International Symposium on Standardization
to Promote Transition to Circular Economy

H-AIST CE Lab.

International Standardization toward Digital CE Transition

April 23, 2024

Hitachi-AIST Circular Economy Collaborative Research Lab. (H-AIST CE Lab.)
WG3 Leader
Osamu Hoshino

Background

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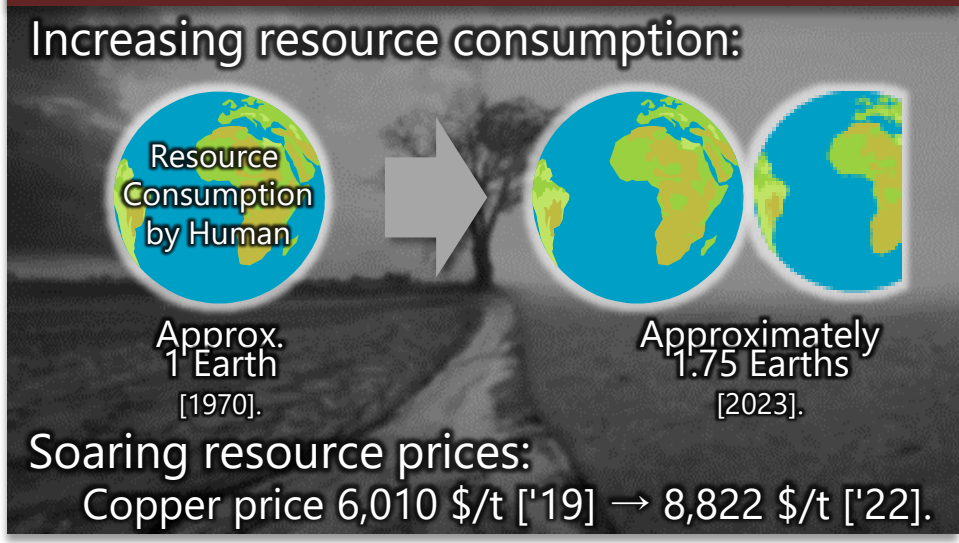
Shift from a "linear economy" to a "circular economy (CE)" that pursues low environmental impact and resilience

Facing complex environmental challenges on a global scale, Comprehensive solutions are needed

Resilience to procurement difficulties is necessary due to increasing resource consumption and localized resource production.



[1] https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_SPM_final.pdf
[2] https://jp.reuters.com/article/insurance-catastrophes-idJPKBN2TI0GO
[3] OECE, "Environmental Outlook 2050: The Cost of Not Taking Action Summary Version," (2012)
[4] https://www.oecd.org/tokyo/newsroom/global-plastic-waste-set-to-almost-triple-by-2060-japanese-version.htm
[5] Earth Overshoot Day, https://www.overshootday.org/

Approaches to transition to CE

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**For transition to CE with economic growth,
we must share issues, collaborate among stakeholders, and
contribute to solving problems through international standardization.**

- In a global and diverse market environment, share a societal vision where resource circulation is not a mere stumbling block but rather leads to economic growth.
- Create use cases on specific digital solutions that improve both environmental and economic value through collecting and using product LC data
- Based on global standardization trends, develop rule-making strategies that show respect to each regional characteristics

Contribute to CE transitions by rule-making

LC: Life Cycle

Purpose of this Symposium

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Share an overview of the issues surrounding CE through the lectures and deepen the discussion with you on the standardization required for the transition to CE.

