# From Mining to E-Waste

## The Environmental and Climate Justice Implications of the Electronics Hardware Life Cycle

CJIT
CLIMATE JUSTICE INSTRUCTIONAL TOOLKIT

2.

# What's in this module?

**Description**

This module consists of a case study that introduces the three main stages of the global electronics hardware cycle. Students will learn how to utilize life cycle assessment and circular economics as a mechanism to assess and understand climate justice disparities.

**Activities**

4 parts
1 video
1 reading
2 activities
3 optional projects

**Key Resources**

- From Mining to E-waste: The Environmental and Climate Justice Implications of the Electronics Hardware Life Cycle
- Bandi Mbubi: Demand a fair trade cell phone
- Ted Talk: Sanika Bhave Your Phone Is Destroying The Planet

# Learning Objectives

**01**

**Digest** core concepts of Environmental justice and sustainability to assess the socio-environmental impacts across the life cycle of a product

**02**

**Learn** to identify stakeholders most impacted by the electronic waste life cycle

**03**

**Explore** implications of the electronic hardware life cycles on diverse communities across the globe
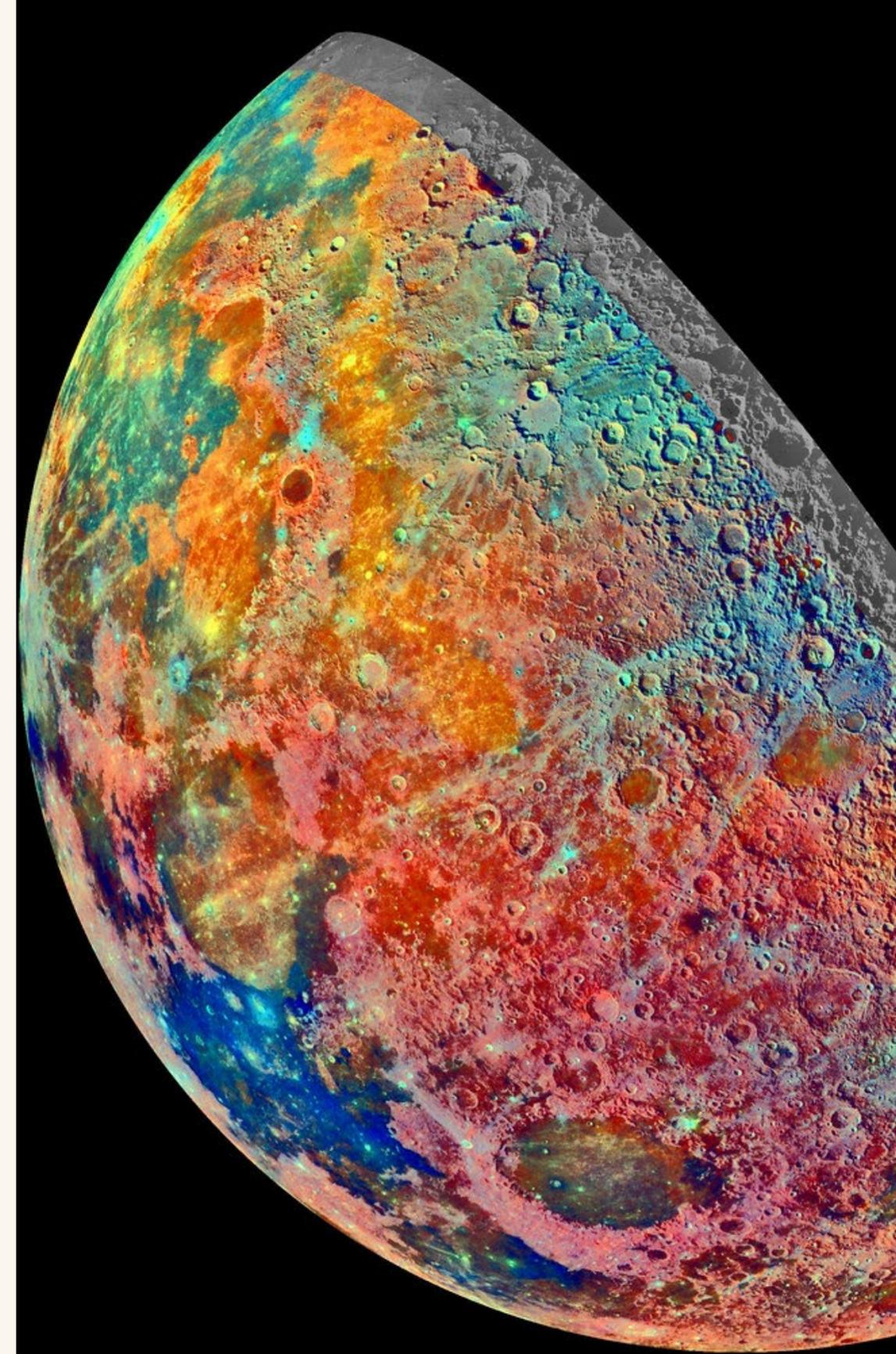
**04**

