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A Glance at the World

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This column comprises notes and info not subjected to peer-review focusing on waste management issues in different corners of the world. Its aim is to open a window onto the solid waste management situation in any given country, major city or significant geographic area that may be of interest to the scientific and technical community.

Analysis of the barriers of sustainable e-waste recycling industry in China

With the booming of China's economy, electrical and electronic products have become the common necessities of life to the Chinese people. However, the treatment of e-wastes in China is a stupendous task for the China's stakeholders due to the recent rapid expansion of the informal sector for the waste of electrical and electronic equipment (WEEE) recycling, and the serious environmental contaminations and human health problems caused by the primitive treatment of e-wastes. China faces many severe barriers to achieve sustainable e-waste recycling. Therefore, analyzing and identifying these barriers, investigating the cause–effect interrelationships among them, and proposing some measures for the China's stakeholders to promote the sustainable development of e-waste recycling, is of vital importance.

Barriers

We summarized a total of thirteen barriers of China's sustainable e-waste treatment in economic (*EC*), environmental (*EN*), technological (*T*), social–political (*SP*) aspects based on literature review and focus group meeting, i.e. uncompetitive collection price (EC_1), lack of policies for subsidies and tax exemption (EC_2), low proportion of recycling by the formal companies (EC_3), serious environmental and human health problems (EN_1), lack of equipments in the individual workshops (T_1), lack of technologies in the individual workshops (T_2), insufficient supporting infrastructure (T_3), incomplete regulatory and legal system (SP_1), lack of complete e-waste management and disposal system (SP_2), lack of governance on e-waste from the developed countries (SP_3), weak awareness of people on legal systems and environment protection (SP_4), unclear responsibilities for governmental sectors (SP_5), and illegal treatment by peddlers (SP_6) (Qu et al., 2013; Wei and Liu, 2012).

Analysis of the barriers

The Grey Decision Making Trial and Evaluation Laboratory (GDEMATEL) has been employed to analyze these barriers (Bai and Sarkis, 2013). Three top representative experts have been invited to participate in GDEMATEL analysis, and the results are presented in Fig. 1. The barriers in the cause–effect diagram have been divided

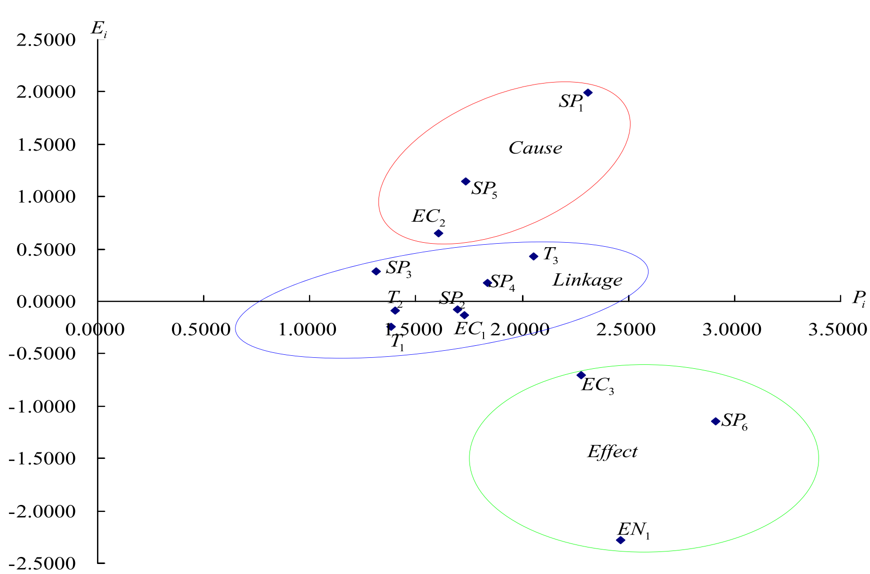

Fig. 1. The cause–effect diagram.

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into three regions, i.e. the 'cause' group, the 'linkage' group, and the 'effect' group according to the values of the vertical ordinate (E_i) with respect to the barriers. The priority sequence of these barriers with respect to their relative importance can also be determined according to the values of the horizontal ordinate (P_i) with respect to the barriers. The illegal treatment by peddlers (SP_6) is regarded as the most important barrier that hinder the sustainable development of e-waste recycling industry in China.

