

Field Report

on the excursion with focus on municipal waste management in Ghana

Summer Term 2022

26.05.2022 – 03.06.2022



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Vorwort

Vom 26. Mai bis zum 03. Juni 2022 wurde in Kooperation mit der University of Ghana eine Fachexkursion in Ghana durchgeführt, an der sowohl 15 Studierende aus Deutschland als auch 15 ghanaische Student*innen teilnahmen. Der Schwerpunkt der Exkursion lag auf dem Themengebiet Abfallwirtschaft.

Ghana hat ein schwerwiegendes Abfallproblem. Es fehlt an Umweltbewusstsein sowie an finanziellen, strukturellen und personellen Ressourcen im Abfallsektor. Eine geregelte Abfallentsorgung existiert nur in wohlhabenderen, städtischen Gebieten, in denen Menschen für diesen Service bezahlen können. Überall sonst wird Abfall in der Umwelt „entsorgt“, vor der Haustüre verbrannt oder auf unkontrollierten Müllhalden abgelagert.

Die Exkursion nach Ghana, die vom laufenden BWS plus Projekt „Problemfelder und Lösungsansätze für eine nachhaltige und einkommensgenerierende Abfallwirtschaft in Ghana“ kofinanziert wird, sollte dazu beitragen, Ansätze zur Lösung dieser Abfallproblematik zu entwickeln, umzusetzen und zu evaluieren. Durch die vollständige Integration des BWS plus Projekts in das Curriculum des Studiengangs „Ressourcenmanagement Wasser“ wurden erstmals Studierende eines Studiengangs über drei Jahre aktiv in die Projektumsetzung in einem Entwicklungsland eingebunden.

Zwei der drei geplanten Exkursionen nach Ghana konnten leider aufgrund der Covid-19-Pandemie nicht stattfinden (2020 & 2021). Die diesjährige Exkursion war insbesondere deshalb für den interkulturellen Austausch von Studierenden, den Aufbau von Sozialkompetenzen und die Förderung des unternehmerischen Denkens in Bezug auf die Durchführung und Evaluation der im Projekt entwickelten Micro-Business-Projekte bedeutungsvoll. Darüber hinaus vermittelte die Exkursion den Studierenden Einblicke in gänzlich andere Lebenswelten und konnte so ggf. Anregungen für die Wahl des Praxissemesters, die Erarbeitung einer Bachelorarbeit oder die spätere Berufswahl vermitteln.

Foreword

From May 26th to June 3rd, 2022, a field trip to Ghana was carried out in cooperation with the University of Ghana. A total number of 15 students from Germany and 15 Ghanaian students participated in this excursion that focused on the topic of waste management.

Ghana has a serious waste problem. There is a lack of environmental awareness as well as financial, structural and human resources in the waste sector. Regulated waste disposal exists only in more affluent, urban areas where people can pay for the service. Everywhere else, waste is "dumped" in the environment, burned on the doorstep, or deposited in uncontrolled landfills.

The field trip to Ghana, co-financed by the ongoing BWS plus project "Problem Areas and Solution Approaches for Sustainable and Income Generating Waste Management in Ghana", was intended to help develop, implement and evaluate approaches to solving this waste problem. By fully integrating the BWS plus project into the curriculum of the "Resource Management Water" degree program, students of a degree program were actively involved in project implementation in a developing country for the first time over a period of three years.

Two of the three planned field trips to Ghana unfortunately could not take place due to the Covid 19 pandemic (2020 & 2021). This year's excursion was therefore particularly significant for the intercultural exchange of students, the development of social skills and the promotion of entrepreneurial thinking in relation to the implementation and evaluation of the micro-business projects developed in the project. In addition, the excursion gave the students insights into completely different living environments and could thus provide suggestions for the choice of the practical semester, the preparation of a bachelor thesis or the later choice of career.

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1. General Overview about Ghana

Authors: Sarah Schöllkopf, Alina Weisser

Facts and Figures



Figure 1: Flag of Ghana
 Source: Country flags, 2020

Name:	Republic of Ghana
Capital:	Accra
Official language:	English
Area:	238.540 km ²
Inhabitants (2021):	31.000.00
Life expectancy at birth:	68.7 years
Child mortality < 5 years/ 1000 births:	46.4 years
Population distribution	
< 15 years:	37.1 %
15-64 years	59.7%
> 64 years	3.1%
Gross Domestic Product (GDP; 2021):	76.4 billion USD
GDP / inhabitant (2021):	2,441 USD
Expenditure (% of GDP):	
Public health (2019)	3.4%
Public education (2018)	4%
Unemployment rate	
15-64 years old (2021)	4.7%
15-24 years old (2021)	9.6%

Source: Statistisches Länderprofil 2021 & Länderprofil Ghana, 2022

History of Ghana

The Republic of Ghana was called Gold Coast in former British colonial times. The first contact between Europe and the Gold Coast was in 1470 when a party of Portuguese landed. The Portuguese built the Elmina Castle as a permanent trading base in 1482. In the next three centuries the English, Danes, Dutch, Germans, and Portuguese controlled different parts of the coastal. The European traders build about forty "slave castles", three on the Gold Coast, e.g. Cape Coast Castle. The castles were originally trading posts but were later used in the trans-Atlantic slave trade.

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In 1821, the British Government took control of the British trading forts in Ghana and the Fanti chiefs in the area signed an agreement with the British in 1844. This agreement became the legal steppingstone to colonial status for the coastal areas in 1878. Before 1946, the four British territorial divisions were administered separately and after 1946 they ruled them as one unit. In 1954, a new constitution was approved, and a new cabinet was established. The cabinet was formed with African ministers drawn from an all-African legislature chosen by direct election. In the following election, the Convention People's Party won the majority of seats. The new Gold Coast government issued a white paper containing proposals for Gold Coast independence in May 1956. The British Government stated it would agree to independence if a majority of the Gold Coast Legislative Assembly were received after a general election. This election turned the Convention People's Party (CPP) with 71 of 104 seats to the power of the Legislative Assembly and Ghana became independent on March 6th, 1957. The Gold Coast was renamed Ghana upon independence in 1957.

Government and Politics

After the independence, the CPP government under Nkrumah present Ghana as a modern, semi-industrialized and unitary socialist state. The CPP's control was criticized because the government got more and more power. In 1964, a constitutional referendum changed the country to a one-party system. On February 24, 1966, Nkrumah's regime was overthrown by the police and the Ghanaian Army. The new government promised a return to a duly constituted civilian government. Members of the judiciary and the civil service remain in their posts and civil servants' committees have been set up for the administration of the country. After a parliamentary election in 1969, Ghana's government returned to civilian authority. In an election in 1970 Akufo-Addo was chosen as President. Economic problems and inflation led to dissatisfaction among the population. In 1971, military officers seized power. The coup leaders promised a better quality of life for all Ghanaians. They could not keep their promises and there were further changes in government. In 1979, the constitution was repealed, the president and his cabinet were suspended, political parties were banned, and the Provisional National Defense Council (PNDC) was established. The PNDC allowed a 258-member Consultative Assembly under international and domestic pressure for a return to democracy. The Assembly drew a draft constitution to establish the Fourth Republic. In 1992, the ban on party politics was lifted and the constitution entered on January 7, 1993. The constitution was

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designed to establish the concept of power-sharing and incorporates provisions and institutions drawn from British and American constitutional models. Since 2017, Nana Akufo-Addo from the National People's Party is the president of Ghana.

Political Conditions

The last constitutional amendment was in 1993. Now there are three branches. The first branch is the executive, with the president, who is popularly elected for a maximum of two 4-year terms. There is also a Council of State and a presidential appointed consultative body with 25 members. The second branch is the legislative with a unicameral Parliament popularly elected for 4-year terms. The third is the judicial, with independent Supreme Court justices, who are nominated by the president with the approval of Parliament.

Geography

Ghana is located on West Africa's Gulf of Guinea close to the Equator. It is bordered by Burkina Faso on the north, by Côte d'Ivoire in the west, and by Togo in the east. The area of Ghana is about 238,500 km² and the capital is Accra with about 2.5 million inhabitants. The distance across the widest part of the country is about 560 km and only half of the county is above 152 meters sea level, the highest point is Mount Afadjato at 883 meters. Ghana has a 537 km long coastline with a low, sandy shore backed by plains and scrub. The tropical rainforest belt which is broken by heavily forested hills and many rivers produces most of the country's cocoa, minerals, and timber. The Volta Lake is the largest manmade lake in the world and is about 1,500 km long. The lake generates electricity and provides inland transportation, and also is a resource for irrigation and fish farming.



