Manual Dismantling of Cars on the Old Fadama Scrapyard

A process analysis and recommendations for improvement

On behalf of the Environmentally Sound Disposal and Recycling of Electronic Waste Programme (E-Waste Programme)

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The motor behind the restless activities at Agbogbloshie are businessmen, their agents andcollectors, who scan urban and rural areas of the country for scrap cars every day. Most scrap dealers have such an extensive knowledge of the quantity and valuable fractions contained in the car that they can estimate the value of recovery very fast.

There are two categories of scrap vehicles at the OFSY:
A) Small and medium-sized cars
B) Trucks and heavy equipment

In comparison to small and medium-sized cars, the potential for improving the process of truck and heavy equipment dismantling -in regard to health and environment- is far slimmer and much more complex. Therefore, in this report, the focus of process and recommendation will be put on Category A – small and medium-sized vehicles.
The scrap car dismantling at the OFSY happens in two major stages. During the first stage of dismantling -the “pretreatment”- the car is dismantled into its main fractions such as body panels, drive train components, interior and the car body is cut into pieces that can be handled and carried by a maximum of two people.
The fractions that are recovered during pretreatment and neither sold nor dumped undergo a series of “further processing” depending on contents and material. During all of the sequence steps, further fractions will be recovered.
The negative impact of the process is a high level of environmental pollution, for which the causes on the other hand are containable.
Three main causes for pollution were identified during the research:

- Improper methods like burning to recover metal contains from mixed fractions
- Improper disposal of plastics, glass and other waste fractions
- Spilling of hazardous operating fluids

The major measures to be taken to improve the situation are:

- Set up recycling shops that fulfill the necessary requirements, including improved equipments starting with a show case workshop as training center
- Create certification and permit system for car scrap shops to operate in an environmentally sound and safe way
- Training to build capacity on existing know-how
- Introduce proper methods to recover metal cores from mixed fractions
- Set up collection points for the non-valuable fractions and waste

A critical, professional evaluation of the situation suggests that with joint efforts to improve the established system at OFSY, the result might be more efficient and environmentally friendly than ”end-of-life-vehicle-recycling” in developed countries, whilst providing an income opportunity for many.

1. INTRODUCTION

Driven by growing consumer demands and habits, the worldwide need for raw materials is growing daily while resources are running short. Often times, after end-of-life, the devices containing some of these precious materials are thrown away recklessly without considering the valuable materials contained inside. In informal places like Agbogbloshie, workers spend their day and "manpower" recycling scraps and recovering these precious raw materials, often using primitive yet effective methods. Some of these recycling and recovery methods are harmful to health & environment and lack economic efficiency.

In the following pages, we examine manual car dismantling on an informal scrap yard.
The main objectives of the report are to
1. **Analyze** the different steps of manual srap car dismantling at the Old Fadama Scrap Yard, herein referred to as OFSY, including following factors:

- Economic efficiency
- Effect on human health and environment

2. **Give concrete technical recommendations** to GIZ on how to improve processes or process steps in regard to the factors mentioned above.

2. BACKGROUND

The "Old Fadama Scrap Yard" at Agbogbloshie in Ghana has in recent years drawn a lot of attention of the worldwide media in many negative ways. Especially the positive sides of the often primitive but in many ways very effective informal recycling sector are often overlooked.
Since the formal car scrap sector in Ghana, including collection channels and certified recycling facilities, is currently not efficiently developed, the scrap dealers are the main drivers of scrap car recycling in the country.

In Europe, for example, it is the car owner's responsibility to dispose of their vehicle at the "end of life", and the car manufacturers to provide possibilities for this disposal. This transaction generally happens at against a fee. The condition of "end of life vehicles" in Europe is very different from the conditions of end of life vehicles in developing countries. European consumers are quick to "dispose and buy new"; especially when the repair or refurbishment is economically draining, simply disposing of the car in one of the wide-spread certified facilites is much simpler. The boarderline defining the end of life of a vehicle in Europe is the cost of repair against value. Due to comparably low labour- and operational cost of the local "car fitting shops", cars in Ghana are refurbished over and over again. Nevertheless, even cars in Ghana will eventually reach a point where the value of the repaired car doesn't justify the efforts and investments to repair it any longer.
Recycling a car at OFSY will exhaust its resources to the fullest. Comparing pollution to the environment and human health caused by old cars or informal recycling in developing

countries to the pollution of consumer habits of developed countries is disputible. In any case, channels and certified facilities for disposal of cars are at the moment underdeveloped in Ghana. Even more importantly, it is questionable if Ghanaian citizens would be ready to pay for the formal recycling of their scrap cars. This, amongst others, is a reason why the informal scrap collection system in Ghana is so efficient; there is a strong drive of individuals to invest their capital to buy scrap, extract every bit of the various materials it contains and turn it to profit.