1:00 (5min)	**Opening/Ceremony**	Opening Declaration, Agenda, and Introduction of Speakers -- Dr. Alex Paul, YORDAS GROUP
1:05 (10min)	**Host Address**	International Standardization toward Digital CE Transition -- Mr. Osamu Hoshino, Hitachi, Ltd. (H-AIST CE Lab. WG3, Leader)
1:15 (25min)	**Keynote Speech 1**	Challenges Indicated by Survey Results on Standardization Trends during the Transition to a Circular Economy -- Dr. Giselle Vincett, YORDAS GROUP
1:40 (30min)	**Keynote Speech 2**	Accelerating Circular Economy Transition through Achieving Data Model Standardization and Interoperability -- Dr.Lan Yamashita, Toshiba Corporation (Chairperson of IEC SC3D)
2:10 (20min)	**Lecture 1 (Web Lecture)**	CE Promotion Activities, Research, and Standardization Examples in the USA (Provisional Title) -- Dr.Kelsea Schumacher, National Institute of Standards and Technology (NIST)
2:30 (30min)	**Lecture 2**	Accelerating Material Circulation and Prolonging Product Lifecycles: IEC/ISO Perspectives and Insights from WRI's recent Circular Economy System (Provisional Title) -- Mr.Walter Jager, Principal, ECD Compliance : IEC TC111 Vice Chairperson
3:15 (20min)	**Lecture 3 (Recorded Presentation)**	The address by Mr. Luiz Carlos Busato on behalf of ABNT -- Mr.Luiz Carlos Busato, Associação Brasileira de Normas Técnicas (ABNT) Circularity matrix: secondary material grading and Brazilian Circular Economy approaches -- Dr.Lúcia Helena Xavier, CETEM(Centro de Tecnologia Mineral) from ABNT
3:35 (15min)	**Lecture 4 (Recorded Presentation)**	Circular Transition Indicators (WBCSD CTI) -- Ms.Irene Martinetti, Leader, Circular Transition Indicators(CTI), World Business Council for Sustainable Development (WBCSD)
3:50 (20min)	**Lecture 5 Web Lecture**	Circular Transition Indicators (WBCSD CTI) -- Mr. Jérôme Petry, The Ministry of the Economy(MECO) Luxembourg : ISO TC323 WG5 Convener
4:10 (30min)	**Lecture 6**	How to enable trust without sharing detailed information about individual items across a digital product life cycle -- DR. Raul Carlsson, RISE Research Institutes of Sweden
4:55 (60min)	**Panel Discussion**	Standardization Approaches from the Cyber-physical system (CPS) Perspective Contributing to the Transition to CE Panelists : Dr. Yoshiaki Ichikawa, Tama University, Dr. Lan Yamashita, Toshiba Corporation, Mr. Walter Jager, ECD Compliance, Mr. Luiz Carlos Busato, ABNT, Mr. Jérôme Petry, MECO, Dr. Raul Carlsson, RISE Research Institutes of Sweden Moderator : Dr. Alex Paul / Dr. Giselle Vincett, YORDAS GROUP

Establishment of H-AIST CE Lab.

H-AIST CE Lab.

Grand design of a circular economy society, development of digital solutions to realize it, and formulate standardization strategies, and disseminate them widely to society

Hitachi-AIST Circular Economy Collaborative Research Lab. , H-AIST CE Lab.

- Established at AIST's Waterfront Center (Aomi, Koto-ku, Tokyo) in October 2022
- Promote open research activities through open forums, etc.
- Participate about 40 specialists, including life cycle assessment, resource recovery system, manufacturing and service engineering, from Hitachi and AIST in the joint research

Working Groups and Themes

WG 1	Establishment of the Grand Design for a Circular Economy Society
WG 2	Digital Solutions for the Circular Economy
WG 3	**Standardization Strategy Planning and Policy Recommendation**

