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91429R

Mana Tohu Mātauranga o Aotearoa
New Zealand Qualifications Authority

Level 3 Geography 2026

91429 Demonstrate understanding of a given environment(s) through selection and application of geographic concepts and skills

Credits: Four

RESOURCE BOOKLET

Refer to this booklet to answer the questions for Geography 91429.

Check that this booklet has pages 2–20 in the correct order and that none of these pages is blank.

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Relevant geographic concepts

Environments
May be natural and / or cultural. They have particular characteristics and features, which can be the result of natural and / or cultural processes. The particular characteristics of an environment may be similar to and / or different from another. A cultural environment includes people and / or the built environment.

Perspectives
Ways of seeing the world that help explain differences in decisions about, responses to, and interactions with environments. Perspectives are bodies of thought, theories, or world views that shape people's values and have built up over time. They involve people's *perceptions* (how they view and interpret environments) and *viewpoints* (what they think) about geographic issues. Perceptions and viewpoints are influenced by people's *values* (deeply held beliefs about what is important or desirable).

Processes
A sequence of actions, natural and / or cultural, that shape and change environments, places, and societies. Examples of geographic processes include erosion, migration, desertification, and globalisation.

Patterns
May be spatial (the arrangement of features on the Earth's surface) or temporal (how characteristics differ over time in recognisable ways).

Interaction
Involves elements of an environment affecting each other and being linked together. Interaction incorporates movement, flows, connections, links, and interrelationships, which work together and may be one- or two-way interactions. Landscapes are the visible outcome of interactions. Interaction can bring about environmental change.

Change
Involves any alteration to the natural or cultural environment. Change can be spatial and / or temporal. Change is a normal process in both natural and cultural environments. It occurs at varying rates, at different times, and in different places. Some changes are predictable, recurrent, or cyclic, while others are unpredictable or erratic. Change can bring about further change.

Sustainability
Involves adopting ways of thinking and behaving that allow individuals, groups, and societies to meet their needs and aspirations without preventing future generations from meeting theirs. Sustainable interaction with the environment may be achieved by preventing, limiting, minimising, or correcting environmental damage to water, air, and soil, as well as considering ecosystems and problems related to waste, noise, and visual pollution.

GLOBAL E-WASTE

RESOURCE A: What is e-waste?

Electronic waste (e-waste) is one of the fastest-growing waste (rubbish) streams in the world. It is the waste generated from discarded electronic equipment. More precisely, e-waste is any electronic device that is no longer useful or is damaged beyond repair.



Figure 1: Categories of e-waste.



Figure 2: The growing problem of e-waste.

RESOURCE B: Global e-waste management

The disposal of e-waste is a growing global problem. In 2019 alone, the world generated 53.6 million metric tons (Mt) of e-waste. E-waste generation is expected to increase as economic development and rapid changes in technology make old technology worthless.

E-waste contains valuable materials, as well as hazardous toxins. This makes the efficient recovery and safe recycling of e-waste extremely important for its economic value, as well as for environmental and human health.

International regulations such as the Basel Convention, aim to control and regulate transboundary (across borders of countries) movements of hazardous waste. But, as of October 2019, less than half of all countries in the world had a policy, legislation, or regulation in place for all types of e-waste. As a result, large volumes of e-waste continue to be shipped illegally to developing regions.

In 2019, nearly 5 million Mt of e-waste crossed borders. 3.3 million Mt were shipped in an uncontrolled manner, labelled as used electronics or hidden inside second-hand products such as vehicles.

Many destination countries for e-waste export are low- and middle-income regions that have insufficient e-waste management facilities. Countries choose to take on e-waste for the potential economic rewards it provides. Consequently, nations such as Ghana have a large informal economy (economic activities that are not taxed or regulated by a government). It is of benefit to high-income regions to export their e-waste, as it can be less expensive than managing their own waste. However, the countries which receive this e-waste tend to have lower recycling rates and a higher presence of informal workers.

Europe, East Asia, and North America have the capacity to manage hazardous e-waste and printed circuit board waste, so they choose to import it for economic benefit.