3. SOURCE OF SCRAP VEHICLES AT THE OFSY

Walking around on the OFSY, there are a lot of unused vehicles standing around. The first impression might be that they are being dumped all over the place without intent of reuse, but all cars, regardless of their state, have owners. The owners are businessmen called "Scrap Dealers", renting workspaces at Agbogbloshie.
The following report will focus on two categories of cars at the OFSY:
A) Small and medium-sized cars
B) Trucks and heavy equipment
Depending on whether the car is of category A or B, process, fractions and environmental hazards can vary. At present, there are at least six car dismantling shops where small and medium size cars are dismantled, and at least three that specialize in the dismantling of trucks and heavy equipment.

3.1 Collection of Scrap Vehicles

The car scrap dealers, their collectors or agents continuously search households, formal workshops and companies in Accra and far beyond for old or damaged cars, equipment and machines to buy. They know the vehicle prices & spare parts and more so, have a unique ability to estimate the metal fractions contained in the car such as iron, aluminum, copper and brass, including their weights and market values. Even when a car is considered obsolete by the owner, the scraps are not for free. But for the informal car scrap dealer, it's a profitable investment.

3.2 Scrap Vehicles Parked Indefinitely

How long a purchased scrap vehicle sits on the scrap yard depends entirely on the scrap dealer & owner of the scrap car. During the one-week period, I encountered different scrap dealers "parking" their purchased scrap vehicles (whether category A or B) for an indefinite amount of time;
- some claiming they were waiting for the car to be resold "as it is",
- some of them waiting for the steel prices to go up before dismantling into fractions,
- some claiming to wait for "the right day" to dismantle the car without any specific external influences.

Sometimes, scrap vehicles are parked at the scrap yard for months or years due to issues with car documents or disputes over the ownership of the car.

3.3 Vehicles Brought for Random Service Dismantling

Some cars, trucks or equipments are brought to Old Fadama Scrap Yard by "outsiders" for the sole purpose of paying for immediate dismantling. For this purpose, there are teams of mostly four to six workers (mostly "boys") available at OFSY. These service chain providers will be elaborated further in a later chapter (4.2).
In all cases, the vehicles entering Agbogbloshie as scrap are either resold as a wholeor dismantled eventually.

4. LOCATIONS OF DISMANTLING AT THE OFSY

Scrap cars are brought to the OFSY daily; it is hard to tell exactly how many. During the research period, different accounts were given of scrap cars entering the yard; they varied from 100 to 300 per week, including both small and medium-sized cars, as well as trucks and heavy equipment. There are different shops and locations where dismantling of these vehicles takes place.
The drive train components like engines, gearboxes, axles, hydraulic cylinders, assemblies of the trucks and construction equipments are piled at the shops and displayed to be sold as "Ghana used spare parts". Nevertheless, if not sold after a certain period of time, the owner may select some of these drive train components, which all consist of heavy metals (e.g high quality steel aluminum and brass) to be dismantled and sold for their scrap weight value.

4.1 Shops of Scrap Vehicle Dealers

4.1.1 Category A – small and medium-sized cars

At present there are six so called "shops" where small and medium sized cars like saloon cars, vans and SUVs are dismantled for recycling at the OFSY. The term "shop" is referring to an untied area of about 150m2 which the scrap dealers rent, mostly from the Greater Accra Scrap Dealers Association (GASDA). Typically, metal containers of 10qm serve as storerooms for a few tools and some selected spare parts. Small shades are usually set up in a corner of the shops for the workers to have their brake time and relax. The dismantling and cutting of the scrap cars are largely done on the soil in the open sun.
Approximately 5 to 6 cars are dismantled in each shop each day, for 5 to 6 days each week, marking roughly scrap car dismantling 500-600 small and medium-sized cars per month on average.
The owners of these shops are generally not very interested in dealing with the extracted spare parts, but rather have them broken into small fractions to recover the metals and sell them for their scrap metal value.

Img.: A dismantling shop specialized in small and medium sized vehicles (Cat. A) / ©GIZ

4.1.2 Category B – trucks and heavy equipment

During the research period, 3 shops were identified that specialize in the dismantling of trucks and heavy equipments. As opposed to small cars, the frames and bolts of large vehicles are too thick and strong to be cut with chisel and hammer; leading to the dismantling and cutting mainly being performed with a torch and the use of gas and oxygen. Furthermore, trucks and construction equipments have far more road clearance –allowing access to the oil drain plugs– and the engine oil contained in an average truck engine (around 30l) being about 6 times that of a saloon car engine, the truck scrap dealers have recognized this large amount of oil as being a valuable fraction contained in their vehicles.
The hydraulic tanks of heavy construction equipments, like for e.g., a pay loader, can contain between 100l - 500l of hydraulic oil; valued at several hundreds of GHS. Therefore, in the truck dismantling shops the oil is mostly drained and collected. Dismantlers of smaller scrap cars rather spill the oil, because access to drain plugs is difficult and no value is assigned to all the operation liquids.

