



Aluminum Cans Market Assessment - Thailand

Context, quantitative baseline, options

Final version

May 2023

List of abbreviations – selection

| Abbreviation | Description |
|----------------|----------------------------------|
| b units | Billion units |
| C2C | Can to can |
| DRS | Deposit return scheme |
| EPR | Extended producer responsibility |
| Horeca | Hotel, restaurant, and catering |
| m units | Million units |
| MRF | Material recovery facility |
| MSW | Municipal solid waste |
| POM | Put-on market |
| UBC | Used beverage cans |
| WM | Waste management |
| WtE | Waste to energy |

Contents

| | | |
|----|---------------------------------------|----|
| 1. | Executive Summary | 4 |
| 2. | Aluminum Cans Market | 8 |
| 3. | Waste management & regulatory context | 11 |
| 4. | Value Chain | 16 |

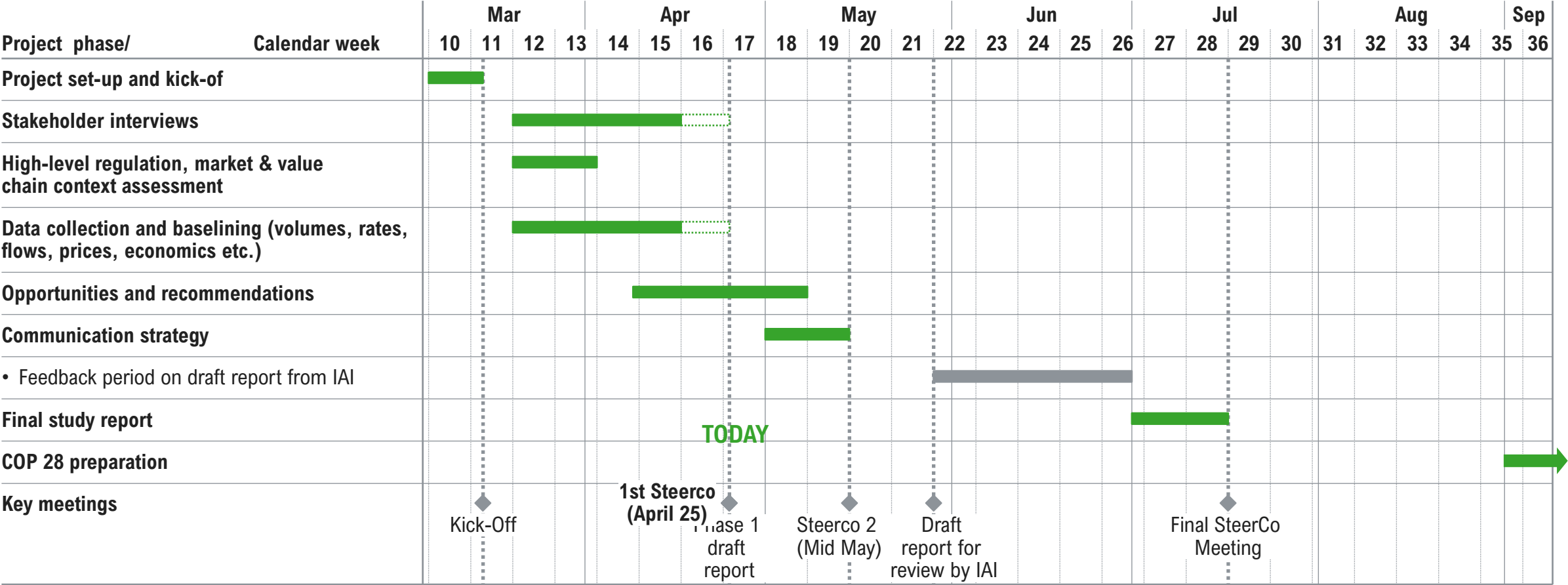
This document shall be treated as confidential. It has been compiled for the exclusive internal use by our client and is not complete without the underlying detailed analyses and the oral presentation. It must not be passed on and/or must not be made available to third parties without prior written consent from Roland Berger.



1. Executive Summary

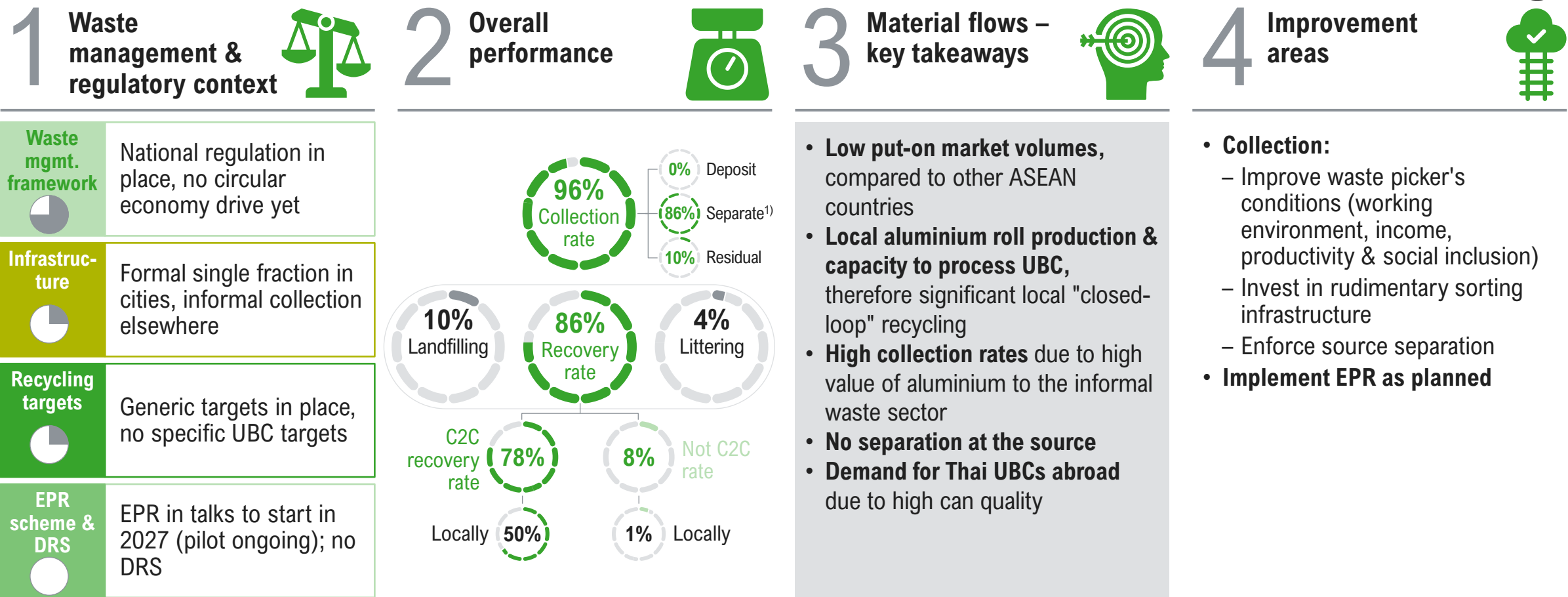
We are approaching the end of phase 1 of the project, with the initial draft report sent and being discussed with relevant country representatives

Project timeline



Thailand reports high collection rates as UBC scrap is very valuable to waste pickers, high quality local scrap allows for high can-to-can ratio

Aluminium can recycling in Thailand

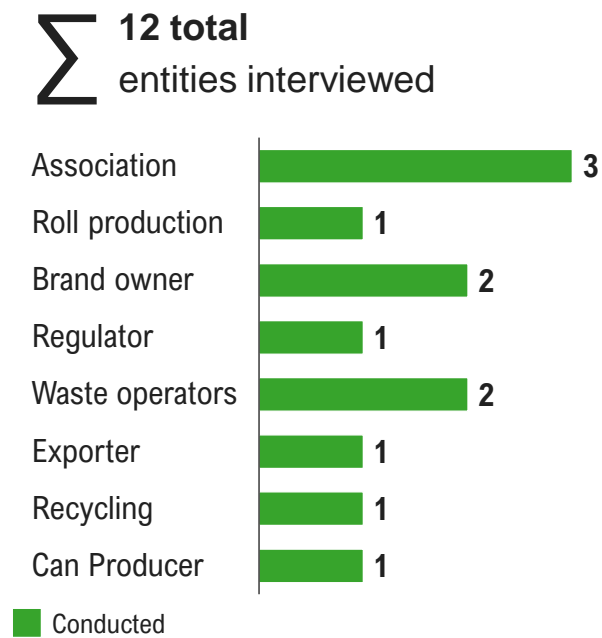


○ Not existing ◐ Incipient, with limited scope ◑ Developing ◒ Matured ◓ Fully developed

1) Separate coll. includes recovered after MRF & transfer station, and all UBCs picked by waste pickers

We have used macro and industry databases, market studies, RB know-how and expert interviews along the value chain to develop our analysis

Overview of interviews and sources



| | # | Company | Position |
|----------------|----|-----------------------------------|------------------------------|
| Waste operator | 1 | Wongpanit | International Coordinator |
| Association | 2 | Yunus Thailand | Director |
| Regulator | 3 | Ministry of Natural Resources | Pollution Control Department |
| | 4 | TIPMSE | Committee |
| | 5 | Department of Environment Bangkok | Employee |
| Alu production | 6 | UACJ (Rayong) | Senior Manager |
| Trader | 7 | Anglo Asia Trading | Assisting Factory Manager |
| Brand owner | 8 | Coca-Cola | Sustainability Director |
| | 9 | Boonrawd | Employee |
| Recycler | 10 | Junk shop 1 | Owner |
| | 11 | Junk shop 2 | Owner |
| Can prod. | 12 | TBC | Sustainability Manager |

Statistics/ databases

- Aluminium Recovery figures
- Export data

Industry players, experts, regulators

- Government and associations
- Recyclers and traders

Market studies

RB sources

- Previous project experience
- Internal experts
- Industry contacts



2. Aluminum Cans Market

Put on market volumes in Thailand are fairly low on a per capita basis, but are expected to grow

