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CLINICAL WASTE MANAGEMENT PRACTICES IN PRIVATE CLINICS IN SELANGOR, MALAYSIA

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By

GOLYASAMIN KHANEHZAEI

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfillment of the Requirement for Degree of Doctor of Philosophy

May 2017

DEDICATION

This research work is dedicated to my beloved parents, my dear late uncle, Seyed Mohammad and Grandfather Hj Mousa and all my family members, who have firmly stood by me and their support, love and prayer made me able to continue this path.

Abstract of the thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the Degree of Doctor of Philosophy

CLINICAL WASTE MANAGEMENT PRACTICES IN PRIVATE CLINICS IN SELANGOR, MALAYSIA

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May 2017

Chairman : Associate Professor Mohd Bakri Bin Ishak, PhD
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Most research findings on clinical waste in developing countries acknowledge that even though good policies and regulations exist, the clinical waste is a threat to public health and the environment due to the lack of knowledge and awareness, budget constraints, and lack of enforcement. A study on clinical waste management (CWM) was conducted among private clinics in Selangor, Malaysia to assess current management practices, the legal approach and enforcement and factors in relation to sustainability. There were 295 private clinics that participated in the questionnaire survey, from which, 57.6% were medical clinics and 42.4% were dental clinics. Semi-structured interviews and observations were also carried out among 3 medical clinics, 3 dental clinics and 6 clinical waste management organisations. A pairwise comparison survey was also conducted among clinical waste experts from related organizations. The data from the questionnaires were tabulated and analysed using descriptive statistics, cross-tab, Kruskal Wallis test, Mann-Whitney U test and factor analysis. The qualitative data from the semi-structured interviews were analysed in terms of the transcription and theme formation. Observations were also made to further address the issue of CWM. An analytic hierarchy process (AHP) was utilised to analyse expert opinions using the pairwise comparison survey.

The assessment of legislative approach and enforcement shows that there is a gap in the laws and its management practice in reference to the needs of private clinics regarding effective clinical waste management. Based on the results of AHP, water quality with the weight 0.386 was the most important in the top priority. Air quality, management and resources conservation are in the second, third and fourth ranks with weights 0.127, 0.121 and 0.080. Inconsistency rate of pairwise comparison is equal to 0.08 and it is acceptable as it is lower than 0.10. A policy recommendation was made based on the results of the semi-structured interviews using SWOT and TOWS analyses. Some of the recommendations were to connect and strengthen the political and economic will towards the development and implementation of a robust

policy on efficient clinical waste management. Others included the involvement of all stakeholders in the policy making process, the promotion of research and the generation of reliable data in the area, the attracting of international technical and financial aid, and the promotion of training and awareness campaigns in the sector. Additionally, promulgating good governance, improving knowledge and skills, establishing benchmark to facilitate monitoring and initiating information and clinical waste data tracking system were also among the recommended policies. The findings of this study can be utilised by both private clinics and relevant clinical waste management organizations in Malaysia to improve clinical waste management practices in order to achieve a more sustainable clinical waste management system.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

AMALAN PENGURUSAN SISA KLINIKAL DI KLINIK SWASTA DI SELANGOR, MALAYSIA

Oleh

GOLYASAMIN KHANEHZAEI

Mei 2017

Pengerusi : Profesor Madya Mohd Bakri Bin Ishak, PhD
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Kebanyakan hasil penyelidikan mengenai sisa klinikal di negara membangun mengakui bahawa walaupun dasar dan peraturan yang baik wujud, sisa klinikal tersebut merupakan ancaman terhadap kesihatan awam dan alam sekitar kerana kekurangan pengetahuan dan kesedaran, kekangan bajet, dan penguatkuasaan yang lemah. Satu kajian mengenai pengurusan sisa klinikal (CWM) telah dijalankan di kalangan klinik swasta di Selangor, Malaysia untuk menilai amalan pengurusan semasa, pendekatan undang-undang, dan faktor-faktor yang berkaitan dengan kemampanan. Berdasarkan 295 klinik swasta yang mengambil bahagian dalam kajian soal selidik ini, 57.6% adalah klinik perubatan dan 42.4% adalah klinik pergigian. Temu bual separa berstruktur dan pemerhatian juga dijalankan di kalangan 3 klinik perubatan, 3 klinik pergigian, dan 6 organisasi pengurusan sisa klinikal. Satu kajian perbandingan dari segi pasangan juga telah dijalankan di kalangan para pakar sisa klinikal dari organisasi yang berkaitan. Data yang diperolehi daripada soal selidik telah dijadualkan dan dianalisis dengan menggunakan statistik deskriptif, Crosstab, ujian Kruskal Wallis, ujian U Mann-Whitney, dan analisis faktor. Data kualitatif daripada temu bual separa berstruktur dianalisis dari segi pembentukan transkripsi dan tema, dan pemerhatian juga dibuat untuk menangani isu CWM dengan lebih lanjut lagi. Proses hierarki analitik (AHP) telah digunakan untuk menganalisis pendapat para pakar melalui kajian perbandingan dari segi pasangan.

Penilaian pendekatan undang-undang menunjukkan bahawa terdapat jurang dalam pendakatan undang-undang penguatkuasaan dan amalan dan berkaitan pengurusan sisa klinikal yang berkesan. Berdasarkan keputusan AHP, kualiti air dengan berat 0.386, merupakan faktor yang paling utama, manakala kualiti udara, pengurusan, dan pemuliharaan sumber-sumber berada di tahap kedua, ketiga dan keempat, masing-masing dengan berat 0.127, 0.121 and 0.080. Kadar ketidakselarasan untuk perbandingan dari segi pasangan adalah 0.08, dan nilai ini boleh diterima kerana ia adalah lebih rendah daripada 0.10. Satu cadangan dasar telah dibuat berasaskan

keputusan temuduga separa berstruktur dengan menggunakan analisis SWOT dan TOWS. Beberapa cadangan tersebut adalah bertujuan menyambung dan menguatkan kehendak politik dan ekonomi ke arah pembangunan dan pelaksanaan dasar yang kukuh mengenai pengurusan sisa klinikal yang cekap. Cadangan yang lain bertujuan melibatkan semua pihak yang berkepentingan dalam proses penggubalan dasar, menggalakkan penyelidikan dan penjanaan data yang boleh dipercayai dalam bidang tersebut, menarik bantuan teknikal dan kewangan antarabangsa, dan menggalakkan latihan dan kempen kesedaran dalam sektor tersebut. Di samping itu, mengisytiharkan tadbir urus yang baik, meningkatkan pengetahuan dan kemahiran, mewujudkan penanda aras untuk memudahkan pemantauan dan memulakan sistem pengesanan data sisa dan klinikal juga merupakan antara dasar yang disyorkan. Hasil kajian ini boleh digunakan oleh kedua-dua klinik swasta dan organisasi pengurusan sisa klinikal yang berkenaan di Malaysia untuk meningkatkan amalan pengurusan sisa klinikal untuk mencapai sistem pengurusan sisa klinikal yang lebih mampan.

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Furthermore, I would like to also thank my friends, colleagues and all those who have helped me in completion of my thesis.

I certify that a Thesis Examination Committee has met on 19 May 2017 to conduct the final examination of Golyasamin Khanehzaei on her thesis entitled "Clinical Waste Management Practices in Private Clinics in Selangor, Malaysia" in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Doctor of Philosophy.

