



Aluminum Cans Market Assessment - Vietnam

Context, quantitative baseline, options

Final version

May 2023 – Updated August 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

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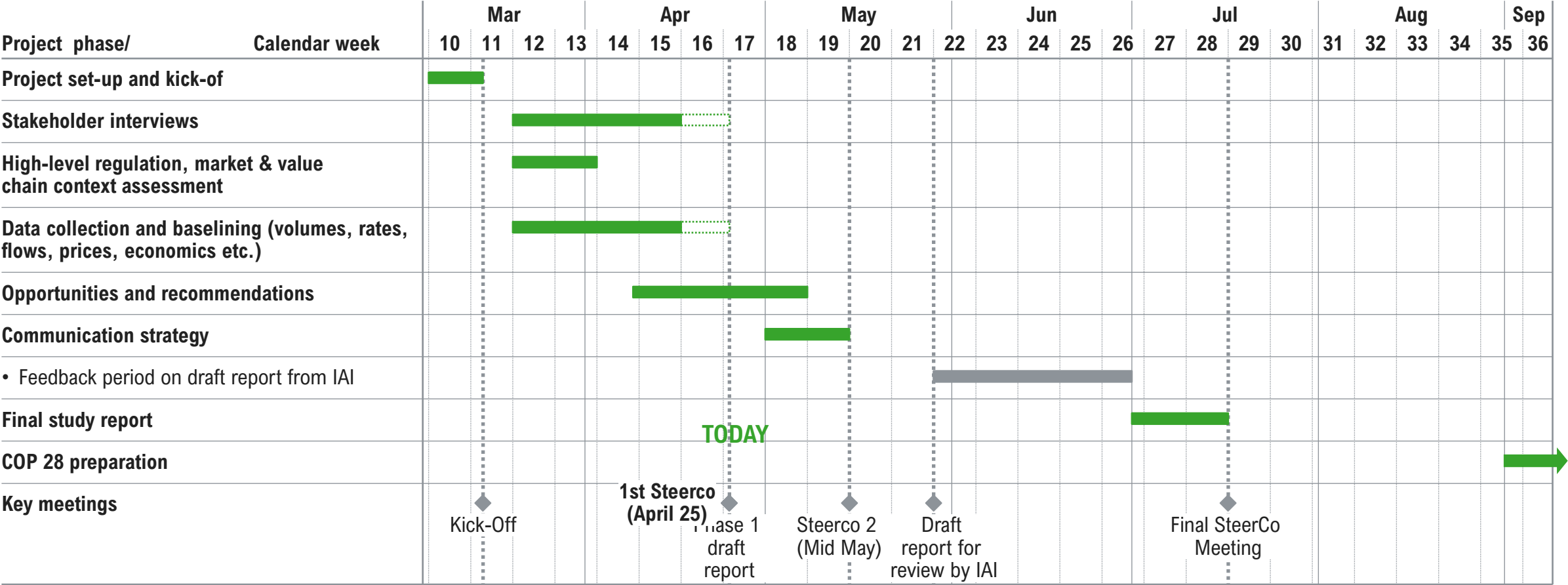
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1. Executive summary

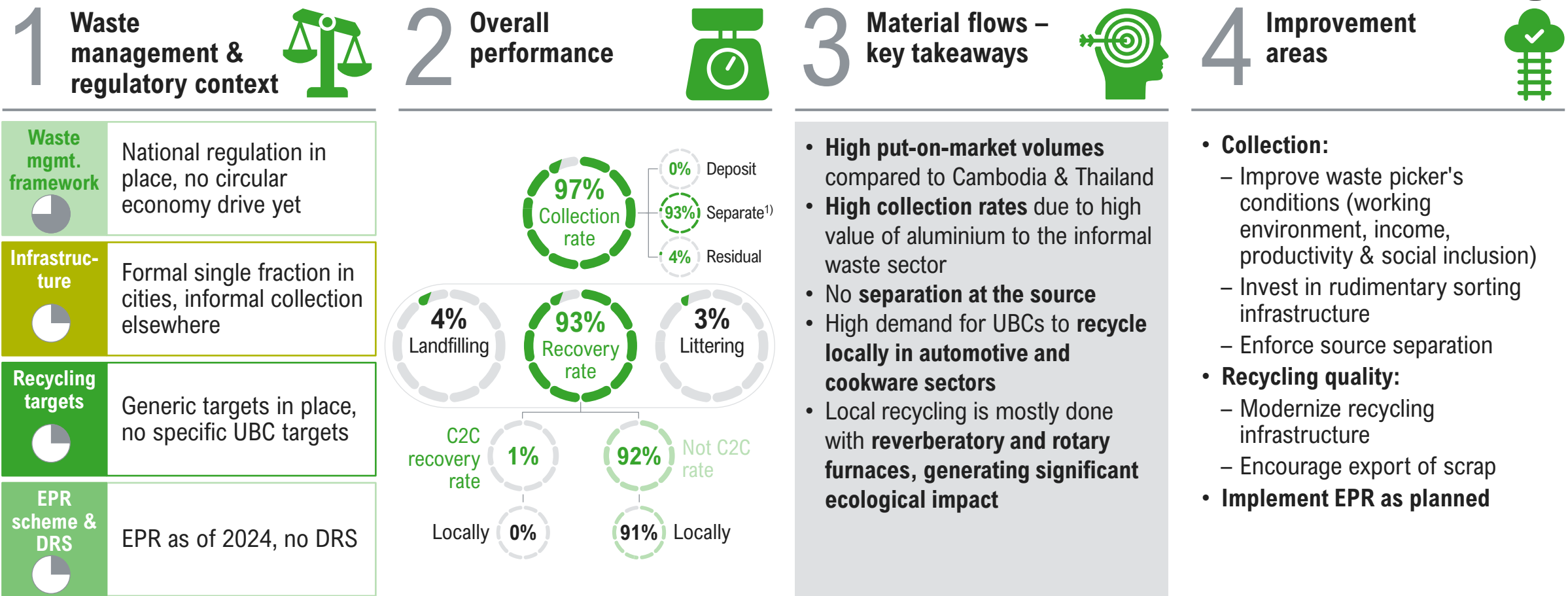
We are approaching the end of phase 1 of the project, with the initial draft report sent and being discussed with relevant country representatives

Project timeline



Vietnam reports high collection rates as UBC scrap is very valuable to waste pickers, UBCs are mostly downcycled locally in poor conditions

Aluminium can recycling in Vietnam



Waste mgmt. framework 	National regulation in place, no circular economy drive yet
Infrastructure 	Formal single fraction in cities, informal collection elsewhere
Recycling targets 	Generic targets in place, no specific UBC targets
EPR scheme & DRS 	EPR as of 2024, no DRS

The diagram illustrates the material flow of UBC scrap in Vietnam. It starts with a **97% Collection rate**, which is broken down into 0% Deposit, 93% Separate¹⁾, and 4% Residual. From the 93% Separate stream, 93% is the **Recovery rate**. The remaining 4% is **Landfilling** and 3% is **Littering**. The 93% Recovery rate is further divided into a 1% **C2C recovery rate** and a 92% **Not C2C rate**. The 1% C2C recovery rate is entirely **Locally** processed (0% elsewhere). The 92% Not C2C rate is 91% **Locally** processed and 1% elsewhere.

- **High put-on-market volumes** compared to Cambodia & Thailand
- **High collection rates** due to high value of aluminium to the informal waste sector
- No **separation at the source**
- High demand for UBCs to **recycle locally in automotive and cookware sectors**
- Local recycling is mostly done with **reverberatory and rotary furnaces, generating significant ecological impact**

- **Collection:**
 - Improve waste picker's conditions (working environment, income, productivity & social inclusion)
 - Invest in rudimentary sorting infrastructure
 - Enforce source separation
- **Recycling quality:**
 - Modernize recycling infrastructure
 - Encourage export of scrap
- **Implement EPR as planned**

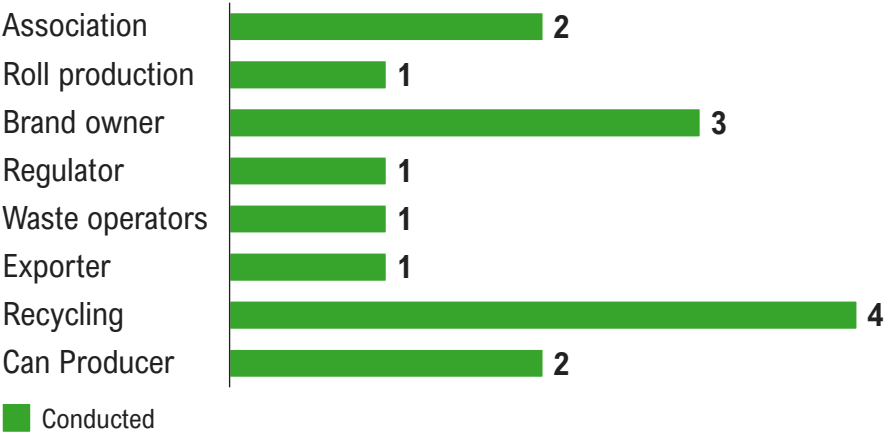
○ Not existing ◐ Incipient, with limited scope ◑ Developing ◒ Matured ◓ Fully developed