Overview of volumes put on market

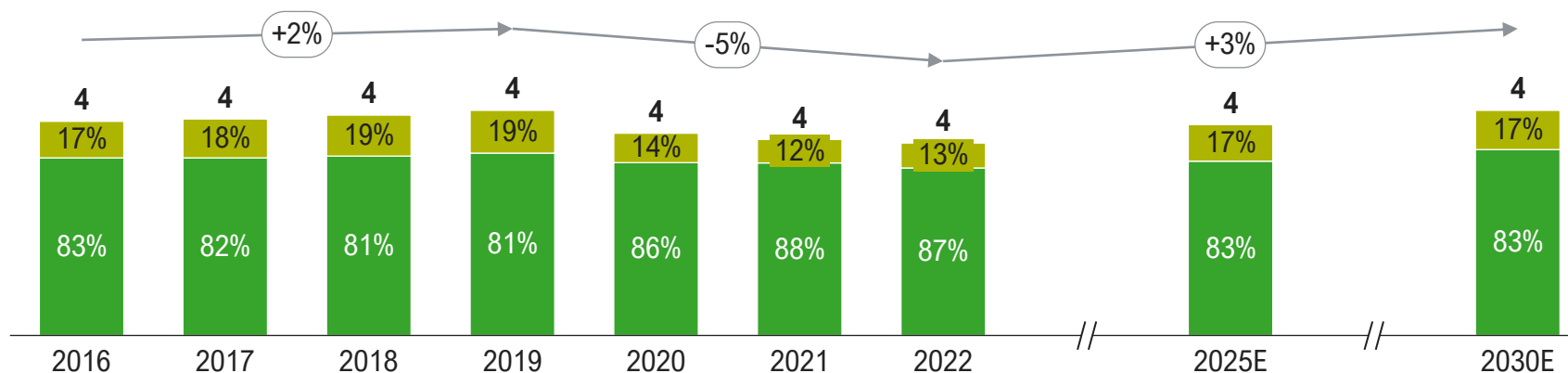


Key takeaways

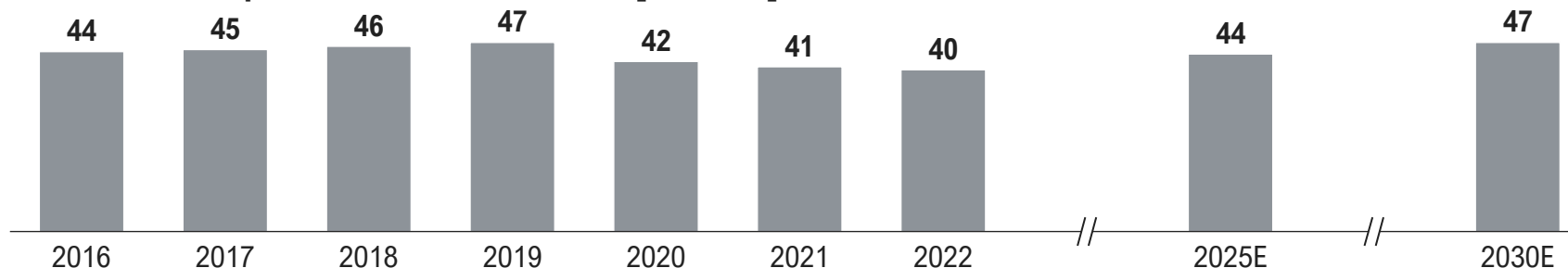
- Put on market volumes in Thailand are on low end on a per capita basis as the Thai market generally prefers other types of beverage container
- In particular in the out of home segment put on market volumes are low as only high-end establishment serve drinks in metal beverage cans
- The share of cans served in the out of home segment is further reduced due to the impact of the COVID-19 pandemic which reduced out of home consumption which hasn't recovered yet
- In the coming years a 3% p.a. growth is expected linked to increased packaged beverage consumption per capita in line with increased consumer spending as well as population growth

Volumes put on market, 2016-2030E [b units]¹⁾

■ At home⁴⁾ ■ Out of home³⁾



Aluminium cans put on market, 2016-2030E [k tonnes]²⁾



1) POM volumes are estimated by averaging input data from interviews with market stakeholders combined with reports from market research; 2) Estimated weight per can 10.8 g;

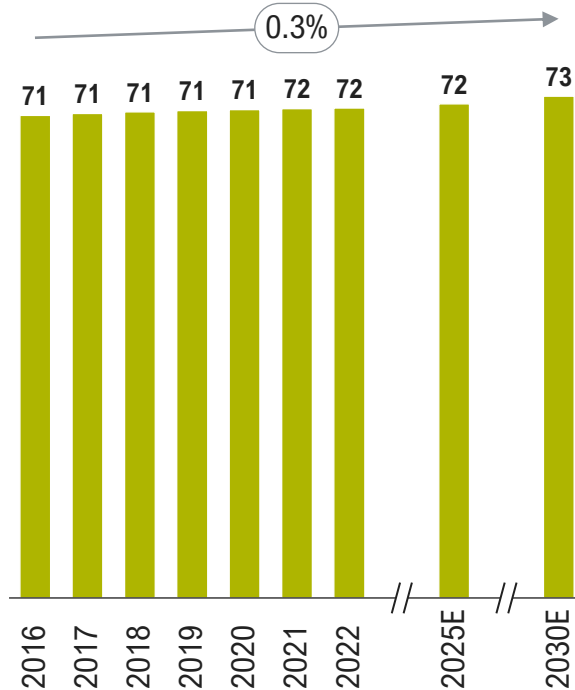
3) Out of home consumption includes hotels, restaurants, and catering; 4) At home consumption includes the remaining cans

Put on market volumes growth will be driven by population growth & increased packaged beverage consumption

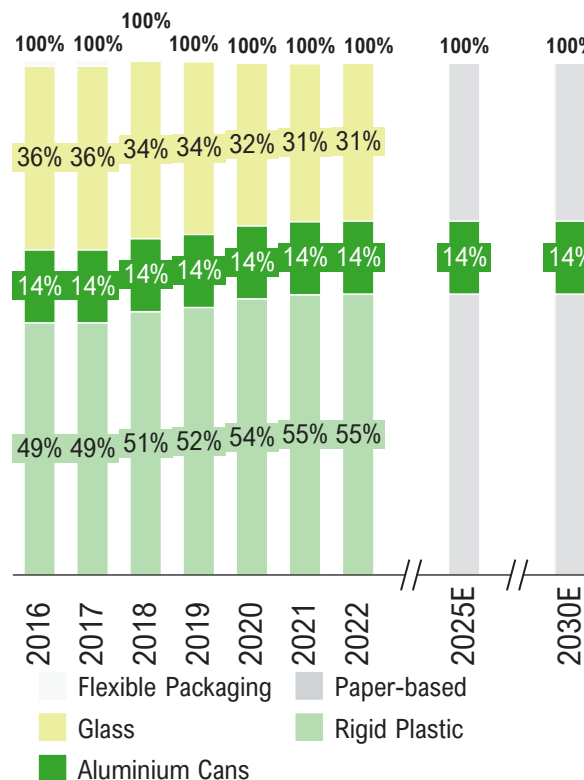
Population, package & beverage trends



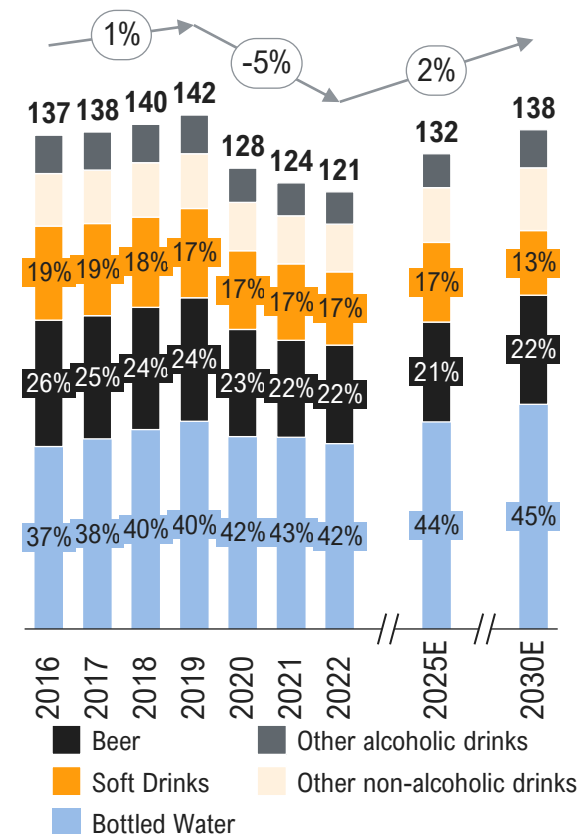
Population, 2016-2030E [m]



Estimated annual package consumption [%¹⁾]

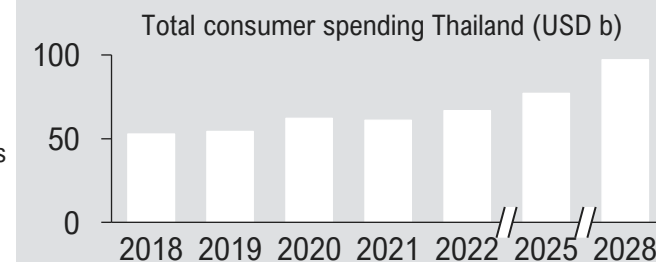


Estimated annual packaged beverage [l/person, %]



Key takeaways

- Rigid plastic share has increased at the expense of glass, the share of aluminium cans in the beverage container market has remained mostly constant and is low compared to the share observed in other countries
- Aluminium cans hold ~14% of volumes
- Carbonates' and beer's share have remained mostly stable, with carbonates share slightly increasing while the share of beer consumption is slightly decreasing



1) Volume per package type of the total volume of packaged drinks



3. Waste management & regulatory context

The waste regulation framework in Thailand is in place, but enforcement is limited – EPR pilot taking place and setting the foundations for EPR

Regulatory Waste Management framework & infrastructure overview



| | | |
|---------------------------|--|---|
| Waste mgmt. framework | | <ul style="list-style-type: none">• Roles & responsibilities: The core legislative framework is in place and developed by the Ministry of Environment, local governments lead the implementation and the waste management• Maturity: Most key aspects to ensure safe disposal of waste has been implemented, no strong drive towards circular economy yet |
| Collection infrastructure | | <ul style="list-style-type: none">• Organized collection: more than 80% of urban population is covered by formal collection, a portion of the rural population is also covered by formal collection; the rest are covered by informal collection• Collection targets: Thailand had set 50% collection rate targets for 2021 for all recyclables• Source separation: Thailand's regulation doesn't mandate source separation; some municipalities (e.g., Rayong) mandate plastic source separation, but they lack enforcement |
| Treatment Infrastructure | | <ul style="list-style-type: none">• Sorting & treatment infrastructure is missing, all sorting is done manually either by street pickers, employees of the waste management companies or waste pickers present on landfills• Some transfer stations in major cities provide opportunities for waste pickers to sort through waste |
| Recycling targets | | <ul style="list-style-type: none">• General waste recycling targets: Thailand had set a 30% recycling rate for all types of municipal waste and a 75% proper disposal rate for 2021 (i.e. waste shall be recycled, converted to energy or used for production of organic fertilizer)• Metal recycling targets: No specific metal packaging recycling target |
| EPR scheme & DRS | | <ul style="list-style-type: none">• EPR:<ul style="list-style-type: none">–EPR in talks to become mandatory for packaging in 2027-28–Currently there is a packaging EPR pilot taking place in Chonburi with 72 organizations participating• DRS: No deposit return systems are available, nor immediately planned, in Thailand |

Maturity level, relative to most developed countries: Not existing Incipient, with limited scope Developing Matured Fully developed

Legislation and targets are very broad in Thailand, and there are no means to implement and achieve them

