrology Strategies • Revision of Metrology Legislation & Regulations	• Economic and financial analysis & business planning • Laboratory Design & Construction • Procurement of Equipment • Capacity Building • Preparation for Accreditation	• Awareness Campaigns. • Value Chain analysis and strengthening. • SME Upgrading. • Capacity Building	• Guides • Publications • Digital Tools



UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION



Funded by
the European Union



inno
Instituto Nacional de
Normalização e
Qualidade-IP

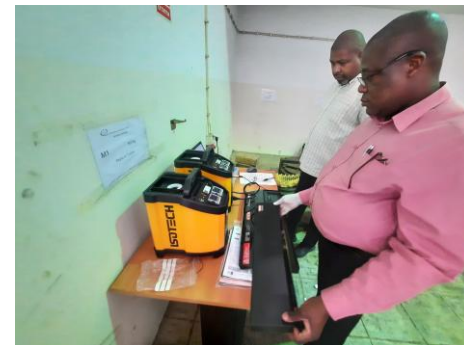
SUSTAINABLE
DEVELOPMENT
GOALS

Mozambique

proM^{ove}
COMÉRCIO

Activities

- Technical assistance towards extending the scope of the calibration services of INNOQ accredited in terms of ISO/IEC 17025.
- Development of software tailored for the newly procured metrology equipment that allows record-keeping, uncertainty calculation and issue of calibration certificates.
- Support the calibration of measurement standards and selected laboratory equipment to maintain traceability to the SI.
- Technical assistance in designing and refurbishing calibration laboratories in the region of Nampula.
- Study tours and training about technical regulations for legal metrology.
- Supported the participation of INNOQ officials in the international and regional metrology fora.





UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION



Funded by
the European Union



inno
Instituto Nacional de
Normalização e
Qualidade-IP

SUSTAINABLE
DEVELOPMENT
GOALS

Mozambique

proM^{ove}
COMÉRCIO

Impact

- Clients have access to a broader scope of accredited calibration services.
- Increased revenues for INNOQ.
- Enhanced access by producers and enterprises in the central region of Mozambique to calibration services.
- Mozambique's enhanced profile in the region and internationally due to active participation in regional and international metrology networks





UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION



QUALITAN
Quality and Standards
for Tanzania



Funded by
the European Union



Tanzania

Provision of Equipment for the 7 metrology labs:

Equipment and Reference Standards procured for 7 metrology labs:
Mass, Volume; Force & Torque; Temperature, Pressure & Chemical metrology

Capacity Building

Development of Business plans & Digital Transformation of the 9 metrology labs

- Business Plans developed for 9 metrology labs at TBS. Implementation of these business plans underway following approval of TBS governing body
- Development, installation of Laboratory Information Management System (LIMS) & training on LIMS

Trainings on ISO/IEC 17025

Impact

Sustained accreditation of calibration services; enhanced scope of calibration services based on client needs

Reduction in turnaround time – issuance of reports etc





UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION



Funded by
the European Union



West Africa



Under the regional component of the EU-funded West Africa Competitiveness Programme (WACOMP), UNIDO provided support to ECOQUAL and CQC, comprising Metrology:

ECOWAS Regional Quality Policy (ECOQUAL): “establish a framework for the development and operation of an appropriate, relevant, effective and efficient quality infrastructure to facilitate intra-regional & international trade, protect consumers, the environment, and promote sustainable economic development.”

The Community Council for Quality (CCQ) is one of the key instruments used for the implementation of ECOQUAL, comprising the following key regional quality infrastructure institutions:

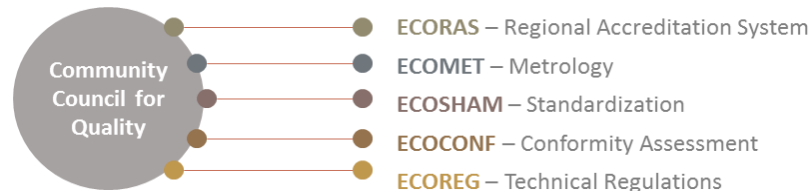
Achievements under Metrology:

Regional level:

- UEMOA metrology law adopted
- Establishment of UEMOA Reference Laboratories in Metrology
- ECOWAS Committee for Metrology (ECOMET) operational & member of AFRIMETS
- TCs and WGs created
- ECOMET guides for calibration developed

National level:

- 320 technicians trained
- 2 national metrology bills drafted
- NMIs provided with basic calibration equipment
- 2 calibration labs re-accredited
- Established NMI for Nigeria



Further support to be provided by UNIDO through the EUR 200 mio EU-funded **Africa Trade Competitiveness and Market Access(ATCMA) Programme** in ECOWAS, SADC, COMESA, ECCAS and Continental Level in support to PAQI Secretariat.



UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION



**QUALITY
IN ACP**



Budget: 7.35 million EUR
Start: January 2022
End: December 2025

79 ACP Group of States

Implementation Partners:

African Organisation for
Standardization (ARSO)

CARICOM Regional
Organisation for Standards
and Quality (CROSQ)

Pacific Islands Forum (PIF)

Africa

Alignment of National
Quality Policies with Africa
Quality Policy

Integration of QI in
education curriculum

Stakeholder awareness in
metrology

Caribbean

Developing National
Laboratories Policies

Revision of metrology
legislation in Grenada,
Jamaica, St. Vincent & the
Grenadines

Metrology strategy for
Dominican Republic

Preparing two metrology
laboratories for
accreditation

Stakeholder awareness in
metrology

Pacific

Developing Pacific
Regional Quality Policy &
Strategy (PRQPS)

Support to the Pacific
Islands Metrology
Committee (PIMC)

Revision of Fiji metrology
legislation

Strengthening of Level 1
Pacific Laboratories

Stakeholder awareness in
metrology



UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION



Development Path



1. Understand the local demand & priorities

2. Strengthen the policy, legal and governance frameworks.

3. Build only the demand that is locally sustainable.

4. Digitalize early.

5. Partner with other institutions to meet unsustainable demand (regional pooling, service agreements, etc.).

6. Apply metrology system to key value chains and priority sectors.

7. Communicate benefits.



The Digital Future of Metrology



Remote Calibrations

Pilot remote calibration hubs

Provide training on remote calibration

Support countries to leapfrog from their analog systems



Laboratory Information Management Systems

Automate processes, calibration records, and calculations.

+ Overcoming Human Resource constraints

+ Improves efficiency and reduces costs



Digital Calibration Certificates

Provide training on DCC implementation

+ Reduces risk of fraud

+ Reduces time required to verify compliance



Cloud-based Data & Knowledge Platforms

Develop and share cloud-based repositories of reference materials, standards and procedures.

+ Ensures access to validated methods and data libraries

+ Reduces implementation time



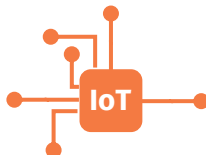
The Digital Future of Metrology



Digital Training Platforms

Create virtual classrooms, simulation labs and VR/AR for training

- + Low-cost solution to build local capacity
- + Reduces travel costs



IoT Enabled Devices

Embed sensors into critical infrastructure connected to cloud systems.

- + Continuous monitoring



Artificial Intelligence

Use AI tools for analyzing trends, prediction and detecting anomalies

- + Reduces downtime
- + Supports fraud detection
- + Helps anticipate future needs



Role for BIPM Member States

Capacity Building & Mentorship

Pair developed NMIs with emerging NMIs for training, staff exchanges, and mentorship.

Provide short-term placements for staff of emerging NMIs in advanced NMIs.

Provide slots and cover costs for emerging NMIs in key and supplementary comparisons.

Deploy experienced metrologists to help design, set up, or audit systems in SIDS/LDC/LLDC labs.

Digital Solutions

Test and roll out DCCs with developing-country partners.

Connect advanced NMIs digitally to developing NMIs for real-time calibration and traceability.

Share e-learning modules, webinars, and simulation tools for metrology staff.

Provide access to LIMS software, calibration software, reference procedures, and uncertainty calculators.

Provision of Decommissioned Equipment with Metrological Value

Donate or loan decommissioned standards or measuring instruments that are still functional and within uncertainty needs of developing economies.

Collaboration

Include emerging NMIs in applied projects on renewable energy metrology, health diagnostics, or climate monitoring.

Open working groups where developing-country staff can shadow or contribute remotely.

Member NMIs can host regional centers of excellence, serving multiple small economies.

Collaborate on UNIDO Technical Cooperation projects to support emerging NMIs



UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION



Together, we can ensure no country is left behind in measurement science

UNIDO: convenes governments, mobilizes funding, delivers projects.