4.2. Random Service Dismantling

Some local spare part dealers have specialized in buying used damaged or working cars for dismantling. This is because, at times, the value of extracted spare parts, including the value of the scrap fractions, is higher than the sales value of the car itself. This applies to both categories of vehicles and equipments. There are two reasons why these car & spare part dealers bring their vehicles to the OFSY for dismantling:

1) At the scrap yard, there are cutting crews specialized in scrap car dismantling. Most of them are working at specific shops, but there are also some that can be hired as generic dismantlers. Generally, these crews have a remarkable know-how of how to dismantle a car into all its fractions within 1 to 2 hours using basic tools.

2) Agbogbloshie is a hub of potential buyers of the metal fractions that remain after the extraction of spare parts; these fractions find a downstream here after dismantling. The dumpsites located at the OFSY also provide a convenient space for the immediate disposal of plastic and other non-valuable fractions of scrap cars. The locations for this service of car dismantling for outside customers are randomly chosen by the cutting crew anywhere at the Old Fadama Scrap Yard, depending on available space.

Img.: The owner of the car (in yellow shirt) is watching as a group of “boys” dismantle his car in a random location on the side of the road at the scrap yard/ ©GIZ

5. PROCESS OF MANUAL SCRAP CAR DISMANTLING

The dismantling process described in the following chapter recollects the dismantling of a car from its entirety to all possible fractions. The sequence of operation is always the same, although depending on which fractions have been previously removed, steps may be skipped.

In the "**pretreatment**" the car is cut apart and dismantled into its fractions. Selected spare parts and metals are packed for sales.

In the second stage the fractions that need further dismantling are "**further processed**" to extract and separate the final materials.

The risk factors of manual car dismantling in both vehicle A and B on the OFSY are similar;
- the burning and/or dumping of non-valuable fractions like plastic and glass
- burning of fractions that contain steel or other metals like car seats and cables

In comparison to small and medium-sized cars, the potential for improving the process of truck and heavy equipment dismantling -in regard to health and environment- is far slimmer and much more complex. Therefore, in this report, the focus of process and recommendation will be put on Category A – small and medium-sized vehicles.

5.1 Workers, Tools and Equipments

The dismantling of scrap cars at OFSY is generally done by groups of 4 to 6 workers, occasionally by less or even a single man. It takes one crew 1 - 2 hours to dismantle and cut a car with 1 - 3 tons of weight into all main fractions. Of particular economic value is the know-how of the dismantling crew about how and along which lines to cut the hard metal to divide the solid car body into handy pieces within the shortest possible time. Cutting the car body with just chisel and hammer is the hardest part of the dismantling job. It is always one team member who will take the contract for dividing the car body; he will also take the "lion share" of the cutting fee. The rest of the crew, more or less, merely assist him by removing all parts that can be unscrewed and making sure he has free access to cut through the metal inch by inch. The toolbox of the cutting crew contains only a simple set of spanners, knives, chisels and hammers. For the handling of the heavy fractions during dismantling, piling and final loading, small mobile truck cranes are available for hiring all over the OFSY.

Depending on the amount of cars that are dismantled in one day, each of the workers will get one turn to cut the body and collect the "lion share". In interviews, several of the dismantlers revealed that it is not possible for one man to run the chisel on more than one car per day. The dismantling fee paid to the "cutting crew" depends mainly on the size and type of vehicle. At the time of research, the average fee was around 50 GHC per car. It takes about 1 to 2 hours for a normal size saloon car to be dismantled into its main fractions.

5.2 Dismantling Stage One: Pretreatment

The system of dismantling at the OFSY much resembles the systemic process at a car assembly line, only in reverse. Each stage consists of several sequence steps, which are elaborated further below. The biggest difference between manual car dismantling in developed countries and Ghana is the lack of technical equipment to lift the car. This guarantees quick access to drain plugs and removal of operating fluids, batteries, tires and other high-valuable components like catalytic converters. Below is a list of pretreatment steps (first step of dismantling) at the OFSY and an overview of their environmental impact.

Pretreatment steps	Impact to Health	Environmental Impact
Cutting of oil and Oil/water hoses	Oil and coolant spilt	Soil/Water bodies
Removal of battery	None	None
Removal of body panels	None	None
Removal of lights	None	None
Removal of interior	None	None
Removal of front and rear screens	Cuts on the body, glass entering eyes	Soil
Cutting of car body with chisel	High risk of injuries (fierce metals)	None
Removal of dash board	None	None
Removal of steering column	None	None
Removal of heating/AC blower	None	None
Removal of exhaust/cat	None	None
Removal of radiator, oil cooler	Oil and coolant spilt	Soil/water bodies
Removal of AC condenser	Refrigerant released into ambient air	Ambient air
Removal of drive train	Oil spilt	Soil/water bodies
	Manul lifting of heavy assemblies	
Removal of suspension	Brake fluid spilt	Soil/water bodies
Removal of fuel tank	Fuel spilt	Soil/water bodies
Removal of wheels	None	None

Table 5.2 Environmental hazards during pretreatment of scrap cars

5.2.1 Steps and Recovered Fractions

The table below shows a list of fractions that are separated during stage one. Fractions marked green are ready to be sold right after pretreatment. The fractions marked red are of no value to the scrap dealer and will probably be dumped or burnt as waste. The unmarked fractions will be further processed in stage two.

