

WORTH FIXING

A case for Bali's community based repair ecosystem

Unmet Needs Report

June 2026

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Executive Summary

COST OF GROWTH

Two decades of stable economic growth have turned Indonesia into a **mass consumer economy**. Aspiring and middle-class households now make up two-thirds of the population, and **ownership of major appliances is near-universal** — 93% own a TV, 89% a refrigerator, 78% a mobile phone. But **end-of-life management has not kept pace**. **National waste volumes have grown 11% per year since 2021**, and 36% of all waste — about 11 million tonnes annually — goes **unmanaged**. In **Bali**, the strain is acute: **Suwung** absorbs half of the island's landfilled waste, and **over 2022–2024 alone took in roughly 4.5x its 2019 design capacity**. Illegal dumping persists despite over a decade of regulation.

CIRCULAR ECONOMY MOMENTUM

Indonesia's **National Circular Economy Action Plan 2025–2045** has formally adopted the **9R** framework, expanding the traditional 3R approach to include the **Restore cluster** — **Repair, Refurbish, Remanufacture**. **Restoration is an order of magnitude more resource-efficient than Salvage**: repairing electronics emits roughly 3–12% of the CO₂ of buying new, compared to 85–95% for recycling. Electronics and textiles carry the highest restoration potential, and **63% of Indonesians say they prefer repair over replacement** — fourth highest among 17 economies surveyed. Yet national statistics suggest **only 4% of broken items are actually repaired**, and **just 0.07% of broken electronics reach a formal repair service**.

FIVE REINFORCING BARRIERS TO REPAIR

To better understand this gap, Kopernik conducted **field research** with **223 households** and **22 repair practitioners** across Gerokgak and Ubud districts in Bali. The survey paints a **more nuanced, yet positive picture** than national figures suggest: **44% of broken items are fixed when self-repair and informal technicians are counted** — well above the **4% national stat**, which captures **formal repair only**. **Yet more than half of broken items still go unrepaired or sit idle at home**, and **five reinforcing barriers** explain why. On the **demand side**: households see broken items as **no longer usable** due to **low awareness of repair potential (D1)**, and **assume buying new is cheaper** — though our cost analysis shows repair usually wins on cost (**D2**). On the **supply side**: **few technicians can handle complex repairs**, limiting what workshops can offer and who they can serve (**S1**); **most workshops run repair alongside other businesses**, limiting investment in skills, tools, and parts (**S2**); and **difficulties in sourcing parts and tools** constrain repair capability and turnaround time (**S3**).

‘BENGKEL BUMI’ TO PROMOTE REPAIR IN BALI

Bengkel Bumi, or Earth Workshop, is Kopernik's new initiative to **close this gap by building a community-based repair ecosystem in Bali**. The initiative delivers **four areas of intervention** to address the above mentioned five reinforcing barriers.

- 1) Awareness and behaviour change** shifts perception, makes repair visible, and changes consumption habits — through pop-up repair markets, repair storytelling, and price comparison signage.
- 2) Training and capacity building** grows repair skills in both technicians and the general public — through hands-on training, peer mentoring, and master–apprentice formalisation, prioritising women and youth.
- 3) Economic and pricing interventions** make repair financially viable for both customers and technicians — through repair vouchers, tiered pricing, and multi-corner services with diversified income streams.
- 4) Parts and tools access** solves the sourcing bottleneck — through a shared specialist tool library, waste upcycling, and a spare-parts salvage and shared inventory. The model is built around local ownership — community members train and gradually take on running the hubs themselves.

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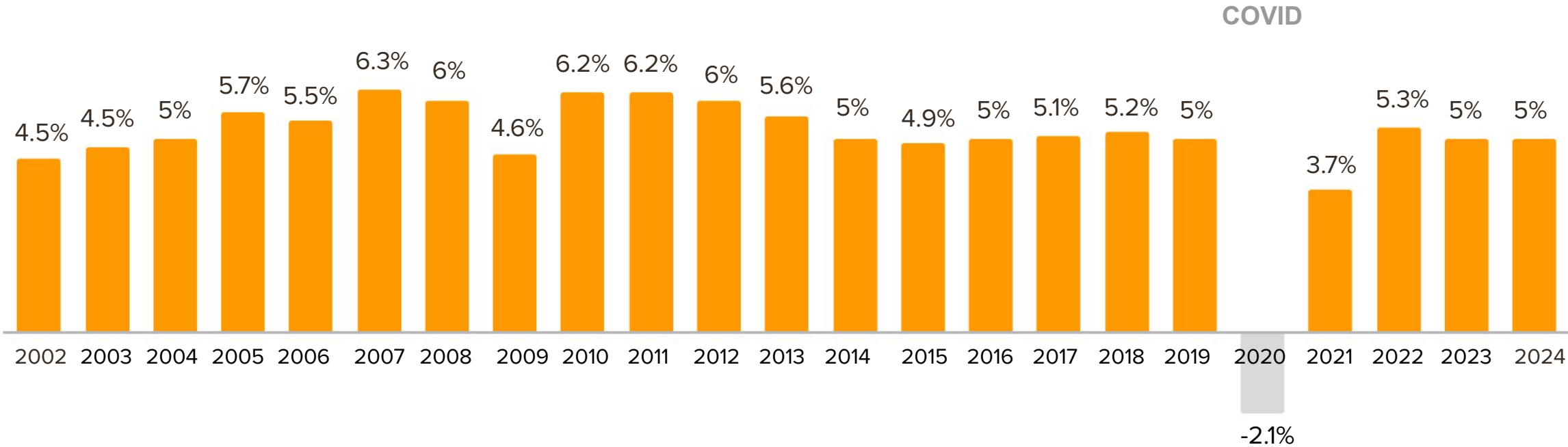
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Indonesia has been experiencing stable economic growth over the last two decades

Indonesia GDP Growth Rate

In % per annum, 2002 - 2024

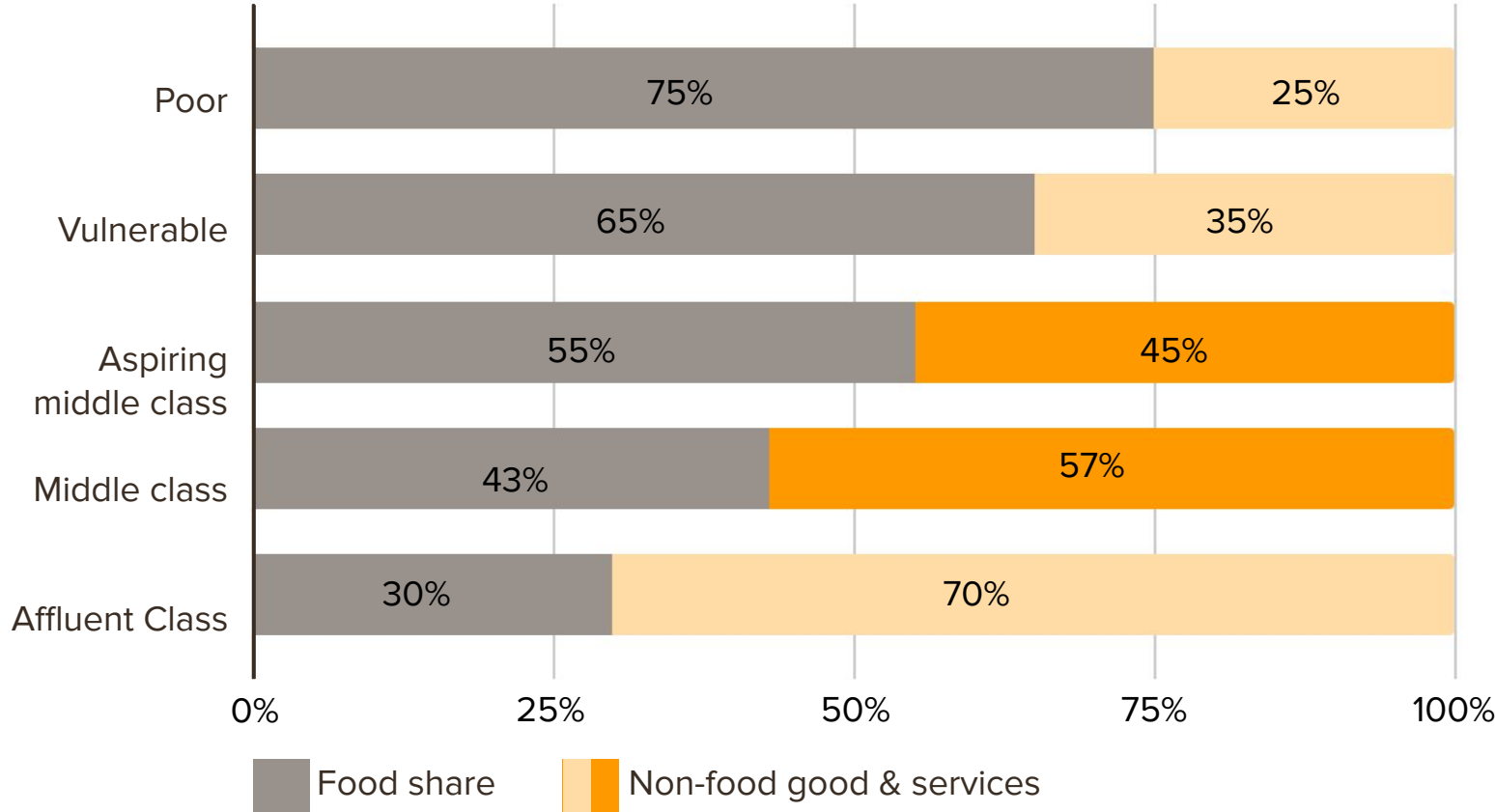


Source : World Bank - [World Development Indicators](#)

As the economy grows, more people are joining the aspiring middle and middle classes, thereby increasingly spending on non-food goods such as electronics, clothing, and appliances

Spending pattern among Indonesia's five economic segments

Food vs Non-Food % | 2014 figures are authors' estimates



Proportion in the overall population

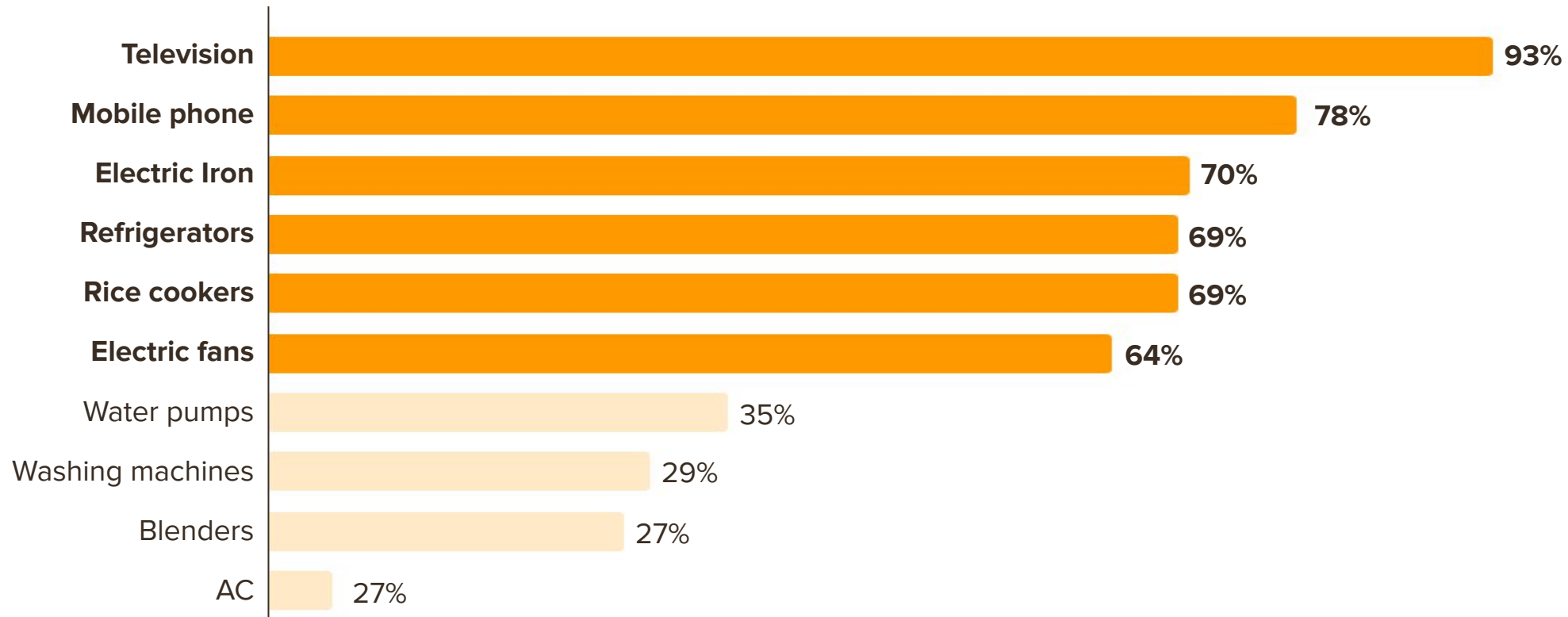
	2014	2024	Change
Poor	11%	8.6%	↓ 2.3pp
Vulnerable	28%	24.4%	↓ 3.6pp
Aspiring middle class	45%	49.3%	↑ 4.3pp
Middle class	15%	17.3%	↑ 2.3pp
Affluent Class	0.4%	0.5%	→ Stable

Source : BPS - 2024 National Socio-Economy Survey; World Bank - Aspiring Indonesia

Looking at electronics, a 2020 survey shows that the majority of Indonesians now own televisions, mobile phones, electric irons, refrigerators, rice cookers, and electric fans.

