8. Annex to FAST FASHION, SLOW POISON: the toxic textile crisis in Ghana

8.1 Burning textiles waste - testing the air in 3 washhouses of Old Fadama, Accra, Ghana

Introduction

The washhouses which are found in the Old Fadama informal settlement also provide hot water to residents for their household or hygiene needs. The washhouses are not connected to the public water network and the water supply is managed through regular collections from an unofficial drinking water pipeline which serves the slum. There are about 15 of these washhouses which are managed by their respective owners. Each washhouse provides 4 to 6 bathing cabins, supplied with hot water by a pipe connected to a hot water tank, or brought in with containers. The water tanks, approximately 1.5 metres high and 1 metre in diameter (i.e. a volume just over $1m^3$), are placed above an open hearth which is then fuelled with textile waste. Wood is used as a starter fuel and potentially many other kinds of combustible waste may also be used. Most washhouses are open air, although sometimes a rudimentary tin roof is erected to protect users from bad weather. The bathing cabins are located side by side with walls just high enough to ensure user privacy. In all of these “establishments” and in their direct proximity, there is a pervasive and permanent atmosphere of acrid smoke. In these still and sheltered conditions, the smoke lingers within the narrow spaces and in the neighbouring alleys. People’s homes, schools or shops are often in the direct vicinity of the washhouses. Each washhouse manager effectively runs the business from the doorstep of their home – they are places of passage, where people gather and socialise. The manager re-lights the fire to heat the water tanks three times a day: before dawn before the residents get up, around the midday lunch break and then from late afternoon until late in the evening.

Protocol:

Greenpeace researchers visited Old Fadama and identified three public bathing establishments to study. With the permission and assistance of the owners, we set up several sampling devices to measure the air quality, according to a common protocol, as follows:

1. **Active sampling:** The active collection devices were positioned on a 1m tripod placed at a distance of 50 centimetres from the hearth. Around 3 litres of ambient air were sampled using a Dräger Accuro pump and adsorbed into Tenax tubes for 20 minutes during which time the fire was fuelled exclusively with used clothing. Each tube was immediately wrapped after sampling in aluminium foil and stored in a labelled polyethylene bag in cool and dry conditions.

2. **Passive sampling:** Charcoal tubes Dräger ORSA 5 were attached to a wall near the hearth for a sampling period of one week during which time the fire was only fuelled with used clothing and the wood used for starting the fires. Each tube was put into a labelled vial, then wrapped in an aluminium foil bag and stored into a PE bag in cool and dry conditions.

3. **Soot sampling:** In each washhouse, two sterile wipes moistened with distilled water were passed over squares of wall measuring 20 cm by 20 cm (4 times in each direction) located in the heating chamber, at a height of about 1.7 metres and at 1 metre and 4 metres distance away from the fire.

All the samples were sent for analysis to the ALAB GmbH laboratory in Berlin, from which the collection devices were acquired (see the Laboratory report (in German).

Active sampling provides a snapshot of measured air pollution parameters within the washhouse, while passive sampling, as a more integrated sampling method, allows some insight of the consistency of contamination over the longer term. Soot sampling provides additional insight into the surface deposition of pollutants such as PAHs from the inefficient and incomplete combustion processes being used.

Results

1. Results from air sampling

The active samples taken on Tenax tubes were thermally desorbed. The passive collectors were desorbed from the loaded carbon adsorbents with carbon disulfide in the shaker. The quantitative analysis for both types of samples was carried out using capillary gas chromatography and mass spectrometry (GC-MS). The individual substances were quantified according to the internal standard method using reference mixtures.

On the active samples,the quantification focussed on the presence of three categories of volatile organic compounds:

- Aromatic chemicals
- Polycyclic Aromatic Hydrocarbons
- Phenolic compounds, derived from phenol

On the passive samples, only aromatic chemicals and halogenated hydrocarbons were searched and quantified.

Table 1: Most prominent chemical substances identified by GC-MS on Tenax tubes

Group	Individual chemicals	Associated hazards (source : ECHA, unless indicated)
Aromatics	Benzene	Carcinogenic (IARC group 1) and Mutagenic
	Toluene	Suspected Toxic to reproduction
	Ethylbenzene	Harmful if inhaled and may cause damage to organs through prolonged or repeated exposure (…) may cause genetic defects, may cause cancer. May cause respiratory irritation, ototoxic[1]
	Styrene	Toxic to reproduction
	Phenylacetylene	-
	m/p/o-xylene	May cause respiratory irritation
	Trimethylbenzene isomers	May cause respiratory irritation. May affect the nervous system.[2]
	Indene	Suspected of causing cancer
	Methylstyrene isomers	Suspected toxic to reproduction, skin sensitizer
Polycyclic Aromatic Hydrocarbons	PAHs (generic)	The most significant endpoint of PAH toxicity is cancer.[3] Many PAHs are widely referred to as carcinogens, mutagens, and teratogens.[4]
	Naphthalene	Suspected to be carcinogenic

	Pyrene	PBT
	Fluoranthene	PBT
	Methylnaphthalene	May cause damage to organs through prolonged or repeated exposure and may cause respiratory irritation.
	Phenanthrene, Fluorene, Fluoranthene, Pyrene, Methylnaphthalene, Ethylnaphthalene, Dimethylnaphthalene, Trimethylnaphthalene	not classifiable for carcinogenicity (IARC)
Phenol compounds	Phenol	Mutagenic. Suspected of causing genetic defects and may cause damage to organs through prolonged or repeated exposure.
	Cresols	May cause respiratory irritation and possible human carcinogens (US EPA). Shown as reproductive toxicants in mice.[5]
	Dimethylphenol	Skin sensitizer
	Methoxyphenol	Skin sensitizer
	2-Methoxy-4-ethylphenol	Skin sensitizer, may cause respiratory irritation
	2,6-Dimethoxyphenol	Skin sensitizer, may cause respiratory irritation

The results show that the ambient air of the three washhouses was contaminated with numerous dangerous chemical substances, most of which exhibit one or more of the CMR (carcinogenic, mutagenic, toxic for reproduction) properties. These substances are commonly generated as pollutants during incomplete combustion processes including the combustion of plastic materials.[6]

Among the chemicals of greatest concern that were found were:

- benzene, a carcinogenic substance, classified in group 1 by the IARC;
- styrene and toluene, two substances which are toxic to reproduction;
- many PAHs (including naphthalene) which can cause various types of cancer with chronic exposure; the active sampling method, however, only allows the most volatile PAHs to be measured (see wipe tests below);
- phenol, a substance classified as mutagenic by ECHA;
- three isomers of cresol, classified as possible carcinogens by the US EPA.

We compared the concentrations of these most significant chemical substances with the indoor air quality guideline values specified by the German Ministry of the Environment.

According to the threshold system set up by the Ministry, the RW1 guide value corresponds to a target level below which exposure does not present a risk to health, while exceeding the RW2 guide value implies potential health effects. This system was designed to establish health rules for housing; it is obviously not designed for the type of environment and the practices observed in the Old Fadama settlement. Moreover, its “administrative” approach does not take into account other parameters such as non-threshold effects or the effects of mixed substances, or other health factors involved in the daily life of the inhabitants of Old Fadama. Nevertheless, these values provide a benchmark against which the level of air contamination measured through this sampling exercise can be assessed.

