



## **Socio-Demographic Assessment of Surrounding Community to a Material Recovery Facility (MRF) and a Dumpsite: The Case of Lapu-Lapu City, Philippines**

**Van Ryan Kristopher R. Galarpe**

Faculty, Physics and Chemistry Departments, Mindanao University of Science & Technology,  
C.M. Recto Avenue, Cagayan de Oro City, 9000 Philippines

Email: [vanryangalarpe@gmail.com](mailto:vanryangalarpe@gmail.com)

---

**Abstract:** This study assessed the socio-demographic profile of surrounding community to a Material Recovery Facility (MRF) and a dumpsite in Lapu-Lapu City, Philippines. A total of twenty-two (22) households were interviewed using survey questionnaire instrument assessing household profile, opportunities, water resource and utilization, health status and services, waste management practices, and perception to disposal sites management. Result showed that most of the households were scavengers, microfinance businessmen, and material recovery facility (MRF) contract workers earning below the per capita poverty threshold. Prevalence of diarrhea, gastrointestinal, and respiratory diseases were likely common and medical services availed were largely dependent on barangay clinic and government hospitals. The use of groundwater for bathing, washing, cleaning, and cooking other than drinking exists. Domestic waste disposal of the surveyed households were complex involving collection, dumping elsewhere, recycling, and burning. Considering the current condition of the studied area it is recommended to establish an analysis on the impact of the MRF and the dumpsite to the groundwater resources and comprehensive health evaluation among households.

**Keywords:** material recovery facility (MRF), Lapu-lapu City, socio-demographic.

---

## INTRODUCTION

The Philippines urgency for comprehensive solid waste management under the monitoring and implementation of the Department of Environment and Natural Resources (DENR) and the National Solid Waste Management Commission (NSWMC) were given emphasis for the last years through the establishment of the following facilities; compost, landfill (38), open dumpsites (640), and material recovery (7327) (NSWMC, 2001). It has become a common practice elsewhere that these facilities tend to attract informal settlers because of the available economic option and livelihood (Sia Su, 2007; Paul *et al.*, 2012; Afon, 2012; Galarpe and Parilla, 2014). The community surrounding disposal sites seeks employment through scavenging, collecting, and as middlemen agents (Asim *et al.*, 2012; Sia Su 2007; Rankokwane and Gwebu, 2006; Nzeadibe, 2009), which becomes an integral part of the informal sector of solid waste management (Dhokhikah and Trihadiningrum, 2012). This typically exists since dumped waste potentially becomes a profitable resource through recycling or converting it into an intermediate product (Galarpe and Parilla, 2014; Nzeadibe, 2009).

However, the surrounding community exposed themselves to health risks owing to direct exposure to the disposal site with them unable to acknowledge the ill effects (Al-Yaqout *et al.*, 2001). Studies elsewhere showed potential contamination of the groundwater resources in the disposal sites, which were similarly utilized by the surrounding community (Galarpe and Parilla, 2012; Sabahi *et al.*, 2009; Akoteyon *et al.*, 2011; Watananugulkit *et al.*, 2003) further aggravating the concern. Thus, a need for socio-demographic assessment of surrounding community to a disposal site was seen necessary.