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

To well-document the recycling infrastructure in Vietnam, multiple interviews with stakeholders across the value chain were held, in addition to research sources

Overview of interviews and sources

Σ 15 total entities interviewed



	#	Company	Position
Waste operator	1	URENCO	Project Manager
	2	AMACCAO	Deputy General Director
Association	3	Vietnam Aluminium Association	Chairman
	4	PRO Vietnam	Project Director
Regulator	5	MONRE Vietnam	EPR Committee Member
Alu production	6	UACJ (Rayong)	Senior Manager
Trader	7	Anglo Asia Trading	Assisting Factory Manager
Brand owner	8	Coca-Cola	Sustainability Director
	9	Coca-Cola	Sustainability Manager VN
	10	Heineken	Engineering Manager
Recycler	11	Donar	CEO
	12	Lagom (Can to can)	CEO
	13	Waste picker	Not disclosed
Can prod.	14	TBC-Ball (VN)	Business Development
	15	TBC-Ball (VN)	Sr. Sustainability Manager

Statistics/databases

- Aluminium Recovery figures
- Export data

Industry players, experts, regulators

- Government and associations
- Recyclers

Market studies

RB sources

- Previous project experience
- Internal experts
- Industry contacts



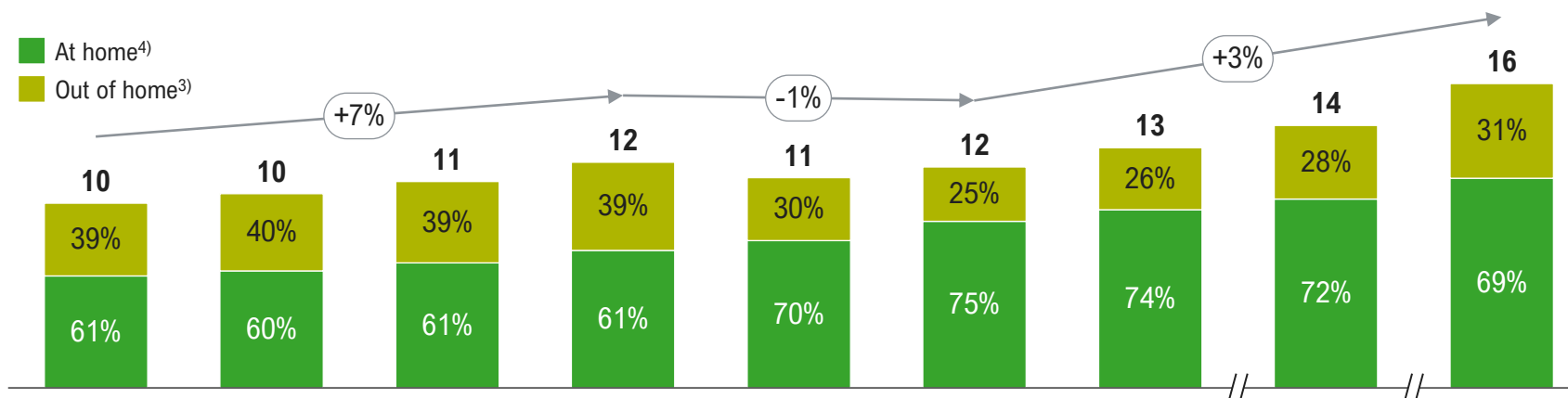
2. Aluminum Cans Market

The aluminium can market has been steadily increasing in Viet Nam in the past years, by 7% on average

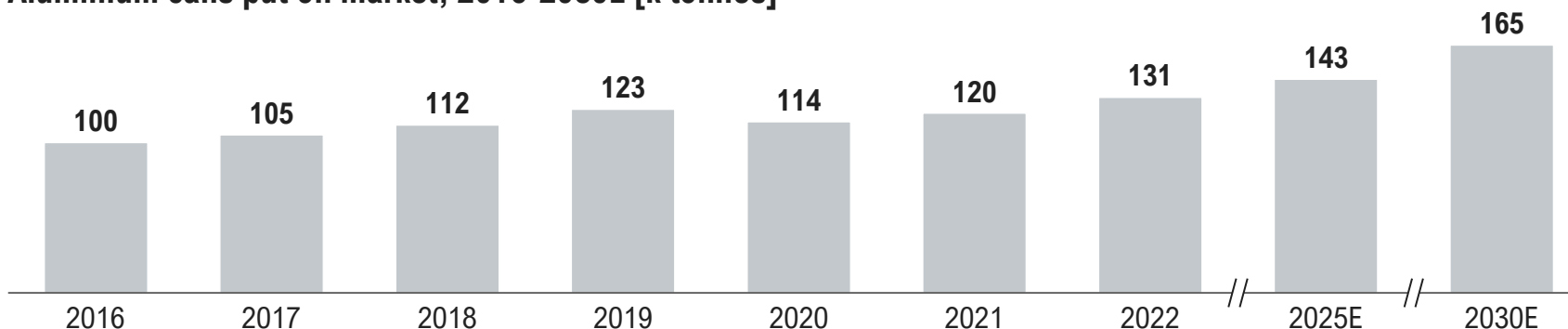
Overview of volumes put on market, aluminium cans



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



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

Key takeaways



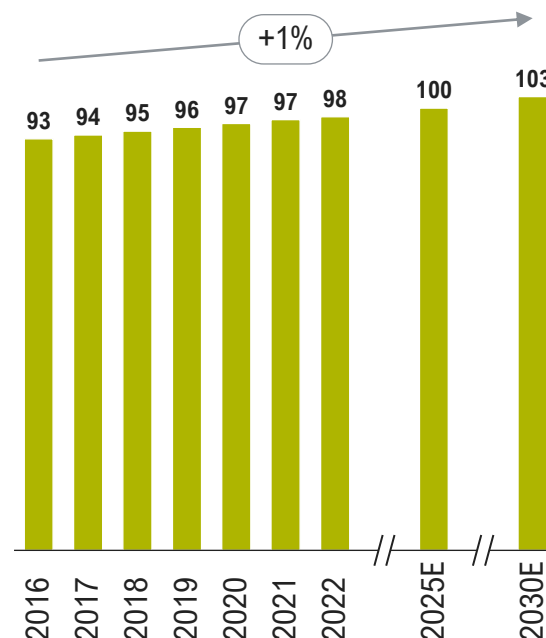
- Vietnam is considered a country inclined towards can consumption, and therefore put on market volumes are high compared to neighboring countries on a per capita basis
- Aluminium beverage packaging volumes steadily increased, and they are expected to keep increasing driven by population, GDP, and consumption growth
- Most of the aluminum cans are consumed for retail rather than in restaurants, but the share of aluminium cans consumed on restaurants is high (26%) compared to other geographies (e.g., Thailand 13%)

The aluminium can market has been steadily increasing due to increase in population and of alum. cans' market share

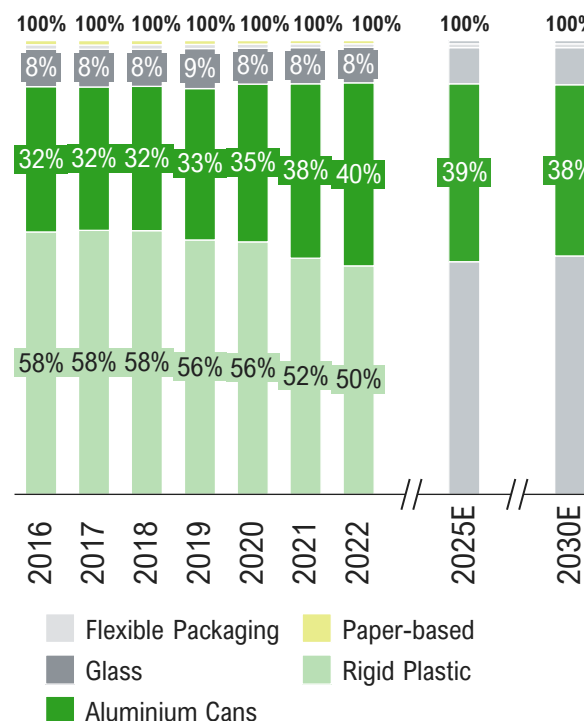
Population, package & beverage trends, 2016-2030E



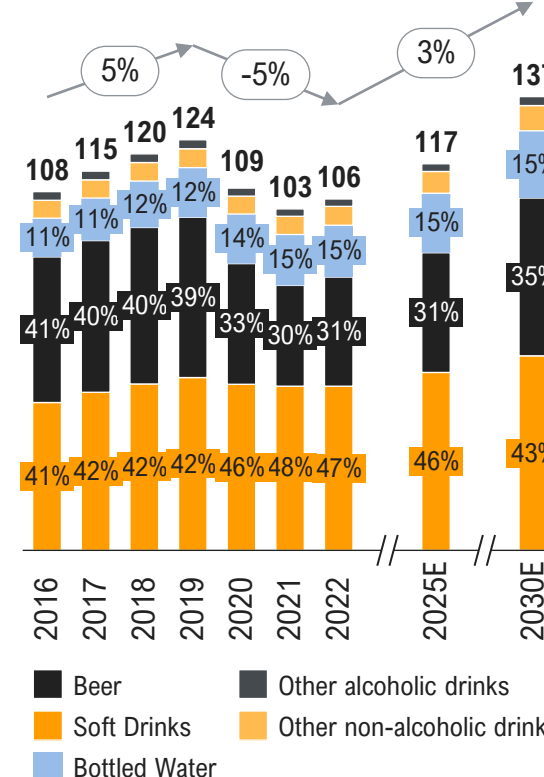
Population [m inhabitants]