**Propose** methods with which to minimize the socio-environmental impact of electronics

# Warm up

**What do you do with your old devices (phones,laptops, etc.) after you are done with them? What do you think happens to them?**

Turn to a partner or small group and discuss.

# Introduction

**PART 1**

# Introduction

**What is climate justice?**

"Climate justice recognizes the disproportionate impacts of climate change on low-income and BIPOC communities around the world, the people and places least responsible for the climate crisis." (Center for Climate Justice)

**Connection between E-waste and CJ**

Climate justice is crucial to understanding the global electronics cycle. All stages of mining, manufacturing, and disposal contribute to a variety of inequities across the globe. These include health issues, labor rights abuses, greenhouse gas emissions, and environmental contamination. Much of which disproportionately affects low-income and BIPOC communities across the world and must be addressed.

# Key Definitions

**PART 2**

# 01 Crufting

This term has historical relevance to MIT and has been described by MIT alumni as "being able to take cruft [junk, discarded items] and make it work again, or do something new and useful" (B., 2008).

A way in which MIT students participate "in the cycle of electronic device consumption, which involves material extraction, production, use, and disposal" (B., 2008).

# 02 Life Cycle Assessment

**Life Cycle Assessment (LCA)** is used to evaluate the environmental, economic, and social impacts of products throughout their life cycle.

LCA is often quantitative in nature and focuses on GHG and chemical emission for example.

**Extra Resources:**

- A Path Toward Systemic Equity in LCA and Decision-Making
- An overview of LCA and research-based teaching in renewable and sustainable energy education
- **A comprehensive understanding of life cycle assessments (LCAs)**
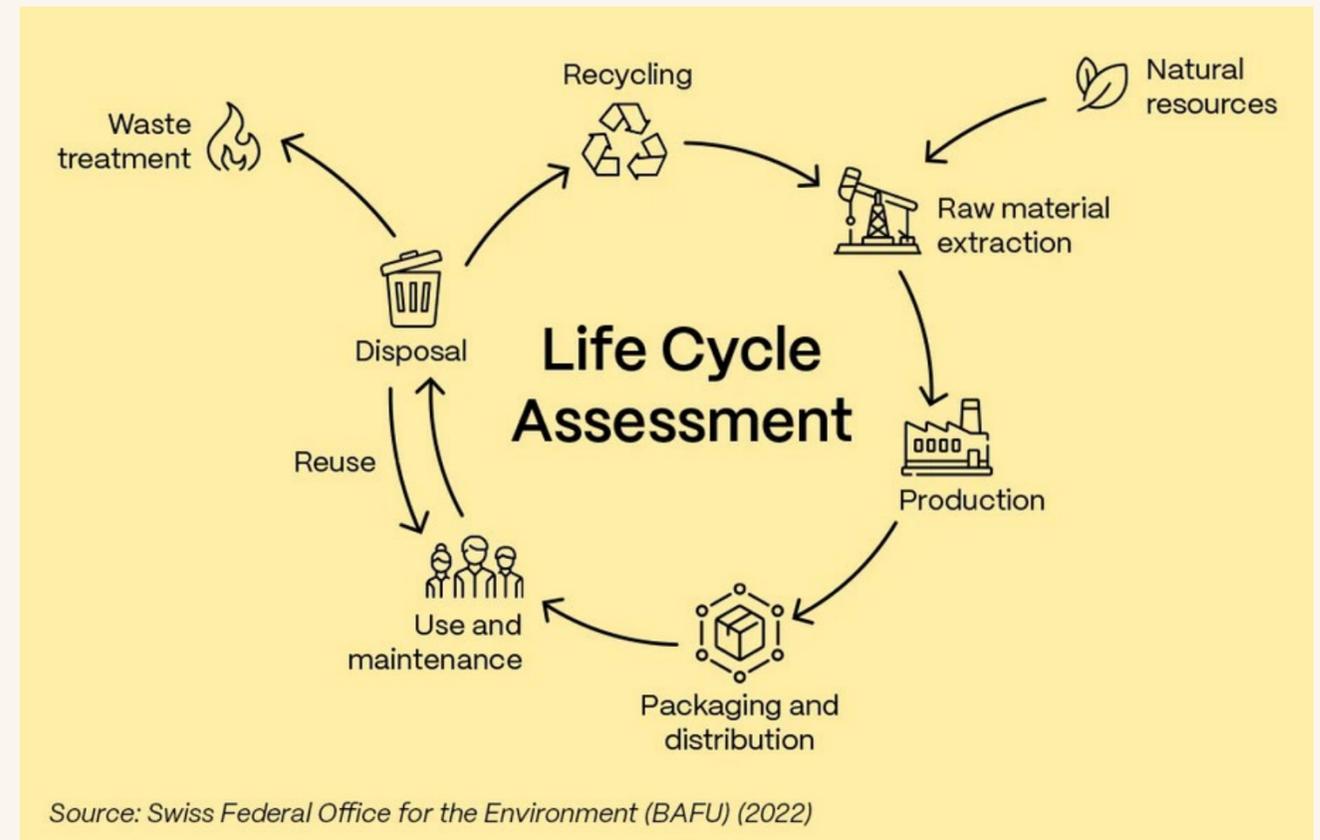


