



Scrap S&D Modeling

China Aluminum Scrap Industry S&D Market Research



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.

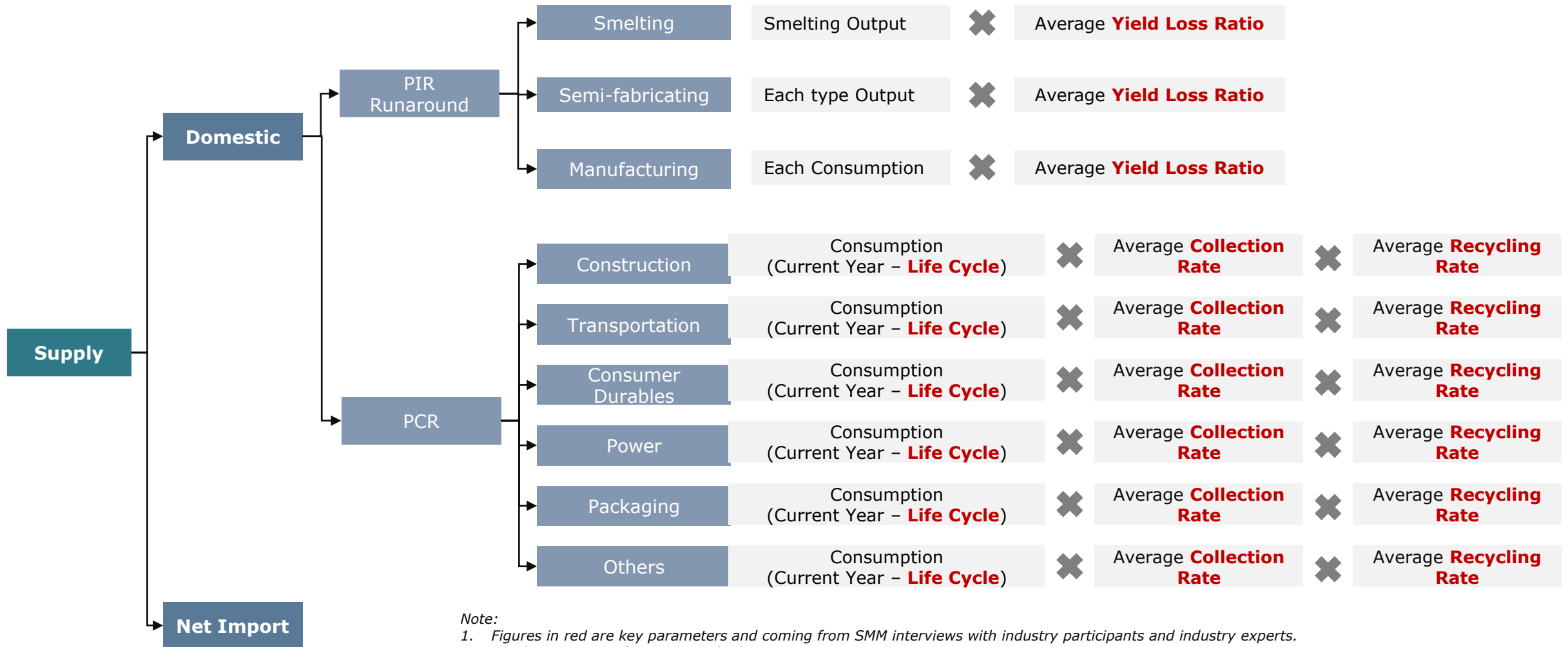
PROCESS

- 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

