

Legal statement

The purpose of the information in this presentation is to guide ICA programs and provide members with information to make independent business decisions.

Antitrust Guidelines for Copper Industry Trade Association Meetings

The following guidelines with respect to compliance with antitrust laws of the United States, Japan and European Community¹ are intended to govern the conduct of participants in copper industry trade association meetings, both at the meeting itself and in informal discussions before or after the formal meeting.

Price: Competitors should not discuss future prices (including terms of sale) of their products. There is no blanket prohibition against the mention of or reference to current or past prices but limits must be observed. Such references or mentions should occur only when necessary in connection with the development of association programs. For example, reference to a particular price level in comparing the cost of a copper product to a competing product is permitted. Whenever possible, such references should be discussed in advance with legal counsel.

Competitive Information: Competitors should not discuss the market share of a particular copper producer or copper fabricator's products. Furthermore, nothing should be said at a meeting which could be interpreted as suggesting prearranged market shares for such products or producer production levels. The overall market share of copper products may be discussed with regard to competition with non-copper products and general market acceptance.

New Products: Competitors should not encourage or discourage the introduction of a new product by another competitor or reveal a particular copper company's plans to change the production rate of an existing product or to introduce a new product. No company should disclose to another company whether it is in a position to make or market a new product. New products may be discussed in a technical manner or from the standpoints of competition with non-copper products and general market acceptance. In addition, proposed methods for and results of field and laboratory testing can be considered.

The Role of Legal Counsel: Legal counsel attends association meetings to advise association staff and other meeting attendees regarding the antitrust laws and to see that none of the matters discussed or materials distributed raise even the appearance of antitrust improprieties. During the course of a meeting, if counsel believes that the discussion is turning to a sensitive or inappropriate subject, counsel will express that belief and request that the attendees return the discussion to a less sensitive area.

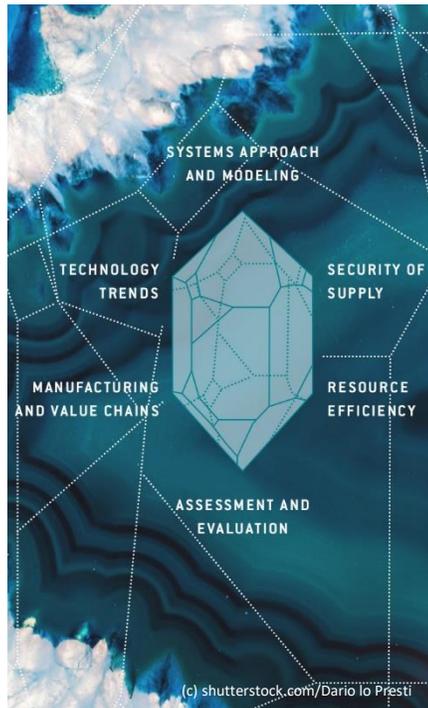
A paper entitled 'Copper Industry Trade Associations and Antitrust Laws' is available upon request.

