

Simulating the Dynamics of E-waste Production from Mobile Phone: Model Development and Case Study of Rwanda

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Abstract : Mobile phone sales and stocks showed an exponential growth in the past years globally and the number of mobile phones produced each year was surpassing one billion in 2007, this soaring growth of related e-waste deserves sufficient attentions paid to it regionally and globally as long as 40% of its total weight is made from metallic which 12 elements are identified to be highly hazardous and 12 are less harmful. Different research and methods have been used to estimate the obsolete mobile phones but none has developed a dynamic model and handle the discrepancy resulting from improper approach and error in the input data. The study aim was to develop a comprehensive dynamic system model for simulating the dynamism of e-waste production from mobile phone regardless the country or region and prevail over the previous errors. The logistic model method combined with STELLA program has been used to carry out this study. Then the simulation for Rwanda has been conducted and compared with others countries' results as model testing and validation. Rwanda is about 1.5 million obsoles mobile phone with 125 tons of waste in 2014 with e-waste production peak in 2017. It is expected to be 4.17 million obsoles with 351.97 tons by 2020 along with environmental impact intensity of 21times to 2005. Thus, it is concluded through the model testing and validation that the present dynamic model is competent and able deal with mobile phone e-waste production the fact that it has responded to the previous studies questions from Czech Republic, Iran, and China.

Keywords : carrying capacity, dematerialization, logistic model, mobile phone, obsolescence, similarity, Stella, system dynamics

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