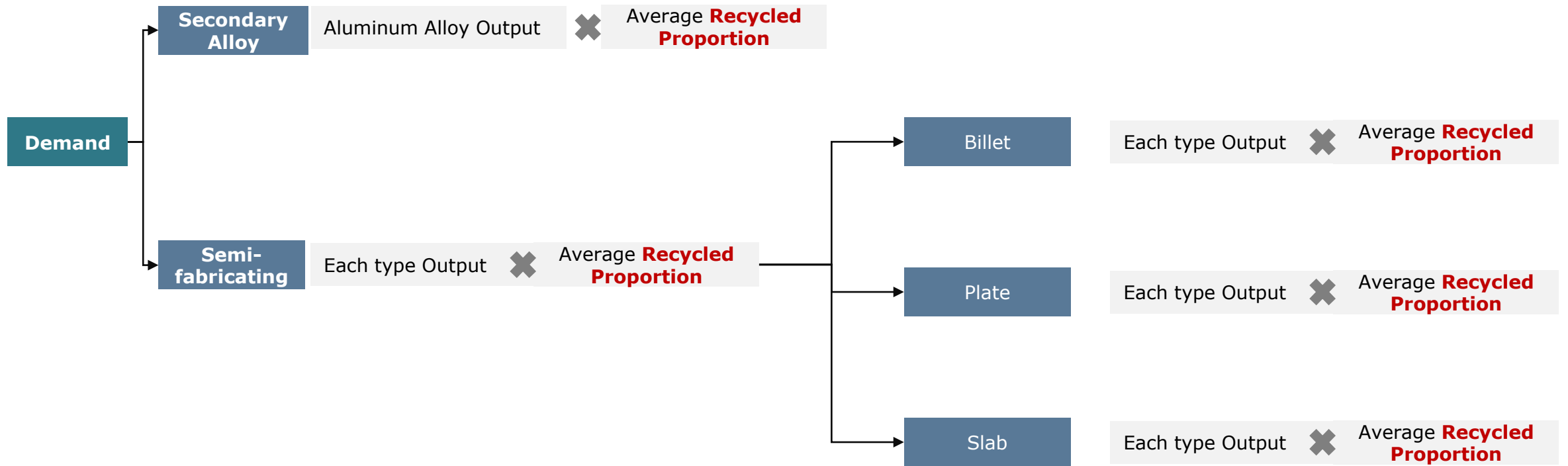
SMM Bottom-up Methodology of AI Scrap Supply Model



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

SMM Bottom-up Methodology of AI Scrap Demand Model



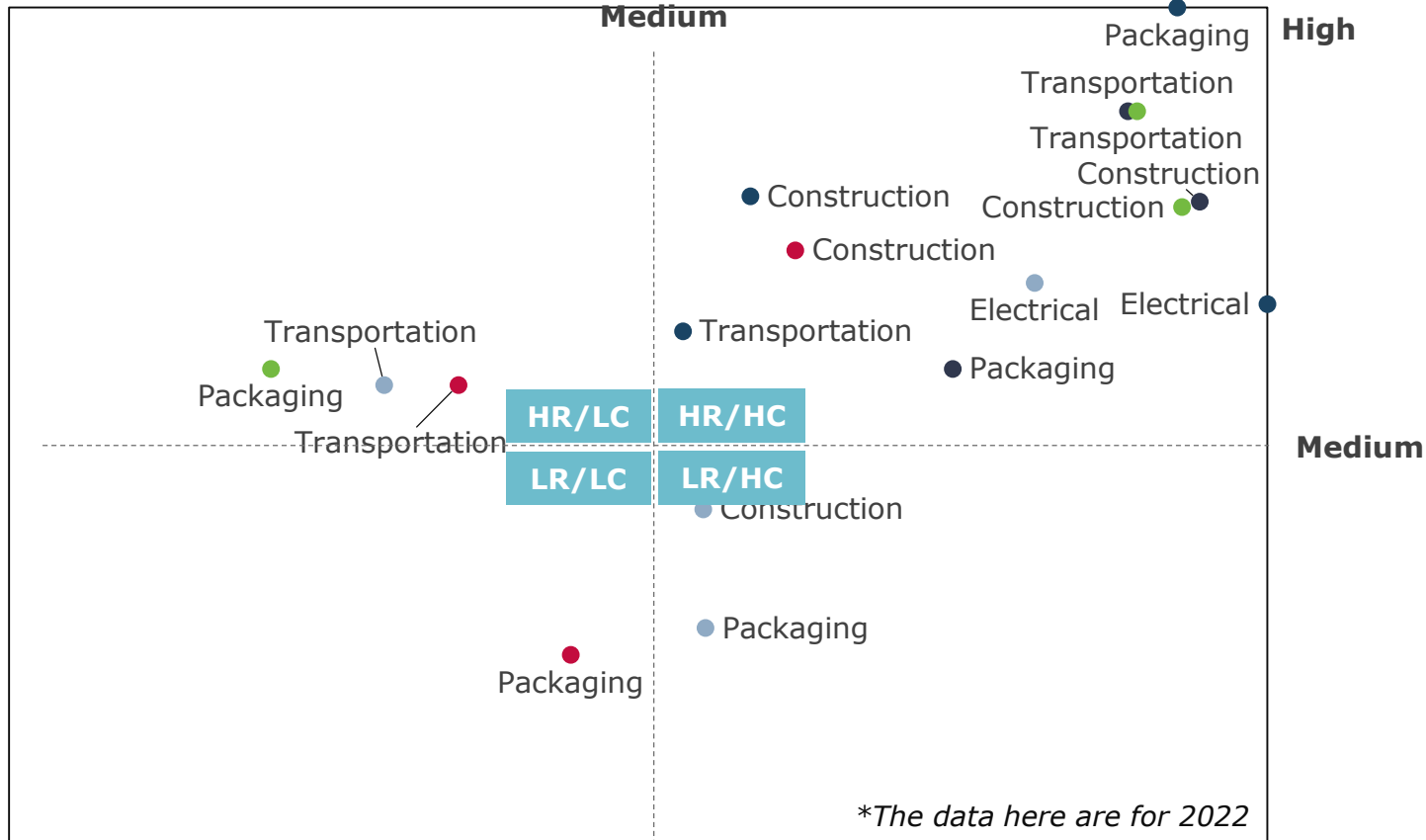
Note:

