China AL Scrap S&D Modeling

China Aluminum Scrap Industry S&D Modeling

OBJECTIVES

- The objective of the project is to assist companies in establishing a rigorous aluminum industry supply and demand model, tightly integrating production data from the mining side with consumption data from the terminal end, to provide a quantifiable decision-making basis for the layout of company products.

PROCESS

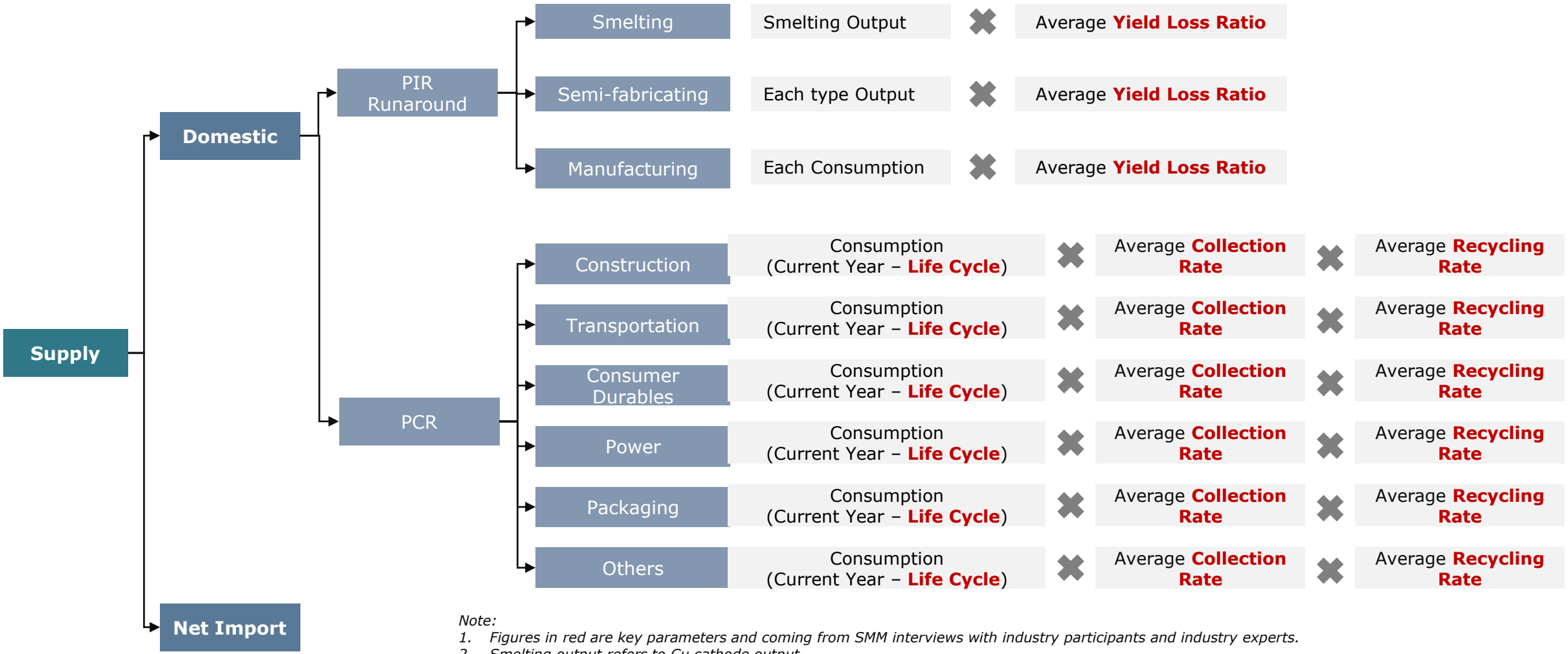
- Methodology
  - Establishment of supply data one by one from company level
  - Demand modeling from industry level to accessory parts (I-VI Class)
  - Determination the key indicators and conduct the primary research
  - Double check with balance with inventory data
- Sample Size
  - Smelters(27), Casthouse(30), End-uses(18), Dismantlers(12), traders(10), Institution(3)
- Project Time
  - 12 weeks

DELIVERABLES

- Market Transparency Outlook
  - Value chain drawing
  - Pricing mechanism
  - Technology and policy evolution trend, etc.
- Key parameter analysis
  - Collection rate, recycling rate, yield loss, life cycle, etc.
- Key regions Al scrap supply and demand
  - Supply: runaround scrap, new scrap, old scrap
  - Demand: smelting, fabricating
- Aluminum demand and scrap generation volume forecast up to 2050E

SMM bases on primary research, internal database and modelling, successfully help our client deeply understand China LIB recycling market and mapping future development strategy