The German Committee on Indoor Air Guide Values (AIR) derives two indoor air guide values for the purpose of health risk assessment:

Indoor air guide value I (RW1, precautionary guide value) describes the concentration of a substance in indoor air for which or below which, according to current knowledge, adverse effects on health are not to be expected even after a lifetime of exposure.

At values above Indoor air guide value I, however, precautionary action must be taken. Measures to minimise the concentrations of the pollutant in indoor air should also be taken. Indoor air guide value I can serve as a remediation target value.

Indoor air guide value II (RW2, hazard guide value) is an effect-related value, based on current toxicological and epidemiological knowledge of a substance’s effect threshold. It represents the concentration of a substance in indoor air at and above which immediate action is required. At concentrations above these levels, harmful effects on human health cannot be ruled out with sufficient certainty. Guide value II correlates to the building codes of the federal states in Germany, which stipulate that structures must be designed to prevent hazards due to chemical, physical or biological impacts.

1.1. Active sampling - Aromatics

1.1.1. Benzene

The concentrations of benzene measured in the washhouses were compared with the guide value for carcinogenic substances (4.5 µg/m3) for indoor air published by the German Ministry of Environment. The results show benzene levels between 50 to almost 200 times the guide value.

Table 2: Concentrations of benzene compared to German Ministry of Environment guide values

Guide-value	***4.5 µg/m³***
Washhouse 1	**250** µg/m³
Washhouse 2	**887** µg/m³
Washhouse 3	**552** µg/m³

1.1.2 Active sampling - Other aromatics

The concentrations of styrene measured in the rooms were compared with the guide values for indoor air published by the German Ministry of Environment - RW1 30µg/m³ and RW2 300µg/m³ – all exceeded RW1 while remaining an order of magnitude below RW2.

All of the other aromatic compounds, apart from styrene, were below their respective RW1 guide-values: at similar levels in the case of toluene, ranging from 50% to 71% of the RW1 guide-value across samples, while ethylbenzene and the sum of xylene isomers were an order of magnitude below their respective guide-values.

Table 3: Concentrations of other aromatics compared to German Ministry of Environment guide values

blue : above RW1 / red: above RW2

	Styrene (µg/m³)	Toluene (µg/m³)	Ethylbenzene (µg/m³)	Sum of xylenes (µg/m³)
Guide-value RW1	*30*	*300*	*200*	*100*
Guide-value RW2	*300*	*3000*	*2000*	*800*
Washhouse 1	**62**	214	27	22
Washhouse 2	**68**	212	26	40
Washhouse 3	**54**	150	39	27

1.2 Active sampling - Polycyclic Aromatics Hydrocarbons (PAHs)

All samples exceeded RW2 by a factor ranging from 2.5 to almost 10.

Table 4: Concentrations of Polycyclic Aromatic Hydrocarbons compared to German Ministry of Environment guide values

blue : above RW1 / red: above RW2

Bicyclic and tricyclic aromatic hydrocarbons (µg/m³)	
Guide-value RW1	*10*
Guide-value RW2	*30*
Washhouse 1	**73.4**
Washhouse 2	**294**
Washhouse 3	**79.7**

1.3 Active sampling - Phenolic compounds

All samples exceeded RW1 for phenol by a factor ranging from almost 4 to 6 but did not exceed RW2.

All samples exceeded RW1 for cresols by far, the lowest level reaching 6 times this value, and two exceeded RW2 with the highest level reaching 4 times the RW2.

Table 5: Concentrations of phenolic compounds compared to German Ministry of Environment guide values

blue : above RW1 / red: above RW2

	Phenol (µg/m^3)	**Sum of cresol isomers (µg/m^3)**
Guide-value RW1	20	5.0
Guide-value RW2	200	50
Washhouse 1	**124**	**197**
Washhouse 2	**119**	**31.9**
Washhouse 3	**73.7**	**56.4**

1.4 Active sampling - TVOC (Total Volatile Organic Compounds)

The German Ministry of Environment also publishes guide-values for TVOC which requires additional consideration of individual substances for their interpretation.[7]

TVOC results from two of the three washhouses reach the indoor air guide-value described as “hygienically noticeable” (1000-3000 µg/m^3), while the sample from washhouse 2 falls in the category “hygienically alarming” (3000-10000 µg/m^3). Concentrations above RW3 require immediate action to reduce the concentrations.

Table 6: Concentrations of Total Volatile Organic Compounds (µg/m^3) compared to German Ministry of Environment indoor air guide values (µg/m^3)[8]

blue : above RW3 / red: above RW4

Guide value RW1: hygienically safe	*≤ 300*
Guide value RW2: hygienically still safe, if indoor air guide values are not exceeded for single substances or substance groups	*300 – 1000*
Guide value RW3: hygienically noticeable	*1000-3000*
Guide value RW4: hygienically alarming	*3000-10,000*
Guide value RW5: hygienically unacceptable	*> 10,000*
Washhouse 1	**2510**
Washhouse 2	**3760**
Washhouse 3	**2730**

1.5. Passive sampling - Aromatics and organohalogens

The quantification of the aromatic substances detected by the passive sampling confirms similar levels to the active samples, often at concentrations slightly higher, with the notable exception of benzene in the passive sample taken from Washhouse 2: **the carcinogenic substance was measured in the latter at a concentration 6 times higher than that of the active sample, i.e. more than 1000 times the guide value of the German Ministry**.

With the exception of 1,4-dichlorobenzene which was measured at its detection threshold, no organohalogen chemical substances were detected in the passive sampling of the ambient air from the three public baths.

Table 7: Concentrations of aromatics and organohalogens from passive sampling

	Sum Aro -matics ($\mu g/m^3$)	Benzene ($\mu g/m^3$)	Toluene ($\mu g/m^3$)	Styrene ($\mu g/m^3$)	Ethylbenzene ($\mu g/m^3$)	Sum Halogenated HCs - only 1,4 dichloro-benzene ($\mu g/m^3$)
Washhouse 1	310	217	45	1	10	1
Washhouse 2	5760	5250	212	131	41	1
Washhouse 3	1250	1059	105	38	18	1

2. Results from wipe samples - Poly Aromatic Hydrocarbons (PAHs)

Substances from the wipe samples were extracted in an ultrasonic bath with acetone/cyclohexane and analysed by gas chromatography and mass spectrometer (GC/MS), to determine the presence and levels of 16 PAHs.

Table 8: Sum of Poly Aromatic Hydrocarbons - from wipe samples

	Sum 16 PAHs ($\mu g/m^2$)
Washhouse 1	**3.1**
Washhouse 1	**17.7**
Washhouse 2	**14**
Washhouse 2	**241**
Washhouse 3	**81.2**
Washhouse 3	**2160**

As mentioned above, this analysis complements the findings of the active air sampling by providing information on the presence of less volatile PAHs which are not captured by the active sampling methodology but are of high concern due to their PBT and carcinogenic properties.

All of the 8 following PAHs were not captured by the active sampling, but were found across all wipe samples and measured at particularly high concentrations in the samples from Washhouse 3.

