JAPAN PERSPECTIVE
ON NANOTECHNOLOGY STANDARDIZATION

International Workshop on Challenges to Increased Use
of Documentary Nanotechnology Standards

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What factors inform your current nanotechnology standards development activities?

- Japan is one of the leading countries in nanotechnology R&D.

- Japanese industries have already been widely and deeply involved with nanotechnologies, especially material and instrumentation industries.

- However application industries of emerging nanomaterials, i.e. carbon nanotubes and fullerene, are not yet mature and expected to grow faster.

- Emerging nanomaterials application industries are becoming more interested in well-characterized, reproducible, safety-endorsed and less expensive nanomaterials.

- Environment, health and safety issues affect dissemination of emerging nanomaterials to the market.

- Standardization of emerging technologies is Japan's national technology policies.

How is your nanotechnology standards development activity prioritized?

1. Emerging Nanomaterials

Carbon nanotubes

Standardization for carbon nanotubes, both of single and multi walls, are of highest priority because of their high potential. R&D progresses in national institutes and universities. Commercialization is under way in companies.

Fullerenes

Fullerene is commercialized by a Japanese company.
However, standardization is not of high priority because of limited suppliers.

2. Methods for Characterization and Measurement

Standardization of test methods for carbon nanotubes is of high priority because well-characterized nanomaterials are inevitable for industrial applications and risk assessments of carbon nanotubes.

3. Test Materials for Toxicity Assessments

Well-characterized samples of nanomaterial are of high priority to obtain reliable and comparable results in toxicity tests and product applications associated with nanomaterials.

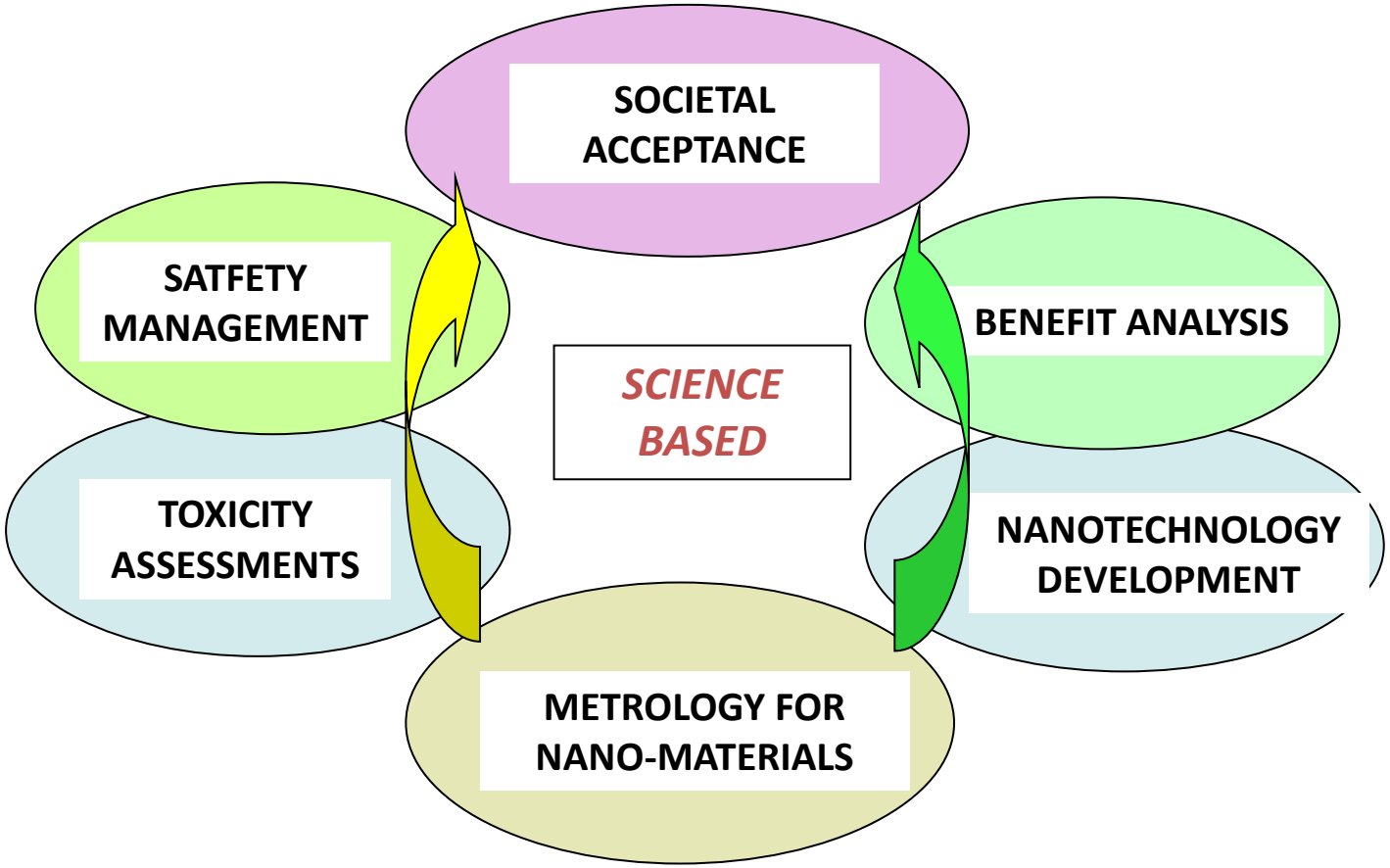
4. Risk Assessment of Emerging Nanomaterials