SMM Bottom-up Methodology of Al Scrap Supply Model

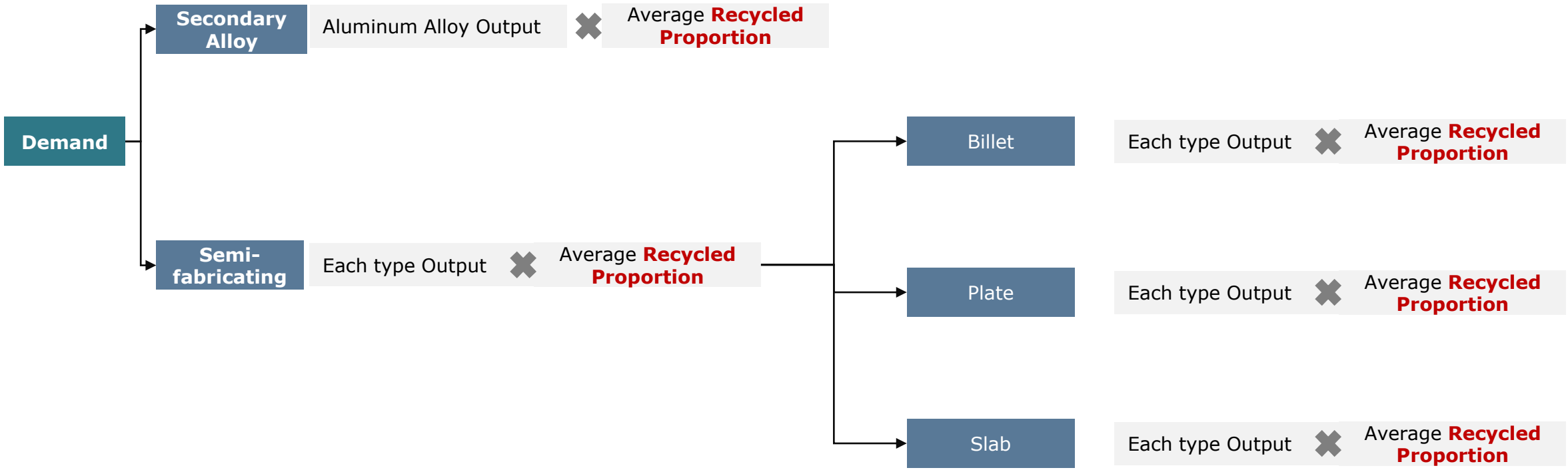


Note:

1. *Figures in red are key parameters and coming from SMM interviews with industry participants and industry experts.*
2. *Smelting output refers to Cu cathode output.*
3. *Each type output of semi-fabricating includes wire, rod, plate, tube, foil, others.*
4. *Manufacturing sector includes power, automobile, internal appliance, construction, machinery and other industry, where related metal parts are produced.*
5. *SMM apply a 5 year average to smooth the historical copper consumption pool for PCR collection*

Source: SMM

SMM Bottom-up Methodology of Al Scrap Demand Model



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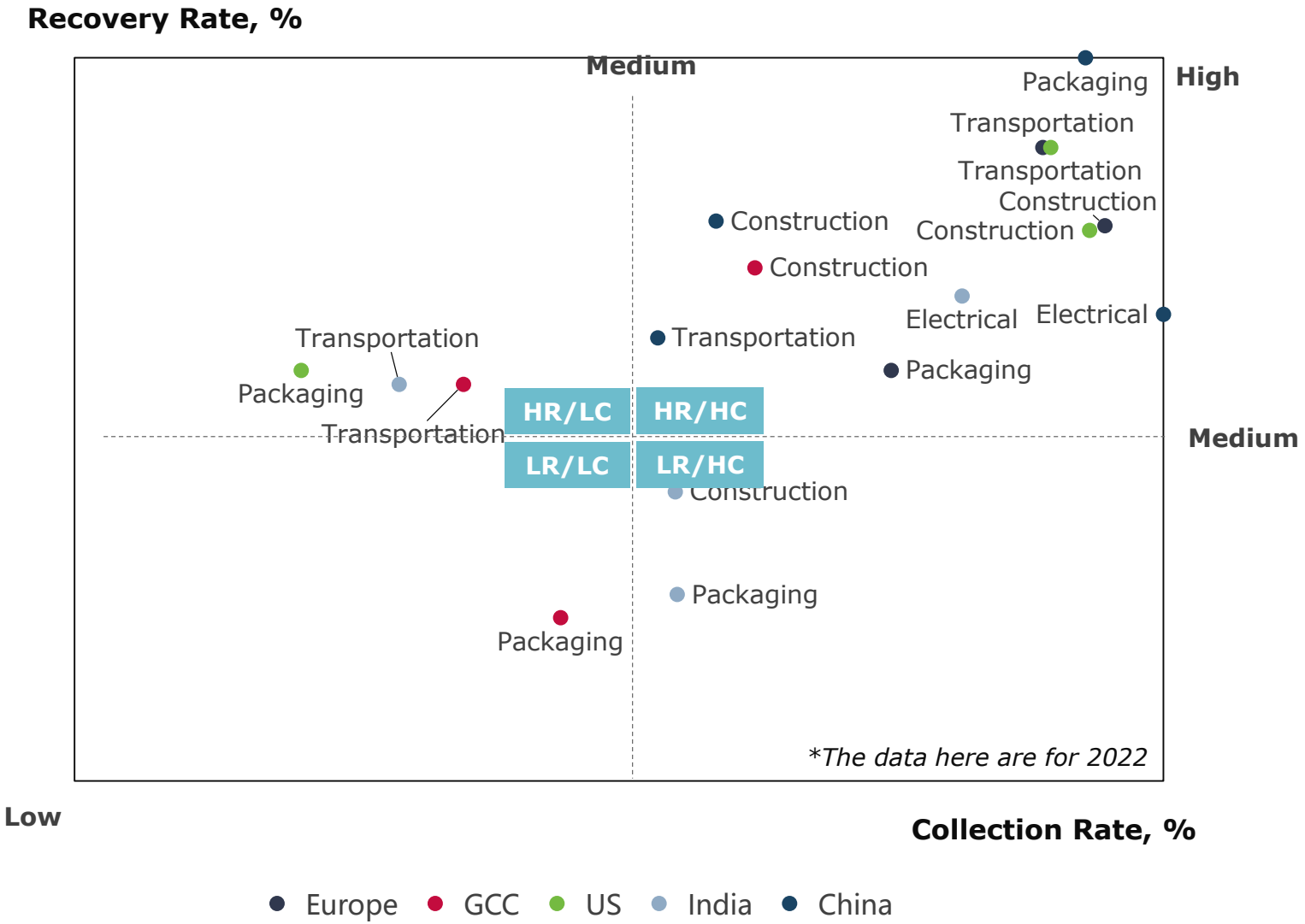
Source: SMM

