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Review

Benchmarking approaches and methods in the field of urban waste management

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ABSTRACT

Waste management is a matter of concern to all countries. It is important both in an urban and in a rural context, being especially acute in the former. Yet, despite the importance of solid waste management in the urban environment, the ways in which many municipalities across the world handle the issue show that there is much room for improvement. The ever-growing amounts of solid waste being produced across the world, especially in developing countries, are mostly due to problems such as lack of policies and financing, as well as the non-availability of irregular services. They compel many local authorities to simply dispose waste, instead of managing it. But even though much is known about individual approaches and methods to manage municipal waste, there is a lack of research which specifically looks at integrated urban waste management. The paper addresses this need by reviewing the state of the art on municipal solid waste management in a sample of developing countries and rapidly growing regions. The paper has identified the fact that the wide range of approaches and available technologies in the field of urban waste management are not being fully used. Also, there is a general lack of governance in this field, which makes it difficult to use waste management systems for improved urban ecological infrastructure. The paper, which pays special attention to experiences from Latin America (with a special focus on Brazil), Asian countries as well as the European Union new Member States (the Baltic States), documents and presents some of their experiences, which may be useful to other developing countries and rapidly growing regions.

Contents

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1. Introduction

Waste management is, along with water and energy management, one of the key issues surrounding any municipality. Indeed, municipal solid waste (MSW) has become an issue of increasing global concern, as the world population continues to grow, leading to greater levels of consumption, and the subsequent need to dispose food waste, packages, paper and other elements that make up the various waste streams. There is also a need to make better use of the resources available in waste streams in order to secure the access to raw materials.

According to some recent studies, the estimated quantity of MSW generated worldwide is between 1.3 and 1.9 billion tonnes per year (UNEP 2010 in UNEP, 2011; Hoornweg and Bhada-Tata, 2012). It is projected to increase to approximately 2.2 billion tonnes per year by 2025 (Hoornweg and Bhada-Tata, 2012). The total amount of MSW generated per person per day has noticeably increased as well. It has almost doubled during last ten years from 0.64 kg to 1.2 kg and is expected to reach 1.42 kg by year 2025 (World Bank, 2013).

The municipal waste problem is a matter of concern to industrialised nations (Eriksson et al., 2005), but particularly acute in developing countries,[1] the total population of which accounts for more than 70% of the world's population. One of the main reasons why municipal waste as a whole and food waste (Papargyropouloua et al., 2014) in particular, is so problematic in these countries, is the rapid process of urbanization, coupled with an intensive population growth, which in turn has intensified waste management issues. Indeed, the growth of waste production in developing countries is taking place at a pace that is much faster than what was ever experienced by today's industrialized countries (JICA-RI, 2003). Therefore, national and local authorities in those countries are struggling with the problems of growing volumes of waste, the costs involved, questions related to waste management technology choices and the impact of waste on the local and global environment. Efforts from municipal waste management companies have focused primarily on the disposal options, by choosing landfills as a preferred waste management method, despite all disadvantages associated with it.

However, the problems related to the development of municipal waste management have also provided possible opportunities for developing countries to find solutions for improving urban waste management – involving innovative and suitable technologies and disposal methods; and applying better governance methods. These issues have been demonstrated by good practices from many cities and regions around the world.

This paper addresses this need by reviewing the state of the art on municipal solid waste management in a sample of developing countries and rapidly growing regions. Based on extensive literature and data review the various urban waste management approaches are discussed in addition to an analysis of practices and barriers. The role of governance is considered, in order to better use waste management systems for improved urban ecological infrastructure. The paper pays special attention to experiences from Latin American (with a special focus on Brazil), Asian countries as well as the European Union new Member States (the Baltic States), with a view to documenting some of their experiences, which may be useful to other developing countries and rapidly growing regions.

[1] The classification of developing countries in this paper is based on the criteria set by the World Bank (2015).

2. Development of urban waste management practices

Waste streams, waste collection, treatment and disposal methods are combined into a practical waste management systems that are different in different regions and countries. Despite the differences, waste hierarchy as a philosophy underlying waste policy is widely accepted in the world and ranks waste management options in a preferred order. The waste hierarchy states that the most preferred option is to not generate wastes at all. This often lies outside the mandate of the waste organisations and regulations in a country. When there is actually a waste the preferred action is to reuse the waste. After that in order comes material recycling (including biological treatment where nutrients are re-used), incineration with energy recovery and last landfilling.

Collecting, transporting and disposing of MSW represent a large expenditure especially for low-income developing countries. Therefore many cities collect less than half of the municipal waste generated. On average, collection coverage is estimated to be roughly 41% in lower-income countries and 85% in upper-middle income countries, but can be as low as 10%, in some African countries, and as high as 100%, as in many large Chilean cities (Hoornweg and Bhada-Tata, 2012). Open and controlled dumps are still the predominant form of municipal waste management in most of the developing counties. For example, in Latin America about 60% of the municipal waste ends up in dumps (Hoornweg and Giannelli, 2007) and in some cities in Asia neary 90% may be landfilled (Cointreau, 2008 and Medina, 1997 in Medina, 2010).

However, extensive developments and transfer of technologies in municipal waste management sector are underway. In developing countries, the principal activities focus on building-up waste collection system and upgrading existing waste management infrastructure (from dumping to more controlled and environmentally sound landfilling). Countries with economies in transition (e.g. Eastern European countries) tend to have a more extensive waste management infrastructure in place (based mainly on sanitary landfilling), but require substantive investments in upgrading the system towards recovery and other higher hierarchy options. Even in developed countries many municipal waste management systems and existing technologies/facilities are ageing and must be upgraded to meet community demands and increasing regulatory/environmental requirements and targets.

Waste management solutions in one region might not be appropriate elsewhere. For example, incineration and anaerobic digestion that are used in many developed countries are limited in developing countries because of their high costs and the associated stringent operating requirements. The development of advanced waste management infrastructures is, and will be for a certain time period, too expensive for most of the developing countries (Wilson, 2007 in Marshall and Farahbakhsh, 2013). This issue is addressed by