Thailand – regulation overview



Highlights and key take away

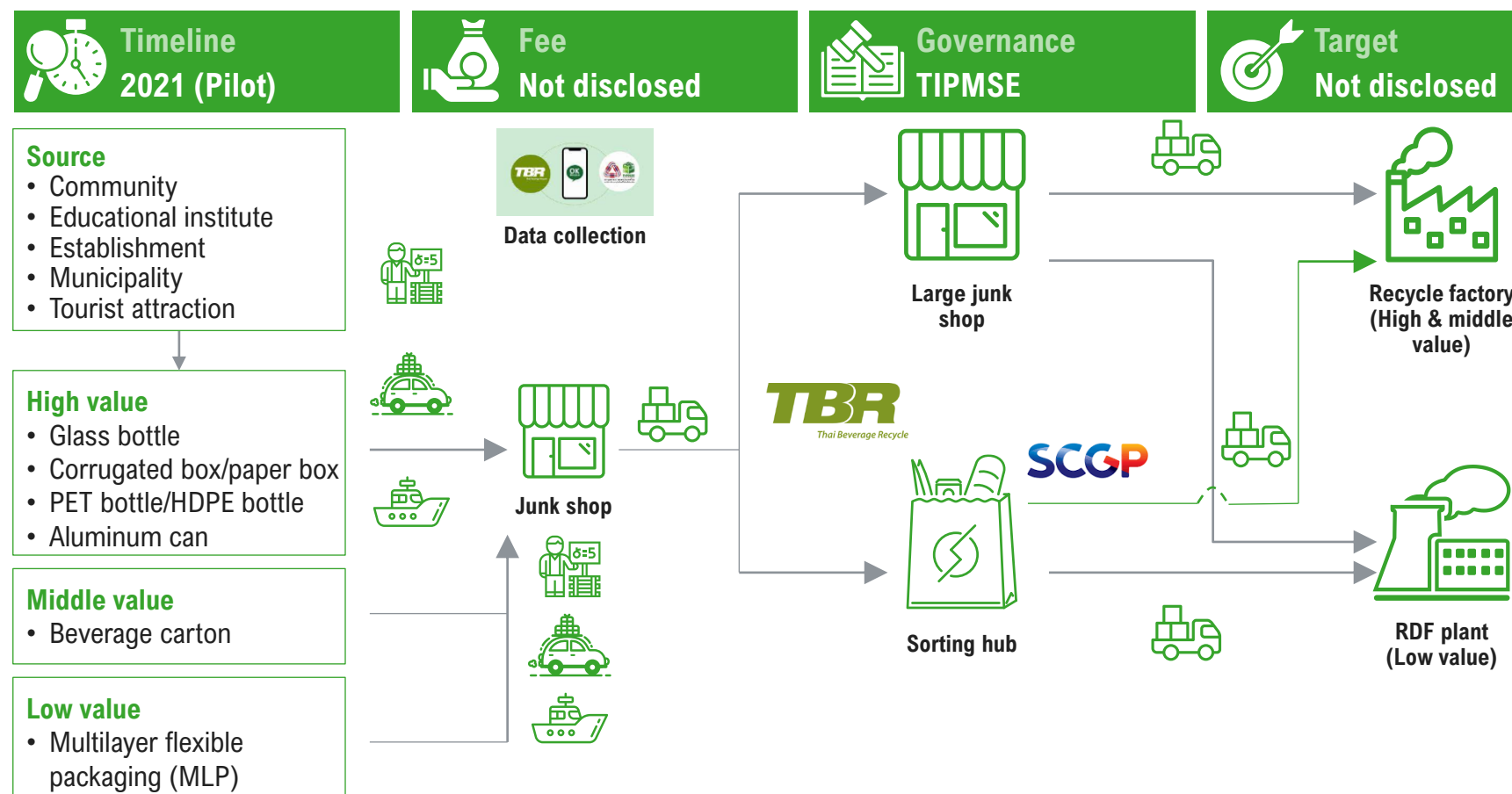


- Legislation is responsibility of the MONRE²⁾, and local governments are responsible of the implementation
- Thailand is mainly focusing on plastic recycling, as it is a big problem for their oceans
- Targets of the National Solid Waste Management Master Plan were not met; a new master plan for 2022-2026 sets a 36% source separation target, and an increase in recycling content for aluminium packaging
- Separation at the source is mandatory in a few municipalities, like Rayong (for plastic) and some districts in Bangkok
- There is an EPR pilot & Thailand aims to enforce EPR in 2027

1) National Determined Contribution; 2) Ministry of Natural Resources and Environment

As a first approach towards EPR in Thailand, a pilot model has been launched in Chonburi

Overview of the EPR pilot in Chonburi



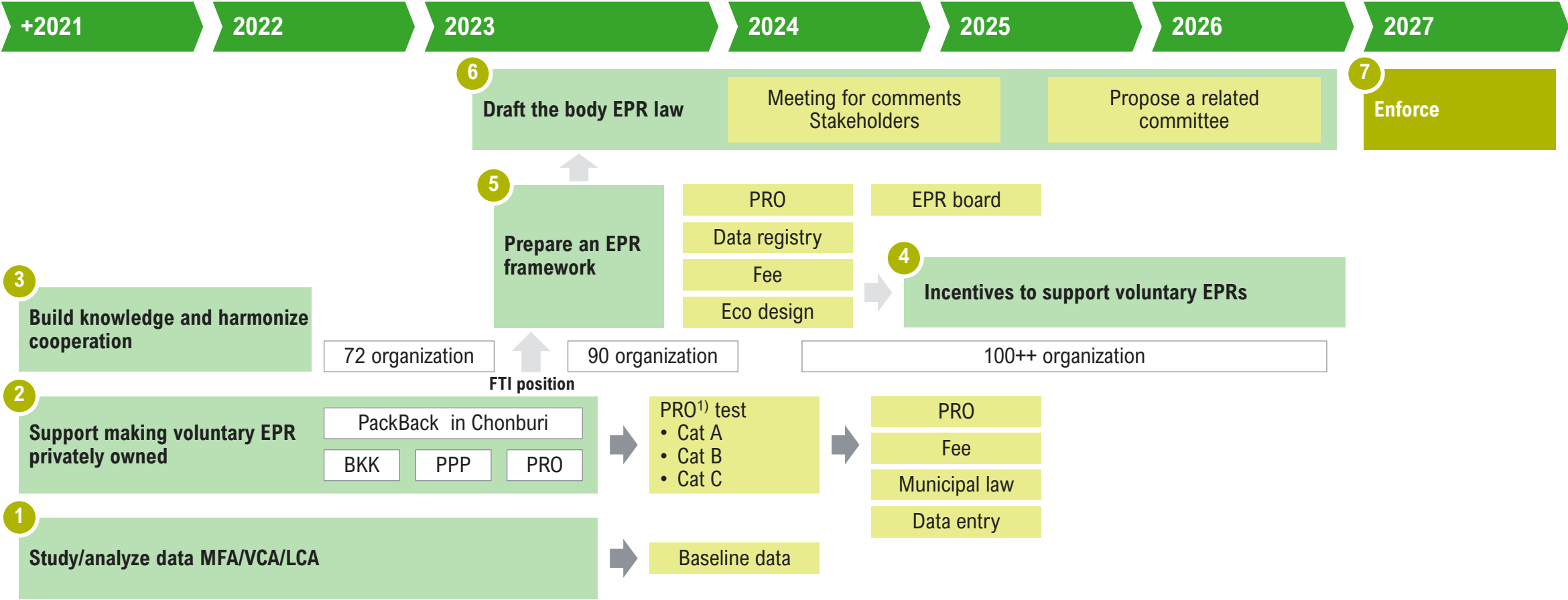
Highlights and key take away



- The pilot started in 2021 and will have a duration of 2 years
- The pilot will help TIPMSE to gather quantitative and economic data of the EPR in the Chonburi Area
- The objective of the pilot will be to analyze the EPR model and study the feasibility of expanding EPR to a country level
- After the pilot, the participants will elaborate a policy proposal based on the knowledge acquired for the government

The EPR implementation started in 2021 with a pilot in Chonburi, and is expected to be enforced in 2027

EPR roadmap overview



1) Producer Responsibility Organization

0 Order of the steps that are planned to be followed



4. Value Chain

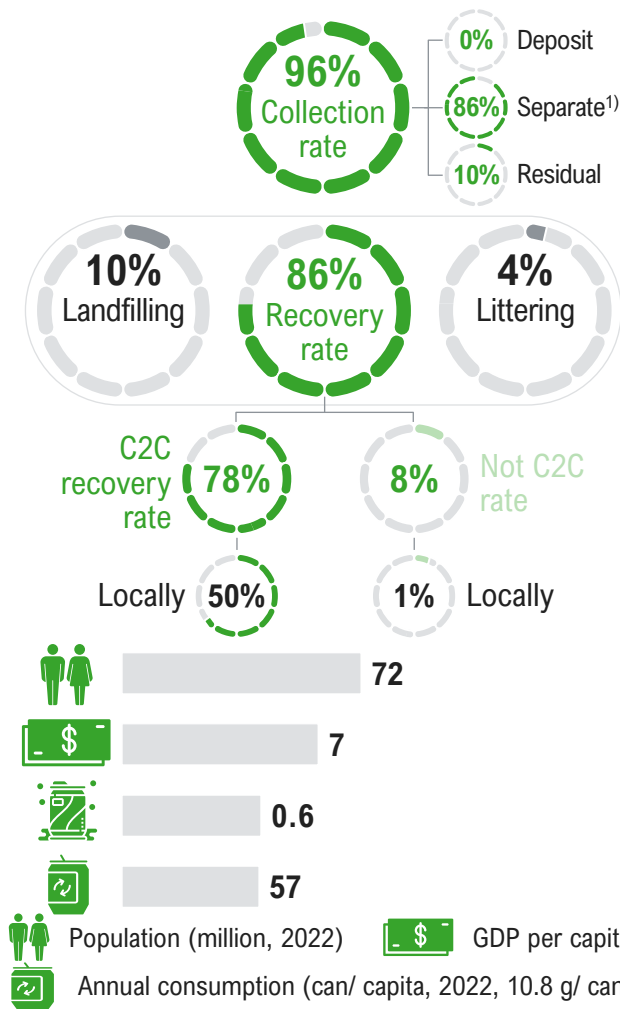
High recovery rates are achieved through a large network of waste pickers, the local rolling mill capacity coupled with high quality scrap leads to high C2C rates