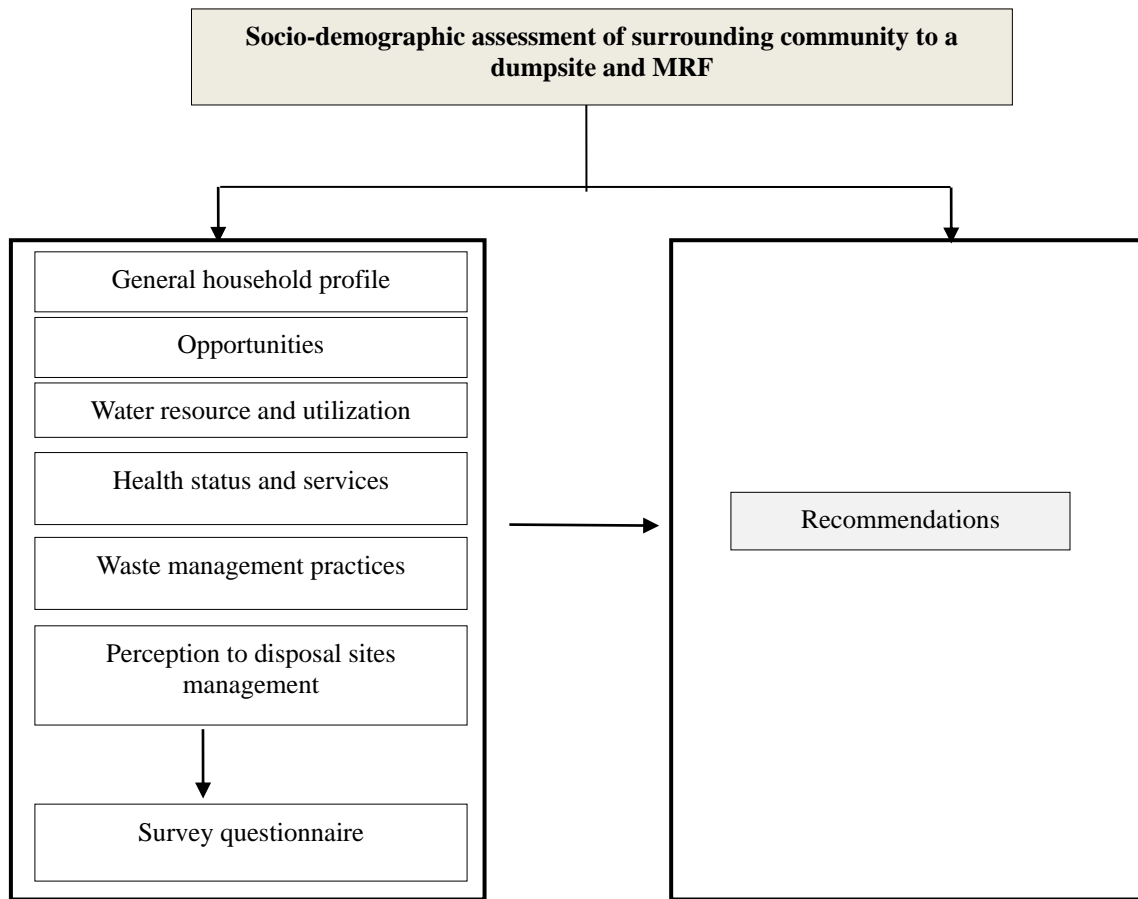
Locally, the case of Lapu-Lapu City, Philippines showed unique features since the latter dumpsite was replaced with MRF. Both facilities co-existed in the area in which the surrounding communities were directly involved to its operation. It is essential therefore to identify possible needs of the community and the environment in

this area to ensure health and environmental sustainability. This study was initialized with the aim of assessing the following key areas: household profile, opportunities, water resource and utilization, health status and services, waste management practices, and perception to disposal sites management in Lapu-lapu City.

## **MATERIALS AND METHODS**

### *Framework of the study*

A survey questionnaire was administered to assess the socio-demographic status of adjacent community to both MRF and dumpsite in Lapu-Lapu City, Philippines. The questionnaire was made tailored to the study of Galarpe and Parilla (2014) with modifications covering the following subcomponents: i) general household profile; ii) opportunities; iii) water resources and utilization; iv) health status and services; v) waste management practices; and vi) perception to disposal sites management as these were evaluated to fit for the studied site. These five subcomponents were assessed highlighting both opportunities and threats to the community. The outcomes of the survey served as basis for local concern entities to address the need of the community. Figure 1 shows the theoretical framework on the study.



**Figure 1.** The theoretical framework employed in the study

### *Study site*

Lapu-Lapu City (10°19'N 123°57'E) is located in the Mactan Island, Cebu. The city is composed of 30 barangay's (smallest unit in the community) classified as urban Class A (NSCB, 2014) with a total population of 350, 467 as of 2010 census of population and a total land area of 58.10 km<sup>2</sup> (NSO, 2010). The city has a total of 159 manufacturing industries located in Mactan Export Zone Authority (MEZA) I and II and Cebu Light Industrial Park with combine total work force of 55,593 in September 2004.