Figure 3: Global e-waste recycling, 2019.
Mt=metric ton, with figures in millions.

RESOURCE C: The economy of e-waste

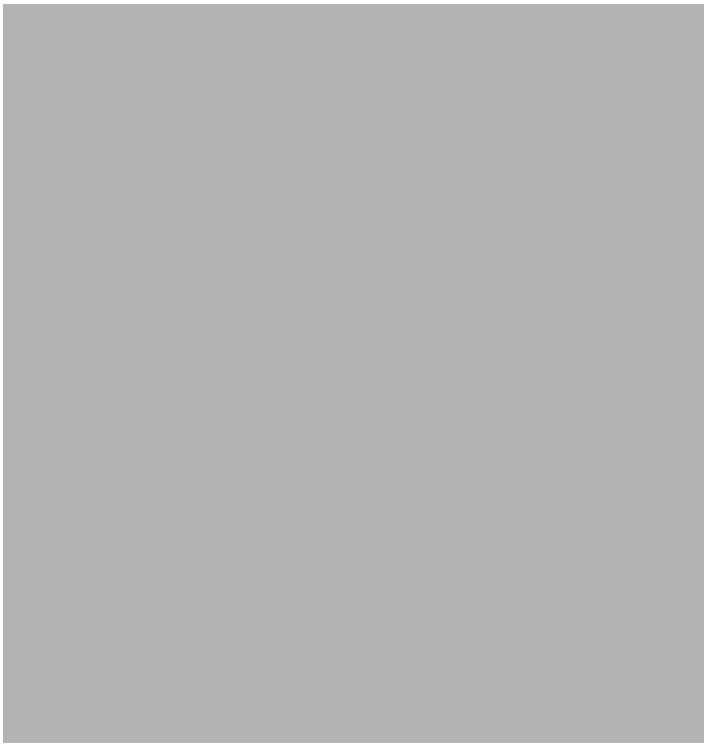

Figure 4: E-waste in a circular economy.

The dismantling, resale, and recycling of e-waste can be lucrative for those involved. It is a circular economy, which means products can be recycled either partially or fully. This can be very sustainable if done correctly in a well-regulated environment. If e-waste recycling plants or e-waste processors can extract the precious metals that are found in most electronics (copper, gold, and silver) then the work can turn a healthy profit.

E-waste trading (buying, selling, and refurbishing) also operates in a grey economy, meaning it is heavily underregulated, workers receive untaxed income, and it typically operates outside of government or political influence.



Figure 5: The amount and value of collected and recycled e-waste, 2019.
Mt=metric ton, kt=kiloton, t=ton, with all figures in millions.

RESOURCE D: Global e-waste trends



Figure 6: E-waste generated and collected worldwide.