Overview of aluminum cans value chain

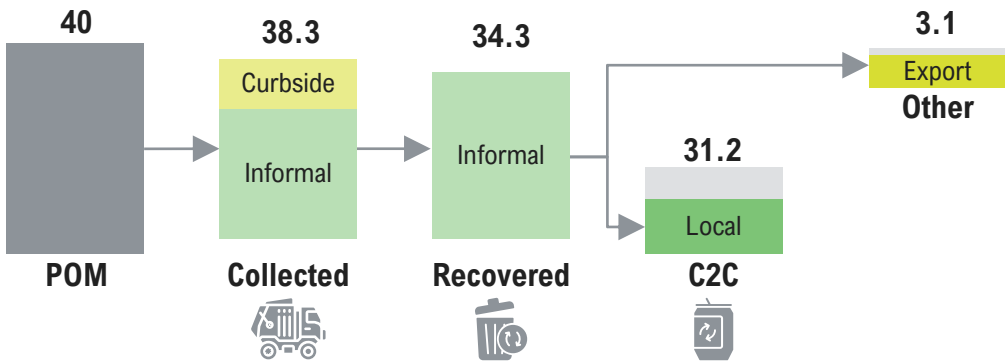


Thailand reports high collection rates and high local can-to-can rates thanks to local mill, avoiding downcycling

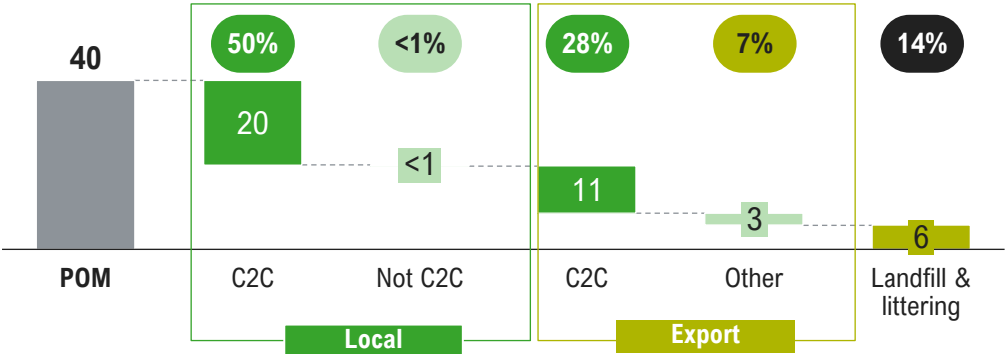
Summary of aluminium cans flows, 2022 [k tonnes]



Key market indicators [k tonnes, %POM]



Destinations [k tonnes, %POM]



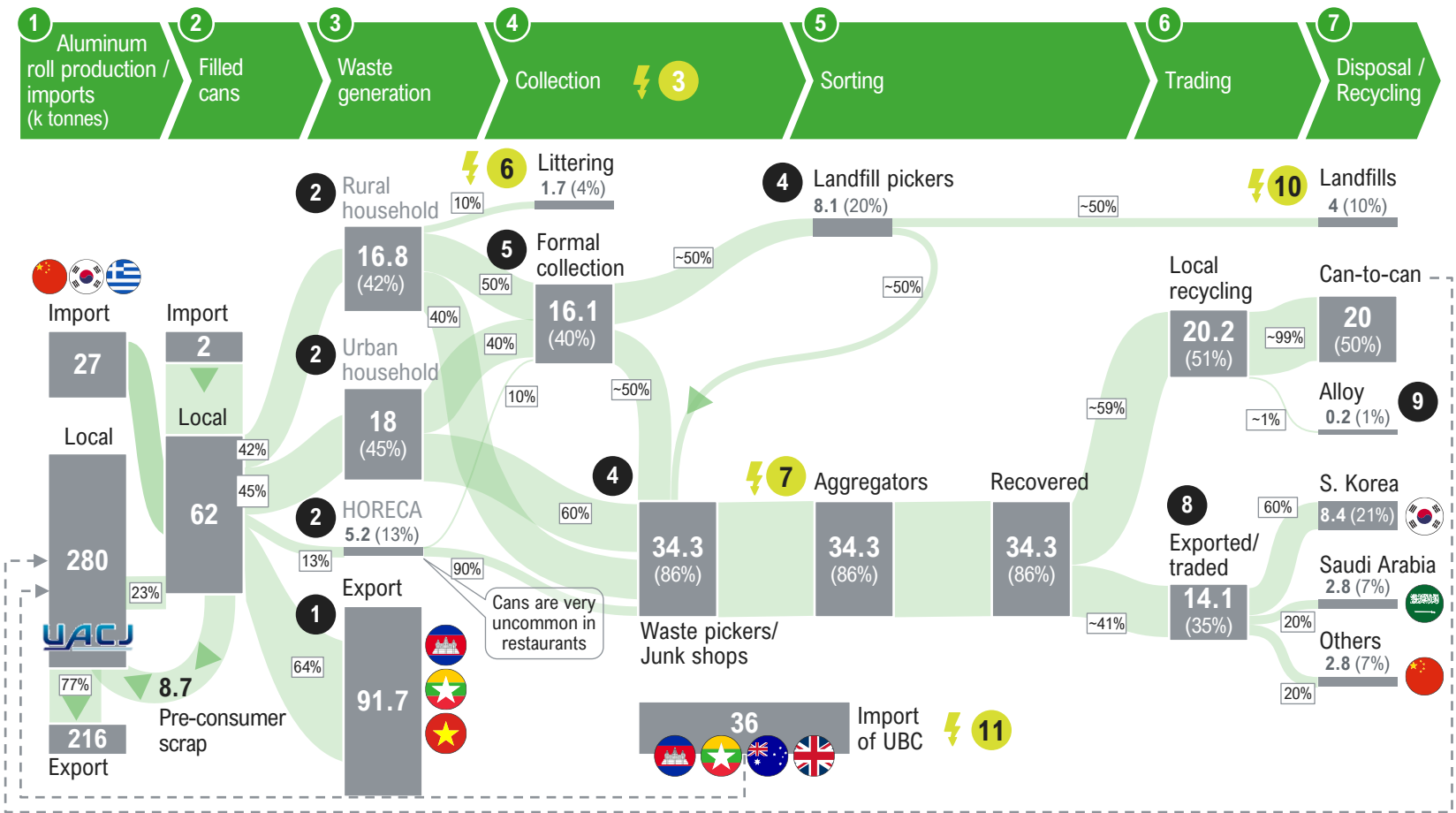
Key takeaways

- **Low put-on market volumes**, compared to other ASEAN countries
- **Local aluminium roll production** & capacity to process UBC, therefore there is significant local "closed-loop" recycling
- **High collection rates** due to high value of aluminium to the informal waste sector
- **No separation at the source**
- **Demand for UBCs** abroad to recycle into cans due to high can quality



The informal waste collection system in Thailand performs quite well on overall recycling rates for Al. cans – UACJ's facility allows can-to-can recycling

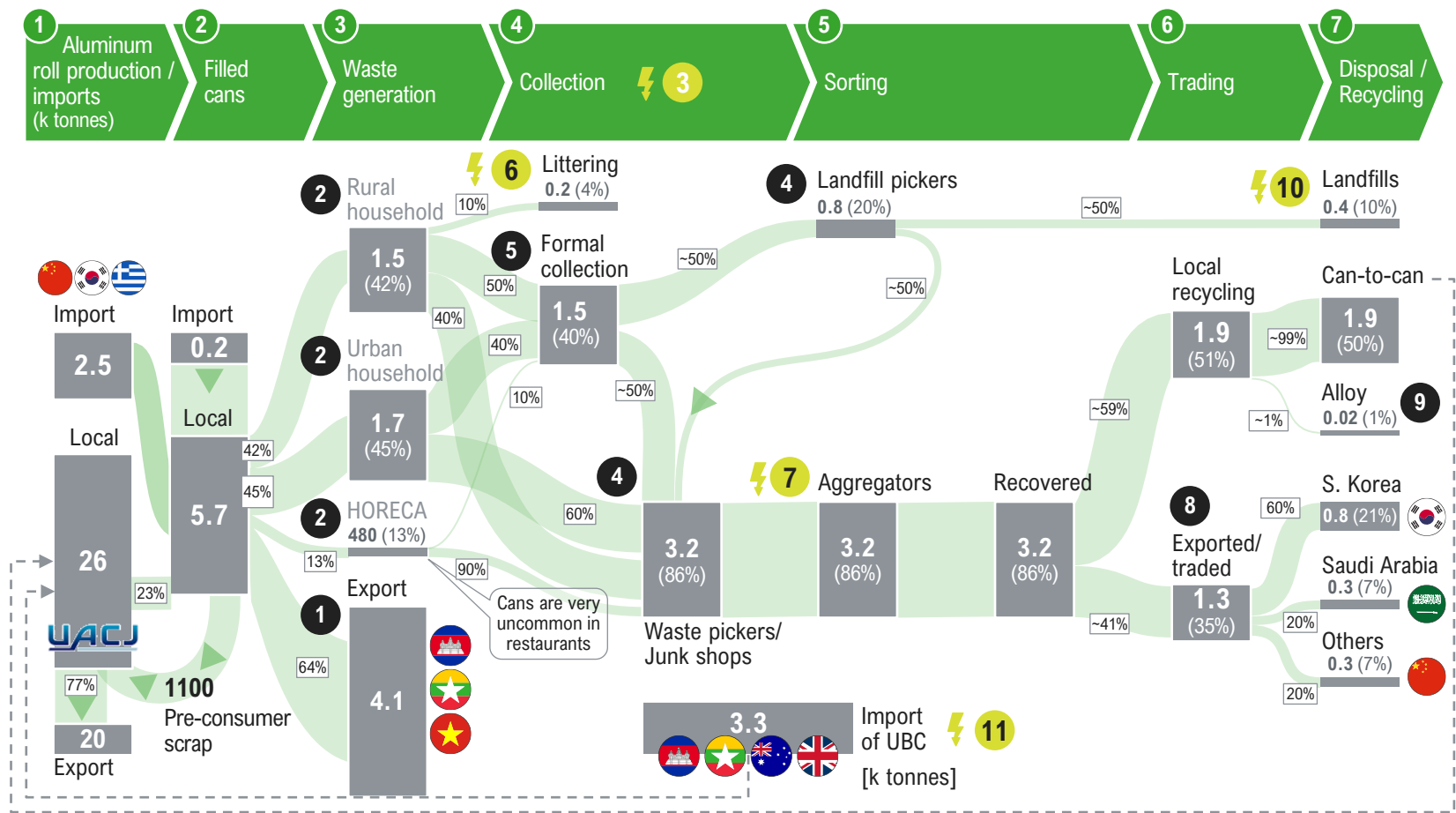
Material flows of aluminium cans in Thailand, 2022 [k tonnes²], (% of total POM volume)



1) The share of exports varies due to many factors, but the countries listed are always the top 3; 2) ~3.2% of can weight is due to paint

The informal waste collection system in Thailand performs quite well on overall recycling rates for Al. cans – UACJ's facility allows can-to-can recycling

