Table 1:
The origin story

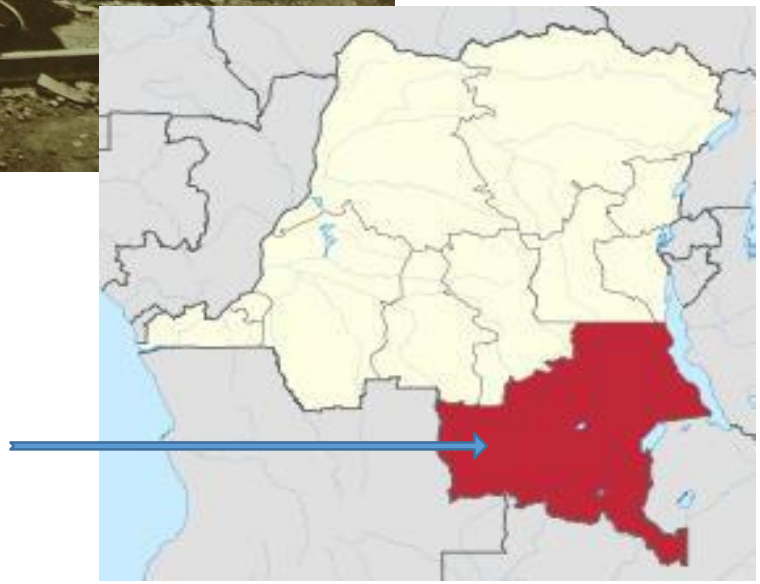
The **Democratic Republic of the Congo (DRC)** is located in central Africa and has a population of 77 million

DRC has a rich source of many minerals that people use across the world. The region has an estimated **$24 trillion in untapped minerals**

DRC ranks among the poorest countries in the world at 176 out of 187 countries on the most recent Human Development Index calculated by the UN (2015)

The DRC has the potential to become one of the richest countries on the continent of Africa

Workers at the Kisanga mine in Katanga, c. 1920



Katanga province (*Marked in red on the map*) is in the South of the DRC. Many mines are still active in the province today

- The DRC's minerals have attracted foreign attention since Portuguese explorers first arrived in the 15th century.
- In the 19th century DRC was a Belgian colony. Congolese worked in the mines for the Belgians.
- The mining and mineral processing sector is Congo's main source of state revenue. It provides employment at least half a million people.
- On the 30 June 1960 Congo became an independent state.

STEAM
IN JUNIOR CYCLE

- Many wars have been fought in the DRC.
- Internal conflicts and conflicts with other African countries have killed more than 5.4 million people since 1998 and displaced over 4.5 million.
- Today the DRC is still in the mist of violence, some of which is funded through the sale of the countries rich sources of minerals, and is sometimes over control of the minerals themselves.
- In 2015 Transparency International ranked the DRC 147 out of 167 countries in the Corruption Perception Index. This means that people do not trust the government of the Congo – many officials have been accused of taking bribes and making unjust decisions.

- The Democratic Republic of Congo (DRC) is the most biologically diverse country in Africa and one of the most important centers of biodiversity in the world, encompassing over half of Africa's tropical forest.
- Despite the armed conflicts that ravaged the country starting in the mid-1990s, World Wildlife Fund maintained a continuous presence in the DRC and gradually expanded its geographical and thematic scope. The country office in Kinshasa opened in March 2004.
- This information is from the World Wildlife Fund Website.

What do we know about the Congo:

Economy

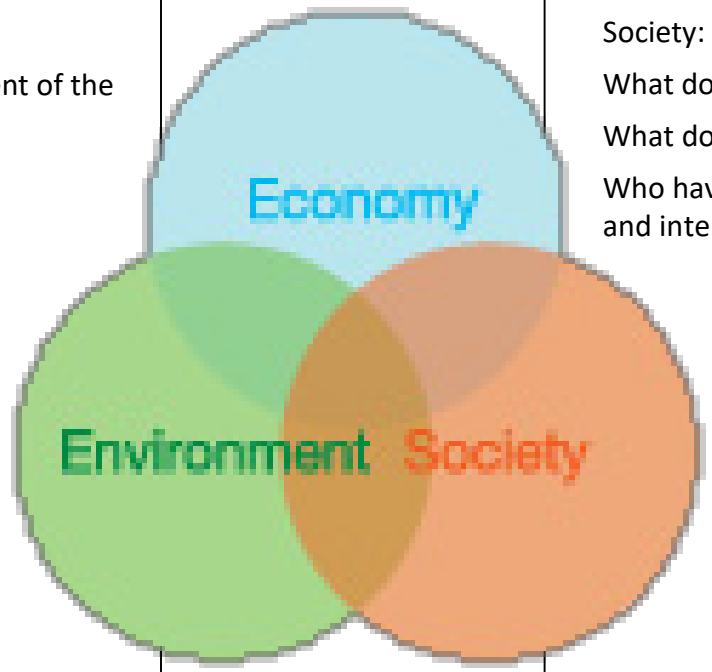
Is economic development balanced?

Who is involved in the economy?

What do we know about the Congo:

Environment:

What do we know about the environment of the Congo?



What do we know about the Congo:

Society:

What do we know about the society of the Congo?

What does its history tell us?

Who have we learnt about so far? What national and international organisations are involved?

What was your perception about the Congo before doing this activity?

Table 2:
Cobalt and mining

- This is Cobalt (Co) a hard and lustrous metal and is mainly obtained as a by product of nickel and copper mining activities.
- Cobalt is found in every rechargeable battery on the planet – from smartphones to tablets to laptops to electric vehicles – and wearable devices.
- Market prices of cobalt have spiked 300% in the past two years .
- Global demand for cobalt is increasing, but the global cobalt market remains largely **unregulated** as it falls outside "conflict mineral" legislation regulating the extraction and sale of other

minerals such as gold, coltan and tin from the DRC.