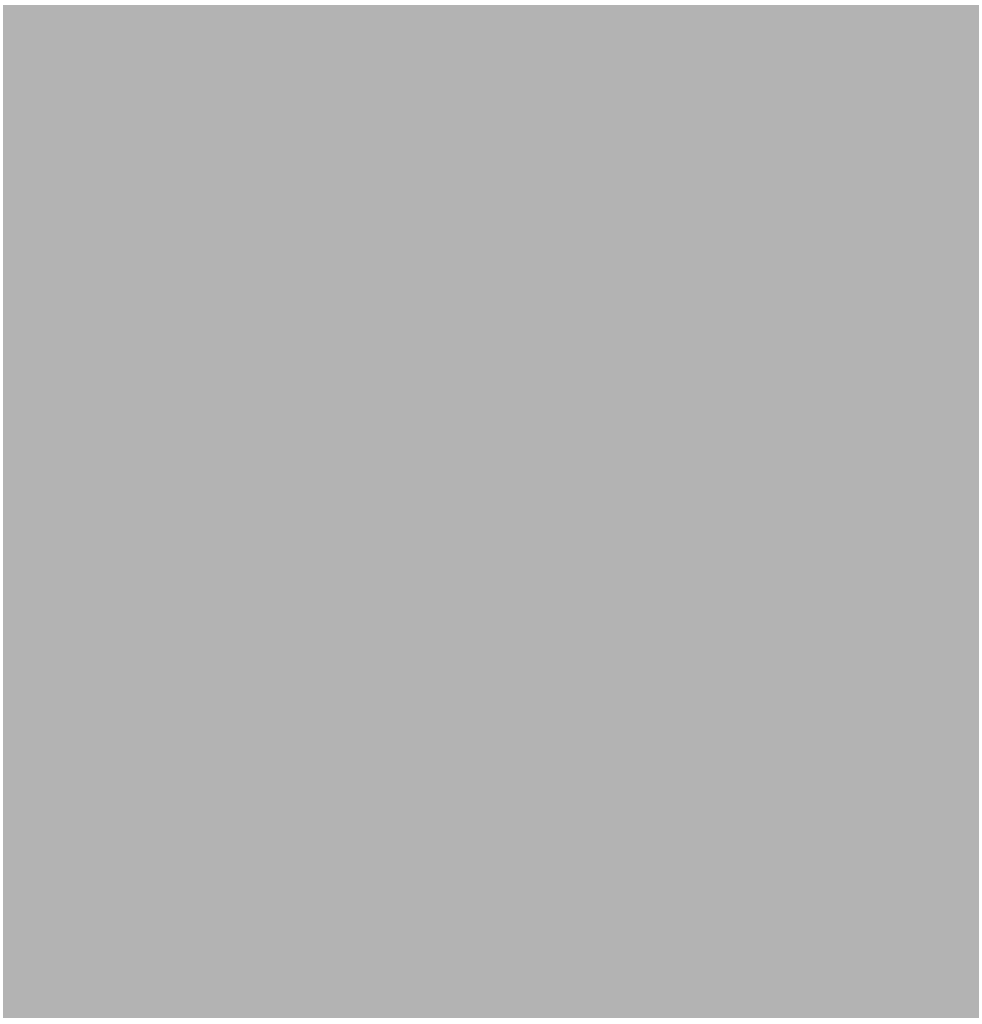

Figure 7: Scatter graph linking e-waste generation and income.

Purchasing Power Parity (PPP) is a way of measuring how far your money goes in different countries. It helps to compare living standards and show the real value of money by accounting for difference in prices and living costs.



Figure 8: Main sources and receivers of e-waste.



Figure 9: Global e-waste generation and documented recycling, 2019. Mt=metric ton, with figures in millions.



Figure 10: Map showing global movement of e-waste.

RESOURCE E: E-waste and Ghana

Ghana is a member of the Basel Convention and ratified (joined) in 2003. The agreement is aimed at reducing transboundary movement of hazardous waste. However, Ghana still imports a large amount of illegal and unregulated hazardous waste from overseas nations that often ends up in e-waste dumps such as Agbogbloshie, located just outside the capital, Accra. The 'illegal' hazardous waste (often e-waste) makes its way to Ghana in intentionally mislabelled shipping containers, mostly from high-income nations in Europe and North America.

Ghana's informal e-waste industry employs an estimated 200,000 people.



Figure 11: Countries that export e-waste to Ghana.



Figure 12: The sources and levels of processing of e-waste in Ghana.

RESOURCE F: Background to Ghana





Figures 13 and 14: Map and national flag of Ghana.



Figure 15: Global location of Ghana.

Ghana's landscape consists mainly of expansive plains and low plateaus that are covered with rainforest. Although relatively small in area (238,533 km^2), Ghana has one of the leading economies in Africa. This could be due to the wealth of natural minerals found here, such as gold, diamonds, salt, manganese, bauxite, lithium, oil, and gas, or to political actions, such as Ghana being one of the African countries south of the Sahara to achieve early independence from colonial rule.

