The WEEE Value Chain in Low-Income Countries in West Africa: State of the Art and Future Perspectives

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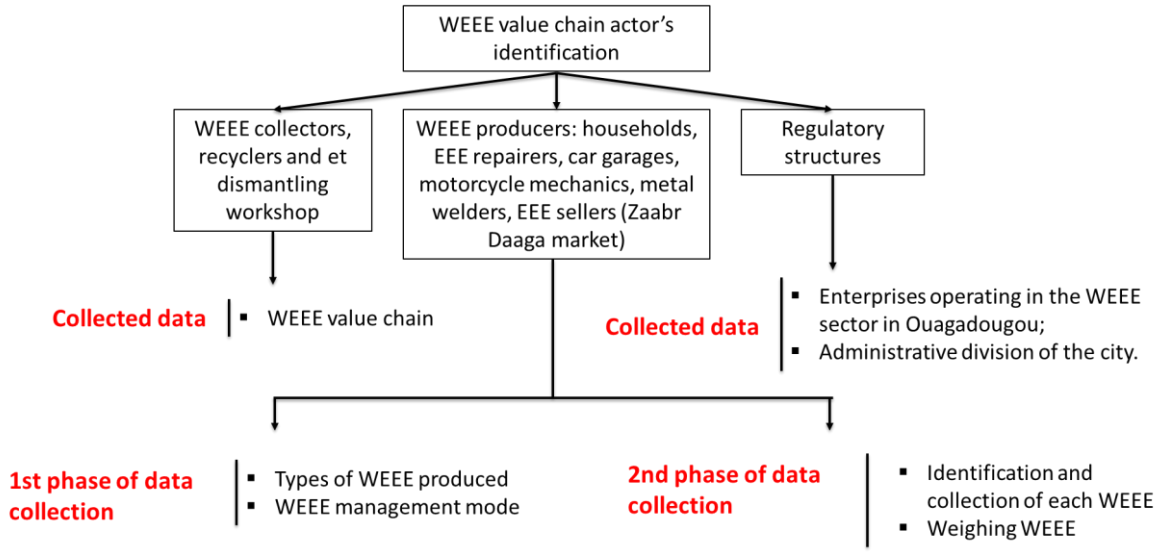
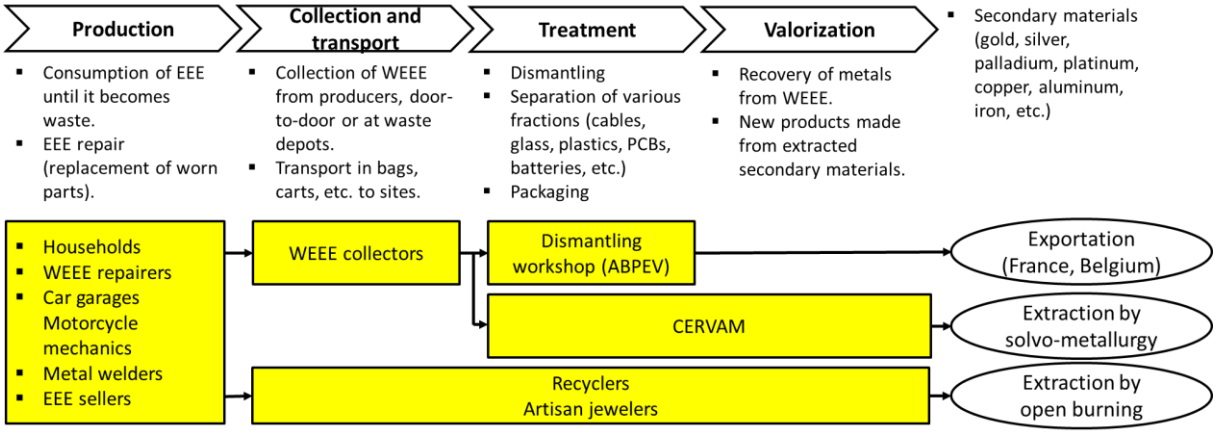
Increasingly, WEEE is seen as a source of secondary resources that can be exploited in order to contribute to the circular economy (Cucchiella et al. 2015; Parajuly & Wenzel, 2017). To date, several studies have focused on the recovery of the different fractions (plastic, glass, metals, etc.) of these types of waste. The metal fraction attracts particular attention due to the fact that several precious metals are identified in it (Schaeffer et al., 2018). While in developed countries, the WEEE value chain is quite developed with a point of honor given to the extraction of precious metals (Salhofer, 2018), this is less the case in low-income countries in West Africa such as Burkina Faso. The fundamental problem in these countries is that despite the availability of large quantities of WEEE, there is a lack of knowledge about the economic potential of developing a complete value chain for this waste based on the principles of the circular economy. The objective of this study is to analyze the WEEE value chain in Burkina Faso in order to identify the key points to be improved for the development of the circular economy.