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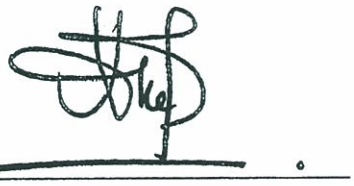

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This thesis was submitted to the Senate of the Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Doctor of Philosophy. The members of the Supervisory Committee were as follows:

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This is to confirm that:

- the research conducted and the writing of this thesis was under our supervision;
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LIST OF ABBREVIATIONS

CW	Clinical Waste
CWM	Clinical Waste Management
WHO	World Health Organization
MOH	Ministry of Health
DOE	Department of Environment

CHAPTER 1

INTRODUCTION

1.1 Background of study

Clinical waste generates from numerous bases, including hospitals and clinics, medical and dental operations, veterinary practices, medical centres, medical research laboratories, and nursing homes (Bendjoudi, Taleb, Abdelmalek, & Addou, 2009; Da Silva, Hoppe, Ravanello, & Mello, 2005; Marinković, Vitale, Holcer, Džakula, & Pavić, 2008). Public health laboratories, blood donation places as well as blood banks, vaccination/immunization clinics and services associated to mental health and learning disabilities are amongst the related bases of clinical waste (Hagen & Blake, 2001; Marinković *et al.*, 2008). Clinical waste is potentially hazardous as it might contain infectious agents such as bacteria, virus, fungi and protozoans. Needle and sharps are likewise potentially hazardous content of clinical waste. Moreover, clinical waste which contain human body parts could be harmful in nature. Thus, it is significant to practice special attention for handling and management of clinical waste in order to minimize its potential hazard to public health or environmental pollution.

In the recent years, human actions and changes associated with life routines and consumption patterns caused vast amounts of several kinds of wastes (Oweis, Al-Widyan, & Al-Limoon, 2005). Furthermore, inadequate clinical waste management is causing both health hazards and environmental contamination and pollution (Bdour, Altrabsheh, Hadadin, & Al-Shareif, 2007; Coker, Sangodoyin, Sridhar, Booth, Olomolaiye, & Hammond, 2009). Several types of illnesses like infection of the skin, and infectious hepatitis might extent in epidemic manner because of the problems in managing the clinical solid waste (Coker *et al*., 2009). Therefore, identifying suitable approaches regarding the safe management of clinical waste is a crucial necessity.

Numerous researchers in developing countries have examined the current clinical waste management practices in certain health care establishments of their countries (Bdour *et al*., 2007; Coker *et al*., 2009; Hassan, Ahmed, Rahman, & Biswas, 2008; Marinković *et al*., 2008). According to these researchers, insufficient financial support, limitation of awareness and operational control, limitation of trained and skilled clinical staffs in the waste management framework are the causes of inappropriate clinical waste management practices in their regions. Safe and secure management of medical and health-care waste might be confirmed by adopting the management practices that are established on clear strategies and strategies which offer constant improvement. These practices should be combined with routine worker preparation and training, ongoing education, and management assessment procedures for organizations and staffs' (Da Silva *et al*., 2005). Unsuitable management practices and lack of awareness regarding the threats to well-being from clinical waste are among the most important matters about the health-care

waste. Additionally, the significance of management and disposal of clinical waste was ignored in several developing countries due to budget limitation.

Healthcare waste in Malaysia contains general waste, clinical waste, pharmaceutical waste, hazardous chemicals, and radioactive waste (where 75 to 90 percent are general waste), and the remaining 10 to 25 percent of the wastes are hazardous (Omar, Nazli, Subramaniam, & Karuppannan, 2012; MOH, 2009). In term of the disposal of the clinical waste, incineration is the main strategy in discarding clinical waste used in Malaysia (Zaimastura, 2005). According to Ambali, Bakar, & Merican, (2013) five incinerators with the capacity of 20-500kg every hour were developed for handling clinical waste. In addition, some higher capacity incinerator with the limit of 200kg/hour is in progress but yet to be built because of some problem in siting and local's approval. Furthermore, RM17 million was spent by the government to develop seven more mini-incinerators that have a limit of 5 to 20 ton each day in islands of Langkawi, Labuan, Tioman and Pangkor (Ambali, *et al.*, 2013; Consumers' Association of Penang (CAP), Malaysia Country Report, 2001). Before the year ended in 2013, three more giant incinerators where developed across the country that could handle waste materials. Malacca, Bukit Payong in Johor and Taman Beringin in Kuala Lumpur are the potential locations proposed for these incinerators. However, civic is more receptive of sanitary landfill compared to incinerator as an outcome of a study that was carried out back in 2010. The impression of the general population is that sterile landfills are less harmful to the environment and poses less hazards to human than incineration plants. Relentless effort needs to be done to have the general population educated and to correct this misconception (Chuen-Khee & Othman, 2010, p.910).

The main sources of clinical waste generation (DOE, 2009) in Malaysia are healthcare establishments which have been grouped as, large, medium and small source. Large sources are including: University hospitals and clinics; Maternity hospitals and clinics and General hospitals. Medium sources are including: Medical centres; Out-patient clinics; Mortuary/autopsy facilities; Farm and equine centers; Hospices; Medical laboratories; Medical research facilities; Animal hospitals; Blood banks and transfusion centres and Emergency services. Small sources are including: General medical practitioners; Convalescent homes; Nursing and remedial homes; Medical consulting rooms; Dental practitioners; Animal boarding and hunt kennels; Tattooists; Acupuncturist; Veterinary Practitioners; Pharmacies and Cosmetic piercers.

Healthcare facilities in Malaysia are growing annually specially the private clinics especially in Selangor state (study location) which is considered as the most developed city of Malaysia which has the largest population in Malaysia. Thus, proper clinical waste management is very important to be practice in all sources of the clinical waste generation from large source to small source. In private clinics, however small in size and with the small amount of clinical waste generation, it is very important to manage and segregate the clinical waste fully and according to the guidelines as improper management of clinical waste and mixing these waste with general waste will cause the general waste to become clinical waste.

1.2 Problem statement

Clinical waste management issues created many concerns for decision makers in the recent past years. Clinical waste could threaten not only the environment but also public health by exposing the human population to blood infections such as hepatitis B, hepatitis C and HIV. Clinical waste contains wide range of biohazards like sharps, infectious, pathological, and genotoxic waste and many other hazardous elements. Medical demands had been raised due to global increase in population especially in developing countries, which caused a significant rise in clinical waste generation. Population increase, along with growth in healthcare sector as well as great tourist influx has increased the clinical waste generation in Malaysia (Chee, 2007). According to the report released by Malaysian Department of Environment, 8000t of pharmaceutical and clinical waste is produced in Malaysia (Razali & Bakri, 2010).

Based on the researches that were conducted in this field, several gaps have been identified in the management of clinical waste in Malaysia and other parts of the world. According to the Ministry of Health Report (MOH, 2007) it was found out that clinical waste was mixed with daily general waste, for example sharp waste were not separated and disposed in sharps bin. In addition to that, yellow containers were also found in unhygienic conditions posing risks to healthcare employees and general public. The principle purpose of the Department of Health is to give safe healthcare services to patients who are also involved in the segregation of waste. The lack of knowledge and instructions amongst patients and healthcare providers can cause risks on the well-being of the general public and the environment. In any country it is the responsibility of the national government to manage the waste. The clear vision of the characteristics and quantities of the clinical waste generated is the main factor for development of the cost effective management strategies of the clinical waste.