- 60% of the worlds cobalt comes from the Congo, 20% of which comes from **artisanal mines** in the southern part of the country. This image is of an artisanal mine in Katanga province.
- As many as 100,000 diggers, sorters and washers are believed to work at these mines. In 2014, UNICEF estimated that around 40,000 children were involved in artisanal mining in the DRC.
- In a recent research trip by Harvard Business school interviewed some of the children, as young as 7, working in these mines. Older children and women also work in artisanal mines washing stones. Chinese traders will pay them about $0.65 (50p) for a day's work.

This information is from The Guardian Newspaper


N39
N39
Mutanda mining
Mutanda Mining
Mumi Kolwezi
500 m

- This is Mutanda mine (photo) in Katanga province in the Congo. This mine is now owned by Glencore, a Swiss Company. It was granted a licence to operate by the Congolese Ministry of Mines.
- The mine is located in the Basse Kando, a game reserve. Its development lead to the destruction of vegetation posing substantial risks to forests and forest carbon stocks and biodiversity.
- All mining starts with deforestation of the area. In some cases this has caused a loss of subsistence livelihoods among local communities, as they have seen a clear decrease in the availability of non-timber forest products (NTFPs), such as honey, caterpillars, medicinal plants, and bush meat.
- Some local people claim that local rivers have been polluted rendering the water unfit for use by villagers in the surrounding area. Fishing, irrigating farmland, washing and drinking have begun to impose a health risk.

- This information is from a report by Centre for Research on Multinational Corporations, based in the Netherlands, ‘Cobalt blues Environmental pollution and human rights violations in Katanga’s copper and cobalt mines’ April 2016.


GLENCORE

- 40% of Cobalt comes from **large scale mines** in the southern part of the country.
- Glencore, a Swiss company, now owns two of the largest open pit mines in Congo; they are located in the Katanga province. The mines employ about 12,000 people.
- https://www.youtube.com/watch?v=0MltwauaN6M

- This information is from Glencore

- What do we know about the Mines:

  Economy:

  Is economic development balanced?

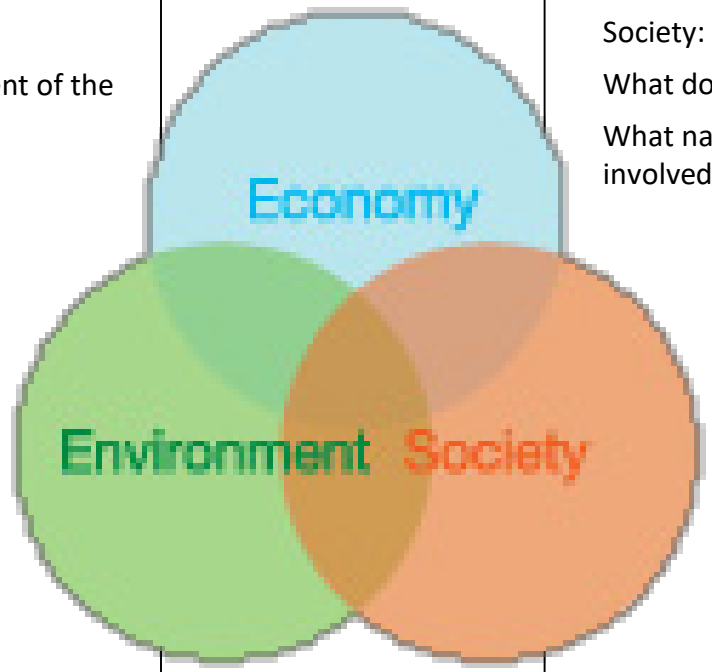
  Who is involved in mining?

  Who grants permission for mines?

- What do we know about the Congo:

  Environment:

  What do we know about the environment of the Congo?



- What do we know about the Congo:

  Society:

  What do we know about who works in the mines?

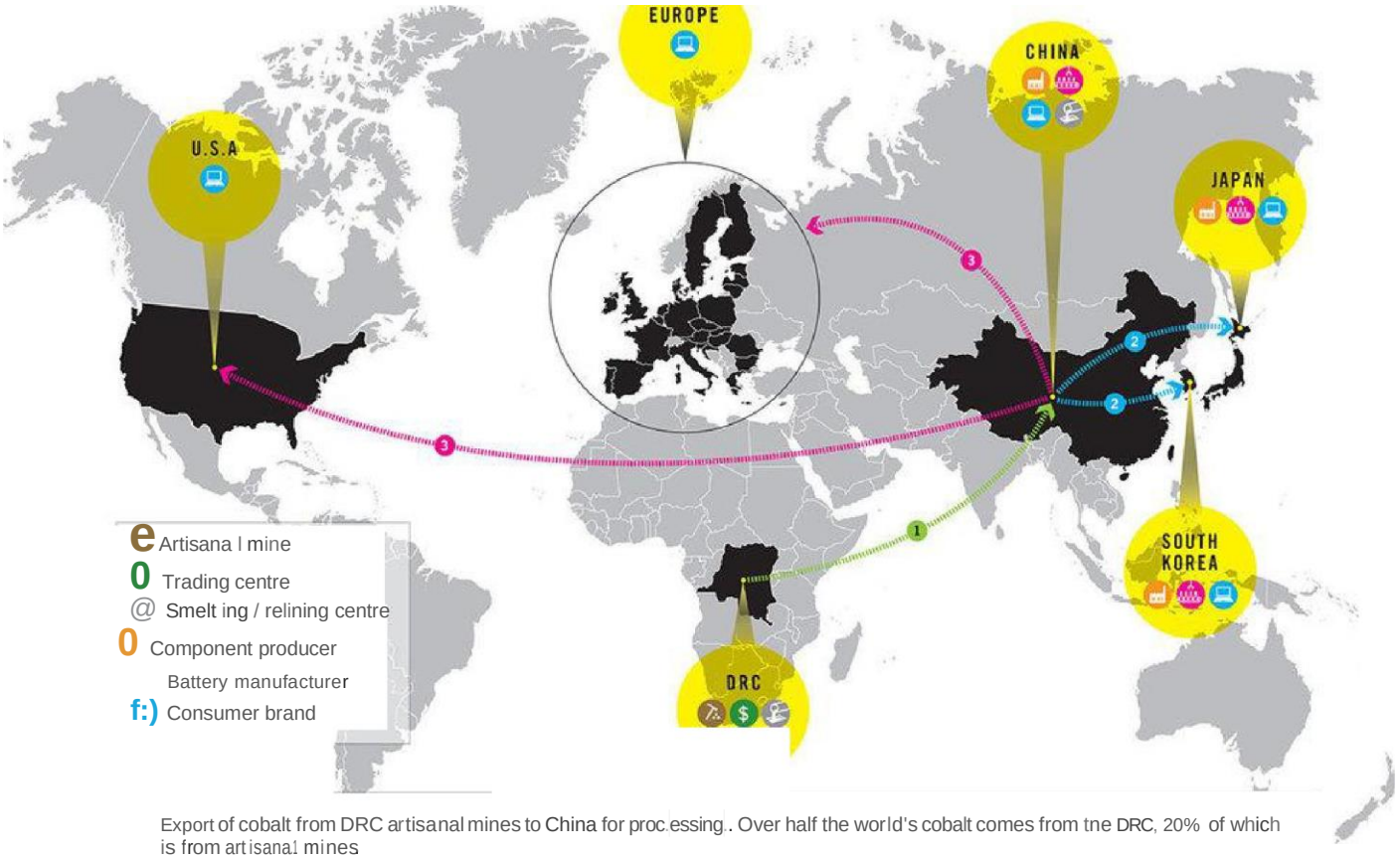
  What national and international organisations are involved?