Household ownership rates by product

% of Electrified households (N=5,443)

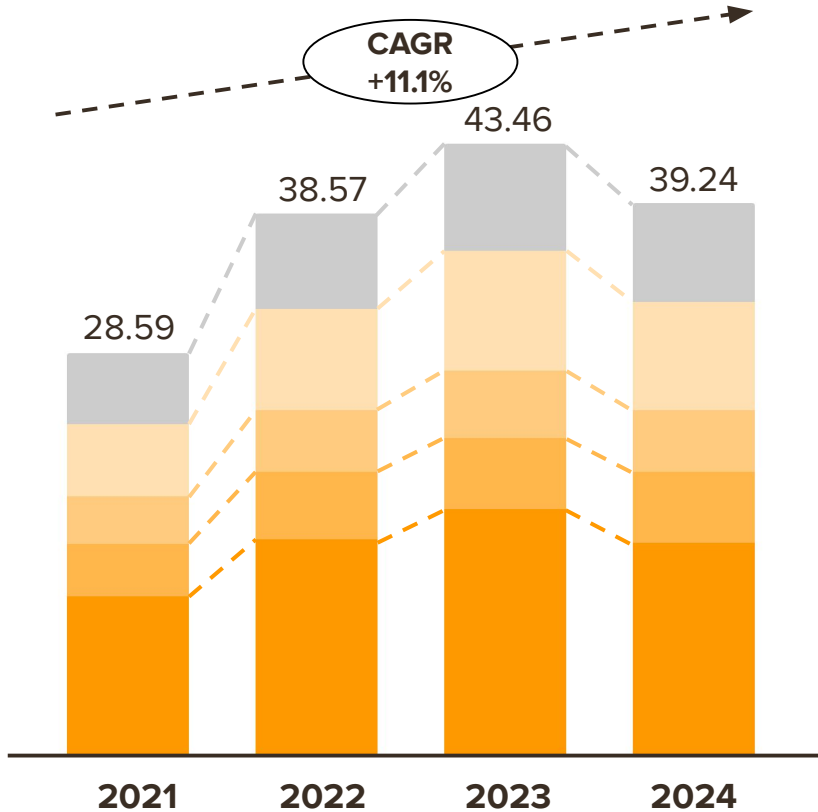


Source : IPSOS - *Indonesia Residential End Use Survey*, 2020

As more people spend money, waste volumes have increased in Indonesia

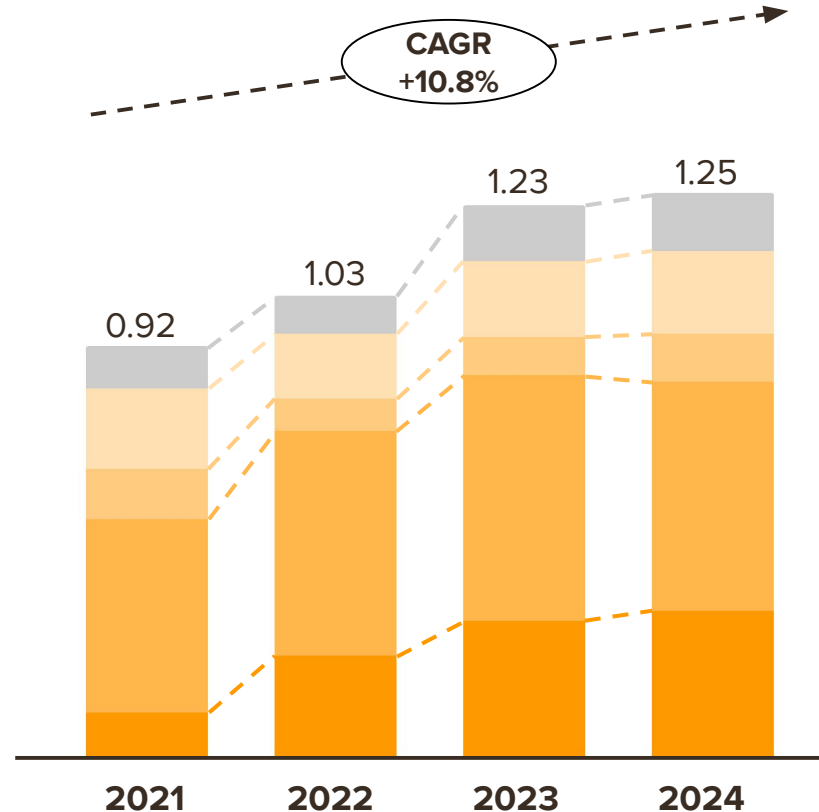
Indonesia's total annual waste generation

In million tonnes



Bali's total annual waste generation

In million tonnes



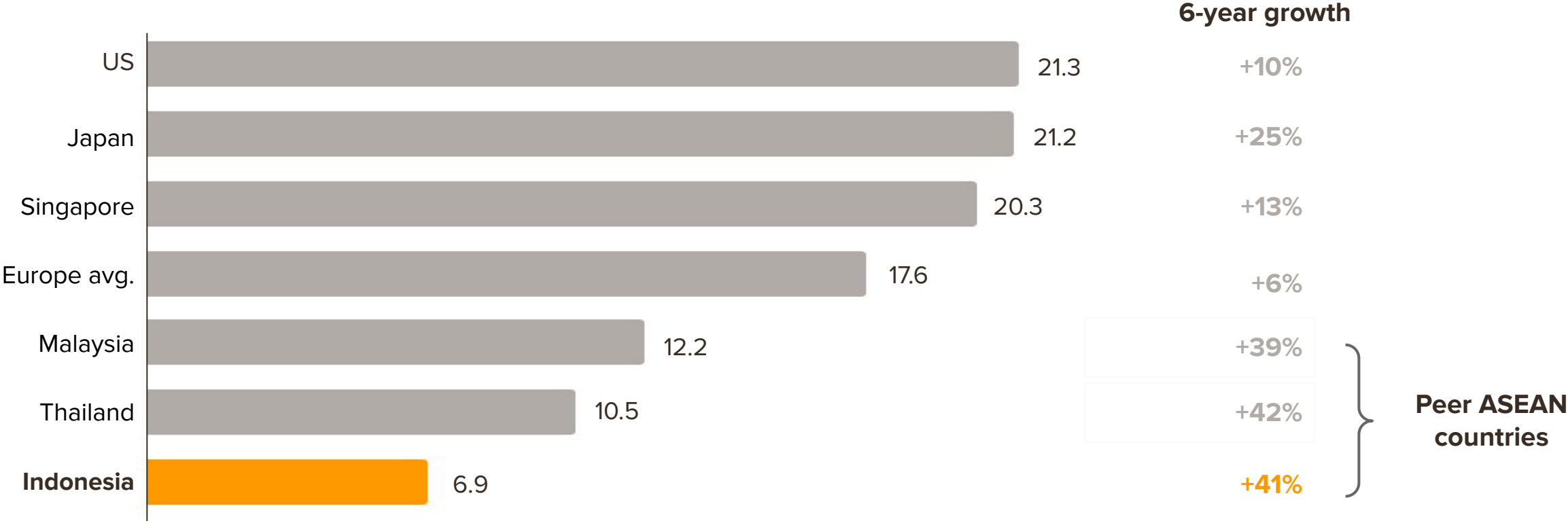
- Others (Metal, Fabric, Rubber, Leather, Glass, etc)
- Plastic
- Paper
- Wood
- Food Waste

Source : [National Waste Management Information System \(SIPSN\)](#) (To get the data, select Bali from the province table to access the relevant data)

Indonesia generates only a third of the e-waste per capita compared to the US, Japan or Singapore, but the volume is growing fast, together with emerging economy peers Malaysia and Thailand

E-waste generation per capita

In kg/year, 2022

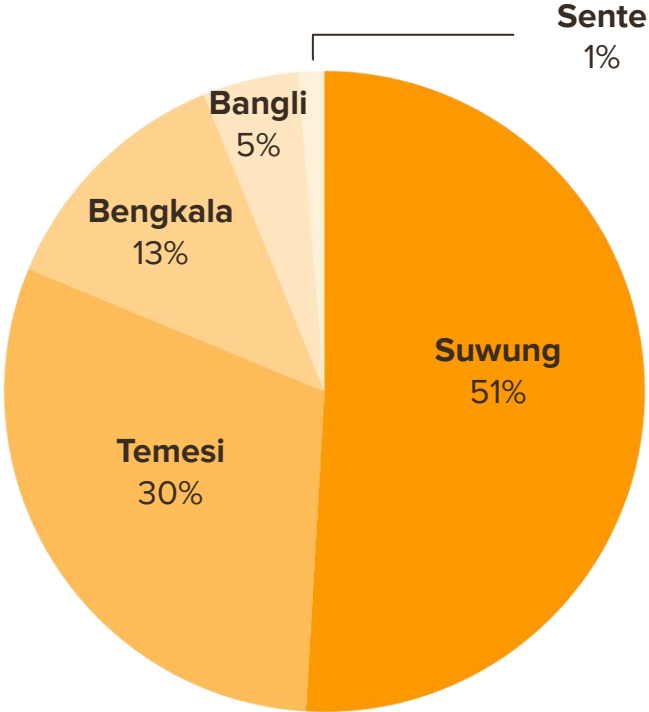


Source : [Global E-Waste Monitor 2017](#); [Global E-Waste Monitor 2024](#)

In Bali, Suwung absorbs half of its landfilled waste — and has taken 4.5x its 2019 design capacity in just three years (2022-2024)

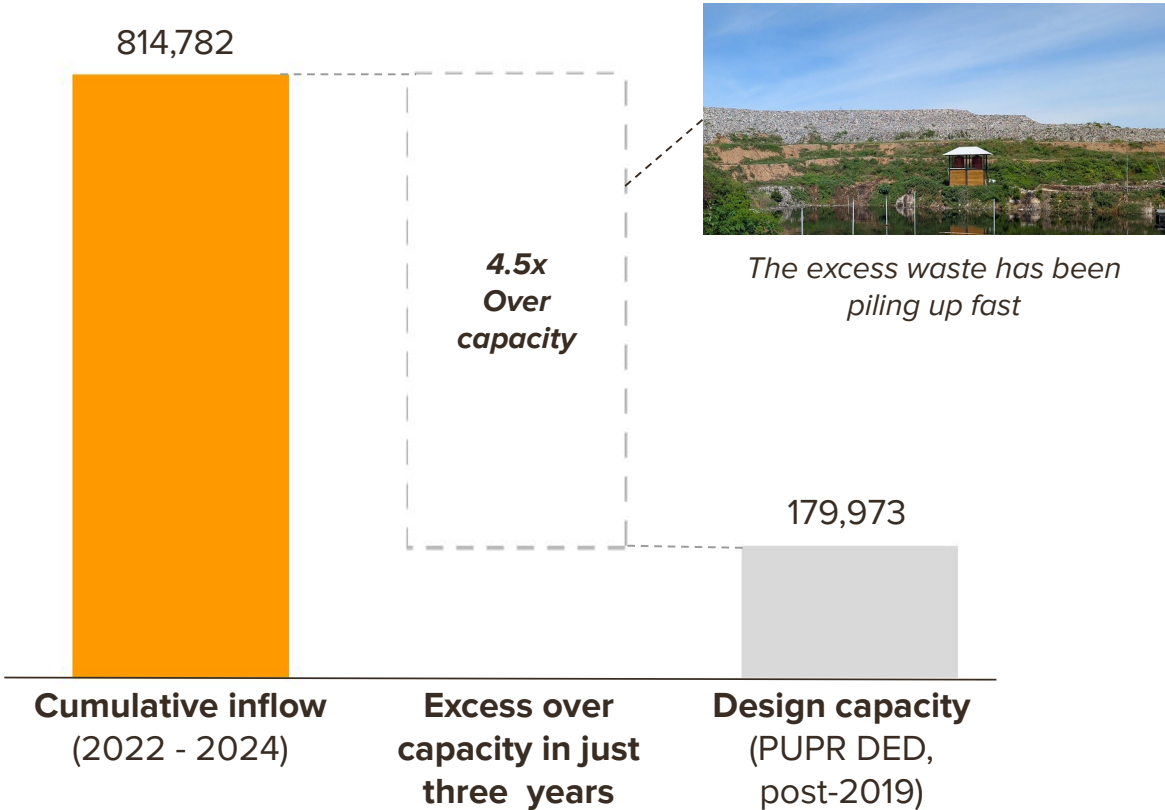
Waste tonnage proportion in Bali’s landfills

100% = 1,600,221 tonnes of waste (2022–2024)



Suwung waste 3 year inflows v.s design capacity as of 2019

Tonnes



Source : [National Waste Management Information System \(SIPSN\)](#); [Bali Post](#), 2025

Despite existing regulations at both national and local levels, illegal dumping persists in Bali — pointing to a systemic gap in on-the-ground waste management practices

Over a Decade of Waste Regulations — Yet 36% of Indonesia's Garbage Still Goes Unmanaged

Approximately 36% of Indonesia's waste — around 11 million metric tons — remains unmanaged annually, finding its way into rivers, ravines, and roadsides (BRIN, 2024)



A pile of garbage at a street corner in Denpasar (PosBali, 2025)



Waste conditions at TPS Lumintang, Denpasar (Detik, 2023)

Local Governments Caught Using Illegal Dump Site Despite Existing Waste Regulations

Buleleng Regency's Environmental Department confirmed that despite existing waste regulations, multiple village governments were found routinely using an illegal dumping site — with enforcement only possible after nearly a year of coordination (NusaBali, 2026)



Kedongan Beach in Bali is one of the beaches heavily affected by waste (Kompas, 2025)



The East Bali Forest Management Unit installed a no-dumping warning banner in Kintamani (Balipost, 2025)