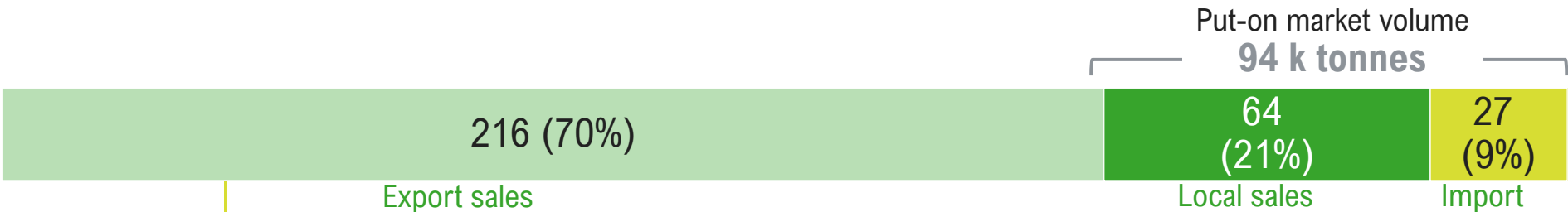
Material flows of aluminium cans in Thailand, 2022 [b units¹], (% of total POM volume)



1) Estimated weight per can: 10.8 g

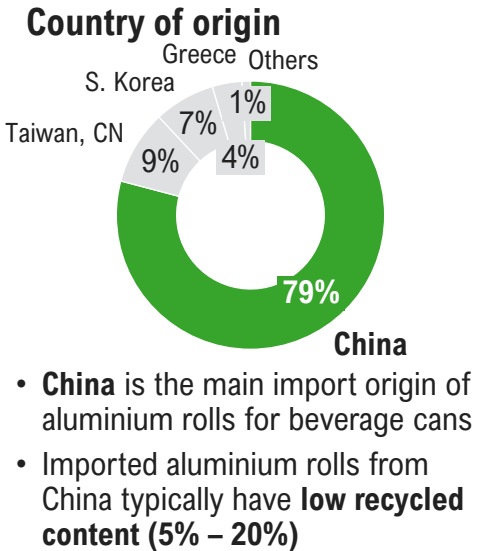
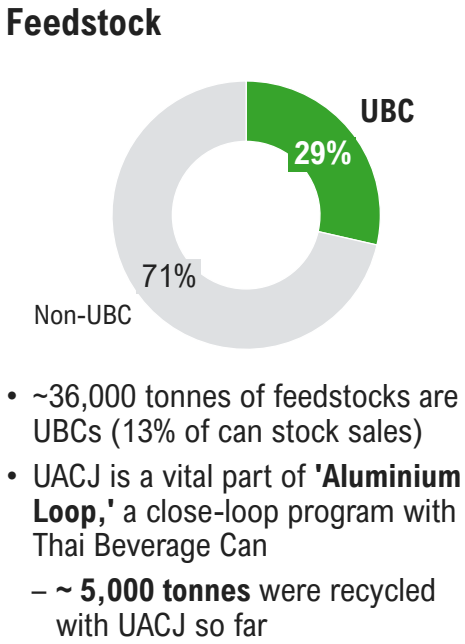
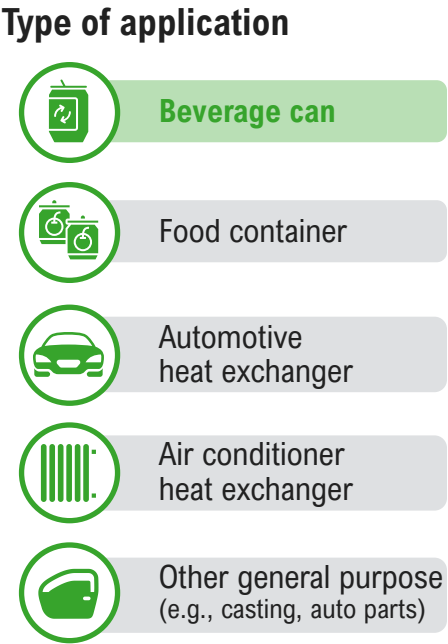
UACJ supplied ~ 70% of rolls for local can manufacturing at 64k tonnes; the remaining 27k tonnes are supplied mainly by Chinese imports

Beverage can-grade aluminium roll volume in Thailand by origin, 2022 [k tonnes]



UACJ Thailand is the only hot-rolling aluminium roll manufacturer in Thailand and Southeast Asia

| | |
|--------------------------|---------------------------|
| Establishment year | 2011 |
| Annual capacity (tonnes) | 320,000 |
| Capabilities | Hot-rolling, UBC smelting |

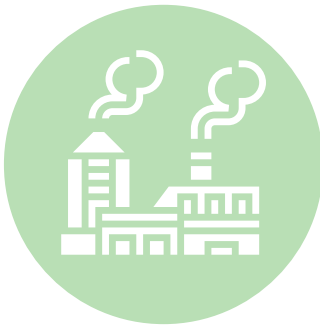
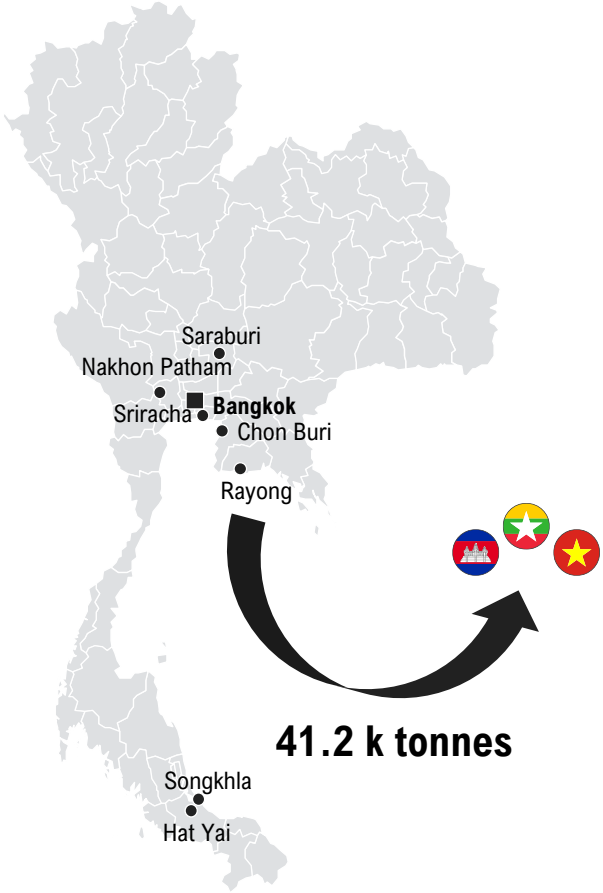


Key Takeaways

- UACJ is the **only aluminium roll manufacturer in Thailand** who supplies to can manufacturers
- Beverage can segment** accounts for ~ **70% of UACJ's annual sales**
- Majority of both local and imported rolls have **low recycled content**
- Strong competition from abroad for local UBC due to high UBC quality (i.e., low humidity, clean, high aluminium content)

More than 6 manufacturing plants in Thailand, with Thai Beverage Can being the largest can manufacturer in Thailand and the only one with closed-loop recycling

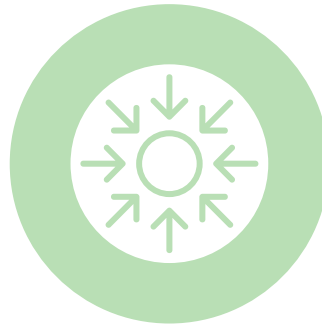
Overview of the can manufacturing plants in Thailand



6 manufacturing plants



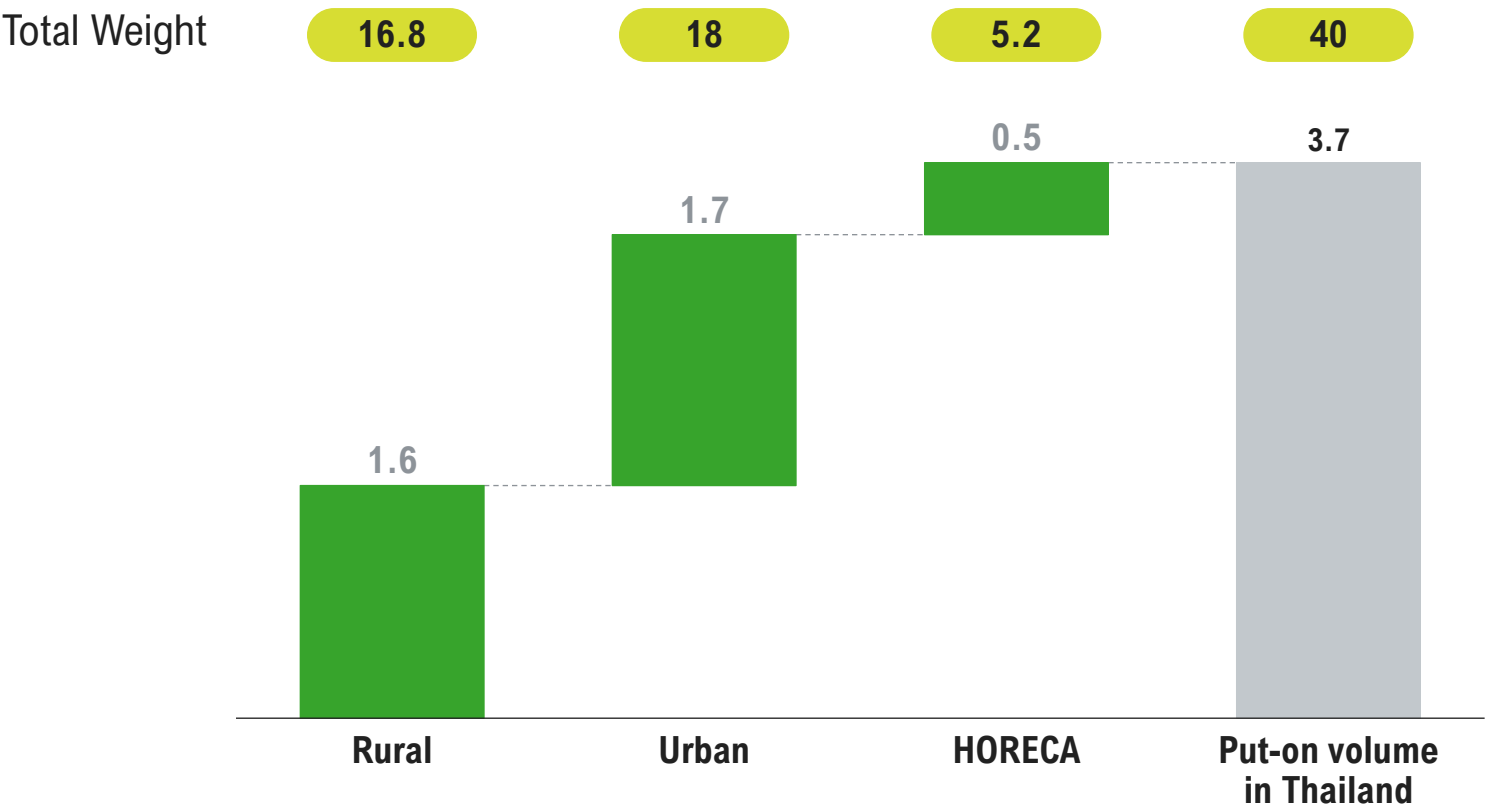
3.7 b cans put on market



0.2 b cans import

Cans are not predominant in Horeca consumption, and the share is low compared to neighboring countries; urban and rural areas' consumption is similar