What was your perception about the Congo before doing this activity?

Table 3:

Transporting and refining Cobalt

Movement of cobalt from artisanal mimes in the DRC to the global market



Export of cobalt from DRC artisanal mines to China for proc essing . Over half the world's cobalt comes from tne DRC, 20% of which is from artisanal mines

fJ Supply of processed cobalt to factories in Asia io make rechargeable batteries.

Q Supply of batteries to gl◊bal technology and car companies.


Nigeria
Central African Rep.
S. Sudan
Ethiopia
Uganda
Kenya
Gabon
Dem. Rep. Congo
Tanzania
Angola
Lubumbashi
Mozambique

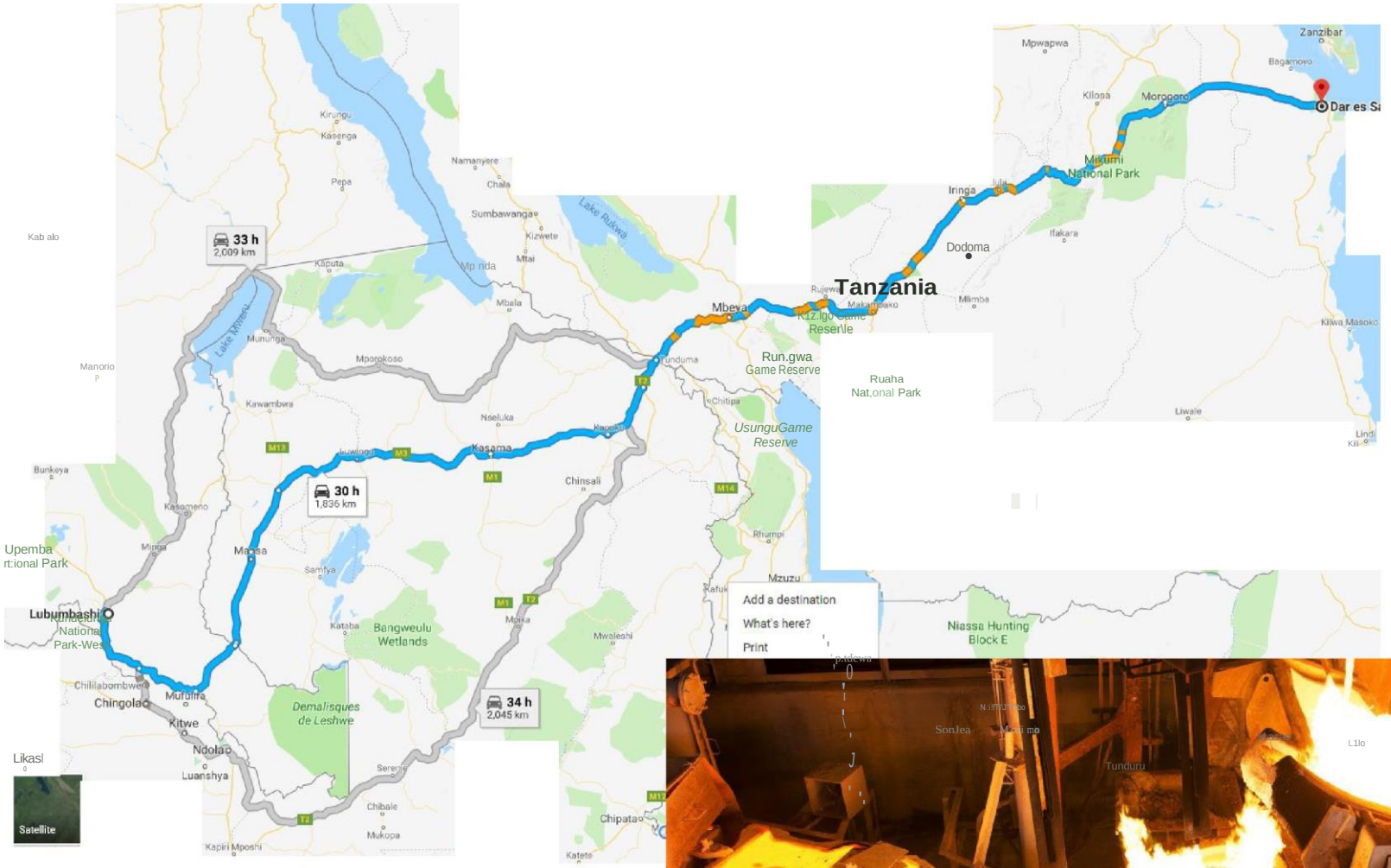
Image of a lorry carrying ore from mines to Lubumbashi.