The city is generally flat with slopes of 0-3%. There are no rivers or creeks in the island and geologically made of hard coral rock with 40% of the total area comprising of rocky terrain. Disposal site in Lapu-Lapu City is located in Barangay Bangkal. It is an open dumpsite of about 2-5 ha. Identified gaps by the Department of Environment and Natural Resources-Environmental Management Bureau 7 (DENR EMB 7) in the dumpsite included: i) abandoned limestone quarry; ii) no segregation of wastes and; iii) persistent smoke as complaint by residents nearby. Adjacent to the dumpsite is MRF, which accommodates segregated wastes from the facing dumpsite.

### *Survey instrument*

A total of 22 households residing adjacent to the dumpsite and MRF (10-30 m) were surveyed using purposive questionnaire instrument on March, 2012. This was carried particularly assessing the following: i) general household profile; ii) opportunities; iii) water resources and utilization; iv) health status and services; v) waste management practices; and vi) perception to disposal sites management. There were no secondary data used in this study to assess the socio-demographic profile of the surrounding community.

### *Statistical analysis*

The obtained data were statically expressed in percentage and frequency. Descriptive statistic using arithmetic mean and standard deviations were collectively used to evaluate the data including the maximum and minimum quantitative values.

## **RESULTS AND DISCUSSIONS**

### *General household profile*

The 9% of the surveyed households were locals living near the dumpsite and MRF whereas the other 90% relocated from other nearby cities owing to seen economic

opportunities. Majority of the households owned a house without lot entitlement. Average member per household were five with an average income of Php 7,880 (161.28 \$) per household on a monthly basis. Income generated by households was found to be higher than the previous study of Galarpe and Parilla (2014) in Cebu City Sanitary Landfill (CCSL) although both are located in one metropolitan area. It was evident that the surrounding community has secured other economic option through the MRF facility and manufacturing industries in MEZA providing stable and higher income per household. In general it was still below the per capita poverty threshold in 2012 which was Php 18, 767 (437.87 \$) (NSCB, 2014). On the other hand most of the houses were built with light materials (woods and plastics) to cement. This is common to surrounding community in a disposal site due to informal lot ownership.

**Table 1.** Monthly income of surveyed households

| Household Profile                 | Total         | Mean        | Maximum     | Minimum    | SD          |
|-----------------------------------|---------------|-------------|-------------|------------|-------------|
| Household members                 | 113           | 5           | 11          | 1          | 3           |
| Monthly income (Php) <sup>a</sup> | 173,360       | 7,880       | 25,000      | 1,600      | 5,488       |
|                                   | (4,044.80 \$) | (161.28 \$) | (583.29 \$) | (37.33 \$) | (128.04 \$) |

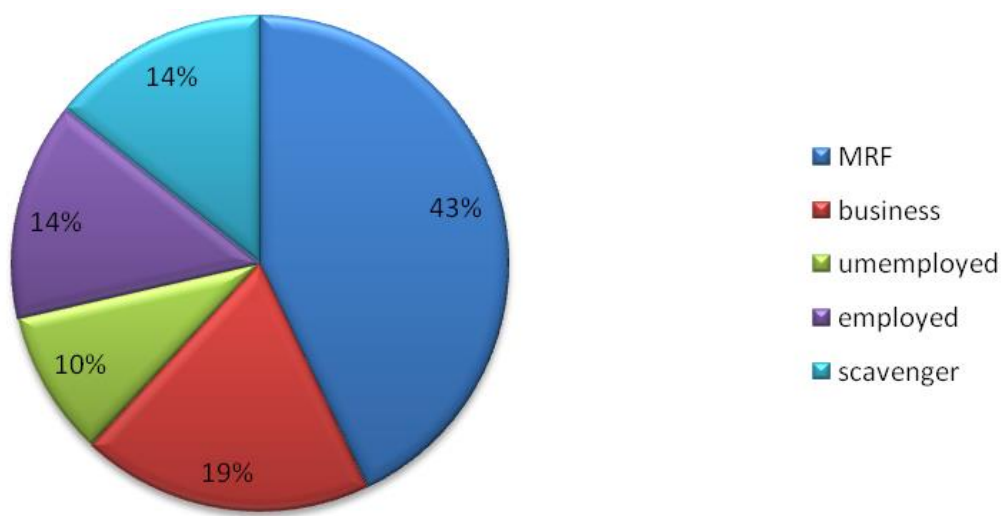
<sup>a</sup> March, 2012 rate I US \$ = Php 42.86 (NSCB, 2014)