Source: Swiss Federal Office for the Environment (BAFU) (2022)

# 03 Social LCA

**Social-LCA** is a methodology to assess the social impacts of products and services across their life cycle (Benoît et al., 2020).
– United Nations Environmental Program

**Extra Resources:**

- Guidelines for Social LCA
- Introduction to evaluating energy justice across the life cycle
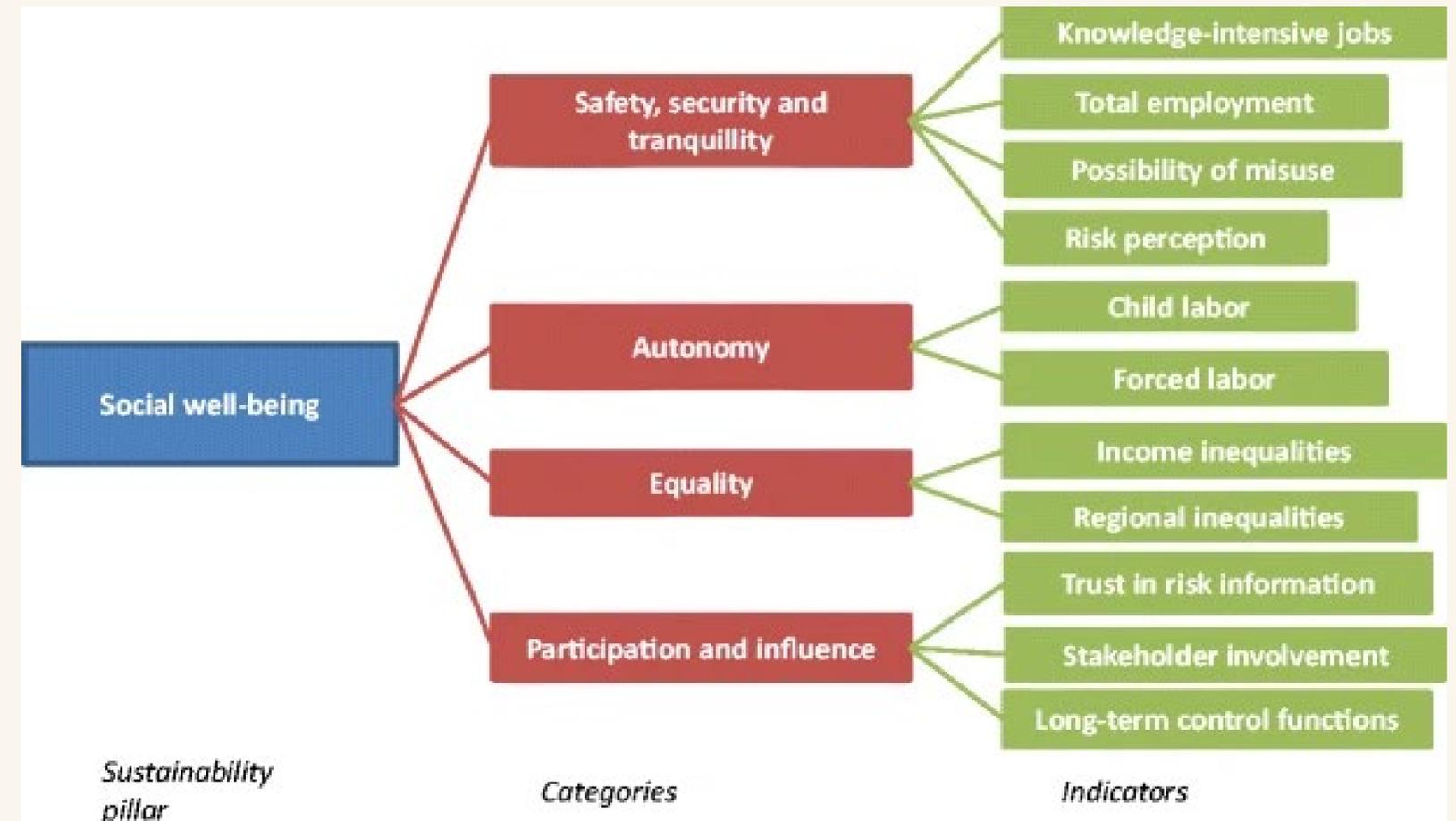- Social LCA: An Introduction