Estimated annual package consumption [%¹⁾]



Estimated annual packaged beverage [l/person, %]

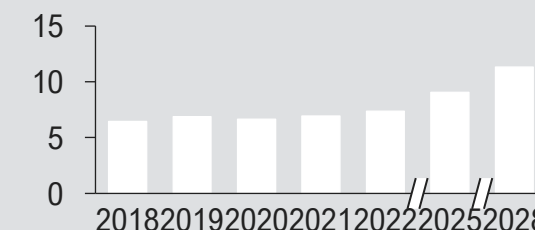


Key takeaways



- Population is steadily increasing, and is expected to keep increasing in the following years
- Rigid plastic and aluminium can share's have increased benefited by a decrease on glass' share, which has worse recycling capabilities
- Overall annual packaged consumption per capita has increased; however, it hasn't recovered yet the levels before the COVID-19 pandemic. Further increase, in line with overall increase in customer spending is expected

Total consumer spending Vietnam (USD b)



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



3. Waste management & regulatory context

The waste regulation framework in Vietnam is in place, but enforcement is limited – the mandatory EPR is expected to have significant impact starting in 2024

Regulatory Waste Management framework & infrastructure overview

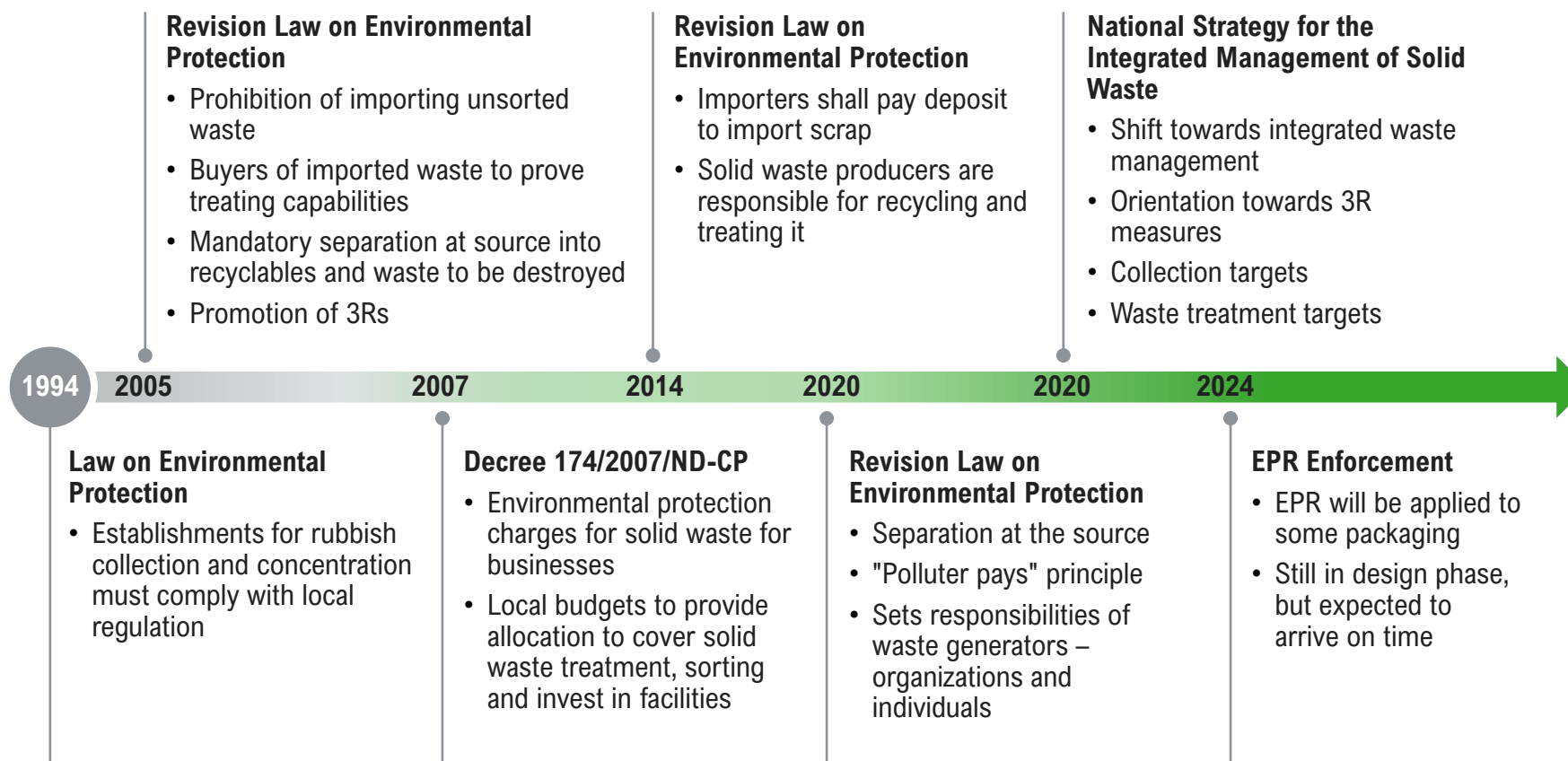


Waste mgmt. framework		<ul style="list-style-type: none">• Roles & responsibilities: The core legislative framework is in place and the developed by the National Assembly, the Ministry of Natural Resources and Environment leads the implementation• Maturity: Most key aspects to ensure safe disposal of waste have been implemented, no strong drive towards circular economy yet
Collection infrastructure		<ul style="list-style-type: none">• Organized collection: 80% of urban population is covered by formal collection, the rest of the urban population & rural population is only covered by informal collection• Collection targets: Vietnam has set 100% urban and 90% rural collection rate targets for 2025• Source separation: Vietnam's regulation mandates source separation, but implementation and enforcement is difficult
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 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: Vietnam has set a 85% recycling rate for all types of municipal waste (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 to become mandatory for packaging in January 2024, for the moment it is still in the design phase–Brand owners will have a choice to pay the EPR fee to the EPR Scheme Operator OR organize the collection and recycling of the volumes put on market themselves–The targets are to reach a collection target of 22% and the collected cans must be recycled with a 40% efficiency, obtaining 8.8 recycled cans for each 100 cans put on market• DRS: No deposit return systems are available, nor immediately planned, in Vietnam

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

Broad legislation & municipal implementation; mandatory separation at source, but unable to enforce it

Vietnam – regulation overview



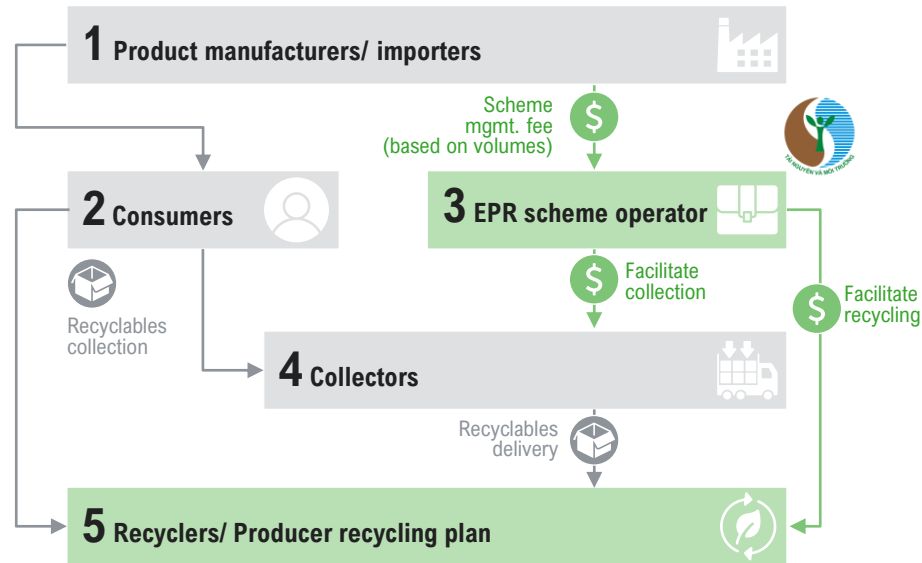
Highlights and key take away



- Legislation is responsibility of the National Assembly, the Ministry of Natural Resources and Environment leads the implementation, and local governments are responsible for the waste management
- Vietnam's regulation obliges to separate at the source, but implementation and enforcement is difficult
- Vietnam has set 100% urban and 90% rural collection rate targets for 2025
- Vietnam has set a 85% recycling rate out of the collected waste for municipal waste for 2025
- EPR for Packaging Recycling Obligations in design phase, and expected to enter into force between 2023 and 2025

EPR to become mandatory for packaging in January 2024, for the moment it is still in the design phase

Packaging EPR system operation



1 Manufacturers register volume report to EPR Supporting Office

Two options: brand owners pay the EPR fee to EPF²⁾ or they plan their own waste recycling & treatment:

- 2 • The **producers organize the collection** and recycling by themselves, or they outsource it
- 3 • **EPF collects fund** and **makes notification** to EPR Supporting Office
- 4 EPF sponsors/pays to collectors and recyclers when R&T³⁾ jobs are done
- 5 **Recyclers work with collectors** and make **notification to EPR Supporting Office**:
 - **Collection target:** 22% of the produced cans must be collected
 - **Recycling target:** the collected cans must be recycled with a **40%** efficiency, obtaining 8.8 cans for each 100 cans put on market

 **Brand owners pay waste recycling and treatment (R&T) fee OR they organize R&T (by themselves or outsourced)**

→ Material flow → Money flow

1) Ministry of Natural Resources and Environment; 2) Environmental Projection Fund 3) Recycling and Treatment



4. Value Chain

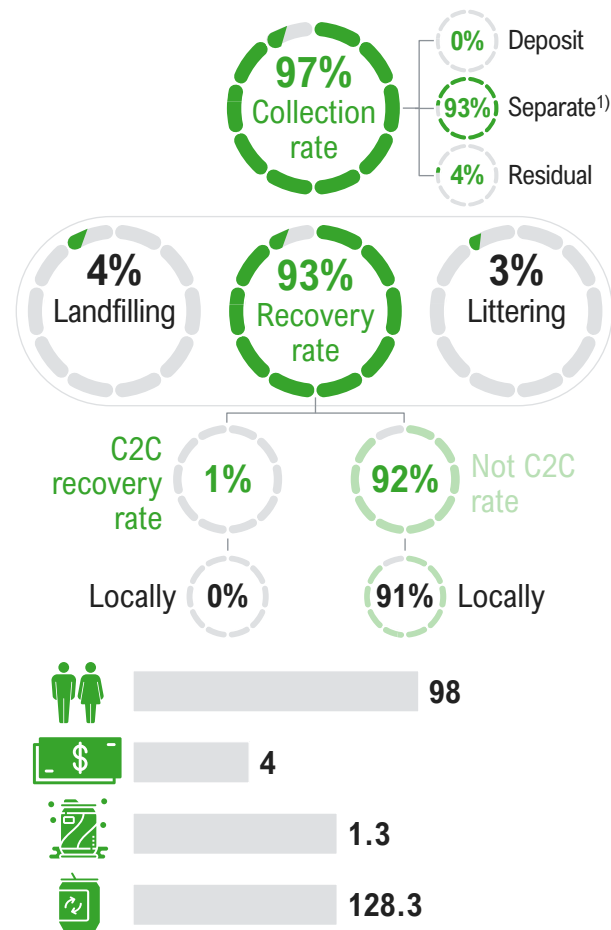
High recovery rates are achieved through a large network of waste pickers, recycling is done using basic methods with often bad impacts on the environment

Overview of aluminum cans value chain

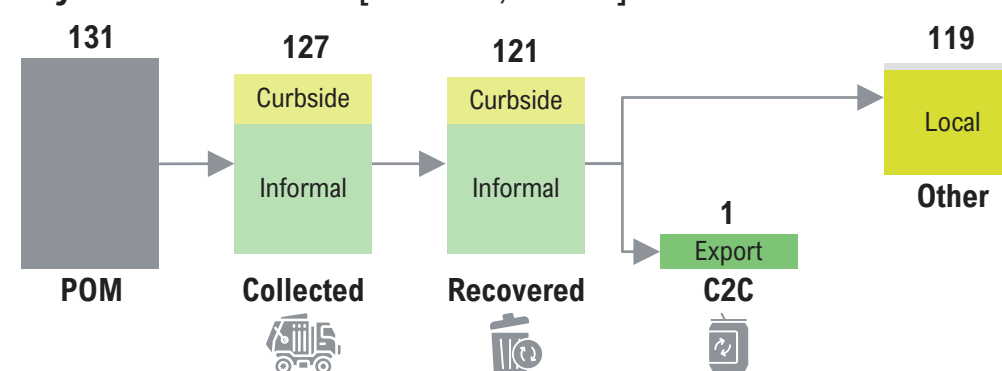


Vietnam reports high collection rates as UBC scrap is very valuable, UBCs are downcycled in bad conditions

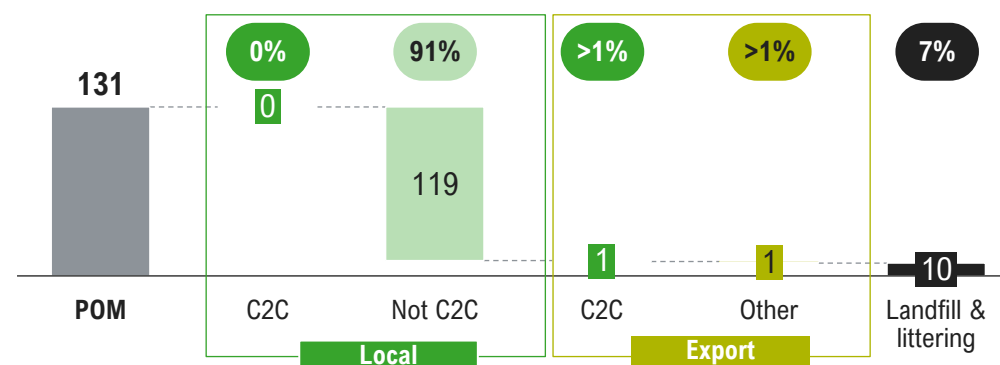
Summary of aluminium cans flows, 2022 [k tonnes]



Key market indicators [k tonnes, %POM]



Destinations [k tonnes, %POM]



Population (million, 2022) GDP per capita (USD k/ capita, 2021) Annual consumption (kg/ capita, 2022)

Annual consumption (can/ capita, 2022, 10.44 g/ can) X% Final destination [%POM]

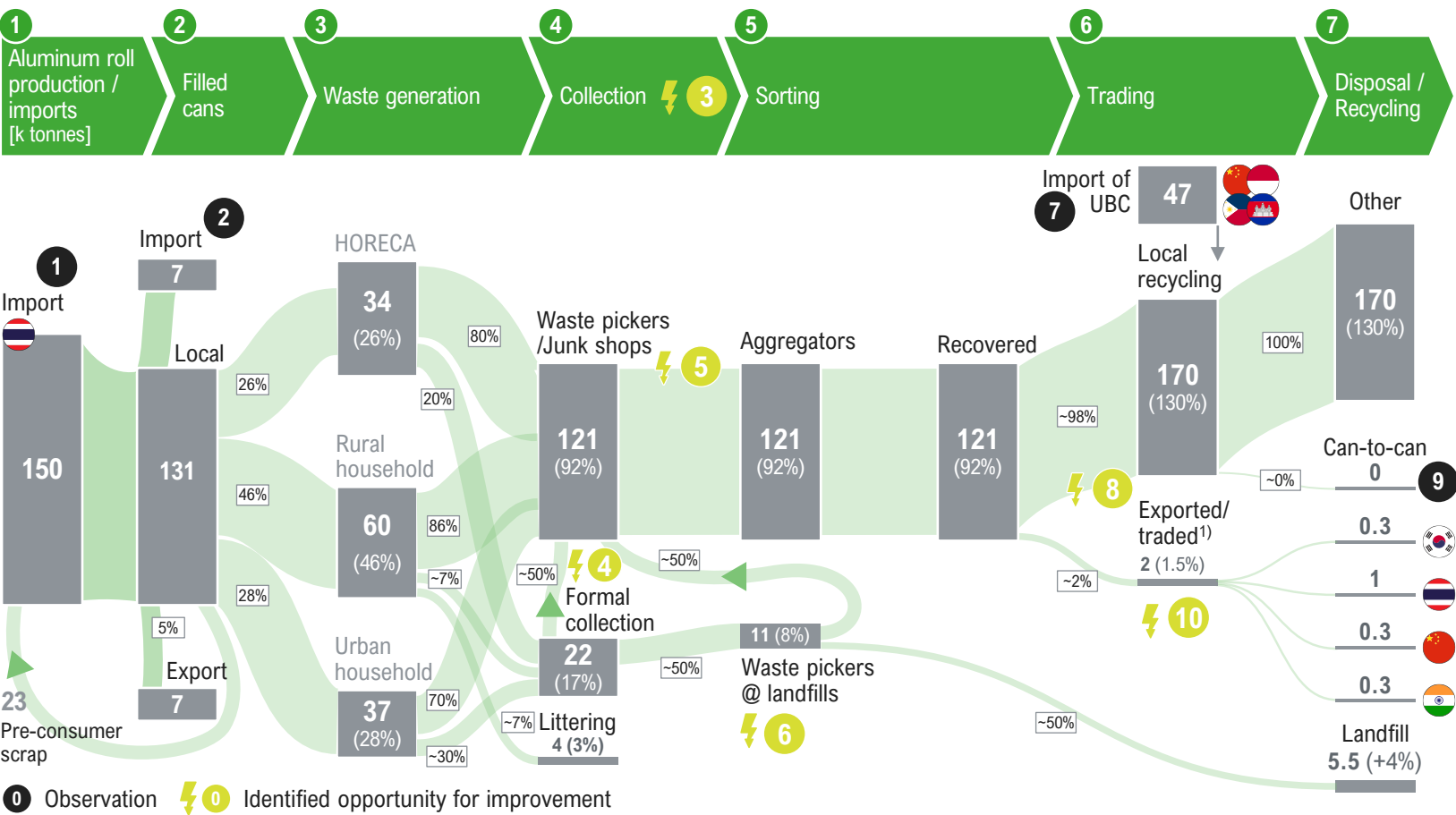


Key takeaways

- **High put-on market volumes**, compared to other countries in Southeast Asia such as Cambodia & Thailand
- **No local aluminium roll production** & no capacity to process UBC, hence no local "closed-loop", approximately 1% is recycled through closed loop via Thailand
- **High collection rates** due to high value of aluminium to the informal waste sector
- **No separation at the source**
- **High demand for UBCs** to recycle locally in automotive and cookware sectors
- Local recycling is mostly done with **reverberatory and rotary furnaces**, generating significant ecological impact