Key Indicator Hypothesis by Region



Source: SMM

Transportation

The recovery rate of the transportation industry is similar all over the world, and there will be a **certain gap in the collection rate**. For example, India and GCC countries are significantly lower than other countries, located in the HR/LC quadrant.

Construction

Except India, there is **little difference between collection rate and recovery rate** of construction industry countries, all of which are located in HR/HC quadrant, while India has a lower recovery rate, located in LR/HC quadrant.

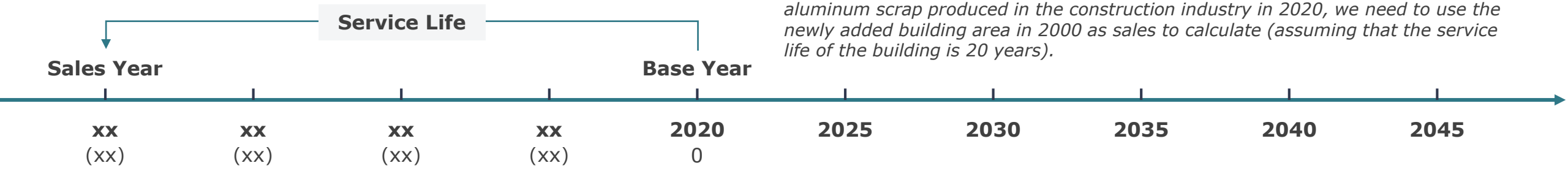
Packaging

The packaging industry is **relatively scattered**, with a certain gap between the recovery rate and collection rate.

Only the recovery rate and collection rate of China and European countries remain at a high level, while the collection rate of America is relatively low. India's recovery rate is low, while the GCC countries are at a low level in both indicators.

