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Exploring social dimensions of municipal solid waste management around the globe – A systematic literature review

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ABSTRACT

Currently, municipal solid waste (MSW) is experiencing a massive increase in both the amount and composition throughout the world. Effective and efficient MSW management has been widely accepted as an emergent factor for future social development, which requires not only technical innovation, but also the involvement of all stakeholders as well as social, economic, and psychological components. On account of this reality, there is an urgent need for research related to the social dimensions of MSW management. In this paper, a systematic literature review was carried out to characterize and critically evaluate the published literature on the social dimensions of MSW management from 1980 to 2014 in terms of vulnerability, public participation, public attitude and behavior, and policy. A keyword search was first performed by using the Institute for Scientific Information (ISI) Web of Science, which retrieves 1843 documents. After removing the papers that were not closely related to the topic, 200 articles were retained for an in-depth review. In each category, major research issues and observations were summarized, and important insights were obtained. Besides compiling a related list of key references, the analysis results indicate that the global distribution of social dimensions reports on MSW management is inequitable and the research on the social dimensions of MSW management is insufficient, which may attract increased research interest and attention.

1. Introduction

Today, one of the critical issues accompanying global economic and social development is the significant increase of the amount of waste generated. According to the Global Waste Management Outlook (UNEP, 2015), the global annual increasing rate of MSW is about 2 billion tons. Besides the explosive growth in the weight and volume, the composition of the MSW is becoming more and more complex. It has been widely recognized that these two trends (both increased generation and composition complexity) in MSW have induced severe degradation of air quality, water quality, and public health, and also have contributed to climate change (for example, the release of methane gas). Effective and efficient MSW management is, thus, one of the most important and challenging issues throughout the world (Vergara and Tchobanoglous, 2012).

Currently, MSW management is undergoing an evolution from mere disposal, such as landfills, to sustainable management, such as 3R (reuse, recycle, reduce) (Shekdar, 2009; Agamuthu and Fauziah, 2011; N. Li et al., 2013). In Europe, the concept of waste hierarchy was proposed, which consists of five steps: prevention, reuse and preparation for reuse, recycle, recovery, and disposal (Waste Framework Directive, 2008). The goal is to achieve waste minimization by source-reduction, waste diversion, and "non-diverted wastes" disposal through incineration and landfilling (McBean et al., 1995; Taylor, 2000; Neo, 2010; Achillas et al., 2011; Ahsan et al., 2012). This new trend pushes MSW management beyond the scope of technology and requires the involvement of all stakeholders, including product manufacturers, government institutions, private businesses, and householders. Thus, the success of an MSW management system not only depends on technical innovation, but is also significantly influenced by social, economic, and psychological factors, such as public participation, policy, and public attitude and behavior. Hence, it is important for researchers to understand, design, and evaluate MSW management from a social dimensions point of view.

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In this paper, a preliminary and exploratory systematic literature review methodology was employed for globally tracking issues in the social dimensions of MSW management. Based on a preliminary literature review, four major research topics were emphasized. The first was vulnerability. Vulnerability pertains to the influence of MSW on subpopulations (such as children, women, and minorities) in terms of health, income, access to services, and environmental justice. Although these subpopulations are vulnerable, their opinions and situations are ordinarily less of a concern to decision makers. The second were public attitude and behavior. This topic deals with the influencing factors on participating in MSW management at the individual level. The third was public participation. This topic addresses participation in MSW management at the organizational level. Specifically, the authors focused on the discussions on public education, public-private-partnership (PPP), and informal sector. The fourth and final was policy, which concerns the effects of legislation and incentives on promoting the involvement of stakeholders in MSW management. Publications in the peer-reviewed literature were used as a proxy sample in order to (i) characterize and critically evaluate these topics in the social dimensions of MSW management; (ii) illustrate how these studies vary with respect to time and location; and (iii) identify any important gaps in understanding. Peer reviewed studies constitute reliable, reputable and rigorous resources for assessing knowledge and developing scientific syntheses (Ngai et al., 2008; Arnell, 2010; Berrang-Ford et al., 2011).