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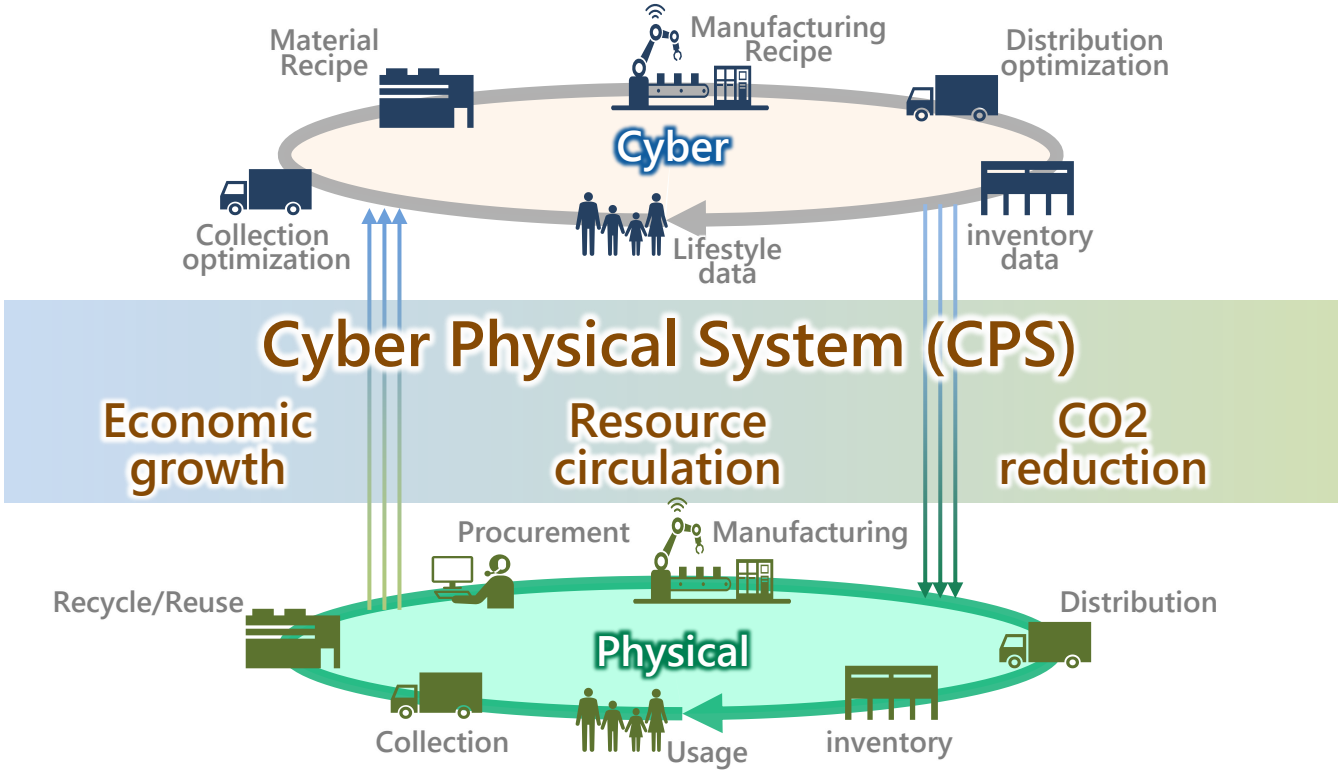
Data utilization accelerates the transition to digital circular economy



To achieve the vision

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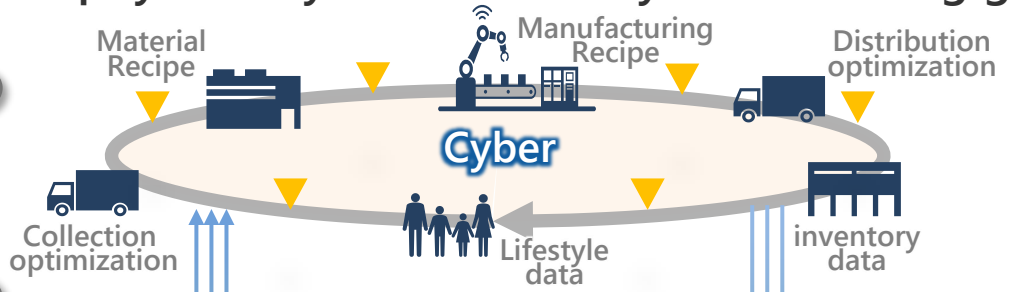
Lowering the barriers (i.e., interface standardization) between stakeholders or between cyber and physical layers is necessary -> visualizing grades and KPIs