Toilet ownerships were mostly communal (41%) shared by several families and households. Other households discharge their septic elsewhere (36%) in the area. The other 23% owned a septic sewage system. In general the urban use of shared sanitation facilities in the Philippines in 2010 accounts to 17% of the population (UNICEF-WHO, 2012), which was in agreement with the findings of this study accounting to 41% of the households. The seen health-associated risk due to poor sanitation exists owing to poor housing and low family income (Kumar Karn and Harada, 2002).

### *Opportunities*

Both MRF and the dumpsite brought economic opportunities to the locals since 14% of the surveyed households were scavengers (Figure 2). This is usually the case in landfills or dumpsites since scavenging provides subsistence livelihood among those who cannot secure employment in the formal urban market (Rankokwane and Gwebu, 2006). Scavenging is generally recognized as an integral component of solid waste process prior to final disposal (Dhokhikah and Trihadiningrum, 2012) or recycling. Scavenging also provides immediate income as compared to formal employment requiring individuals to wait for paycheck (Aida *et al.*, 2011).

Further, associated sectors like stores and junkshops (19%) also exists acting as middlemen among scavengers to that of recycling industries (Asim *et al.*, 2012; Galarpe and Parilla, 2014; Nzeadibe, 2009). These micro-finance businesses proliferated owing to the need of establishing resource trading locally. The bulk of employment was found to be associated with the MRF workers accounting to 43% of the surveyed households. When the MRF was opened most of the former scavengers (43%) in the dumpsite were able to secure employment as staff and segregators. In general dependency to disposal site is expected to reduce if other opportunities were made available (Sia Su, 2007).



**Figure 2.** Employment of surrounding community in the dumpsite and MRF (n =22)

### *Water resource and utilization*

All of the surveyed households depend on commercially available water for drinking (Table 2). The rest of domestic water utilization such as cooking, bathing, and washing solely depends on groundwater without undergoing water filtration and purification. Although it was not established whether the groundwater in the area was contaminated by leachate and other pathogens from the dumpsite and MRF it was evident however that the metropolitan area was heavily affected by saltwater intrusion (Walag, 1984; Engelen, 1975; Bruell, 1973; Bennett, 2012). Similarly, studies elsewhere showed evidence of groundwater contamination in disposal sites (Galarpe and Parilla, 2012; Sia Su, 2005; Watananugulkit *et al.*, 2003; and Sabahi *et al.*, 2009). Adding to the concern was the improper septic discharge of the 36% surveyed households in the area. Extrapolating from these, health risk due to groundwater usage is inevitable.

**Table 2.** Water sources and utilization of surrounding community (n = 22)

| Water Usage          | Purchased <sup>a</sup> | Deep well        |
|----------------------|------------------------|------------------|
| Drinking             | 100 <sup>c</sup>       | NA               |
| Cooking              | NA                     | 100 <sup>c</sup> |
| Bathing              | NA                     | 100 <sup>c</sup> |
| Cleaning and Washing | NA                     | 100 <sup>c</sup> |