- After extracting Cobalt ore from the mines it must be transported to a refiner. Veryoften this is done by road and through the main town Lubumbashi.
- Pollution caused by copper and cobalt mining has induced widespread illness in Lubumbashi, a city of more than 2-million residents in the country's southeast. Plumes of smoke and clouds of dust rise into the air from vehicles transporting ore to be refined. Used water containing chemicals and mineral alloys run off untreated from the mines into streams. "High concentrations of toxic metals ... cause respiratory disorders and birth defects", particularly in people living near the mines, said toxicologist Celestin Banza of the University of Lubumbashi.
- MP Davon N'Sa Mputu Elima, who served as environment minister from 2012-2014 says that mining companies put up considerable resistance to a 2009 amendment in the country's environmental code, which imposed stringent new health and safety requirements. Such protective measures are often not enforced because of what the MP calls "a lack of expertise" among administrative officials who are responsible for seeing that mining companies comply.

This information is from Business Day, a national daily newspaper in South Africa, published

from Monday to Friday and also available as an e-edition

https://www.businesslive.co.za/bd/world/africa/2016-08-23-drc-mines-cause-toxic-damage/


33 h
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30 h
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34 h
2,045 km
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Zambia
Lubumbashi
Kasama
Mbeya
Dodoma
Dar es Sa
Zanzibar
Add a destination
What's here?
Print
Satellite

11111]

Refining ore

- Refining adds value to cobalt, which is why the Congolese government wants to stimulate producers to have their cobalt ore refined in the country. Although the government has tried several times to ban the export of unrefined ores, lack of electricity in DRC renders it impossible to have all ore refined.
- The copper-cobalt ores are initially processed using heat and chemicals to produce a copper-cobalt concentrate. Different reagents are used to attract the cobalt minerals to separate the copper from cobalt. Cobalt concentrates, which can contain as much as 15 percent cobalt, are then transported to further smelting and refining sites in Indonesia and China.
- Congo Dongfang Mining International (CDM) is a refiner and processes some of the ore in Congo before exporting it to Huayou Cobalt in China via the port of Dar Es Salam in Tanzania.
- The company which smelts and refines the cobalt is in a key position in the supply chain (often referred to as the “choke point”). As the point at which minerals are processed before being incorporated into components and other

products, it is generally seen as the best point at which a company can track the mineral and the conditions of its extraction and trading from the mine site through to local suppliers (i.e. occurrence of human rights abuses linked to the extraction and movement).

- What do we know about the Mining process:

  Economy:

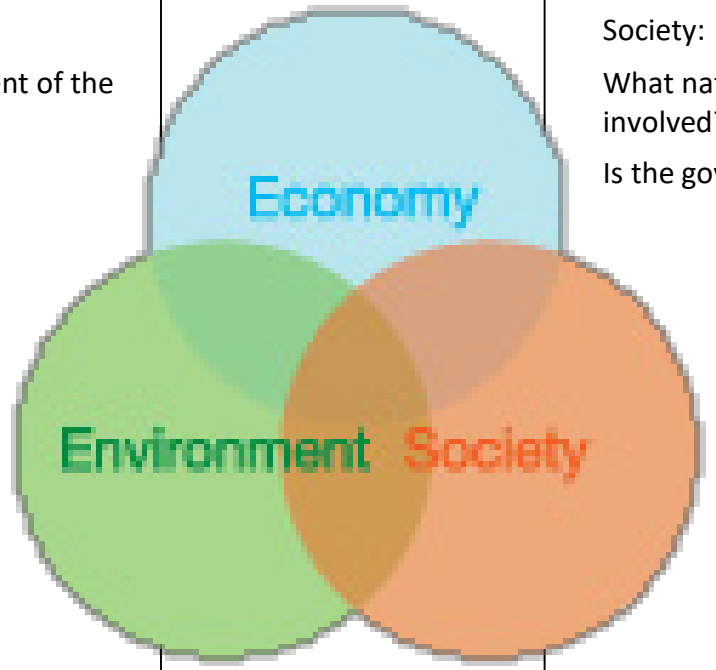
  Is economic development balanced?

  Who is involved in this stage of processing of Cobalt?

- What do we know about the Congo:

  Environment:

  What do we know about the environment of the Congo?



- What do we know about the Congo:

  Society:

  What national and international organisations are involved?

  Is the government trying to help? How?