Figure 2: Umbrella Tree
Source: Guentherodt, 2022

Climate

Ghana has a tropical climate. The coast belt in the east is warm and dry, the southwest is hot and humid, and the north is hot and also dry. In the south are two rainy seasons, which are from May to June and August to September. The rainy seasons in the north merge. The rainfall in the coastal zone is between 1100 mm in the north to 2100 mm in the southeast. The south is much wetter and has high temperatures, therefore, lush forests and all kinds of crops grow throughout the year. The highest temperatures are in March and the lowest in August. The average temperature is about 26 °C (*Ghana - a country profile o. D.*).

Economy

Ghana has a rich and diverse natural resource base, which leads to the export of products like minerals, gold, diamonds, manganese, and so on. In addition, in 2007 they discovered oil off the coast of Ghana. Because of the oil, Ghana gained international interest. Ghana is now the third-largest producer of oil in West Africa. In Ghana, agriculture is a mainstay of the economy. A third of all export revenues is provided by cocoa. Other products such as timber, coconuts, shea butter, and coffee are also exported. Basic food like rice, peanuts, corn, millet, and sorghum are grown for local consumption. Compared to many other African countries, Ghana's industrial base is advanced. In Ghana, there are industries like textiles, apparel, steel, tires, cocoa processing, tobacco, and car assembly. The Industry including mining, manufacturing, construction, and electricity is 30 % of GDP. For Ghana, the two top export products are gold and cocoa. Due to political stability and economic growth over the last 20 years, there was an inflation rate of 20 % but it has been reduced to 10 %.

Education

In Ghana, primary and junior secondary school is mandatory and tuition-free. In 1996 launched one of the most ambitious pre-tertiary education programs in West Africa. Article 39 of the law stipulates the major tenets of the free, compulsory universal basic education initiative in Ghana. Since then, the costs for education have risen from 1.5% to nearly 3.5 % of GDP. The ministry of education, Science, and Sports have different units which are responsible for education. For example, the Ghana Education Service or the West African examinations Council. Pre tertiary education in Ghana includes six years of primary education, three years at the junior secondary

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school level, and three years at senior secondary school level. This school program was introduced in 1986. In 2007 a new educational reform is introduced.

At age four there are now two years of kindergarten, and three years of senior secondary school are increased to four. If you complete successfully from senior secondary school you are admitted to colleges, polytechnics, and universities. Of 5.1 Million students are, 68 % at primary level, 23% at junior secondary level, and 10% at senior secondary level. Only about 34% of senior secondary school graduates are able to gain admission to universities.

There are nine public universities in Ghana and twelve private degree-granting universities in Ghana. Also, there are teacher training colleges and nurses training colleges, as well as polytechnics. (*Ghana - Statistisches Länderprofil 2021 & Länderprofil Ghana 2022*)

Culture

Language

In Ghana there are many ethnic groups, therefore many languages are spoken. For example, Akan languages, Ga Hausa Ewe, and many more. In addition, there are several dialects. English is the official language. In school, English and Akan are taught. French is also becoming increasingly important in Ghana. Most Ghanaians can speak several languages fluently.

Music

Music, singing, and dancing play an important role in Ghana. There is traditional music, as well as modern music. Traditional music is mainly characterized by drums. In the past, drumming was used for all kinds of festivities, such as funerals and weddings.

Religion

There is freedom of religion in Ghana and there is a lot of tolerance for different faiths. Many ethnic groups are represented in Ghana, but Christianity is the most dominant religion. Due to the many religions, many religious holidays are celebrated.

The Position of Women

In Ghana, women have a high status. For example, the Akan people have a tradition where the maternal line decides on questions of consanguinity. Also, women always have custody of the children after a divorce. The inheritance after the death of the husband does not go to his own children, but to the children of his sister. As the British introduced their system, inequalities arise in positions of professions or the double burden of child and work. However, the woman is considered equal and respected. (Kultur Ghanas, Afriwhere; Afrika – Ghana, Planet Wissen)

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2. Waste Management Situation in Ghana

Author: Lukas Leib

Initial Situation

Ghana is located on the west coast of Africa. It has a population of 30.79 million (2021). Accra alone, the state capital, has a population of 2,388,000 (2017). It is there and in Kumasi, the only other city of a million people in Ghana, with 2,907,000 (2017) people, that the problem with waste is most visible. Each Accra and Kumasi produce over 1500 tons of waste per day. (Kumasi – Wikipedia 2022; Accra – Wikipedia 2022; Ghana – Wikipedia 2022) .Population growth and greater affluence are leading to greater demand for household and consumer electronics in Ghana. Waste from electrical and electronic equipment and e-waste are thus increasing. In addition to recyclable materials, these also contain pollutants whose improper treatment endangers health and the environment. Ghana has recognized the challenge and developed its legislative framework since 2016. Despite this, there are still few recycling companies that meet environmental and social standards (Giz, 2022). Currently, Ghana is taking a multi-sector & decentralized approach to their waste management. Private companies collect the waste, mostly operating under umbrella companies, which is also used as communication platforms for the companies. The Ministry of Local Government and Rural Development (MLGRD), the Ministry of Environment, and the Ministry of Sanitation and Water Resources are responsible for the waste sector. There were major changes in 2015, when the transport system, collection and storage of waste were improved.

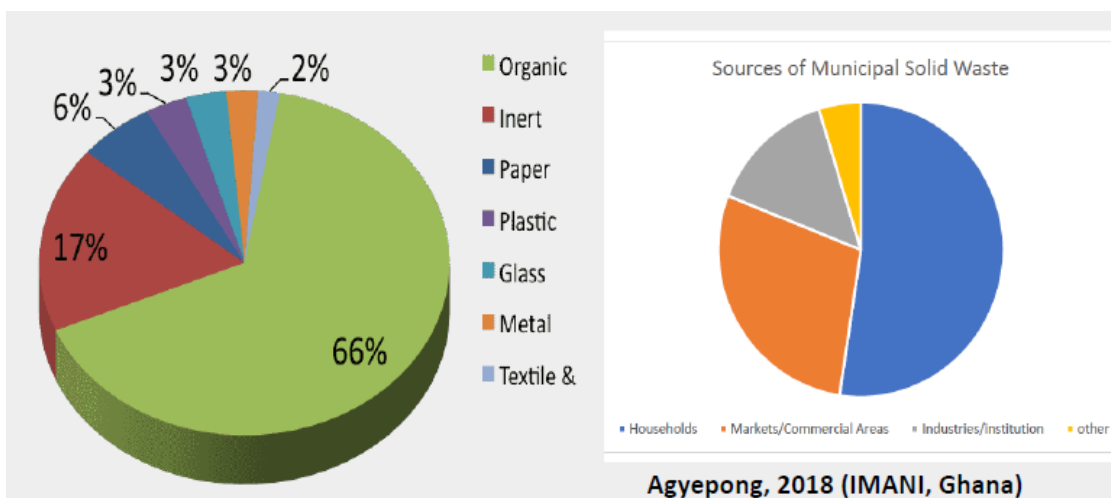


Figure 3: Different Types of Waste and their Origin
Source: Dr. Daniel Nukpezah, Prosper Adiku, 2022

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Unfortunately, it is easy to see that the waste system is currently not designed for these quantities of waste. There is a lack of clean waste separation, as this is the only way to make recycling economical. The final storage in landfills, without a benefit to be able to draw from it, makes little sense, but is much better than to dispose of the waste everywhere in the environment.