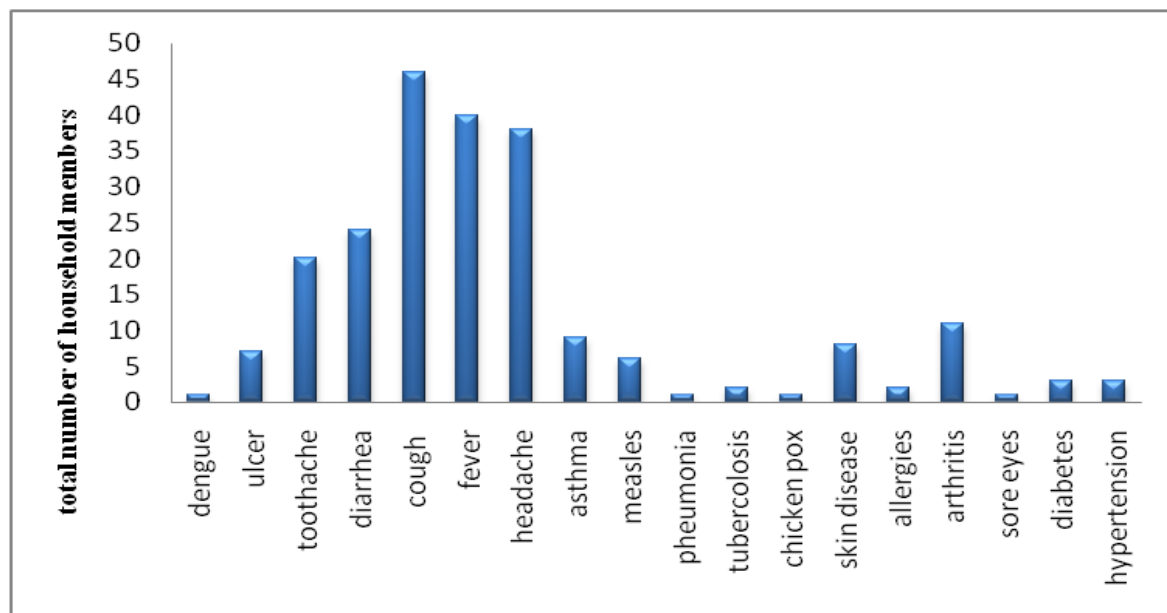
<sup>a</sup> Commercially available mineral <sup>c</sup> values in %; NA= not applicable

### *Health status and services*

Common illnesses and conditions experienced by the surveyed households were cough and cold, diarrhea, fever, headache, and toothache (refer to Figure 3). This may not however conclusively be attributed to the dumpsite and MRF operation given the physical condition of the settlers (refer to Figure 3). However, studies elsewhere on



landfill employees (Gelberg, 1997), waste workers (Athanasidou *et al.*, 2010), scavengers (Galarpe and Parilla, 2014; Nguyen, 2010), and waste picking children (Romero *et al.*, 2010) showed prevalence of work-related dermatologic, neurologic, gastro-intestinal, and respiratory illnesses. While current available literature (Vrijheid, 2000; Gouveia and Prado, 2010; Jarup *et al.*, 2002; Rushton, 2003) indicated cancer risk and birth ill effects, generally it does not provide common health indicator analyses covered in this study (descriptive health assessment reflected in Figure 3).



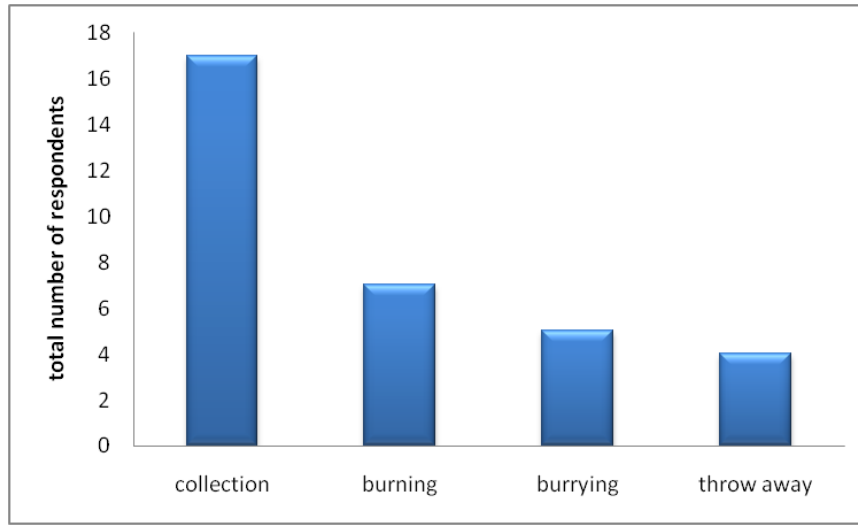
**Figure 3.** Summary of common health illnesses and conditions