RESOURCE G: Ghana's natural environment

Topography

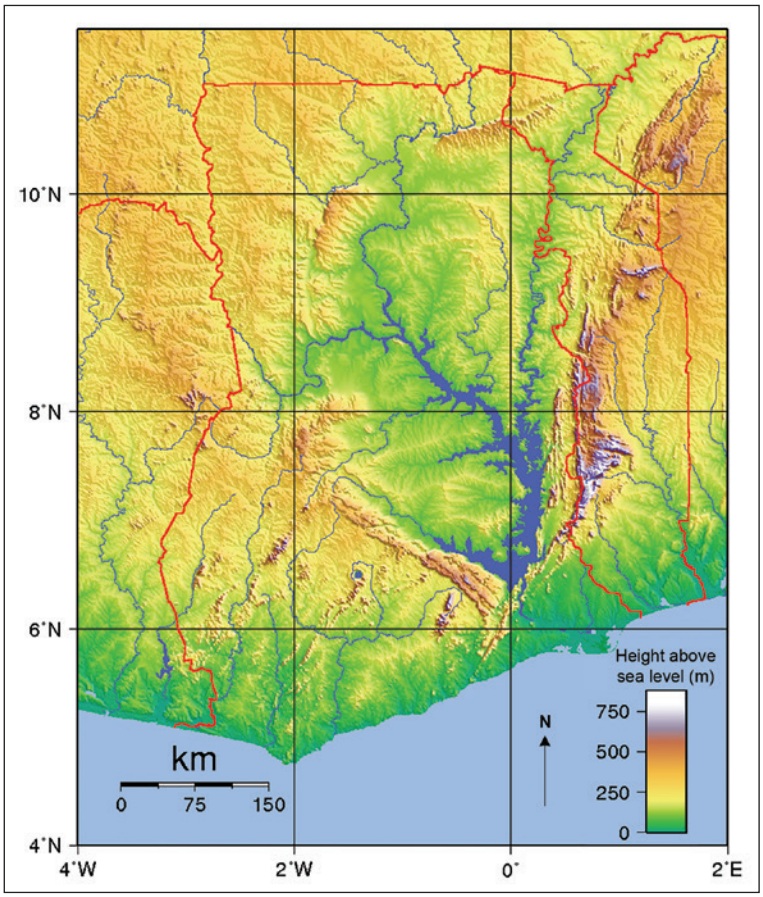

Figure 16: Topographic map of Ghana.

Climate

Ghana has wet and dry seasons rather than a four-season climate, due to its position in the tropics.

Figure 17: Climate graph for Accra, Ghana.

Waterways

Rivers and bodies of water, primarily the Black Volta and White Volta, are a key part of Ghana's environment. These support fisheries, farming, and tourism. However, they also contribute to the breeding of mosquitoes and carry waterborne diseases.

In 2024, it was reported that 60% of Ghana's waterways were polluted to dangerous levels, due to run-off, waste disposal, and industrial activities such as mining. Heavy metals, such as lead and mercury, are now at dangerously high levels in many rivers such as those shown in the map below. E-waste contributes to this through the process of run-off.