Recovered Fraction	Further Processing
Battery	Sold to Battery recycler
Doors	Further separation
Bonnet	Sold as steel scrap
Fenders	Sold as steel scrap
Bumpers	Waste, dumped or burned
Lights	Waste, dumped or burned
Seats	Further separation
Interior plastics	Waste, dumped or burned
Carpets	Waste, dumped or burned
Wind/rear screen	Waste, dumped
Steering column	Further separation
Dash board	Further separation
Cables	Further separation
Control units	Sold to E-waste recycler
Electric motors	Further separation
Heat/AC blower	Further separation
Exhaust	Sold as steel scrap
Catalytic converter	Further separation
Radiator	Further separation
Oil cooler	Further separation
AC condenser	Further Separation
Engine	Further separation
Gearbox/transmission	Further separation
Axles/differential gear	Further separation
Drive/propeller shaft	Sold as high grade steel
Front suspension	Further separation
Rear suspension	Further separation
Fuel tank	Further separation
Wheels	Further separation
Air bags	Sold as spare parts

Table 5.2.1 Fractions from first dismantling stage

5.2.2 Impact on Health and Environment

Currently, since there is no technical equipment available on the yard, the workers generally commence the dismantling without the necessary “draining” of the vehicles. This poses a challenge, as shown in table 5.2, the main health and environmental problems caused during pretreatment of cars at Agbogbloshie are harmful fluids like oils, brake fluids, coolants and fuel spiltinto the soil. These liquids do not have a drastic effect on the workers, but contaminate the ground and, in effect, the water bodies nearby. This negative impact on human health and the environment causes an ecological as well as biological imbalance and harm far beyond Agbogbloshie on a medium and long term.

Direct health risks for the workers are sharp fragments and pieces of broken glass that can cut into body parts during the breaking of wind/rear-screen or other car windows. As well, lacerations caused by the fierce edges of rough chiseled metal sheets and bruises and broken bones in effect of slipped and fallen heavy car parts carried by hand. During the mission, the only safety equipment that was occasionally observed to be worn were hand gloves.

Img.: A car dismantling shop and the harmful remains of the improper manual dismantling process: brake fluids, oil, coolant and fuel have contaminated the ground / ©GIZ

5.3 Dismantling Stage Two: Further Processing

5.3.1 Steps and Recovered Fractions

The fractions that are recovered during pretreatment and neither sold nor dumped undergo a series of further dismantling and process steps depending on contents and material. During all of these sequence steps, further fractions will be recovered. Below is a list of these fractions, including further processing steps and their environmental and health impacts.

Stage One	Stage Two Step 1	Step 2	Step 3		
Recovered	Recovered/ Process	Recovered/ Process	Output	Health Risk	Environmental Impact
Doors	Steel	None	Steel, sold	None	None
	Glass	None	Dumped	Low	Soil
	Cables	Copper	Copper, sold	None	None
		Gas/ashes	Soil/ambient air	High	Soil/ambient air
		Ashes	Soil	High	Soil/Water bodies
	Power window motors	Steel	Steel sold	None	None
		Copper	Copper, sold	None	None
	Plastics	Gas/ashes	Soil/ambient air	High	Soil/ambient air
		Ashes	Soil	High	Soil/Water bodies
Seats	Steel	None	Steel, sold	None	None
	Gas/ashes	None	Soil/ambient air	High	Soil/ambient air
	Ashes	None	Soil	High	Soil/Water bodies
Steering column	Steering wheel	Steel	Steel sold	None	None
		burnt	Gas/ashes	High	Soil/ambient air
		burnt	Ashes	High	Soil/Water bodies
	Steering shaft	Steel	Steel sold	None	None
	Airbag	None	Sold as spare part	None	None
Dash board	Instrument cluster	None	Sold as E-waste	None	None
	Steel	None	Steel, sold	None	None
	Gas/ashes	None	Soil/ambient air	High	Soil/ambient air
	Ashes	None	Soil	High	Soil/Water bodies
Cables	Copper	None	Copper, sold	None	None
	Gas/ashes	None	Soil/ambient air	High	Soil/ambient air
	Ashes	None	Soil	High	Soil/Water bodies
Electric motors	Copper	None	Copper, sold	None	None
	Steel	None	Steel, sold	None	None
Catalytic converter	Stainless steel	None	Steel, sold	None	None
	Platinum	None	Metal, sold	None	None
	Iridium	None	Metal, sold	None	None
	Palladium	None	Metal, sold	None	None
Heating/AC Blower	Blower motor	Steel	Steel sold	None	None
		Copper	Copper, sold	None	None
	AC Evaporator	Aluminum	Aluminum, sold	None	None
	Heat exchanger	Aluminum	Aluminum, sold	None	None
	Plastics	Gas/ashes	Soil/ambient air	High	Soil/ambient air
		Ashes	Soil	High	Soil/Water bodies
Radiator	Aluminum	None	Aluminum, sold	None	None
	Plastics	Gas/ashes	Soil/ambient air	High	Soil/ambient air
		Ashes	Soil	High	Soil/Water bodies
Oil cooler	Aluminum	None	Aluminum, sold	None	None
AC condenser	Aluminum	None	Aluminum, sold	None	None
Engine, Gear box, Trans-mission, Axle, diff. gear	Oil	None	Spilt to soil	High	Soil/Water bodies
	Steel	None	Steel, sold	None	None
	High grade steel	None	Steel, sold	None	None
	Aluminum	None	Aluminum, sold	None	None
	Bras	None	Bras, sold	None	None
	Brake fluid	None	Spilt to soil	High	Soil/Water bodies

