

Assessing the human cost of PCB assembly production

Laura Sondakh

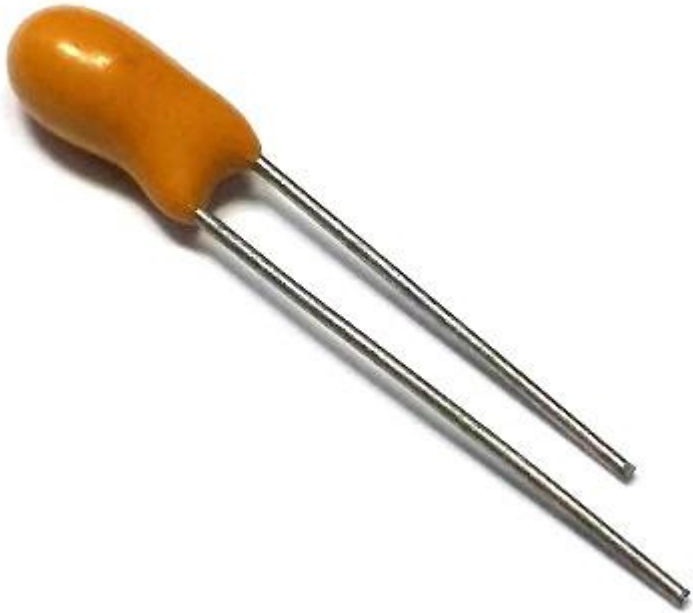
About me



Laura Sondakh

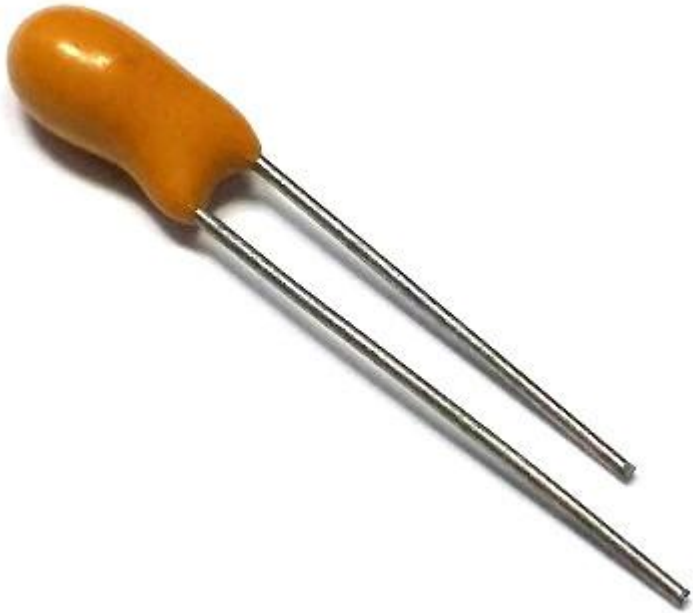
- ECSA Student ambassador
- Ghent University
 - Last year's master student
 - Educational Sciences (engineering and technology)
 - Electrical Engineering (electronic circuits and systems)
- Thesis / dissertation

Which kind of capacitor is this?



- 1) Aluminium electrolytic capacitor
- 2) Ceramic disk capacitor
- 3) Tantalum electrolytic capacitor
- 4) Metallized film capacitor

Which kind of capacitor is this?



- 1) Aluminium electrolytic capacitor
- 2) Ceramic disk capacitor
- 3) Tantalum electrolytic capacitor**
- 4) Metallized film capacitor

<https://www.electroniccomp.com/2.2uf-16v-tantalum-capacitor>

What metal is used in iPhones & has an oxide with this color?



- 1) Lithium
- 2) Cobalt
- 3) Gold
- 4) Palladium

What metal is used in iPhones & has an oxide with this color?



- 1) Lithium
- 2) **Cobalt**
- 3) Gold
- 4) Palladium

<https://www.ancienteearthpigments.com/product/cobalt-blue/>

What do Ta and Co have in common?