Figure courtesy of van Haaster et al. License: CC BY.

## 04 Circular Economy

"The idea of a CE is rooted in decreasing the use of raw materials by maximizing the reuse and recycling of resources, materials, and waste in order to make consumption and production more sustainable and efficient" (Peña et al., 2020).

To design a circular economy, the most important components are designing sustainability, regenerating natural systems, and maintaining the usability of products for as long as possible.
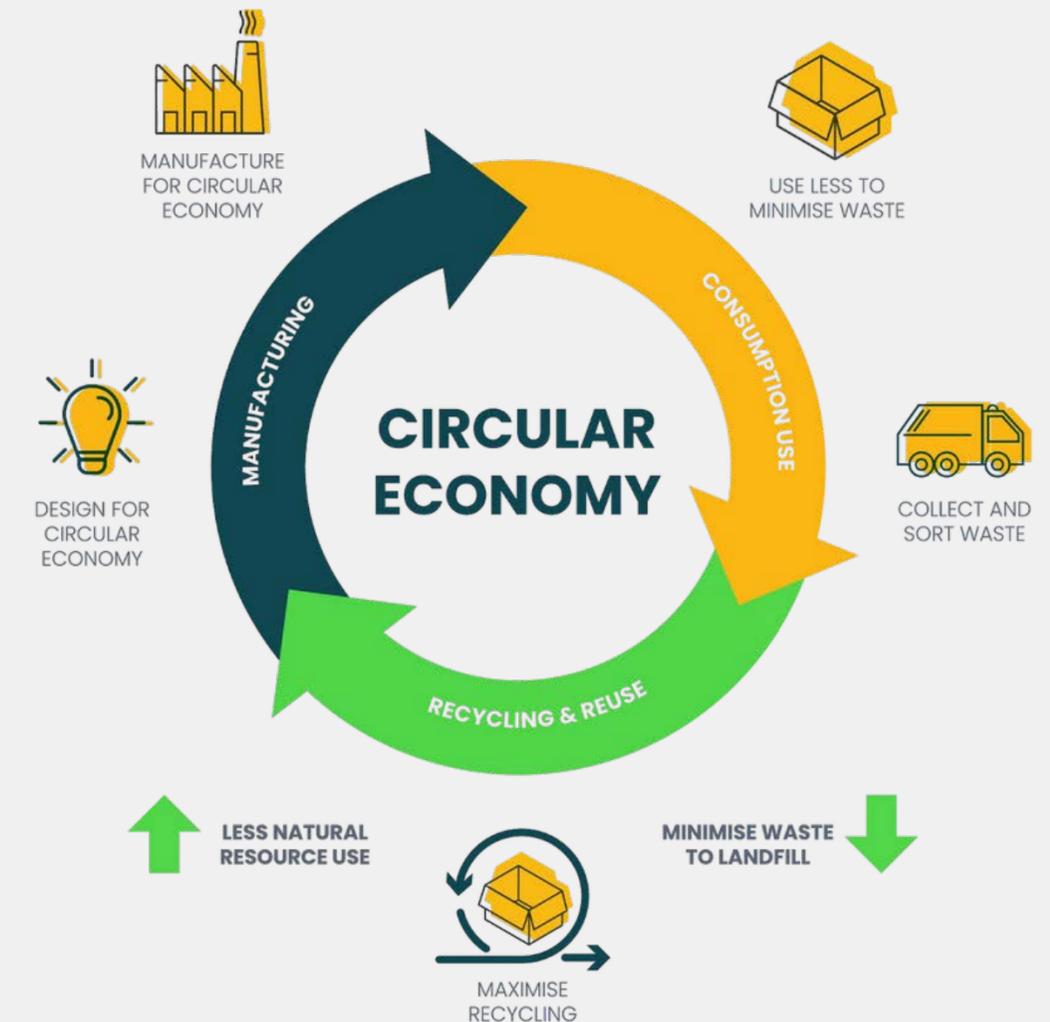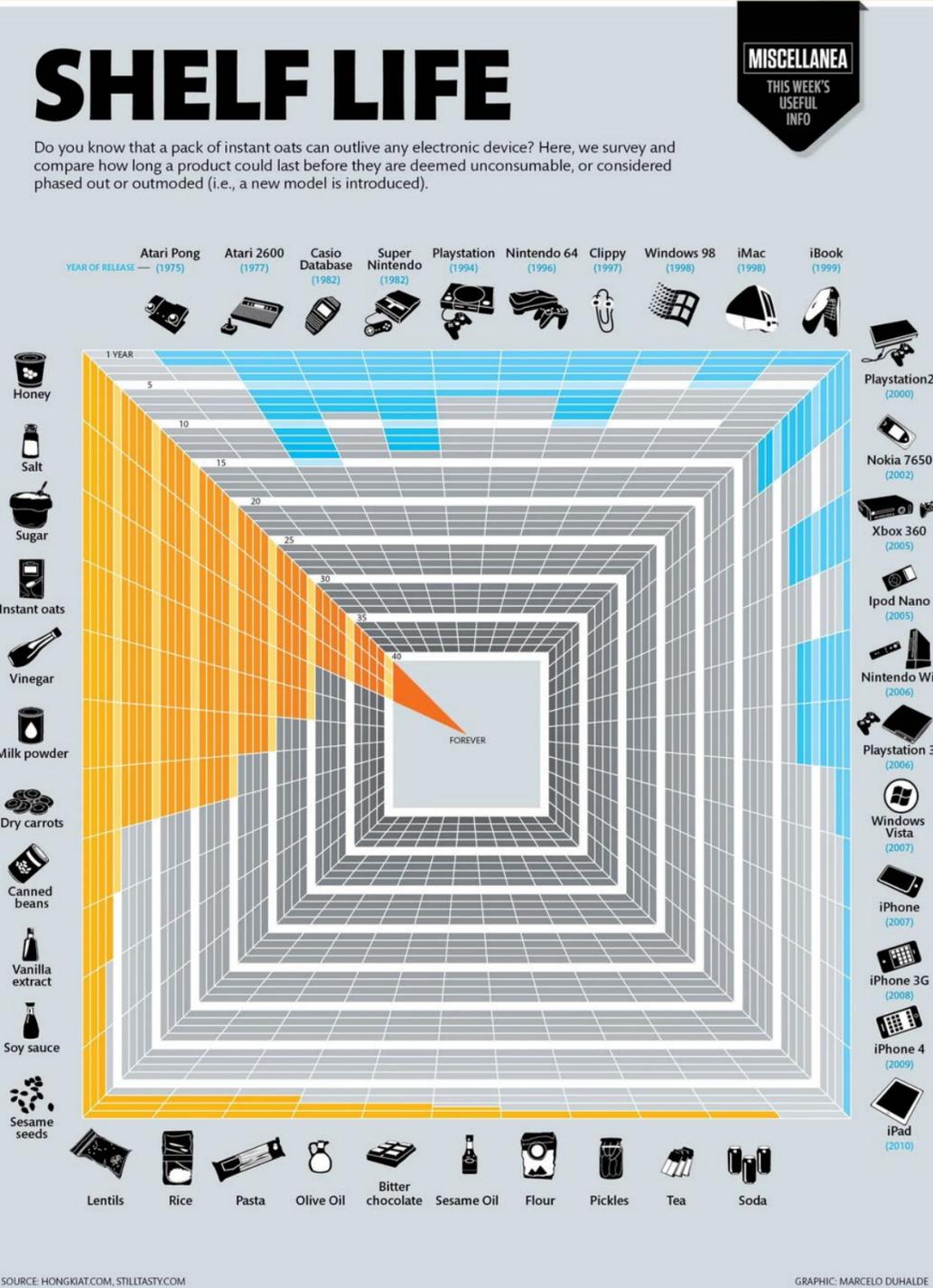
## 05 Right to Repair