In Malaysia, characteristic and quantification of the clinical waste forms the basic requirements for managing this types of the wastes by the government and other relate agencies (DOE, 2009). Clinics and medical health centers in Selangor Malaysia are continually growing. The amount of clinical waste generated from the healthcare facilities is increasing with the growing demand of the medical services of Malaysia (Ambali, *et al.,* 2013). The number of foreign patients who come to be treated in Malaysia clinics is increasing every year and makes an increasing amount of hospital and clinical waste (Chee, 2007; Pocock & Phua, 2011). In Malaysia most of the clinical waste management studies were focused on hospitals, therefore private clinics which are more neglected in previous researches (Hamadan *et al*., 2012; Omar *et al*., 2012; Razali & Bakri, 2010), were chosen as the sample of the current study. It is to fill the gap by determining present status of the clinical waste management practice in a number of private clinics.

1.3 Significance of the study

This study emphasized the obstacles and significance of handling clinical waste in sustainable way. For ensuring the sensible assessment and analysis of management system, current clinical waste management system in selected private clinics is assessed in this study. Finding and outcomes of this research study will have contributions for the Malaysian government, local authorities, private health-care facilities, as well as researchers and current body of knowledge. The recommendation driven from the research outcomes and results will sensitize and enlighten relevant authorities in this regard and it would assist the policy makers on their upcoming plans. This would take into perspective the efficiency of the present practices of clinical waste management and offer some recommendations based on the results of this research study with the purpose of moving towards sustainability. The recommendations and the results might be beneficial for ensuring the effectual management of clinical waste in private clinics.

The results of the current study would be particularly supportive as a guideline for developing and enhancing the clinical waste management standard principles in the Malaysia for efficiency and effectiveness for the forthcoming years. The recommendation would contributes toward improving a more operative and suitable clinical waste management. The findings could be useful as a reference for the future and it can suggest appropriate explanations for improving the situation within the existing clinical waste management system. This study would help to bridge the gap in the body of knowledge regarding the clinical waste management by assessing the present situation of clinical waste management in private clinics which have been neglected in past researches. The outcomes of this research study could be used as a primary framework for modifying the system and by providing the recommendations will help in improving the concept of sustainable development for clinical waste management with the focus on private clinics.

1.4 Objectives of the study

The main objective of this study is to assess the clinical waste management practices in private clinics located in Selangor, Malaysia.

Following are considered as the objectives of the study:

1. To determine and compare the existing status of clinical waste management in private clinics located in Selangor, Malaysia
2. To determine the perspective of private clinics about efficiency of legislative approach and enforcement with regards to clinical waste management in private clinics located in Selangor, Malaysia
3. To identify and select the most significant factor for sustainable clinical waste management by means of Analytical Hierarchy Process (AHP) method
4. To recommend the strategies for improvement of the clinical waste management practices in private clinics based on SWOT and TOWS analysis

1.5 Research questions

This research contains the management features of clinical waste in Malaysia and the level of efficacy of clinical waste management systems operating in private clinics situated in Selangor. Are they following the proper standards? The research questions designed a framework for the variables. The methodology was directed by the nature of research questions that likewise identified the required instruments for the data analysis.

1. How is the current practice of clinical waste management in private clinics?
2. How effective is the current legislative approach and enforcement towards clinical waste management in private clinics?
3. What are the most significant factors for sustainable clinical waste management practice in private clinics?
4. What are the best strategies for improvement of clinical waste management practices in private clinics?

1.6 Scope of study

Current study emphases on developing the clinical waste management system in private clinics of the main populated state of Malaysia, Selangor. The scope of this research is private clinics situated in this state. Primary data of the current study is gathered through the questionnaire. The researcher used simple random sampling method for the sampling procedure of the study. The field survey was inclusive of all areas within the scope of this research.

1.7 Limitation of study

Lack of comprehensive data on current clinical waste situation in private clinics was considered as one of the most important limitations of this research. According to the literature review that was done by the researcher, the number of studies conducted on clinical waste from the private clinics in Malaysia (Tiong, Latif, & Karuppannan, 2012) was very limited The studies in this regard, did not have the actual quantitative data and available data were not appropriate and applicable for the aims of the current study.

Furthermore, the data collection procedure of the study was very time-consuming as most of the respondents were not willing to give the detailed information of their clinical waste management practices because of its hazardous nature and significance of the appropriate handling. It should be noted that the researcher had access to limited information during the data collection procedure. As, some documents regarding the clinical waste from relevant organizations had no authorization and permission to use the data and therefore specific and detailed information was limited and confidential that could not be accessed by the researcher.

1.8 Organization of the thesis

This thesis includes five chapters that were organized in the following order:

Chapter two presents to the literature review of the study that were based on the previous researches that were related to the area of the current research. The researcher tried to highlight and present an overview regarding the clinical waste management in several countries of the world and Malaysia. Several research instruments that were applied in previous studies will be discussed as well. The legislative framework regarding the clinical waste management would be likewise highlighted.

Chapter three relates to the methodology that has been used in the current study. Data collection process and analytical framework will be presented in chapter three as well. The background of the case study will be discussed with detailed description of the research design. The instruments that were used for the data collection procedure will be explained, additionally, the reliability and validity examination of the research instrument is also discussed in chapter three.

Chapter 4 comprises the outcomes, results and discussion of this study for evaluating several factors particularly the system elements of the clinical waste management in private clinics. The flow of this chapter is established to highlight the demographic evaluation based on the research questions, following by each research objective. The investigation of each research question is necessary in order to fulfil the objectives of this research.

Chapter 5 of the current study presents the summary, conclusion and recommendations according to the overall findings of the research and the recommendation addressing the issues of the current clinical waste management system and the other potential areas for further research in future.

REFERENCES

Adedibu, A. A. (1988). Measuring waste generation in third world cities: A case study of Ilorin, Nigeria. *Environmental monitoring and assessment*, 10(2), 89-103.

Adedibu, A. A., & Okekunle, A. (1989). Issues in the environmental sanitation of Lagos mainland, Nigeria. *The Environmentalist*, 9(2), 91-100.

Adewole, A. (2009). Waste management towards sustainable development in Nigeria: A case study of Lagos state. *Inter nation NGO Journal*, 4(4), 173-179.

Afroz, R., Hanaki, K., and Tudin, R. (2011). Factors affecting waste generation: a study in a waste management program in Dhaka city, Bangladesh. *Environmental monitoring and assessment*, 179(1-4), 509-519.

Agamuthu, P., Khidzir, K., & Hamid, F. S. (2009). Drivers of sustainable waste management in Asia. *Waste Management & Research*, 27(7), 625-633.

Aguarón, J., & Moreno-Jiménez, J. M. (2000). Local stability intervals in the analytic hierarchy process. *European Journal of Operational Research*, 125(1), 113–132.

Ahmadi, H., Rad, M. S., Nazari, M., Nilashi, M., & Ibrahim, O. (2014). Evaluating the factors affecting the implementation of hospital information system (HIS) using AHP method. *Life Science Journal*, *11*(3), 202-207.

Akter, N. (2000). Medical waste management: a review. *Environmental Engineering Program, School of Environment, Resources and Development Asian Institute of Technology, Thailand*, 1-25.

Alagöz A. Z., & Kocasoy, G. (2008). Determination of the best appropriate management methods for the health-care wastes in Istanbul. *Waste Management*, 28(7), 1227—1235.