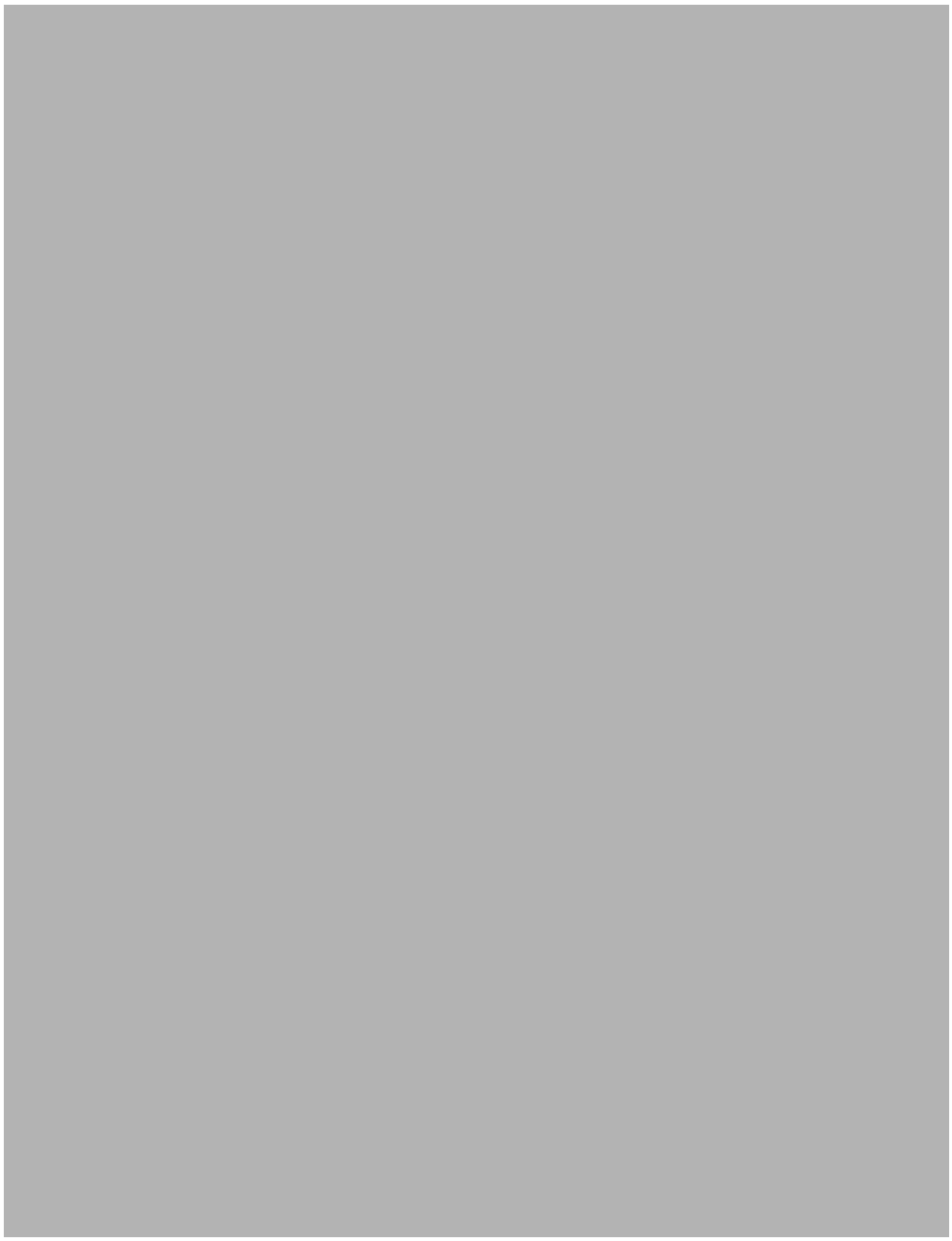

Figure 18: Large-scale rivers and waterways of Ghana.

RESOURCE H: Ghana's cultural environment

Population pyramid (2025)