Further, majority of the surveyed households preferred to avail the barangay health services owing to accessibility, free medical consultations, and free medicines. This is followed by government hospital for further referrals.

### ***Waste management practices***

All households were able to distinguish biodegradable from non-biodegradable wastes practicing recycling. Their recycling practices goes with reusing plastics, bottles,

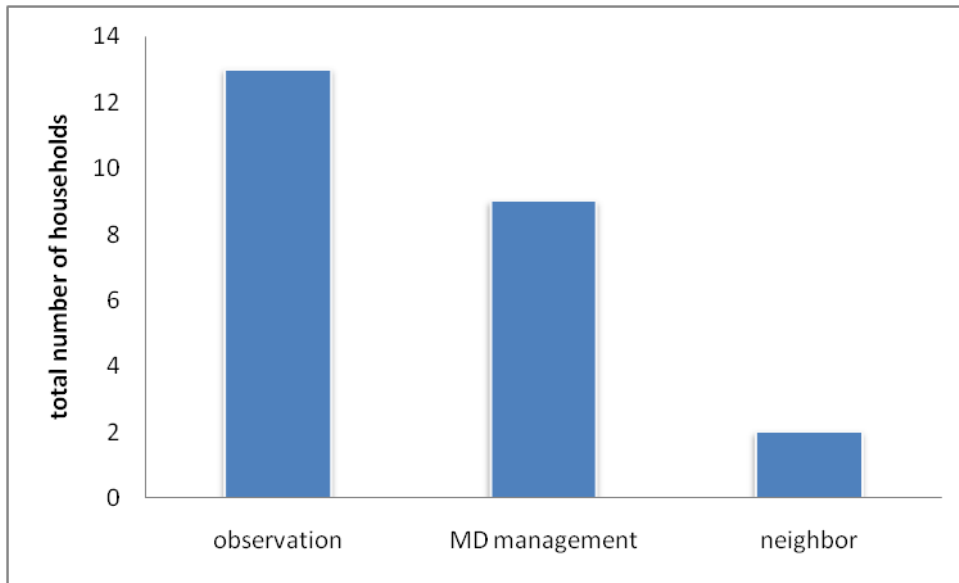
and selling cans to junkshops nearby (refer to Figure 4). Well-planned recycling programs in coupled with composting were found to be an imperative formula to save waste management costs to 18.6% and 57.7% in landfill or dumpsite avoidance costs (Agunwamba, 2003). However, the practices burning, burying, and throwing away waste materials still exist.



**Figure 4.** Waste disposal scheme of surveyed households (n =22)

### *Perception to disposal sites management*

Fifty nine percent (59%) of the households identified the use of the dumpsite and MRF as dumping area by seeing it personally whereas the others were informed through the management prior to construction, invitation as a consequence of employment opportunity, and neighbor's invitation (see Figure 5). Most of the households responded to have a positive (86%) perception to the management due to the following perceptual benefits, employment opportunity, resources, business, and security. Mainly, it provided them opportunities to establish junkshops wherein local trading of recycled goods exists. Food and grocery vendors were similarly found. The rest generally were dependent on scavenging and employed with the MRF.



**Figure 5.** Awareness of surrounding community to the operation of the dumpsite and MRF (MD management = MRF-Dumpsite management)

The surveyed households also expressed less concern (2.54 points) and opposition (7.14 points) to the management as summarized in Table 3. Reasons for opposition were associated to livelihood concerns.