Methodologies of hazard and exposure assessments has been developed with manufactured nanomaterials.

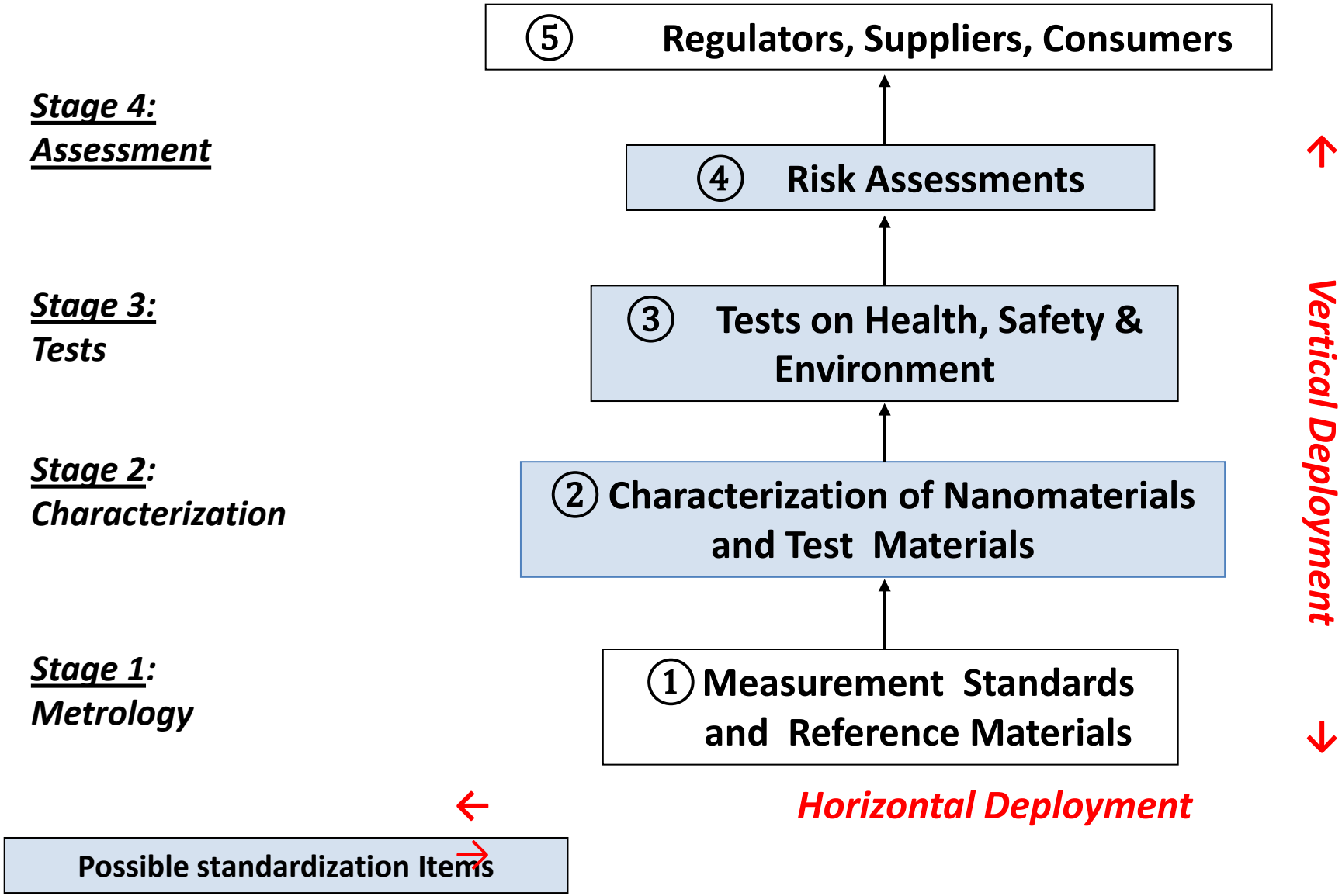
Occupational exposure limits were set for carbon nanotubes, fullerenes and titanium dioxides through toxicity tests.