Distribution of Put-on Market Volumes across Urban & Rural households and HORECA¹⁾²⁾
[b units, k tonnes]



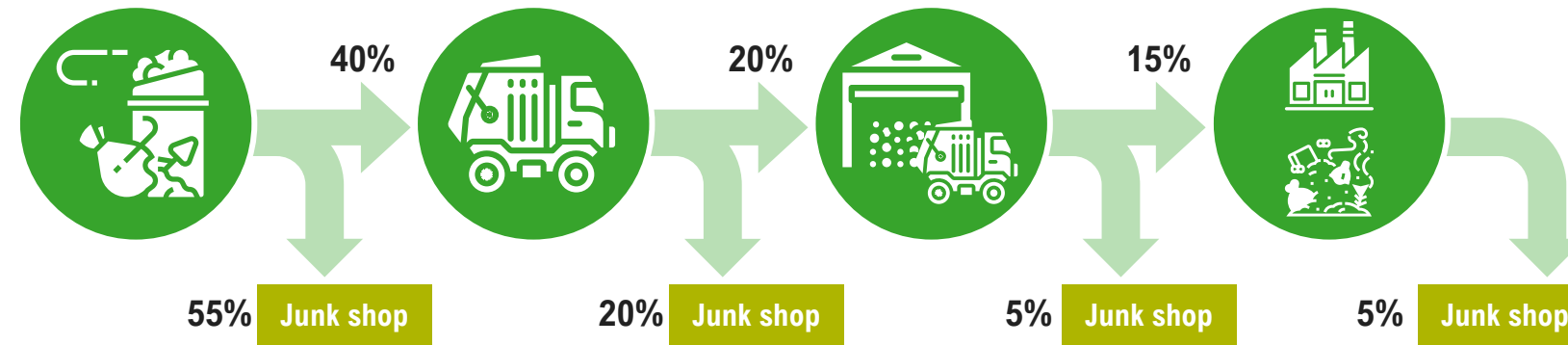
Key Takeaways

- 87% of the cans are purchased for in-home consumption:
 - urban consumption is slightly higher than its rural counterpart at 45% and 42% of total domestic volume, respectively
 - HORECA consumption is accounted for 13% of domestic volume due to competition from other packaging varieties for HORECA (e.g., glass, plastic, soda fountain)
- Out of the total cans consumed in Thailand, around 5% cans are imported; imported brands are typically up-scale and more niched in nature due to the extremely high import tariff and excise tax on imported beer (~ 138% tax / tariff levied)

1) Including imports 2) 10.8 g per can

Though recyclables are mixed with other waste in formal collection process, high-value recyclables such as UBC would be sought informally for throughout the process

Formal collection structure of municipal waste in Thailand



Waste disposal

- Households and businesses dispose the waste in curbside dumpsters or piled together in an area
- All waste types are mixed; no segregation at source is required

Waste pickers sort for recyclables in the garbage bins / piles before collection

⚡ Safety of the waste pickers (women with children on the street at night)

Formal collection

- Garbage trucks weekly collect the waste from designated dumpster or curbside garbage piles
- No separate collection** for recyclables & general waste

Garbage truck workers sort for recyclables while collecting garbage

⚡ Sorting must be done very quickly leading to leak

Waste consolidation & transfer

- For large urban cores (e.g., Bangkok), waste get consolidated at transfer stations before being sent out in larger trucks
- No MRF for recyclables

Transfer station staffs sort for recyclables while the waste are stored for transfer

⚡ Pickers in transfer stations lack any technology support, leading to leakages

Disposal facilities

- Collected waste is disposed in designated facilities e.g.,
 - sanitary landfills
 - unsanitary landfills
 - waste-to-energy incinerator
 - composting

Waste pickers sort for recyclables in landfills

⚡ Landfill pickers live and work in unsanitary and dangerous conditions

Key Takeaways

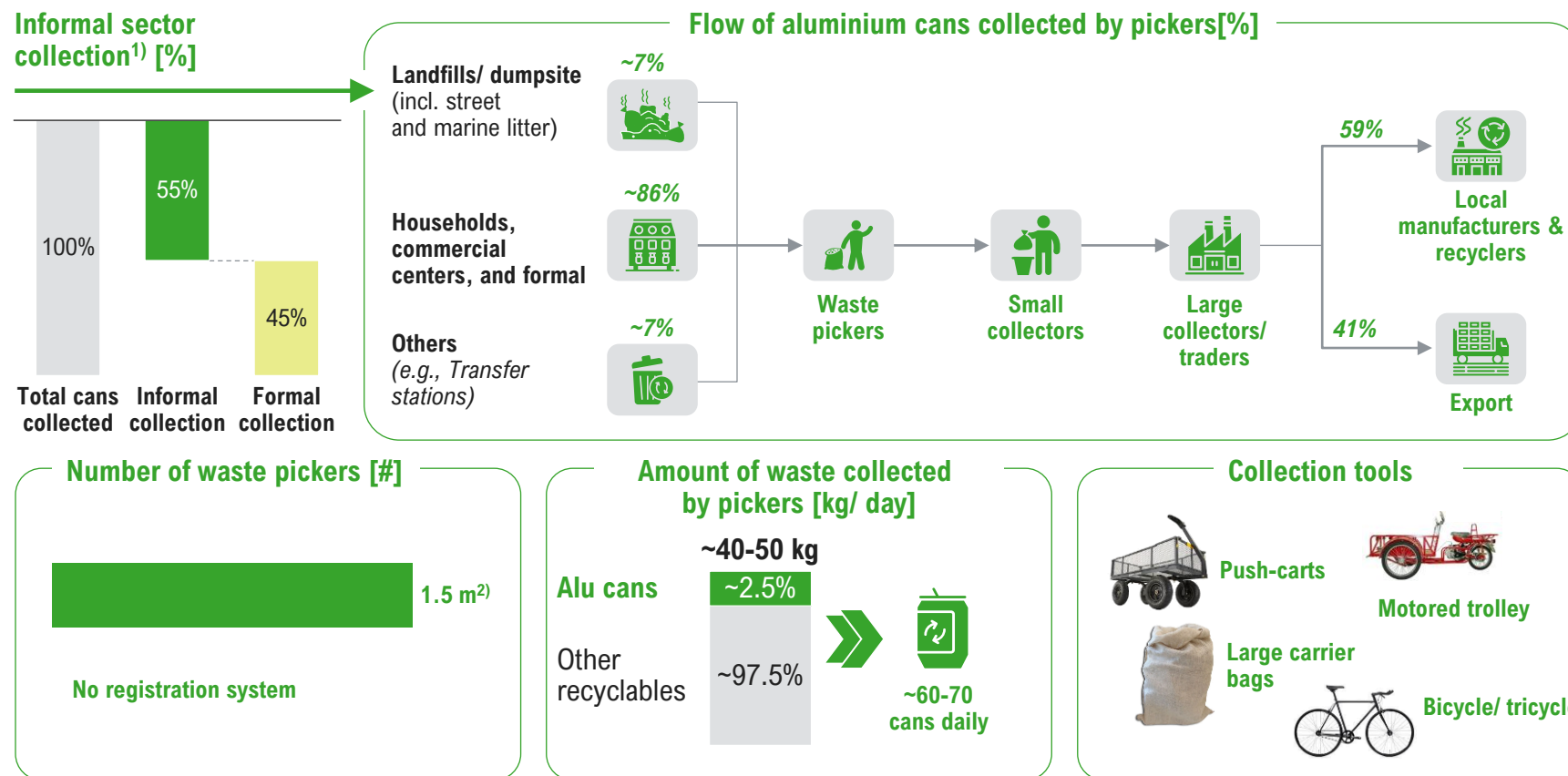
- No requirement for waste segregation at source**
- Local municipalities** are responsible for household waste management with concessions awarded to **private companies** to **operate** or **invest** in a Build-Operate-Transfer¹⁾ model in parts of the system for **4 and up to 20 years**
- Households are charged with **collection & disposal fees** by **local municipalities**
 - THB 80 (~ USD 2.4) / month for households in Bangkok with <20 liters of garbage per day
- Waste pickers** typical seek for **high-value recyclables** (e.g., UBC, PET bottles) in garbage dumpsters **before formal collection** and **in landfills**
- Formal collection workers** (e.g., in garbage truck) **seek for high-value recyclables for personal extra income** as they collect and transport waste



1) In the Build-Operate-Transfer model, awarded private companies have right to invest/build in facilities and operate for the concession period; after the period ends, the invested assets are transferred to the government or local municipalities

Waste pickers in Thailand collect less waste in the first step, and especially they collect fewer aluminium cans compared to Vietnam

Informal sector overview - Thailand



Comments

- Thailand has around 1.5 m informal collectors, who are responsible of most of the recyclables collection
- Since Thailand is not a can country, and aluminium is already a small share of MSW, the share of aluminium cans collected is relatively small compared to other ASEAN countries
- Waste pickers and junk shops additionally buy aluminium cans from formal collection workers, allowing them to have an additional source of income (500 cans/day equal their salary)

1) First step collection; 2) Not all these pickers work full-time

There are several key challenges affecting the informal sector that hinder the overall progress of the waste management sector in Thailand

Key challenges and advances affecting waste pickers

Challenges affecting waste pickers



Health/ environmental hazard risk due to **lack of protective clothing or equipment**



Unstable/ constantly evolving aluminum UBC waste prices

"It would be a huge improvement if waste pickers were able to get better prices: they are happy with their job, but better prices would allow them to live better"



Lack of regulation, government recognition and organization of waste pickers



Lack of skills and financial condition making them a vulnerable group towards unstable situations

Positive advances for waste pickers



Efforts for integration of waste pickers and economical support

"Waste pickers can access social security paying less than 3 USD per month"



Price transparency, which makes waste pickers trust junk shops

"Wongpanit publishes online the prices of the recyclable materials, which are common to all their junk shops, so waste pickers know what they are going to be paid"



Opportunity to improve the quality of life of the informal sector by committing to a floor price on the recyclables

Aluminium cans from informal collection then go to junk shops and aggregators; Wongpanit utilizes franchise system and daily price list to aggregate more waste

Informal recyclable aggregation in Thailand

Informal aggregation system

Junk shops

Small, independent recyclable buyers, typical from waste pickers and households

Mostly small player; highly fragmented

Aggregator

Large-scale buyers aggregate the aluminium can scrap from waste pickers and junk shops before selling to recyclers



- Private entities / companies are the main parties in purchasing collected recyclables such as aluminium can scrap from waste pickers, households, and businesses
- For UBC, each step of the aggregation value chain gains small THB 1 – 2 (~ USD 0.05) / KG margin; margin per KG is higher for larger batches