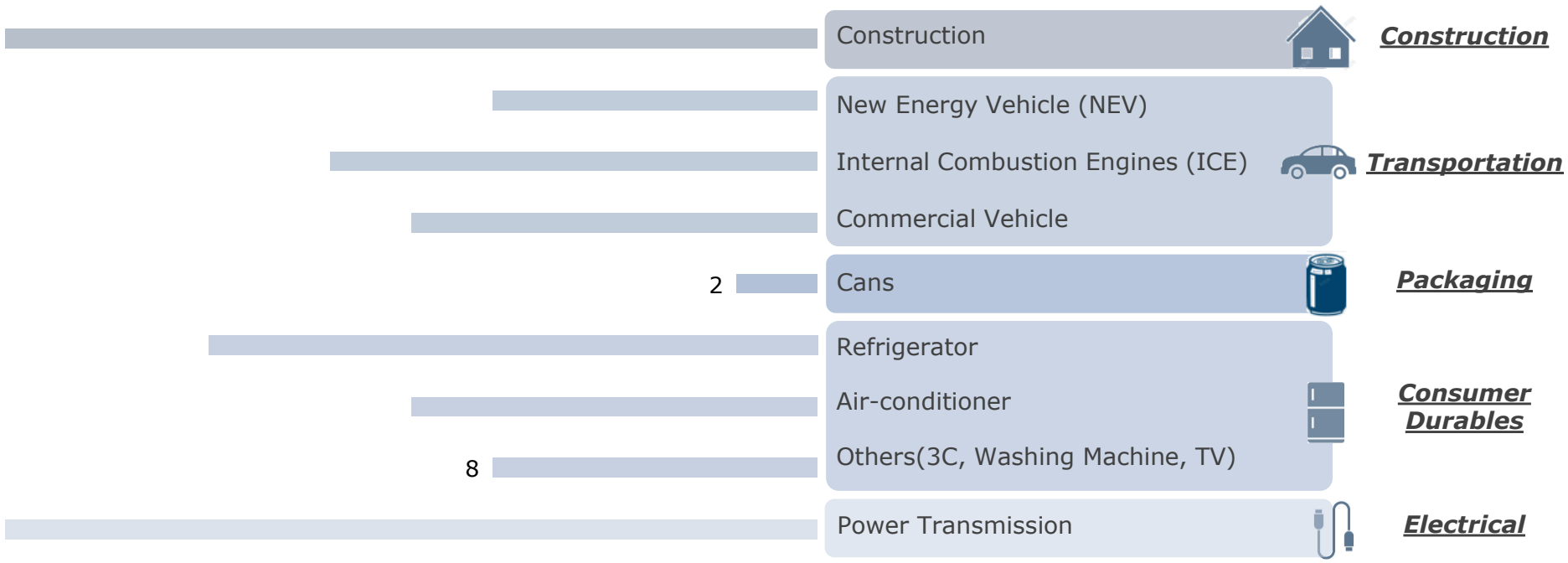
Product Service Life Assumption

Taking 2020 as the base year for example, if we want to calculate the amount of aluminum scrap produced in the construction industry in 2020, we need to use the newly added building area in 2000 as sales to calculate (assuming that the service life of the building is 20 years).



Product Service Life Assumption by Industry

Unit: Year



The aluminum products transform into retired products and generate old scrap after serving for society for a while. Nevertheless, their **lifetimes are diverse** for end-use products of different categories, and SMM adopts the lifetime intervals on the basis of previous studies (*Melo, 1999; Chen and Shi, 2012; Luca et al., 2013; Zhang et al., 2015a*).

Source: SMM

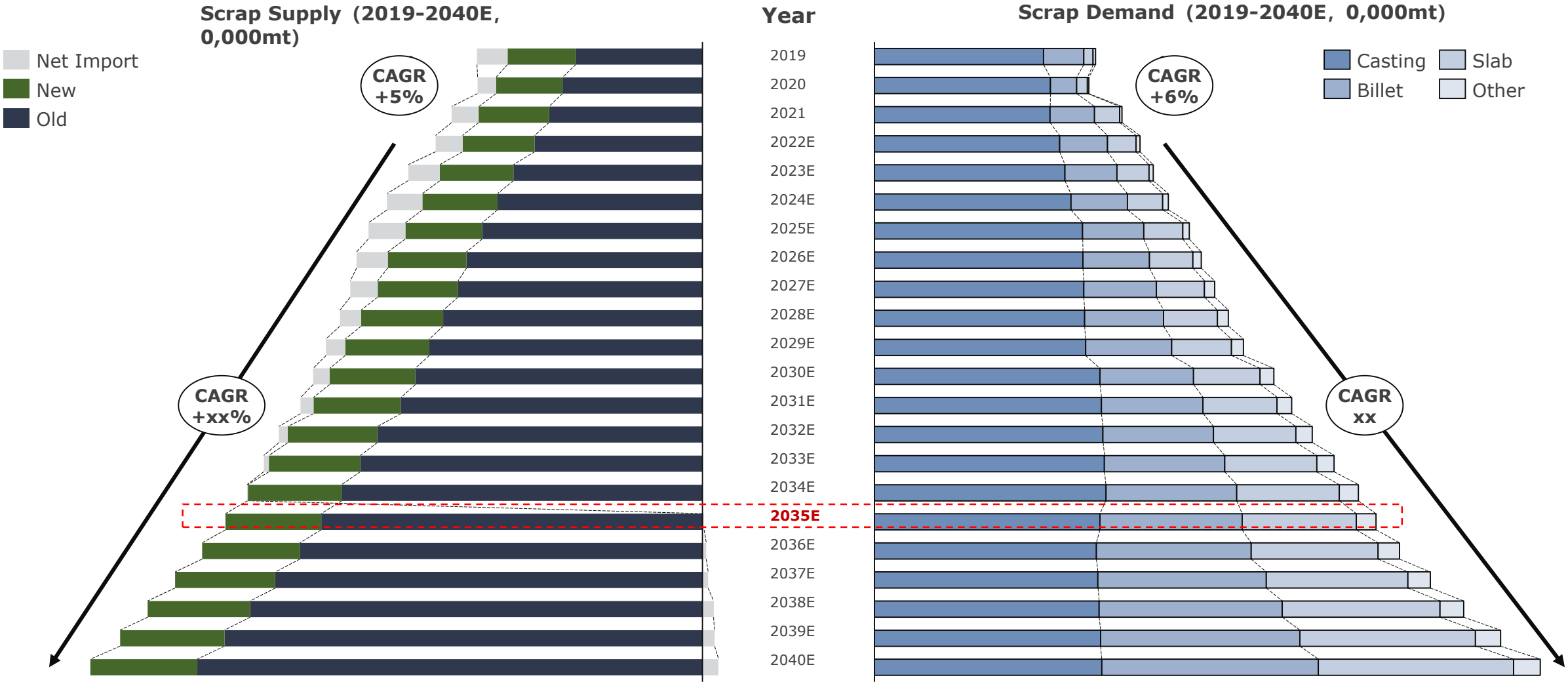
Demand modeling from industry level to accessory parts (I-VI Class)