Alam Sarkar, M. S. K., Haque, M. A., & Tanvir, A. K. (2006). Hospital waste management in Sylhet City, Bangladesh. *ARPN Journal of Engineering and Applied Sciences*, *1*(2), 1

Aljunid, S. (2009). Primary healthcare and health information needs in Malaysia. Retrieved from http://www.whofic-apn.com/pdf_files/4th_17_35p.pdf

Al-Khatib, I. A., & Sato, C. (2009). Solid health care waste management status at health care centers in the West Bank–Palestinian Territory. *Waste management*, 29(8), 2398-2403.

Allahyari, M. S., Chizari, M., and Homaee, M. (2008). Perceptions of Iranian agricultural extension professionals toward sustainable agriculture concepts. *Journal of Agriculture and Social Sciences*, 4(3), 101-106.

Ambali, A. R., Bakar, A. N., & Merican, F. M. (2013). Environmental policy in Malaysia: biomedical waste, strategies and issues. *Journal of Administrative Science*, *10*(1), 1-17.

Anschütz, J., IJgosse, J., & Scheinberg, A. (2004). Putting integrated sustainable waste management into practice. *Using the ISWM assessment methodology, WASTE, Gouda, The Netherlands*.

Arnette, A., Zobel, C., Bosch, D., Pease, J., & Metcalfe, T. (2010). Stakeholder ranking of watershed goals with the vector analytic hierarchy process: Effects of participant grouping scenarios. *Environmental Modelling & Software*, *25*(11), 1459-1469.

Askarian, M., Vakili, M., & Kabir, G. (2004). Results of a hospital waste survey in private hospitals in Fars province, Iran. *Waste management*, *24*(4), 347-352.

Ashley, R. M., Souter, N., Butler, D., Davies, J., Dunkerley, J., & Hendry, S. (1999). Assessment of the sustainability of alternatives for the disposal of domestic sanitary waste. *Water Science and Technology*, *39*(5), 251-258.

Avlonitis, G. J., & Salavou, H. E. (2007). Entrepreneurial orientation of SMEs, product innovativeness, and performance. *Journal of Business Research*, *60*(5), 566-575.

Ayotamuno, J. M., & Gobo, A. E. (2004). Municipal solid waste management in Port Harcourt, Nigeria: Obstacles and prospects. *Management of environmental quality: an international journal*, *15*(4), 389-398.

Azage, M., & Kumie, A. (2010). Healthcare waste generation and its management system: the case of health centers in West Gojjam Zone, Amhara Region, Ethiopia. *Ethiopian Journal of Health Development*, *24*(2).

Baabereyir, A. (2009). *Urban environmental problems in Ghana: a case study of social and environmental injustice in solid waste management in Accra and Sekondi-Takoradi* (Doctoral dissertation, University of Nottingham).

Babalola, Y. T., Babalola, A. D., & Okhale, F. O. (2010). Awareness and Accessibility of Environmental Information in Nigeria: Evidence from Delta State. Retrieve from http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1478&context=libphilprac&seiredir=1#search=%22Babalola%20%282010%29.%20Awareness%20Accessibility%20Environmental%20Information%20Nigeria%3A%20Evidence%20from%20Delta%20State.%22

Ball, A., Broadbent, J., & Jarvis, T. (2006). Waste management, the challenges of the PFI and 'sustainability reporting'. *Business Strategy and the Environment*, *15*(4), 258-274.

Barro, R., Regueiro, J., Llompart, M., & Garcia-Jares, C. (2009). Analysis of industrial contaminants in indoor air: Part 1. Volatile organic compounds,

carbonyl compounds, polycyclic aromatic hydrocarbons and polychlorinated biphenyls. *Journal of Chromatography A*, *1216*(3), 540-566.

Baruch, Y. (1999). Response rate in academic studies-A comparative analysis. *Human relations*, *52*(4), 421-438.

Baruch, Y., & Holtom, B. C. (2008). Survey response rate levels and trends in organizational research. *Human relations*, *61*(8), 1139-1160.

Basel Convention. (2003). Technical guidelines on the environmentally sound management of biomedical and healthcare wastes (3rd ed., pp. 4-10). Chatelaine: Secretariat of the Basel Convention. Retrieved from http://archive.basel.int/pub/techguid/tech-biomedical.pdf

Bdour, A., Altrabsheh, B., Hadadin, N., & Al-Shareif, M. (2007). Assessment of medical wastes management practice: A case study of the northern part of Jordan. *Waste management*, *27*(6), 746-759.

Begum, R. A., Siwar, C., Pereira, J. J., & Jaafar, A. H. (2007). Implementation of waste management and minimisation in the construction industry of Malaysia. *Resources, Conservation and Recycling*, *51*(1), 190-202.

Bello-Dambatta, A., Farmani, R., Javadi, A. A., & Evans, B. M. (2009). The Analytical Hierarchy Process for contaminated land management. *Advanced Engineering Informatics*, *23*(4), 433-441.

Bendjoudi, Z., Taleb, F., Abdelmalek, F., & Addou, A. (2009). Healthcare waste management in Algeria and Mostaganem department. *Waste management*, *29*(4), 1383-1387.

Birpınar, M. E., Bilgili, M. S., & Erdoğan, T. (2009). Medical waste management in Turkey: A case study of Istanbul. *Waste Management*, *29*(1), 445-448.

Blaikie, N. (2003). *Analyzing quantitative data: From description to explanation*. Sage.

Blenkharn, J. I. (2006). A backward step: landfill disposal of clinical wastes. *Journal of Hospital Infection*, *63*(1), 105-106.

Bosshard, A. (2000). A methodology and terminology of sustainability assessment and its perspectives for rural planning. *Agriculture, ecosystems & environment*, *77*(1), 29-41.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative research in psychology*, *3*(2), 77-101.

Brent, A. C., Rogers, D. E., Ramabitsa-Siimane, T. S., & Rohwer, M. B. (2007). Application of the analytical hierarchy process to establish health care waste management systems that minimise infection risks in developing countries. *European Journal of Operational Research*, *181*(1), 403-424.

Brunner, P. H., & Fellner, J. (2007). Setting priorities for waste management strategies in developing countries. *Waste Management & Research*, *25*(3), 234-240.

Bryson, N. (1995). A goal programming method for generating priority vectors. *Journal of the Operational Research Society*, *46*(5), 641-648.

Burns, R. B. (2000). Introduction to research methods. SAGE publications. *United States of America*..

Cairncross, S., & Feachem, R. (1993). *Environmental health engineering in the tropics: an introductory text* (No. Ed. 2). John Wiley & Sons Ltd.

Canada. (2013b). Sampling method. Retrieved from http://www.statcan.gs.ca/edu/power pouvoir/ch13/prob/5214899-eng.htm.

Carifio, J., & Perla, R. J. (2007). Ten common misunderstandings, misconceptions, persistent myths and urban legends about Likert scales and Likert response formats and their antidotes. *Journal of Social Sciences*, *3*(3), 106-116.

Carmines, E. G., & Zeller, R. A. (1979). *Reliability and validity assessment* (Vol. 17). Sage publications.

Chaerul, M., Tanaka, M., & Shekdar, A. V. (2008). A system dynamics approach for hospital waste management. *Waste Management*, *28*(2), 442-449.

Chartier, Y. (Ed.). (2014). *Safe management of wastes from health-care activities*. World Health Organization.

