FAIRPHONE

Responsible Tin Recycling
Project Scope

25 July 2018

alpha
ASSEMBLY SOLUTIONS

Problem Statement

The supply chain of electronics, and the raw materials and processes used in their production, form a very complex network of different types of parties. When one considers the full lifecycle of electronic products and the recovery of materials contained in these products, the picture becomes even more cloudy.

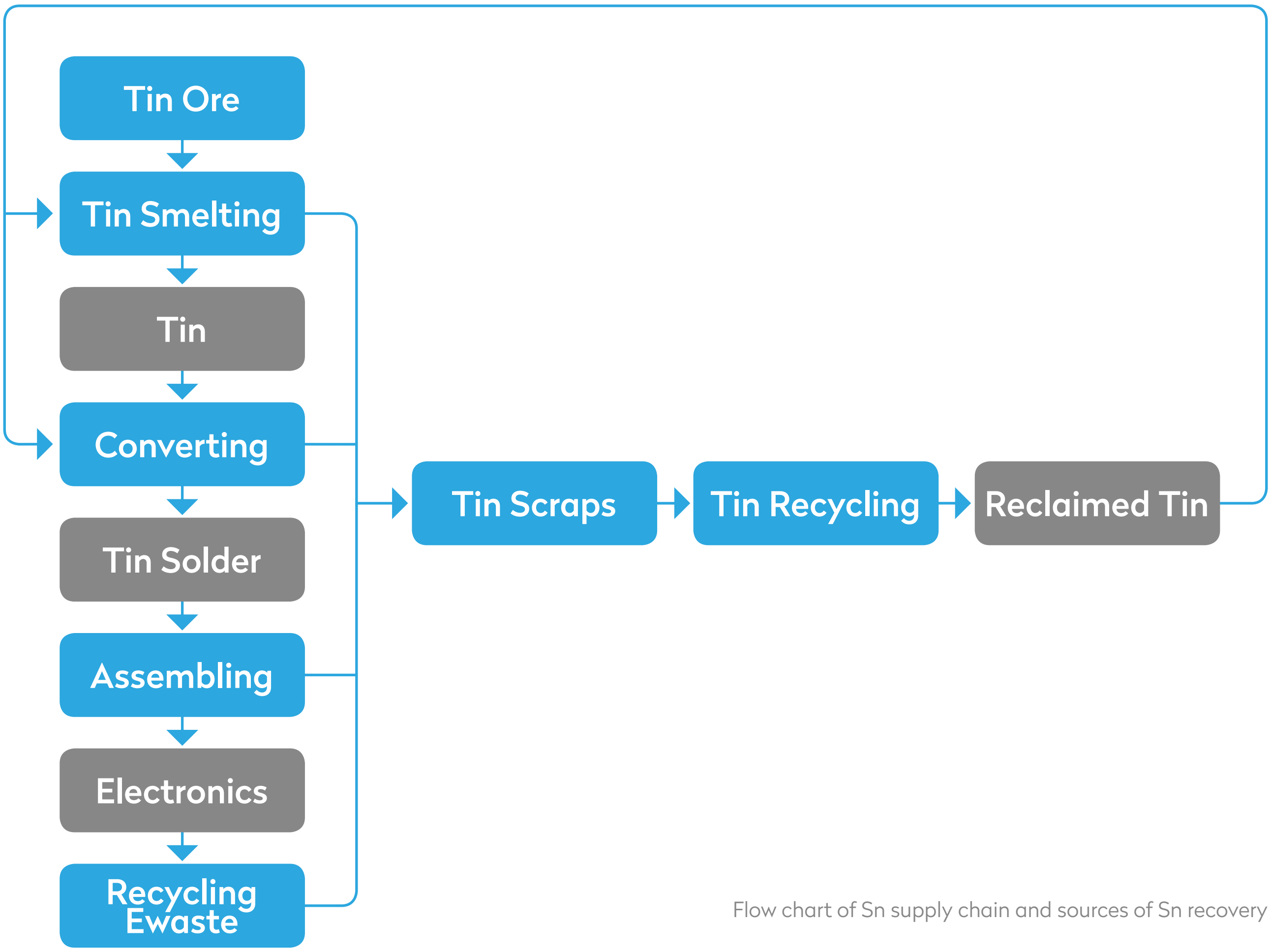
If we specifically refer to the supply of raw materials, market forces and a highly competitive environment makes it challenging to build material chains with sufficient transparency and stewardship to offer responses to today's ethical and environmental concerns.

When we look to the reuse and recovery of raw materials used in electronics assembly, tin scraps are generated in different stages; during the production of tin (Sn), use of tin during the assembly of electronics, and during the recycling of the end of life electronics. One of the challenges is that part of the tin fractions are reclaimed by informal recycling companies that might not adhere to acceptable, ethical, environmental and personal safety standards and could utilize recycling processes that might not achieve acceptable production efficiencies and result in otherwise reclaimable tin to be lost to landfills. Other social and environmental challenges may surface in other parts of the chain, however these have not been yet inventorised.

Project Research Overview

This research intends to build understanding on the lifecycle of tin in the electronics industry, with a focus on sustainability hotspots. It will consist of characterizing the flows of tin in the the main stages of tin processing and usage in the electronics industry while inventorizing/analyzing the main inefficiencies that hamper a possible positive impact (e.g. scaling recycled tin sources).