Data was collected from three main categories of actors in the chain. These are (i) WEEE producers, (ii) WEEE collectors, recyclers & dismantling workshops, and (iii) regulatory structures. The methodological approach to data collection is described in the figure below.



The WEEE value chain in Burkina Faso is made up of 4 main steps, namely, production, collection & transport, treatment, and recovery. There is no governmental actor specifically designated to regulate the WEEE sector. The operational actors involved in this chain are not very diverse and, moreover, some operate straddling several links in the chain. Expected products from this chain include metals such as gold, copper, palladium, platinum, silver, aluminum, etc.) which are extracted by solvo-metallurgy by CERVAM or by open burning by recyclers and jewellers. Extraction at CERVAM is still experimental, while that carried out by recyclers and jewelers is not only insignificant in relation to the deposit, but also disregards the environment and human health.



The most commonly produced WEEE in Burkina Faso are phones, tablets, computers, radios and TV sets, batteries. These include telecommunication devices. The main means of disposal of this WEEE are storage, sale and landfilling. More specifically, EEE sellers are better at dismantling this WEEE into spare parts that they resell to customers for the repair of their appliances. These results are related to those obtained by Alam (2016) in the Philippines, which reveal that household WEEE disposal patterns are storage, landfilling and sale, respectively. The data collected on the costs of the different components of the WEEE sold shows that the most valuable parts in the devices are the PCBs. In addition, it has been found that the PCB of a major brand phone like Samsung can cost almost the same amount as an entire tablet from another brand. These results lead to the conclusion that what is most valuable in a WEEE in terms of recovery is the PCB. Moreover, these PCBs are even more valuable when the devices belong to a high brand rank.

The improvement of the WEEE value chain should be based on an assessment of the economic potential of the implementation of technologies for the extraction of precious metals from WEEE PCBs on a national scale, taking into account the types of WEEE produced specifically in Burkina Faso. These studies are an ongoing prospect for the authors.

References

Alam, Z. F. (2016). The Assessment of the of E-Waste Management Generated from Cellular Phones, Laptops, and Personal Computers in the Philippines. *WASTE MANAGEMENT*, *9*.

Cucchiella, F., D'Adamo, I., Lenny Koh, S. C., & Rosa, P. (2015). Recycling of WEEEs: An economic assessment of present and future e-waste streams. *Renewable and Sustainable Energy Reviews*, *51*, 263–272. https://doi.org/10.1016/j.rser.2015.06.010

Parajuly, K., & Wenzel, H. (2017). Potential for circular economy in household WEEE management. *Journal of Cleaner Production*, *151*, 272–285. https://doi.org/10.1016/j.jclepro.2017.03.045

Salhofer, S. (2018). E-waste collection and treatment options: A comparison of approaches in Europe, China and Vietnam. *Source Separation and Recycling: Implementation and Benefits for a Circular Economy*, 227–227.

Schaeffer, N., Passos, H., Billiards, I., Papaiconomou, N., & Coutinho, J. A. (2018). Recovery of metals from waste electrical and electronic equipment (WEEE) using unconventional solvents based on ionic liquids. *Critical Reviews in Environmental Science and Technology*, *48*(13–15), 859–922.