1. Figures in red are key parameters and coming from SMM interviews with industry participants and industry experts.

Source: SMM

Key Indicator Hypothesis by Region

Recovery Rate, %



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.

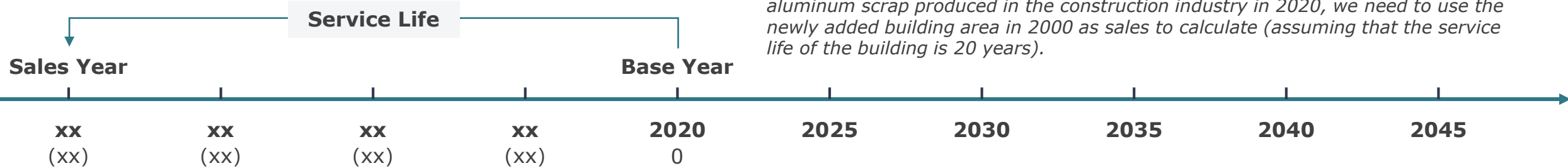
Packaging

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.

- Europe
- GCC
- US
- India
- China

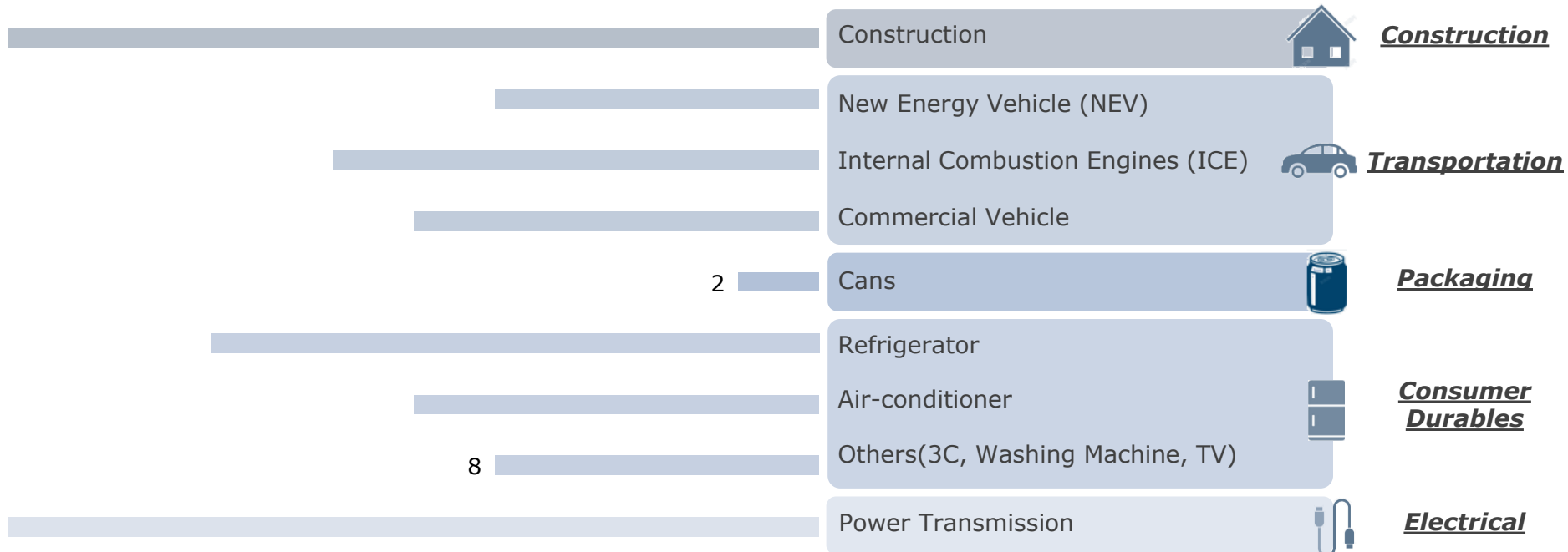
Product Service Life Assumption