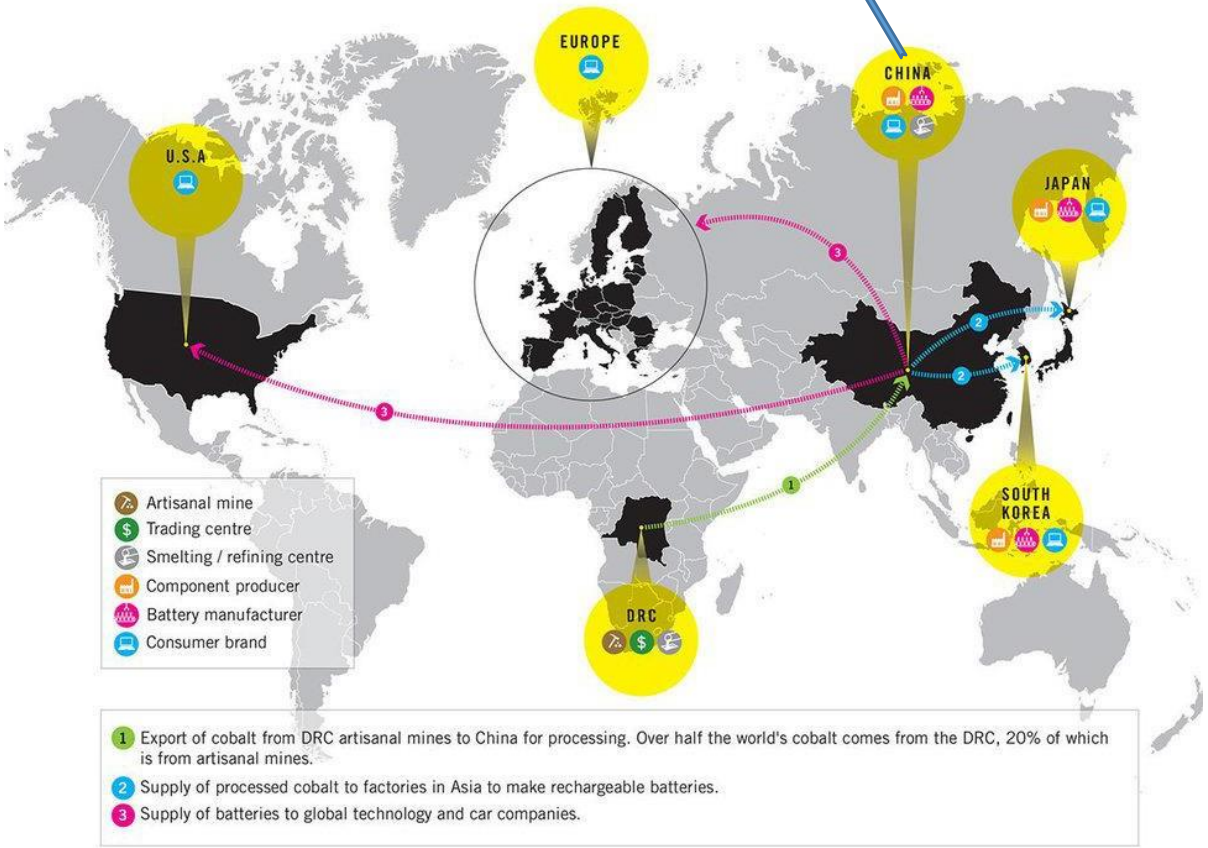
What was your perception about the Congo before doing this activity?

Table 4:

Incorporating Cobalt into rechargeable batteries

STEAM
IN JUNIOR CYCLE

Movement of cobalt from artisanal mines in the DRC to the global market



1 Export of cobalt from DRC artisanal mines to China for processing. Over half the world's cobalt comes from the DRC, 20% of which is from artisanal mines.

2 Supply of processed cobalt to factories in Asia to make rechargeable batteries.

3 Supply of batteries to global technology and car companies.

AMBER

- Zhejiang Huayou Cobalt Ltd (Huayou Cobalt) Zhejiang, China, is a Chinese cobalt processor and refinery that is primarily a supplier of cobalt to the battery industry. Some estimate that between 68 - 90 per cent of Chinese cobalt is imported from the Democratic Republic of Congo.
- According to a joint Amnesty International and African Resources Watch report suppliers of cobalt to Huayou Cobalt were from "artisanal" mines in the Democratic Republic of the Congo, where there are few worker protections and child labour has been employed. Huayou Cobalt admits to having "insufficient awareness of supply chain management", and did not know that buying artisanal cobalt would increase child labour.

Source: Huayou Cobalt Website

Note: ASM = artisanal mines

Landmark responsible ASM cobalt pilot initiative launches at sites in Huayou Cobalt's supply chain in DRC

Friday, 6 July 2018.

We are delighted to confirm that the Better Cobalt pilot project on ASM sites in Huayou Cobalt's supply chain in the DRC has officially launched in-country in June in the presence of the provincial government.

Prior to the Better Cobalt launch, Huayou Cobalt has already started implementing additional due diligence measures on issues including child labor and have developed and implemented responsible sourcing policies and procedures in line with global good practice as defined by the OECD. Their cooperation with Better Cobalt will allow the company to monitor and demonstrate continuous improvement of working conditions at the sites it sources from.

Since last week, a Bet ter Cobalt team has been deployed to the region to conduct preliminary mine site and supp ly chain assessments and prepare the monit oring system.

What is Better Cobalt?

The Better Coba lt n on- profit pilot gathe rs sit e-sp ecifi c due diligence data in line wit h int er nat ional market entr y st an dar ds - including child labour and human rights - via the deployment of trai ned Better Cobalt monit or ing agents equipped with a bespoke smartphone-based ap plicat ion. The sol ut i on also monitors cont ext ua l data on development cond itions in the mining communities.

Both data sets combined allow for a) direct intervention an d tar geted CSR expend iture towards the improvement of pract ices and to address development deficiencies at the mine site and in impacted com munities an d b) to quanti t at ive ly monit or the impact of said interventions.

Better Coba lt t he refor e provides t h e data to direct improvem ent efforts in a targeted man ner to change the act ual con ditions of p roduct io n in the sector. It simultaneously builds in the monit oring of such int er vent ion s allowing global industry to demonst r at e the impact that their interventions

are having. It is the most cost effective approach for a global company to demonstrate its real impact.

Better Cobalt also has the capacity to digitally trace cobalt from the mine pit through the supply chain and provide this data in a Blockchain-ready format, positioning Better Cobalt as a key data aggregator and due diligence provider at the first stage of the artisanal and mechanised mining supply chain.

Better Cobalt builds on the Better Sourcing validation system, which is successfully validating conflict minerals supply chains and can be used to progressively scale validation to additional responsible artisanal and mechanized mine sites.

The pilot and Huayou Cobalt's participation

The initial scope of the pilot project focuses on delivering up to 5 supply chains originating from ASM and mechanized mine sites by the end of the year. Huayou Cobalt has identified three ASM sites they source from to form part of the initial pilot scope. Cobalt production at these sites will be monitored and validated against globally accepted market entry standards for responsible cobalt production, while also specifically focusing on child labor and human rights abuses.