10/92, 5/93, 10/10

1. Other foreign competition laws apply to International Copper Association, Ltd. (ICA)'s activities worldwide.

SHAPING THE FUTURE OF COPPER RECYCLING

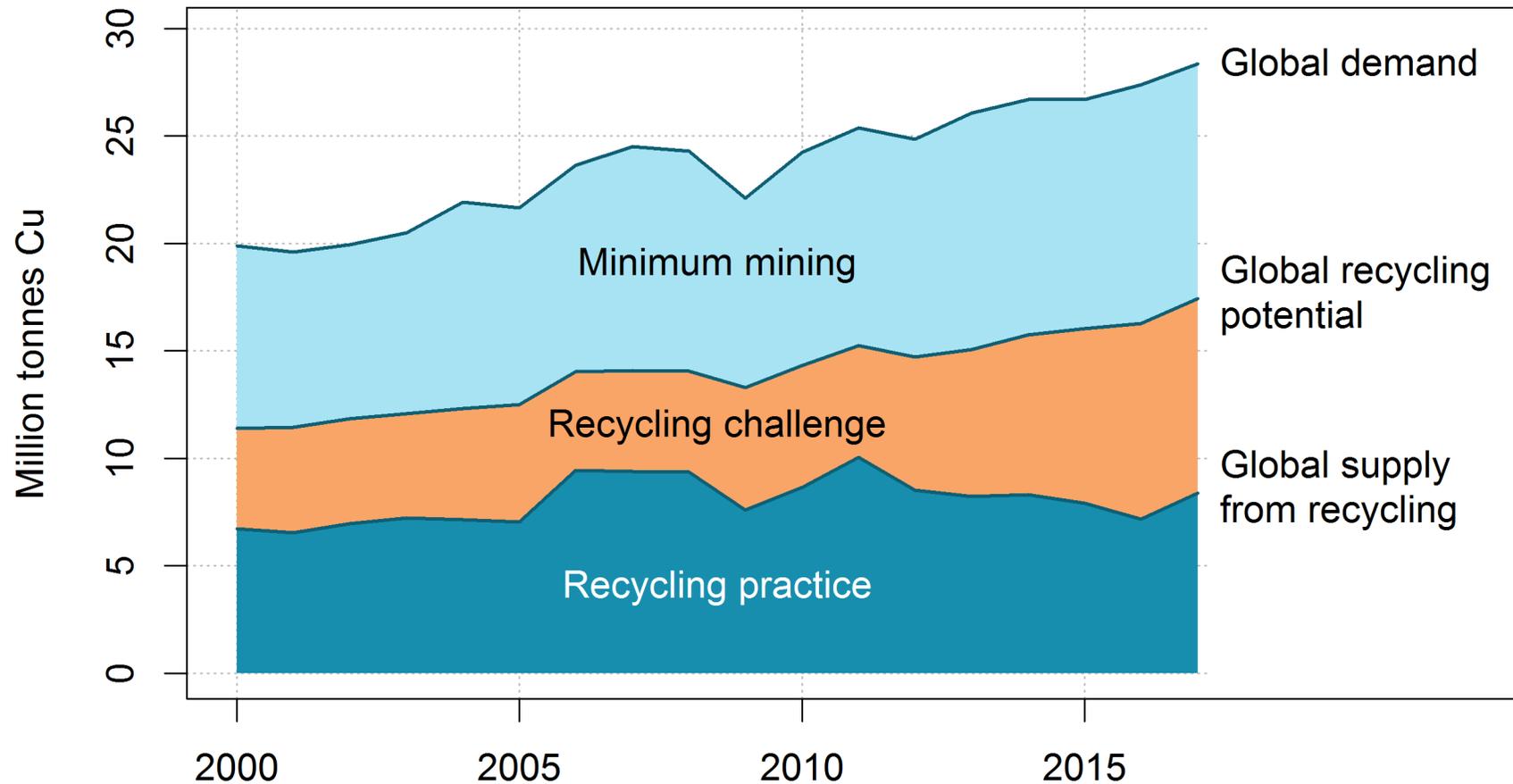
Luis TERCERO ESPINOZA, Kerstin CUHLS, Svetlana MEISSNER & Antonia LOIBL
Shanghai, 21 November 2019



Why look to increase recycling?

- Manufacturers are faced with increasing regulatory and public pressure to move away from a largely linear to a more circular economy
 - Example: EU Circular Economy package
 - Increased public awareness of environmental damage caused by improper disposal of discarded products
 - Increased pressure for more responsible recycling (e.g. China's Green Fence)
- Recycling is a source of raw materials
 - Central in raw materials criticality discussions
 - Important for environmental footprint; recyclability of copper makes copper overall more attractive
 - Supports the long term availability of raw materials by better use of resources → meet the need for increasing volumes of copper (industrialisation, affluence, new technologies)