Chavan, M. (2005). An appraisal of environment management systems: A competitive advantage for small businesses. *Management of Environmental Quality: An International Journal*, *16*(5), 444-463.

Chee, H. L. (2007). Medical tourism in Malaysia: international movement of healthcare consumers and the commodification of healthcare.

Chuen-Khee, P. & Othman, J. (2010). Household demand for solid waste disposal options in Malaysia. *International Journal of Human and Social Sciences* 5(14), 905-910.

Chung, S. S., & Lo, C. W. (2003). Evaluating sustainability in waste management: the case of construction and demolition, chemical and clinical wastes in Hong Kong. *Resources, conservation and recycling*, *37*(2), 119-145.

Cochran, W. G. (1977). Sampling techniques. *New York: John Wiley and Sons.*

Coker, A., Sangodoyin, A., Sridhar, M., Booth, C., Olomolaiye, P., & Hammond, F. (2009). Medical waste management in Ibadan, Nigeria: Obstacles and prospects. *Waste management*, *29*(2), 804-811.

Compendium of environmental statistics. (2013). Retrieved from: http://www.statistics.gov.my/portal/download_Environment/files/Compendium_2013/Compendium_Of_Environment_Statistics_Malaysia_2013.pdf

Compendium of environmental statistics. (2013). Retrieved from: https://www.dosm.gov.my/v1/index.php?r=column/pdfPrev&id=YlluUUM1NGNKZ21ZRUZvYUtqV1d2Zz09

Consumers' Association of Penang (CAP), Malaysia Country's Report. (2001). In Waste Not Asia, Taipei, Taiwan.

Contreras, F., Hanaki, K., Aramaki, T., & Connors, S. (2008). Application of analytical hierarchy process to analyze stakeholders preferences for municipal solid waste management plans, Boston, USA. *Resources, Conservation and Recycling*, *52*(7), 979-991.

Creswell, J. W. (2003). Research design: Qualitative, quantitative, and mixed methods approaches. Thousand Oaks: Sage Publications

Creswell, J. W. (2013). *Research design: Qualitative, quantitative, and mixed methods approaches.* Sage publications.

Cruz, C. P., Garcia, R. C., Colet, P. C., Cruz, J. P., & Alcantara, J. C. (2014).Healthcare waste management of the government hospitals in Northern Philippines. *European Scientific Journal, ESJ*, *10*(26).

Da Silva, C. E., Hoppe, A. E., Ravanello, M. M., & Mello, N. (2005). Medical wastes management in the south of Brazil. *Waste management*, *25*(6), 600-605.

Darby, L., & Obara, L. (2005). Household recycling behaviour and attitudes towards the disposal of small electrical and electronic equipment. *Resources, Conservation and Recycling*, *44*(1), 17-35.

Dawson, C. (2002). Practical Research Methods. A user-friendly guide to mastering research techniques and projects. Magdalen Road.

Dawson, C. (2009). *Introduction to research methods: A practical guide for anyone undertaking a research project*. Hachette UK.

De Vaus, D. A. (2002). *Surveys in social research.* Psychology Press.

Dehghani, M. H., Azam, K., Changani, F., & Fard, E. D. (2008). Assessment of medical waste management in educational hospitals of Tehran University Medical Sciences. *Journal of Environmental Health Science & Engineering*, *5*(2), 131-136.

Dehghani, M. H., Fazelinia, F., Omrani, G. A., Nabizadeh, R., & Azam, K. (2011). Investigation of Management Status on MedicalWastes in Public Hospitals of Arak City. *Iranian Journal of Health and Environment*, *4*(1), 93-104.

Den Boer, J., Den Boer, E., & Jager, J. (2007). LCA-IWM: a decision support tool for sustainability assessment of waste management systems. *Waste management*, *27*(8), 1032-1045.

DenBos, A., & Izadpanah, A. (2002). Building capacity for comprehensive medical waste management in Asia. *EM The Urban Environment*, *18*, 20.

Desmond, M. (2006). Municipal solid waste management in Ireland: assessing for sustainability. *Irish Geography*, *39*(1), 22-33.

Díaz, D. B., Follegatti, J. L. L., & Hordijk, M. (1996). Innovative urban environmental management in Ilo, Peru. *Environment and Urbanization*, *8*(1), 21-34.

Dillman, D. A. (2000). Mail and internet surveys: The total design method. *New York: Wiley*.

Dodgson, J. S., Spackman, M., Pearman, A., & Phillips, L. D. (2009). Multi-criteria analysis: a manual.

DOE. (2009). Guidelines on the Handling and Management of Clinical Wastes in Malaysia (3rd ed.). Putrajaya: Ministry of Natural Resources and Environment.

DOE. (n.d.). Current practice of recycling and treatment of hazardous wastes in Malaysia report. Putrajaya. Malaysia.

Easley, R. F., Valacich, J. S., & Venkataramanan, M. A. (2000). Capturing group preferences in a multicriteria decision. *European Journal of Operational Research*, *125*(1), 73-83.

Ehliyagoda, D. (2016). Swot Analysis of Urban Waste Management: A case Study of Balangoda Suburb. *Journal of Global Ecology and Environment*, 5(2), 73-82.

El-Salam, M. M. A. (2010). Hospital waste management in El-Beheira Governorate, Egypt. *Journal of environmental management*, 91(3), 618-629.

Environmental Quality Act, 1974 and Regulations: All Amendments up to November 2001, Kuala Lumpur: MDC Publisher Printers Sdn. Bhd.

Fatta, D., Moll, S., & Tsotsos, D. (2003). Assessment of information related to waste and material flows. *European Environmental Agency, Copenhagen*.

Felice, F. D., Petrillo, A., Autorina, C., and Carlomusto, A. (2013). Sustainable decision making model based on analytical hierarchy process and SWOT analysis: "S-AHP" model. Paper presented at the international symposium on the Analytical Hierarchy Process.

Felício, J. A., Couto, E., & Caiado, J. (2012). Human capital and social capital in entrepreneurs and managers of small and medium enterprises. *Journal of Business Economics and Management*, *13*(3), 395-420.

Fellows, R. F., & Liu, A. M. M. (2008). *Research Methods for Construction:* John Wiley and Sons.

Fichtner, J. (1986). On deriving priority vectors from matrices of pairwise comparisons. *Socio-Economic Planning Sciences*, *20*(6), 341-345.

Field, A. (2000). Discovering statistics using SPSS for Windows: Advanced techniques for beginners (Introducing Statistical Methods series).

Forman, E., & Peniwati, K. (1998). Aggregating individual judgments and priorities with the analytic hierarchy process. *European journal of operational research*, *108*(1), 165-169.

Frost & Sullivan (2010).Medical waste finds growth in Malaysia's robust healthcare system. Retrieved from http://www.frost.com/prod/servlet/presselease.pag?docid=209446374

Garfi, M., Tondelli, S., & Bonoli, A. (2009). Multi-criteria decision analysis for waste management in Saharawi refugee camps. *Waste management*, *29*(10), 2729-2739.

Garson, G. D. (2009). Structural equation modelling. Stat notes: Topics in multivariate analysis.

George, D., and Mallery, M. (2003). Using SPSS for Windows step by step: a simple guide and reference. *Boston, MA: Allyn y Bacon.*

Glawe, U., Visvanathan, C., & Alamgir, M. (2005, July). Solid waste management in least developed Asian countries–a comparative analysis. In *International Conference on Integrated Solid Waste Management in Southeast Asian Cities* (pp. 5-7).