Front/rear suspension	Spring steel	None	Steel, sold/up-cycling	None	None
	Steel	None	Steel, sold	None	None
	Aluminum	None	Aluminum, sold	None	None
	Shock absorbers	Oil	Spilt to soil	High	Soil/Water bodies
		Gas	To ambient air	Low	Ambient air
		Steel	Steel, sold	None	None
Fuel tank steel or plastic	Fuel level Sensor	None	Sold as E-waste	None	None
	Steel	None	Steel, sold	None	None
	Plastic	Gas/ashes	Soil/ambient air	High	Soil/ambient air
		Ashes	Soil	High	Soil/Water bodies
Wheels, steel or Aluminum rims	Steel	None	Steel, sold	None	None
	Aluminum	None	Aluminum, sold	None	None
	Tires	Steel	Steel, sold	None	None
		Gas/ashes	Soil/ambient air	High	Soil/ambient air
		Ashes	Soil	High	Soil/Water bodies

Table 5.3.1: Materials recovered and risks for environment and health during further processing of scrap car fractions

5.3.2 Health Risks

The following table has zoomed in on the health risks and environmental pollutions (as shown in 5.3.1) caused during further processing of the fractions recovered in the pretreatment. The table illustrates clearly that many of the hazardous outputs and implications in the dismantling process could be avoided by improving the first stage of dismantling, or the first steps of the second stage of dismantling.
Clearly visible in the table below are the impacts on the ground and soil by spilling of fluids, as well as the impact on the ambient air by burning of non-valuable fractions recovered from dismantling. The high-risk processes are not very many in comparison to the overall process amount of manual car dismantling, but due to a highly repetitive character, the impacts inevitably cause medium and long-term negative effects on the environment.

Stage One	Stage Two Step 1	Step 2	Step 3		
Recovered	Recovered/ Process	Recovered/ Process	Output	Health Risk	Environmental Impact
Doors	Glass	None	Dumped	Low	Soil
	Cables	Gas/ashes	Soil/ambient air	High	Soil/ambient air
		Ashes	Soil	High	Soil/Water bodies
	Plastics	Gas/ashes	Soil/ambient air	High	Soil/ambient air
		Ashes	Soil	High	Soil/Water bodies
Seats	Gas/ashes	None	Soil/ambient air	High	Soil/ambient air
	Ashes	None	Soil	High	Soil/Water bodies
Steering column	Steering wheel	Gas/ashes	Soil/ambient air	High	Soil/ambient air
		Ashes	Soil	High	Soil/Water bodies
Dash board	Gas/ashes	None	Soil/ambient air	High	Soil/ambient air
	Ashes	None	Soil	High	Soil/Water bodies
Cables	Gas/ashes	None	Soil/ambient air	High	Soil/ambient air
	Ashes	None	Soil	High	Soil/Water bodies
Heating/ AC Blower	Plastics	Gas/ashes	Soil/ambient air	High	Soil/ambient air
		Ashes	Soil	High	Soil/Water bodies
Radiator	Plastics	Gas/ashes	Soil/ambient air	High	Soil/ambient air
		Ashes	Soil	High	Soil/Water bodies
Drive train components	Oil	None	Spilt to soil	High	Soil/Water bodies
Front/rear suspension	Brake fluid	None	Spilt to soil	High	Soil/Water bodies
	Shock absorbers	Oil	Spilt to soil	High	Soil/Water bodies
		Gas	To ambient air	Low	Ambient air
Fuel tank plastic	Plastic	Gas/ashes	Soil/ambient air	High	Soil/ambient air
		Ashes	Soil	High	Soil/Water bodies
Wheels	Tires	Gas/ashes	Soil/ambient air	High	Soil/ambient air
		Ashes	Soil	High	Soil/Water bodies