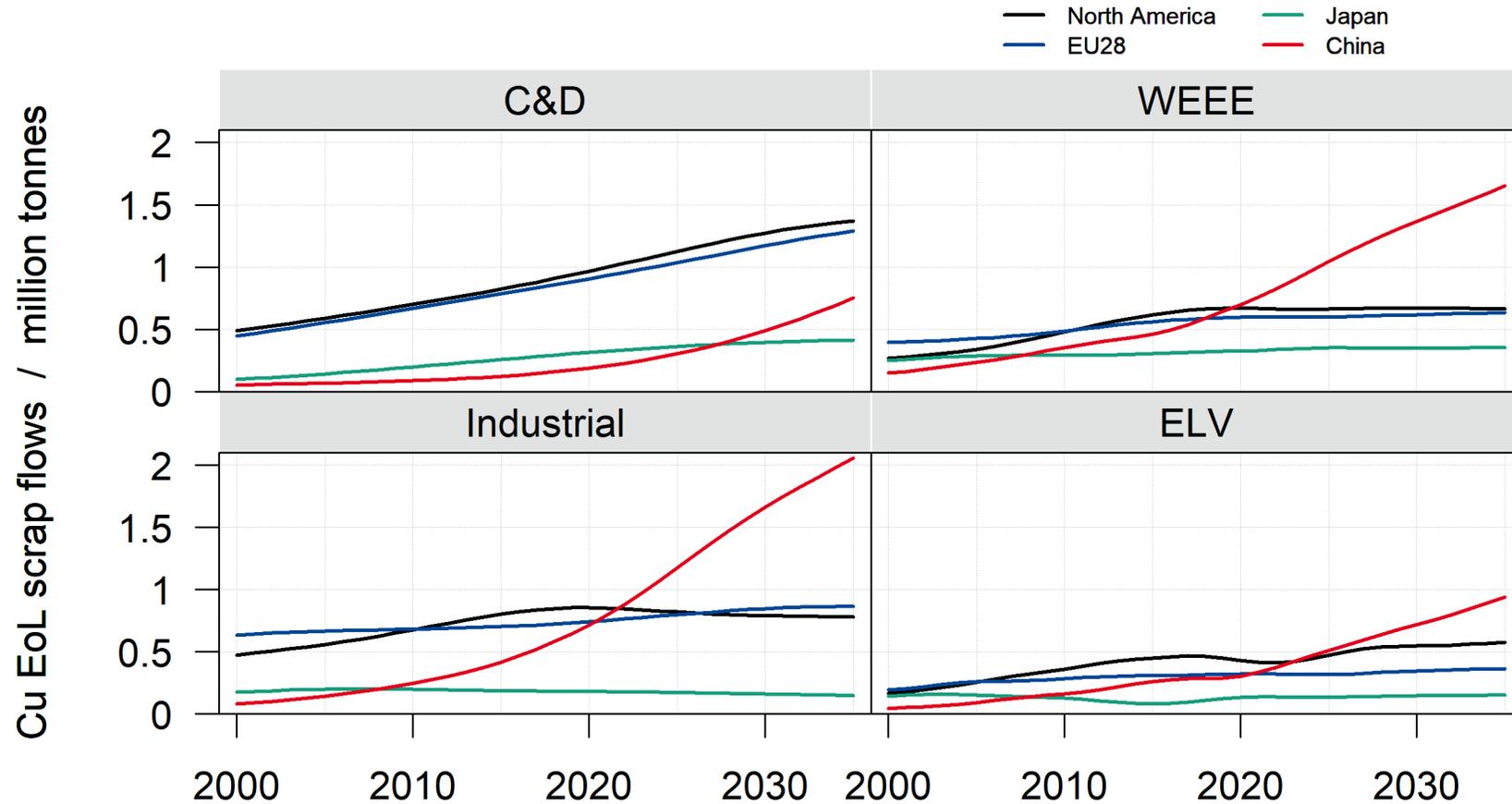
Quantifying the challenge: Global copper demand and how it is met by primary and secondary supply



- Globally increasing copper demand
- Globally stagnating amounts of recycled copper
- Unused recycling potential!