The research aims, as well, to provide recommendations/guidelines for improvements. The project will also look to identify opportunities for improving the transparency of the recovery and recycling of tin. The outcome of the project should enable the discussion for the development of guidelines to define responsibly recycled tin. Figure 1 provides the illustration of tin supply chain in the electronics industry. The key stages (categories) are mining, smelting, converting, assembling, and recycling e-waste.



Flow chart of Sn supply chain and sources of Sn recovery

A brief definition of each category, % of research committed, and emphasis of investigation is found below:

A. Mining

a. **Definition:** the process of extracting ore from the Earth.
b. **Project resource allocation:** 5%
c. **Emphasis:** estimate of the % Sn that is recovered for each metric ton of earth that is mined. Provide context for the anticipated benefit of decreasing the amount of Sn that is only used once.

B. Smelting

a. **Definition:** this can take on two forms:
    i. The processing of ore and recovering virgin Sn.
    ii. This can also include the refining of secondary Sn. The end product of this process is saleable Sn ingot. An example of a smelter is MSC.
b. **Project resource allocation:** 15%
c. **Emphasis:** To determine the efficiency of converting ore to Sn. What is the % waste during the processing of the ore and what are the quantities and sources of secondary tin used.

C. Converting

a. **Definition:** the conversion of the Sn ingot into solder materials. The solder can take many form factors such as solder bar, solder paste, solder wire, etc. An example of a converter is Alpha Assembly Solutions.
b. **Project resource allocation:** 15%
c. **Emphasis:** to determine the efficiency of converting ingot to saleable solder material that is used in electronics assembly. Work will also be done to determine how waste from assemblers can be efficiently brought back into the supply chain. The research will also look at the use of secondary Sn during the conversion process.

D. Assembling

a. **Definition:** the process of building a populated PCB. The assembler uses the solder to attach components to the PCB. An example of an assembler is Foxconn, Jabil or Hi-P.

b. **Project resource allocation:** 50%

c. **Emphasis:** to understand the life of solder waste after the solder is used in the assembly process. It is well known that soldering of components onto a PCB during electronics assembly is not 100% efficient – i.e. scrap is generated during the assembly process. This waste can take many forms – solder dross, unused solder paste, scrap wire, scrapped boards with defects that cannot be reworked, etc. In many cases, the Sn in the solder alloy can be recovered and reused. However, the efficiency of that recovery process depends on many factors. These factors can include:
    1. the relationship between the OEM and the contract manufacturer that is manufacturing the PCBs,
    2. how the assembler/contract manufacturer handles and isolates the material at their site,
    3. the 3rd parties that collects the material,
    4. what smelters and recyclers obtain the material,
    5. the incentives or disincentives for using "audited" smelters to process this material,
    6. the process used to refine the material,
    7. how the recycled Sn is made available to the metals market.

E. Recycling e-waste

a. **Definition:** the process of taking consumer products, such as mobile phones, flat panel displays and etc., and processing them so as to reclaim the metals and other materials. The alternatives to recycling e-waste are landfills and above the ground non-use (i.e. devices that remain in the home, storage, warehouses that are neither discarded nor recycled).

b. **Project Resource Allocation:** 15%

c. **Emphasis:** the recycling of e-waste is a highly segmented and driven by many factors that are difficult to influence. This work will evaluate programs that have been successful in increasing the amount of e-waste that is recycled. It will also evaluate the efficiency of extracting Sn and other metals from final end use products and how this recovered material makes its way back into metals used for finished good production.

After the inventory of the different waste streams has been completed, the major waste streams will be researched to understand where the main social and environmental hotspots are per waste stream. A specific area of focus for this research will be China. China is both the largest opportunity for increasing the amount of recycled Sn and is perhaps the area that is least well understood with regard to the supply chain and network of reclaimed and recycled materials. Based on research needs, founding members of this project could facilitate the introduction of the supply chain to the facilities in Asia.

Research partner(s) requirements

The founding members of this project are Fairphone and Alpha Assembly Solutions. A budgetary cost of the above work is estimated to be $30,000. The primary research outcome is expected by December 2018 or before, depending on the capacity of the 3rd party research team. The example companies listed above are for demonstration purposes only and does not imply that they will be partners for this research.

Research firms shall have the following capabilities:

- Significant experience in product life cycle assessment.
- Proven understanding of industrial manufacturing process, for instance, the production process of tin products.
- Proven understanding of material flow management, both primary and secondary input and waste material streams in the electronics industry.
- Excellent written and oral communication skills in English.
- Given that the focus of this project will naturally shift to a Chinese context, the organization should have the access to Chinese resources. At least one consultant involved in the project should have working Chinese skills.

Parties interested in participating in this project can submit the proposal and letter of intent [in pdf format] covering the following requirements:

- A cover letter introducing the personnel to be involved in the project and how the skills and competencies described above are met and giving concrete examples.
- Updated Curriculum Vitae (CV) of the personnel aforementioned with details of qualifications and experiences related to this project.
- A sample of a recent report of a similar work undertaken.
- A budget detailing the proposed cost of the consultancy (up to $30,000).
- A proposed work plan including proposed timelines.

Proposals should be valid for a minimum period of 2 months after the established deadline for proposal submission.The proposals will be evaluated based on the following criteria:

- Organizations capacity and experience to carry out the project
- Proposed work plan and timelines to completion
- Qualifications and relevant experiences of key consultants
- Cost, time, and proposed payment term

Contact for questions and proposal submission: research@fairphone.com

All enquires will be automatically sent to both Fairphone and Alpha Assembly Solutions.

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