Table 5.3.2: Health risks and environmental pollutions during further processing of scrap car fractions (second stage dismantling)

6. IMPACT OF MANUAL CAR DISMANTLING

6.1 Challenges at the OFSY

The majority of the direct risks to the human body like cuts bruises, broken bones etc. of the workers dismantling cars at Agbogbloshie is due to the **lack of tools and technical equipment and as well the absence of protective equipment** like safetyboots, protection goggles etc. It was observed on several occasions during the mission that dismantlers were wearing only sandals or slippers on their feet. The manual dismantling of scrap vehicles is a very hard and tough physical challenge for the workers. To cut the car body manually as it is done at Agbogbloshie the worker has to keep hitting the chisel nonstop for about 1 hour with full force through door frames and along the floor metals and metal sheet assemblies. One dismantler said:

“By the time I am done, skin will be peeling off my hands. My arms, legs and hands will be full of cuts and bruises and my whole body will be tired”.

The drain plugs to drain the various operation fluids contained in the drive train and other systems of a car are almost exclusively located in the floor group and can generally only be accessed from underneath. Moreover, a clearance to the floor is required to position necessary containers to collect the liquids. This means for a proper “draining”, the car needs to be lifted. Since there are **no lifting equipments or car jacks** at any of the dismantling shops at OFSY, there is currently no proper draining of the vehicles, causing the fluids to spill on the ground. These operation fluids communicate between various components within the technical system of a car via connection pipes and hoses, which are cut, broken or torn during the dismantling process, making the spilling of hazardous fluids currently inevitable. When operating fluids are not drained as a very first step of the dismantling process, the uncontrolled leaking into the soil and ground continues throughout both dismantling stages, since fluids are contained in different parts that will be further processed. Detached from the dismantling of an entire car, dismantling of single car parts such as engines and all other drive train components is a common practice all over Agobloshie in random locations throughout the yard.

Another challenge is the disposal of non-valuable fractions. The dumping and burning of residue plastics, cables and other fractions seems to be an effect of **lack of sustainable downstream channels, clean disposal mechanisms and/or lack of collection streams to recycling facilities** and is a general problem at the OFSY, unlimited to car scrap dismantling. During the whole duration of the research not a single waste truck was seen taking waste out of the scrap yard. According to statements in interviews only materials and goods with economic value leave Agbogbloshie.

Many of the plastic- and other waste-fractions recovered from dismantling a scrap car at Agbogbloshie are quite spacious and piling them occupies a huge area and volume. Agbogbloshie is a vastly growing landscape of businesses and entrepreneurs, and **space is limited**. If a material does not have economic value, the shop owner will not use his space to pile waste materials, but immediately send them for dumping.

6.2 Risks to Human Health and Environment

The impacts on the human body, health and the environment as a subsequence of the challenges mentioned above can be summarized into following categories:

- **Spilling of Hazardous Operating Liquids of the Scrap Cars**
  This is mainly due to lack of proper car draining and has led to a big part of the surface having turned black from dirty oil that has soaked into the ground and will eventually also find its way into water bodies.

- **Dumping of Non-Valuable Fractions (e.g Plastics & Glass)**
  There is no alternative for the dismantlers to dispose of the non-valuable materials, leading to the dumping of these waste materials on the dumpsite located within the scrap yard.

- **Burning of Non-Valuable Fractions (e.g Plastics)**
  End-of-life vehicles come in and fractions of them leave the scrap yard again as valuable output. But the non-valuable fractions remain on the scrap yard. These non-valuable fractions are frequently burned, releasing toxic gases, fumes and ashes into the ambient air and leaving toxic ashes in the soil. Occasionally these fractions are burned next to the dismantling shop right after dismantling the car.

- **Burning of Valuable Fractions to Recover Metal**
  Burning of cables to recover copper and aluminum is the most well-known health risk and environmental pollution at Agbogbloshie. The same improper recycling method is used to recover the metals from seats, steering wheels, dash boards and other scrap car fractions consisting of a metal core that is covered with foam or other plastic materials. The pollutions effect health and environment and the chemical composition of the gases, fumes and substances released are toxic.

- **Injuries and Damages to Human Body**
  The work is done on the loose and dirty soil in the open sun. The sweat and dirty oil softens the skin and dust and dirt rub like sandpaper between hand and handles of chisel and hammer. As well, the cutting creates sharp edges and fierce metal sticking out, causing cuts and flesh wounds.
  Finally, the drive train components like engine and transmission assemblies are most of the time oily and slippery. Lifting and carrying them by hand poses a high risk of bruises and broken bones.