Table 9: Poly Aromatic Hydrocarbons - IARC / ECHA classification

Selected PAHs	IARC / ECHA classification
Benz(a)anthracene	Group 2B possibly carcinogenic to humans, PBT
Chrysene	Group 2B possibly carcinogenic to humans, suspected to be mutagenic, PBT
Benzo(b)fluoranthene	Group 2B possibly carcinogenic to humans, POP
Benzo(k)fluoranthene	Group 2B possibly carcinogenic to humans, PBT, POP
Benzo(a)pyrene	Group 1 carcinogenic to humans, Mutagenic, Toxic to reproduction, skin sensitizer, PBT
Indeno(1,2,3-cd)pyrene	Group 2B possibly carcinogenic to humans, POP
Dibenz(a,h)anthracene	Group 2A probably carcinogenic to humans
Benzo(g,h,i)perylene	PBT

* PBT: persistent, bioaccumulative, toxic
* POP: Persistent Organic Pollutant

The VdS institute has established a guide-value for PAHs for the German Insurance Association, published in its “Guidelines for fire damage restoration”[9] and used to inform the clean-up of residential or professional buildings after a fire:

Table 10: VdS Institute guide value for Poly Aromatic Hydrocarbons

Typical/frequently encountered background values: - Industrial sector: < 100 µg/m^2 - Living and office spaces: < 10 µg/m^2 - Remediation target: ≤ Background value “Richtlinien zur Brandschadensanierung” - VdS 2357, 2014-06, p30

Following these recommendations, none of the washhouses would meet the target to be considered a healthy living space:

- Samples from Washhouse 1 have the lowest contamination with one wipe sample meeting the target and the other slightly overpassing it;
- Samples from Washhouse 2 are more contaminated with the lowest value exceeding the 10µg/m^2 target and the other with levels of contamination above the limits for an industrial sector;
- Samples from Washhouse 3 are even worse with the lowest value approaching the industrial background value and the other more than 20 times above it.

It is worth reporting that one of our passive samplers hung on the wall of washhouse 1 had literally disappeared under deposits of soot after one week. This speaks volumes about the unhealthy nature of the ambient air and the pace at which the particle pollution occurs.

Conclusion

These results show that the ambient air in the Old Fadama public washhouses is considerably polluted by the practice of open burning of textile waste. The establishments themselves are made unsanitary and their managers, employees and customers are exposed to worrying levels of carcinogenic substances such as benzene or PAHs, among other things. Due to the direct proximity of homes and various establishments open to the public such as shops and schools, it cannot be ruled out that larger groups of individuals are also regularly exposed in surrounding buildings, albeit at lower levels, to these same pollutants.

Furthermore, the practice of open burning of textile waste on informal dumpsites is common in Accra, where the research team came across such fires almost everywhere in the area around Korle Lagoon and on the outskirts of the capital, and in particular near its most deprived neighbourhoods. The analysis we performed in the washhouses provides a snapshot of the more diffuse air pollution that the populations of these neighbourhoods have to endure.

Finally, for the purposes of this experiment, the managers agreed not to fuel their heating fires with other calorific waste, particularly plastics, which are otherwise common fuels. Burning of mixed plastic/textile waste could change the emissions profile considerably particularly in relation to organohalogen chemical substances, including chlorinated dioxins, from the burning of chlorinated plastics.

8.2 Data from the collection of used clothes collected in Accra's second-hand market

In October 2023, Greenpeace Germany and Greenpeace Africa conducted joint research into the environmental impact of second-hand textile exports to African countries, using Ghana as an example.

During the research, items of clothing that would otherwise have been thrown away were collected for a week at Ghana's largest second-hand market, the Kantamanto market in Accra, and brought to Hamburg for analysis.

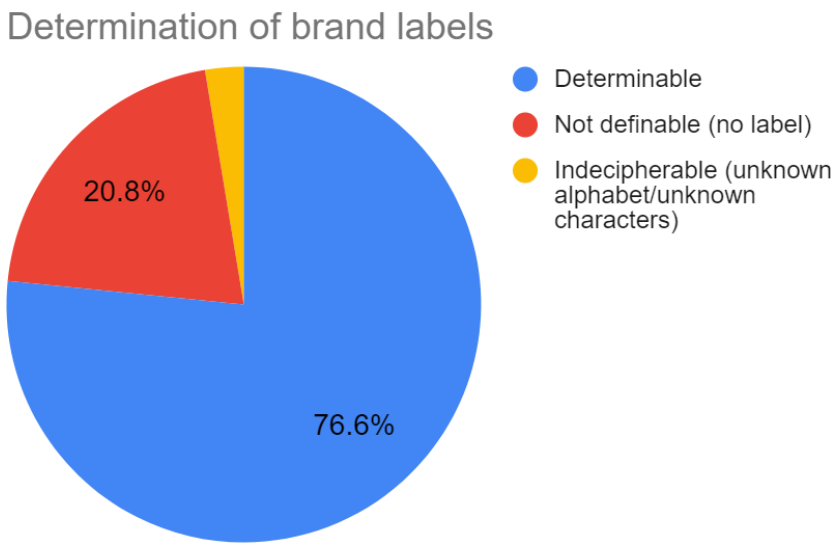
A total of 4.6 tons of textiles were collected, around 19,000 items of clothing. 1432 kg of clothing was used for further analysis.

The mass of textiles analysed still contained 78 kg (5.5% by weight) of textile waste, the remainder being wearable textiles.

Identifying brand names

A total of 5710 items of clothing were examined to identify brand names in the label. Out of the 4,523 items of clothing, it was possible to determine the brand name for a total of 4,373 or 76.58% (for 150 items the brand name couldn't be deciphered). A further 1187 items did not have a brand label.

Figure 1: Percentage of labels that could be determined for the identification of brands



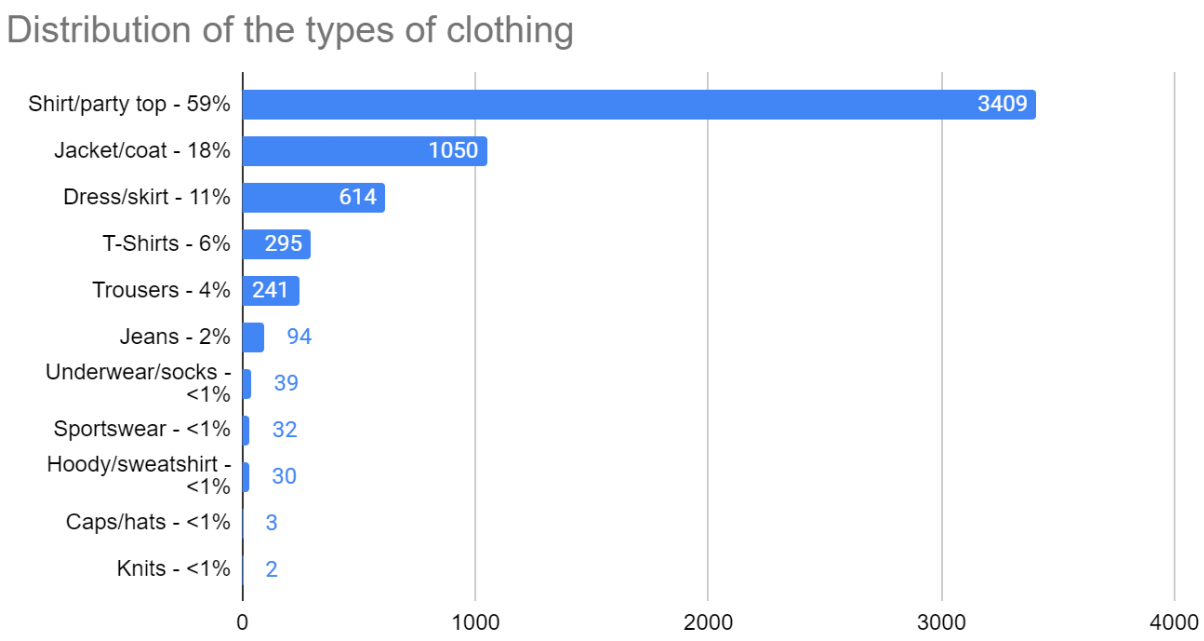
The top 20 brand names that were identified are listed below, in descending order. As the largest exporter of used clothes to Ghana is the UK, it's not surprising that the UK brands such as Marks & Spencer, F&F, and brands that are popular in the UK such as Primark, George, predominate. It is also notable that SHEIN already appears in the top 20, despite being relatively new on the market, indicating the relatively short lifespan of these clothes.