"If you own something, you should be able to repair it yourself or take it to a technician of your choice. Right-to-repair advocates argue that modern tech, especially anything with a computer chip inside, is rarely repairable" (NY Times).

## 06 Planned Obsolescence

Planned obsolescence is "a business strategy in which the obsolescence (the process of becoming obsolete) of a product is planned and built into it from its conception, by the manufacturer" (Kramer, 2012, p. 13).



**SHELF LIFE**

Do you know that a pack of instant oats can outlive any electronic device? Here, we survey and compare how long a product could last before they are deemed unconsumable, or considered phased out or outmoded (i.e., a new model is introduced).

SOURCE: HONGKIAT.COM, STILLTASTY.COM

GRAPHIC: MARCELO DUHALDE

# 07 Conflict Minerals

Conflicts minerals are mined in order to "influence and finance armed combat" (Earthworks). For example, demand for cobalt in phones and electric vehicles fuels genocide and conflict in the Democratic Republic of the Congo.

# 08 Critical Minerals

Critical minerals are those critical to manufacturing and technological needs across the globe. The criticality of a mineral is determined by economic importance and risk of disruption (UNN).

**Extra Resources:**
- Bandi Mbubi: Demand a fair trade cell phone
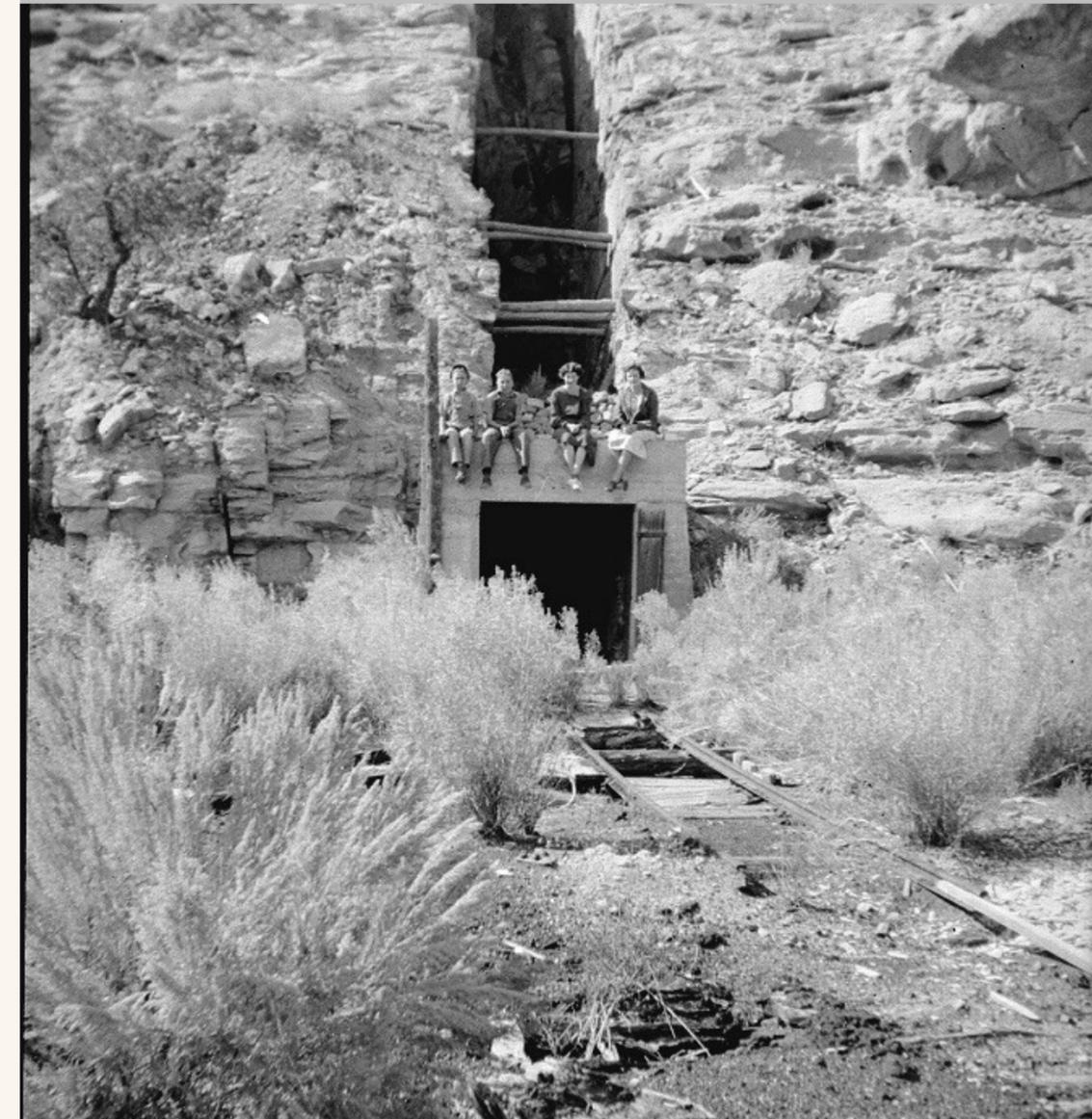- How Conflict Minerals make it into our phones

Photo courtesy of Ed Yourdon on Flickr. License: CC BY-NC-SA.

