Methodology for Technical-Economic Analysis of Municipal Solid Waste Management Systems

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1. Introduction – The main objective of the paper is present a methodology for technical-economic analysis of Municipal Solid Waste (MSW) management systems that consider private and external impacts. An impact is defined as any outcome that results from MSW system implementation, wished or not, promoted or accidental, generally susceptible of measurement, in a specific study area. It is distinguished between private and external impacts. The internal or private impacts are those directly tied to the treatment process of MSW and its later reuse. These are costs and incomes that are incurred by the investor or project developer [2]. The negative private impacts pertain to the financial expenditures associated with investing (CAPEX) and operating (OPEX) waste treatment systems [2]. In positive private impacts are included revenues for sale of recycled waste or energy generate from incinerators facilities. On the other hand, external impacts or externalities (for example, the affectation to third parties, control of pollution, the increase in the availability of resource or the guarantee in the supply), refer to those that are directly or indirectly caused by the operation of the plant, but whose effects are borne by a party other than its owner or operator [2]. The externalities are generally related to social and environmental impacts. Traditionally, an economic-financial analysis of waste management systems focuses exclusively on the study of private costs and benefits (internal impacts). The methodology that is presented in this paper takes into account not only the private impacts but also social and environmental impacts (externalities) which could have relevance on the project. Generally, the most relevant impacts (positive and negative) of the MSW systems have been documented in isolation, usually as a reflection of specific solutions of case studies as [3], [4], [5], [6], [7], among others.

In this paper, we propose to adapt the methodology presented by Seguí-Amórtegui et. al. [8] to realize a technical-economic analysis of MSW management systems. In Seguí-Amórtegui et. al. [8] is presented a methodology to realize a Technical-Economic Analysis of Wastewater Regeneration and Reutilization Systems, where are analysed projects considering private and external impacts. This methodology is based in social Cost-Benefit analysis (CBA), this is an analytical tool for judging the economic advantages or disadvantages of an investment decision by assessing its costs and benefits in order to assess the welfare change attributable to it [9]. The essential theoretical foundations of CBA are that benefits are defined as increases in human wellbeing (utility) and costs are defined as reductions in human wellbeing. For a project or policy to qualify on cost-benefit grounds, its social benefits must exceed its social costs [10].

2. Results and Discussion - The methodology presented in this paper is constituted by seven steps that should be fulfilled for its application: (1) objective definition, (2) definition of study scope, (3) project impacts, (4) identification of involved stakeholders, (5) study of financial necessities and possibilities, (6) adding of costs and revenues, and (7) sensitivity analysis.
Externalities are not generally reflected in waste management charges or taken into account in decision making regarding waste management options. This results in a bias against alternatives such as recycling, which may be more expensive than landfilling from a purely financial perspective, but preferable from an environmental and social perspective. There is therefore a need to quantify externalities in monetary terms, so that different treatment and disposal options can be compared on the basis of their overall costs to society (private costs and incomes plus external costs and benefits) [11]. For this reason, a key point in the methodology is the identification, periodicity, quantification and valuation of impacts of the project. The impacts identified and discussed are: (1) MSW infrastructures, (2) Reuse, recycling and recovery of waste, (3) Resource use, (4) Public Health, (5) Environment, (6) Education and (7) Quality life.

3. Conclusions - Based on CBA principles, the methodology developed aims to provide a consistent and comprehensive framework for the economic assessment of MSW management systems. The aim objective of the methodology is to reduce uncertainty and risk of investing in certain MSW management system. This tool will allow decision makers to analyse and compare different MSW management systems taking into account private benefits and costs and monetary valuation of externalities. The main objectives of the methodology is determinate the maximization of benefits of the project and visualize two situations separately: 1) that the MSW management system is economically and financially viable and for its operation, which is defined by the determination of private benefit (situation that normally interests the technicians and politicians); and 2) that MSW management system is economically, financially, socially and environmentally viable (which interests economists and society).

4. References