Urban: scrap aluminum generation volumes				
Urban: total aluminum consumption				
Residential	residential scrap aluminum generation volumes			
	residential, total aluminum consumption			
	door & window	scrap generation volumes		
		total aluminum consumption		
		service lifespan		
		collection rate		
		recovery rate		
		New apartment	door window al consump	
			completed area	
			window/floor ratio	
			Al penetration ratio	
			unit consumption	
	Ceiling	scrap Al generation volumes		
		total aluminum consumption		
		service lifespan		
		collection rate		
		recovery rate		
		New apartment	al consumption	
			completed area	
			ceiling/sqm	
			Al penetration ratio	
			unit consumption	
	Al Formwork	scrap Al generation volumes		
		total aluminum consumption		
		service lifespan		
		collection rate		
		recovery rate		
		New apartment	al consumption	
			completed area	
			formwork/sqm	
			Al penetration ratio	
			formwork turnaround tim	
			unit consumption	

Category-1	Category-2	Category-3	Category-4	Category-5	Category-6	Unit
Transportation - scrap generation volumes (total)						10kt
Transportation - aluminum consumption volumes (total)						10kt
	Automobile - scrap generation volumes					10kt
	Automobile - aluminum consumption					10kt
	NEV (New Energy Vehicle)	EV passenger vehicle	PEV	scrap generation volumes		10kt
				aluminum consumption volumes		10kt
				PEV sales volumes		million unit
				PEV Al unit consumption		mt/unit
				PEV Ali spare parts	battery system	mt/unit
					wheel & break	mt/unit
					4 doors 2 covers	mt/unit
					chassis & suspension	mt/unit
					heat exchanger	mt/unit
					others	mt/unit
				service lifespan		Years
				collection rate		%
				recovery rate		%
			Hybrid	scrap generation volumes		10kt
				aluminum consumption volumes		10kt
				hybrid vehicle sales volumes		million unit
				hybrid vehicle Al unit consumption(AVG)		mt/unit
				hybrid vehicle Ali spare parts	battery system	mt/unit
					wheel & break	mt/unit
					4 doors 2 covers	mt/unit
					chassis & suspension	mt/unit
					heat exchanger	mt/unit
					others	mt/unit
				service lifespan		Years
				collection rate		%
				recovery rate		%
				scrap generation volumes		10kt
				aluminum consumption volumes		10kt
				commercial vehicle sales volumes (for passenger)		million unit

