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Methodology for combined use of data envelopment analysis and life cycle assessment applied to food waste management

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1 Methodology for combined use of data envelopment analysis 2 and life cycle assessment applied to food waste management

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13

14 Abstract

15 A considerable amount of food is wasted every year around the world. This makes it necessary to manage
16 and treat such food waste while trying to minimize impacts to the environment. The most common options
17 for treating food waste include anaerobic digestion, composting, incineration and landfilling. The aims of
18 this paper are (1) to develop a 3-stage methodology which capitalizes on the DEA+LCA framework
19 proposed recently in the literature and combines data envelopment analysis, life cycle assessment and
20 process retrofit into a single consistent framework; and (2) the application of this methodology to the
21 assessment and retrofit of a number of technological options for food waste management. In essence, it
22 starts by assessing the management options with respect to 12 environmental indicators (recommended in
23 the European Commission Product Environmental Footprint method). With this information at hand, data
24 envelopment analysis is applied to identify efficient and inefficient options. For the latter group,
25 improvement targets are calculated, which are then used in the last stage of the methodology to guide
26 retrofit actions to be implemented in the inefficient options so as to improve them. The capabilities of this
27 methodology are illustrated by means of a case study that analyses 6 management options in an average
28 European context. Results show that 4 of the 6 options are deemed efficient, while the other 2 are
29 considered inefficient. A contribution analysis of the life cycle assessment results in the inefficient options

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