Data from the global copper flow model, ICA/IWCC dataset, ICSG

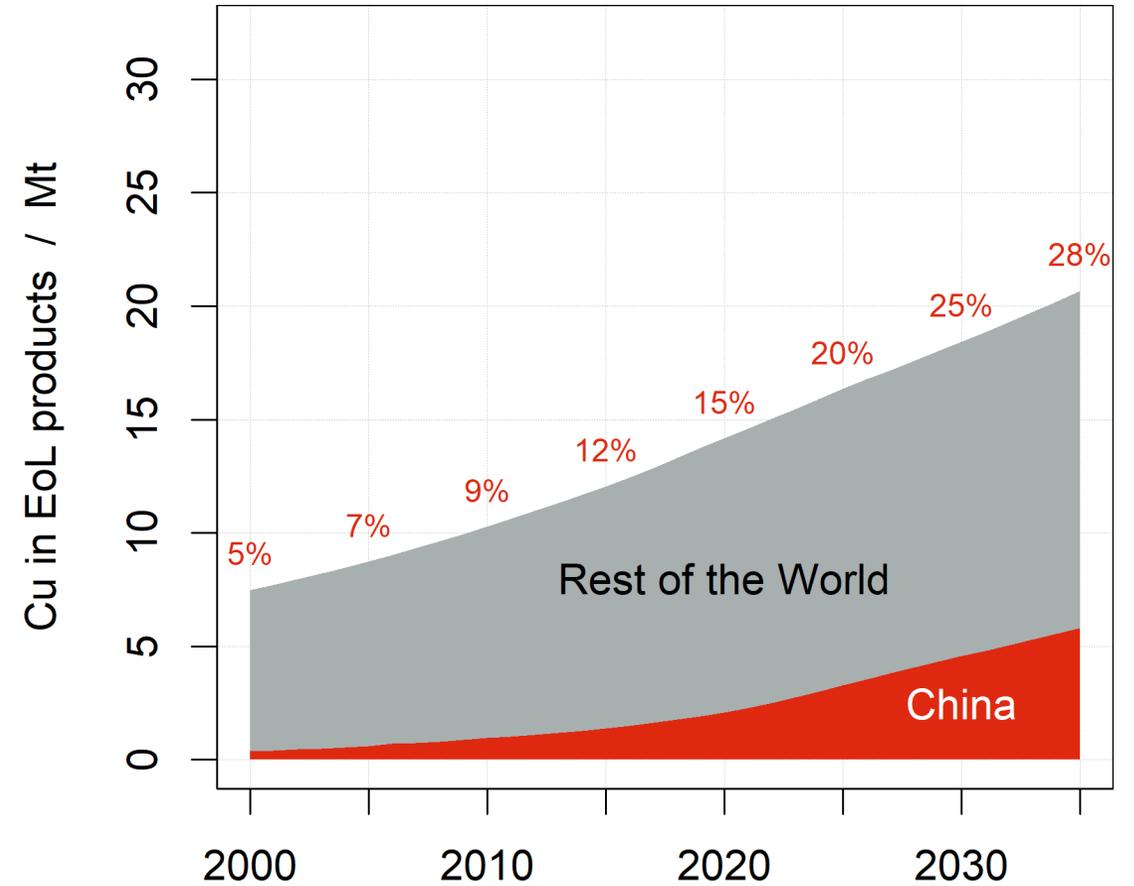
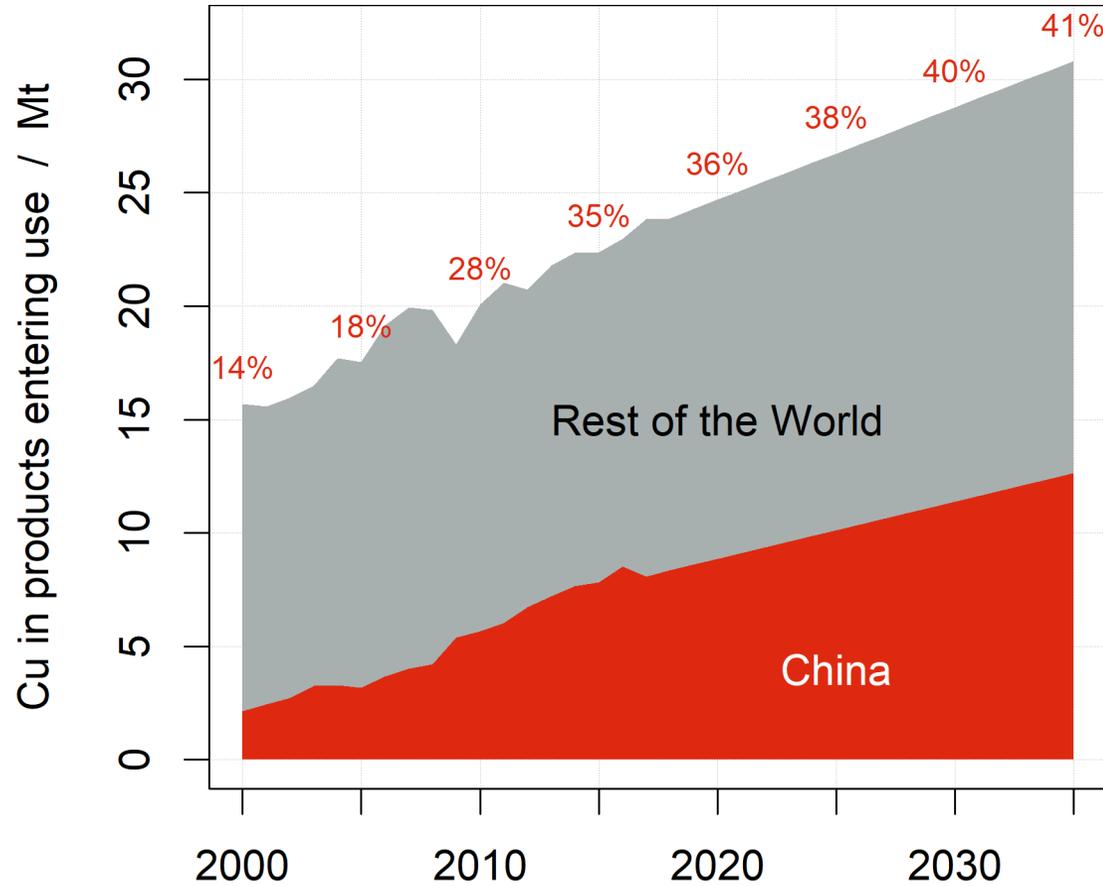
EoL scrap generation by scrap type and region until 2035