Managerial implications

The following measures are recommended for promoting the sustainable development of e-waste recycling industry in China: (1) establishing the special administration sector for the supervision and management of the plants and workshops for e-waste treatment in China; (2) establishing the complete legislations, regulations, and standards for supervising, guiding and regulating the sustainable development of e-waste treatment in China, and clarifying the legal liability of the corporate for environmental pollution caused by e-waste treatment; (3) establishing the complete supporting infrastructure for e-waste collection and treatment; (4) training and education on China's residents to increase the awareness of legal systems and environment protection; (5) clarifying the responsibilities for different governmental sectors in e-waste management, and specifying their roles in e-waste treatment; (6) drafting more policies for subsidies and tax exemption to encourage the residents to sell their e-wastes to the formal recycling sector at an attractive price, and drive formal recycling sectors to invest more on purchasing advanced facilities for e-waste treatment.

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Low Emission Scenario approach to Solid Waste Management from the landfills in Surat City, Gujarat

Municipal solid waste generation rate is over-riding the population growth rate in all mega-cities in India. The existing policies, programmes and management structure do not adequately address the imminent challenge of managing this waste which is projected to be 165 million tonnes by 2031.

The collection of solid waste increased from 30% in 1995 to 98% in 2006. Surat City, with its population of 4.46 million (2011), produces 1350 Mt/d of waste.

Until 2002, Surat had one open dumpsite at Bhatar (about 0.23 km^2 and 35,45040 Mt of waste). Currently the city has one sanitary landfill site at Khajod (Gujarat) whit a Gabion walled structure and a methane extraction mechanisms. Currently 1243.847 Mt of MSW are collected from six transfer stations based at Bhatar, Katargam, Varachha, Anjana, Pal and Bhestan. In the landfill the waste is leveled by the heavy machineries and a daily cover of soil is also applied. About 400 t/d of garbage are sent to a processing plant established in 2008 on BOOT basis. Other 600 Mt/d of waste are planned to be sent to an energy plant of 'Concorde Blue' technology (Germany) which will be commissioned in 2015.

The composition of waste processed by Waste to Energy Plants is assumed to be the same as the SW collected as the plant receives mixed/residual waste from the SMC.

Data on municipal solid waste was collected from the Surat Municipal Corporation and other sources to quantify the changes in waste generation rate and decomposable matter. Surat's residents are currently producing municipal solid waste of about 500 g/capita/d. This is currently set to increase at the rate of about 1.33%/capita/g/y totalling to about 550 g/capita/d by 2031.

Studies have shown that there is an increasing trend of the amount of organic waste (Xiao et al., 2006). In this model we have calibrated the changes in the composition of MSW produced by the city on a yearly basis.

The objectives of this research was (i) to evaluate the GHG emission values of the current year on a city level emission inventory and (ii) to estimate their reduction for the year 2030 in a Low Emission Scenario (LES) with improved waste management technological interventions.

The emissions for the year 2013, as calculated by first order decay model, were about 232 Gg CO_2 equivalent.

In the Business As Usual scenario (BAU), considering also the waste to energy Hanjer plant of 400 Mt/d capacity of waste the per capita waste emissions of the solid waste disposal systems (SWDs) is about 0.073 kg CO_2 eq/capita (see Fig. 1).

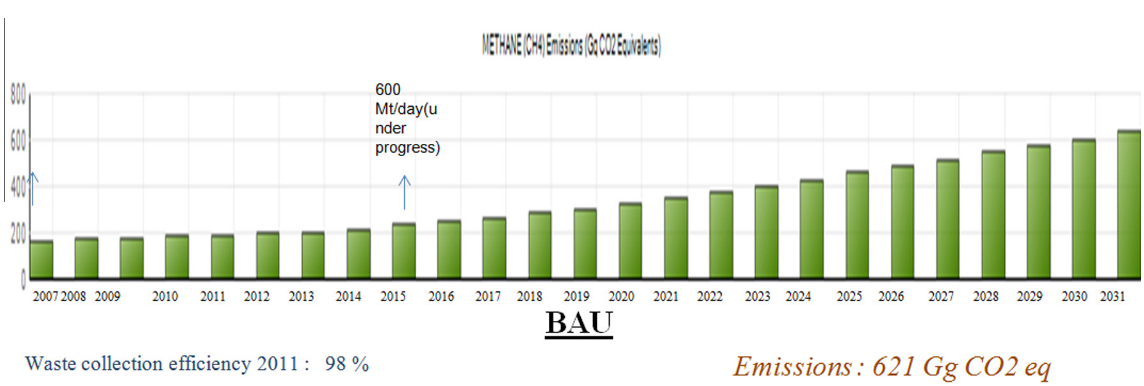

Fig. 1. Graph showing GHG emissions from the SWDs in the Business as Usual (BAU) Scenario of Surat City 2007–2031.