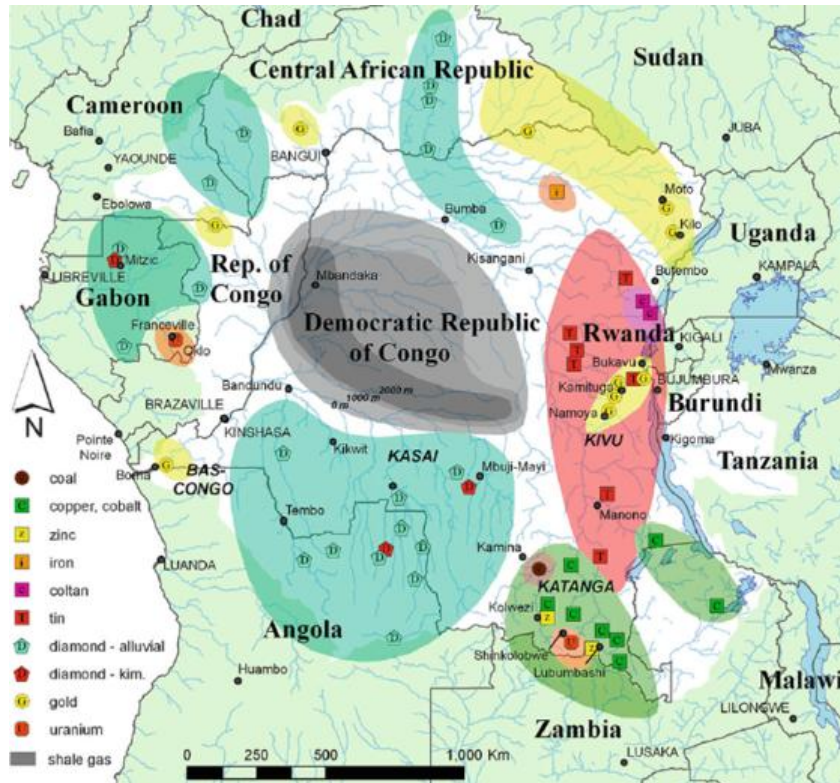
- 1) Both were discovered by Swedish scientists
- 2) Both are transition metals
- 3) Both are produced for more than 50% in the Democratic Republic of Congo
- 4) All of the above

What do Ta and Co have in common?



- 1) Both were discovered by Swedish scientists
- 2) Both are transition metals
- 3) Both are produced for more than 50% in the Democratic Republic of Congo
- 4) **All of the above**

The Democratic Republic of Congo



- Richest country in terms of mineral resources
- Cobalt: copper belt (Katanga)
- Tantalum: Kivu regions

Maarten J De Wit, François Guillocheau, and Michiel CJ De Wit, Geology and resource potential of the Congo Basin (Springer Science & Business Media, 2015)

Tantalum and Cobalt

Tantalum

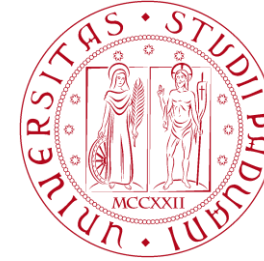
- Part of 3T **conflict** minerals (tungsten, tin)
- Mostly artisanal small-scale mining (ASM)
- Core of armed conflict in Eastern Congo
- 50% mined in DRC
- Superalloys, capacitors,...

Cobalt

- Mined with Cu
- Mostly industrial mining
- Conflict with small scale ASM
- Part of controversial Sicominex deal with China
- 70% mined in Congo
- Superalloys, batteries,...