Zoomlion and ACaRP

Zoomlion is the largest waste management company in Ghana. It was founded in April 2006 and employs 90,000 people. Their cleaning vehicles can also be seen regularly in Accra (Figure 4)

Zoomlion offers the following services:

- Public Cleansing
- Communal Container
- Solid Waste Collection
- Waste Transfer Station
- Compost Production & Recycling
- Plastic Recycling
- Landfill Site Management
- Faecal Waste Treatment
- Medical Waste Treatment
- Waste Recovery & Recycling
- Fabrication & Sales
- Vector control
- Tricycle Waste Collection
- Landscaping and Beautification
- Cesspit Emptier
- Sale & Rental of Mobile Cabins
- Janitorial Service
- Capacity Building and Training



Figure 4: Zoomlion Truck
 Source: Leib, 2022

Accra Compost and Recycling Plant Limited (ACaRP) is another company that works with Zoomlion, but also with the Ministry of Environment. It specializes in recycling and water recovery from waste. With 500 employees, it produces organic compost, Refuse Derived Fuels and recovered materials. (Accra Compost and Recycling Plant Limited)

The processing steps of liquid waste are divided into 4 phases:

- Material is collected, weighed and sorted; solids are separated.
- Liquid waste is collected in collecting tanks, sand is separated
- Transfer to aerobic digesters
- Transfer to bioreactors to separate waste and water, resulting biogas is used

The processing of solids is divided into 5 phases:

- Material is collected
- Sorting processes:
 - a. Large solids are sorted out (180-200mm)
 - b. Rotating screen mesh sorts out solids larger solids (60mm)
 - c. Sorting out large pieces, like plastic bags
 - d. Magnetic sorting of metals

Problem Plastic and Urban Mining

A large proportion of the waste produced is plastic. Due to the poor degradability and the associated persistence in the environment, this is becoming an increasing problem. Due to poor waste separation, it is difficult to recycle the plastic cleanly. Processing steps are necessary, which would not be necessary with a functioning waste separation. The existing landfills are not designed for the resulting larger volume of waste, which is why the waste is improperly disposed of in illegal landfills. A lot of plastic waste therefore also simply ends up in the rivers and is eventually washed into the sea. A small share of plastic waste is washed back onto the beach, where it is pulled back in at the next high tide (Figure 5)

At illegal waste dumps, like Agbogbloshie, money is made from electronic waste. Under adverse conditions, the workers there are busy collecting copper and other rare metals from old electronic scrap, which is then sold on. The working conditions are very poor and the physical strain caused by hard work and toxic fumes is enormous. This so-called "urban mining" also has an impact on the environment. Pollutants, such as oil, come into contact with the soil in large quantities, which are washed into the ground, the groundwater, and also into the sea at the next rainfall.



Figure 5: Trash at the Beach

Source: <https://citinewsroom.com/2020/02/video-of-university-of-ghana-46-years-ago-gets-ghanaians-talking-on-social-media>Figure, 2022

Challenges

The biggest challenge is to teach citizens what they can do better. That waste separation is important for the reuse of this waste and what negative consequences are associated with the current improper waste management, like the loss of species and health problems. It needs a more controllable, functional, uniformly regulated system that is supported by all citizens. Training on recycling management must be kept regular and easily accessible. Another problem are the insufficient disposal infrastructures for municipal solid waste. There are far too few official garbage dumps with too little capacity, leading to open dumping of waste across the country.

Conclusion

The excursion allowed me to see the waste situation with my own eyes. Through which I now understand why the implementation of a complete improvement of waste management will be very difficult. There are many small projects that are already raising awareness to separate even plastic waste. One example is that on the campus of the University of Ghana, plastic bottles and other plastic waste are already collected in two different buckets so that they can be recycled more easily afterwards. Raising the awareness of the students is already a good start, but I think it would also be important to hold lectures for the ordinary population to make them aware of the situation and that it can be done differently.

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3. University of Ghana

Authors: Malaika Grüger, Vanessa Kurz

History

The University of Ghana, founded on August 11th, 1948, is the first university in Ghana, “for the purpose of providing and promoting university education, learning and research”. Until the declaration of independence in 1957 by then President Kwame Nkrumah, the university was still called “University College of the Gold Coast”. With the declaration of independence, the then "Gold Coast" was renamed Ghana and the University was renamed “University College of Ghana”. Despite Ghana's independence, the awarding of academic degrees continued to be administered by the University of London, the former colonial power of the British. In 1961, however, this dependency was lifted, and the University was renamed the “University of Ghana”. Since then, academic degrees have been awarded autonomously by the University of Ghana. Today, the university is the largest and oldest of a total of 13 national public universities in Ghana (University of Ghana: History)

Vision and Mission

The Vision is “to become a world class research-intensive University.” This goal will be reached by the mission: “We will create an enabling environment that makes University of Ghana increasingly relevant to national and global development through cutting-edge research as well as high quality teaching and learning.” (University of Ghana: Overview).

Location

The University of Ghana is located in Accra, the capital of Ghana. There are three campuses. The main campus is in Legon (*Figure 6*). Two more are in Korle-Bu and Accra City. Furthermore, two more campuses are being started in Takoradi and Kumasi. On the Legon Campus, unlike the rest of the city, there are many green spaces and bushy areas. To the north of the campus is the university's botanical garden, which makes up a large part of the campus' wooded area.



Figure 6 : University of Ghana

Source: <https://citinewsroom.com/2020/02/video-of-university-of-ghana-46-years-ago-gets-ghaians-talking-on-social-media>Figure, 2022

Education

More than 60,000 students are currently enrolled at the university of Ghana. *Figure 7* shows, that approximately 98% students are Ghanaian nationals, while 2% of students have international roots. Furthermore, the gender distribution within the enrolled students is almost balanced (51% male, 49% female), as you can see in *figure 8*. The academic calendar runs from August to May, while June and July a lecture-free period is. Ghana has a high linguistic diversity, with a total of 79 languages and dialects. Therefore, children grow up bilingual and the official language as well as the language of instruction is English.

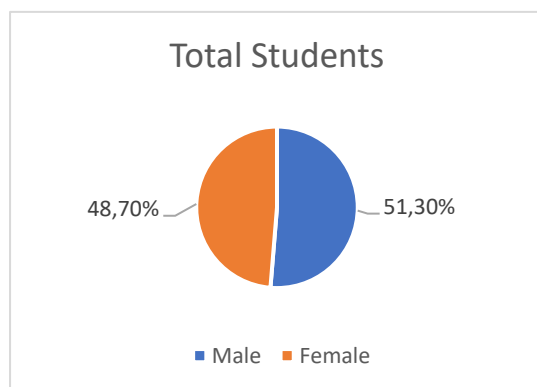


Figure 7: Total Number of Students

Source: Kurz, 2022, based on Data from University of Ghana

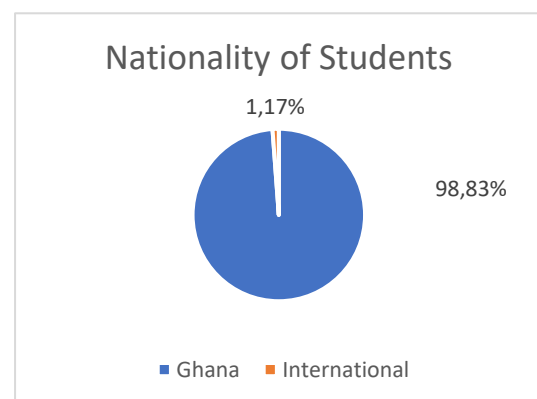


Figure 8: Nationality of Students

Source: Kurz, 2022, based on Data from University of Ghana

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Research is an important building block, and the University of Ghana has institutions and centres for it: Noguchi Memorial Institute for Medical Research, the Centre for Tropical, Clinical Pharmacology and Therapeutics, the Regional Institute for Population Studies, the Institute for Environmental and Sanitation Studies, and the Institute for Statistical, Social and Economic Research.

“As part of its vision to become a world-class research-intensive institution, University of Ghana has identified four priority areas by which it promotes international collaboration in research initiatives to enhance research output.”

- Malaria Research
- Trans-disciplinary Research into Climate Change Adaption
- Enhancing Food Production and Processing
- Development Policy and Poverty Monitoring and Evaluation

The administration is central and “includes a collegiate system”. There are four colleges and several programmes within the individual colleges: The College of Basic and Applied Sciences, the College of Education, the College of Health Sciences, and the College of Humanities (University of Ghana: Enrolment and Graduation Statistics).

Facilities

The Campus of the University of Ghana in Legon is as big as a whole city itself. Therefore, it has all the facilities anyone would need. To start with, the Campus has 14 Halls and Hostels where the students can live in. Some are traditional halls; others are private hostels (University of Ghana - Alumni Association: Halls & Hostels). On the campus tour of the excursion, we visited Akuafo Hall, Legon Hall and Mensah Sarbah Hall (*Figure 9*).



Figure 9: Mensah Sarbah Hall
Source: Kurz, 2022



Figure 10: Balme Library
Source: Grüger, 2022

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A number of churches and mosques are available for the practice of religion. Numerous sports activities can be practised on campus, such as Swimming, Rugby, Goalball, Debate, Cricket, Chess, Baseball, Basketball, Volleyball and Tennis. The University of Ghana Sports Directorate is responsible for this (University of Ghana - Sports Directorate: GUSA Games). The famous Balme Library (*Figure 10*) can be used by students to study. On our campus tour, we learned that it is one of the biggest libraries in West Africa. Any health problem can be treated at the University of Ghana Medical Centre. In addition to that, there are some pharmacies around campus. The banking square together with the night market (*Figure 11*) and plenty of restaurants all over the campus ensure that all students can meet their daily needs. The University of Ghana has its own Fire service station and Post office. In addition to that, the University has a botanical garden, which we also visited during the excursion (*Figure 12*).