Table 11: The Top 20 brands identified in used clothes collected from Kantamanto Market

	Brand	**Number of items, out of 4,373**	**Percentage of the items where the brand could be determined**
1	H&M	134	3.06%
2	Marks & Spencer	131	3.00%
3	Next	109	2.49%
4	Zara	90	2.06%
5	George	88	2.01%
6	Primark	68	1.55%
7	New Look	64	1.46%
8	Atmosphere	51	1.17%
9	F&F	45	1.03%
10	River Island	36	0.82%
11	TU	35	0.80%
12	Papaya	33	0.75%
13	Topshop	30	0.69%
14	Dorothy Perkins	23	0.53%
15	Shein	22	0.50%
16	Gap	19	0.43%
17	BHS	18	0.41%
18	Old Navy	15	0.34%
19	Forever21	15	0.34%
20	Fashion	14	0.32%

We also examined the types of discarded clothes that had been collected (see Figure 2). These were predominantly shirts/party tops at 59% of the sample, followed by jackets/coats at 18% and dresses/skirts at 11%. While shirts/party tops are identified as popular items by market traders (see 8.4 Analysis of second hand textiles Ghana), these types of clothing are often of poor quality, designed to be worn once for a night out and then discarded. This might also be the case for some of the dresses/skirts. The significant number of jackets and coats that were discarded is likely to be because these types of garments are inappropriate for the climate in Ghana.

Figure 2: Breakdown of the types of used clothes collected from Kantamanto Market



8.3 Infrared identification of fibre materials in used clothes collected from Accra's second-hand market and informal dumpsites

To further analyse the composition of the textiles collected during our stay in Ghana, infrared spectroscopy (IFR) was applied to identify the materials or blends of materials:

- In the Greenpeace Germany warehouse, on a subset of the clothes brought back to Germany from the Kantamanto market,
- On-spot in several informal dumpsites visited during the stay.

A portable near-infrared spectrometer from the brand Trinamix was used. It can detect molecules of between 800-2,500 nanometres wavelength. It is a non-destructive method that doesn't require the disassembling of the textile sample. Applied directly to the surface of the sample, the Trinamix spectrometer interacts with the molecules in the textile and within seconds it provides a material specific reaction that can be read on the device and stored via an app on a mobile phone. It is calibrated to identify the most common textile materials and blends of fibres (Figure 3). The Trinamix is reputed to be a reliable material distinguishing device to assist professional waste sorting of textiles under heavy use conditions.[10] However, it requires the textile samples to be dry and clean enough which makes it difficult to apply on textile waste exposed to harsh environmental conditions (eg: retrieved from the sea, dug out from the seashore or from the non-superficial layers of a dumpsite).

Table 12: Reliable identification of various textile types, TrinamiX[11]

- Including pure materials and blends					
>95%	Blends with <95% are classified in main and minor materials				
	I*ncludes % of materials*				
Acrylic		Acrylic/ Polyester			
Cotton	Cotton/Polyester %	Cotton/Viscose	Cotton/Acrylic	Cotton/Elastane	Cotton/Polyamide
Nylon (6 & 6.6)	Polyamide/Elastane				
Polyester	Polyester/Viscose	Polyester/ Cotton			
Polypropylene					
Silk					
Elastane	Elastane/ Cotton				
Viscose	Viscose/Cotton	Viscose/Polyester			
Wool	Wool/Acrylic	Wool/Polyester	Wool/Polyamide		

8.3.1 Characterisation of second-hand clothes rejected from Kantamanto

8.3.1.1 Sampling methodology

Random selection protocol: While the textiles were processed as detailed in Annex 8.2, a list of 1000 numbers was generated randomly by software. This list was applied after the first 1100 textile items had been processed. As clothes were picked out of the bags and numbered by one team, the list of random numbers was called by another team to ensure a blind selection. Whenever the number of the current item was equal to the next number on the random number list, the clothes were put aside to be tested by IFR. Time and resources constraints enabled the creation of a subset of 608 garments.

IFR testing protocol: For each of the 608 garments, type, brand and label were obtained and the item was photographed twice - the item as a whole and a close up of the label. Using the portable Trinamix spectrometer, at least three and up to seven individual IFR tests were conducted on each item, according to its complexity; the more variety the textile item offered, the more tests were performed. If results such as “Unrecognized Material” or “Insufficient contrast” were yielded, additional tests were performed. All information obtained from the procedure was instantly retained in either the Evaluation Sheet or the web portal of the manufacturer of the IFR device. Data of IFR and other tests is available on the Greenpeace Germany data portal “Analysis of second-hand textiles Ghana”.

8.3.1.2 Results

Erratum: Reviewing our raw data for further detailed analysis in the preparation of this report, we realised that the Trinamix device could not properly identify linen fibres, which had introduced a few mistakes in the counting of materials and material blends published in February 2024. Therefore, the table below provides consolidated figures, which only deviates marginally compared to the original publication. The overall interpretation remains unchanged.

Table 13: Percentages of the various fibres detected by IFR in used clothes collected from Kantamanto Market

	Elastane counted as synthetic fibre	Elastane not counted
Garments that include synthetic and man-made cellulosic fibres alone or blended	95.9 %	92.9 %
Garments that include fossil-fuel derived synthetic fibres alone or blended	**89.1 %**	85.1 %

Garments that include a blend of at least 2 different fibre types	86.9 %	67.0 %
Garments made only of fossil-fuel derived synthetic fibres	24.9 %	-
Garments made only of cellulosic man-made and/or natural fibres	10.8 %	14.8 %
Garments made of 100% natural fibres	4.0 %	7.0 %

- 89% of the scanned garments contained one or more fossil-fuel derived synthetic fibres; unsurprisingly these were mostly polyester. More than 24% of the garments were made of 100% synthetic fibres.