In your opinion, what are the greatest challenges in nanotechnology standards development and use?

Responsible Development of Nanotechnologies with Societal Acceptance



PROCESSES OF RESPONSIBLE DEVELOPMENTS OF NANOTEDCHNOLOGIES



Risk Assessment Associated with Manufactured Nanomaterials

Risk Assessment Documents

OELs (Occupational Exposure Limit) for nanoscale TiO2, CNT and C60 were set as "OELs (Period Limited)".

Development of exposure assessment methods

Development of hazard assessment methods

Exposure Scenario Documents were published based on "Field Surveys" and "Dustiness Tests. "

Our policy: to carry out tests relevant to risk assessment in terms of exposure route, dose level, etc.

Development of characterization method

Our policy: to prepare test samples with secondary particles in the nanoscale and well characterized.

The results were published as Sample Preparation Manuals

For further information: http://www.aist-riss.jp/projects/nedo-nanorisk/index_e.html

Occupational Exposure Limit (Period Limited)

OELs were set that assume a subchronic exposure period of 15 years or so, on the condition that a reevaluation be conducted within the next ten years or so using future scientific findings.

Material	OEL (PL)	Remarks
Carbon Nanotubes (CNT)	0.03 mg/m^3	Value was derived for SWCNT with specific surface area of approx. 1000 m^2/g.
Fullerene (C_{60})	0.39 mg/m^3	For C_{60} with a number-weighted geometric mean diameter of 96 nm (GSD = 2.0)
Titanium Dioxide (TiO_2)	0.6 mg/m^3	Value was derived for Evonik Degussa P25, which is considered to have a relatively high toxicity among TiO_2 nanomatrials.

Endpoint: pulmonary inflammation

Gamo 2011

Japan Contribution as Project Leaders to ISO/TC229

(Terminology)

ISO/TS 80004-3:2010 Nanotechnologies -- Vocabulary -- Part 3: Carbon nano-objects

(Characterization and Measurement)

ISO/PRF TS 10797 Nanotechnologies -- Characterization of SWCNT using TEM

ISO/TS 10868:2011 Nanotechnologies -- Characterization of SWCNT using UV-Vis-NIR absorption spectroscopy

ISO/TS 10867:2010 Nanotechnologies -- Characterization of SWCNT using NIR-PL spectroscopy

ISO/TS 11251:2010 Nanotechnologies -- Characterization of volatile components in SWCNT samples using EG/GC-MS

ISO/PRF TR 10929 Nanotechnologies -- Characterization of MWCNT samples

ISO/AWI TS 16195 Nanotechnologies -- Guidance for developing test materials (TM) consisting of nano-objects in dry powder form (*Well-characterized materials*)

(Material Specification)

ISO/NP TS 17200 Nanotechnology -- Nanoparticles in powder form -- Characteristics and measurements *(Generic Specification to determine whether it is nanomaterial)*

SUMMARY OF JAPAN PERSPECTIVE

1. Emerging and Existing Nanomaterials

   SWCNT and MWCNT, fullerenes and titanium dioxides

2. Method for Characterization and Measurement

   Characterization of SWCNT and MWCNT

3. Test Materials

   Development of well-characterized nanomaterials
   Reliability & comparability in toxicity tests and product applications

4. Risk Assessment of Nanomaterials

   Test methods for hazard and exposure assessments
   Occupational exposure limits