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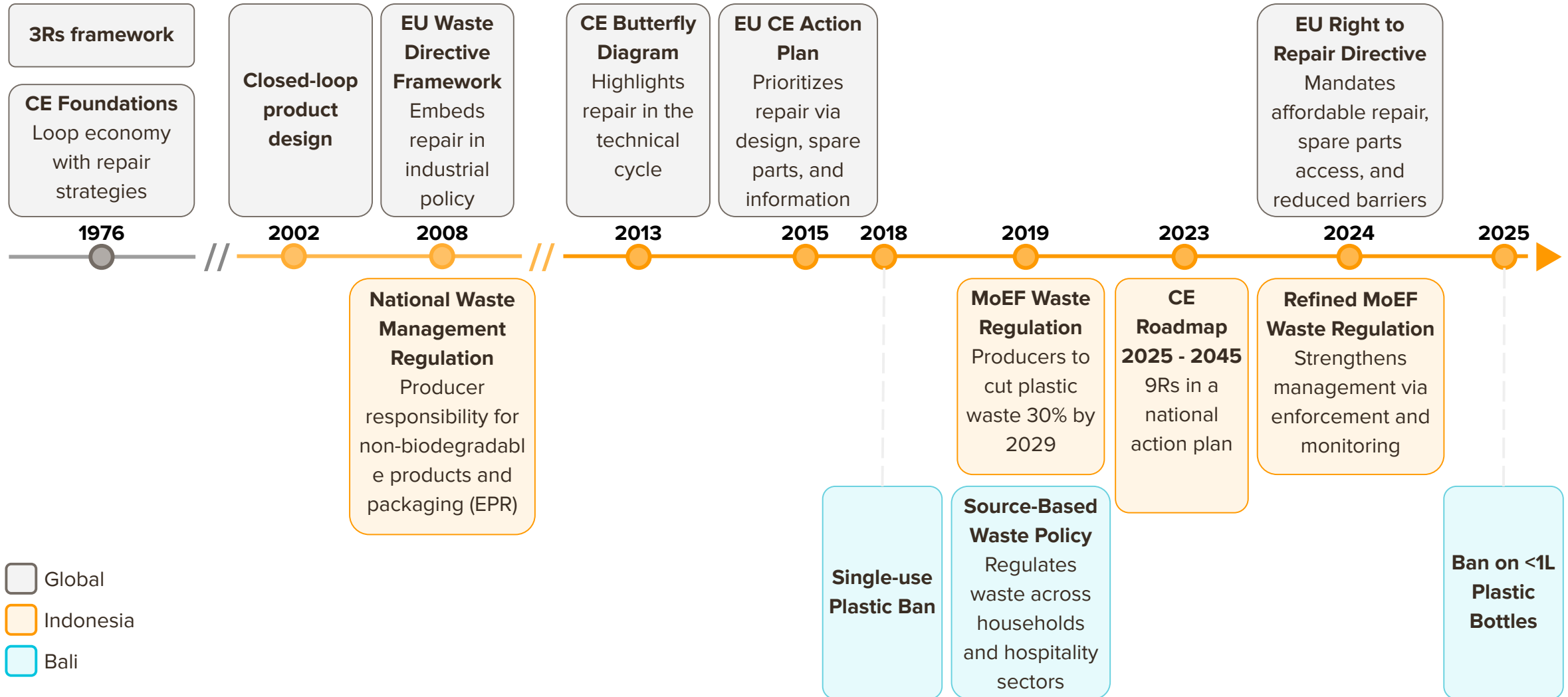
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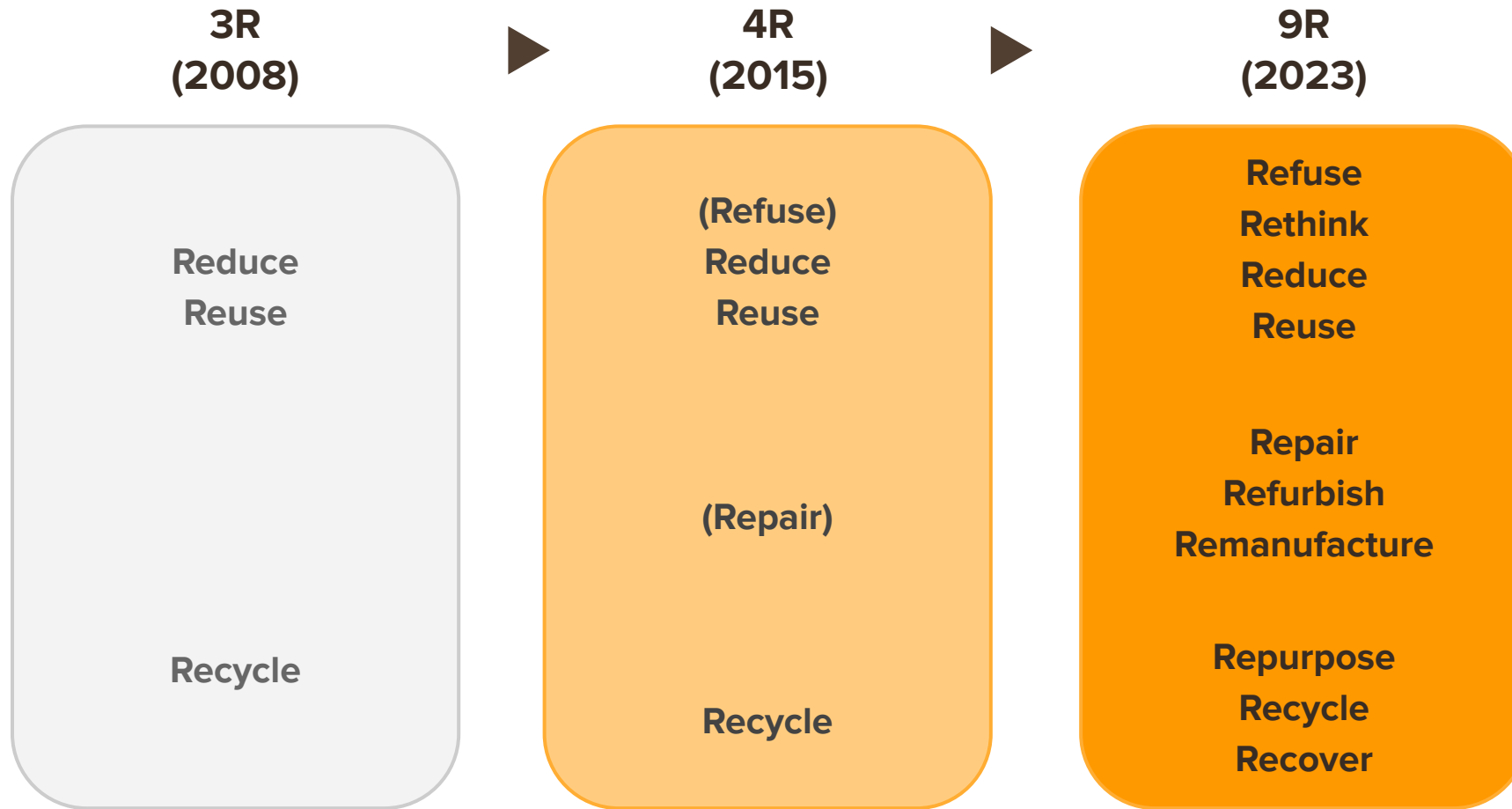


There have been global movements to transition towards Circular Economy, and Indonesia is following suit with different milestones achieved



Source: *Stahel & Reday (1976); Mcdonough & Braungart (2002); EU Waste Directive 2008/98/EC; EMF Vol.1 (2013); EU CE Action Plan (2015); EU Right to Repair Directive (2024); UU No. 8/2018; Permen LHK No.75/2019; National Roadmap & Action Plan CE 2025-2045; Permen LHK No.14/2024; Pergub No.97/2018; Pergub No.47/2019; SE No.9/2025*

As the circular economy concept has evolved, so has R framework, expanding from 3, 4 and to 9R



Source: *EU CE Action Plan (2015) UU No. 8/2018; National Roadmap & Action Plan CE 2025-2045*

9R can be categorised into Avoid, Restore and Salvage Clusters, with the Restore cluster being the most developed in the recent years, which focuses on extending the product life

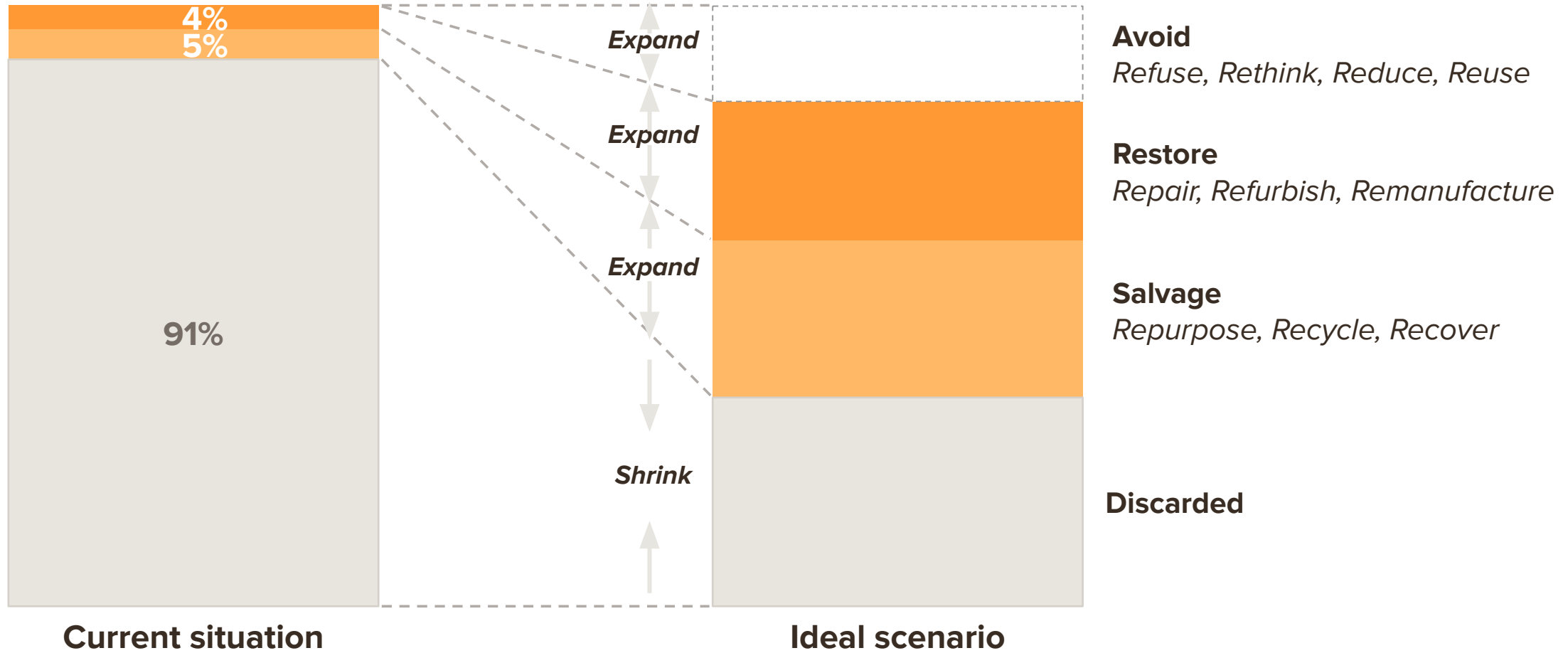
Cluster	9R	Definition
Avoid <i>Preventing the new product from existing</i>	0. Refuse	Avoiding redundancy in the creation of products with the same function
	1. Rethink	Using products more intensively
	2. Reduce	Cutting material consumption — by lighter design, efficient production, or using less in daily life.
	3. Reuse	Continuing to use a working product — by the same or new user — without alteration.
Restore <i>Extending the product life</i>	4. Repair	Bringing a broken product back to use by fixing or replacing the failed part.
	5. Refurbish	Overhauling an older product to bring it back to good working condition, often with multiple components replaced or upgraded.
	6. Remanufacture	Using components from old, nonfunctional products in new products with the same function
Salvage <i>Breaking the product down for materials or energy</i>	7. Repurpose	Using a non-functional product, or its parts, in a new application unrelated to its original purpose.
	8. Recycle	Processing materials to produce the same material (with the same or lower quality)
	9. Recover	Converting materials into energy

Most developed in recent years

Source: [National Roadmap & Action Plan CE 2025-2045](#)

By systematically applying 9Rs, discarded goods can be significantly reduced

Ideal shift in waste treatments



Source: National Roadmap & Action Plan CE 2025-2045

Comparing these Rs, Repair and Refurbish emit much lower CO₂ than Repurpose, Recycle, and Recover - the environmental case for Restore is an order of magnitude stronger than for Salvage

Estimate CO₂ emissions compared to buying a new product

Cluster	9R	Electronics*	Textiles **
Avoid Cluster	0. Refuse	~0-5%	~0-5%
	1. Rethink	~0-5%	~0-5%
	2. Reduce	~0-5%	~0-5%
	3. Reuse	~0-5%	~0-5%
Restore Cluster	4. Repair	~ 3-12%	~ 1-3%
	5. Refurbish	~ 8-15%	~ 2-6%
	6. Remanufacture	~75%	~5-15%
Salvage Cluster	7. Repurpose	~15-25%	~1-5%
	8. Recycle	~85-95%	~60-75%
	9. Recover	~95-99%	~90-98%

Note:

* Electronics baseline: iPhone 13/16, ~48-58 kg CO₂e (manufacturing)

** Textile baseline: cotton/polyester garments, ~5-12 kg CO₂e (manufacturing)

Source: Fangeat et al. / ADEME (2022); Apple Inc. (2021, 2024); Pamminger et al. (2021); Cordella et al. (2021); Sánchez et al. / Fraunhofer IZM (2024); Kirchain et al. / MIT (2015); Cotton Incorporated (2012); Trzepacz et al. / EuRIC Textiles (2023); Zamani et al. (2015); Ellen MacArthur Foundation (2017); R-framework: Potting et al. / PBL Netherlands (2017)

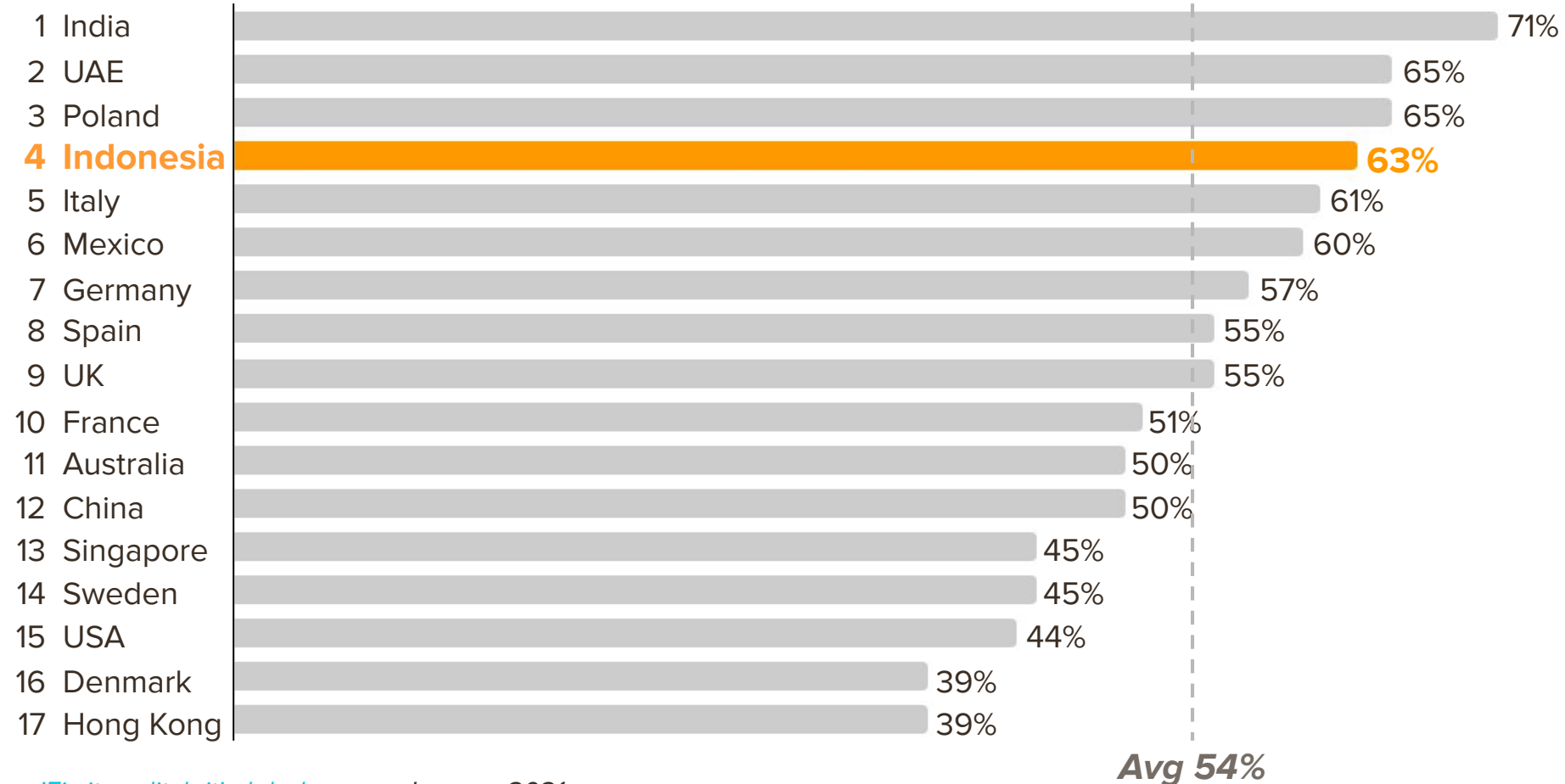
While not all categories of waste could be restored, electronics, textiles and furniture have the highest restoration potential

Category	Typical Items	Restoration Potential
E-Waste	Phones, fans, ACs, blenders, TVs.	HIGH. (Often just one component fails)
Textiles & Furniture	Clothes, shoes, chairs, sofas.	HIGH. (Can be sewn, reupholstered, or re-glued.)
Inorganic (Recyclables)	Plastic bottles, paper, cardboard, glass.	Low. (Usually cheaper to recycle than fix a plastic bottle).
Organic (Biodegradable)	Food scraps, garden leaves, wood.	None. (You can't "repair" an apple core).
Hazardous	Batteries, chemicals, medical waste.	None. (Dangerous to attempt).
Residual	Diapers, contaminated wrappers.	None.