Figure 12: Botanic Garden
Source: Guentherodt, 2022



Figure 11: Night Market
Source: Kurz, 2022

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4. Agbogbloshie

History

Agbogbloshie is located in the capital of Ghana, Accra, right next to the Old Fadama Slum. Along the Odaw river Agbogbloshie used to be a beautiful wetland creating a perfect habitat for fishes. Less than one kilometre downstream the Odaw river ends as the Korle lagoon in the Pacific Ocean (see map below). During the 1960s economic growth led to an urbanization in the greater Accra region, forming slums all around the city. During that time the Old Fadama Slum formed as well. Afterwards in the 1990s demand for electronic devices skyrocketed after the construction of the Akosombo Dam. The Akosombo Dam has a reservation that builds the largest water body in Ghana and produces over 70% of the national demand of electricity.

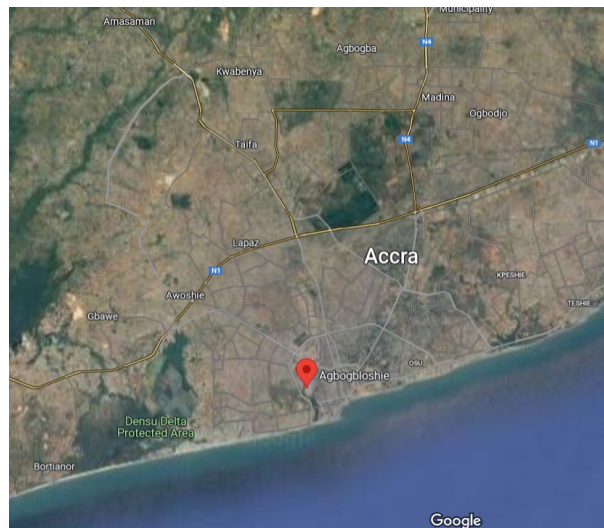


Figure 13: Aerial View of Accra

Source: <https://www.google.com/maps/place/Agbogbloshie>

To close the gap between demand and supply of e-devices they imported a lot of second-hand products from Europe and other western countries. Although over half of the imported products were not reusable, they continued importing further devices. Some of them could be fixed and were sold at the market together working ones (see chart below). But as soon as they would break down again, they got dumped, heaps of electronic garbage started to accumulate. In order to “recycle” them, places like Agbogbloshie formed to dismantle, repair or break down the devices into their individual parts.

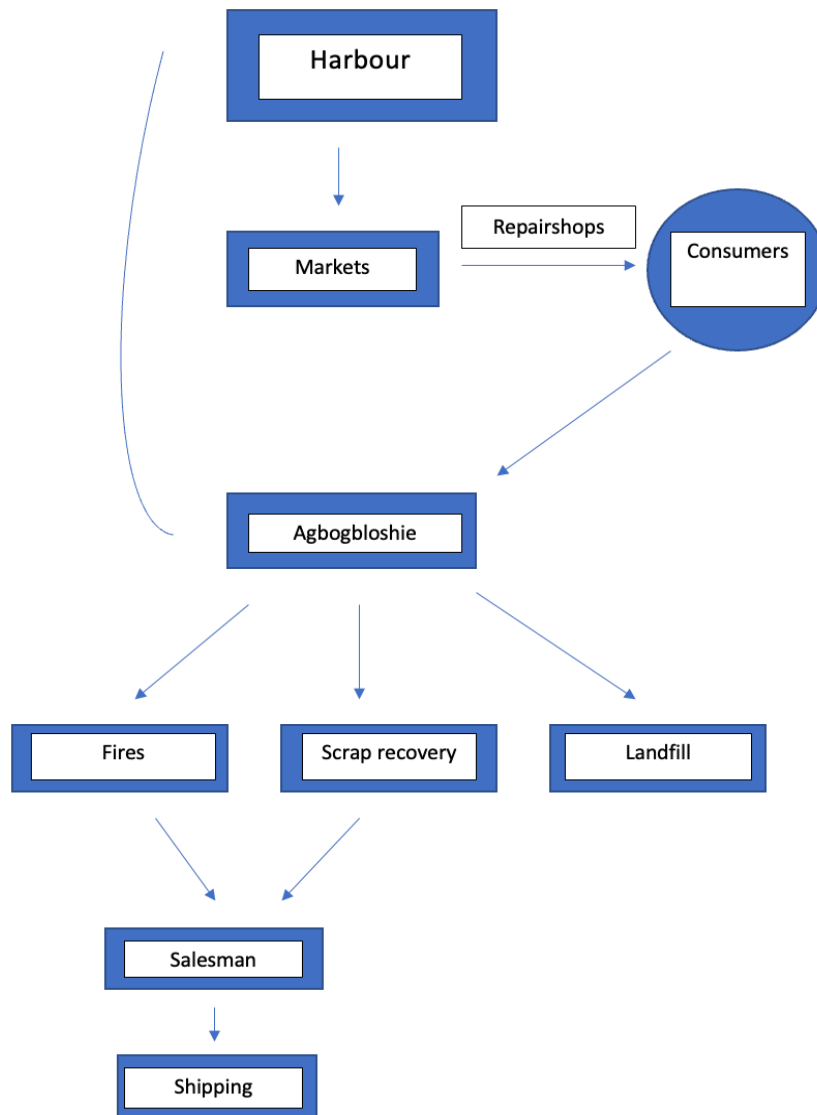


Figure 14: Path of the Waste
 Source: Siemens, 2022

Social, Health and Environment Issues

A big majority of workers in Agbogbloshie are migrants from poorer regions from Ghana in search of a job and money. Since they left their home, they are desperate to work, even in inhumane and dangerous conditions. So even burning copper wire seems like an adequate solution to make some money. Thus, creating health hazards for workers and children on-site like a lack of safety equipment (masks, gloves, shoes), child labour issues, toxic smoke from open burning metals, heavy metals in the ground and crops growing around Agbogbloshie. Speaking of health insurance or an adequate wage to pay for paying medical bills is far from the reality and not present for most of the workers at Agbogbloshie.



Figure 16: Cows on a pile of trash
Source: Thompson, 2022



Figure 15: Trash heap next to the river site
Source: Thompson, 2022

For those reasons, the bodies of workers are highly contaminated. Traces of iron, lead and antimony were found in childrens urins working on side. Blood analysis showed workers blood contains high amounts of lead. Even breast milk of women living around Agbogbloshie contained high amounts of polychlorinated byphenils, which is very toxic and belongs to the "dirty dozen", which have been banned at the Stockholm convention in 2001.



Figure 17: Scrap Metals
Source: Thompson, 2022

There are children being born and growing up in Old Fadama slum. Before they are even born, they already get in contact with all those toxic materials, since the mother is carrying them in her blood. Growing up in poverty, they have to start working very early and have very little chances of ever getting any school education. There won't be a choice, but to keep working in Agbogbloshie or something in similar conditions.



Figure 18: Korle Lagoon, one of the dirtiest water bodies in the world
Source: Voth, 2022

Since on Agbogbloshie is uncontrolled burning, crushing and mounting of hazardous material happening, it's a big endangerment to the environment, including air, soil, the adjacent Korle Lagoon (Figure 18) and the nearby markets. The Korle Lagoon is one of the dirtiest bodies of water in the world. To prevent flushing all the toxic material into the ocean, it gets dredged every year before rainy season starts. There's no life of fish at all anymore. On the other hand, Agbogbloshie is also a gift, creating jobs and a source of income for many people, who otherwise might have nothing at all. Even the whole Greater Accra region owes part of its wealth to the inflow of used electronic goods. And of course, the recycling of material is also a sustainable idea. So how can the way of recycling be changed

Recent News

On July 1st Agbogbloshie dump site was torn down by Henry Quartey, the Greater Accra Regional Minister, since it had gotten very big and out of control. It's part of his decongestion exercise "Let's make Accra work". Ironic, because it put hundreds of people out of their job or forced them to take their business elsewhere. It's assumed, that there are illegal recycling corners all over town, because the area they were moved to is far away.

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5. Makola Market and Kaneshi Market

Author: Julian Klabunde

Makola Market

Makola Market is a marketplace and shopping district in the center of the city of Accra, constructed in 1924. A wide array of products is sold in the markets and its surrounding streets, from car parts to land snails. Dominated by women traders, the market sells fresh produced, manufactured and imported foods, clothes, shoes, tools, medicines, and pots and pans. To this day, the market is one of the most important wholesale and retail markets as well as one of the most important social and cultural institutions in the country.