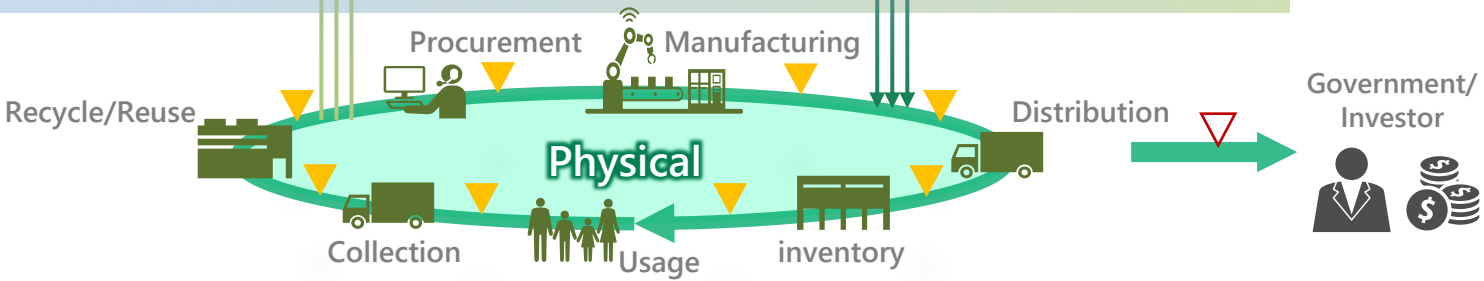
▼ : Interface between players inside value chain(grades of goods) p.8

► : Interface between cyber and physical

▽ : Interface between players and outside value chain (organizational KPIs) p.9



Cyber Physical System (CPS)



Further standardization and further activation of trade

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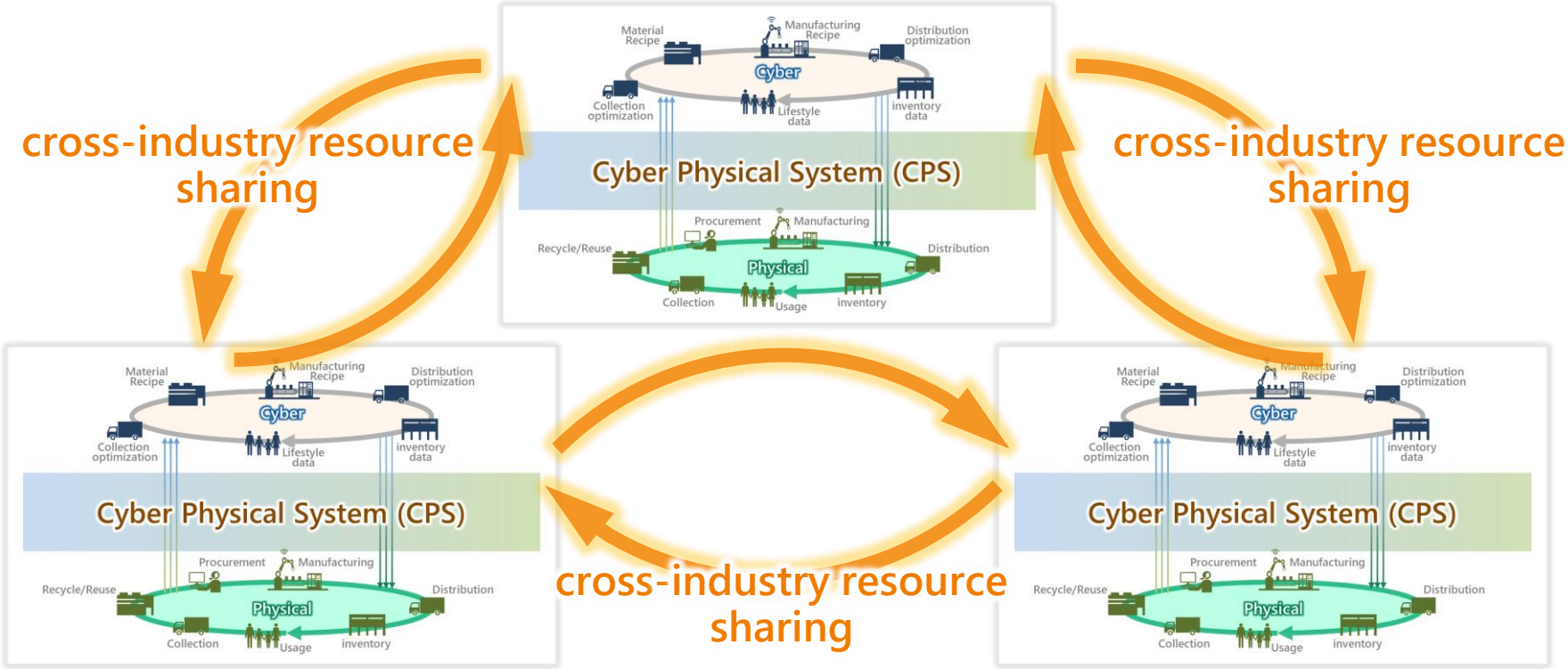
Resolving supply shortages through cross-industry resource circulation, and international standardization supports it.