If successful, the approach can be scaled across the DRC cobalt sector, benefitting producers,

purchasers, and the mining communities impacted by its production.

For more information on Huayou Cobalt's involvement in the project, or to learn more about Better Cobalt and how to get involved, please contact nicholas@bettersourcing.io or CSR@huayou.com .

POTENTIAL DRC COBALT SUPPLY CHAIN According to pub licly avai lable i nformat ion

Smelter/refiner

- Battery component manu facturers
- Battery manuf acture r
- Electron ic ,ioods and vehicle Illanutacturers

• Indicates companies which deny a connect ion to this p otential s upply chain and/or lo DRC cobalt.

COM/ Huayou Cobalt

Toda Hunan Shanshan New Materia

Tianjin Bamo Tech nolo gy

L&F Material

(parent company of Toda Shanshan)

BAK

Tianjin Lishen*


Apple
Dell
HP*
Huawei*
Lenovo
(Motorola)
Microsoft
Samsung*
Vodafone*
VW*


Model No.:CS-IPW1S3SH
Part No :A1576
Rating :3.8VDC ⎓ 200mAh
0.76Wh
Lithium-Polymer Battery Pack
CAUTION WARRANTY VOID IF LABEL IS REMOVED
•DO NOT ATTEMPT TO DISASSEMBLE, OPEN OR SERVICE THE BATTERY PACK.
•REPLACE ONLY WITH THE BATTERY PACK DESIGNATED FOR THIS PRODUCT.
•DO NOT CRUSH, PUNCTURE, SHORT EXTERNAL CONTACTS OR DISPOSE OF IN FIRE OR WATER.
•DO NOT STORE ABOVE 60°C (140°F).
Made in China


Model No.:CS-FTS100SH
Part No :LSSP491524AE
Rating :3.7VDC ⎓ 100mAh
0.37Wh
Lithium-Polymer Battery Pack

- This image is of a rechargeable battery.
- There is a large presence of rechargeable battery producers in China, where four of the five largest battery producers operate manufacturing plants. These battery companies operating in China, namely Panasonic, Samsung SDI, LG Chem, and Amperex Technology Limited (also known as ATL) together reportedly account for over 60 per cent of the world's total annual rechargeable battery production.
- Rechargeable batteries are currently the most popular type of batteries but have shortcomings due to their large size, bulky volume, and heavy weight. They also suffer from several inherent limitations such as liquid electrolyte leakage, flammability, and unsatisfactory safety and flexibility.
- Once made the batteries are then transported to the end supplier, e.g. Apple, Samsung, Intel who incorporate the batteries into the end device for export.

- Cobalt is currently a key component in rechargeable battery manufacture.

Flow chart of the cobalt supply chain

In 2016, Apple said that starting in 2017, they will treat cobalt as a conflict mineral, and require all cobalt suppliers to agree to outside supply-chain audits and risk assessments.

In 2017 Apple Inc. said that approximately 20% of the in Apple's batteries were sourced from Huayou Cobalt.

After a 2017 Sky News report that showed that child labour continued to be utilized in the Cobalt supply chain Apple but in place more stringent processes. Apple has mapped its supply chain down to the mines and formed a coalition of

industry players that led to the creation of a risk readiness assessment tool. One hundred percent of smelters in the chain receive third-party audits and Apple works closely with suppliers and miners to build capacity and improve practices.

- What do we know about the

- Economy:

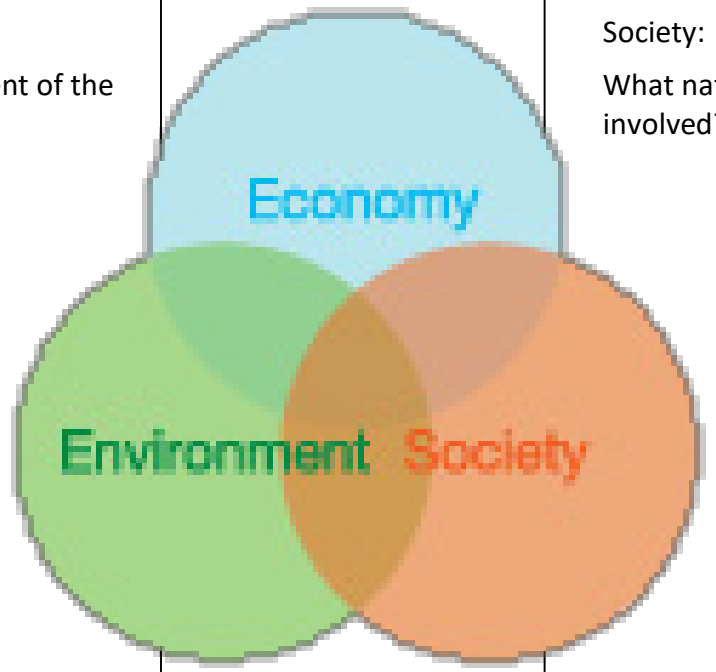
  Who is involved in processing and supplying Cobalt for rechargeable batteries?

  Why do their supply processes need to be examined? What are the company's doing? When did events happen to change this part of the supply chain?

- What do we know about the Congo:

  Environment:

  What do we know about the environment of the Congo?



- What do we know about the Congo:

  Society:

  What national and international organisations are involved?

What was your perception about the Congo before doing this activity?