- China to be the largest generator of WEEE, industrial electrical and non-electrical scrap and ELV by 2035
- Europe and North America remain important, especially for C&D waste

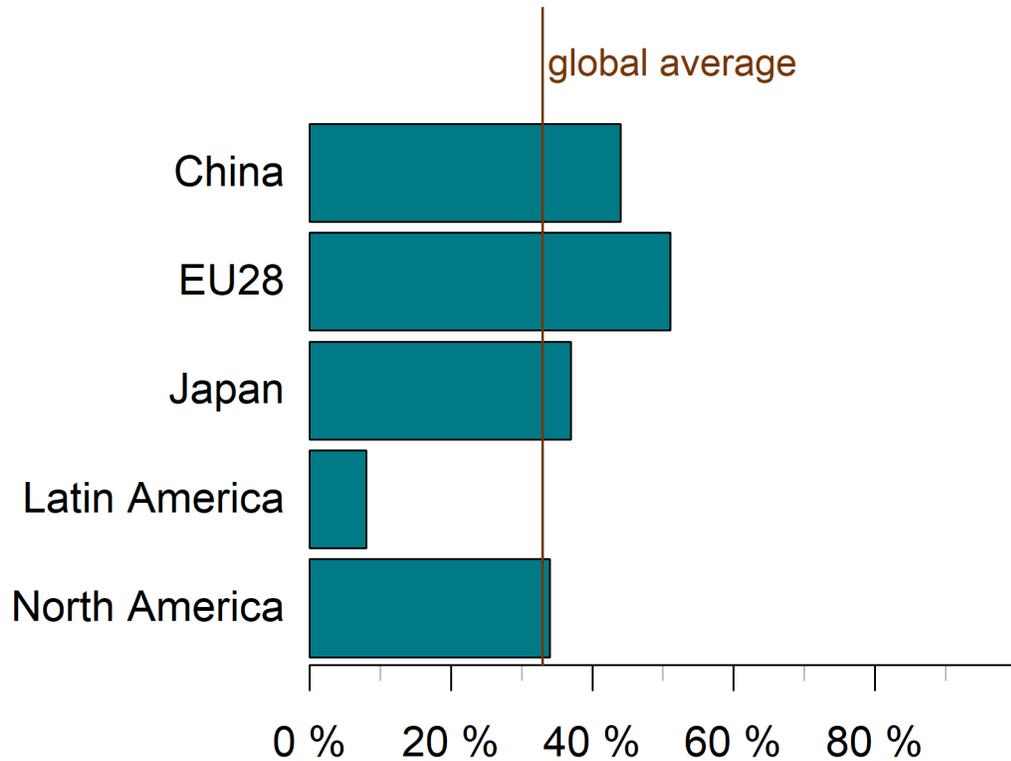
Data from the regional copper flow models (modified to provide forecasts)