63% of Indonesians prefer repair - the most dominant pathway of Restore Cluster - over replace, surpassing major European countries and the United States

% of consumers who agree: 'When tech I own breaks, I'd prefer to repair rather than replace'

N = 2,029, All data is nationally representative except for data from Hong Kong, Indonesia*, Vietnam, and India



Source: YouGov, 'Fix it or ditch it' global survey, January 2021

Repair preference, however, rarely translates to practice — only 4% of broken items are fixed, and just 0.07% of broken electronics reach formal repair

Household owning at least one major appliance

%

~93%

Major appliance ownership

Share of broken items repaired

%

4%

Repair rate

Share of broken electronics repaired

%

Just
0.07%

of broken electronics reach formal repair

Broken electronics repair rate

Source: Bappenas - National Roadmap & Action Plan CE 2025-2045; IPSOS - Indonesia Residential End Use Survey

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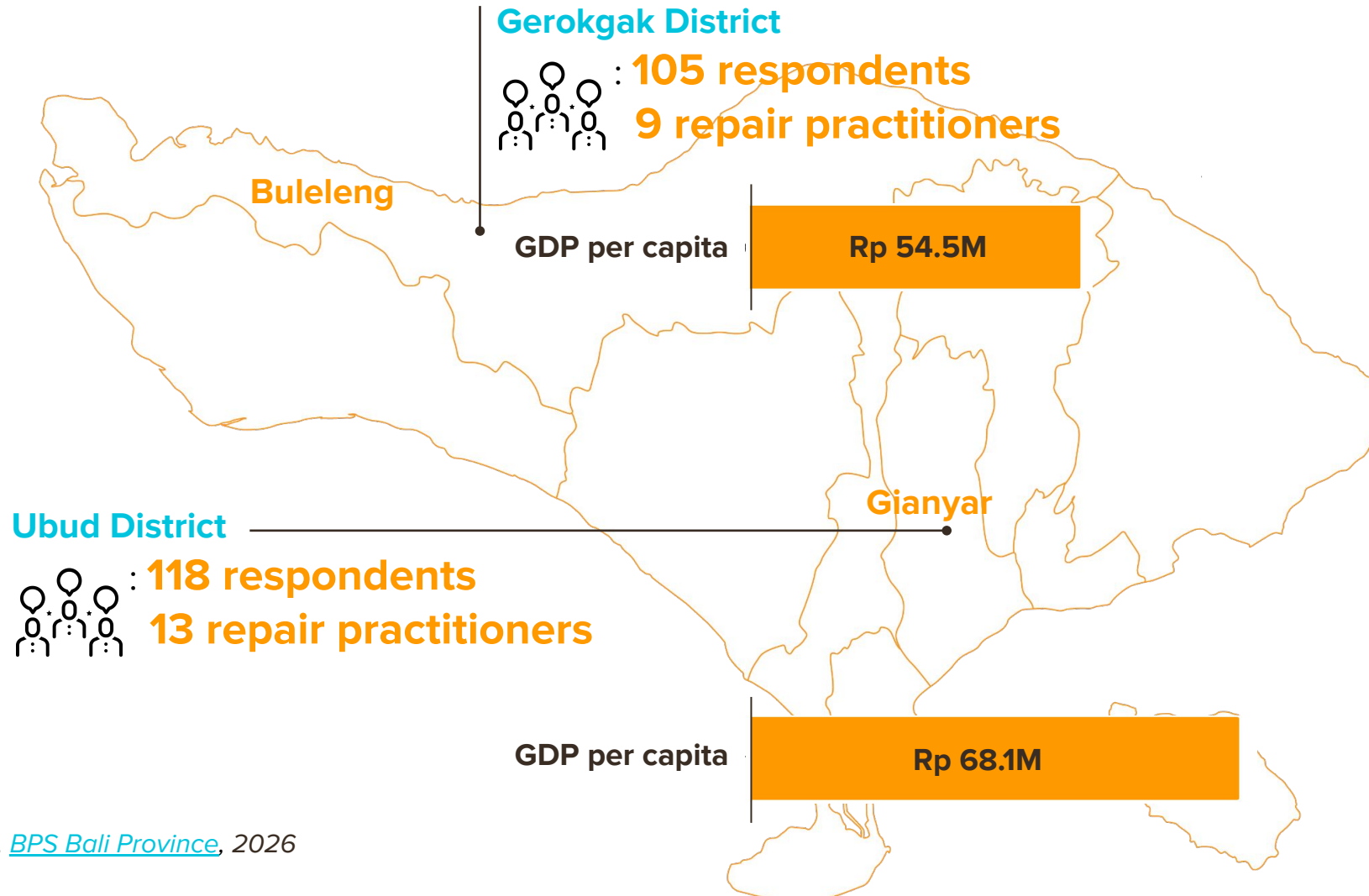
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In order to better understand on-the-ground repair status and barriers to promote repair in Bali, **online and offline surveys** were conducted with **223 respondents** and **22 repair practitioners** across the Gerokgak and Ubud districts, using snowball sampling method



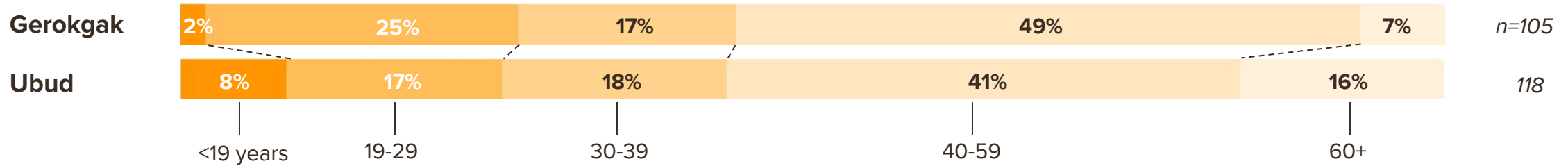
Source: Kopernik Survey, [BPS Bali Province](#), 2026

Survey respondent profile differs between Gerokgak and Ubud, especially profession

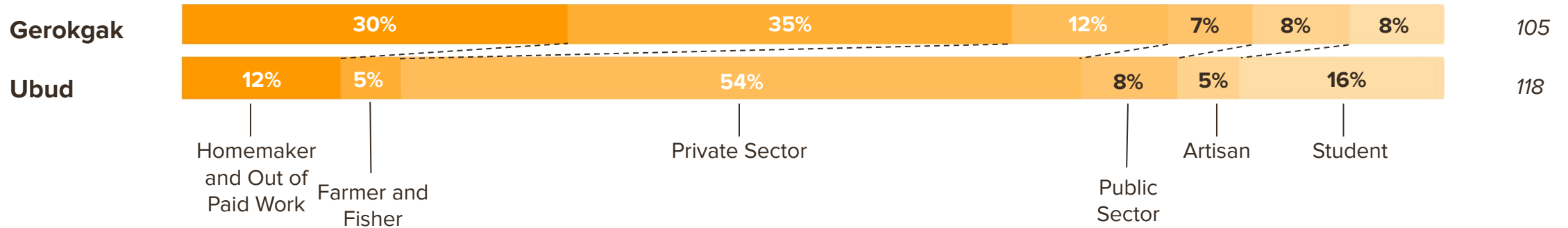
Respondent demographic profile

100% stacked composition by location N=223 respondents (105 Gerokgak, 118 Ubud)

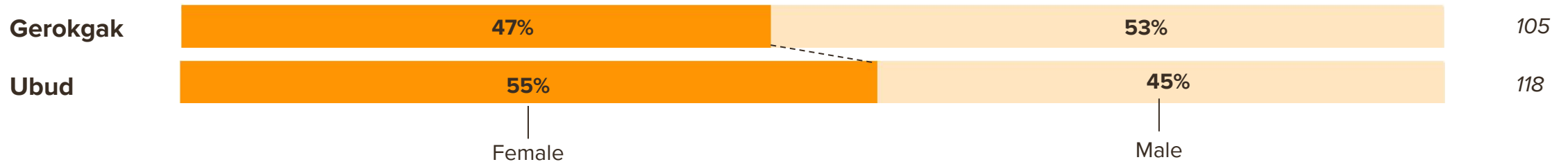
Age group



Occupation



Gender

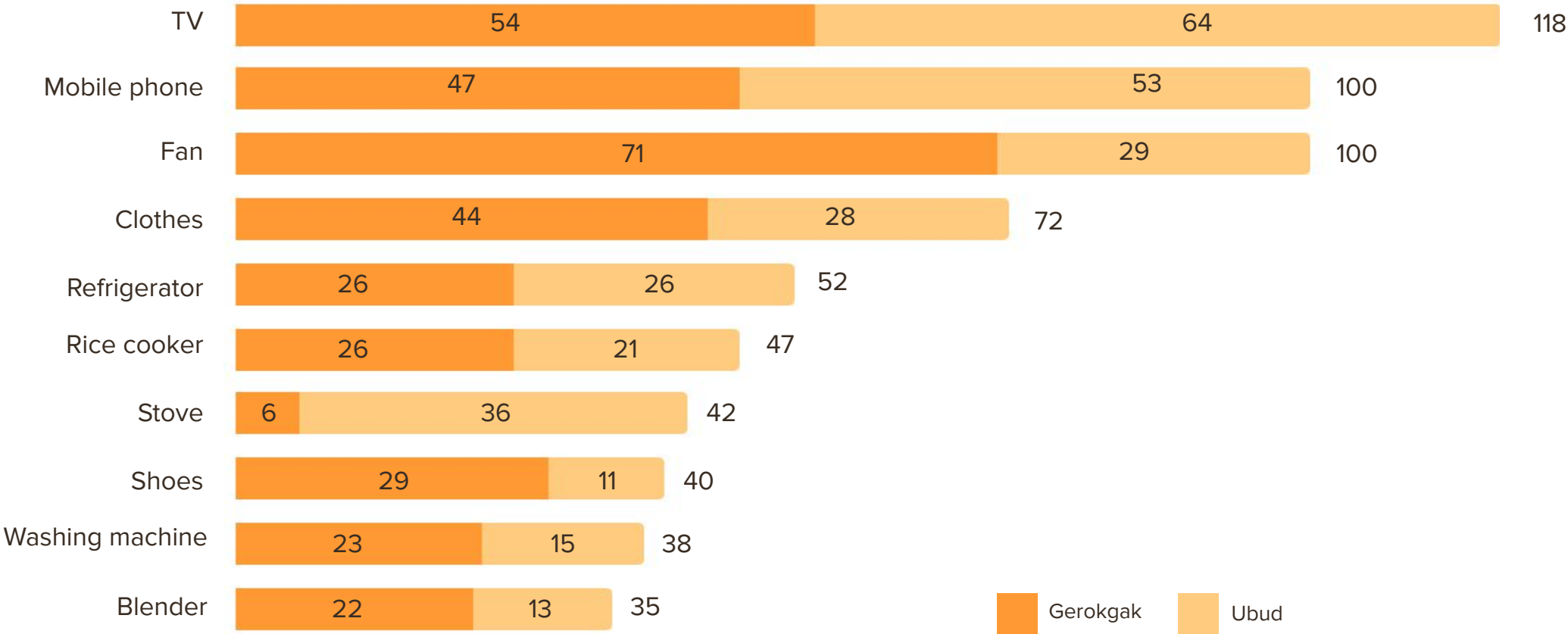


Source: Kopernik Survey

Electronics dominate household breakage — TVs, mobile phones, and fans top the list, all high-restoration-potential goods

Top 10 broken products reported by respondents, by location

Number of mentions | N=223 respondents (105 Gerokgak, 118 Ubud) | multiple-answer survey | 1,052 items reported in total

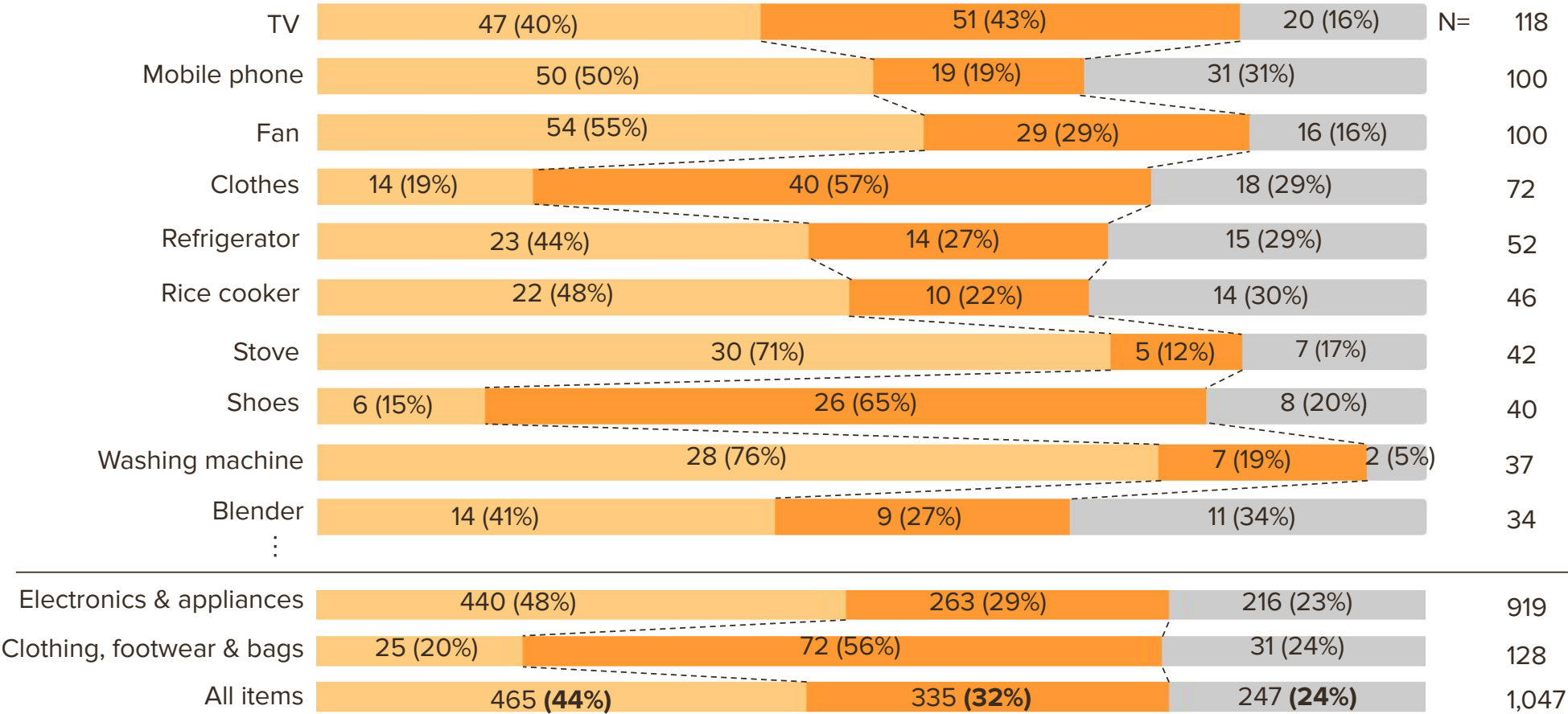


Source: Kopernik Survey

Self and informal repair lift Bali's fix rate to 44% — well above the 4% national figure — but more than half of broken items still go unfixed