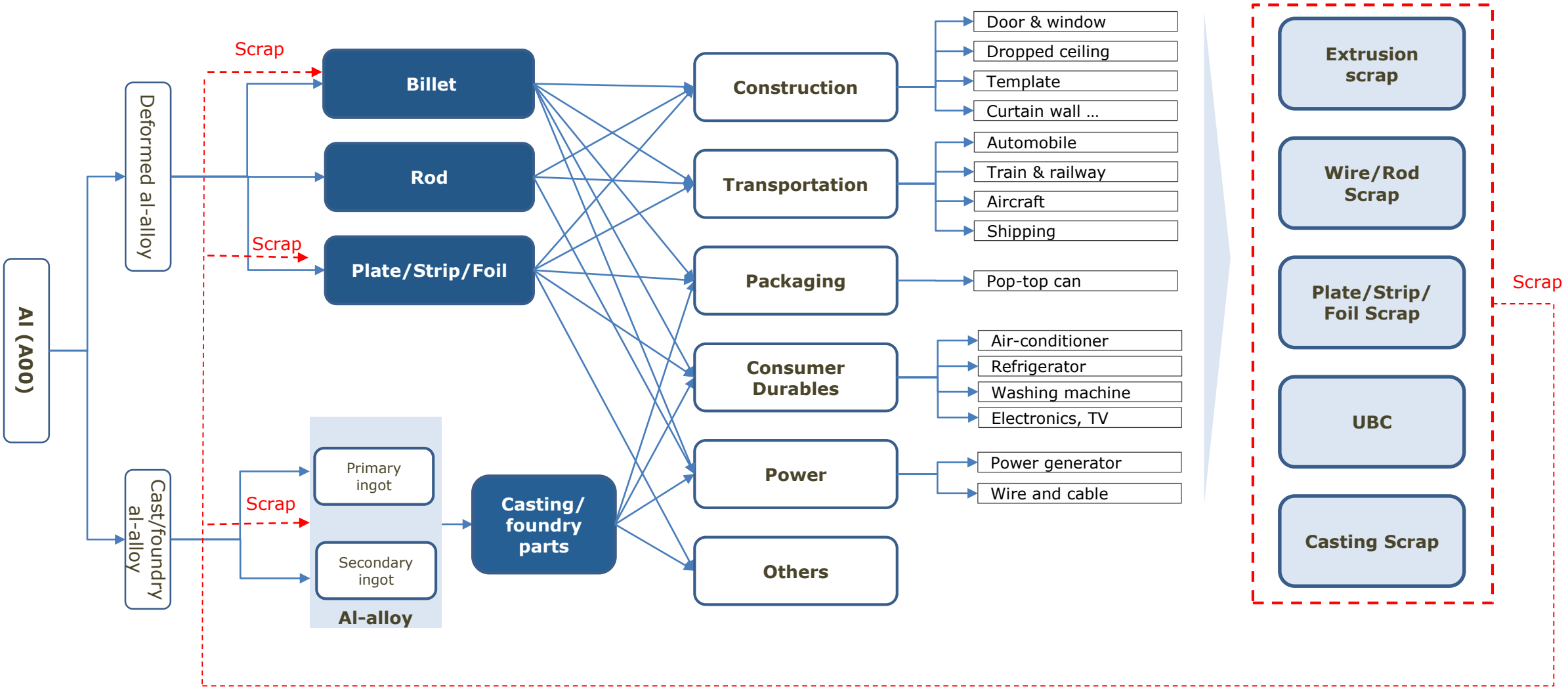
Source: SMM

China Aluminum Scrap S&D



Source: SMM

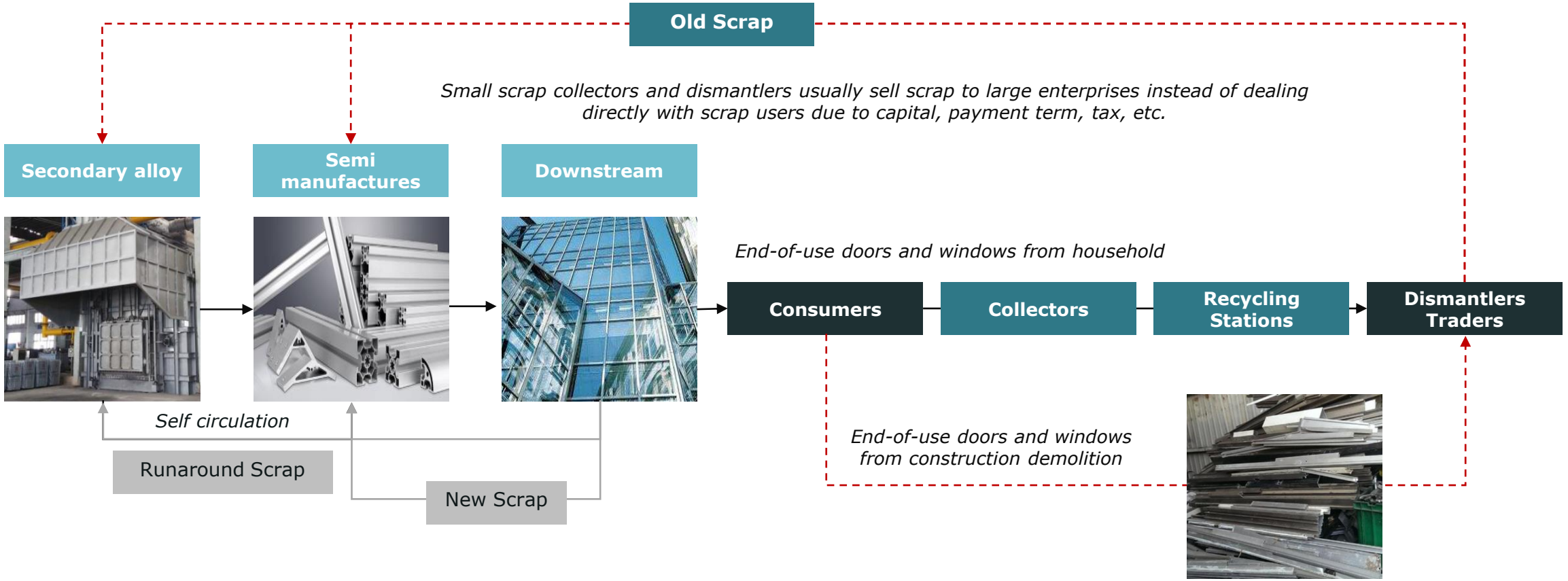
Aluminum Scrap Value Chain



Source: SMM

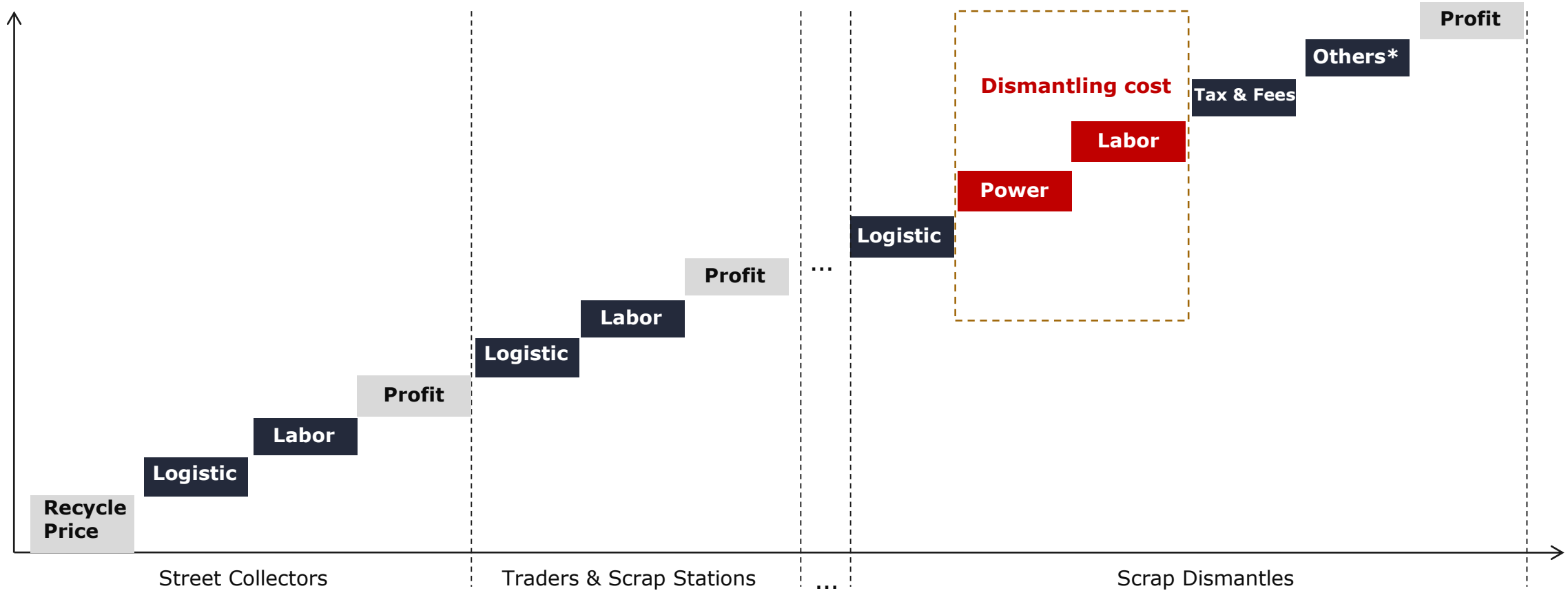
Aluminum Scrap Recycling System

Al Scrap Recycling System – Construction Industry as an example



Source: SMM

Value Added Chain



Notes

1) Tax & Fees : including all kinds of tax & fees such as VAT, environmental tax, pollution discharge fees, etc.

2) All other cost (depreciation & amortization , maintenance fees, management fees, etc.) are grouped into Others

Source: SMM

Aluminum Scrap Pricing Mechanism

Scrap Aluminum Price = **Virgin Aluminum Price** * **Index** ± **Negotiate Premium**

	Platform	Grade	Period	Analysis
Long-term	**LME/SHFE/SMM Aluminum Price**	**A00**	**Monthly Average Price**	Use futures fluctuations and speculation to earn additional market income, which is mostly used in the signing of long-term orders between traders and real companies. For enterprises without research and transaction capabilities, the risk is greater
Short-term			**Price of The Day**	

- **Virgin aluminum price** usually refers to the LME aluminum price, which changes in time, and the current price is between xx-xx USD/ton.
- The **index** varies according to the type and recovery rate of scrap aluminum
- The negotiate **premium** is determined according to the procurement volume, customer reputation, and long-term/short-term orders