- Between 67% and 87% of the scanned garments (depending on whether elastane was included or not) were made of a blend of textile fibres which would significantly impact their effective recycling in regions equipped with such technologies and infrastructures. Moreover, research suggests that blending synthetic fibres with non-fossil fuel based man-made fibres is not only a false solution but could impair the expected biodegradability of the latter.[12]

- Although elastane is a minority component, the aforementioned range of between 67 to 87% clearly highlights its pervasive presence. Less than 11% of the scanned garments were manufactured without any detectable synthetic fibres, including elastane. Research suggests that this systematic reliance on elastane imposed by recent fashion trends could worsen the release of microfibres in the environment.[13] Even currently available recycling technologies are impaired by as little as 1% elastane fibre content.[14]

- Only 4% of the scanned garments were made entirely of natural fibres (on their own or blended) without any trace of fossil-fuel derived elastane.

8.3.2 **Characterisation of textile waste from several dumpsites**

8.3.2.1 Sampling methodology

A total of 164 samples were collected and scanned between the 8th and 15th October 2023, at the Mortuary Road dumpsite in Old Fadama, and at the Agbogbloshie and the Weija dumpsites, with the majority taken in a coordinated effort at the Mortuary Road dumpsite.

Amongst the huge and irregular mountains of waste, it was possible to pick out examples of clothing that were suitable for testing. Most importantly, the items needed to be clean and dry, because the neo-infrared technology does not work with materials that are wet. Inevitably this meant picking clothes from the surface or within the top layers of the dumpsite, which hadn’t

been rained on or soiled by the cows that roam on these dumpsites. Therefore the methodology was determined by the conditions that Greenpeace researchers found on the ground.

IFR testing protocol: For each of the 164 garments, type, brand and label were obtained and the item was photographed twice - the label in a close up and the item as a whole. Using the portable Trinamix spectrometer, at least five positive individual IFR tests were conducted on each item. If results such as “Unrecognized Material” or “Insufficient contrast” were yielded, additional tests were performed. All information obtained from the procedure was instantly retained in either the Evaluation Sheet or the web portal of the manufacturer of the IFR device. Data of IFR and other tests is available on the Greenpeace Germany data portal “Analysis of second-hand textiles Ghana”.

8.3.2.3 Results

Table 14: Percentages of the various fibres detected by IFR in used clothes from informal dumpsites

Garments that include synthetic and man-made cellulosic fibres alone or blended	**90.2 %**
Garments that include fossil-fuel derived synthetic fibres alone or blended	**89.0 %**
Garments that include a blend of at least 2 different fibre types	**93.3 %**
Garments featuring elastane	**58.5%**
Garments made of synthetic mono-material (polyester)	**4.3 %**
Garments made of man-made cellulosic mono-material (viscose)	**0.6 %**
Garments made of natural mono-material (cotton)	**1.8 %**

Despite being limited by a less systematic sampling methodology and a smaller sample, the results show a similar rate of synthetic materials (89%) and a slightly higher rate of blended materials (93.3%) to the IR analysis performed on Kantamanto’s rejected garments. More than half of the garments contained elastane.

Conclusion

Given the lack of relevant waste management infrastructure in Ghana and the fate of these used garments, synthetic and blended synthetic materials will undoubtedly translate into significant emissions of microplastic fibres into the air, land, water and coastal environment of Accra. The release of microplastic fibres from textiles in the environment and their bioaccumulation in the food chain are not only a worrying problem in itself; these microplastic fibres can in turn expose living

organisms to the hazardous chemicals that they carry. Recent research has added the group of Bisphenols (such as BPA, BPS and others) – infamous for their endocrine disrupting properties – that can be found in trace amounts in polyester or elastane from their use in the manufacturing of these synthetics, including elastane.[15] Therefore the priority strategy to address the massive global pollution from textile microplastic fibres from textiles, is to move away from fossil fuel-based textile.[16]

8.4 Analysis of second-hand textiles Ghana, collected from Kantamanto Market and from informal dumpsites by waste pickers

The sorting and reselling of used clothes in Kantamanto Market

A recent survey by the Ghana Used Clothing Dealers Association of 370 retailers in the Market,[17] finds that the amount of textile waste in newly imported bales is on average less than 5%, with the majority finding about 1% of textile waste and ranging between traders that find no textiles waste to those finding 15-35% of waste.

Although this is presented as new information with the claim that this represents the total amounts of used clothing waste resulting from the import of used clothes, this figure does not contradict pre-existing information on the percentages of textiles waste in a bale, for example the OR Foundation reports that 4% or more of a newly delivered bale is textile waste.[18]

It is, however, misleading. Firstly, 'textile waste' is a separate customs category, which should not be classified as 'used clothes', but is a common practice to avoid the extra regulations associated with waste exports.[19] Secondly, it does not account for the used clothes that can't be resold in Ghana, for whatever the reason. The OR Foundation describes a nearly universal practice, where retailers sort each bale into four selections, and finds that the average for re-sellable items in a bale is up to 60%.[20] Greenpeace research in October 2023 suggests that in some cases this is lower, (see below), with stallholders reporting that as much as 60% of the used clothes in these bales are unsellable, and described as 'borla'.[21] However, not all of the remaining 60% of the clothes will eventually become clothing waste, even though they were rejected as 'borla' in the first selection; some will be repaired or refurbished by tailors, sold at a lower price, or get picked by locals. According to The Revival, about 10-40% of the estimated 7 million items that circulate in the market every week become waste.[22]

Greenpeace findings from examining the selection of used clothes with stallholders

Greenpeace researchers interviewed seven stallholders at Kantamanto market to understand how the market works, their work, their conditions, the reasons why some imported used clothes are not suitable for re-selling and what they think about the imported used clothes.

Four of the market traders provided details on the number of items in a bale and/or the typical proportion of items that they could sell at their stall, compared to the numbers rejected. These items were mostly garments such as jeans and trousers for men or women, womenswear such as tops and dresses, and one stall selling bedding. The overall average of resellable items was 34%, rising to 40% when the bedding was not included, which also reflects the findings of the OR Foundation.[23] A summary of the information they provided is in Table 15.

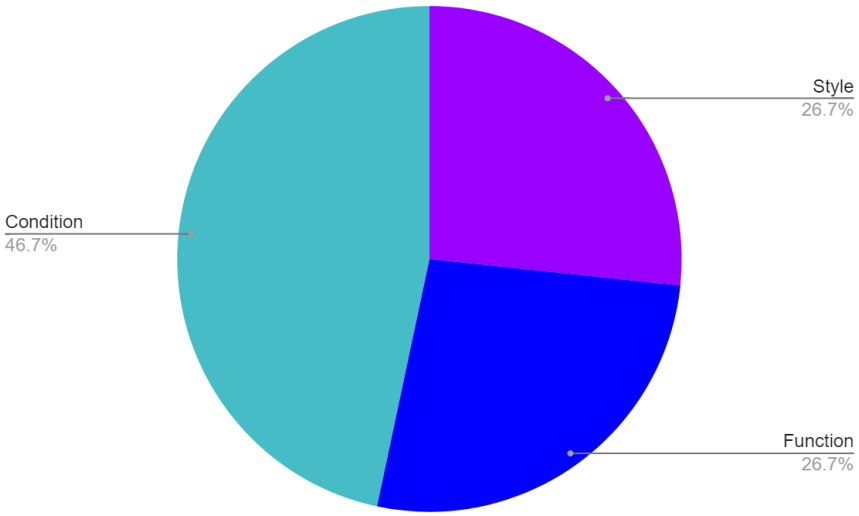
Table 15: The number of used clothes with "market value" in a bale