Thesis research

- Carried out at Padova University, **within** Microelectronics & Geopolitics course
- Researched the impact of the mining of these minerals and copper in DRC
- Technical analysis: copper and cobalt
- Historical analysis: post-colonial
- Political analysis: mining policy, foreign policy
- Inspired my **master** thesis topic

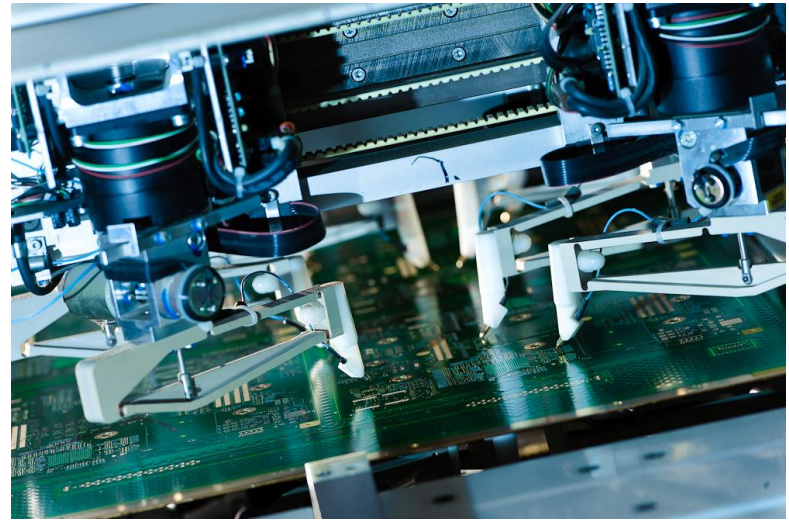


UNIVERSITÀ
DEGLI STUDI
DI PADOVA

Research Approach

- STEP 1: discuss materials used for
 - Wafer fabrication
 - IC fabrication
 - Packaging
 - PCB fabrication
 - Component assembly

Make a selection of materials of interest

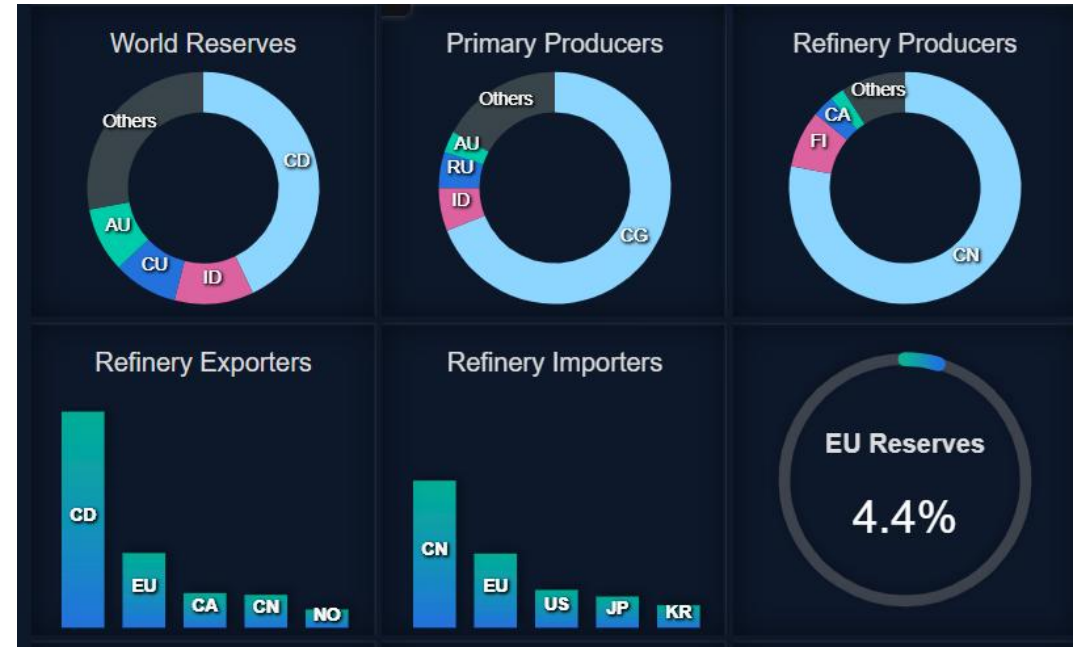


<https://acb.be/fr/qualite-et-fiabilite/>

Research Approach

- STEP 2: for each material, research:
 - How much is used within the electronics industry?
 - How much is produced and refined each year?
 - In what countries are the materials refined