What happened to each broken product - (repaired, left idle at home or replaced)

Share of mentions per product (%) | N=223 respondents (105 Gerokgak, 118 Ubud) | multiple-answer survey | 1,047 recorded action



Source: Kopernik Survey

Repaired (including informal and self repair)
 Left idle at home
 Replaced

Why aren't people repairing more? Our field survey reveals five reinforcing barriers — two on the demand side and three on the supply side

DEMAND SIDE

From household survey: 223 respondents

D1. Repairability perception gap

Many items are seen as “no longer usable,” despite being repairable, due to low awareness of repair options

D2. Replacement bias (especially for cheaper goods)

Households assume buying new is cheaper — but the data shows repair usually wins on cost

Weak repair practice in Bali

SUPPLY SIDE

From technician interviews: Gerokgak & Ubud

S1. Skilled labour shortage compounded by capacity gap

Few technicians can handle complex repairs, limiting what workshops can offer and who they can serve

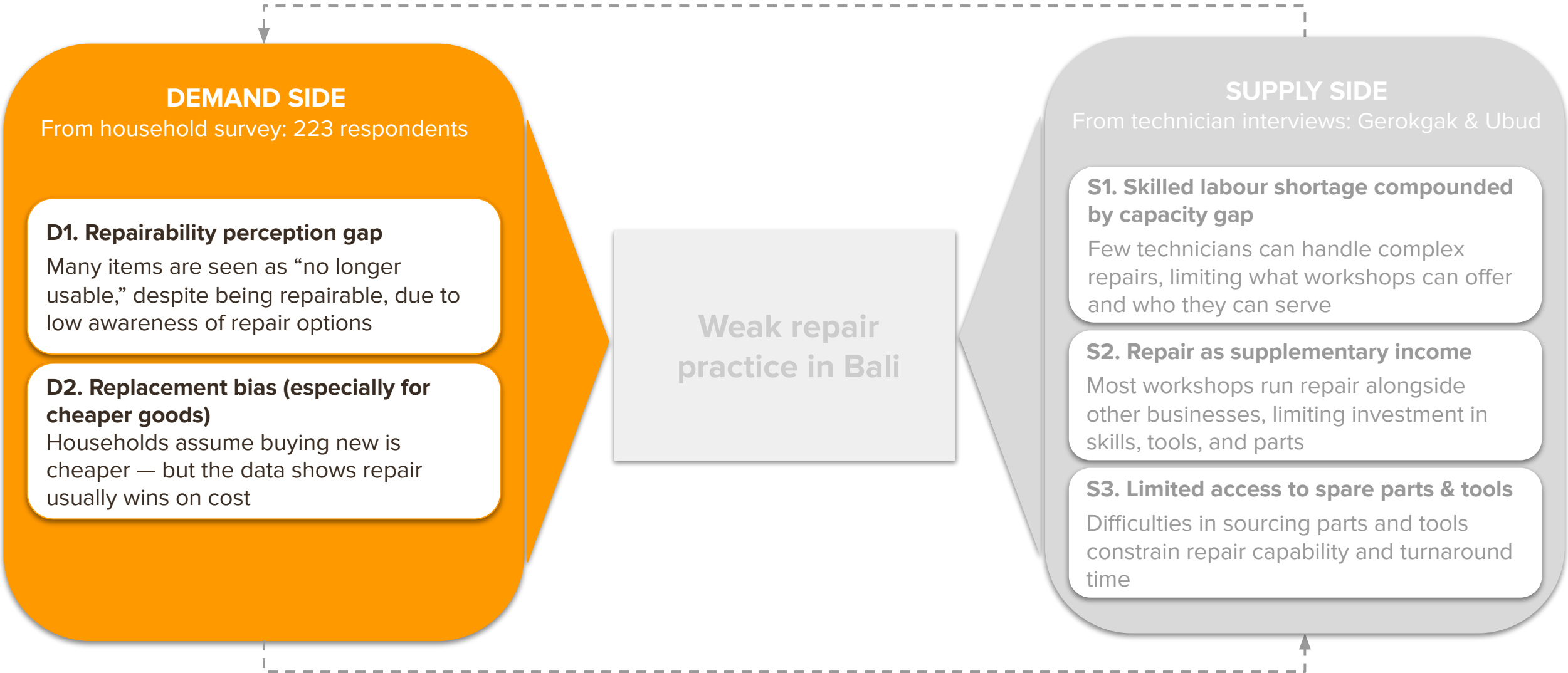
S2. Repair as supplementary income

Most workshops run repair alongside other businesses, limiting investment in skills, tools, and parts

S3. Limited access to spare parts & tools

Difficulties in sourcing parts and tools constrain repair capability and turnaround time

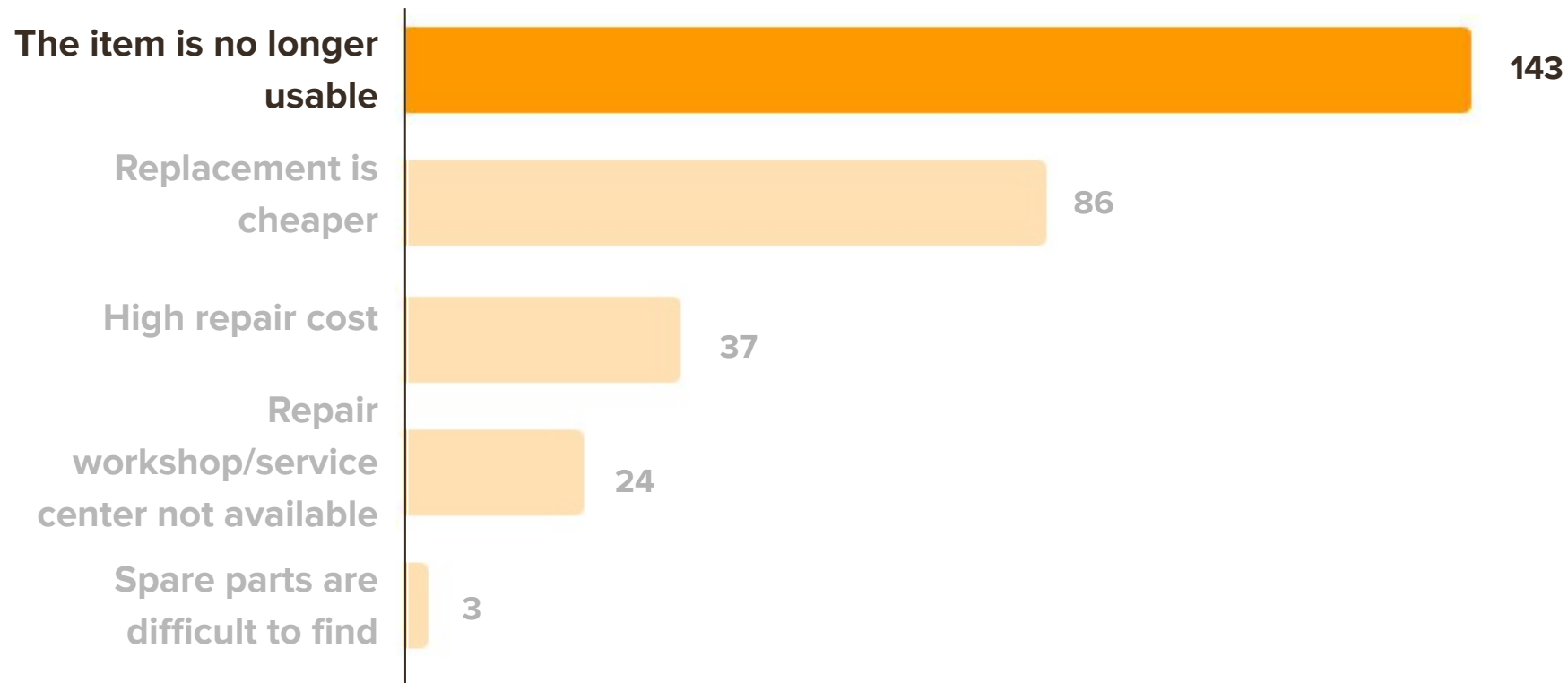
Demand side barriers



D1 Repairability perception gap: People leave broken products unrepaired as these items are thought to be no longer usable

Reasons Items Remain Unrepaired

(N=223 Respondents, multiple-answers)

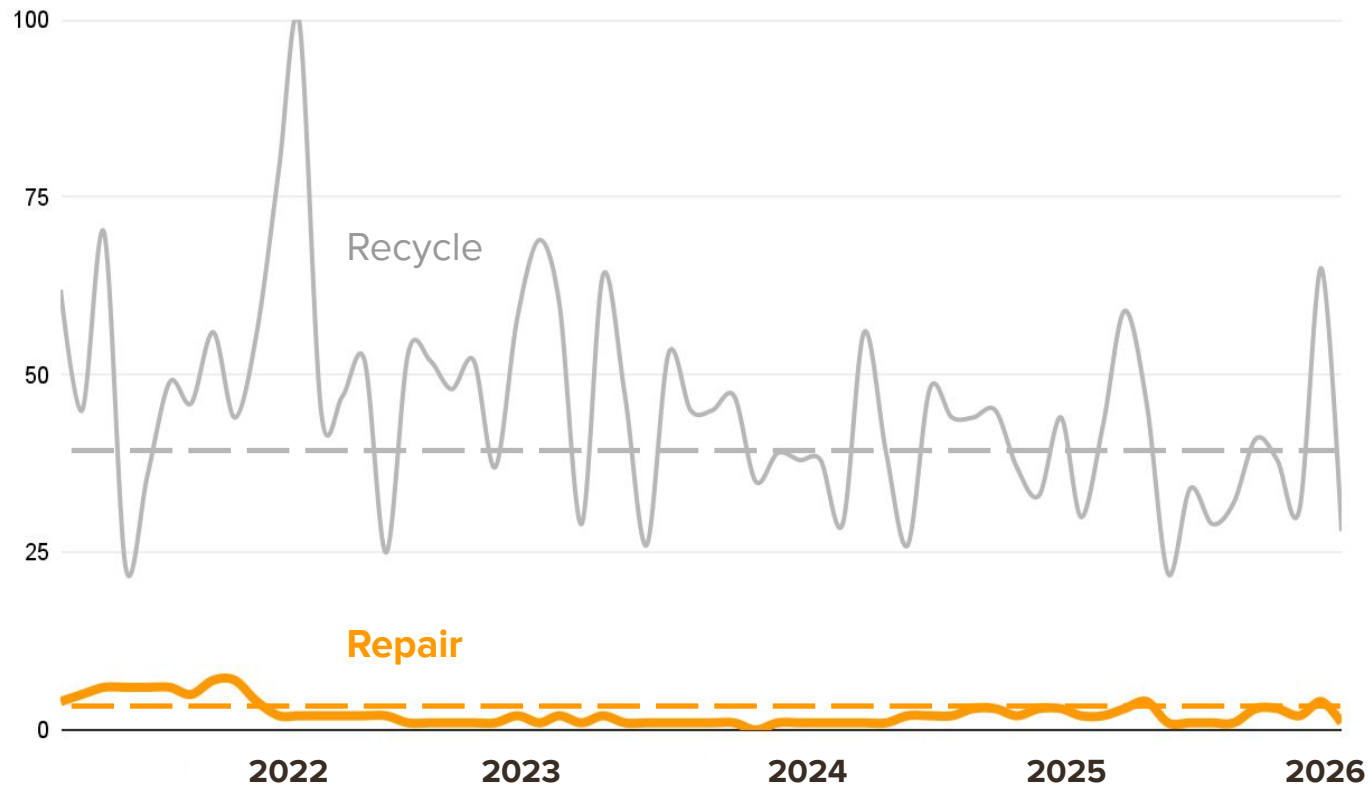


Source: Kopernik Survey

D1 Repairability perception gap: This may have to do with the fact that repair concept has yet to enter public consciousness as a mainstream option, compared to ‘recycle’

Google trend analysis of repair v.s. recycle

Search interest indexed 0–100, where 100 indicates peak interest and 0 indicates insufficient data



"I don't usually make the effort to look for a service center or check whether the item can be repaired, it mostly comes down to convenience on my part."
- Survey respondent, M, Ubud

5 year average

45

5 year average

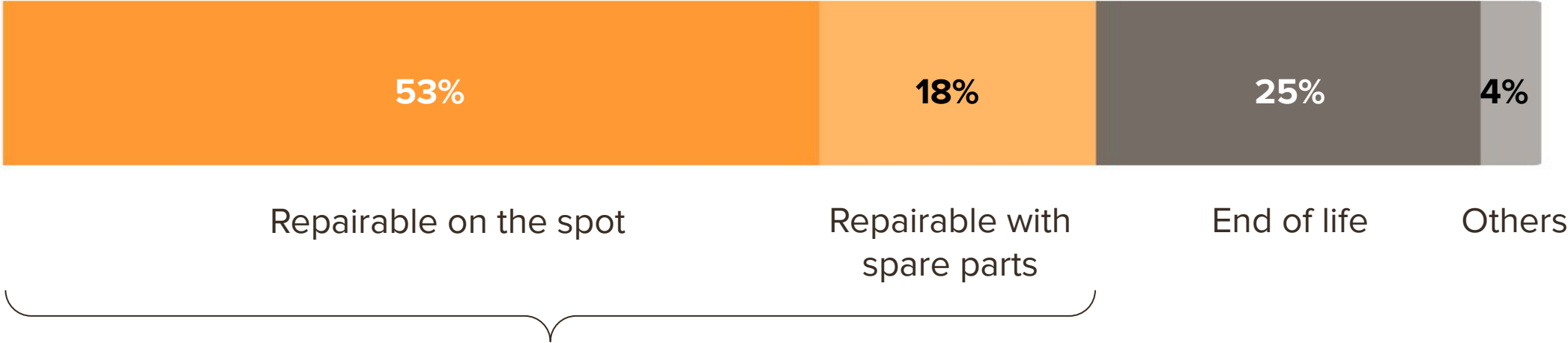
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Source: [Google Trends](#)