The informal waste collectors achieve high recycling rates – most of the UBCs are recycled by the informal sector into lower value products

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



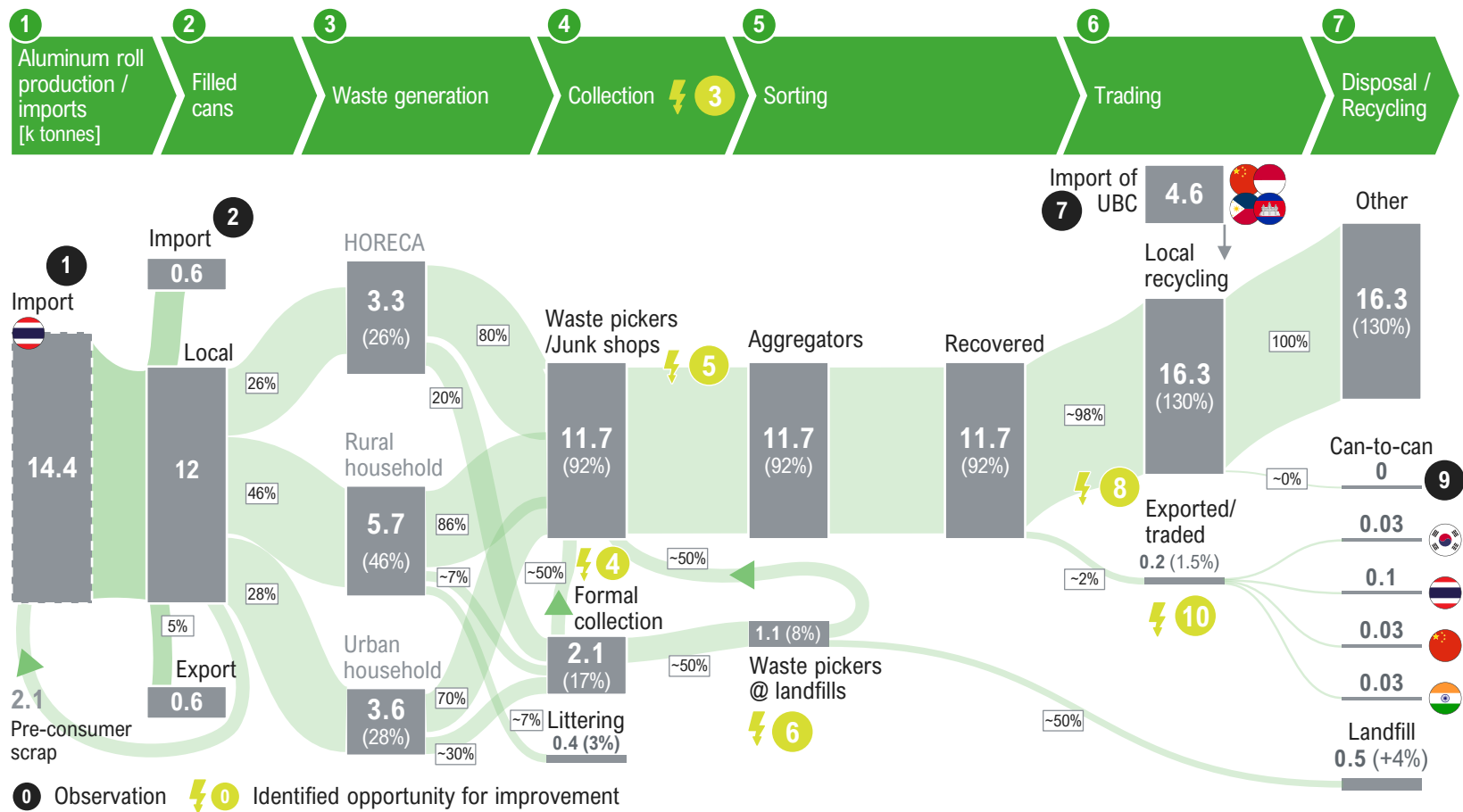
Key observations

- 1** No local coil production
- 2** Informal collection system & waste pickers contribute to high collection & recycling rates in Vietnam
 - Aluminium is the most valuable recyclable, so it will be a priority to waste pickers
- ⚡ 3** The market is experimenting with EPR in Vietnam, which is expected to come into force in January 2024
- ⚡ 4** Separation at the source is mandatory but not enforced; no separate collection
- ⚡ 5** Fluctuating UBC trading price at times make UBC collection less appealing for junk shops and waste pickers
- ⚡ 6** Sorting in landfill is done manually, in unsanitary HSE conditions
- 7** Import of higher-quality scrap, easier to treat for recyclers, and import of scrap to match aluminium demand
- ⚡ 8** Local recycling using old technologies which are not efficient and are very polluting
- 9** No local can-to-can recycling locally, UBCs are either exported or downcycled: can-to-can recycling via Thailand (TBC-Ball, UACJ, and Anglo-Asia Trade) only 100 m cans
- ⚡ 10** 22% export duty prevents more cans reaching can-to-can recyclers

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 collectors achieve high recycling rates – most of the UBCs are recycled by the informal sector into lower value products

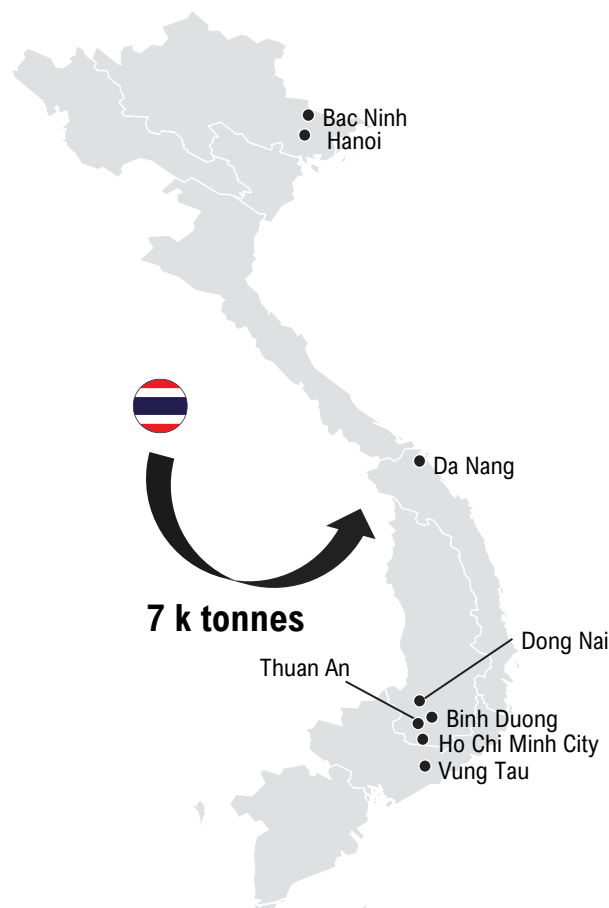
Material flows of aluminium cans in Vietnam, 2022 [b units¹⁾, (% of total POM volume)]



1) Estimated weight per can: 10.44 g

More than 10 manufacturing plants in Vietnam supply beer and soft drink companies with 12.6 b cans per year

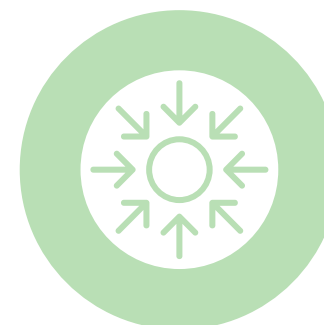
Overview of the can manufacturing plants in Vietnam