	Market stallholder 1	Market stallholder 2	Market stallholder 3	Market stallholder 7
How long have they been trading, how long at this stall	15 years	Unknown	15-16 years	15 years, 2 months at particular stall
Type of used clothing/textiles	Jeans	Bedding	Ladies tops, dresses, shorts, trousers etc.	Ladies jeans & trousers
Number of items in bale / number given	2 bales, 320 items	Usually about. 30 items	300	193 (1 bale)
Number of good resalable items in bale (Grade 1)				46
Number of items to sell at lower price (Grade 2)				19
Number of items for upcycling (Grade 3)				29
TOTAL number of resalable & usable items	120	5	100	94
Percentage of resalable items	37%	17%	33%	49%
TOTAL value of resalable and reusable items				1522 -1609
Price paid for bale (s)	3500			2,200
Is the income sufficient from this bale	No	No		No
Number of items thrown away	200	25	200	99
Has there been a decline in the quality and re-saleability of items in bales over recent years			Yes	Yes

Three of the stall holders reported that the income likely to be earned from the bale was insufficient, and two commented that they had noticed a decline in the quality and re-saleability of the items in bales over the last 5 - 6 years.

We discussed the reasons why used clothes are not suitable for re-sale at Kantamanto market with stall holders 1-6, which we documented and divided into three broad categories: style, function and condition (Figure 4).

Figure 3: The main reasons why used clothes have no market value for selected stall holders (1-6), percentage



The condition of used clothes is the most common reason, mainly because of clothes that are old and worn, followed by those that are broken and torn, or stained. Functional reasons include clothes being of poor quality (such as fast fashion) with thin material, even if they are in good condition, and sizing issues, especially jeans from Asia being too small. Finally, style reasons are also important, in particular dislike of certain colours, like white, pale colours and brown, stretch fabrics, unstylish clothes and maternity trousers with fake tops. Some stall holders will also reject jeans with fake 'rips' in them, although others say that there is a market for these, probably due to individual preferences and different types of customers. In general, if clothes have more than one of the problems mentioned, and if any of the problems is severe, it is not worth the effort to make them sellable.

The bale importer and stallholders also made the following comments about why imported clothes become waste, and Greenpeace researchers made their own observations from looking through the rejected clothes.

- The main reason is that they are old and worn
- Clothes from Asian countries are usually very small, they don't fit people in African countries so more of these garments are thrown away.
- Clothes made with fabrics unsuitable for a warm climate, especially those made with synthetics
- Extra-large sizes from Europe and North America, are too big for people in Africa
- Style - for example, loose 'Indian style' clothing

Stallholder 7 - deep dive

We also went through a newly arrived bale in detail with stallholder 7, who has been selling ladies jeans and trousers for 15 years (2 months current stall), Greenpeace observed in detail how and why some garments were selected, and others were rejected as "borla".

After sorting the bale of 193 items, 94 were selected as suitable for selling in the local market. After further sorting, these better quality clothes were further divided into 3 broad categories:

- Grade 1. The best quality, which were well made, good quality materials, often vintage or older clothes. 46 garments were in this category, and would sell for 25 Ghana Cedi.
- Grade 2. Clothes of good condition but less good quality, typically fast fashion items from brands like Primark or Mango, 19 garments in this category which would sell for 15 Cedi.
- Grade 3. Clothes that need adapting, a few made of good material like linen (1st grade material, eg. not plastic), 29 pieces, would sell for 3 - 6 Cedi.

The buyer doesn't even recover his costs, with a market value of the three grades of saleable clothes of 1502 - 1609 Cedi (€105 - €112), compared to the 2,200 Cedi (€154) cost of a bale.

The stallholder commented that a decline in the quality and usability of garments in the bales began about 5 years ago, and that previously it wasn't like this, there was no "borla" (waste) and it was all good enough to sell. We documented the reasons the stallholder gave for why clothes were not suitable for resale, which are summarised below in Figure 5.

Figure 4: REASON for no market value of item = "borla", stall holder 7, categorised by STYLE, FUNCTION, CONDITION

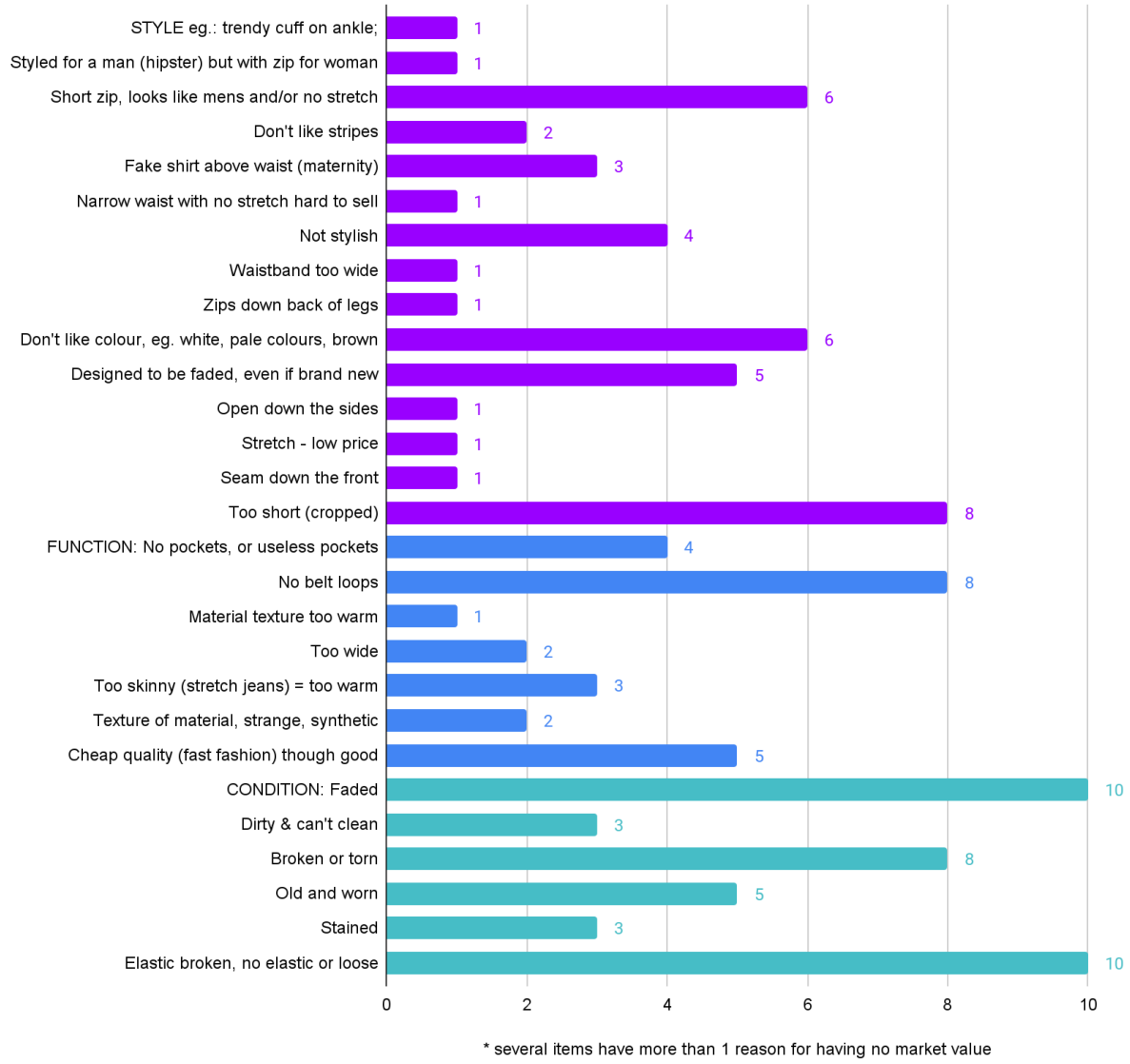
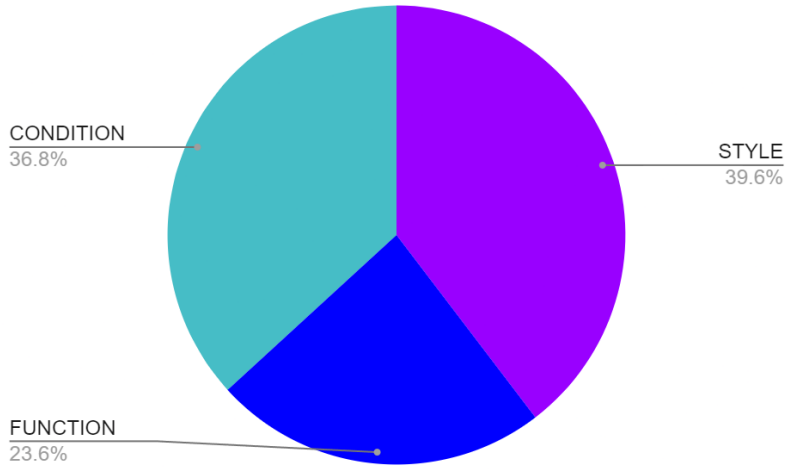