Table 5:
Wearables & Waste

STEAM

IN JUNIOR CYCLE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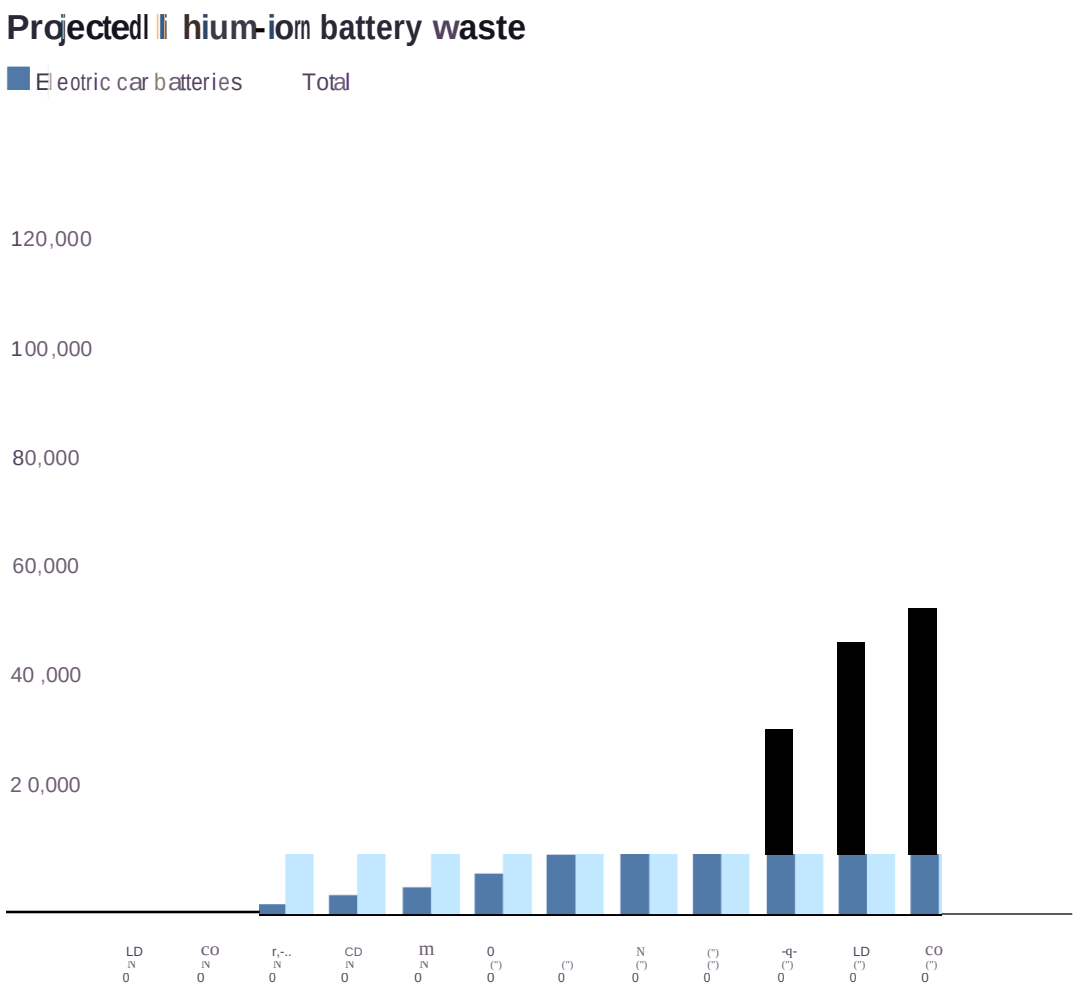
135

- The global wearable device market is forecast to grow $24.8 billion in 2017 to more than $84 billion in 2022. Ear-worn devices (hearables), smartwatches and head-mounted displays are expected to be the largest dollar segments.
- All of these devices will require batteries. Making rechargeable batteries currently requires Cobalt, although some companies have decided to start looking for ways to make batteries without it.
- Deciding what to do with our wearables and other electronic devices will increasingly become an issue as we move into a more connected society.


Projected lithium-ion battery waste
Electric car batteries
Total
120,000
100,000
80,000
60,000
40,000
20,000

N N N N N N N N N N N N

Source: Randell Environmental Consulting• Get Ute d ata •Embed

- This graph is represents the projections in waste from rechargeable batteries, otherwise know as Lithium Ion Batteries.
- Recycling the 1.6 billion used mobile phones said to be wasting away in people's drawers, could provide cobalt to meet demand for millions of electric vehicles, phones, new technologies according to Belgium-based Umicore. "There is an amazing mine of cobalt that is totally untapped," the company's chief executive Marc Grynberg has said, adding that about 10% of global cobalt supply goes to smartphones production.
- Samsung SDI, South Korea's leading battery maker, has unveiled plans to recycle cobalt from used mobile phones and develop lithium-ion batteries with minimum content of the metal, or no cobalt at all, as a way to offset soaring prices for Cobalt.
- Cobalt prices rose dramatically in 2017 sparked by intensifying supply fears and an expected demand spike from battery markets.

- Prices for the metal are expected to rise even further this year, as the Democratic Republic of Congo, responsible for more than half the world's supply, recently hiked its taxes and royalties on the metal.

STEAM
IN JUNIOR CYCLE

- WEEE Ireland, the electrical and battery recycling scheme in Ireland, recycled a total of 35,708 tonnes of e-waste and 874 tonnes of waste batteries from householders, consumers and businesses in 2017. “E-Waste is a term used to cover items of all types of electrical and electronic equipment (EEE) and its parts that have been discarded by the owner as waste without the intention of re-use”.
- WEEE Ireland said that 830 tonnes of copper were recovered
- The group also surpassed EU targets in waste portable battery collections, where the quantity collected increased from 812 to 874 tonnes.
- The LauraLynn "Every Battery Counts" campaign and is testament to how the "Blue Box" has become synonymous with battery recycling in schools, retailers and businesses

across Ireland.

- Awareness of the need to recycle batteries therefore increasing in Ireland.