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



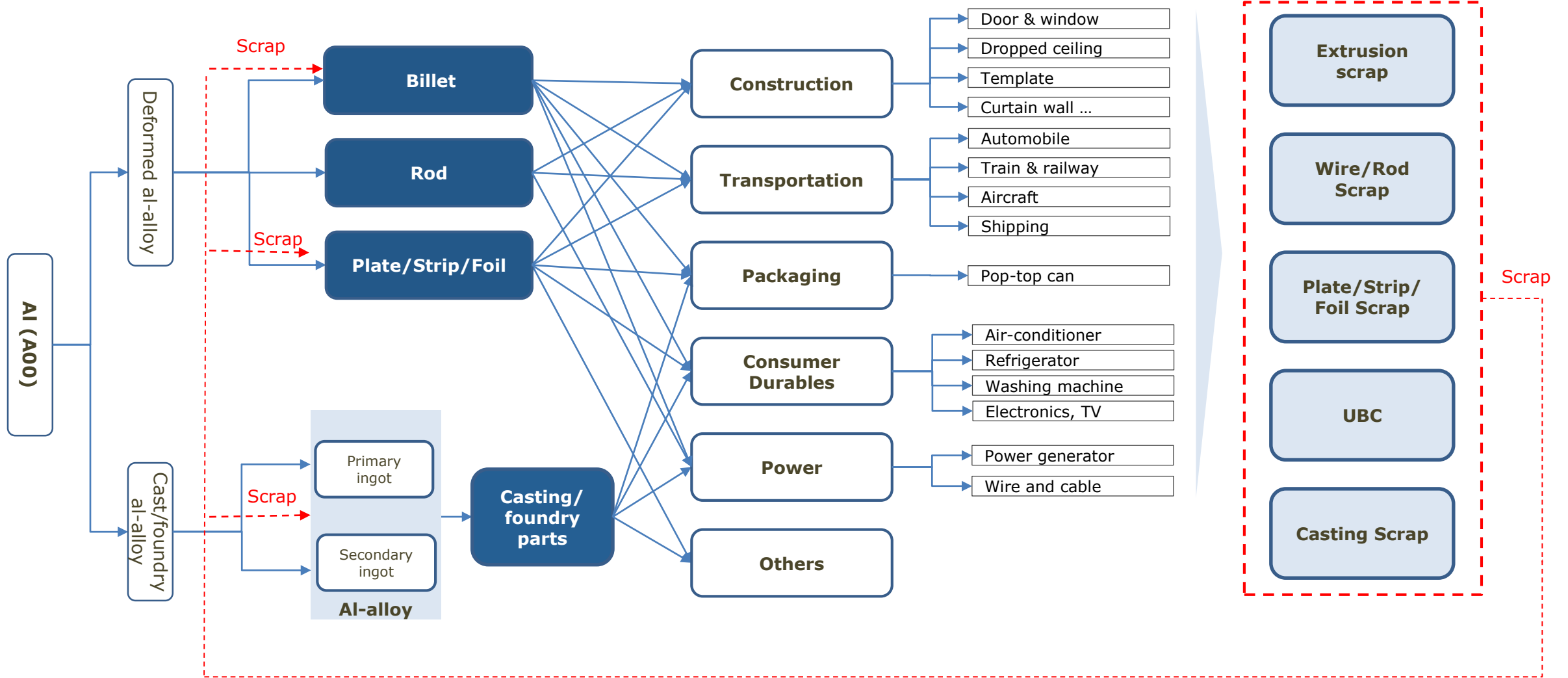
The aluminum products transform into retired products and generate old scrap after serving for society for a while. Nevertheless, their **lifetimes are diverse** for end-use products of different categories, and SMM adopts the lifetime intervals on the basis of previous studies (*Melo, 1999; Chen and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