# Case Study

**PART 3**

# ELECTRONICS LIFE CYCLE CASE STUDY

**Step 1: Group and assign**

Split the class into 4 groups and assign each group one section of *From Mining to E-waste*:

- Mining, Deforestation and Forest Fires
- The Socio-environmental Costs of Electronics Manufacturing
- The Growing E-Waste Crisis
- Higher Education's Role in Expanding Awareness

**Step 2: Group discussion**

In your group, spend 10 minutes reading your assigned section and reviewing the discussion questions. Take some bullet point notes on your answers. Then, be prepared to discuss your answers in a full class discussion.

**Step 3: Share out**

Allow 5-10 minutes for each group to share the summary of their section and pose their discussion question to the class.

**Step 4: Reflect in groups**

Now turn to your partners and reflect on the important action steps to address the impacts of the electronic lifecycle. What are the most important things to work on in the future?

# DEBATE

## Step 1: Read

_From Mining to E-waste: The Environmental and Climate Justice Implications of the Electronics Hardware Life Cycle_

## Step 2: Set Up Debate

- Split the class into two groups
- Choose a prompt:

   a. Responsibility for the environmental harms should be shared equally among corporations, governments, and consumers
   b. The global electronics industry perpetuates environmental inequity
   c. Transitioning to circular economy for the electronics economy is feasible