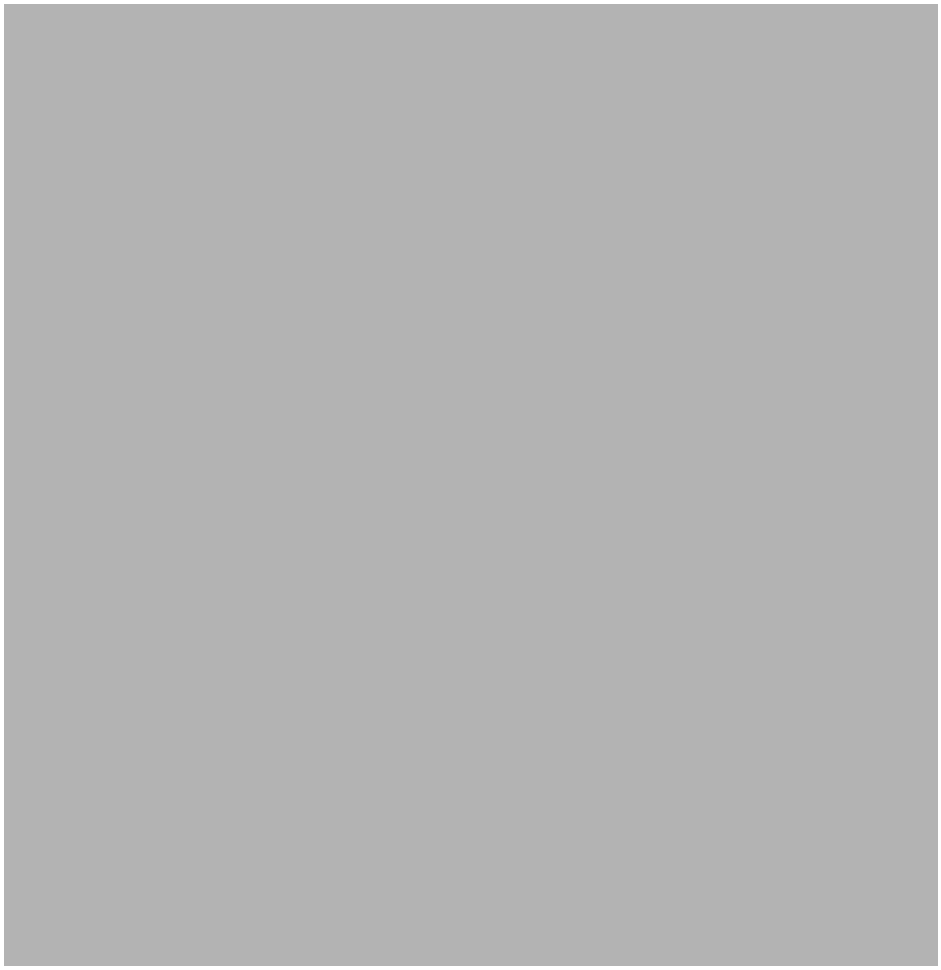

Figure 19: Ghana's population structure.

Religion



Figure 20: Religions in Ghana.

Ghana is a multicultural country with many different religious groups. Alongside the main religions, it is common for the people of Ghana to uphold and practise more traditional customs and beliefs related to their tribal ancestry. These practices vary from location to location.

There are over 100 ethnic groups living in Ghana. The largest are Akan, Moshi-Dagbani, Ewe, and Ga.

The Ashanti tribe of the Akan is the largest tribe in Ghana and one of the few societies in West Africa where lineage is traced through the mother and maternal ancestors.

Economy

Ghana's economy is a mixture of private and government-owned enterprise. More than two-fifths of the country's gross domestic product (GDP) is gained from the services sector.

Approximately 52% of the population is employed in agriculture, forestry, and fishing, but this accounts for only one-fifth of Ghana's GDP.

The Ghanaian domestic market for agriculture is important, as the value of food produced for local consumption is considerable. The soil and climate favour a wide range of crops, such as yams, cereals, rice, millet, and nuts.

Although Ghana has a wide range of minerals, only some – gold, diamonds, manganese, and bauxite – are mined to be sold. Ghana's principal exports are cocoa, gold, and crude petroleum.



Figure 21: Graph showing Ghana's GDP over time.
GDP is measured by the total monetary value of all goods and services produced within a country's borders per year. Ghana currently ranks 79th out of 196 countries for GDP.

RESOURCE I: Agbogbloshie dump in Accra, Ghana

Agbogbloshie is the world's largest e-waste dump. It is located in Accra, Ghana and is listed among the top 10 most polluted places in the world. It covers 10 hectares and sits in a densely populated area, with 2 million residents within 10 kilometres.



Figure 22: Location of Agbogbloshie dump in Accra, Ghana.

E-waste processing in Agbogbloshie began in the early 1990s. Increasing numbers of migrants from northern Ghana moved to the region to escape inter-tribal conflicts and famine, seeking alternative livelihood sources for their declining agricultural opportunities.

The e-waste site at Agbogbloshie directly employs approximately 6,000 people, and an estimated 90% of these workers live in informal settlements (slums). 30,000 people are indirectly employed by the e-waste recycling industry here and many migrants are attracted to the Accra region for the economic opportunities available.

Agbogbloshie's informal economy enables people to save small amounts of money to send to their families living elsewhere. Work in the e-waste dump offers a way of earning money and improving their economic standing, but there are long-term costs that come with the immediate survival this money creates.