10+ manufacturing plants



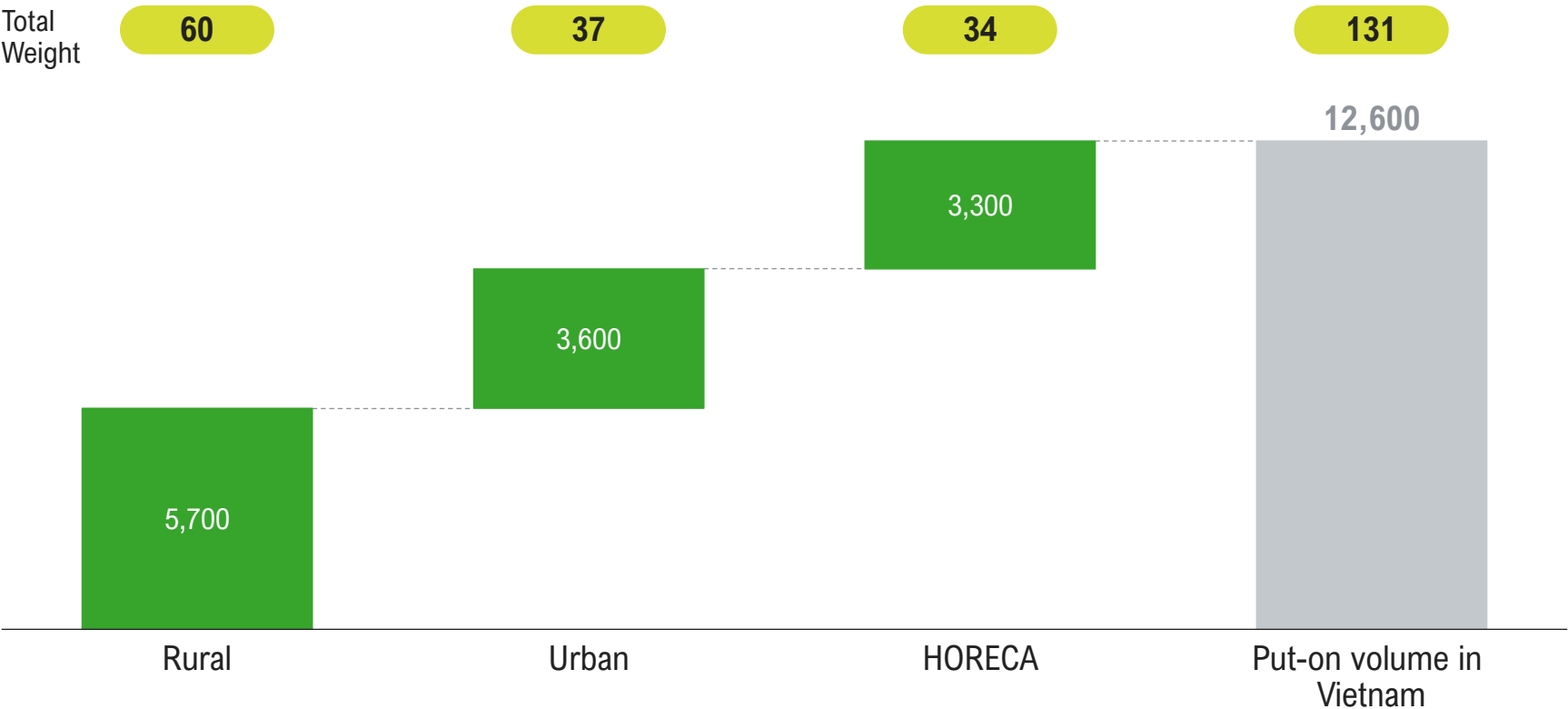
12.6 b cans put on market



0.6 b cans import

Only 5% of the locally produced cans are exported, and 95% of the consumed cans in Vietnam are locally produced

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



1) Including imports

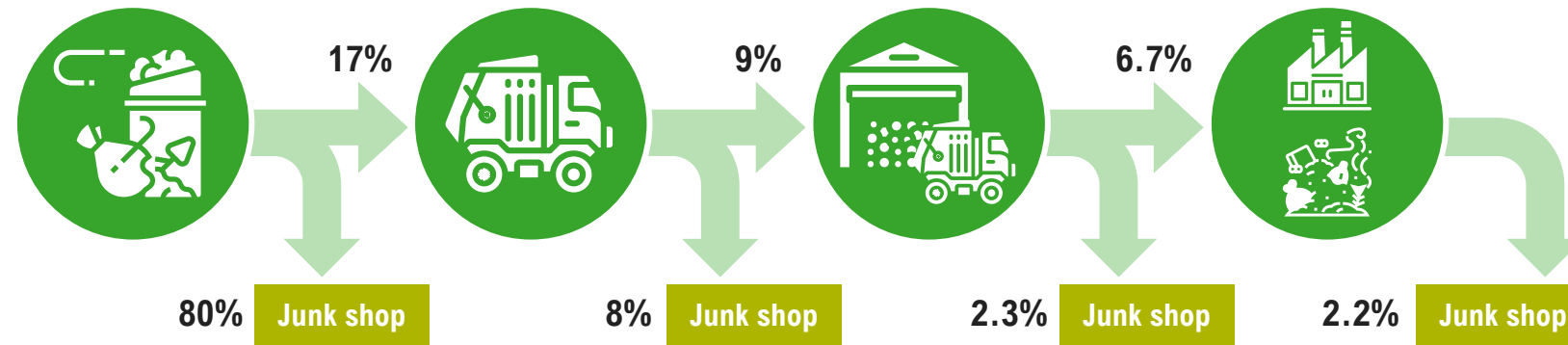
Key takeaways



- **74% is in-house consumption**
 - **rural consumption is higher than urban** consumption, accounting respectively for **60%** and **40%** of the total in-house consumption
 - **HORECA consumption** accounts for 26% of domestic consumption; relatively high compared to nearby countries due to **the affordability of street food** and the high **popularity** of aluminium cans in **street restaurants**
- **Around 5% cans locally consumed are imported; imported brands cans are energy drinks and different sizes of can** (little local production range of sizes), mainly coming from Thailand

Most of the recyclables are sorted before reaching formal collection; after formal collection high-value recyclables are sorted by workers or informal sector

Formal collection structure of municipal waste in Vietnam



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 enforced

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 periodically 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 leaks

Waste consolidation & transfer

- In large urban cores (e.g., HCMC), waste gets consolidated at transfer stations before being sent out in larger trucks
- All the sorting is done manually

In transfer station recyclables are manually sorted while waste is stored

⚡ 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

- Segregation at source is **mandatory**, but it's **not implemented** nor enforced
- Local municipalities are responsible for urban household waste management with **public companies**, such as URENCO and CITENCO, and **concessions** awarded to private companies:
 - URENCO and CITENCO try to buy the cans back from their workers, but they can't offer competitive prices
- Households are charged with **collection & disposal fees by local municipalities**
 - VND 31,000-75,000 (~ USD 1.3-3.2) / month for households in Ho Chi Minh City
- Most of the **aluminium cans are picked before formal collection**, and then formal collection system is very leaky
- Sorting infrastructure is **inexistent**, and all the sorting is done manually in very poor conditions

The informal sector in Vietnam is not a homogeneous group, and is composed of different actors that are well organized on a local level

Overview of the different participants in the informal sector



Street waste pickers

- Street waste pickers are usually women and children that have migrated from rural areas
- They work covering a specific area, and they depend on their reputation with waste generators
- They are very effective sorting the recyclables before the formal workers arrive



Landfill waste pickers

- Landfill waste pickers live in the landfills or nearby and collect the waste when the truck unloads
- There won't be many aluminium cans arriving



Occasional waste pickers

- Occasional waste pickers are a heterogeneous group that sometimes sort or/and collect recyclable to earn extra income