Expected developments in China vs. global

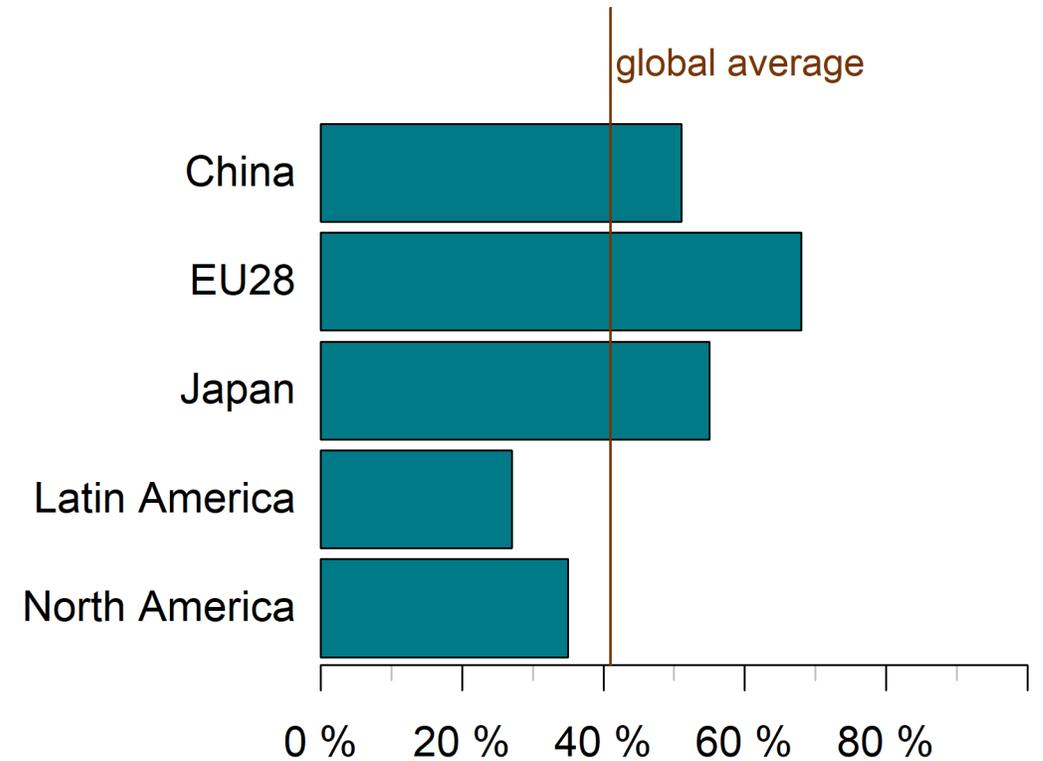


Key global and regional recycling indicators for copper

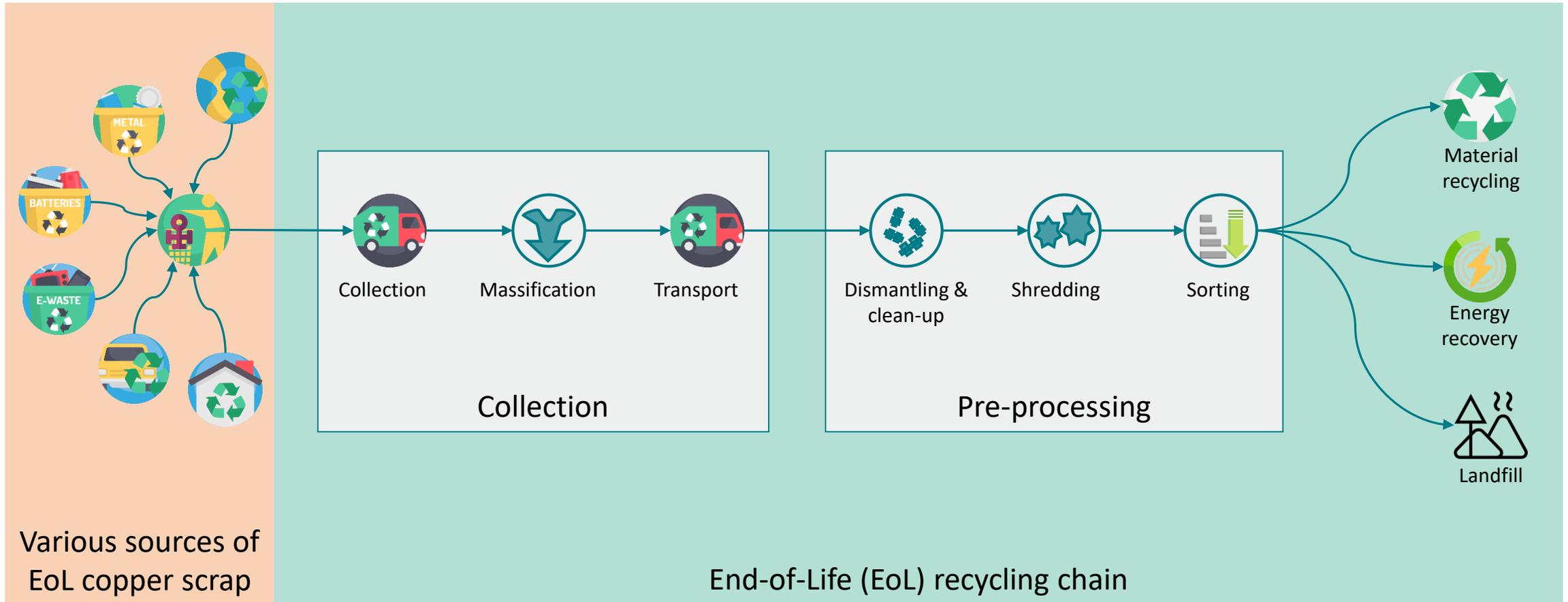
Recycling Input Rate (RIR)