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 consumption
			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 time	
unit consumption			

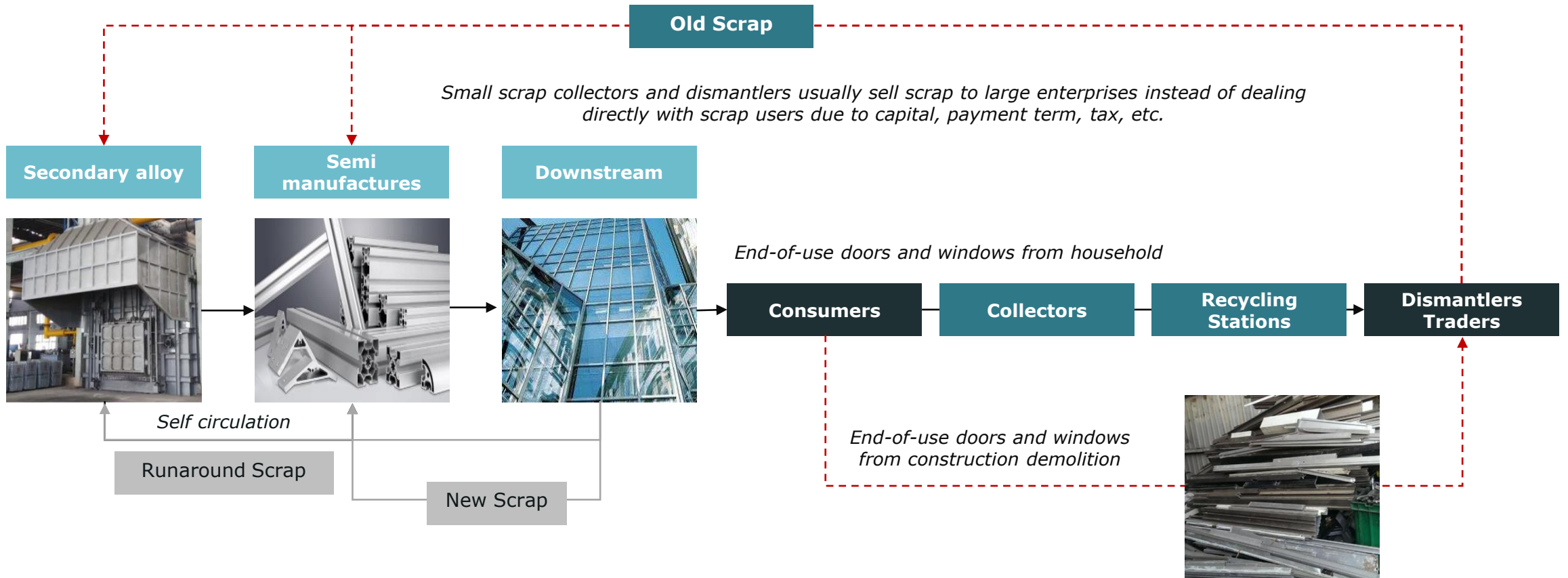
Category-1	Category-2	Category-3	Category-4	Category-5	Category-6	Unit	
					Transportation - scrap generation volumes (total)	10kt	
					Transportation - aluminum consumption volumes (total)	10kt	
					Automobile - scrap generation volumes	10kt	
					Automobile - aluminum consumption	10kt	
					scrap generation volumes	10kt	
					aluminum consumption volumes	10kt	
					PEV sales volumes	million unit	
					PEV Al unit consumption	mt/unit	
				PEV	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	%
							scrap generation volumes
					aluminum consumption volumes	10kt	
					hybrid vehicle sales volumes	million unit	
					hybrid vehicle Al unit consumption(AVG)	mt/unit	
				Hybrid	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
					aluminum consumption volumes	10kt	
					commercial vehicle sales volumes (for passenger)	million unit	