Gonzalez, P., Sarkis, J., & Adenso-Diaz, B. (2008). Environmental management system certification and its influence on corporate practices: Evidence from the automotive industry. *International Journal of Operations & Production Management*, *28*(11), 1021-1041.

Graikos, A., Voudrias, E., Papazachariou, A., Iosifidis, N., & Kalpakidou, M. (2010). Composition and production rate of medical waste from a small producer in Greece. *Waste Management*, *30*(8), 1683-1689.

Guest, G., MacQueen, K. M., & Namey, E. E. (2011). *Applied thematic analysis*. Sage.

Costa, H. G. (2006)."Multi criteria Decision Aid - AHP Method" 1st ed., Rio de Janeiro, RJ: Abepro.

Hagen, D. L., Al-Humaidi, F., & Blake, M. A. (2001). Infectious waste surveys in a Saudi Arabian hospital: an important quality improvement tool. *American journal of infection control*, *29*(3), 198-202.

Hair, J. F., Bush, R. P., and Ortinau, D. J. (2003). Marketing research: Within a changing information environment: Richard d Irwing.

Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., & Tatham, R. L. (2006). Multivariate data analysis (Vol. 6): Pearson Prentice Hall Upper Saddle River. *NJ. 連結*.

Hamadan, N., Sapri, M., Mohammed, A. H., Awang, M., Rahman, M. S. A., Rosli, N. W., & Lah, N. M. I. N. (2012). The Implementation of Clinical Waste Handling in Hospital Sultanah Aminah Johor Bahru (HSAJB). *Procedia-Social and Behavioral Sciences*, *65*, 802-807.

Hammond, S. B. MG & Fife-Schaw C.(2000) Research Methods in Psychology.

Harrell, M. C., & Bradley, M. A. (2009). *Data collection methods. Semi-structured interviews and focus groups*. Rand National Defense Research Inst santa monica ca.

Hassan, M. M., Ahmed, S. A., Rahman, K. A., & Biswas, T. K. (2008). Pattern of medical waste management: existing scenario in Dhaka City, Bangladesh. *BMC Public Health*, *8*(1), 36.

Hayward, D., & Gaskin, S. (2005). Sustainable waste management systems. Paper presented at the 33rd Annual General Conference of CSCE, Toronto, Canada

Huizinga, D., & Elliott, D. S. (1986). Reassessing the reliability and validity of self-report delinquency measures. *Journal of quantitative criminology*, *2*(4), 293-327.

Hung, M. L., Ma, H. W., & Yang, W. F. (2007). A novel sustainable decision making model for municipal solid waste management. *Waste management*, *27*(2), 209-219.

Ifegbesan, A. (2010). Exploring Secondary School Students' Understanding and Practices of Waste Management in Ogun State, Nigeria. *International Journal of Environmental and Science Education*, *5*(2), 201-215.

Ilomäki, M., & Melanen, M. (2001). Waste minimisation in small and medium-sized enterprises—do environmental management systems help?. *Journal of Cleaner Production*, *9*(3), 209-217.

Imran, I. S., Si, M., Wardhani, C., Fatimah, S., Barlinti, Y. S., Setiawan, B., ... & Rosadi, A. (2008). Institutionalization of Sustainable Waste Management: An Extension Program of Environmental Awareness in Jakarta and West Java.

Izugbara, C. O., & Umoh, J. O. (2004). Indigenous waste management practices among the Ngwa of Southeastern Nigeria: Some lessons and policy implications. *Environmentalist*, *24*(2), 87-92.

Jang, Y. C., Lee, C., Yoon, O. S., & Kim, H. (2006). Medical waste management in Korea. *Journal of environmental management*, *80*(2), 107-115.

Johnson, B., & Christensen, L. (2008). *Educational research: Quantitative, qualitative, and mixed approaches*. Sage.

Johnson, B., & Turner, L. A. (2003). Data collection strategies in mixed methods research. *Handbook of mixed methods in social and behavioral research*, 297-319.

Jones, R.A. (1985). *Research methods in the social and behavioral sciences.* Massachusetts, Sinauer Associates.

Joseph, K. (2006). Stakeholder participation for sustainable waste management. *Habitat International*, *30*(4), 863-871.

Kallas, Z., Gómez-Limón, J. A., & Hurlé, J. B. (2007). Decomposing the value of agricultural multifunctionality: combining contingent valuation and the analytical hierarchy process. *Journal of Agricultural Economics*, *58*(2), 218-241.

Kaseva, M. E., Mbuligwe, S. E., & Kassenga, G. (2002). Recycling inorganic domestic solid wastes: results from a pilot study in Dar es Salaam City, Tanzania. *Resources, Conservation and Recycling*, *35*(4), 243-257.

Kinnear, P., & Gray, C. (2006). *SPSS 12 made simple*. Psychology press.

Van de Klundert, A., & Lardinois, I. (1995, April). Community and private (formal and informal) sector involvement in municipal solid waste management in developing countries. In *Background paper for the UMP Workshop in Ittingen* (pp. 10-12).

Barlett, J. E., Kotrlik, J. W., & Higgins, C. C. (2001). Organizational research: Determining appropriate sample size in survey research. *Information technology, learning, and performance journal*, *19*(1), 43.

Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. *Educational and psychological measurement*, *30*(3), 607-610.

Krippendorff, K. (2012). *Content analysis: An introduction to its methodology*. Sage.

Laforest, J. (2009). *Safety Diagnosis Tool Kit for Local Communities. Guide to Organizing Semi-Structured Interviews With Key Informants in The Charting a Course to Safe Living Collection.* Quebec, Institut national de sante publique du Quebec.

Laininen, P., & Hämäläinen, R. P. (2003). Analyzing AHP-matrices by regression. *European Journal of Operational Research*, *148*(3), 514-524.

Lancaster, G. A., Dodd, S., & Williamson, P. R. (2004). Design and analysis of pilot studies: recommendations for good practice. *Journal of evaluation in clinical practice*, *10*(2), 307-312.

Lehmann, M., Lugossy, R., and Horváth, J. (2011). *UPRT 2010: Empirical Studies in English Applied Linguistics:* Lingua Franca Csoport.

Leung, P., Muraoka, J., Nakamoto, S. T., & Pooley, S. (1998). Evaluating fisheries management options in Hawaii using analytic hierarchy process (AHP). *Fisheries Research*, *36*(2), 171-183.

Lin, C. H., Wen, L., & Tsai, Y. M. (2010). Applying decision-making tools to national e-waste recycling policy: an example of Analytic Hierarchy Process. *Waste management*, *30*(5), 863-869.

Litwin, M. S. (1995). *How to Measure Survey Reliability and Validity*. SAGE Publications.

Longe, E. O., & Williams, A. (2006). A preliminary study of medical waste management in Lagos metropolis, Nigeria. *Journal of Environmental Health Science & Engineering*, *3*(2), 133-139.

Mabert, V. A., Soni, A., & Venkataramanan, M. A. (2003). The impact of organization size on enterprise resource planning (ERP) implementations in the US manufacturing sector. *Omega*, *31*(3), 235-246.

Manaf, L. A., Samah, M. A. A., & Zukki, N. I. M. (2009). Municipal solid waste management in Malaysia: Practices and challenges. *Waste management*, *29*(11), 2902-2906.