Img.1: Operation liquids are leaked into ground and soil, causing pollution / ©GIZ
Img.2: Non-valuable fractions like glass often get dumped and cause hazards to human safety / ©GIZ

6.3 Opportunities and Economic Value

The main agenda of the people working at the OFSY is to recycle and sell the raw materials they extract. This becomes apparent when observing the scraps and end-of-life devices coming in and the well-separated fractions like Fe- and non-Fe metals going out of the scrap yard daily. Although most reports about places like Agbogbloshie focus on the pollution and impoverished living conditions in immediatesurroundings, there are also some positive sides to informal scrap car recycling in places like Agbogbloshie. Some of these aspects that contribute to economic efficiency in the country are mentioned below.

- **The OFSY: Hub for Scrap Vehicle Recycling in Ghana**
  Scrap vehicle recycling has become the source of income for many Ghanaians. Although it is done all over the country, the OFSY is currently the

hub for manual scrap vehicle dismantling. The men that are part of this service chain to recover and deliver raw materials feed on the value gained by dismantling and separating the scrap cars into all possible fractions. Without them, there would be much more unused cars standing around all over the country.

- **Unique Knowledge- & Skills**
  The OFSY has an economically functioning and efficient system when it comes to scrap extraction and recycling. Although there are a few improvements that would be required to make Agbogbloshie an environmentally sound "scrap park", the system doesn't have to be reinvented entirely. There is an incredible amount of know-how and expertise on the scrap yard when it comes to scrap metals. The separation of scrap cars into the various material fractions at the OFSY goes very close to as far as it can, and this knowledge is effectively passed on between shop owner and his "boys", comparable to the system of apprenticeships in European countries.

- **Effective and Low-cost Separation of Scrap Vehicle Fractions**
  It seems like most of the materials entering the scrap yard are resold and sent back into the economy, including developed countries.
  In comparison to the highly costly and energy-intensive car recycling system in Europe, where the car is shredded into small fractions before the materials are separated again using a combination of physical methods, the separation of scrap car fractions on the OFSY is highly effective, while keeping costs low. The manual dismantling consumes no energy apart from manpower, and the whole scrap car is broken straight into the final fractions with exception of electronic components that are further processed as e-waste. As well, the manual process of dismantling at Agbogbloshie is debatably more environmentally friendly than the high-tech processes of car recycling in Europe.

- **Creative Upcycling of Scrap Car Fractions**
  Many workers are very innovative in upcycling waste fractions. Almost all the chisels used by the dismantler at Agbogbloshie are made by black smiths at the scrap yard using old car springs, drive shafts or other high-quality steels coming from scrap cars. Entrepreneurs here create brass rings from vehicle gear boxes into elegant bracelets or manufacture coal pots and other household appliances from car bonnets and other waste metal sheets.

7) RECOMMENDATIONS FOR PROCESS OPTIMIZATION

7.1) Recommendations to Reduce Negative Impact on Health and Environment

a) Reduce the Risk of Injuries

i. Safety and Protective Equipment
Many injuries of the workers during scrap car dismantling could be prevented by using safety boots, goggles, hand gloves, proper working clothes and upgraded tools and equipment.

ii. Optimized Workshop Setup
A proper workshop structure with roof, walls and concrete floor, as well as proper order of tools and equipment will reduce chances of accidents and injuries

iii. Improve Process of Glass Removal
Pieces of broken glass on the soil and all over the scrap car present a health and environmental hazard. A proper method for the removal of wind/rear screen and other car windows needs to be introduced

iv. Training
Regular training of dismantlers in regard to safety, accident prevention and first aid in general, and specifically in respect to risks occurring during the process of scrap car dismantling.

b) Prevent Contamination of Soil and Water Bodies through Oil and Other Operating Fluids

i. Proper Draining of Cars
One of the major improvements towards a more environmentally sound system of recycling would be the prevention of spilling of operating fluids. The first sequence step in the first stage of dismantling (pretreatment) must be draining the car, which means both the extraction of all liquids, as well as their subsequent recycling or proper disposal. To prevent contamination of soil and water bodies, this must become a routine for the dismantlers and their first work step. After the draining, it should be mandatory for all parts and components that will be further processed to be “dry” and free of hazardous fluids.

ii. Solid Floors
To capture all hazardous fluids that might spill during draining and dismantling process, the dismantling should be done on a leakage-proof floor with appropriate oil-traps and –separators connected between workshop and environment.

c) Prevent Burning of Non-Valuable Fractions

i. Proper Scrap Car Recycling Methods
Introduction of recycling methods that allow recovering of metal cores from

components like seats, dash boards and cables to prevent the burning of those components

ii. Waste Collection Points
Setup of plastic waste collection points on the OFSY for to prevent burning of such materials

d) Prevent Dumping of Non-Valuable Fractions

i. Waste Collection Points
Introduction of collection points for plastic, glass and waste to prevent dumping of such materials

7.2) Recommendations to Enhance the Work Process

a) Introduce Proper Workshops, Equipments and Training

i. Setup of Workshops
Dismantling the scrap cars in a proper workshop with concrete floor, roof and walls will be a great enhancement for work. Protection against direct sun and a clean floor will improve the workflow and contribute to a pleasant work environment and positive mindset.

ii. Introduction of Technical Equipment
The design and introduction of special lifting equipments to elevate cars will allow access to the floor group from underneath. In combination with additional lifting equipment and power tools like impact wrench, pneumatic chisel and electric or pneumatic cutting tools, taking out of suspension and the major drive train components becomes much easier and faster for the dismantlers. Lifting equipments will also enhance the handling of all heavy components.

iii. Training and Capacity Building
The introduction of sophisticated equipment at the Old Fadama Scrap Yard will require a solid training of the dismantlers. If these heavy duty equipments are not handled properly, they are likely to cause harm and injures than to help the process.