Figure 19: Makola Market from above
Source: Klabunde, 2022

Accra's largest market is busiest on Thursdays and Saturdays. Normal opening hours are from 6 am to 6 pm. These are also the times when traffic on the streets of Accra is at its heaviest. This is because all sellers and also buyers want to get into the city in the morning and out of Accra in the evening. In addition to commercial products, there are also important facilities such as pharmacies and hospitals on this site, which again illustrates the economic as well as social importance or institution that this market embodies. Due to the traffic and busy streets it is important that people get away from the market as quickly as possible in emergencies. In the market there are also public toilets for everybody with a fee of 1 GHC (0,12 €). Moreover, this is a large parking deck in the center of the market. This parking deck is accessible to all sellers, but especially to customers and buyers, as there is no alternative parking area.

Structure of the markets

Ghanaian markets in particular are famous for their large size and female dominance. Most of the vendors are women, estimates varying between 70-85%. These large markets dominated by female traders appear to be well organized due to a particular system of personalized ties between traders. The central component of this system is the “Market-Queen-Institution”. A market queen is a democratically elected representative of traders trading a certain product or product-group, who enjoy a considerable degree of economic power as well in society. Moreover, markets are structured according to the characteristics of the products for sale. In some areas, only the same characteristic products can be sold. If a seller wants to sell other products, he must abandon his store and buy a new one where he can sell the new products.



Figure 20: Beans, peas, living snails, crabs and a sewing machine
Source: Klabunde, 2022

There are also two different types of vendors in the markets. The majority of vendors sell their products in a shop or at a stall. These shops are registered and numbered. Then there are those vendors who do not have a fixed stall and sell their goods at the roadside. The number of these informal vendors is not known because they are not registered. In total, there are about 5000 vendors in the Makola market. Many of the shops are smaller than 3 m² and have been passed down for generations.



Figure 21: Kaneshi Market
Source: Friedle, 2022

Waste Management

At nightfall, the market is cleaned up and the rubbish collects in the appropriate places. Then a cleaning team collects the rubbish and transports it to a large landfill on the outskirts of the city. This rubbish system is too overloaded, so the rubbish often lies in large accumulations in the markets. This endangers the health of the vendors, among others. Another problem is that the sight of the rubbish puts customers off, so as a result shops located near the rubbish are often avoided.



Figure 22: Garbage at Kaneshi Market
Source: <https://www.publicagendagh.com>, 2022

Covid-19

The Corona period also had an immense impact on the markets in Ghana. Ghana was in absolute lockdown for a complete month - no one was allowed to leave the house without permission. As a result, the markets were also closed. Those vendors who have to make a living from the money they earn every day suffered particularly from this measure. It is assumed that some people in Ghana did not die from Covid, but from the economic consequences, as there was simply not enough money to buy food and water. Even after the lockdown, it took a very long time for the economic power of the markets to increase again and for the hustle and bustle of life to resume.

6. Kakum National Park (Canopy Walk + Hiking)

Author: Nadine Appenzeller

On the 3rd Day of the excursion the excursion participants had to get up early in the morning because a four-hour drive towards Cape Coast with the final destination Kakum National Park. Departure time was at 5:30am. At around 9:30am the guided tour to the Canopy Walk started. The tour guide was a botanist, who told the participants everything about the plants and trees and how the forest is used as a natural pharmacy to treat diseases.

About the National Park

Kakum is Ghana's most visited nature attraction with the world-famous canopy walkway and a wide variety of plant and animal life. The Kakum sanctuary is a nature reserve in the central region of the Republic of Ghana about 35 km north of Cape Coast which is the regional capital. It is located in the Assin South and Twifo Lower Denkyira districts and traditionally belongs to the Twifo, Assin, Denkyira and Fanti (Abakrampa) of the Central Region. The park is named after the Kakum River which begins within the reserve. The protected area extends over 360km and consists of the Kakum National Park and the Assin-Attandanso Reserve. In the communities around the two reserves, subsistence and commercial agriculture is predominant (Kakum Canopy Walkway Ghana). In 1932 the area was declared as a forest reserve and was managed by the Forestry Commission. During this time the main tree species harvested was mahogany (*Khaya ivorensis*). Logging continued for more than 50 years until 1989, when management of the reserve was transferred to the Wildlife Department. In 1992 the Wildlife Department declared Kakum a National Park under the Wildlife Reserves Regulations (LI 1525) as the Kakum Conservation Area including the Assin Attandanso Forest Reserve. Following a survey of the abundance of wildlife in the reserve, it was split into Kakum National Park and Assin Attandanso Forest Reserve later that year. The reason given for the split was that Cape Coast and 33 other towns and villages still needed timber from the forest and drinking water from the Kakum River. Kakum is the first protected area in Ghana to receive extensive support for visitor facilities. It is located on a 512-acre site adjacent to Kakum National Park and was built with funding from USAID and technical assistance from Conservation International.

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The visitor center opened on Earth Day 1997 and the following year the park received the Global Tourism for Tomorrow Award. The Visitor center is now managed by the Ghana Heritage Conservation Trust (GHCT). Tourist numbers have increased over the past years from 2,000 in 1992 up to 135,870 visitors in 2009. In 2014, visitor numbers reached their maximum with 439,323 visitors (Kakum National Park). Since then, the numbers have decreased. In 2017, there were only 113,830 visitors at the park. Currently, about 200,000 visitors are expected annually (Statistics from the Ghana Heritage Conservation Trust)



Figure 23: View of Kakum and Canopy Walk
Source: Appenzeller, 2022



Figure 24: Gift Shop at Visitor Center
Source: Appenzeller, 2022

Wildlife

Wildlife includes buffalo, civets, colobus monkeys, red river hog, giant forest hog, pangolins, pygmy crocodiles and the North African crested porcupine, among many others. Furthermore, the park is home to the largest assemblage of forest elephants in the country. The Diana Monkey, Giant Bongo Antelope, Yellow-Backed Duiker and African Elephant are all endangered species protected in the park. The park is also recognized as an “Important Bird Area” by Bird Life International. During the latest bird inventory, 266 species were identified such as the Tit Hylia, African Piculet, Forest Wood Hoopoe, Black-Casqued Hornbill, Green-Tailed Bristlebill, Western Bearded Greenbul and many more (BirdLife International 2022).

Canopy Walkway

With the goal of promoting tourism (especially ecotourism) in the largely ignored national park, the designers wanted to create a unique feature that would make the park a popular tourist destination. Since 90% of the park's landscape is tropical forest, an elevated trail through the treetops was thus designed by two Canadian engineers and five Ghanaians. The treetop trail reaches heights of 130 feet (40 m). Some of the treetops are 160 feet (50 m) high. It covers a distance of 1,150 feet (350 m) and passes through seven different trees. It was opened on Earth Day in 1995 (Kakum Canopy Walk, 2014).



Figure 25: Canopy Walkway
Source: Appenzeller, 2022

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7. Cape Coast Castle

Author: Simon Kellerer

Field Trip Report

Our group, consisting of Ghanaian and German students, arrived at the Cape Coast Castle around lunchtime and began their guided tour shortly after. We entered the building which is located directly on the coastline and looks like an old beautiful fortress. Little did we know what things happened here a few hundred years ago. After a short time, we met our tour guide for the Cape Coast Castle. The tour guide gave us all a welcome and bid us to follow him to the first halt. The first halt was the old church building of the Cape Coast Castle, which today functions as a library. Here he told us about the history of Cape Coast Castle and its development. See: "Origin of Cape Coast Castle" for more information about what he told us. The church was used by Europeans which ruled and lived in the Castle. In front of the Church was a hole, in which every visitor of the church looked down when they left from their service. Down in that hole they could see the slaves which lived in the cellars beneath the church. Why they did such a despicable thing still remains to be seen. After the church we took a small stroll through the different halls and rooms of Cape Coast Castle. These included for example negotiation rooms and the rooms of the garrison commander. However, the trip to Cape Coast Castle took a harsh turn when we visited the cellars of Cape Coast Castle. These were Cellars only built for the slave trade, under which many Africans had to suffer. Our guide explained us a lot about the cellars, the torturing methods and the slave trade in Cape Coast Castle. After the cellars and the rooms used for torture, we went onto the Door of no Return. The Door of no Return was a very important part of Cape Coast Castle as it signified the irreversible departure from Ghana



Figure 26: Cape Coast Castle
Source: Guentherodt, 2022

Field Report - Ghana Excursion

or their homeland. The Door was a huge double door made out of wood and is still a very impressive part of Cape Coast Castle. Our tour guide gave us a rough idea of what it was like to walk through the door of no return as a slave and explained to us what awaited us as a slave behind the door. In addition, he gave us information about the door of return which appeared much later in history.

