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Review

Hazardous waste generation and management in China: A review

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Abstract

Associated with the rapid economic growth and tremendous industrial prosperity, continues to be the accelerated increase of hazardous waste generation in China. The reported generation of industrial hazardous waste (IHW) was 11.62 million tons in 2005, which accounted for 1.1% of industrial solid waste (ISW) volume. An average of 43.4% of IHW was recycled, 33.0% was stored, 23.0% was securely disposed, and 0.6% was discharged without pollution controlling. By the end of 2004, there were 177 formal treatment and disposal centers for IHW management. The reported quantity of IHW disposed in these centers was only 416,000 tons, 65% of which was landfilled, 35% was incinerated. The quantity of waste alkali and acid ranked the first among IHW categories, which accounted for 30.9%. And 39.0% of IHW was generated from the raw chemical materials and chemical products industry sectors. South west China had the maximum generation of IHW, accounted for 40.0%. In addition, it was extrapolated that 740,000 tons of medical wastes were generated per year, of which only 10% was soundly managed. The generation of discarded household hazardous waste (HHW) is another important source of hazardous waste. A great proportion of HHW was managed as municipal solid waste (MSW). Hazardous waste pollution controlling has come into being a huge challenge faced to Chinese environmental management.

Keywords: Industrial hazardous waste; Medical waste; Household hazardous waste; Generation; China

Contents

1. Introduction

In recent years, both public health impact and transboundary movements of hazardous waste continue to be the hot topics through the world [1]. As one of the fastest developing countries with an average of 8% GDP increase, China is no exception for

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facing the hazardous waste problems, especially toxic chemicals and heavy metal pollutants discharged from factories. Owing to the hazardous waste issue, China is not only suffering from huge pressure from domestic, but also arousing great concerns from abroad. Thus, how to control hazardous waste pollution is a key issue of environmental protection in China. According to Chinese law, hazardous waste is classified as three types: industrial hazardous waste (IHW), medical waste (MW), and household hazardous waste (HHW). Whereas, before managed as hazardous waste, IHW should be identified by one of the following methods: National Catalogue of Hazardous Wastes (NCHWs, hazardous waste list in China) or Identification Standards on Toxicity and Corrosivity Characteristic for Hazardous Wastes.

2. Generation and ultimate disposal of hazardous waste

2.1. Industrial hazardous waste

2.1.1. Generation

Based on effective NCHWs in 1998, IHW is classified into 46 categories, from HW-01 to HW-46, just conformed to Basel Convention (Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal). The quantity variation of IHW from 1999 to 2005 is shown in Fig. 1. The official statistic (National Bureau of Statistics of China, NBSC) quantity of IHW was about 11.62 million tons in 2005 [2], an average of which 43.4% was recycled, 33.0% was stored, 23.0% was securely disposed, and 0.6% was out of control, which means that 70,000 tons of IHW is discharged to the environment without any controlling measures annually. However, the actual generation of IHW was about 25.00 million tons according to a report from Nationwide General Investigation by Chinese Academy for Environmental Planning [3], which is as two times as the data from NBSC. Above difference has resulted from the unclear identification system of hazardous wastes and various sources of statistic data. In this paper, all the analyzed data is based on the statistic data from NBSC.

Fig. 2 shows a simple comparison on IHW generation between China and USA in 2005. The volume of IHW in USA was nearly four times more than in China [4]. However, a common characteristic between each other could be found that raw chemical material and manufacturing industry sector ranked the first contributor to the volume of IHW. While mining and processing of nonferrous metal ores was the second generator in China. USA is the petroleum and coal products industry.

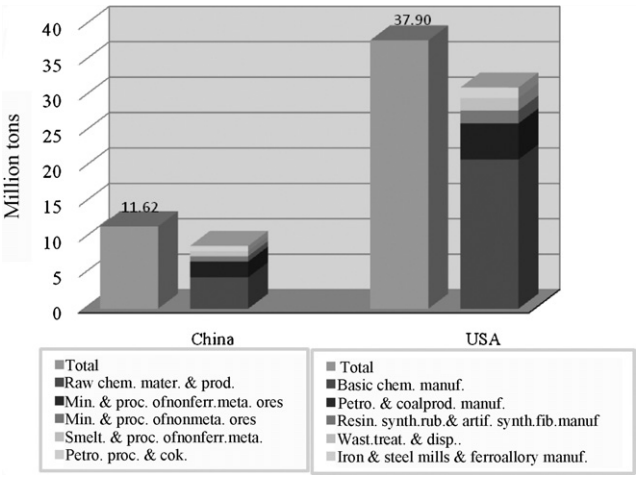

Fig. 2. A comparison on hazardous waste generation between China and USA (2005).

IHW was widely generated in China. The generation proportion of IHW in different regions is shown in Fig. 3. In 2005, almost above 40% of IHW was generated in South west China [5], which means that 4.65 million tons of IHW was from Sichuan, Guizhou, and Yunnan provinces which belong to undeveloped regions. The level of economic development and structure of the industry has resulted in the volume of IHW generation. The gross regional product among different regions is shown in Fig. 4. In South west China, the large quantity of IHW generation was due to the primitive and traditional production techniques, accompanied with mass but inappropriate mining and dressing activities for metals and other natural resource. Another 24% of IHW was from South east China, including Shanghai, Zhejiang, Jiangsu, and Shandong provinces. South east China belongs to developed regions. Accelerated development of economy, mass manufacturing and processing industry, and strict standard on environmental quality assessment, made the quantity of IHW increase continually.

IHW was almost generated in all industrial sectors (6 mining sectors and 41 manufacturing sectors defined by National Bureau of Statistics), but almost 90% of the IHW was from 9 main industrial sectors (Table 1). And 38% of IHW was gener-

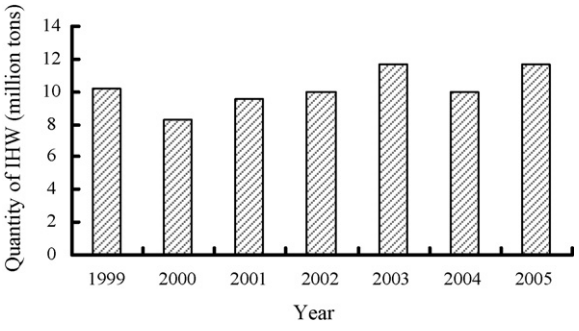

Fig. 1. Quantity of industrial hazardous waste in China from 1999 to 2005.

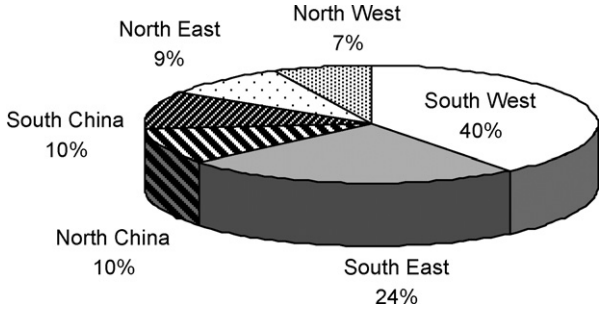

Fig. 3. Regional distribution and proportions for industrial hazardous waste in China (2005).