Aluminum Scrap Value Chain



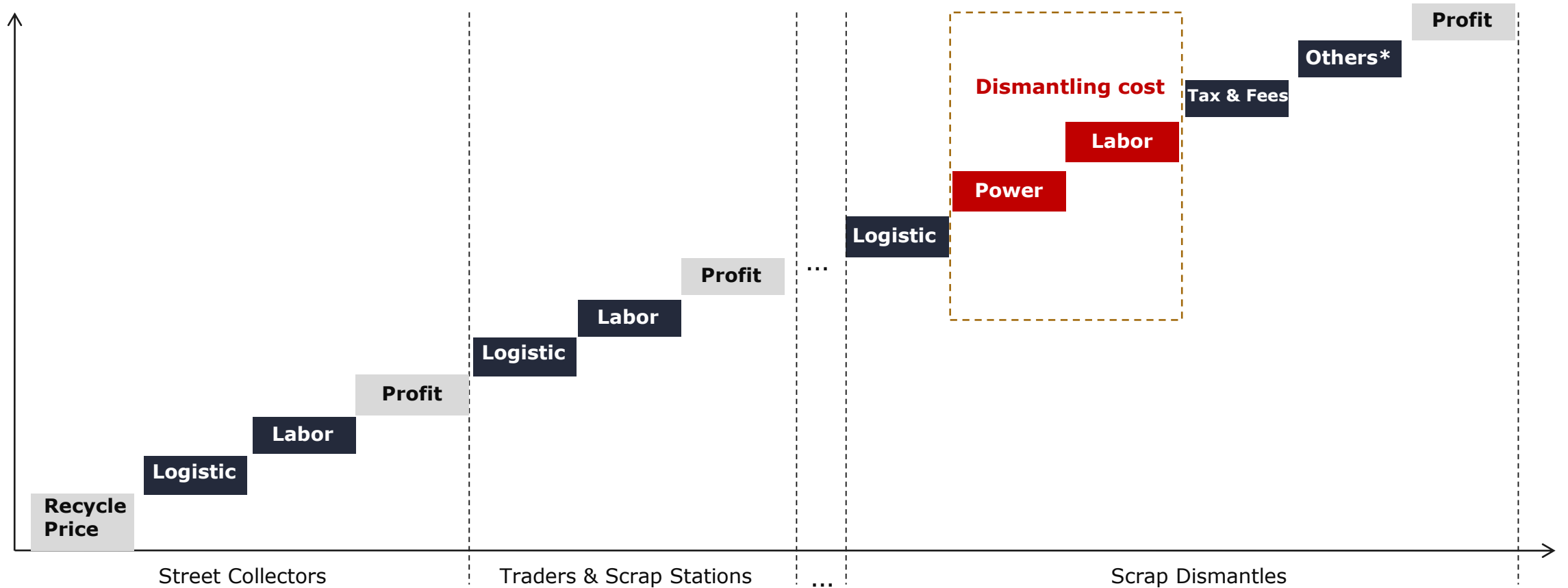
Aluminum Scrap Recycling System

Al Scrap Recycling System – Construction Industry as an example





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

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

