

## **Products from Recovered Wastes as a Technological Option: The Waste Input-Output Model with a Choice among Technologies**

Topic: (4.4) Special Session: Building a Circular Economy: Assessing the Sustainability of New Technologies for Material Recovery and Waste Cycling

Author: Stephen Harris Levine

Co-Authors: Faye DUCHIN

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Authors: F. Duchin and S.H. Levine

Presenter: S.H. Levine

Abstract. The Rectangular-Choice-of-Technology Model (RCOT) [Duchin and Levine, 2011] is a constrained optimization model that has been applied in a number of empirical studies to select relatively low-cost production options subject to factor and other constraints within an input-output framework. One example is [López-Morales and Duchin, 2015], with agricultural options of rainfed production or irrigation from surface water sources or groundwater. The Waste Input-Output (WIO) model [Nakamura and Kondo, 2002] has likewise been applied in a number of empirical investigations to quantify, for example, the flows of metals in the Japanese economy [Nakamura and Nakajima, 2005]. Our purpose in this presentation is to integrate the two frameworks into the WIO/RCOT model that provides producers of a given product with choices among technologies that depend on virgin ores and ones that rely instead on a variety of recovered materials. This paper describes the integrated conceptual framework and applies it to illustrative numerical examples focusing on alternative technologies for producing computers. The baseline technology relies on mined materials, one alternative makes use instead of recycled materials, and another refurbishes existing computers. We examine the physical impacts of several sets of scenario assumptions compared to the baseline case, such as changes in output of the mining sector, in employment, and in landfill requirements, as well as differences in costs of production and in prices of computers and of other goods. We conclude by describing scenarios that would merit a full-scale empirical investigation.

### References

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