Case Study



Wongpanit is the leading recyclables aggregator in Thailand with **more than 2,000 branches** throughout Thailand

Franchise system



- Wongpanit allows junk shops / investors to use its brand and franchise system **free of charge**
- Franchisees must follow **strict initial requirements and training** to ensure the branch success, i.e.,
 - Proposed location survey to ensure strong potential
 - Business and investment plan review
 - Close monitoring for first 3 months
- Franchisees are free to sell its collected recyclables to anyone, not bound to only Wongpanit

Daily pricing announcement

The middle price to buy garbage today

Wednesday, April 5, 2566

| | | |
|--|-------|--------|
| can | 5.50 | ▼ 0.20 |
| 1 inch rebar (length 120 m. or more) | 10.00 | |
| No.4 Cast Iron Crank Mount Machine | 6.90 | |
| No.3 Large cast iron pieces (over 500-1500 kg) | 6.10 | |
| No.2 Large cast iron pieces (up to 500 kg) | 7.30 | |

- Wongpanit **announce its buying price everyday** as well as its historical price list, promoting pricing transparency within the market
- This price list is **applicable to any sellers** who wishes to trade with Wongpanit

Littering still exists outside urban areas and in small, rural communities; however, aluminium cans are typically sorted by households

Littering activities in Thailand



Littering in Thailand is mainly done by both households and businesses **outside of urban areas and in rural communities**

Littering locations

Household



- **Pit burial / open burn** in each household's backyard
- **Disposal in public space** (e.g., roadside, forest, canal, water body)

Business

(e.g., manufacturing, construction)

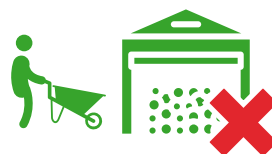


- **Disposal / Open burn in public space** (e.g., roadside, forest, canal, water body)

Key reasons behind household waste littering



Limited formal waste collection in small, rural community



Lack of waste picker / junk shop coverage



Lack of knowledge on proper household waste management

Key Observation

Household

- Most households are aware of the **high sales value of aluminium cans** and will try to sort and sell the UBCs
- UBCs are being littered in communities where it is **inconvenient to reach junk shops** due to distance and/or terrain (e.g., island, mountainous) or **municipal waste collection is not available**

Business

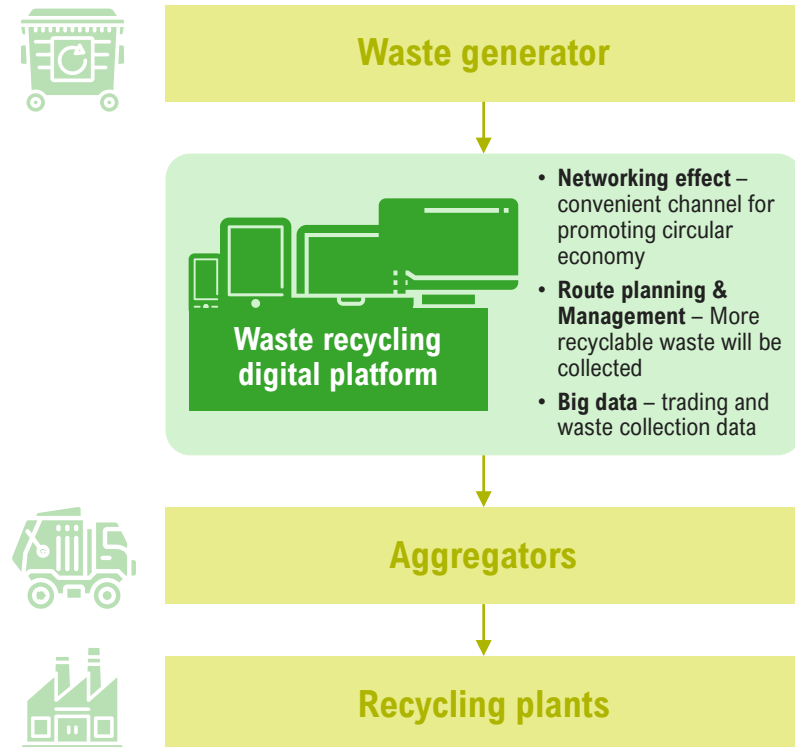
- **Manufacturing and construction** companies are the main culprits for littering as proper waste disposal would incur extra cost
- Businesses that involves beverage cans such as **street hawkers** would keep the cans to sell due to **UBCs high sales value and ease of segregation at source**

The use of digital platform has recently been emerging in the country to better manage the waste and increase the collection and recycling rate

Innovative collection solutions in Thailand



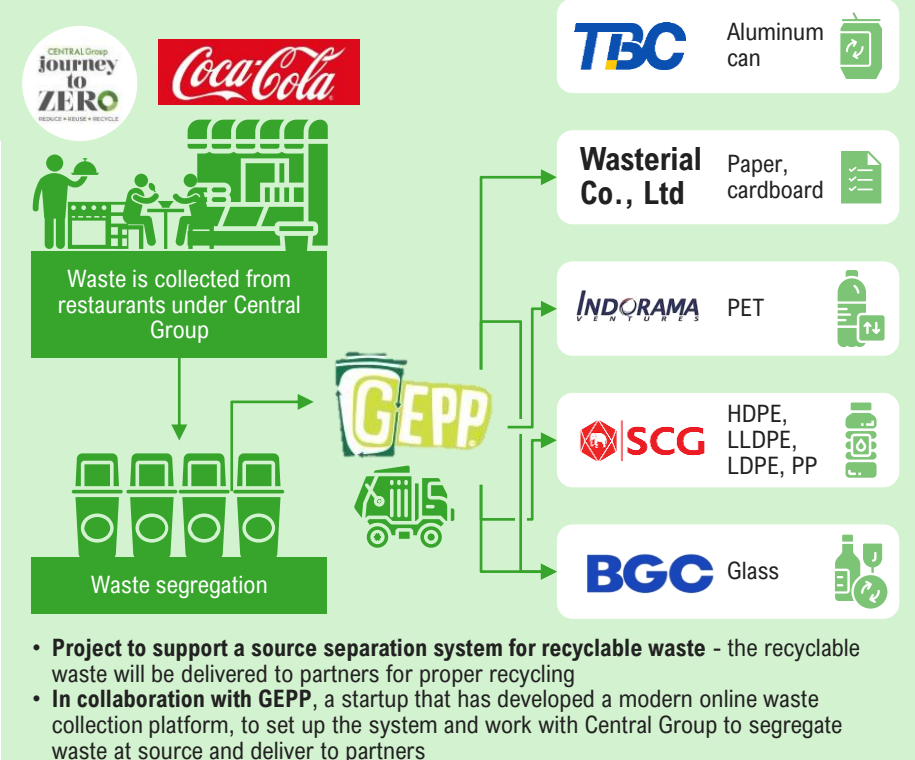
Business model



Company examples

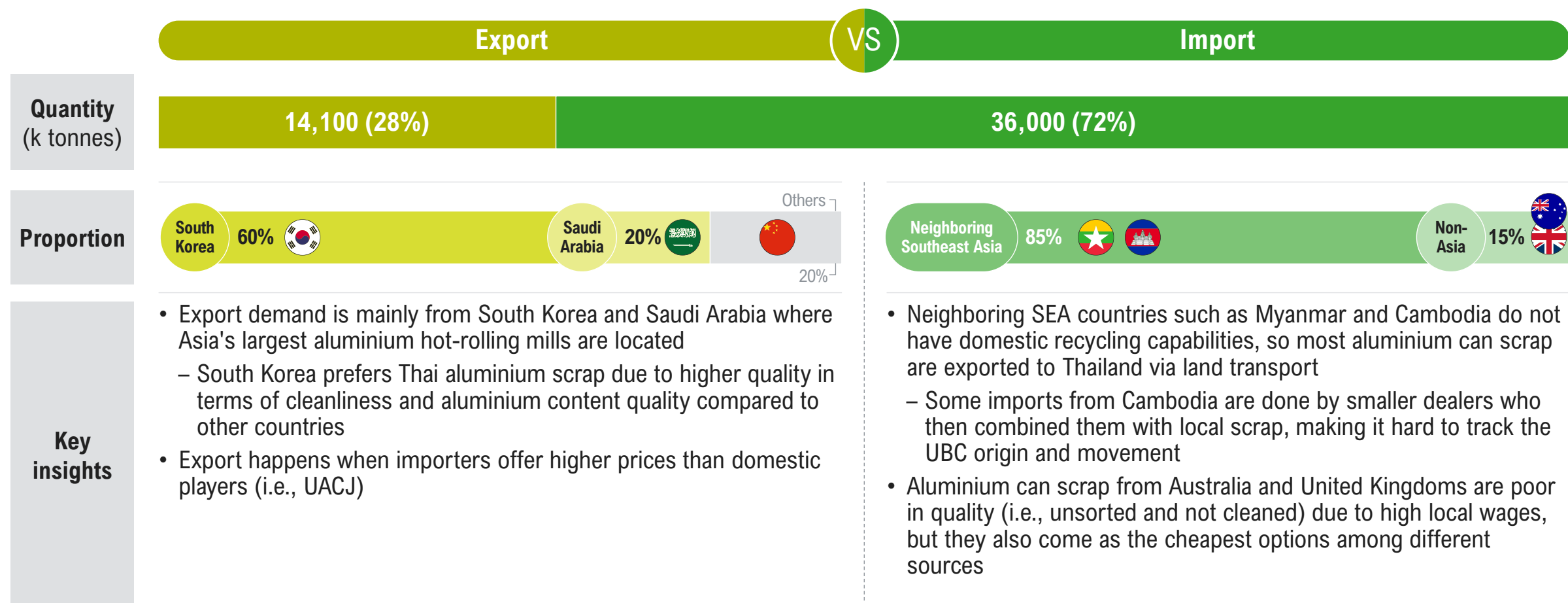
| | |
|--------------------------------|---|
| Gepp | Web application for connecting individuals with aggregators with waste collection appointment |
| Go Greens | Only available in Bangkok; Individuals to drop waste at collection point and collect rewards |
| Recycle Day | Connecting individual with collectors with fee being transferred directly to user's account |
| Recycle Time Keeper | Available for Areeya property's residents to sell their recyclable waste |
| Trash Lucky | Connecting individual with collectors with fee being transferred directly to user's account |

Case study - Gepp



Thailand is a net importer of aluminium can scrap, mainly from neighboring countries; export is only done when the offered price is higher than that of the locals