## Step 3: Debate

- Each side presents an argument (2-5 minutes)
- Time given for rebuttals (5 min)
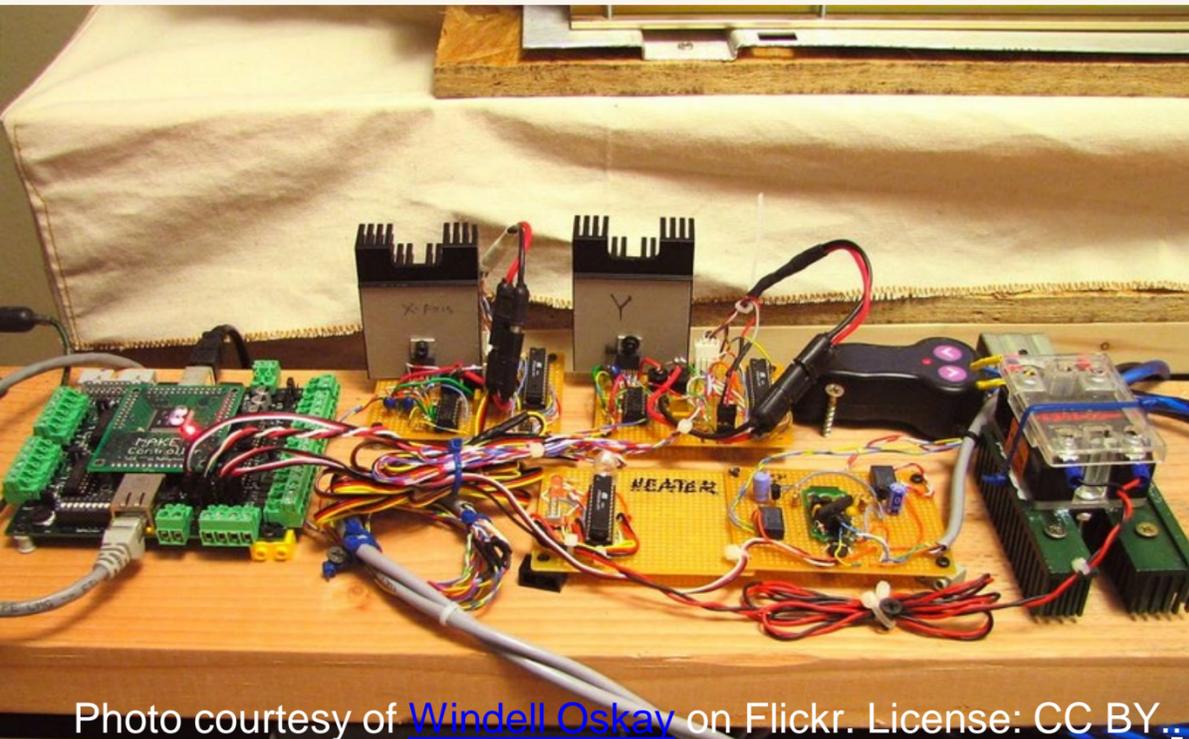- Conclusions (5 min)

# Beyond the Module

**PART 4**

# Life Cycle Analysis (LCA)

**Instructions**

1. Review the case study introduction and definitions of LCA and SLCA
2. Choose an approach: LCA (environmental) or SLCA (social)
3. Map out the plan using the 4 LCA phases:
    a. Goal and Scope- Define purpose, system boundaries, and functional unit
    b. Inventory- identify data needed and possible sources
    c. Impact Assessment- determine the impacts assessed
    d. Interpretation- hypothesize findings and limitations
4. Collect Sample data and present findings to the class (optional)

# Crufting Experience & Discussion

## Instructions

1. Read *From Mining to E-waste: The Environmental and Climate Justice Implications of the Electronics Hardware Life Cycle*
2. Scout for Cruft: explore dumps, recycling centers, free piles, etc for discard electronics and materials
3. Brainstorm: In your group discuss possible inventions or new uses for the materials collected
4. Design and Build: Sketch your concept, assign roles, and work to assemble your new creation

## Discussion prompt

What does crufting reveal about how we value materials/objects?

# Case Studies

Have students work in groups to create a presentation (poster, google slides) describing another instance of inequities within the global electronics cycle.

**Suggested prompts**

- Where does this event take place?
- Who are the affected groups?
- What are the potential solutions?
- What is the community response?

**Example topics**

- Mining in the global south
- Electronics manufacturing in China
- Burden of e-waste disposal on Ghana

For more resources on climate and environmental justice: **Please explore other modules in the Climate Justice Instructional Toolkit.**

# Module References

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