Origins

The Origin of Cape Coast Castle dates back to the year 1555. At this time the Portuguese build a trading post with the name „Cabo Corso“, to trade and barter with the local people. It was nearly 100 years later when the Swedish Africa Company decided to build a Timber Fort at the same spot in 1653. In 1660 it was then conquered by the British. Only 3 years after it was captured by the Dutch and recaptured by the English in 1664. It was attacked regularly by the townspeople and the French until 1757. It was then rebuilt by the by the Royal African Company and expanded over the next decade.

Slave Trade

The slave trade was a very lucrative business in which many European nations took part of. The trade began with the discovery of America in 1492. Many workers were needed for different tasks. This began the huge slave trade also in Ghana. The slave trades started around the year 1505 and lasted until 1807 in which it was banned by the British. The slaves were held in the basements of Cape Coast Castle for up to 3 months awaiting transport to America or Europe. *“[...] it ‘is estimated that around 1700, the Royal African Company was exporting some 70,000 slaves per annum to the New World”*. The living conditions for slaves were horrid. Very little food and water. Up to 200 men in one single cell and up to 1000 men and 500 women in total. No human way to relief yourself, no sleep, no light or hope. For the most men and women these cellars were the last thing they saw until their departure to America or Europe.



Figure 27: Part of the men cellar
Source: Apoh, 2019



Figure 28: Part of the women cellar
Source: Apoh, 2019

Door of No Return / Door of Return

The Door of no Return is where over 200 years ago many thousands of slaves were sent to America and Europe under brutal conditions. *“Today many African-Americans can trace their ancestral roots as having passed through that door.”*¹ *“After many years, that has changed from the “door of no return” to “door of return”.”*² The door of return makes it possible for many people to trace back their Ancestors and come back to their homeland the same way their ancestors left. Through the door of no return. The door of return is in fact nothing else then the backside of the door of no return. Instead of leaving, your entering the door which makes it the perfect symbol for reentering the land of your ancestors.



Figure 30: Door of Return
Source: Steward, 2009



Figure 29: Door of NO Return
Source: Steward, 2009

¹ <https://africanarguments.org/2019/12/ghana-year-of-return-politics-of-exclusion/door-of-no-return-at-cape-coast-castle/> (15.06.2022)

² <https://thisisafrica.me/politics-and-society/tracing-history-ghanas-cape-coast-castle-infamous-door-no-return/> Chapter: From the “door of no return” to the “door of return” (15.06.2022)

Today's Use

Today the Castle is used as an ethnography and archeological museum. It was established 1974. Many people come here every day to learn about the history of the slave trade and the history of Ghana. In addition, it is used by many people with African roots as a place of return to their home country.

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8. NGOS: UGPRP and Global Mamas

Author: Elena Springer, Vanessa Kurz, Malaika Grüger

UGPRP – The University of Ghana Plastic Recycling Project

"Let's separate our waste to give it a second life." The UGPRP is a student-led initiative that was created in 2018. The initiative aims to bring a culture of separating plastics to the students at the university.

Waste Management in Ghana

There are different conventional disposal methods, which are commonly seen and accepted in society, but they are harmful to the environment and to health. That is why a sustainable solution is essential.

- Open Burning
- Landfilling
- Backyard Dumping
- Skip Containers
- Compactor Pick-ups



Figure 31: Open Dumping of Plastic Waste
Source: Thompson, 2022



Figure 32: Dumpsite for Coconut Shells and Plastic Bags
Source: Guentherodt, 2022

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Part of the excursion was to learn something about the University of Ghana Plastic Recycling Project (UGPRP). For this reason, Julius Jayson Botchway, the team leader of UGPRP introduced the initiative to us. Jayson is a certified recycling ambassador since 2016. He alone has trained 250 other people in plastic recycling. UGPRP is a student-led initiative connected to the Institute of Environmental and Sanitation Studies (IESS). It started in the 2018/2019 academic year. The aim of this project is to create awareness for the topics of waste management and recycling and to encourage people to segregate their waste. Also, they collect data to inform about plastic waste management and the team wants to create a university where waste becomes a resource (University of Ghana – Institute for Environment and Sanitation Studies: University of Ghana Plastic Recycling Project (UGPRP)). Some achievements of the UGPRP include that:

- ... they saved a landfilled site of 54,3 m³
- ... they provided a recycling infrastructure to over 37,000 students with 1,500 special baskets distributed on the floors of the student's hostels and around campus
- ... they have activated over 343 homes to participate in the project and
- ... they saved over 5,000US\$

In one of the halls, we could see their self-designed segregation system for plastic bottles and plastic water sachets (*Figure 33*). The containers were designed half-transparent, so that everyone can check if the waste is properly segregated. Another important aspect is that throwing away trash should be done in an open place. If people are allowed to dispose anonymously and uncontrolled, then the waste separation works better. The collection, storage and sale of the recyclable waste are also managed by the UGPRP. This ensures that the plastic is given a second life.



Figure 33: Trash Cans of UGPRP
Source: Springer, 2022

Sharing Education

Wherever there is education, the quality of the waste also increases. Jayson and his team spread their knowledge:

- In the auditorium
- From room to room
- At church
- On social media platforms and also
- Via radio

Collected, Separated, What's Next?

The collected waste gets sorted and recorded in data on a daily basis. Proper separation is so important that the plastic bottles (PET) and the water bags (HDPE) can be resold to the customers.

Reliable customers are for example:

- Trashy Bags
- Nelplast
- Environment 360

Challenges

Separating and recycling waste have great potential in Ghana. Only nine percent of the waste collected in the country has been recycled so far. Yet this nine percent is already a great deal. Separated waste is a sought-after resource. And that is precisely where the difficulty lies. Inadequate infrastructure makes waste separation difficult. There are too not enough trash cans and also insufficient capacity to recycle the trash. Another problem is that plastic and garbage have no economic value in Ghana. After the garbage has been separated, it is difficult to find buyers who will make something new out of it. A deposit system would be an interesting incentive for the inhabitants. The goal is sustainable consumption. This is exactly what Jayson and his team are working towards every day.

Workspace UGPRP



Figure 35: Collection Tanks
Source: Springer, 2022



Figure 34: Separately collected PET bottles
Source: Springer, 2022

Global Mamas: *Focus on people, create an impact*

Global Mamas is a fair-trade organization based in Ghana. It supports the sustainable development of women craftspeople through the production and export of fair-trade products. The community was founded in 2003 by six mamas. Now their network consists of thousands of people from around the world working together to create prosperity for African women and their families. Their products are produced in 7 countries and resold to 21 countries. In the process, 60% of their products come from recycled and reused materials. Global Mamas and Papas integrate social responsibility. In doing so, they focus on sustainable growth. Fair trade practices are used to ensure a steady and living income for families. Each product is handmade by Ghanaian women and men. Depending on the place, the art of batik, colouring fabrics, sewing or making pearls, shea butter and black soap are practiced.

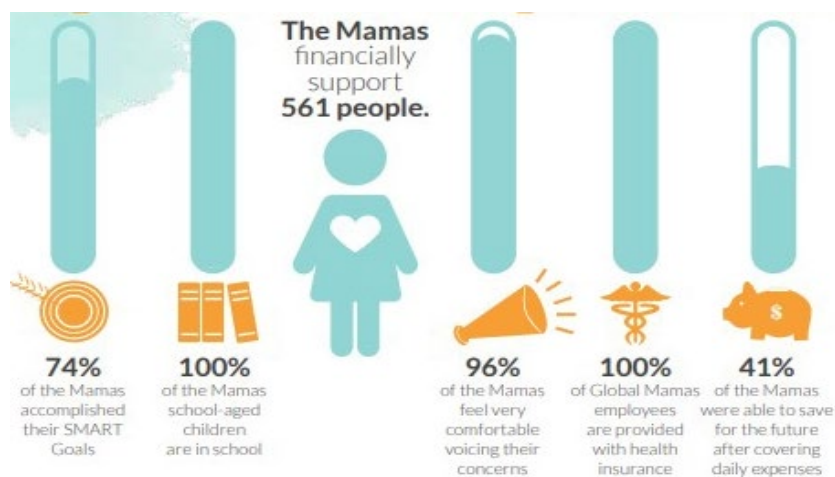


Figure 36: Impact on the Global Mamas
Source: <https://globalmamas.org/>, 2022

Field Report - Ghana Excursion

Bead Making Workshop

On Tuesday, May 31st, the team headed out for a Recycled Glass Beadmaking Workshop. After a four-hour drive, the participants arrived at an idyllic location. A Global Mama greeted us and gave us an introduction to the NGO. Then, our workshop started:

1st step: Pounding old glass into glass powder



Figure 37: Pounding Glass
Source: Springer, 2022



Figure 38: Pounded Glass
Source: Springer, 2022

2nd step: Insert small pieces of cassava sticks into the gaps of the clay mould



Figure 40: Cutting Cassava Sticks with a Razor Blade
Source: Springer, 2022



Figure 39: Clay Mould with Cassava Sticks
Source: Springer, 2022

3rd step: Dye powder into desired colour and then fill dyed powder into the earthenware shell. Care must be taken not to tap the powder too hard into the bowl.