EoL Recycling Rate (EoL RR)



General scheme of recycling flows



Framework conditions for recycling are globally diverse

EU

- Well functioning recycling systems despite regional differences
- Strong pro-recycling regulation
- Well developed company landscape covering entire recycling value chain
- Extensive use of machinery
- Clear disposal ways for consumers

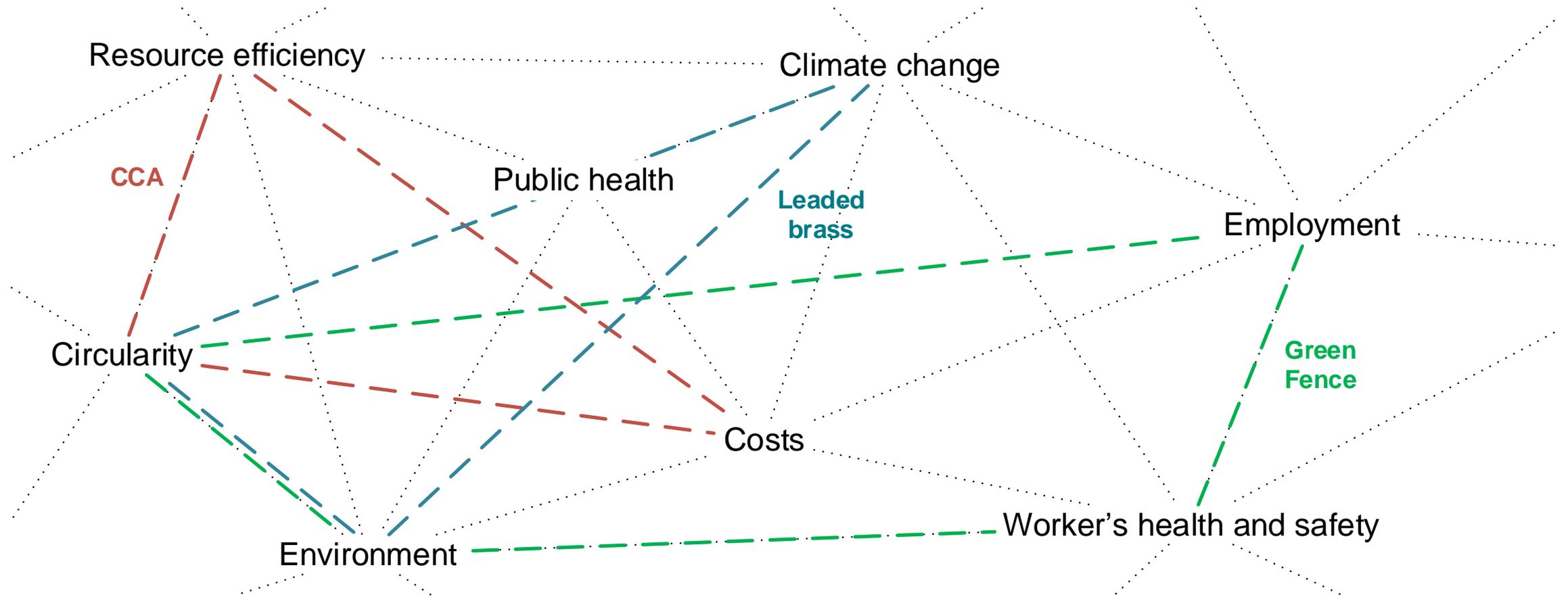
USA

- Well established recycling industry but without secondary smelters
- Different regulations in different states
- Long transportation distances
- Landfill space is plentiful
- Only nascent activities to foster a more circular economy

China

- Increasing attention to recycling
 - Green Fence
- Large recycling capacities but scrap scarcity
- Very high copper demand
- Regional diversity of recycling systems: from fully developed to non-existent
- Unclear disposal ways for consumers

Trade-offs



Framework conditions: Quo vadis?