2. Methodology

To better understand the state of research on the social dimensions of MSW management, the published literature in related areas were characterized and critically evaluated, which further results in an informative reference list. This approach consists of two main steps: reviewing documents, and selecting the critically appraised, relevant research (Petticrew and Roberts, 2006). Although a systematic literature review has been widely used in health science (Ford and Pearce, 2010), its potential in MSW management studies, a field with extensive research, has not been exploited (Berrang-Ford et al., 2011, pp. 1–2).

2.1. Document selection

A keyword search was performed in the search engine called the Institute for Scientific Information (ISI) Web of Science. The reason for the selection of ISI Web of Science is that it is one of the most powerful, up-to-date, comprehensive, and widely used search engines for the analysis of interdisciplinary, peer-reviewed literature (Jasco, 2005). A list of key topic terms was developed, as shown in Table 1.[4] The search focused on peer-reviewed literature published between 1980 and 2014 in order to cover a relatively comprehensive set of publications. The search retrieved 1843 documents. All retrieved documents were reviewed based on the title and abstract to evaluate their suitability for inclusion in the final categorizations. However, in some cases when insufficient information was available in titles and abstracts, a full-text review was also conducted. Only articles explicitly discussing the social dimensions of MSW management were selected. In this paper, our emphasis is on the issues in social dimensions related to vulnerability of any subpopulations, public participation, attitude and behavior, and policy. If there are duplicate results in the various

search outcomes, the categorization is based on the major topic addressed in these papers.

2.2. Document review

After document screening (papers not fitting the scope of our discussion were removed), 200 articles were retained for an in-depth review. A recording form was then developed to document and characterize specific details in the social dimensions related to MSW management, and examine key trends and associations. The recording form begins with categories related to the general characteristics of articles in terms of authorship, article title, year published, document type, first author affiliation, and region of interest. The main section consists of fixed forced choice questions focusing on vulnerable population category, vulnerability category, public participation category, attitude and behavior category, policy category, system component under consideration, and method.

3. Results

The major observations from the review are summarized in this section following the categories given in Table 1.

3.1. Vulnerability

The disposal of MSW (such as plastics, chemicals, and toxic substances) and the presence of microorganisms during processing, storage, and utilization, may cause environmental contamination. Such contamination may be spread or concentrated in the soil, water, air, and biota, as well as products made from MSW. This in turn can potentially impact the health of exposed populations, especially those with vulnerabilities (Deportes et al., 1995). Based on the vulnerable subjects, the screened papers can be classified into four categories: children, women, low-income/poor, and minorities. The distributions of articles with respect to these four categories are 41%, 36%, 18%, and 5%, respectively. Since health risks to informal collectors, informal recyclers, or to people working within the informal sectors are mostly occupational, the associated papers are included in the "Public Participation" category, although some risks may result from lack of support in terms of finance and health due to marginalization and societal exclusion (Binion and Gutberlet, 2012). Unsurprisingly, effects of MSW on "Children" attracted the most attention, followed by "Women." This is based on the intuition that children and women are the two most vulnerable populations.

According to risk types, the screened papers can also be classified into four groups: health (77%), economic/wage inequity (5%), environmental injustice (9%), and inequity in service provisioning (9%). The details of each group are provided in the following paragraphs. One can see that health risks due to MSW dominate the risk research.

The research on "vulnerability" contains controversial conclusions. For all of the screened papers, some showed a significant increase of health risks from MSW to the exposed populations, while others revealed no clear trend. For example, Silveira Correa et al. (2011) indicated the high risk of respiratory disease in children due to living close to a landfill, while no clear evidences on increased risks of mortality and morbidity were observed by Ranzi et al. (2011).

For almost all cases, children are always more vulnerable than adults (Deportes et al., 1995; Parveen and Faisal, 2005; Cordier et al., 2010; Ma et al., 2012; Sun et al., 2013; Candela et al., 2013), except for the research of Reis et al. (2007) and Mari et al. (2007). This is attributed to children having greater exposure to contaminations from hand-mouth contact and ingestion. For

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[4] The topic terms were refined throughout the whole procedure of the authors' analysis so that they were sufficient to locate most major documents the authors were interested in.