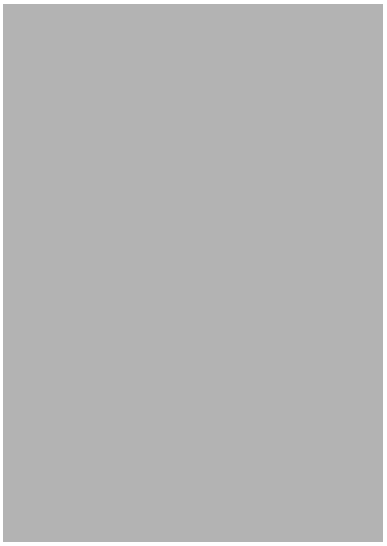

Figure 23: An e-waste worker.

Workers are exposed to harmful chemicals, such as lithium-ion and lead car batteries, and some suffer from chemical and fire burns. Speaking on the dangers, an 18-year-old male justified continuing to work in the e-waste industry, as he "can gather metals and sell them to bigger companies. After that, I can feed myself and send money to [my] family."

However, the ongoing e-waste recycling and burning create a toxic environment for all residents in the area, as well as across the city. A 19-year-old female, who works selling beverages to the community, commented that it is "tough to work here. I face many challenges, like the smell in the air. It makes me cough so much. I am not sure if it is asthma or the air."

RESOURCE J: Impacts of e-waste

Many countries have national legislation that regulates the management and disposal of e-waste. Yet e-waste management in developing countries is predominantly carried out by informal workers (workers whose jobs lack legal protection and are not covered by labour laws). They dismantle components manually and are typically young (under 25) and unskilled in this type of work.

In Ghana, for example, informal workers are often organised in small private associations. This labour-intensive process often involves burning unwanted materials or discarding them in open dumpsites. These practices release toxic substances, such as lead, cadmium, and polychlorinated biphenyls (PCBs), into the environment. These toxic substances can bioaccumulate in the food chain and end up causing serious health issues and environmental issues (as illustrated in the diagram below).



Figure 24: The negative impacts of e-waste.



Figure 25: Workers at an e-waste dump in Ghana.

RESOURCE K: Ghana e-waste workers' perspectives

Adjoa, 23, is one of the few women working in the informal e-waste sector in Ghana. She specialises in recovering and reselling parts from old smartphones and laptops. While most workers burn wires to extract copper, Adjoa earns income through manual disassembly and resale. Her exposure to lead, cadmium, and brominated flame retardants increases her risk of neurological and reproductive health issues.





Kojo, 16, performs open-air burning of insulated copper wires to extract metal. This common method releases dioxins, lead, and polycyclic aromatic hydrocarbons (PAHs), all linked to cancer and organ damage. Kojo works without gloves or a mask. Studies have shown that adolescent workers in these conditions often experience chronic cough, headaches, and impaired lung function.

Bernard, 21, was diagnosed with sickle cell disease, a condition worsened by physical stress and exposure to pollutants. Despite this, he worked at the dump site in Accra to support his family. E-waste workers like Bernard frequently lack access to healthcare, even as they handle materials containing mercury and arsenic. He died in 2024 from complications made worse by his working conditions.





Selorm, 30, repairs damaged electronics collected from dump sites and informal markets in Accra. Unlike those who burn parts, he focuses on reusing or reselling viable parts, such as circuit boards and display screens. Ghana imports over 150,000 tons of e-waste annually, much of it unusable. Informal repair workers like Selorm help reduce environmental impact but still face exposure to toxic residues on older devices.

Francis, 19, came to Accra from the Upper East during the dry season, part of a growing trend of climate migration. He dismantles discarded printers and appliances for aluminium and steel, earning a few dollars per day. Without formal training or safety equipment, Francis works amid soil and air contaminated with heavy metals. Such exposures are linked to cognitive decline, skin disorders, and kidney damage.



RESOURCE L: Impacts of e-waste processing in Africa



Figure 26: The human cost of e-waste.



Figure 27: The environmental cost of e-waste.