Manyele, S. V., & Lyasenga, T. J. (2010). Factors affecting medical waste management in lowlevel health facilities in Tanzania SV. *African Journal of Environmental Science and Technology*, *4*(5).

Marinković, N., Vitale, K., Holcer, N. J., Džakula, A., & Pavić, T. (2008). Management of hazardous medical waste in Croatia. *Waste management*, *28*(6), 1049-1056.

Marshall, M. N. (1996). Sampling for qualitative research. *Family practice*, *13*(6), 522-526.

Martuzzi, M., & Tickner, J. A. (Eds.). (2004). The precautionary principle: protecting public health, the environment and the future of our children. Copenhagen: World Health Organization, Regional office for Europe.

Ministry of Health. (n.d.). Master Agreed Procedure, Clinical Waste Management Services Report. Putrajaya, Malaysia.

Mathur, V., Dwivedi, S., Hassan, M. A., & Misra, R. P. (2011). Knowledge, attitude, and practices about biomedical waste management among healthcare personnel: A cross-sectional study. *Indian journal of community medicine: official publication of Indian Association of Preventive & Social Medicine*, *36*(2), 143.

Mbarki, A., Kabbachi, B., Ezaidi, A., & Benssaou, M. (2013). Medical waste management: A case study of the souss-massa-draa region, morocco. *Journal of Environmental Protection*, *4*(09), 914.

Mbongwe, B., Mmereki, B. T., & Magashula, A. (2008). Healthcare waste management: current practices in selected healthcare facilities, Botswana. *Waste Management*, *28*(1), 226-233.

Merriam, S. B. (1998). *Qualitative Research and Case Study Applications in Education. Revised and Expanded from" Case Study Research in Education."*. Jossey-Bass Publishers, 350 Sansome St, San Francisco, CA 94104.

McDougall, F. R., & White, P. R. (2001). *Integrated solid waste management: a life cycle inventory:* Wiley-Blackwell.

Ministry of Health Malaysia (MOH), (2007). Auditor General Report. Kuala Lumpur: Ministry of Health Malaysia.

Ministry of Health Malaysia (MOH), (2009). Healthcare waste status report. Putrajaya: Engineering Services Division, Ministry of Health Malaysia. Malaysia.

Mohamed, A. F., Awang, M., Hassan, M. N., & Jaafar, A. B. (2008). Ecosystem approach for sustainable industrial hazardous waste management in Malaysia. *Environ. Res. J*, *2*, 306-310.

Mohamed, L. F., Ebrahim, S. A., & Al-Thukair, A. A. (2009). Hazardous healthcare waste management in the Kingdom of Bahrain. *Waste management*, 29(8), 2404-2409.

Rezaei, F., Monavari, S., & Omrani, G. A. (2007). An assessment of hospital waste management system in areas of waste storage, collection and disposal in private hospitals of Tehran. *Environmental Sciences*, 5(1), 67-80.

Moritz, J. M. (1995). Current legislation governing clinical waste disposal. *Journal of Hospital Infection*, *30*, 521-530.

Mühlich, M., Scherrer, M., & Daschner, F. D. (2003). Comparison of infectious waste management in European hospitals. *Journal of Hospital Infection*, *55*(4), 260-268.

Nema, S. K., & Ganeshprasad, K. S. (2002). Plasma pyrolysis of medical waste. *Current Science*, 271-278.

Nemathaga, F., Maringa, S., & Chimuka, L. (2008). Hospital solid waste management practices in Limpopo Province, South Africa: A case study of two hospitals. *Waste management*, *28*(7), 1236-1245.

Ngwuluka, N., Ochekpe, N., Odumosu, P., & John, S. A. (2009). Waste management in healthcare establishments within Jos Metropolis, Nigeria. *African Journal of Environmental Science and Technology*, *3*(12).

Neuman, W. L., & Kreuger, L. (2003). *Social work research methods: Qualitative and quantitative approaches*. Allyn and Bacon.

Ogbonna, D. N., Chindah, A., & Ubani, N. (2012). Waste management options for health care wastes in Nigeria: A case study of Port Harcourt hospitals. *Journal of Public Health and Epidemiology*, *4*(6), 156-169.

Ogu, V. I. (2000). Stakeholders' partnership approach to infrastructure provision and management in developing world cities: lessons from the sustainable Ibadan project. *Habitat International*, *24*(4), 517-533..

Olaniyan, I. O., Alayande, A. W., & Bamgboye, O. (2009). Predicting Surface Water Contamination from the Kaduna, Yola and Maiduguri Landfill Sites. *Researcher*, 1(6), 63.

Oluwoporoku, (2007). Air quality management in Lagos. Retrieved from http://www.uwe.ac.uk/aqm/files/Air_Quality_Management_in_Lagos_Nigeria.pdf

Omar, D., Nazli, S. N., Subramaniam, A., & Karuppannan, L. (2012). Clinical waste management in district hospitals of Tumpat, Batu Pahat and Taiping. *Procedia-Social and Behavioral Sciences*, *68*, 134-145.

Onwuegbuzie, A. J., Daniel, L. G., & Collins, K. M. (2009). A meta-validation model for assessing the score-validity of student teaching evaluations. *Quality & Quantity*, *43*(2), 197-209.

Oslen, M. (2003). Analysis of the Stockholm Convention on Persistent Organic Pollutants (1st ed.). Dobbs Ferry, NY: Oceana Publications

Oweis, R., Al-Widyan, M., & Al-Limoon, O. (2005). Medical waste management in Jordan: A study at the King Hussein Medical Center. *Waste management*, *25*(6), 622-625.

Palmer, J. A. (1995). Environmental thinking in the early years: Understanding and misunderstanding of concepts related to waste management. *Environmental Education Research*, *1*(1), 35-45.

Pallant, J. (2007). SPSS survival manual: A step-by-step guide to data analysis using SPSS version 15. *Nova Iorque: McGraw Hill*.

Pant, D. (2012). Waste management in small hospitals: trouble for environment. *Environmental monitoring and assessment*, 184(7), 4449-4453.

Park, H., Lee, K., Kim, M., Lee, J., Seong, S. Y., & Ko, G. (2009). Detection and hazard assessment of pathogenic microorganisms in medical wastes. *Journal of Environmental Science and Health Part A*, *44*(10), 995-1003.

Patwary, M. A., O'Hare, W. T., & Sarker, M. H. (2012). Occupational accident: An example of fatalistic beliefs among medical waste workers in Bangladesh. *Safety science*, *50*(1), 76-82.

Periathamby, A., Hamid, F. S., & Khidzir, K. (2009). Evolution of solid waste management in Malaysia: impacts and implications of the solid waste bill, 2007. *Journal of material cycles and waste management*, *11*(2), 96-103.

Petts, J. (1994). Effective waste management: Understanding and dealing with public concerns. *Waste management & research*, *12*(3), 207-222.

Petts, J. (2000). Municipal waste management: inequities and the role of deliberation. *Risk analysis*, *20*(6), 821-832.

Pocock, N. S., & Phua, K. H. (2011). Medical tourism and policy implications for health systems: a conceptual framework from a comparative study of Thailand, Singapore and Malaysia. *Globalization and health*, *7*(1), 12.

Pönkä, A., Kaski, A., & Lähdevirta, J. (1996). Recommendations for the management of wastes from healthcare facilities in Helsinki. *Waste management & research*, *14*(2), 145-150.