(c) Luis Tercero Espinoza

All types of copper scrap (more tonnes)

Complexity of materials & products

New technologies – real innovations (e.g. in separation)

Regulation: around copper, chemicals, other...

Availability of personnel



Volatile copper price at a high level



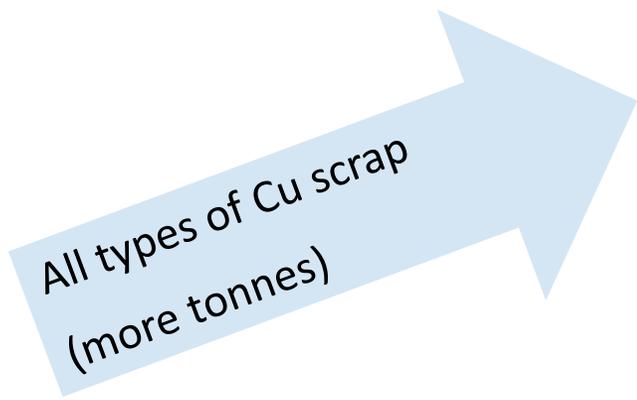
Volatile consumer behaviour/ company behaviour

2019

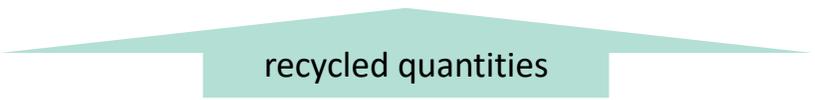
2035

Increased end-of-life (EoL) copper scrap

All types of Cu scrap
(more tonnes)



- EoL scrap is an opportunity for recycling
 - high and increasing demand for copper → enough room for growth of secondary and primary supply
- Expanding global middle class increases demand per capita
 - demand increase today is EoL scrap increase of the future
 - relevant for WEEE and ELV (consumers) as well as industrial electrical and non-electrical scrap (industrialisation)
- Electric cars often seen as the cars of the future → more copper per vehicle
- Land is scarce – unlimited landfilling is no option in the long term → need to improve recycling



recycled quantities

Complex products

Complexity of materials & products

- More complex materials built into more complex products
 - will require higher effort (manual labour and/or machinery) for the same recovery rates & purity of recycled material
 - especially relevant for BEV (safety!) and the increasing amounts of WEEE
 - many technical challenges for separation and sorting → visual inspection and manual separation no longer good enough
 - bi-materials (e.g. copper on aluminum)
- Complex interactions with recovery targets for other materials, e.g. rare earths, gold, platinum
- Complexity limits landfill mining as well as recycling

recovery rates

Regulatory environment

Regulation: around Cu,
chemicals, other...

- Export restrictions for scrap (EU or US) are an issue for recycling
 - Compel industry to solve recycling problems domestically
 - Requires investment
- “Side” (e.g. REACH when it concerns Cu directly or indirectly) or “parallel” regulation (e.g. US State regulations) can hamper recycling
 - Unclear/unknown, complex, costly
 - Effect on Cu (recycling) not immediately obvious
- Changes in regulation are generally costly (licensing, compliance) but may be helpful in the long-term
- Clear and strict regulations generally foster copper recycling

recycled quantities

New technologies



New technologies &
real innovation

- Advances in academia and industry for
 - sorting and separation in general, including robots
 - cable stripping
 - hydrometallurgical processes for special waste streams
 - logistics
 - energy savings
- Still need for technologies for separating complex materials
- Opens up competition from new players (robotics, sensors, software)
- Creates business opportunities for better use of “waste” as a resource



recovery rates

Consumer behaviour: Recycling-friendly?



Volatile consumer behaviour

- An important but non-industry issue?
- Consumers not always react directly to regulation or copper demand
- Increasing concern for the environment can support more recycling
 - Lack of information and lethargy often stronger than good intentions
- Consumer behavior changes with time: Waves of collection and sorting and delivering to recycling points are followed by times of forgetfulness and fallback to apathy
- Communication with consumers is crucial!
 - Large role of social media: awareness raising, establishing a green image, green washing, fake news, and loss of trust in “authorities” (science, politics)



Increasing recycling in the future