**Table 3.** Perception of the surveyed households to the dumpsite and MRF management (n=22)

| Perception to CCSL Management | Total | Mean | Maximum | Minimum | Std Dev |
|-------------------------------|-------|------|---------|---------|---------|
| concern to management         | 56    | 2.54 | 10      | 4       | 3.52    |
| opposed to management         | 157   | 7.14 | 10      | 1       | 3.43    |

## CONCLUSION

Both the dumpsite and MRF attracted informal settlers to relocate in the area owing to the perceived opportunities. The disposal sites were perceived essential ensuring employment, security, and resources to the adjacent community. Although, generated income by the households was found below the poverty threshold it still provided them immediate source of income.

Health associated risks namely utilization of groundwater, communal septic systems, and improper domestic waste management existed among surveyed households. Consequently, prevalence of dermal, gastro intestinal, and respiratory illnesses were likely to manifest through incidence of cough and cold, diarrhea, fever, headache, and toothache.

It is recommended to evaluate further the impact of the dumpsite and MRF to the groundwater resources in the area since it was conveniently used among surveyed households. The results of this study must be considered to address both health and economic needs in the area.

## ACKNOWLEDGEMENT

The financial assistance of the Department of Science and Technology-Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (DOST-PCAARRD) is highly acknowledged. The technical assistance of Ma. Kristina O. Paler and Dr. Julie Otadoy of the Biology Department, University of San Carlos where the study was formerly started are highly appreciated.

## REFERENCES

- [1] Afon A. A survey of operational characteristics, socioeconomic and health effects of scavenging activity in Lagos, Nigeria. *Waste Management Research* 2012; 30(7): 664-71.
- [2] Agunwamba JC. Analysis of scavenger's activities and recycling in some cities in Nigeria. *Environmental Management* 2003; 32(1): 16-27.
- [3] Aida HZ, Firuza B, Fauziah SH. Socio-economic studies of scavengers in Malaysian landfills. *International Conference on Population Dynamism of Asia* 11-13 July 2011.
- [4] Akoteyon IS, Mbata UA, Olalude GA. Investigation of heavy metal contamination in groundwater around landfill site in a typical sub-urban settlement in Alimosho
- [5] Al-Yaquot AF, Koushki PA, Hamoda MF. Public opinion and sitting solid waste landfills in Kuwait. *Resources Conservation & Recycling* 2001; 35(4): 215-27.
- [6] Asim M, Batool SA, Chaudhry MN. Scavengers and their role in the recycling of waste in Southwestern Lahore. *Resources Conservation & Recycling* 2012; 58: 152-62.
- [7] Athanasiou M, Makyrynos G, Dounias G. Respiratory health of municipal solid waste workers. *Occupational Medicine* 2010; 60:618-23.
- [8] Bennett D. Does clean water make your dirty? water supply and sanitation in the Philippines. *Journal of Human Resources* 2012; 47(1): 146-173.
- [9] Bruell W. The intrusion of seawater into the groundwater of Cebu City. *The Philippine Scientist* 1973;10 : 100-106.
- [10] Dhokhikah Y, Trihadiningrum Y. Solid waste management in Asian developing countries: challenges and opportunities. *Journal of Applied Environmental & Biological Sciences* 2012; 2(7): 329-335.
- [11] Engelen HV. The intrusion of seawater into the groundwater of Cebu City and Mandaue City: a progress report. *The Philippine Scientist* 1975; 12: 115-124.
- [12] Galarpe VRK, Parilla RB. Influence of seasonal variation on the bio-physicochemical properties of leachate and groundwater in Cebu City sanitary landfill, Philippines. *International Journal of Chemical & Environmental Engineering* 2012; 3(3): 175-81.