Figure 42: Mixing Colour Pigments into Glass Powder
Source: Springer, 2022



Figure 41: Putting Glass Powder into the Mould
Source: Springer, 2022

4th step: Put shells in the oven. Glass melts and the wood burns. This creates the hole in the middle of the bead.



Figure 44: Putting Moulds into Oven
Source: Springer, 2022



Figure 43: Ready Baked Glass Beads
Source: Schaefer, 2022

5th step: Grinding with the help of sand and gravel.



Figure 45: Polishing Beads with Sand and Water
Source: Guentherodt, 2022



Figure 46: Global Papa at Work, polishing Beads
Source: Springer, 2022

6th step: Thread and be creative...



Figure 47: Selfmade Bracelet
Source: Springer, 2022

Workspace Global Mamas and Papas



Figure 48: Global Mamas and Papas at Work
Source: Springer, 2022



Figure 49: Different Mould Designs
Source: Springer, 2022



Figure 51: Workshop Area
Source: Springer, 2022



Figure 50: Traditional Oven with Roofing
Source: Springer, 2022

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[Accessed:07.06.2022]

9. Jekora Ventures Limited

Author: Benedikt Schäfer

Visit at JVL-YKMA Recycling Plant

After the bead making workshop with the NGO “Global Mamas”, the participants visited the JVL-YKMA Recycling Plant in the Yilo Krobo municipality. JVL-YKMA Recycling Plant, was founded in 2020 and processes organic waste and faecal sludge to produce compost for commercial farming and affordable, fuel-efficient briquettes for households and industries. JVL-YKMA Recycling Plant, is formed of a Public-Private Partnership between Jekora Ventures Ltd and the Yilo Krobo Municipal Assembly. It processes up to 1,800 tonnes of organic solid waste and up to 5,000 cubic meters of faecal sludge to produce up to 200 tonnes of compost and 1,000 tonnes of low-cost fuel briquettes annually. The compost is produced by processing food waste from the markets and fecal sludge which hitherto was disposed of indiscriminately notwithstanding the health consequences. For collecting the raw material of the briquettes, they have an extensive wood waste collection program within Somanya, Odumasi, and neighbouring communities where they collect wood waste from sawmills. The briquettes are sold to small businesses like bead makers and commercial food vendors as well as households with the intention to reduce the use of firewood in the country.



Figure 52: Compost piles at JVL-YKMA
Source: Voth, 2022



Figure 53: Workers sieving soil to make fine
compost
Source: Guentherodt, 2022

General Information

JEKORA VENTURES LTD is active in the market of waste management and defines itself as the leader in Ghana in this segment. It is a fully Ghanaian-owned company, with its beginnings in 2003, providing cleaning services at the Odornaa main lorry park. In 2004, JVL expanded into solid waste collection, cleaning services in shopping malls and realised the construction of a public Water Closet facility in the city of Accra. More expansion programs including the acquisition of additional vehicles, equipment, management, and technical staff followed in the past years and lead to today's success. JVL describes its vision as being Ghana's leader in integrated waste management and resource recovery company, improving Ghana's environment and public health. Its mission is to deliver efficient, cost effective and affordable services and products, through application of appropriate technology and innovation. Creating wealth through resource recovery and promoting a sustainable environment.

Equipment and Operation

JVL is mainly operating in the centre of Accra, currently expanding within the Greater Accra Region, operating under a Solid Waste Collection Franchise Agreement. For the collection of the municipal solid waste, JVL uses the following methods:

- Compaction trucks
- Multi-lifts (open containers with size of a shipping container)
- Roll on/off trucks
- Borla taxis



Figure 54: JVL Compaction Truck

Source: <https://jekoraventures.com/our-operations/2022>

Waste Solutions

JVL provides solutions for residential, commercial, industrial, special (in the event that that a client generates more waste than usual) waste and also public toilet management, including maintenance and cleaning services.

Recycling Solutions

JVL is the first and only Ghanaian waste management company offering recycling services for commercial and industrial clients along with a solid waste source segregation programme. They differentiate between the following recyclables:

- Organic Waste Recycling: Food waste, market waste and garden waste the organic waste is processed into our JV CompSoil organic fertilizer or Fortifer compost
- Plastic Waste Recycling: Any waste material such as water sachets and plastic bottles. It is processed by JVL partners into new plastic products such as domestic products and toys
- Textile Waste Recycling: Cloth material or sewn clothes that have been discarded are processed by their partners into new bags and accessories

Social Responsibility

JVL is an active partner of the Ministry of Local Government and Rural Development and the Environmental Protection Agency and offering events like Clean-up Exercises, School Educational Campaigns, Sensitization Workshops and participation at the National Sanitation Day

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10. Micro-Business Approaches: Transforming Car Tires into Chairs

Author: Jonathan Moser, Sebastian Müller

Background

In Ghana there is a lack of know-how, financial, structural, and human resources for a sustainable waste management. Additionally, to the domestically produced waste, a large quantity of different types of garbage are shipped to Ghana from all over the world. All the different types of waste cause many ecological and health problems. The micro business idea of a chair, which contains parts of a car tires, tries to counteract one part of the issue.

Idea

The idea of the micro business is to build a chair, which contains old tires, to reduce the amount of them. The tire rubber should be cut into stripes and woven into a solid seating and leaning surface. Beside the reuse of old materials, other advantages are an affordable price, a robust, easy to clean surface and the possibility for individual designs.

Initial Situation

In the past two years, two prototypes were developed and built, and a cost analysis was made. This cost statement must be carried out again. In the current year, two different flyers were created. One for potential customers, like restaurants, bars etc. and one for interested craftsman. To create awareness, a social media accounts on Facebook, Instagram, and Twitter were created. The time during the excursion was used to work on the different topics, as it is presented in the following chapters.

Tasks

During the excursion to Ghana, we worked two days on the chair project. We had five different tasks and events: Content creation, radio-show, flyer distribution, talk with artisan and an interview with Prosper. In the following text, all these tasks will be described.

Field Report - Ghana Excursion

- **Content Creation**

During the business days we were able to do the content creation in a group of four for the social media platforms Instagram, Facebook, and Twitter. The content creation included photo shoots and recordings of the two prototypes as well as from tiers. Pictures and videos had to be edited and cut. Furthermore, we created captions for the posts, text images and memes. At the end, we started to upload the content. With the content, we hope to expand our reach and become more attractive for craftsmen and potential customers.

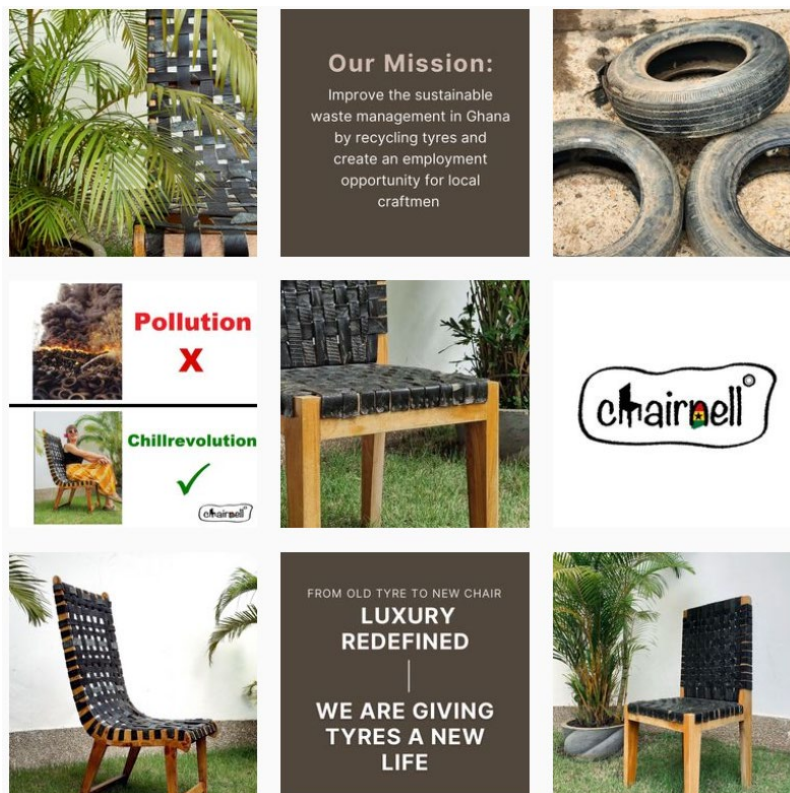


Figure 55: Instagram Post for Chair Promotion
Source: Instagram (Chairnell), 2022

- **Radio Show**

Furthermore, we had the possibility to participate at the campus radio. "You and the Environment" radio show is an educative program hosted by Julius J. Botchway (UGPRP team lead) to enlighten listeners on the menace on the environment caused by human activities resulting in heavy pollution and environmental degradation. We went there with two students from Ghana, Sarah, and Thompson and one from Germany, Jonathan. Winifred and Edward were also there to take coverage of the whole show. The host began with a narrative on waste management in Ghana, and we were being asked to introduce ourselves.