Make a closer selection of materials of interest



<https://rmis.jrc.ec.europa.eu/rmp/Cobalt>

Research Approach

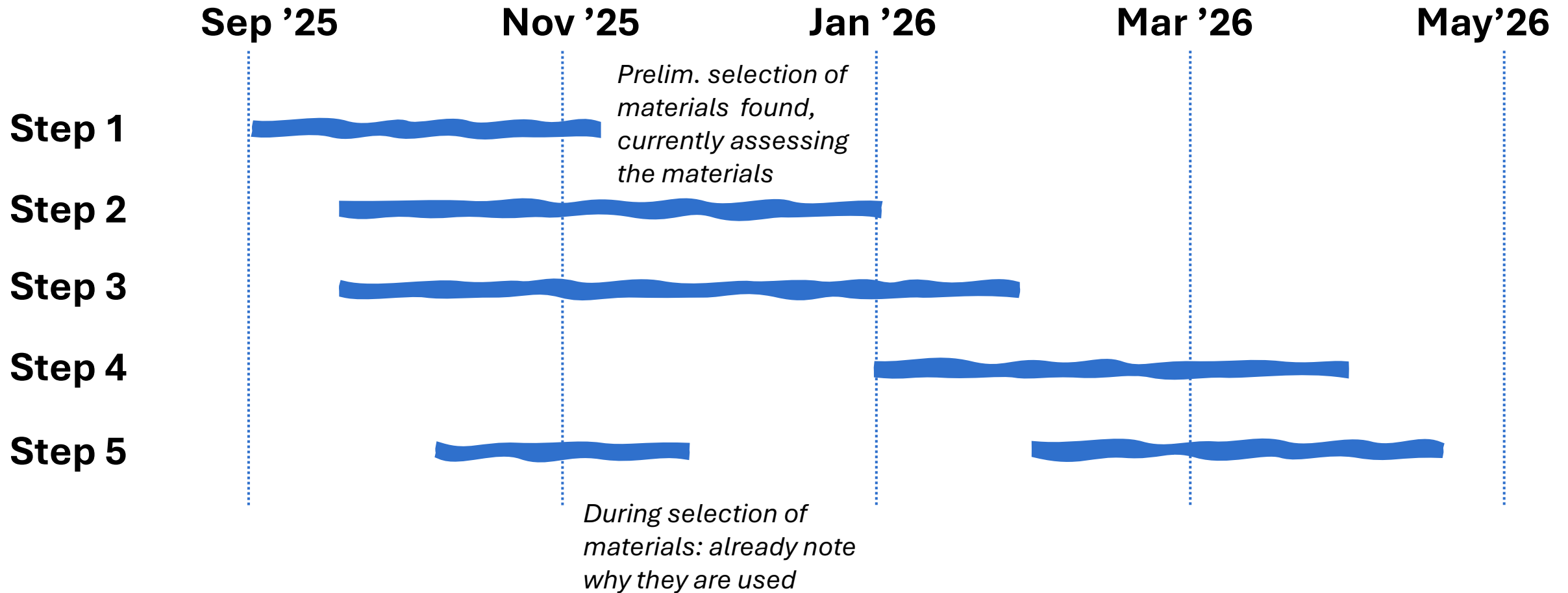
- STEP 3: for each material of interest, research:
 - How the materials are mined, refined and produced until they enter the electronics supply chain
 - Whether there are known issues with mining, refining and production processes, e.g. child labor, armed conflicts, displacement of communities,...



Research Approach

- STEP 4: Use outcomes of step 2 and step 3 to find a metric to ‘quantify’ the impact of the use of these materials
- STEP 5: Compare different design choices from a technological point of view and balance with the metric developed in step 4

Current state



Let's connect



laura.sondakh@ugent.be