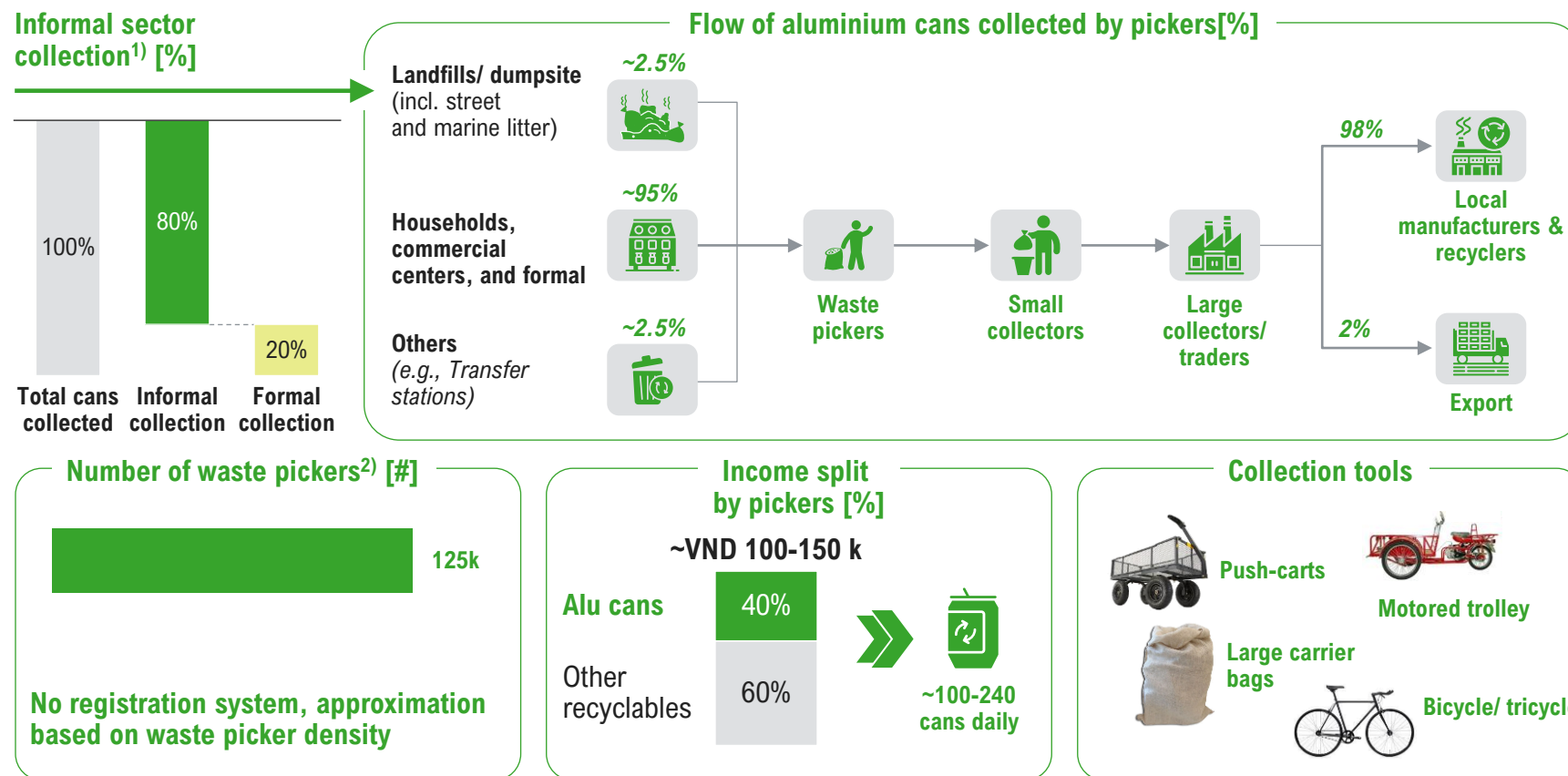
Formal workers

- Formal workers sort the recyclable to earn an extra income
- They can double their salary by collecting 500 cans per day



Waste pickers in Vietnam highly rely on aluminium cans to make a living, being responsible of a 40% of their income

Informal sector overview - Vietnam



Comments

- The waste pickers receive an **attractive salary** (USD 125-200 per month), in some cases being higher than the minimum salary (USD 132-202)
- Most of the waste pickers are **women equipped with bicycles** that come from rural areas
- **Pickers obtain a 40% of their income out of** aluminium cans, even though cans are only the 3-6% of the total waste they collect
- Since Vietnam is a can country waste **pickers rely more** on cans compared to Thailand, they have a high incentive to collect cans
- **Pickers and junkshops are unwilling to be formalized**, as they will need to pay taxes and do legal paperwork

1) First step collection; 2) Full-time waste pickers; 3) VND 100 k = USD 4.26

There are numerous challenges affecting the informal sector in Vietnam, making it lag behind Thailand's

Key challenges affecting waste pickers and the system

Challenges affecting waste pickers



Lack of transparency, which makes waste pickers vulnerable to the prices set by junk shops
"Aggregators capture a 50-70% of value generated, and relationships with junkshops are mainly verbal agreements"



Health/ environmental hazard risk due to **lack of protective clothing or equipment**
"Waste pickers are not aware of the health risks: they just wear a mask and they feel safe"



Unstable/ constantly evolving aluminum UBC waste prices
"Waste pickers don't always see the price changes reflected; brand owners suggest committing to a buying price to improve waste picker salaries"



Lack of **public recognition and respect** leading to stigmatization



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

Challenges affecting the collection and recycling informal system



Lack of **regulation and government recognition** of waste pickers
"Formal collection will be needed to make EPR properly work, adding transparency to the system"



Opportunity to improve the quality of life of the informal sector by improving price transparency and reflecting material price increases

Littering still exists in rural communities that are isolated from formal and waste picker's coverage; however, aluminium cans are typically sorted by households

Littering activities in Vietnam



Littering in Vietnam 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)

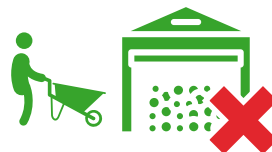


- **Disposal / Open burn in public space** (e.g., roadside, forest, canal, water body)

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**

Some companies are launching innovative solutions to improve the waste management system and increase recycling rates

Overview of three innovative solutions



mGreen

- There are **3 apps**:
 - The first one encourages users to **separate waste at source**, to **receive in exchange points** that can be redeemed for gifts
 - The second one allows collectors to receive collection requests; collectors can then sell the recyclables after paying a fee to cover the resident's rewards
 - The third one allows to redeem the points that have been collected
- The app is **focused on aluminum cans, paper, and plastics**
- The platform claims to have **100,00 users**, and **90 collector accounts**
- They claim to have managed to **collect 300 tonnes of recyclables** so far



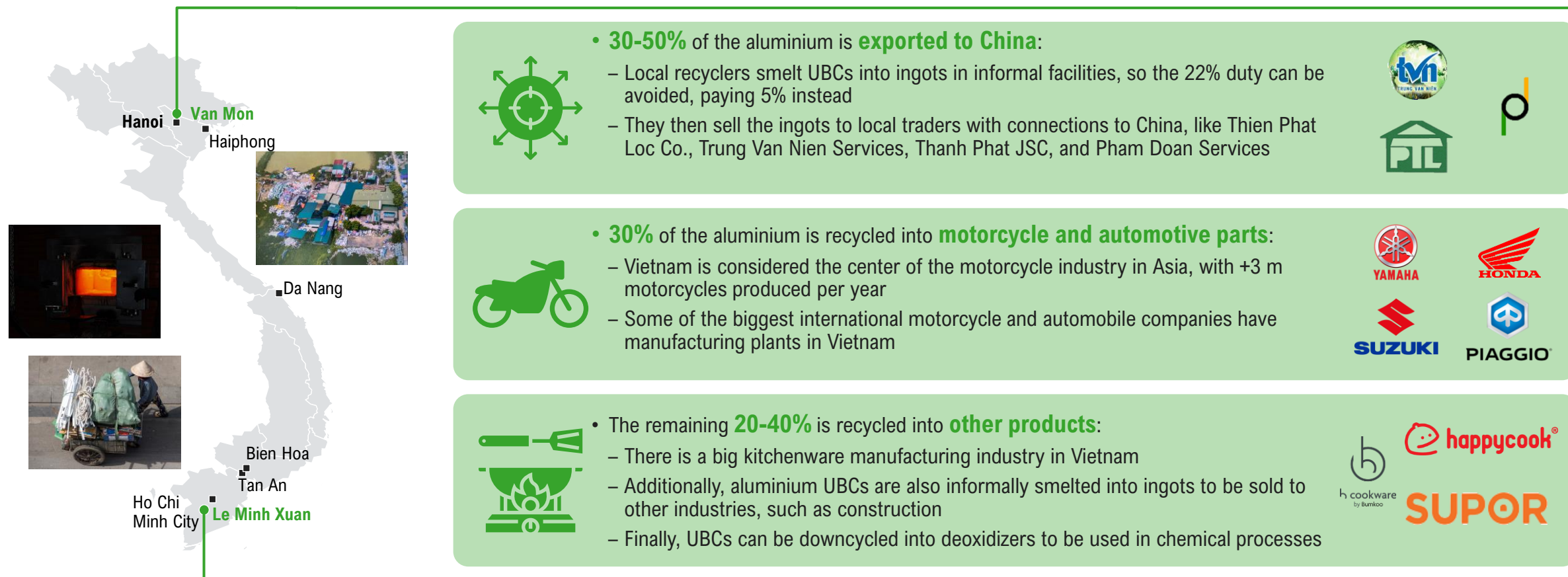
- The company offers a mobile phone app that allows users to **exchange recyclables for points that can later be redeemed**
 - In order to receive the points customers can either bring their recyclables to Grac's shops or connect with collectors
 - Additionally, they offer an Enterprise Resource Planning software for collection enterprises to help them centralize waste collection data
- They claim to have **more than 1 m customers**, covering 250,000 households



- The company offer solutions to both businesses and households:
 - For households it offers a **mobile app** that provides **rewards in exchange of recyclable waste**; it is focused on Tetra Pack
 - For business it offers industrial scrap collection by connecting industrial plants with collectors
- The company claims to have **34,000 users**
- They claim to have collected **80 tonnes of industrial scrap and 100 tonnes of milk cartons**

Recycling in Vietnam is very informal, and it is clustered around two crafting villages: Van Mon in the North and Le Minh Xuan in the South

Local recycling overview in Vietnam



Vietnam is the center of the motorcycle manufacturing industry in Asia, and it is a big consumer of recycled aluminium

Overview of big aluminium consumers – motorcycle manufacturers



Motorcycle manufacturers



- **Honda has 2 motorcycle manufacturing facilities in Hanoi:**
 - **Honda Vietnam:** 2.5 m motorcycles / year, and 23,000 cars / year
 - **Vietnam Autoparts:** manufacture of motorcycle parts



- **Yamaha has 2 motorcycle manufacturing facilities in Hanoi:**
 - **Yamaha Motor:** 350 tonnes / month crankcase capacity
 - **Yamaha Motor Parts:** 540 tones / month wheels and cylinders capacity



- **Suzuki has one facility in Dong Nai:**
 - The plant has a 60,000 motorcycles / year and 6,000 cars / year capacity



- **Piaggio has one facility in Vinh Phuc:**
 - **Motorcycle assembly:** 250,000 motorcycles / year (expected to reach 400,000) capacity
 - **Engine production:** 300,000 units / year (expected to read 400,000) capacity



- **Kymco has one plant in Binh Duong:**
 - **Engine components** manufacturing and assembling
 - **Motorcycle assembling**

Recycling in automotive industry

- The automotive industry has a **high demand** for **aluminium** to make engine parts and wheels
- **Aluminium UBCs** are **recycled by local companies and craft villages**, and then sold to big manufacturers as ingots and billets
- Aluminium recycling is mostly done by the informal sector, but there are **private enterprises** that also **recycle aluminium**

 **ALMINE · VIETNAM**


VIETNAM FUKUNAGA
ENGINEERING Co., Ltd.