Figure 5: The main reasons why used clothes have no market value for stallholder 7, percentage



Style is the dominant reason for lack of market value for this stallholder (Figure 6), in contrast to the findings from the other stallholders, where 'condition' was the most common reason, which suggests sensitivities about customer demand by individual stallholders, and inconsistencies between reasons for clothes being considered as 'borla'. As well as explaining the reasons why used clothes are "borla", the stallholder shared some of the positive reasons for selecting jeans and trousers that could be sold:

- White but good quality, and dirt can be easily removed. Also white is ok if its a good style
- Has belt loops and stylish
- Jeans without stretch and long lasting
- Good jeans even with rips in legs are ok, especially vintage style with leg tears
- Dark blue is popular even with no belt loops
- Black skinny jeans are popular
- Style is most important - glitter is stylish
- Like fake leather & black
- Black is a good colour
- Wide and light material, so cool to wear (even if synthetic)

Overall, the items that sell best at Kantamanto market are women's cotton dresses, followed by cotton blouses, as mentioned by one bale importer we interviewed, and various stallholders.

Further perspectives from discussion with the Used Clothes Dealers Association

Asked for his views about the functioning of Kantamanto Market, Edward Binkley of the Ghana Used Clothes Dealers Association, also comments that customers have different requirements, sometimes it's about quality and sometimes it's fashion, and that it's hard to say which countries send the "best" used clothes. A lot depends on the relationship with the supplier, the importer can ask for clothes from China in larger sizes if that is what's needed. However, while traders

need to get what they want, compromise is sometimes needed so the supplier gets what they want too. Second hand textiles are important to the economy of Ghana, with 2.5 million people working in the sector, as well as being important for extending the lifespan of clothing. However, they would like to promote better quality goods, and see laws in Europe that would take the tastes and preferences in Ghana into account. He suggests that regulators in Europe and other exporting countries should visit Ghana, to see what really happens on the ground, and be informed.

The Ghana Used Clothes Dealers Association wants to go the extra mile to have solutions and are looking for support for a recycling proposal, to create jobs and help the economy, also for climate change mitigation. Remaking and redesigning is also very important in Ghana, where designers buy second hand and remake them, for people with a relatively low income to be able to buy designer clothes at affordable prices.

Edward Binkley also mentions that customers sometimes complain about poor quality clothes;

“You know, the material quality has reduced, and, because of that, the lifespan of the clothing also has been reduced. I’m talking about fast fashion, you know, previously you could wear clothes for a very long time, you iron it, you wash it, and it's still good. But right now, you wash, you iron, and it begins to fray, so the quality they used to produce, they should maintain it, even with an increase in price, I think it would be better.”

“I am appealing to them, to make the quality like they used to, so that the lifespan of clothing can continue as it used to be.”

Analysis of used clothes collected from informal dumpsites

Clothes waste, as well as other waste, is transported from Kantamanto Market to the informal dumpsites by motorised tricycles, which carry loads of about 5-10m^3.

At the dumpsite near the Mortuary Road in Old Fadama, a group of about 20 waste pickers (all men) earn some money by collecting used clothes that have been dumped. They collect as much as they can carry in a day from the dump, looking for useful items such as cargo trousers with pockets, and sometimes even find brand new clothes. They wash them in a stream near the dump, which is full of textiles and also smells of chemicals because run off from the dumpsites drains into it. The clothes are dried and may be sent to Kantamanto market to be dyed and returned to the waste picker, for sale in a local market at prices well below those in Kantamanto market, for example 50 Pesewas (half a Cedi).

Further to the West of Kantamanto, in Greater Accra, the Weija area has been the recipient of all types of waste including textiles for many years. The dumpsite consists of layers of used clothes, which are also piled a foot deep to make a road so that the carts can still bring the waste when it's muddy. Besides the waste pickers who collect old PET bottles to sell for “recycling”, waste pickers work six days a week to collect the waste clothes delivered to the dumpsite.

One female waste picker, who has worked on this dumpsite for many years, competes with four other waste pickers for the best used clothes being delivered by the carts coming from Kantamanto market. Used garments from the dumpsite itself are also recovered. This waste picker collects between 30 - 40 good pieces of clothing a day, which are then washed and repaired for selling.

The waste picker spent a couple of hours collecting a pile of clothes, which were then sorted into two piles. The selection process was observed by Greenpeace researchers, who recorded the reasons for used clothes being selected for sale or for being rejected. Among the 49 items she was able to collect during that time, 27 were deemed suitable for washing, repairing and selling, while 22 were rejected as completely unusable (see Table 16). After this process she continued collecting clothes for that day. Note that there is no information about the proportion of used clothes collected by waste pickers, in relation to the amount that is delivered to the dumpsite every day.