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The interview then went through different topics like the BWS and the collaboration exchange program between the IESS and HFR, the chair project, Agbobbloshie, visited places during the excursion and the German waste management.



Figure 56: Radio Interview with Julius, Jonathan, Sarah, Thompson
Source: Winifred, 2022

- *Flyer distribution*

To widespread the idea of our project and to create more awareness, we designed two flyers in Germany. One for artisan and craftsman's and one for potential customers. Therefore, one task was, to distribute these flyers at different locations. We chose halls and restaurants inside and outside campus and at the beach. In total, we went to 40 locations. We spoke to some owners who seemed to be really interested.



Figure 58: Flyer Distribution at Restaurant
Source: Weisser, 2022

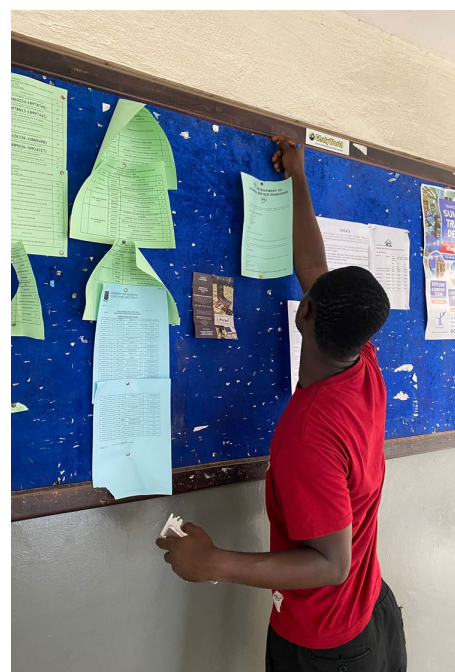


Figure 57: Flyer Distribution at Student's Hostel
Source: Weisser, 2022

Field Report - Ghana Excursion

- *Interview with Artisan*

We invited an artisan over to the campus to ask him some questions about the process of building a chair, the challenges, and the costs. We talked about his experience in the furniture industry, challenges for him and his business, his opinion about the project and the materials, the potential costs, and his interest in taking over the micro business. In the end, he told us he is interested in this idea, if there is a big enough demand.

- *Interview with Prosper*

Nadine, Sebastian and Jonathan also did a 30-minute interview with prosper about four different topics: recycling, communication, chances/ challenges and the project evaluation. Some of these questions were about the general situation and some about especially about the project. The whole interview with the questions and answers will be in the end report of the project.

Conclusion

The two days were very productive, and we achieved a lot. Even though there were some problems in the beginning, we managed to form different teams, which executed all tasks to the needed stage.

11. Micro-Business Approaches: Organic Waste Becomes Activated Carbon

Background

Ghana is considered a model of democratic and economic development for an African country. Due to the rapid economic development, the country has an enormous waste problem. So far, there is no state-run garbage system. In Accra, there is only one private garbage company. In Ghana, organic waste makes up 60% of the municipal waste composition. Therefore, in the first project year, the group considered doing something with organic waste. The recycling of organic waste in Accra has great potential, as it has so far mostly been composted, if at all. The business idea aims to change this situation and put organic waste to a value-added usage. In particular, in this case, the waste product "coconut shell" is to be used for the production of activated carbon, as normally 95% of coconut shells are landfilled and 5% are incinerated. The advantage of this idea is the recycling aspect – producing activated carbon made of organic waste. Thus, waste is reduced during production, and there are no costs for the raw material.



Figure 59: Coconut Shells in Accra

Source: Schaefer, 2022

Production of Activated Carbon

The coconut shells are ideally roofed, dried outdoors, and then processed in a pyrolysis oven. A simple design is sufficient, to protect the nutshells from too much oxygen and combustion. The cooled "coconut charcoal" must be washed before chemical activation takes place. For this purpose, water is added to the coal to remove ash residues. The washed coal can be crushed in the dry state and mixed with a 50% sodium chloride solution, so that a paste is formed. By heating the paste to about 400°C in a closed vessel, the water is evaporating and the number of pores of the coal multiplies. It is assumed that the coconut husks are dry enough to be fed into the pyrolysis process after a drying time of maximum one week. After about two to four

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hours, the shredded coconut shells should be charred. After cooling and the washing cycle, the crushed charcoal is soaked in the sodium chloride solution for about 24 hours before an activation process of about two to four hours follows. Before the activated carbon is packaged and sold to customers, quality control is carried out in the laboratory of the University of Ghana. The carbon is then chemically activated. So that the final product remains activated carbon, which has a wide range of applications:

- Air and water filter
- Cosmetic products
- Cigarette filter



Figure 60: Pyrolysis Oven of the University of Ghana
Source: Adjei-Ayim, 2022

The advantage of activated carbon filters is that the minerals remain in the water and a very high retention of pollutants takes place. In addition, it filters annoying odors and unpleasant taste.



Figure 61: Pyrolysis Oven
Source: Schaefer, 2022



Figure 62: Activated Carbon
Source: Guentherodt, 2022

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- *Task Planning*

In the first year, the idea was developed, and first concepts were worked on from the students at the University of Ghana and University (UG) of Applied Science Rottenburg. In the second year, the first prototype oven was built and developed at the UG. During the third project year, the idea of involving NGOs as costumers came up. Activated carbon could be beneficial for suitable NGOs working in the water sector, for simple filtration systems. The marketing area was expanded with flyers, videos and logos.



Figure 63: Logo for Activated Carbon Micro-Business
Source: Seeger, 2022

- *Excursion*

During the excursion, two days were spent explicitly working on the Micro Business ideas on site. On the first day, the activated carbon group was divided into three teams. One team took care of a promotional video. In this video, attention is drawn to how easy it is to produce activated carbon made of coconut shells and how well it can be used to purify water. In addition, the oven and the way it works is explained. Another team first looked at which NGOs in Ghana would be suitable for the project. The group finally found 7 NGOs, among them Pure Home Water and WaterAid. After successfully finding the NGO's, contact details were researched and finally a text for contacting them was formulated. The third group developed a logo over the two days and as well a name for the activated carbon made of Coconut shells. In addition, a flyer was designed with the visions of the idea. This flyer was then presented to the entire group at the end.



VISION

- To become a credible collaborative entity that seeks to support independence by creating micro-businesses
- To establish sustainable and clean environments
- To achieve enhanced waste management

MISSION

- empowering people by creating income through microbusinesses
- creating circular economy by recycling coconut waste
- implementing an organic water purification

SDG 17- Partnerships for The Goals

SDG 11- Sustainable Cities and Communities

Creating a circular economy using waste coconut shells to produced activated carbon for water purification

WASTE TO INCOME

SDG 1- No Poverty

SDG 8- Decent work and economic growth

Generating income for citizens by purchasing waste coconut shells, supporting local and offering activated carbon to local communities

WASTE TO SUSTAINABLE LIVING

SDG 6- clean water and sanitation

SDG 3- Good Health and Well Being

Providing aids to people to clean their water and reduce waste of resources and dumping in the environment






Figure 64: Flyer for Activated Carcoal Project
Source: Kellerer, 2022

Conclusion

The two days were very successful for the group and it's easy to see how fast a project progresses when you meet in person, and the cultural difference that brings different layers together. The cultural exchange during the excursion was a great enrichment for both sides. We are very grateful and happy for this exchange.



Figure 65: German-Ghanaian Excursion Team

Source: Schäfer, 2022