7.3) Recommendations for Practical Implementation to Improve Process

a) Develop Scrap Car Recycling Workshop as Car Dismantling Training Center

A “show case workshop” that also functions as a training center will ensure that dismantling can be done more effectively and easier with help of modern equipment and under the supervision of qualified trainers. Improving the process should be on a practical base, rather than a theoretic base.

The introduction of proper workshops with leak-proof concrete floors and equipped with appropriate devices like oil-traps/separators to prevent spilling, as well as equipment like lifting devices to elevate cars and machines are the most important measures to sustainably achieve an environmentally sound recycling of “end of life vehicles” at the Old Fadama Scrap Yard. For starters, there should one state-of-the-art recycling workshop and training center at an appropriate location within the Old Fadama Scrap Yard. The training objects will be scrap cars of shop owners, and the dismantling process will be supervised by qualified trainers, teaching proper use of equipments and methods. The dismantlers could use the facility against a fee to do their jobs faster, easier and cleaner and at the same time learn how to handle equipments and adapt new methods.

The design of such a recycling center, especially the equipments to elevate cars should be customized to the manual approach that characterizes the existing system. Main goals for the design must be simplicity, effectiveness and lowest possible cost. For example, standard car lifts used at repair shops are for technical reasons not suitable for this particular challenge.

b) Oil Recycling Equipment

Extra income generated through the recycling of operation fluids will give the workers an incentive to keep the oil as a valuable fraction rather than dispose of it.

Oils mostly don’t go bad or spoil during the use but they only get dirty which reduces the viscosity. The recycling of oil is a simple process, as long as it is one specification and not mixed with any other liquids. E.g the amount of transmission oil contained in cars with automatic transmission is generally higher than the quantity of oil in the engine, and the sales value per liter is also much higher. As long as they are not mixed, they can be resold as fresh after recycling, providing an additional income source for the dismantlers. The recycling equipment needed is only a relatively inexpensive device with a high-pressure pump pushing the dirty oil through fine filters to produce clean oil output.

The additional revenue generated with recycled operating fluids ranges between 50-200GHS per car. Considering the fact that the dismantling fee for a medium size car at the time of the research was around 50GHS, the extra income from recovered oils and liquids will be a strong incentive for the workers to identify the operating liquids they currently spill as a valuable fraction.

c.) Use Recycling Workshop as Role Model for private Workshops

Creating the opportunity on the scrap yard to enhance work process and economic efficiency through the use of a state-of-the-art recycling workshop can be a good incentive for the workers to invest in upgrading their own workshops. To facilitate

this upgrade, financing models supporting construction and the purchase of equipment would be a good method to drive this change.

d.) Certify Scrap Car Recycling Shops

Creating a certification and permit system for scrap car dismantling workshops that operate in an environmentally sound and safe way will support the overall improvement of the OFSY if Scrap car dismantling is only allowed in certified workshops which fulfill the necessary requirements.

8) Final Evaluation

Scrap vehicle recycling at the OFSY in Ghana has established itself as a common informal recycling landscape that provides an income opportunity for many individuals and families. The existing know-how results in efficient manual dismantling, achieving a high level of separation of the various fractions. Especially the metals contained are separated to almost the furthest possible extent. The direct health risks to the workers involved are mainly due to poor tooling & equipment, and the absence of safety and protective equipment. The negative impact of the process is a high level of environmental pollution, for which the causes on the other hand are containable. The main challenge all over the OFSY Yard seems to be to find ways to deal with the “waste of the waste”.

Three main causes for pollution were identified during the research:

- Improper methods like burning to recover metal contains from mixed fractions
- Improper disposal of plastics, glass and other waste fractions
- Spilling of hazardous operating fluids

The major measures to be taken to improve the situation are:

- Set up recycling shops that fulfill the necessary requirements, including improved equipments starting with a show case workshop as training center
- Create certification and permit system for car scrap shops to operate in an environmentally sound and safe way
- Training to build capacity upon existing know-how
- Introduce proper methods to recover metal cores from mixed fractions
- Set up collection points for the non-valuable fractions and waste

With joint efforts of the stakeholders to improve the process of scrap car dismantling at the Old Fadama scrap yard in regard to environment, health and economic efficiency, this recycling hub has the potential to become an effective and safe end-of-life-vehicle recycling center.

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