جارمكو
GARMCO


HANWO


AluViet

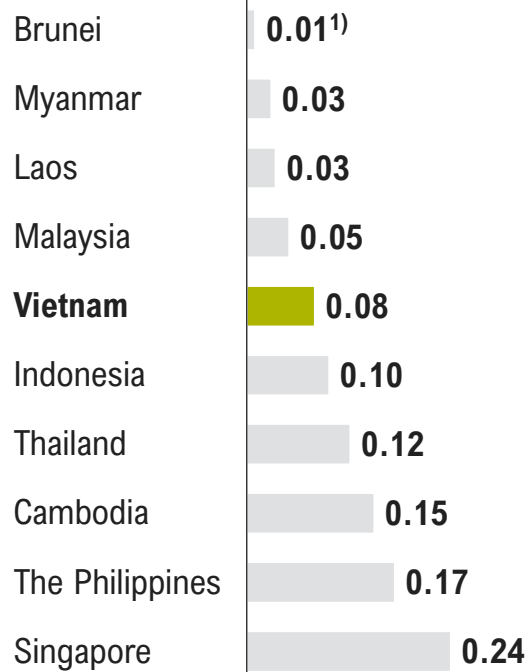

NGỌC DIỆP


KIMSEN

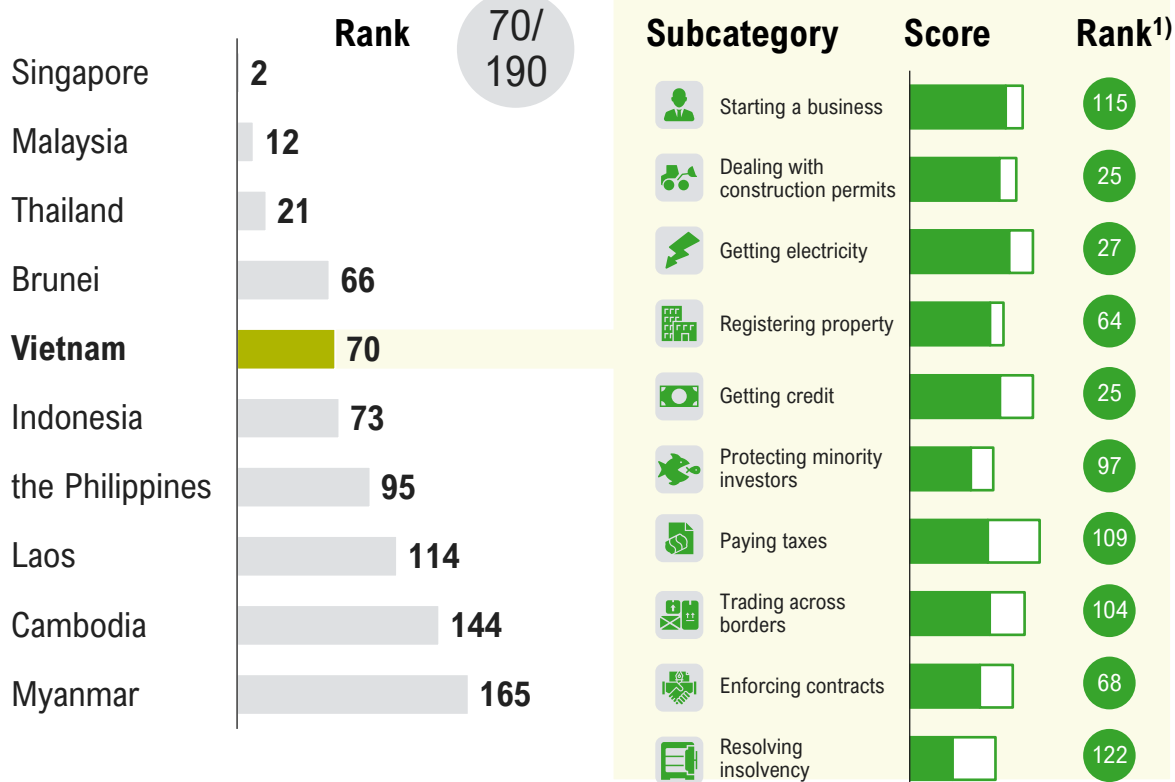
The recycling industry in Vietnam has developed easily due to the ease of doing business and the low energy prices

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

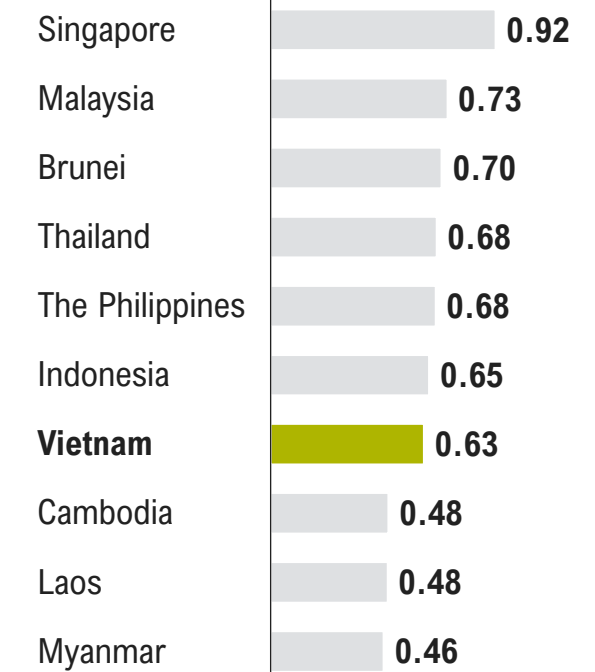
Electricity price ranking, 2022 [USD/kWh]



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

Local recycling of aluminum cans is done with old highly polluting technologies – key focus of regulation to phase out

Overview of aluminium melting technologies

Reverberatory furnace

- They use a chamber to **reflect heat** from a fire, which is lit **using fossil fuels**



Induction furnace

- They use an **electromagnetic field** to generate heat



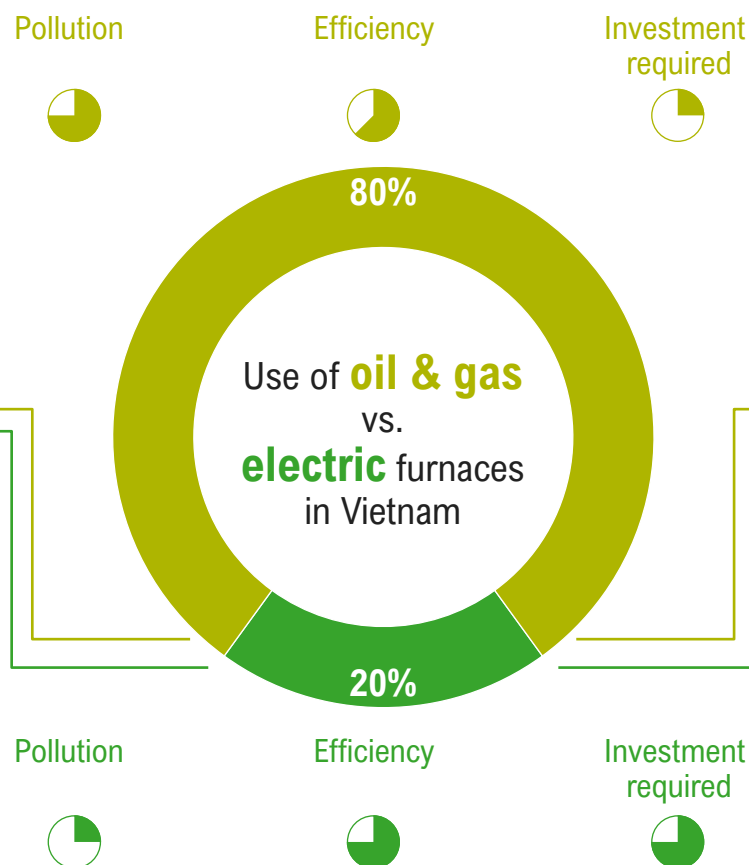
Rotary furnace

- They work similar to reverberatory furnaces, but they **rotate** around their **horizontal axis**



Electric arc furnace

- They use an **electric current** to produce an **arc** and heat the scrap



Consequences



- **Reverberatory and rotary furnaces** have a **low efficiency**, due to a lack of precise temperature control
 - Up to **40% of the aluminium** that is recycled using these methods is **lost to dross**, compared to around 25% using the other methods
 - **Only around 20%** of melting for recycling is **done using induction and electric arc** furnaces
- **Reverberatory and rotary furnaces use fossil fuels to operate**, making the process very polluting
 - Additionally, **burned impurities can be very polluting**
- Even though some of the used methods to recycle locally in Vietnam aren't very efficient, **they still are more efficient than producing aluminium from Bauxite**

Roland
Berger