D1 Repairability perception gap: It is useful to note that, in Europe, when people brought broken items from home to community repair events, over 70% of them were actually repairable, showing significant potential

What happened when people brought their broken items at home to the repair events

Open Repair Alliance dataset | 208,491 repair attempts | 19,986 events | 31 countries | 2012–2024



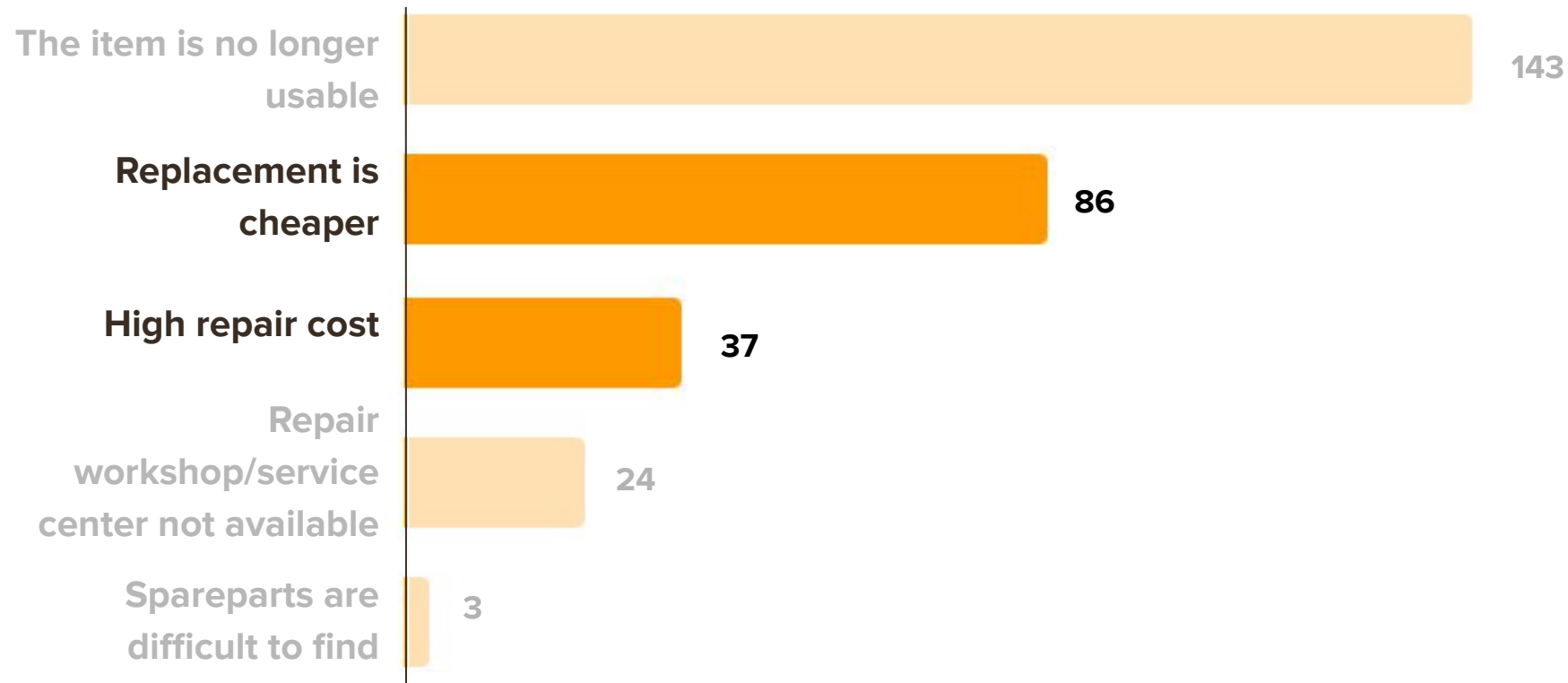
71% of 'broken' items are repairable!

Source: [Open Repair Alliance](#), 2024

D2 Replacement bias: There is also a perception that simply buying a new product could be cheaper

Reasons Items Remain Unrepaired

(N=223 Respondents, multiple-answers)

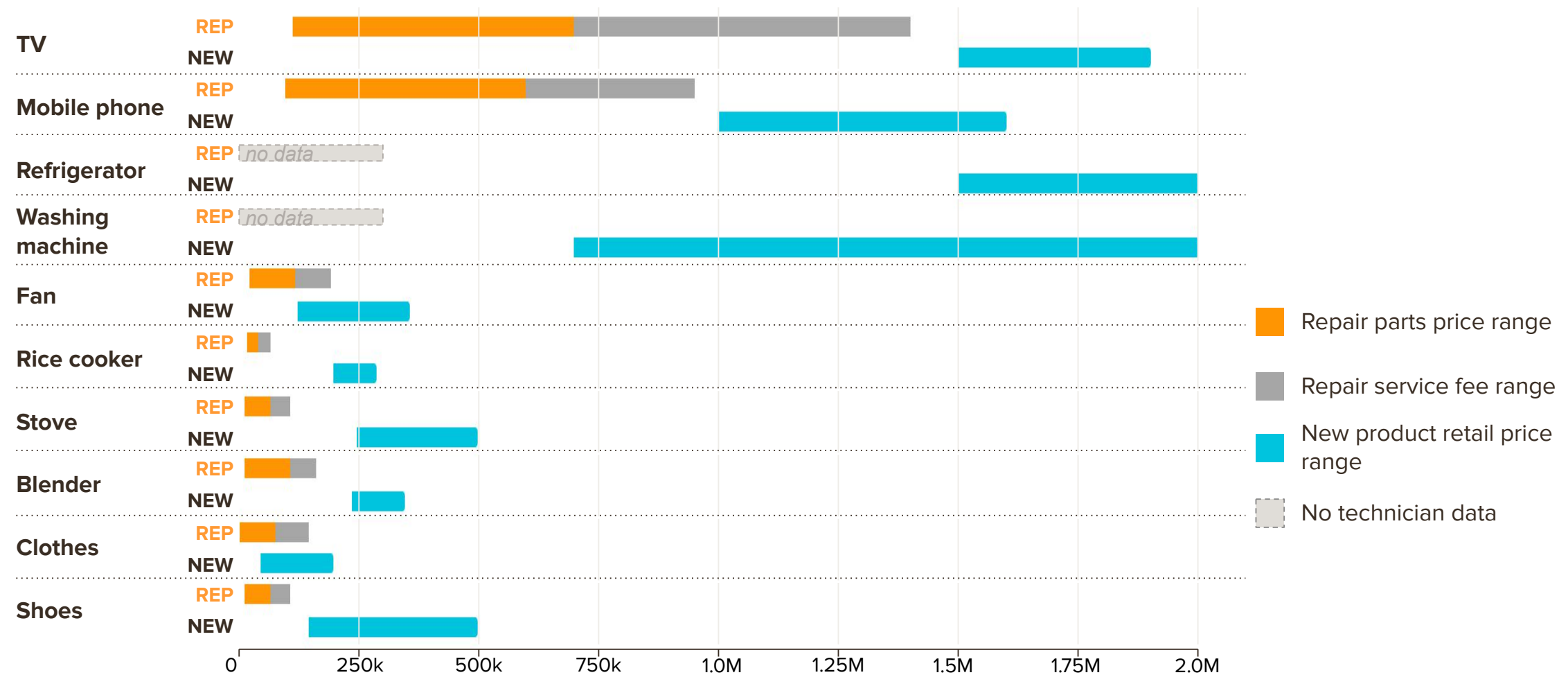


Source: Kopernik Survey

D2 Replacement bias: But further analysis shows that repair could be cheaper than replacement for most appliances

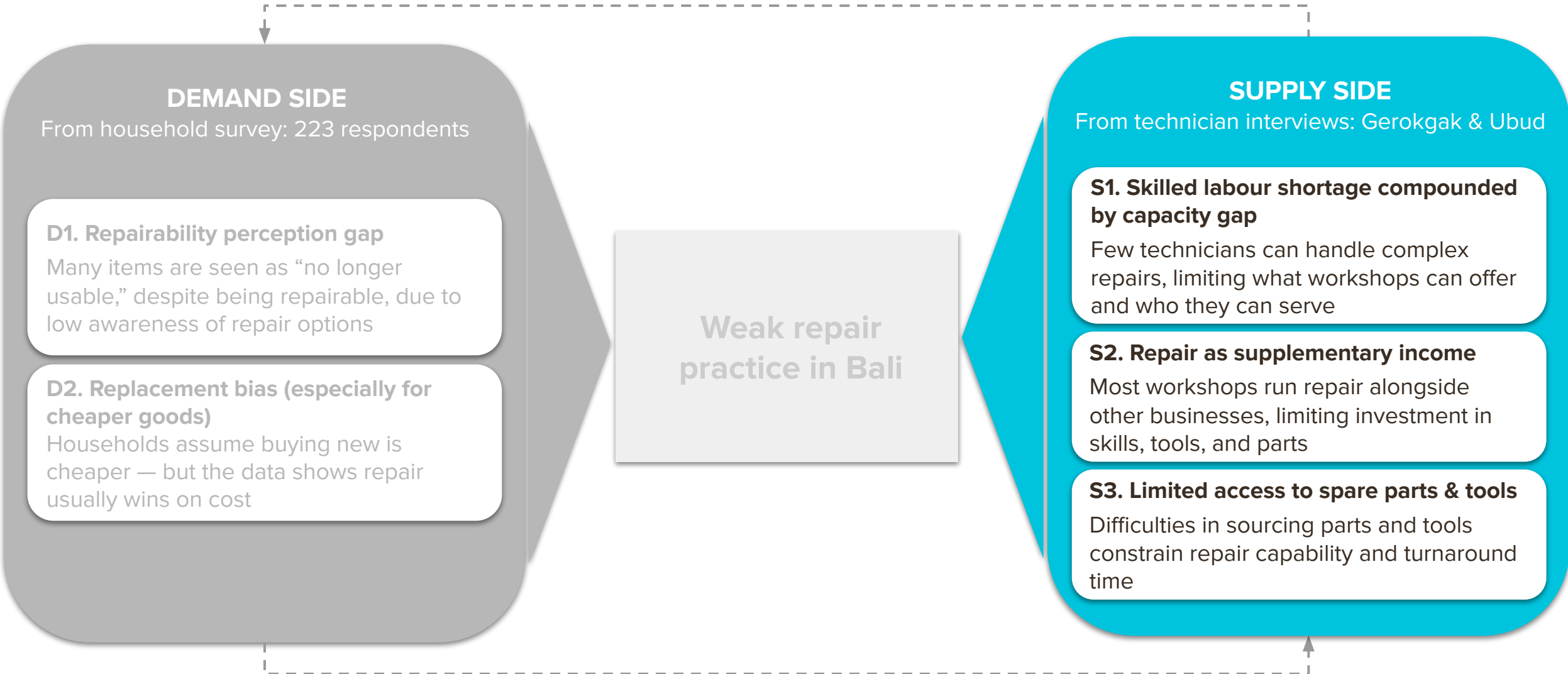
Repair cost vs. new product price range comparison

Repair cost (parts + service margin, technician-quoted) vs. new product retail price range (based on Tokopedia) | All figures in IDR



Source: Kopernik Survey; Tokopedia

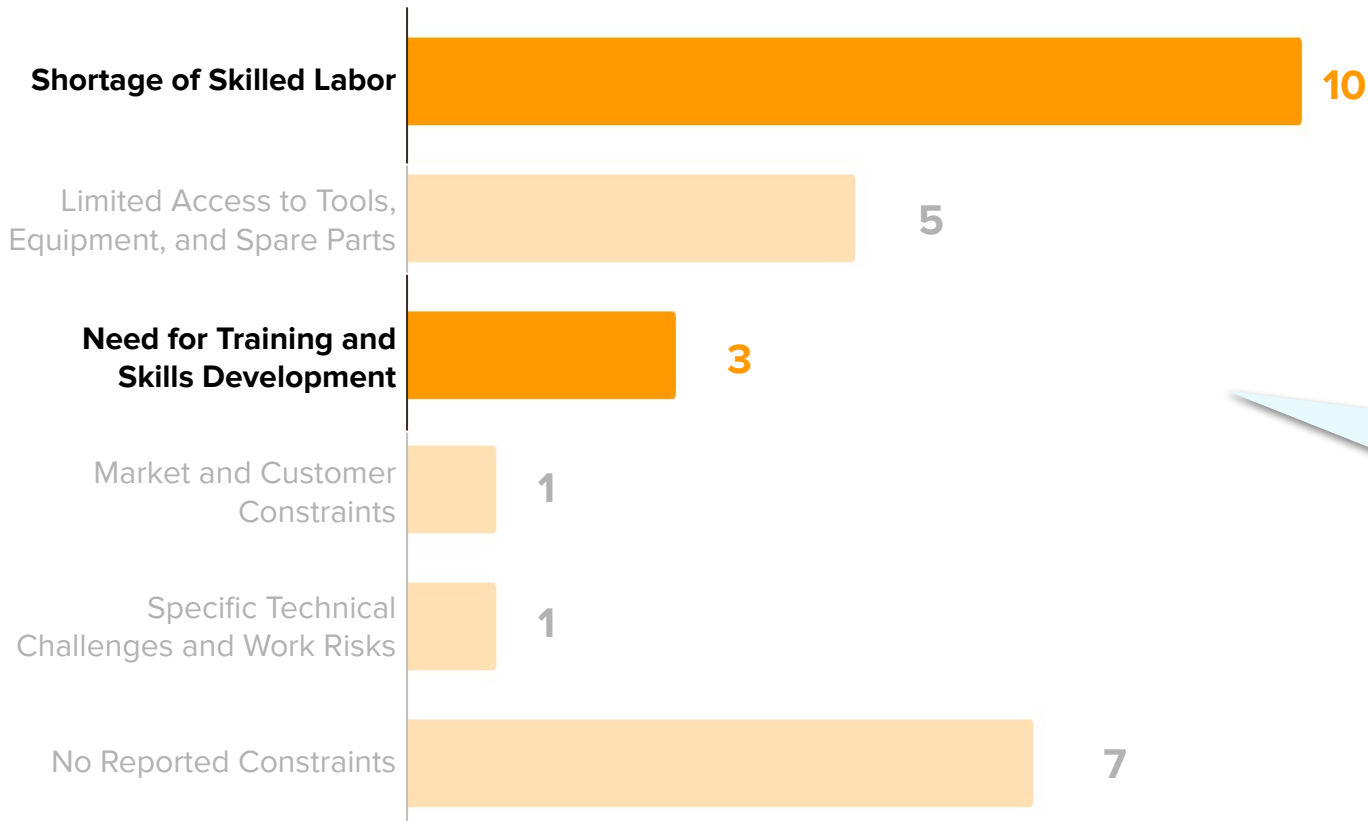
Supply side barriers



S1 Labour shortage and capacity gap: Repair workshop owners report challenges in retaining skilled employees