Acknowledgements
Material from the following sources has been adapted for use in this assessment:

Resource A
Text: https://www.perthbinhire.com.au/what-is-e-waste-and-how-to-dispose-it/
Figure 1: https://ewastemonitor.info/wp-content/uploads/2022/06/Global-TBM_webversion_june_2_pages.pdf (p. 14)
Figure 2: https://ewastemonitor.info/wp-content/uploads/2024/12/GEM_2024_EN_11_NOV-web.pdf (p. 12)

Resource B
Text: https://voxdev.org/topic/health/electronic-waste-silent-killer-west-africa
Text: https://ewastemonitor.info/wp-content/uploads/2022/06/Global-TBM_webversion_june_2_pages.pdf (p. 26)
Figure 3: https://ewastemonitor.info/wp-content/uploads/2020/11/GEM_2020_def_july1_low.pdf (p. 14)

Resource C
Figure 4: https://www.foursfze.com/e-waste-in-circular-economy.html
Figure 5: https://ewastemonitor.info/wp-content/uploads/2020/11/GEM_2020_def_july1_low.pdf (p. 15)

Resource D
Figure 6: https://ewastemonitor.info/wp-content/uploads/2024/12/GEM_2024_EN_11_NOV-web.pdf (p. 14)
Figure 7: https://ewastemonitor.info/wp-content/uploads/2024/12/GEM_2024_EN_11_NOV-web.pdf (p. 33)
Figure 8: https://www.genevaenvironmentnetwork.org/resources/updates/the-growing-environmental-risks-of-e-waste/
Figure 9: https://ewastemonitor.info/wp-content/uploads/2020/11/GEM_2020_def_july1_low.pdf (p. 25)
Figure 10: https://ewastemonitor.info/wp-content/uploads/2022/06/Global-TBM_webversion_june_2_pages.pdf (p. 13)

Resource E
Figure 11: https://journals.sagepub.com/doi/10.1177/0734242X231204457?
Figure 12: https://www.researchgate.net/figure/The-sources-and-levels-of-processing-of-e-waste-in-Ghana-Source-Ministry-of-Environment_fig1_397302223

Resource F
Figure 13: https://cdn.britannica.com/75/5075-050-78E51BD5/Ghana.jpg
Figure 14: https://cdn.britannica.com/54/5054-050-8EC06097/Flag-Ghana.jpg
Figure 15: https://www.mapsofworld.com/ghana/ghana-location-map.html

Resource G
Figure 16: https://commons.wikimedia.org/wiki/File:Ghana_Topography.png (public domain)
Figure 17: https://en.climate-data.org/africa/ghana/greater-accra-region/accra-534
Figure 18: https://www.mapsland.com/africa/ghana/large-scale-rivers-and-lakes-map-of-ghana

Resource H
Figure 19: https://www.populationpyramid.net/ghana/2025/
Figure 20: https://www.britannica.com/place/Ghana/Religion
Text: https://iadcorona.webnode.nl/general-information-g/
Text: https://www.britannica.com/place/Ghana/Economy
Figure 21: https://www.macrotrends.net/global-metrics/countries/gha/ghana/gdp-gross-domestic-product

Resource I
Text and Figure 22: https://www.nature.com/articles/s42949-025-00299-5
Text: https://www.sciencedirect.com/science/article/pii/S0956053X21006711
Text: https://voxdev.org/topic/health/electronic-waste-silent-killer-west-africa
Figure 23: https://www.npr.org/sections/goats-and-soda/2024/10/05/g-s1-6411/electronics-public-health-waste-ghana-phones-computers

Resource J
Text: https://voxdev.org/topic/health/electronic-waste-silent-killer-west-africa
Figure 24: https://www.mdpi.com/toxics/toxics-10-00365/article_deploy/html/images/toxics-10-00365-g002.png
Figure 25: https://assets.bwbx.io/images/users/iqjWHBFdfxIU/ivuLhY.YmU04/v0/-1x-1.webp

Resource K
Text: https://www.npr.org/sections/goats-and-soda/2024/10/05/g-s1-6411/electronics-public-health-waste-ghana-phones-computers
Silhouettes: https://stock.adobe.com/nz/670857578 https://stock.adobe.com/nz/1926857285

Resource L
Figure 26: https://link.springer.com/article/10.1007/s42452-022-04962-9#Fig2
Figure 27: https://www.cell.com/heliyon/fulltext/S2405-8440%2824%2904738-8 (Figure 4)