- What do we know about the

- Economy:

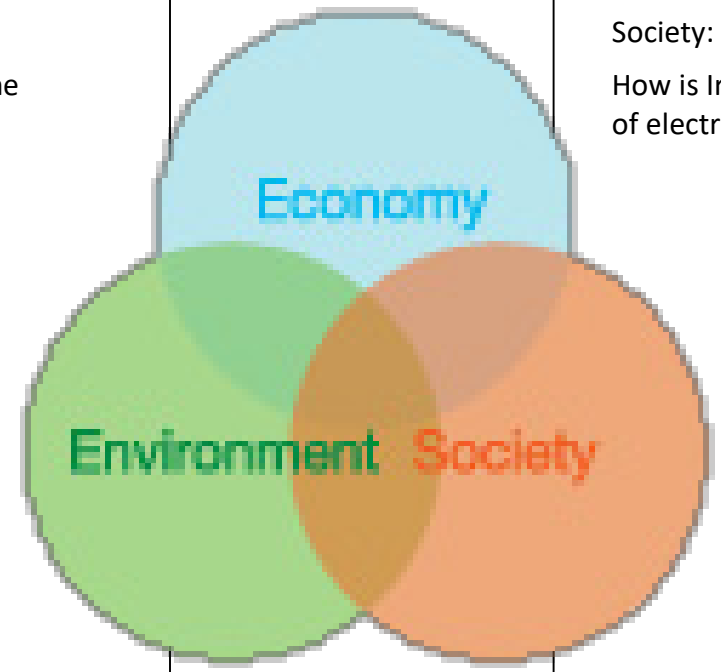
  What do we know about the market for wearables and its implications for waste generation?

  What companies are taking steps to change their reliance on Cobalt? Why are they taking these actions?

- What do we know about the Congo:

  Environment:

  What do we know about the cost for the environment?



- What do we know about the Congo:

  Society:

  How is Irish society trying to make the end of life of electronic devices more sustainable?

What was your perception about the Congo before doing this activity?

Table 6:

How are our electronic devices recycled?

- This image is of Tin Can Island in Lagos, Nigeria.
- A study done in 2015-2016 showed that 6.2% of UEEE is imported from Ireland to Nigeria through Tin Can Island and the Lagos Port Complex – another major port in Nigeria.
- UEEE is waste electronic and electrical equipment which was once used but is still workable and keeps its original form, or can be repaired, modified, reconditioned in order to be used for the same as its original purpose.
- The imports of UEEE can generate considerable profits, especially if they can be sold for re-use. The overall profits depend on the quality and the brand of the UEEE, and on the exchange rate of the Nigerian currency
- Most of the UEEE coming into Lago comes in through these ports via importers that are not registered and therefore not regulated.
- The distance from Dublin to Lagos by sea is 4407 nautical miles (7933 Km). CO_2 emissions from maritime transport represent 3.3% of the world's total

CO_2 emissions and are forecast to increase by 150%–250% by 2050, due to increased freight volumes.


BLUEBIRD
NEST
5
GALAXY Win
GALAXY

- This image is from Alaba Market and Ikeja Computer Village. This area of Lago, Nigeria has become a hub for repurposing and recycling of waste electronic devices that than be reused or repaired for their original purpose.
- The workers in these areas have developed skills and quality levels that are regarded as unique in sub-Saharan Africa. They have become important economic hubs and some jobs within these hubs are comparatively well paid and high status. In some cases people are choosing to study electronic engineering in Lagos to secure a job at these sites.
- Jobs in E-waste collection, recycling and repurposing are dominated by males. The only sections of this sector in which women make up a significant share of the workforce are as waste picker communities on landfills. These jobs earn considerably less than jobs in E-waste collection and recycling. The monthly income for collectors and recyclers ranges from $6.70 to 100.
- There are risks associated with recycling of electronic waste.
  - The open incineration of cables to recover copper and the burning of plastic parts to reduce waste volumes.
  - Soil, dust and air can feature high concentrations of toxic metals such as lead and cadmium, and other chemicals.
  - Exposure to lead fumes or dust is known to cause multiple disorders including

neurological, cardiovascular and gastrointestinal diseases, exposure to cadmium fumes or dust leads to malfunctioning of kidneys and the respiratory system.

What do we know about the Congo:

Economy

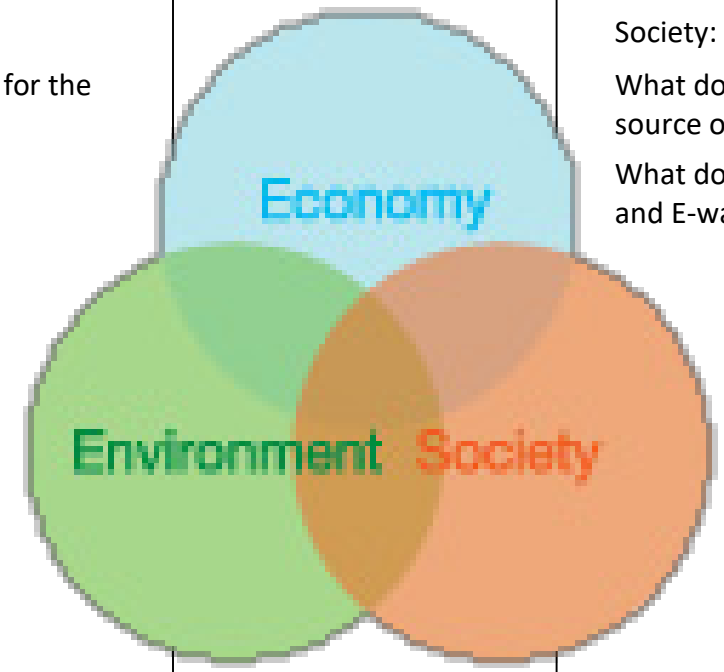
What are the positives and the negatives for recycling in Lagos?

Who is involved in the economy?

What do we know about the Congo:

Environment:

What do we know about the problems for the environment in recycling E-waste?



What do we know about the Congo:

Society:

What does the information tell us about the source of E-waste?

What does the information tell us about education and E-waste?

What was your perception about the Congo before doing this activity?