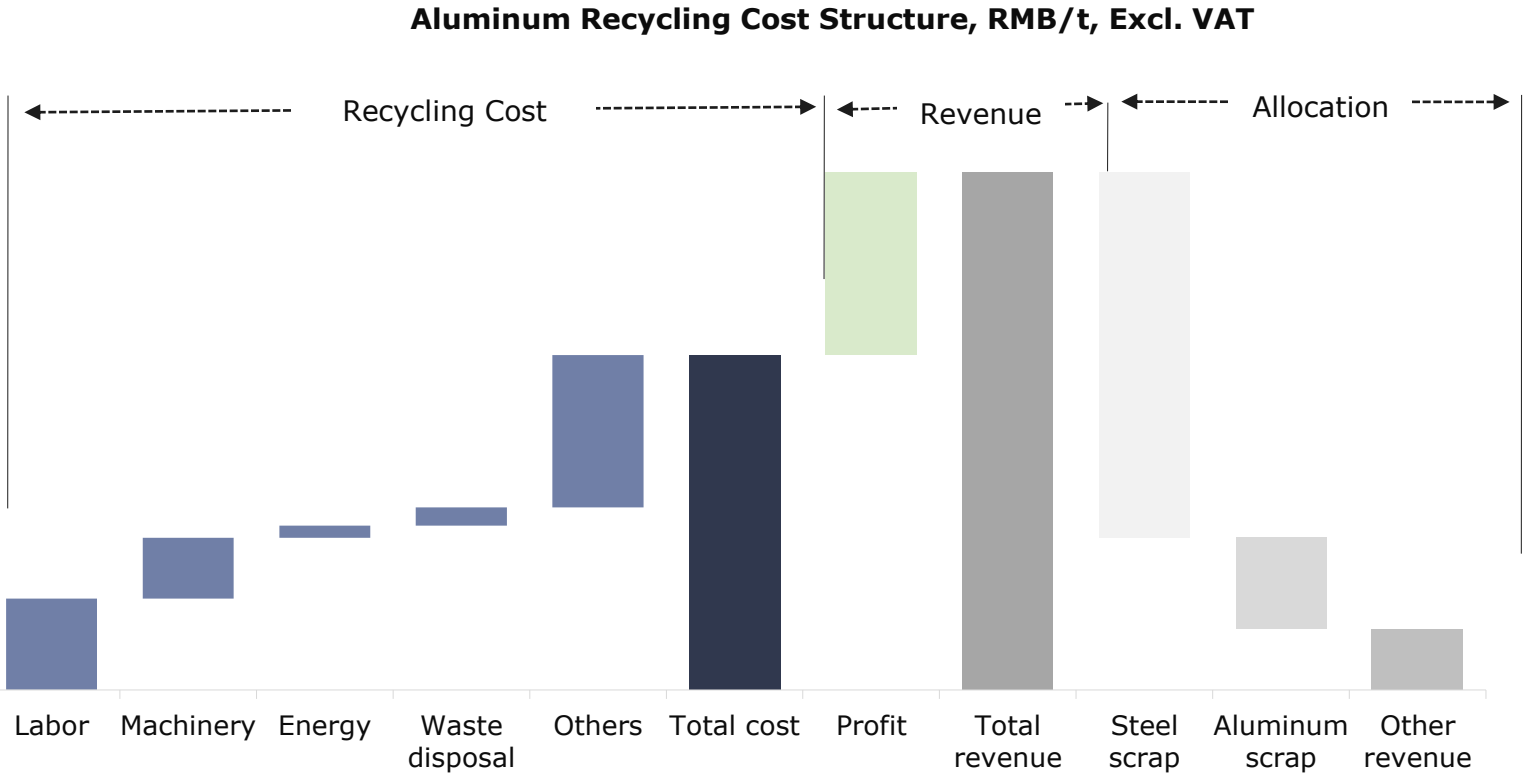
Index Intervals

	Cable Scrap	Casting Scrap	Rolled Scrap	Extrusion Scrap	UBC Scrap
Intervals	xx~xx%	xx~xx%	xx~xx%	xx~xx%	xx~xx%
Price Range (USD/ton)	xx-xx	xx-xx	xx-xx	xx-xx	xx-xx

Source: SMM

Typical Recycling Cost Models

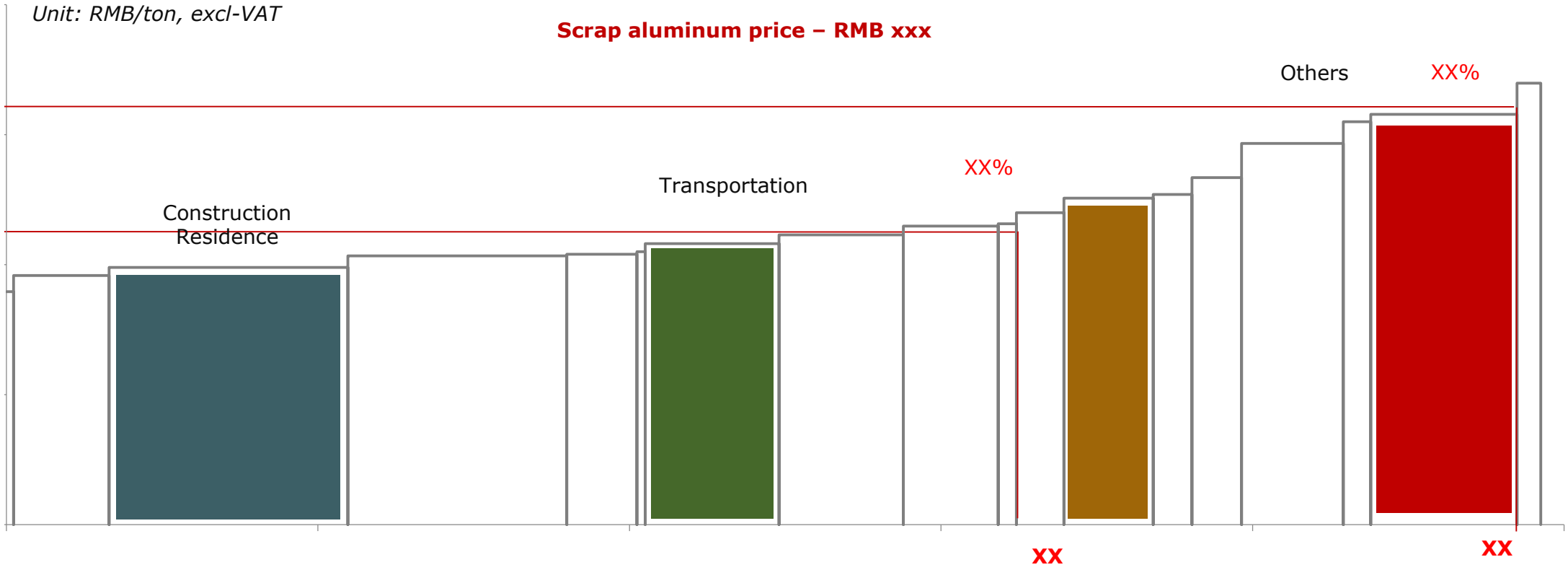
Raw material cost	▪ Recycling price by typical products
Manufacturing cost	▪ Labor cost ▪ Energy cost ▪ Maintenance & depreciation ▪ Waste disposal
Management Fees	▪ Management fees ▪ Others



- Based on the interviews, SMM will summarize typical recycling cost models, breakdown by key cost components
- Total recycling cost will be reallocated based on the proportion of scrap steel, scrap aluminum and revenue coming from other products. Based on the survey, SMM will provide further analysis of major cost components

Source: SMM

Aluminum Recycling Cost Curve



Unit: domestic obsolete aluminum volume

Note
1) Numbers on horizontal axis in this chart refer to domestic obsolete scrap volume
2) Based on the interviews, SMM will summarize the recycling cost of 6000 scrap by major downstream products

Source: SMM