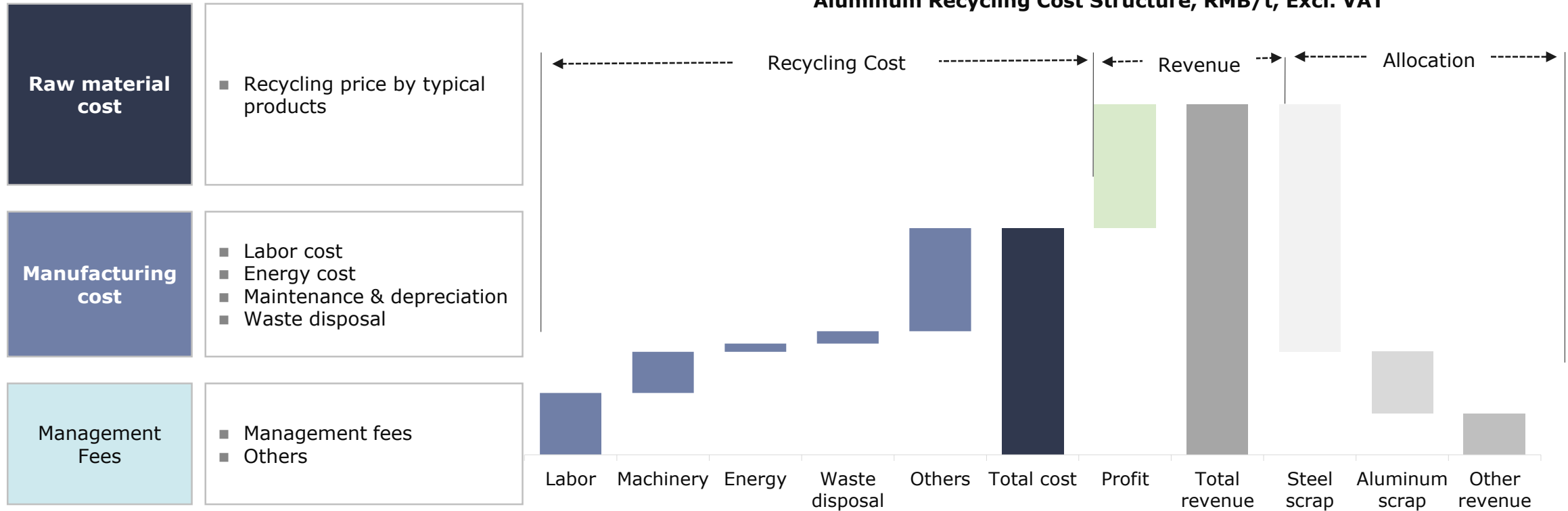
Price of The Day

- **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

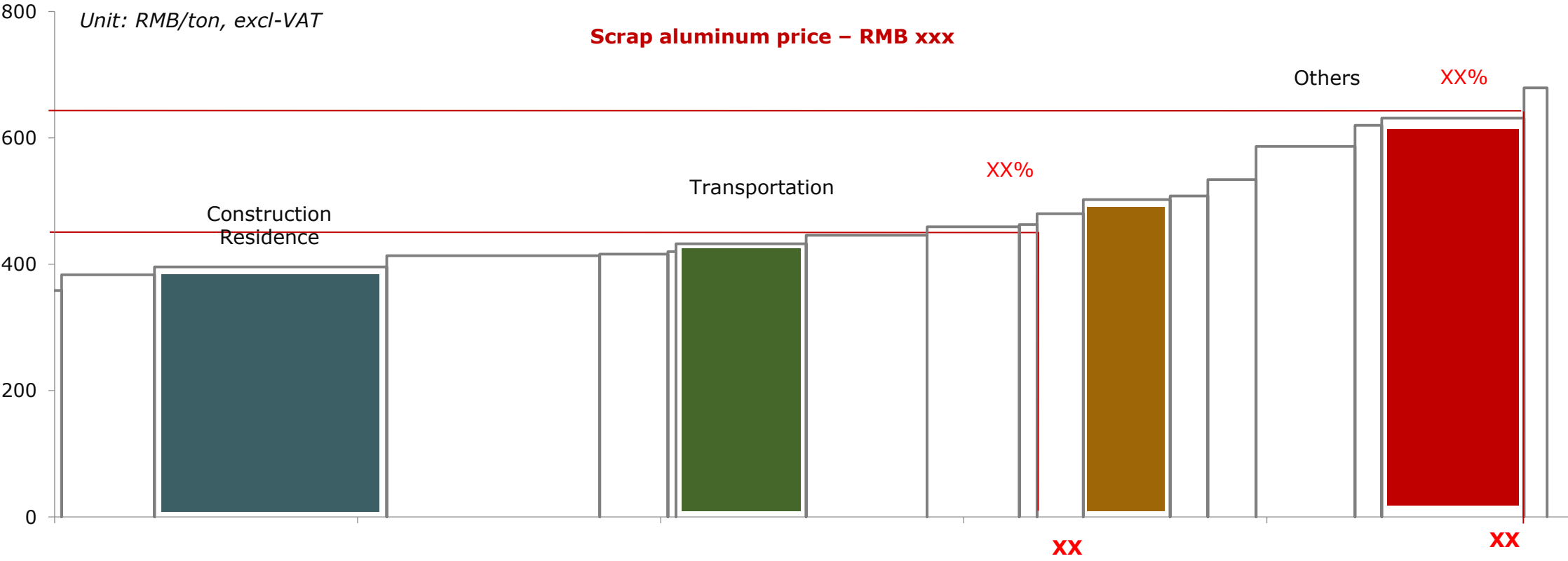
Typical Recycling Cost Models



- 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



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