BIPM: provides global leadership, standards , and technical authority.

Developed NMIs: mentor, share expertise, digital tools, and equipment.



+

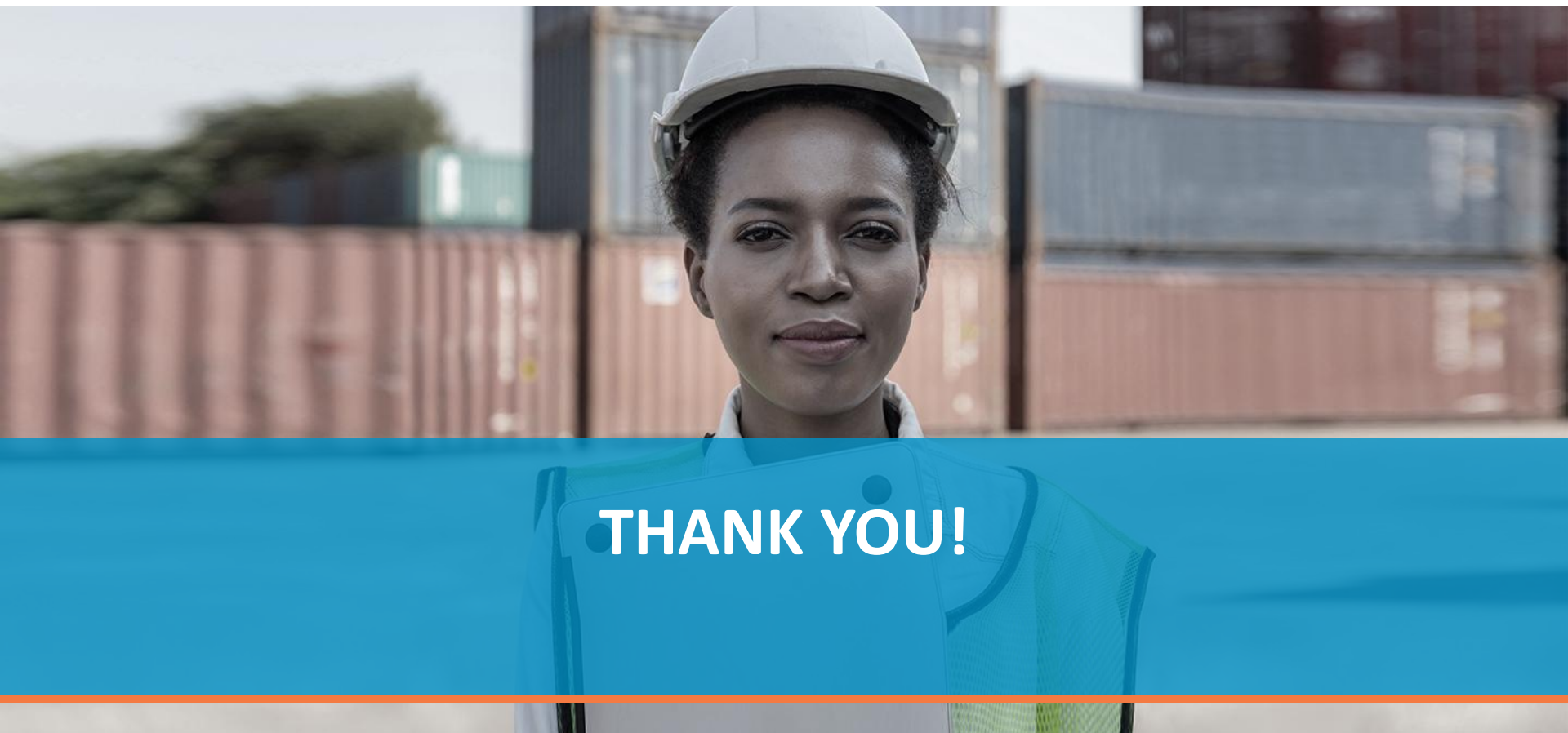


BIPM + NMIs =

- Universal Participation
- Stronger SI
- Trusted measurements everywhere



UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

A woman with dark skin and hair, wearing a white hard hat and a high-visibility safety vest, stands in the foreground. She is looking directly at the camera with a slight smile. The background is a shipping yard with several large, stacked metal containers in various colors (red, blue, green).

THANK YOU!