Constraints reported by technicians

N=22 Respondents, multiple-answers



"I used to have 9 people working under me, but they resigned and prefer to work in hotels or restaurants"

- Seamstress, M, Ubud



"I only take orders for Android phones because that's what I was taught in the shop I used to work for"

- Repair workshop owner, M, Gerokgak

Source: Kopernik Survey

S1 Labour shortage and capacity gap: Surveyed technicians explicitly refuse specific damage types

Mobile Phone		
Damage type	Gerokgak	Ubud
Broken LCD	✓	✓
Battery degraded / swollen	✓	✓
Charging port damaged	✓	✓
Buttons damaged (on/off, volume)	✓	✓
Motherboard/dead phone	x	~
iPhone repair	~	✓

TV		
Damage type	Gerokgak	Ubud
Backlight failure	✓	✓
Power supply failure	✓	✓
Mainboard / firmware	?	✓
Panel / screen broken	?	✓
Flyback (CRT TV)	~	✓
Old brand	x	x

Household appliances		
Damage type	Gerokgak	Ubud
Heating element	✓	✓
Motor / dynamo	✓	✓
Thermal fuse	✓	✓
Bearing / gear	✓	✓
Off-brand fan / rice cooker	x	x
Short circuit	x	~

Clothes & Shoes		
Damage type	Gerokgak	Ubud
Zipper replacement	✓	✓
Buttons	✓	✓
Tear / hole in fabric	✓	✓
Hemming (shorten trousers)	✓	✓
Alteration	✓	✓
Shoe reglue	✓	✓
Shoe resole	✓	✓
Shoe with holes	?	x

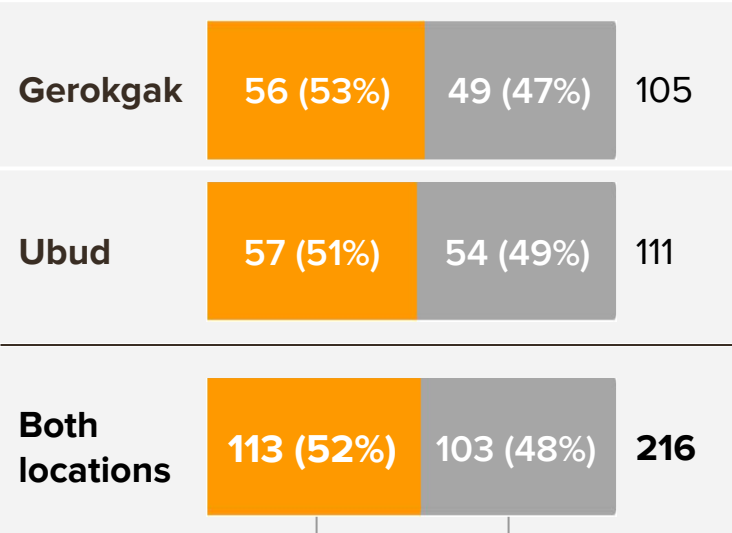
■ Covered
 ■ Partial
 ■ Explicitly rejected
 ■ Not mentioned

Source: Kopernik Survey

S1 Labour shortage and capacity gap: but people are interested in learning repair skills — presenting an opportunity to build a local technician pipeline from within the community

Repair training interest by location

N= 216

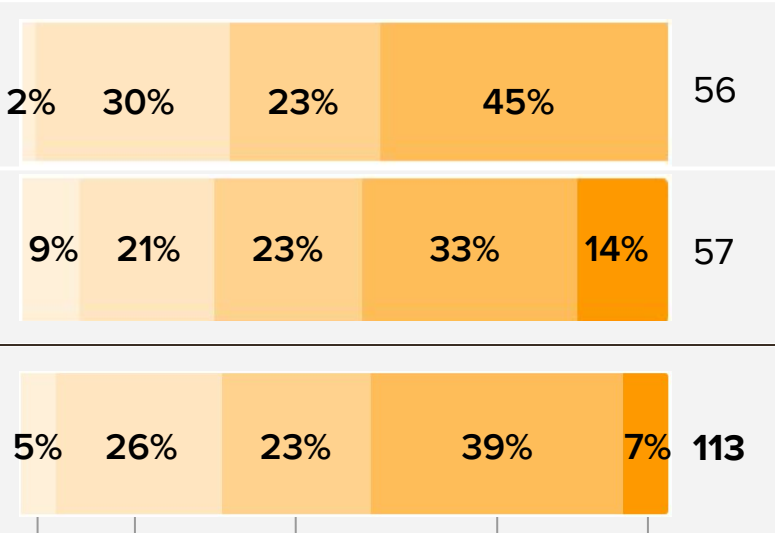


Interested

Not interested

Repair training interest by age

N= 113



<19 years old

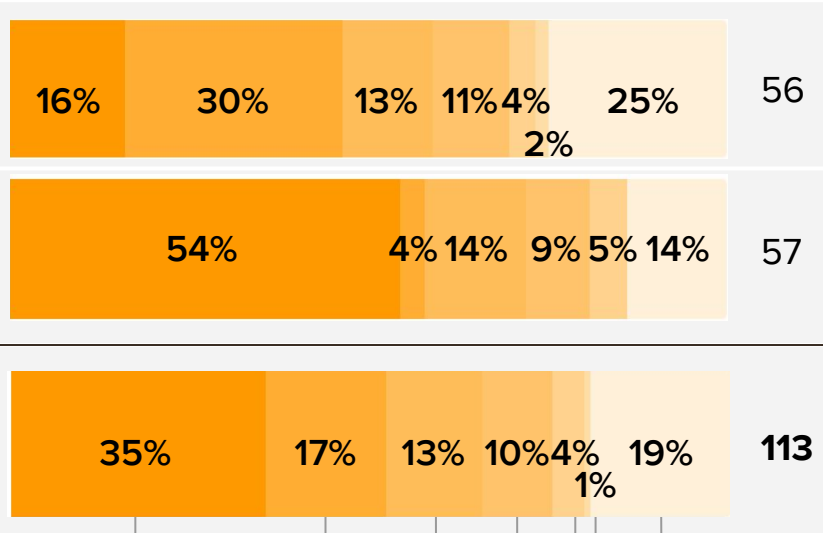
30-39 years old

40-49 years old

>50 years old

Repair training interest by occupation

N= 113



Private sector

Agri/Fishery Labor

Student

Public Sector

Artisan

Fisher (own boat)

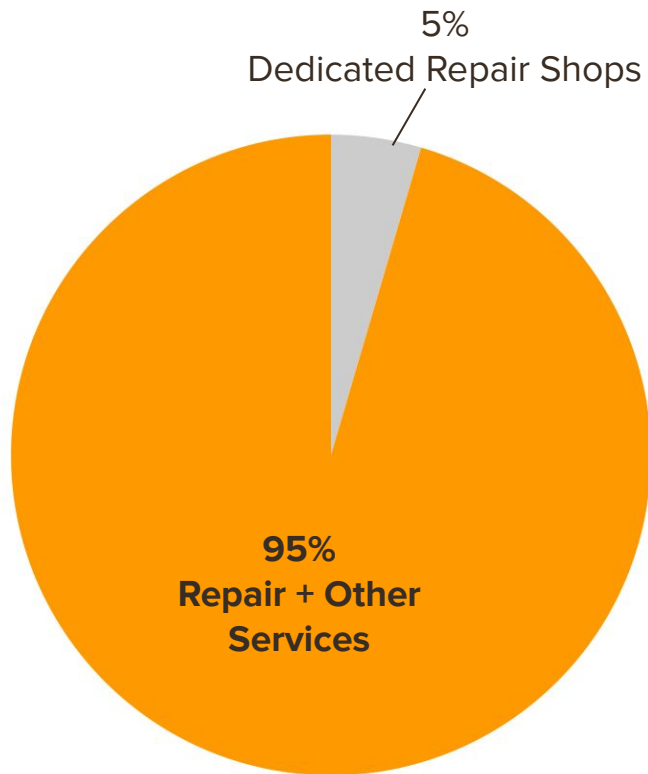
Homemaker and Out of Paid Work

Source: Kopernik Survey

S2 Repair as supplementary income: 95% of shops mix services , limiting their professionalization

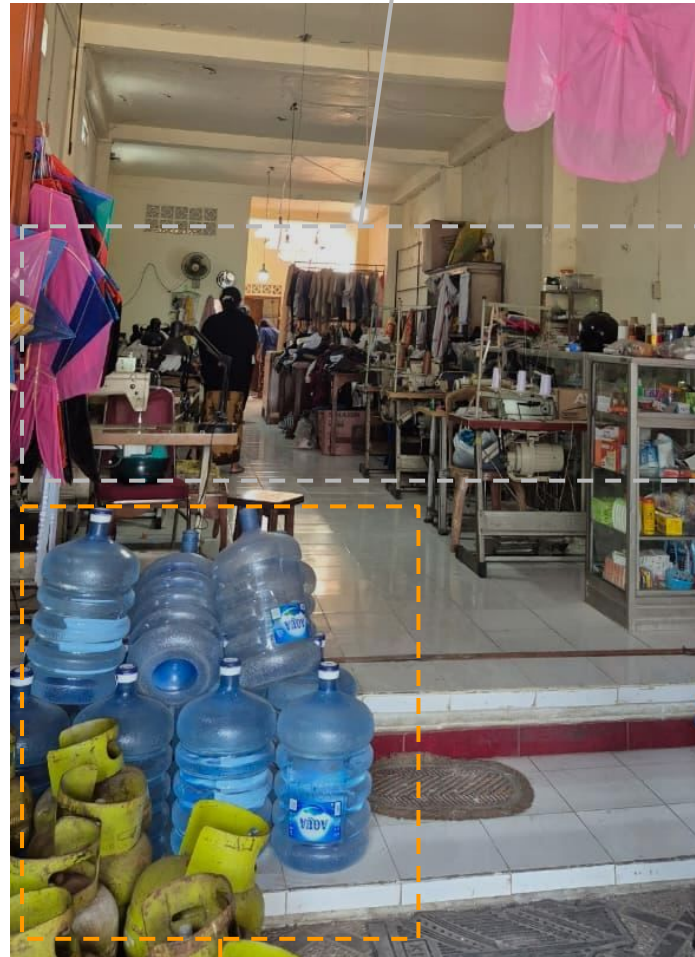
Dedicated v.s. Repair + shops

N=22 Respondents



Source: Kopernik Survey

Textile & shoes repair corner



Gas, staple foods, snack

Mobile phone repair corner



Mobile phone vouchers, electricity voucher, drinks, phone accessories



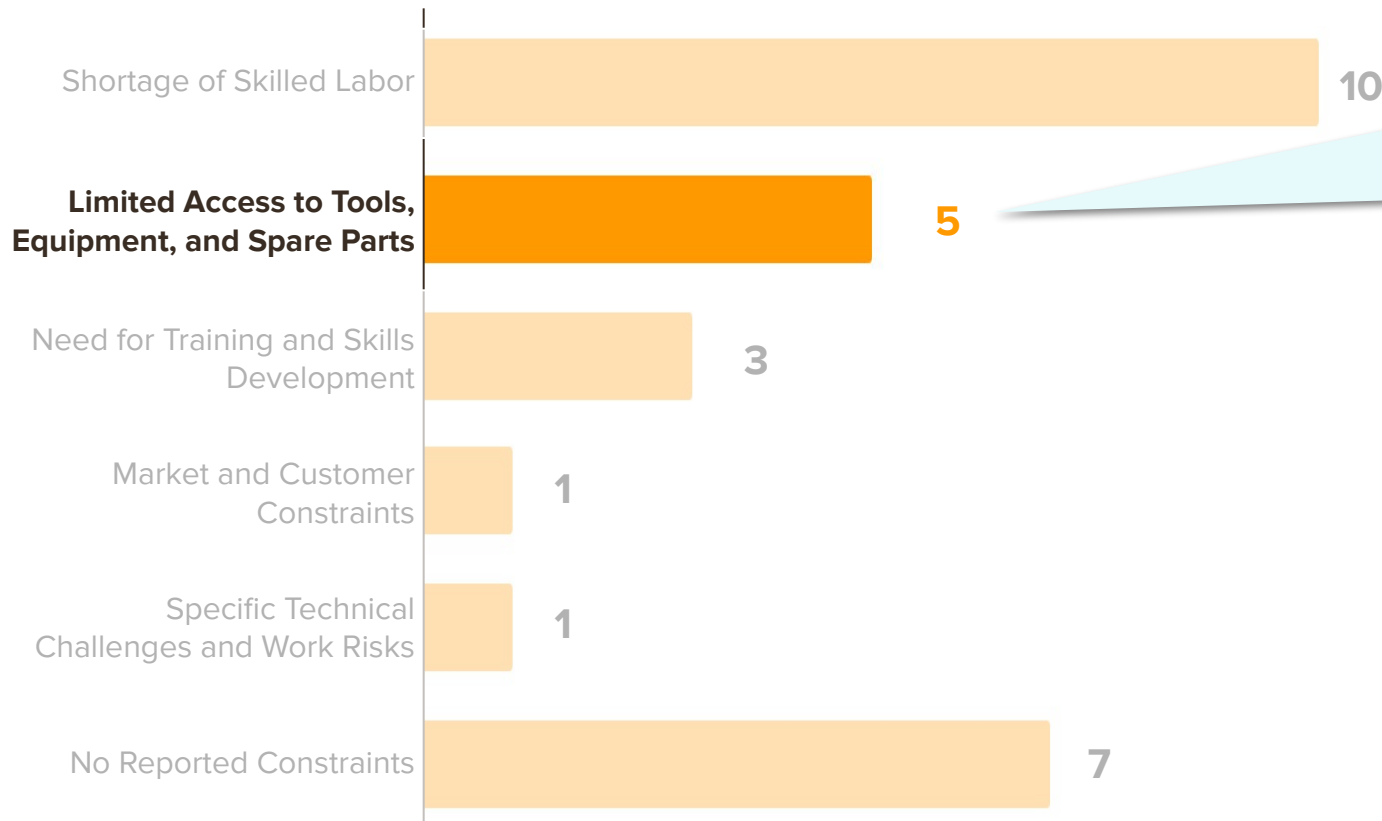
Snacks & drinks

TV & Audio repair corner

S3 Limited access to spare parts & tools: limited supplier access and discontinued parts force workshops to reject repairs they could otherwise complete (1/2)

Constraints reported by repair technicians

N=22 Respondents, multiple-answers



Source: Kopernik Survey



"I reject old fans or TVs my customers bring me, because spare parts are no longer available"

- Repair workshop owner, F, Ubud



Limited Access to Official and Technical Equipment Stores

Gerokgak sits over 100 km from Denpasar, where most equipment and spare parts suppliers are concentrated. Without nearby access, workshops rely on online orders or long trips to the city — slowing down repairs and limiting what they can offer customers