Standardization of grading to visualize value among players

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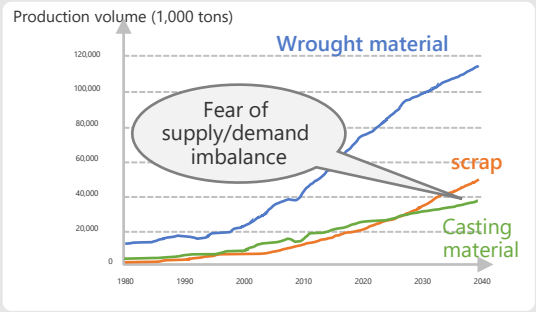
Visualizing the grades of recycled/reused things encourages deals of multiple use.

Not only recycled materials, but also remanufacturing or repairing of components, products and facilities.

Disruption of the supply-demand balance

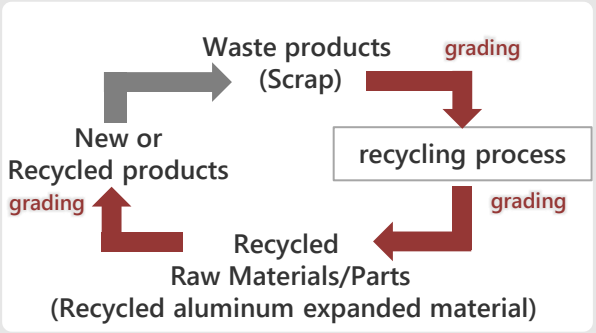
Example: In aluminum wrought material, growing need for reuse of scrap



Source: NEDO report "Aluminum Material Advanced Resource Recycling System Construction Project" (interim evaluation)('23/6)

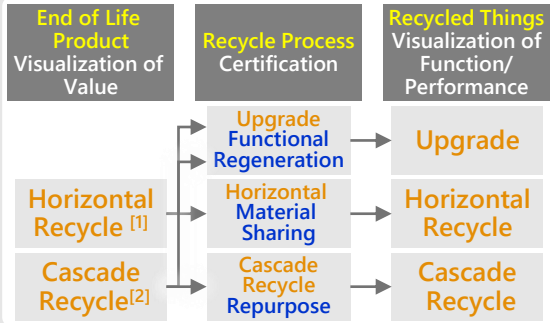
Development of resource circulation systems

Use case of Grading



Standardization of Grades

Visualization of requirements and needs on the demand and supply side



Standardization Roadmap

ISO TC323

Development of horizontal standards that specify the requirements that the grading must meet

Online standards

CDD

ISO SDB 323 Team

SDB: Standard As Database
CDD: Common Data Dictionary

Rapid improvements by each industry

[1] Horizontal recycling: Recirculation into resources of the same use and quality as the original product.
[2] Cascade recycling: recirculation of resources and energy of lowered quality according to their quality.

Indicator considered to realize economic growth with CE

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An organizational KPI that measures the added CE value relative to invested capital induces investment into CE-efficient properties and leads to economic growth

ROIC

How much profit is being made in relation to invested capital?

$$= \frac{\text{Economic value (profit)}}{\text{Invested capital} + \text{CE-Related invested capital}}$$

Applied to CE.

Added CE Value Productivity

"social and environmental value ∩ profit"
= "added CE value" gained in relation to CE-related IC

$$= \frac{\text{Society \& Environment} + \text{Added CE Value} + \text{Economic value}}{\text{Invested capital} + \text{CE-Related invested capital}}$$

Added CE Value Productivity should:

- Have consistent range of evaluation for the denominator and that of the numerator
- Have evaluation criteria
- Be easy to apply and utilize regardless of industry

→ Interrelated at the country, industry, company, and product level

SOURCE: Tahara, "Environmental Efficiency," 2018.

Summary

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- The vision of circular economy involves cyber-physical system
- International standardization is necessary to realize and further enhance the vision
- Grading and CE value-added productivity indicators are key points for international standardization

循環経済社会の実現に向けて、日立-産総研サーキュラーエコノミー連携研究ラボを設立