- [13] Galarpe VRK, Parilla RB. Opportunities and threats to adjacent community in a sanitary landfill, Philippines. *EnvironmentAsia* 2014; 7(1): 112-125.
- [14] Gelberg K. Health study of New York City department of sanitation landfill employees. *Journal of Occupational and Environmental Medicine* 1997; 39(11): 1103-1110.
- [15] Gouveia N, Prado RR. Health risks in areas close to urban solid waste landfill sites. *Rev Saúde Pública* 2010; 44(5).
- [16] Jarup L, Briggs D, de Hoogh C, Morris S, Hurt C, Lewin A, Maitland I, Richardson S, Wakefield J, Elliott P. Cancer risks in populations living near landfill sites in Great Britain. *British Journal of Cancer* 2002; 86(11): 1732-1736.
- [17] Kumar Karn S, Harada H. Field survey on water supply, sanitation and associated health impacts in urban poor communities-a case from Mumbai City, India. *Water Science & Technology* 2002; 46 (11-12) : 269-75.
- [18] National Solid Waste Management Commission (NSWMC). Lists of disposal sites in the Philippines [homepage on the Internet]. Philippines: 2001 [cited 2013 May 27]. Available from: <http://www.emb.gov.ph/portal/nswmc/Resources.aspx>.
- [19] National Statistical Coordination Board (NSCB). Peso-US dollar watch [cited 2014 March 1]. Available from: [www.nscb.gov.ph/stats/pesodollar.asp](http://www.nscb.gov.ph/stats/pesodollar.asp)
- [20] National Statistical Coordination Board (NSCB). Philippine statistical yearbook 2012 family income [cited 2014 February 28]. Available from: [www.bles.dole.gov.ph](http://www.bles.dole.gov.ph)
- [21] National Statistics Office (NSO). 2010 census of population and housing highlights [homepage on the internet]. Philippines 2010 [cited 2013 May 27]. Available from: <http://www.census.gov.ph/statistics/census/population-and-housing>
- [22] Nzeadibe TC. Solid waste reforms and informal recycling in Enugu urban area, Nigeria. *Habitat International* 2009; 33: 93-99.
- [23] Paul JG, Jaque JA, Ravena N, Villamor SP. Integration of informal sector into municipal solid waste management in the Philippines-what does it need? *Waste Management* 2012; 32:2018-2028.
- [24] Rankokwane B, Gwebu TD. Characteristics, threats and opportunities of landfill scavenging: the case of Gaborone-Botswana. *GeoJournal* 2006; 65(3): 151-63.

- [25] Romero DHA, Oudin A, Stromberg U, Karlsson JE, Welinder H, Sequeira G, Blanco L, Jimenez M, Sanchez F, Albin M. Respiratory symptoms among waste-picking child laborers: a cross-sectional study. *International Journal of Occupational & Environmental Health* 2010; 16 (2): 120-31.
- [26] Rushton L. Health hazards and waste management. *British Medical Bulletin* 2003; 68:183-97.
- [27] Sabahi EA, Rahim SA, Zuhairi WYW, Nozaily FA, Alshaebi F. The characteristics of leachate and groundwater pollution at municipal solid waste landfill of Ibb City, Yemen. *American Journal of Environmental Science* 2009; 5(3): 256-66.
- [28] Sia Su GL. Determinants of economic dependency on garbage: the case of Payatas, Philippines. *Asia-Pacific Social Science Review* 2007a; 7(1): 77-85.
- [29] Sia SU GL. Impact of drinking water sources in close proximity to the Payatas dumpsite, Philippines. *Journal of Public Health* 2007b; 15-51-55.
- [30] Sia Su GL. Water-borne illnesses from contaminated drinking water sources in close proximity to a dumpsite in Payatas, the Philippines. *Journal of Rural Tropical & Public Health* 2005; 4: 43-85.
- [31] UNICEF-WHO. Progress on drinking water and sanitation 2012 update 2012: 1-66.
- [32] Vrijheid M. Health effects of residence near hazardous waste landfill sites: a review of epidemiologic literature. *Environmental Health Perspective* 2001; 108 (1): 101-12.
- [33] Walag EL. A study of the seawater intrusion in Cebu and Mandaue: A Progress Report. *The Philippine Scientist* 1984; 21:123-153.
- [34] Watananugulkit R, Intim C, Patnukao P, Tansathit P. Assessment of impact on water quality of leachate at On-nuch disposal site center in Bangkok. *The Journal of Scientific Research Chulalongkorn University* 2003; 28 (Special Issue 1): 97-110.