S3 Limited access to spare parts & tools: limited supplier access and discontinued parts force workshops to reject repairs they could otherwise complete (2/2)

Technician's direct mention in the constraint, parts price, or refusal in repair service

EQUIPMENT / TOOLS — what technicians said they need

Item	Gerokgak	Ubud	What they said
Refrigerant tools (freon, vacuum, gauges)	-	✓	"Won't accept washing machines or AC — need cooling/freon equipment" - ART tech, Ubud
Specialist TV diagnostic tools (ESR meter, blower, magnifier)	-	✓	"ESR meter, blower, magnifying lamp" - TV Tech, Ubud
Software/firmware unlocking tools	-	✓	"PIN-bypass software is expensive — would like to learn how" - Mobile Tech, Ubud
Industrial sewing machine (heavy sewing, overlock, dryer)	✓	✓	"The machine costs IDR 4 million" - Tailor, Gerokgak & Ubud

Source: Kopernik Survey

SPARE PARTS — what's missing or hard to source

Item	Gerokgak	Ubud	What they said
TV spare parts (must be special-ordered)		✓	"Spare parts must be special-ordered, can't keep stock" - TV Tech, Ubud
Flyback transformers (CRT TV)		✓	"Flyback — don't dare keep in stock" - TV Tech, Ubud
Old-brand TV parts (Sony/Sanyo, pre-2000)	✓	✓	"Sony/Sanyo refused — old TV parts no longer sold" - TV Tech, Gerokgak & Ubud
LCD / screen modules (mobile + TV)	✓	✓	"LCD is the most expensive part — phone up to IDR 800k, TV up to IDR 1.3M" - Mobile & TV Tech, Gerokgak & Ubud
Mobile motherboard parts	✓		"Motherboard" (listed as outright refusal) - Mobile Tech, Gerokgak
Audio coil ("spul")		✓	"Coils — we refuse, but if customer brings the part we'll do the work" - Audio Tech, Ubud
Off-brand appliance parts	✓	✓	"Burned-out fans, off-brand Chinese — refused" - TV Tech, Gerokgak & Ubud
Heavy fabric (wool, drill, etc.)	✓		"Have to buy from Klungkung; Buleleng has no fabric stock" - Tailor, Gerokgak

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Photo by Delightin_Dee on Unsplash

Bengkel Bumi, or Earth Workshop, is a **community-based initiative** in Gerokgak and Ubud districts of Bali, designed to address **the five reinforcing barriers** to repair through **four areas of intervention**



FOUR AREAS OF INTERVENTIONS

1: Awareness and behavioural change

2: Training and capacity building

3: Economic and pricing interventions

4: Parts and tools access

1: Awareness & Behaviour Change: Shifting perception, making repair visible, and changing consumption habits



Solution	Description	D1	D2	S1	S2	S3
1.1 Pop-up repair markets and circular economy campaigns	Community events where people bring broken items for free on-the-spot diagnosis, paired with campaigns promoting repair as a smarter consumption choice	✓	✓			
1.2 Repair storytelling series	Short videos documenting real repairs — from drop-off to fixed — shared on social media to show communities that broken items have value	✓				
1.3 Price comparison signage	Simple signs at repair counters showing repair cost vs. buying new, making the financial case for repair at the moment customers decide	✓	✓			

2: Training & Capacity Building: Building repair skills in both technicians and the general public



Solution	Description	D1	D2	S1	S2	S3
2.1 Hands-on repair training and peer mentoring	Free practical repair workshops and upcycling sessions for women and youth, with experienced technicians guiding learners directly	✓		✓	✓	
2.2 Master apprentice formalisation	Paid apprenticeships pairing experienced technicians with new entrants to close the skills gap			✓	✓	

3: Economic & Pricing Interventions: Making repair financially viable for both customers and technicians



Solution	Description	D1	D2	S1	S2	S3
3.1 Repair vouchers	Promotional vouchers (e.g. IDR 50–100K off) making repair financially competitive with buying new	✓	✓			✓
3.2 Tiered repair pricing to sustain low-cost services	Higher-margin repairs subsidise lower-margin ones, keeping affordable repair viable for the community		✓		✓	
3.3 Multi-corner repair services with diversified income streams	Specialized repair teams across multiple product categories, supplemented by parts retail, tool rental, and pickup-delivery services		✓		✓	

4: Parts & Tools Access: Solving the sourcing and access bottleneck



Solution	Description	D1	D2	S1	S2	S3
4.1 Shared specialist tool	Expensive specialist tools are shared across workshops on a rental basis, reducing individual investment burden			✓	✓	✓
4.2 Waste Upcycling	Repurposing broken textiles and e-waste into new products with local collectors, reducing waste while creating new value	✓	✓		✓	✓
4.3 Spare parts salvage and shared inventory	Usable parts recovered from scrap collectors are pooled into a shared stock that multiple workshops can access, reducing sourcing costs		✓		✓	✓

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Survey 1 for Households Interview Questions (1/2)

No	Category	Questions	Answer-type	Objective	Answer Options
1	Item Type	Please mention 5 items in your home that have been and/or are currently broken. <i>(Examples: fan, clothes, leather shoes, mobile phone, computer, washing machine, sewing machine, watch, dynamo, air conditioner, fishing boat engine, water pump, sound system, TV set-top box, radio, CCTV, Wi-Fi router, microphone, remote, water heater, blender, mixer, hairdryer, hair straightener, iron, humidifier, etc.)</i>	Open-answer	Broken items identification	
2	Immediate Action	What do you do when item X is broken?	Multiple choice	Behavior and perceptions toward repair practices	1: I will buy a new replacement item 2: I will repair it / take it to a repair service 3: I leave it as is
3	Repair Method	If you choose to repair the item, who repairs it?	Multiple choice	Supply identification	1: Myself 2: Unofficial repair service 3: Authorized repair service
4	Repair Cost	How much did it cost to repair item X?	Multiple choice	Identifying willingness to pay for repair services	1: < Rp 50.000 2: Rp50.000 - Rp150.000 3: Rp150.001 - Rp500.000 4: >Rp500.000

Survey 1 for Households Interview Questions (2/2)

No	Category	Questions	Answer-type	Objective	Answer Options
5	Repair Location	How far is the repair location for item X from your home?	Multiple choice	Mapping access to repair services	1: Within the same <i>banjar</i> (local neighborhood/community unit) 2: Within the same village 3: Within the same sub-district 4: Within the same district/regency 5: I have to go outside the district/regency
6	Reason for Replacing a Broken Item	Why do you prefer to buy a new one?	Checkboxes	Identify motivations for purchasing a replacement	1: Replacement item is cheap and affordable 2: The item can no longer be repaired 3: Repair shops/services are not available 4: Repair costs are high 5: Spare parts are difficult to find
7	Replacement Item Cost	How much did it cost to buy a new replacement?	Multiple choice	Rationalizing replacement behavior for broken items	1: < Rp 50.000 2: Rp50.000 - Rp150.000 3: Rp150.001 - Rp500.000 4: >Rp500.000
8	Interest in Joining Bengkel Bumi Training	If free training on repairing household items (such as electronics and clothing items like clothes and bags) is offered in your village/sub-district, would you be interested in joining?	Multiple choice	Mapping interest in repair training and market demand for <i>Bengkel Bumi</i>	1: Yes, I am interested 2: No, I am not interested

Survey 2 for Repair Technicians Interview Questions (Mobile phones and laptops)

No	Category	Questions	Answer-type	Objective	Answer Options
1	Type of Damage	What types of damage occur most frequently?	Checkboxes	Spareparts stocking priorities	(a) Cracked screen/LCD, (b) Battery degraded/swollen, (c) Completely dead (short), (d) Charging port damaged, (e) Broken hinge, (f) Overheating
2	Tool Level	On a scale of 1–5, how specialized are the tools required?	Scale 1–5	Tool procurement planning	1: Screwdriver set, tweezers, opening pick 2: Multimeter, soldering iron, solder 3: Heat gun/blower, LCD separator, UV lamp 4: DC power supply, microscope, short killer 5: BGA machine, OCA laminating machine, IC programmer
3	Skill Level	On a scale of 1–5, what level of skill is required to perform this repair properly?	Scale 1–5	Technician profiling	1: Replace casing, install battery, replace screws 2: Replace LCD module, replace keyboard, replace SSD 3: Solder charging port, replace light ICs, flash OS 4: Analyze schematics, reball chips, remove power IC 5: PCB trace bypass, eMMC data recovery, CPU replacement
4	Time	What is the average repair time for all types of damage above? <i>(Example: LCD replacement 30 minutes, motherboard service 2 days)</i>	Open-answer	Daily capacity	
5	Spare Part Cost	What is the purchase cost of commonly damaged parts (LCD, battery, keyboard)?	Numeric	Capital Analysis	
6	Service Fee	What service fee/margin do you charge for repairs?	Numeric	Profit	

Survey 2 for Repair Technicians Interview Questions (Home appliances)

No	Category	Questions	Answer-type	Objective	Answer Options
1	Type of Damage	What types of damage occur most frequently?	Checkboxes	Spareparts stocking priorities	(a) Heating element broken, (b) Thermal fuse blown, (c) Motor/dynamo burned out, (d) Gear/blade worn out, (e) Power cable melted
2	Tool Level	On a scale of 1–5, how specialized are the tools required?	Scale 1–5	Tool procurement planning	1: Screwdriver, combination pliers, test pen 2: Soldering iron, desoldering pump, heat-resistant insulation 3: Digital multimeter, clamp meter, thermometer 4: Hand drill, grinder, bearing puller 5: Variac (Variable AC), oscilloscope, welding machine
3	Skill Level	On a scale of 1–5, what level of skill is required to perform this repair properly?	Scale 1–5	Technician profiling	1: Replace plug, replace cable, clean filter 2: Replace thermal fuse, replace gear, replace capacitor 3: Diagnose thermostat, replace heating element, replace motor 4: Repair digital module, analyze temperature sensor 5: Rewind motor dynamo, modify AC control
4	Time	What is the average repair time for all types of damage above? <i>(Example: LCD replacement 30 minutes, motherboard service 2 days)</i>	Open-answer	Daily capacity	
5	Spare Part Cost	What is the purchase cost of commonly damaged parts (LCD, battery, keyboard)?	Numeric	Capital Analysis	
6	Service Fee	What service fee/margin do you charge for repairs?	Numeric	Profit	

Survey 2 for Repair Technicians Interview Questions (TV)

No	Category	Questions	Answer-type	Objective	Answer Options
1	Type of Damage	What types of damage occur most frequently?	Checkboxes	Spareparts stocking priorities	(a) Backlight failure, (b) Power supply failure, (c) Lines on panel, (d) Mainboard error, (e) Firmware stuck
2	Tool Level	On a scale of 1–5, how specialized are the tools required?	Scale 1–5	Tool procurement planning	1: Magnetic screwdriver, brush, magnetic tray 2: Backlight tester, multimeter, soldering station 3: ESR meter, heat gun/blower, magnifying lamp 4: BIOS programmer, microscope, jumper wire 5: COF bonding machine, vacuum suction, panel laser machine
3	Skill Level	On a scale of 1–5, what level of skill is required to perform this repair properly?	Scale 1–5	Technician profiling	1: Install bracket, disassemble casing, replace screws 2: Replace full backlight set, replace PSU module 3: Flash firmware via USB, replace LED buttons 4: Cut panel traces, replace SMD ICs, analyze T-Con 5: COF bonding, bypass panel glass traces, CPU repair
4	Time	What is the average repair time for all types of damage above? <i>(Example: LCD replacement 30 minutes, motherboard service 2 days)</i>	Open-answer	Daily capacity	
5	Spare Part Cost	What is the purchase cost of commonly damaged parts (LCD, battery, keyboard)?	Numeric	Capital Analysis	
6	Service Fee	What service fee/margin do you charge for repairs?	Numeric	Profit	

Survey 2 for Repair Technicians Interview Questions (Audio)

No	Category	Questions	Answer-type	Objective	Answer Options
1	Type of Damage	What types of damage occur most frequently?	Checkboxes	Spareparts stocking priorities	(a) Humming noise, (b) Crackling potentiometer, (c) One channel not working, (d) Distorted bass, (e) Bluetooth not working
2	Tool Level	On a scale of 1–5, how specialized are the tools required?	Scale 1–5	Tool procurement planning	1: Cutting pliers, screwdriver set, tweezers 2: Audio soldering iron, desoldering pump, silver solder 3: Analog multimeter, LCR meter, capacitor tester 4: Signal generator, dummy load, oscilloscope 5: Audio analyzer, transformer winding machine, CNC box machine
3	Skill Level	On a scale of 1–5, what level of skill is required to perform this repair properly?	Scale 1–5	Technician profiling	1: Connect cables, replace jack, replace portable battery 2: Replace volume potentiometer, replace speaker cone, replace switch 3: Replace output transistors, fix grounding 4: Analyze Class D circuits, assemble crossover, replace IC 5: Sound quality modification (tuning), transformer repair
4	Time	What is the average repair time for all types of damage above? <i>(Example: LCD replacement 30 minutes, motherboard service 2 days)</i>	Open-answer	Daily capacity	
5	Spare Part Cost	What is the purchase cost of commonly damaged parts (LCD, battery, keyboard)?	Numeric	Capital Analysis	
6	Service Fee	What service fee/margin do you charge for repairs?	Numeric	Profit	

Survey 2 for Repair Technicians Interview Questions (Textile and shoes)

No	Category	Questions	Answer-type	Objective	Answer Options
1	Type of Damage	What types of damage occur most frequently?	Checkboxes	Spareparts stocking priorities	(a) Broken zipper, (b) Pants too long, (c) Sole detached (reglue), (d) Worn-out sole (resole), (e) Torn/perforated material
2	Tool Level	On a scale of 1–5, how specialized are the tools required?	Scale 1–5	Tool procurement planning	1: Hand needle, seam ripper, fabric scissors 2: Shoe tree, cleaning brush, heat gun 3: Portable sewing machine, small overlock machine, steam iron 4: Industrial sewing machine, overedge (neci) machine, drying machine 5: Lasting (cangklong) machine, air sole press, paint compressor
3	Skill Level	On a scale of 1–5, what level of skill is required to perform this repair properly?	Scale 1–5	Technician profiling	1: Sew buttons, clean canvas, replace shoelaces 2: Hem jeans, glue standard shoe soles 3: Replace jacket zipper, adjust waist, repaint 4: Pattern alteration, manual sole stitching (stitched sole) 5: Leather reconstruction, hydrolysis sole repair
4	Time	What is the average repair time for all types of damage above? <i>(Example: LCD replacement 30 minutes, motherboard service 2 days)</i>	Open-answer	Daily capacity	
5	Spare Part Cost	What is the purchase cost of commonly damaged parts (LCD, battery, keyboard)?	Numeric	Capital Analysis	
6	Service Fee	What service fee/margin do you charge for repairs?	Numeric	Profit	

Main Authors



Hafiza Raisya Indrani



**Amelinda Pandu
Kusumaningtyas**

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<http://kopernik.info>