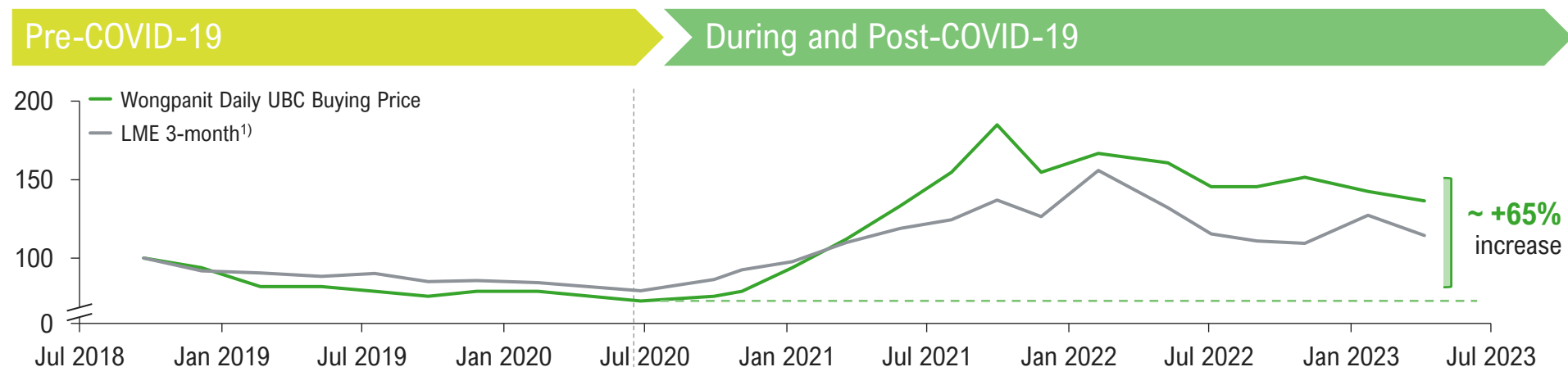
Aluminum can scrap export/ import status



Can-to-Can recycling is the only application in Thailand that use UBC as feedstock due to high UBC price; expected to remain as-is in the future

Aluminium beverage can recycling in Thailand

UBC spot price movement, compared to virgin aluminium price [Indexed at 100]



- Used aluminium cans were used in various recycling method, e.g.,
 - Can-to-can recycling
 - Alloy smelting for other general manufacturing
 - Deoxidizer

- Much higher UBC price** has pushed **down-cycle applications** (e.g., deoxidizer, alloy) to **seek other, more affordable aluminium scrap**
- Can-to-can recycling** is now **the only buyer of UBC (i.e., 99%)** to fulfill recycled content requirements from brand owners / can manufacturers
 - UACJ** has its own **UBC smelting capabilities**, thus alloy recycling is not necessary for can-to-can recycling
- UBC price is **expected to remain high** with demand pressure from both UACJ and export market to fulfill brand owners' growing recycled content needs

Key Takeaways

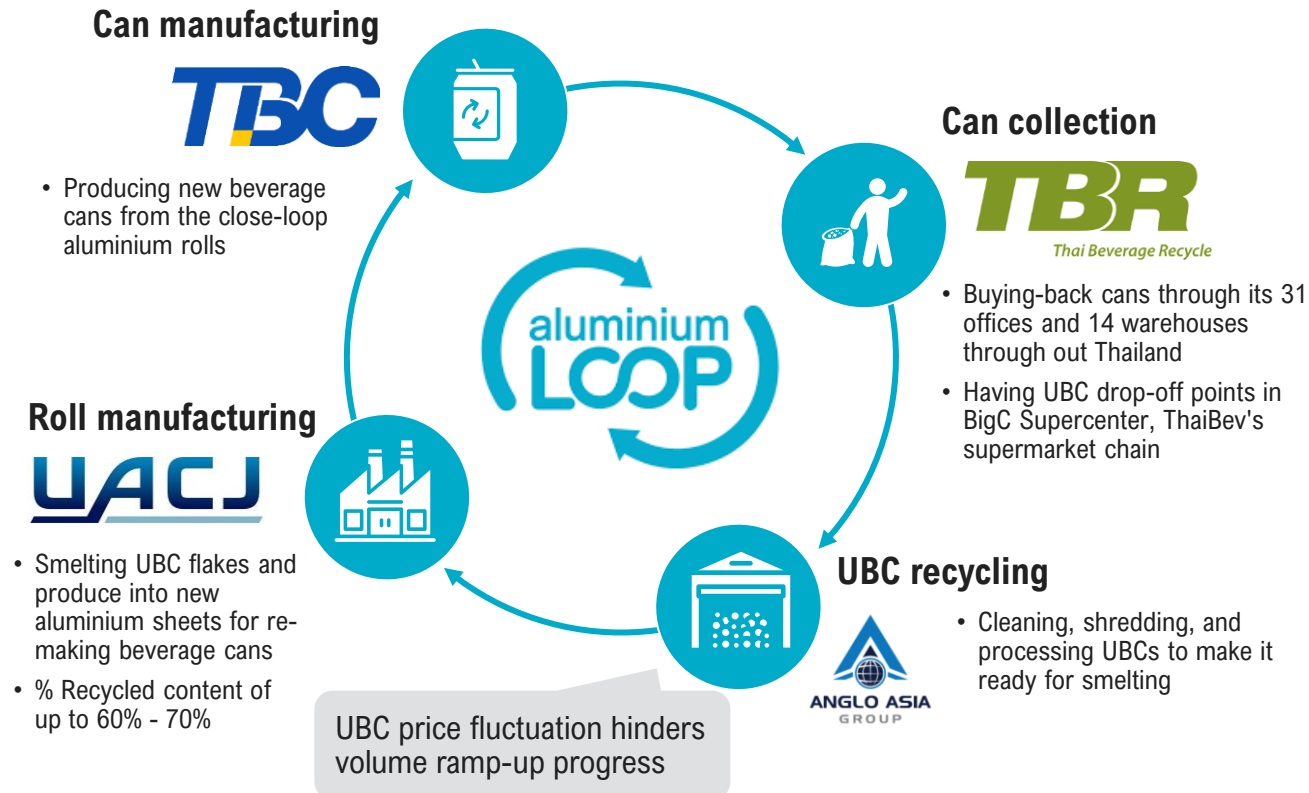
- UBC buying price is **highly correlated** with the virgin aluminium commodity price
- Can-to-can recycling** is expected to remain as **the only application in Thailand that use UBC** as feedstock due to high UBC price
- UBC price will remain high and may detach its link from virgin aluminium** as more brand owners seek for UBC to fulfill their recycled content goal and/or EPR requirement

1) The London Metal Exchange, 3-month aluminium future contract price

Aluminium Loop is the only close-loop effort in Thailand, aiming to achieve 5,000 tonnes of UBC collection in 2023

Aluminium can close-loop campaign in Thailand

Aluminium Loop is a close-loop initiative led by Thai Beverage Can, launched in 2021; currently it is the only aluminium can close-loop program in Thailand



Collection target in 2023



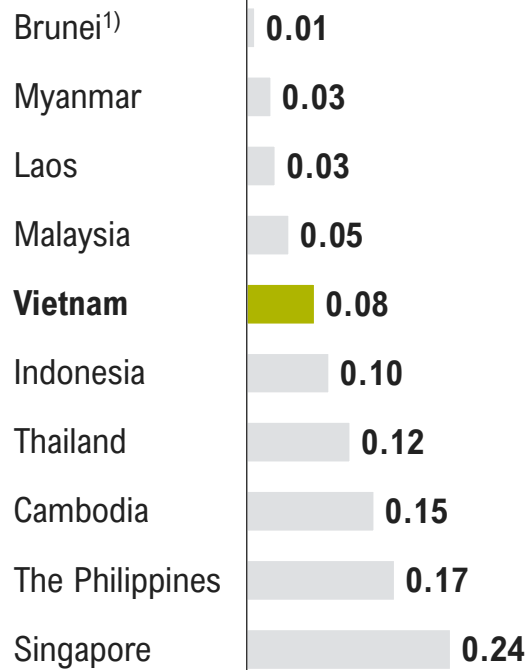
Collaborating parties



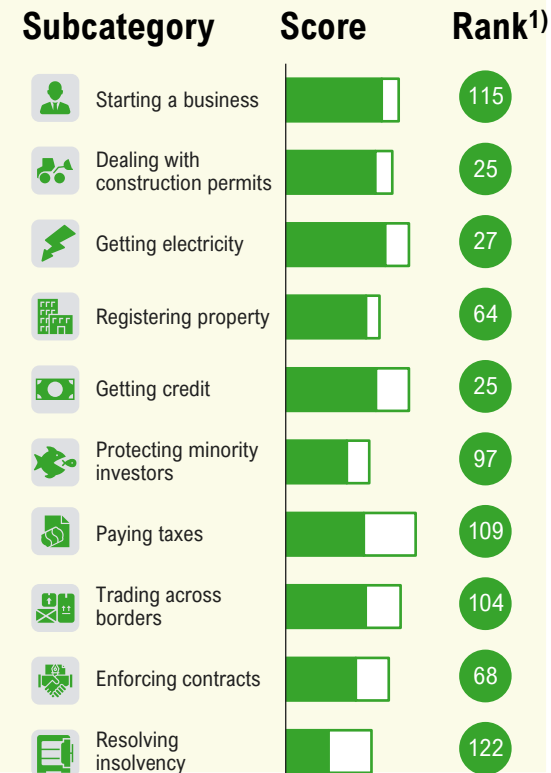
The recycling industry in Vietnam has developed easily due to the ease of doing business and the low energy prices

Vietnam's energy prices, ease of doing business, and skills overview

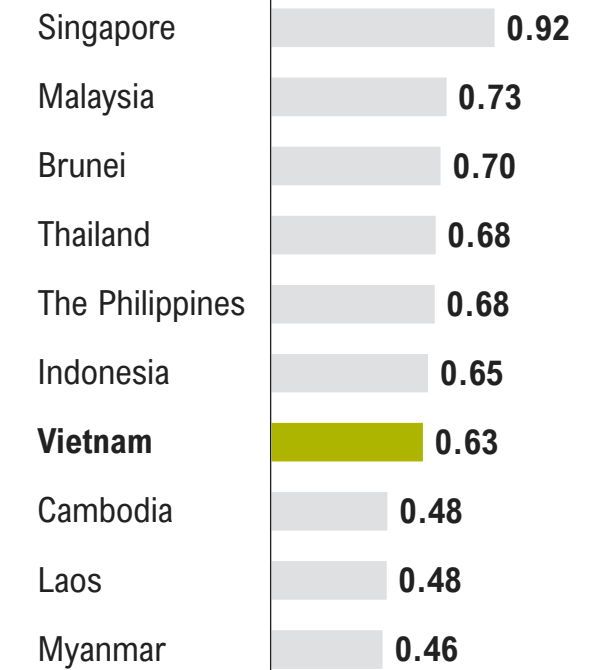
Electricity price ranking, 2022 [USD/kWh]



Ease of doing business index, 2020 [1=most easy country in the world]



Education ranking, 2019 [1=best education in the world]



1) Brunei has multitier electricity tariffication, the rate shown corresponds to the first 600 kWh consumed on a monthly basis for households

Roland
Berger