Table 16: Reasons given by waste picker for each item of clothing to keep or reject

Item	Main reason to keep this item (to sell, after washing etc.)	Item	Main reason to reject this item
1	Like black	28	Doesn't look good -don't like colour, too dirty
2	Trousers are mainly good	29	Broken - damaged, torn
3	White OK if garment is stylish	30	Too big, not stylish, old
4	Stylish top	31	Damaged, has a hole
5	Good quality	32	Badly sewn, one side bigger than the other - bad quality
6	Brand new skirt	33	Loose elastic and holes
7	Stylish top	34	Zip is broken
8	Trousers - dirty but can be cleaned	35	Hole
9	Jeans, black & stylish	36	Jeans but faded and mainly because old
10	Dress, stylish, material not important	37	One piece - no one would buy, separates are best
11	Stylish skirt for girls	38	Girls school uniform - torn
12	Jeans - dirty but can be cleaned	39	Too big, with alterations, though new - break easily
13	Children's denim waistcoat ok	40	Hole in middle of garment
14	Colourful printed Tshirt for kids	41	Too dirty and old
15	Trousers, stylish & intact	42	Too old, dirty and altered (smaller) & bad quality
16	C&A black women's jeans - good (small but ok for kid)	43	Silky dress, not too old but already broken

17	Pink dress for girl, dirty but can wash	44	Sports shirt, good & cool to wear, but colour washed out and tears
18	Woman's dress, large, nearly brand new	45	Cargo jeans, wet, faded, from Asia so small
19	Woman's dress, large, bit dirty can wash	46	Kids shirt, looks nice but holes
20	White blouse from Mexico, good	47	Mens shirt, broken & cut
21	Jeans, torn but can be repaired, good quality so worth it	48	T-shirt - stained, dirty, not possible to wash
22	Skirt, slightly altered	49	Underwear - would not buy from dumpsite (would buy 2nd hand from Kantamanto market)
23	Women's trousers, well made		
24	Women's green dress, well made		
25	Atmosphere women's top, pink		
26	M&S Petite womens top, white		
27	Coloured women's top		

The majority of clothes unsuitable for selling are rejected because of their poor **condition**: they are dirty, old and mouldy, bad quality, badly sewn, broken, with old elastic or broken zips, or old and faded. The waste pickers are also discerning about the types of clothes with local market value locally: clothes have to be **functional** - a one piece is no good compared to separates. **Style** is also a factor in determining whether clothes are worth the effort of cleaning and repairing, but unlike the stallholders at Kantamanto market, it is usually not a reason on its own. Good quality jeans with a small tear that can be repaired, can be sold. Brand new clothes are sometimes found in the waste.

Comparison with broader survey

As part of their report, the UCDA also surveyed 35 waste pickers at various dumpsites in Accra,[24] and the types of waste they collected were mostly plastics, paper, metal and finally textiles, in that order. Only 5 of these waste pickers collect textiles, and it's likely that these individuals also collect other types of waste, as the report states that four of these people report finding fewer than 5 items a day.

This contrasts with the numbers of items collected by the waste pickers we interviewed for this report, who collect either as much as they could carry each day (suggesting far more than 5 items) and the waste picker at Weija who collects between 30 and 40 items per day.

Textiles as a proportion of other waste

The recent UCDA report states that textile waste would make up "just 1.7-2.2% of all waste in Accra … and a small minority of that would viably be second-hand clothing". However, the studies used to calculate this estimate appear to be either outdated or irrelevant in their scope.[25]

This estimate also relies on the figure of 5% textile waste present in the bales delivered to Kantamanto Market, which does not reflect the numbers of used clothes that can't be sold in the Market, and are not refurbished or upcycled. It also excludes the unknown volumes of used clothes and textiles waste transported to Old Fadama to use as fuel in the public washhouses (see 8.1).

The claim that used clothes are not a major part of waste in Accra contrasts strongly with the visible evidence of uncontrolled dumping and distribution of textiles waste (see visual documentation below, starting from just one of the many dumpsites in the Korle lagoon area), as well as the history of waste management, in particular the early closure of the Kpone landfill in 2019, nine years before its planned capacity limit, because of a fire – partly caused by the large amounts of textile waste – which burned for 11 months.[26]

Conclusion

The USCA report understandably aims to defend the used clothes business, which is an important part of the economy and the livelihoods of many people in Ghana, from negative publicity in Western media reports about the disposal of used clothes in informal dumpsites in Accra. Greenpeace and other NGOs have expressed their support to the communities in Accra who are making their living from used clothing imports and have proposed solutions that need to be adopted in both exporting countries and Ghana in this respect. Nevertheless, presenting the situation in Accra in an over-positive light, as the UCDA report does, may not be helpful in face of a truly tough environmental reality and the dire need to improve the environmental, health and social conditions that used clothes imports have generated.

This shies away from the true source of the problem, the growing volumes of poor quality, disposable, fast fashion, and the evidence that many of these items are not useful, usable or resellable in Ghana, and cannot therefore be refurbished, repaired or upcycled, despite the skills and creativity of the local people in these aspects.

It also evades the fact that the more immediate threat to the used clothes trade to Ghana is not a ban on the export of used clothes, but the potential collapse of the used clothes collection system in Europe, which is straining under the volumes of low value fast fashion clothing.[27]

All parties involved in this system should therefore direct their attention to this failure of the fast fashion business model, and find solutions.

Endnotes

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[18] The OR Foundation (2022), A waste landscape: waste makes visible our separation from nature, 31st January 2022; 4% or more of a newly delivered bale is waste (p.26), Webpage: https://theor.org/newsroom/post/60 full report; https://theordev2.s3.amazonaws.com/2023-01/Waste%20Landscape%20Report%20-%20Compressed.pdf

[19] Circle Economy Foundation/Ministry of Infrastructure and Water Management, the Netherlands. (2023), Destination of Dutch used textiles, December 2023;. Page 11: However, there is much uncertainty about the quality and nature of used textiles categorised as 6309; items are not necessarily always fit for reuse and are sometimes even unsorted. Moreover, the 6310 code is often avoided due to

additional regulations on waste exports; as a result, the default is to trade both usable and unusable textiles under the 6309 code.
https://www.government.nl/documents/reports/2024/02/02/destinations-of-dutch-used-textiles

[20] The OR Foundation (2022), op.cit. Around 40% of the clothes circulating through the retail side of Kantamanto leave the market as waste (p.28)

[21] The term “borla” is commonly understood to mean “waste”, but there are other interpretations. At Kantamanto market, “borla” is a technical term referring to quality and is used as a form of bargaining. It’s hard to know what defines ‘borla’ as this can change according to what’s in fashion, as stylish clothes are important in Ghana, or the season, eg. in the lead up to Xmas people want designer clothes. Therefore clothes with nothing wrong with them can be “borla”. If they have no market value at Kantamanto, they effectively become waste.

[22] The Revival states that an estimated 7 million items circulate weekly with about 10% - 40% of clothing bales being thrown away polluting the environment. https://www.therevival.earth/

[23] The OR Foundation (2022), op.cit

[24] Used Clothes Dealer Association (2024), op.cit.See page 15, pages 95-96

[25] Used Clothes Dealer Association (2024), op.cit. This report cites studies on the percentage of textiles waste in Ghana, showing that textile waste makes up just 1.7-2.2% of all waste in Accra, with used clothes a small minority of that. However, most of the studies cited are decades out of date, or refer to waste discarded from households, which would be expected to be low, or not relevant to the location of Accra. See page 17, page 87

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