Preble, J. F. (1997). Integrating the crisis management perspective into the strategic management process. *Journal of Management Studies*, *34*(5), 769-791.

Ananth, A. P., Prashanthini, V., & Visvanathan, C. (2010). Healthcare waste management in Asia. *Waste Management*, *30*(1), 154-161.

Prüss, A., & Townend, W. (1998). Management of waste from healthcare management in Asia. *Waste management*, 30 (1), 154-161.

Prüss-Üstün, A., Giroult, E., & Rushbrook, P. (1999). Safe management of wastes from health-care activities. In *Safe management of wastes from health-care activities*. World Health Organization.

Prüss, A., Emmanuel, J., Stringer, R., Pieper, U., Townend, W., Wilburn, S., ... & World Health Organization. (2014). Safe management of wastes from health-care activities.

Ramanathan, R. (2001). A note on the use of the analytic hierarchy process for environmental impact assessment. *Journal of environmental management*, *63*(1), 27-35.

Razali, S. S., & Ishak, M. B. (2010). Clinical waste handling and obstacles in Malaysia. *Journal of Urban & Environmental Engineering*, 4(2).p.47-54.

Rea, L. M., and Parker, R. A. (2012). *Designing and conducting survey research: A comprehensive guide:* John Wiley and Sons.

Reeves, C. C. (1992). *Quantitative research for the behavioural sciences*. John Wiley and Sons Inc. Washington. USA.

Rich, S. R. (2013). Handbook of research methods in tourism: quantitative and qualitative approaches. *Journal of Tourism and Cultural Change*, 11(1-2), 135-136.

Rietveld, T., & Van Hout, R. (1993). *Statistical techniques for the study of language and language behaviour*. Walter de Gruyter.

Rogers, J., Englehardt, J., An, H., & Fleming, L. (2002). Solid waste collection health and safety risks-survey of municipal solid waste collectors. *Journal of Solid Waste Technology and Management*, *28*(3), 154-160.

Rosenberg, L. (1996). *International source book on environmentally sound technologies for municipal solid waste management* (No. 6). UN.

Roussat, N., Dujet, C., & Mehu, J. (2009). Choosing a sustainable demolition waste management strategy using multicriteria decision analysis. *Waste Management*, *29*(1), 12-20.

Roussat, N., Méhu, J., & Dujet, C. (2009). Indicators to assess the recovery of natural resources contained in demolition waste. *Waste Management & Research*, *27*(2), 159-166.

Rutala, W. A., & Mayhall, C. G. (1992). Medical waste. *Infection Control & Hospital Epidemiology*, *13*(1), 38-48.

Saaty, T. (1980). The analytic hierarchy process. *McGraw-Hill. New York.*

Saaty, T. (1990). Multicriteria decision making: the analytic hierarchy process: planning, priority setting resource allocation: *RWS Publishers*.

Saaty, T. (2003). "Decision-making with the AHP: Why is the principal eigenvector necessary?". *European Journal of Operational Research,* 145(1), 85-91.

Saaty, T. (2008). Decision making with the analytic hierarchy process. *International Journal of Services Sciences*, 1(1), 83-98.

Saaty, T. L. (1980). The analytic hierarchy process: *McGraw-Hill, New York.*

Saaty, T. L. (1990). How to make a decision: the analytic hierarchy process. *European Journal of Operational Research,* 48(1), 9-26.

Saaty, T., & Shih, H. (2009). Structures in decision making: On the subjective geometry of hierarchies and networks. *European Journal of Operational Research*, 199(3), 867-872.

Saaty, T. L., & Vargas, L. G. (2006). Decision making with the analytic network process: Economic. *Political, Social and Technological Applications with Benefits, Opportunities, Costs and Risks, MA: Springer Science+ Business Media, LLC, Boston*.

Sagar, M. K. & Tomar, A. S. (2014). Ranking critical success factor of total quality management by AHP. *International Journal of Mechanical and Production Engineering*. 2(1), 29-34.

Salhofer, S., Wassermann, G., & Binner, E. (2007). Strategic environmental assessment as an approach to assess waste management systems. Experiences from an Austrian case study. *Environmental Modelling & Software*, *22*(5), 610-618.

Salkin, I. F. (2003). Conventional and alternative technologies for the treatment of infectious waste. *Journal of material cycles and waste management*, *5*(1), 0009-0012.

Sawalem, M., Selic, E., & Herbell, J. D. (2009). Hospital waste management in Libya: A case study. *Waste management*, *29*(4), 1370-1375.

Sefouhi, L., Kalla, M., & Aouragh, L. (2011). Health care waste management in the hospital of Batna City (Algeria). In *Singapore International Conference on Environment and BioScience, Singapore*.

Sekaran, U. (2006). Research methods for business: A skill building approach: John Wiley and Sons.

Sha'Ato, R., Aboho, S., Oketunde, F., Eneji, I., Unazi, G., & Agwa, S. (2007). Survey of solid waste generation and composition in a rapidly growing urban area in Central Nigeria. *Waste Management*, 27(3), 352-358.

Sharholy, M., Ahmad, K., Vaishya, R., and Gupta, R. (2007). Municipal solid waste characteristics and management in Allahabad, India. Waste management, 27(4), 490-496.

Shinee, E., Gombojav, E., Nishimura, A., Hamajima, N., Ito, K. (2008). Healthcare waste management in the capital city of Mongolia. *Waste Management*, 28(2), 435-441.

Singh, S., & Prakash, V. (2007). Toxic environmental releases from medical waste incineration: a review. *Environmental monitoring and assessment*, *132*(1-3), 67-81.

Soma, K. (2003). How to involve stakeholders in fisheries management--a country case study in Trinidad and Tobago. *Marine Policy*, 27(1), 47-58.

Srivastava, P., Kulshreshtha, K., Mohanty, C., Pushpangadan, P., and Singh, A. (2005). Stakeholder-based SWOT analysis for successful municipal solid waste management in Lucknow, India. *Waste management*, 25(5), 531-537.

Stakeholders Guide. (2014). Retrieved from http://www.ahrq.gov/sites/default/files/wysiwyg/research/findings/evidence-based-reports/stakeholderguide/stakeholdr.pdf

Streiner, D. L. & Norman, G. R. (2008). Health measurement scales: A practical guide to their development and use (4th edn). Oxford: Oxford University Press.

Suleiman, S. (2004). *Research Methods for the Social Sciences: Made Simple*. Bangi: DSS Publishing Enterprise.

Taylor-Powell, E., & Steele, S. (1996). Collecting evaluation data: Direct observation. *Program Development and Evaluation. Wiscounsin: University of Wisconsin-Extension*, 1-7.

T. L. Saaty, (1980). "The Analytic Hierarchy Process: Planning, Priority Setting, Resource Allocation", 2nd ed., New York: McGraw-Hill.

T. L. Saaty,(1991). "The Analytical Hierarchy", 1st ed., Sao Paulo, SP: McGraw-Hill/Makron Books.

Thornberry, T. P., & Krohn, M. D. (2000). The self-report method for measuring delinquency and crime. *Criminal justice*, 4(1), 33-83.

Tiong, C. S., Latif, P. A., & Karuppannan, S. (2012, April). Medical waste management in private medical clinics Taiping, Perak. In *Proceedings of the International Conference on Ecological, Environmental and Bio-Sciences (CEEBS'12)*.

Tsakona, M., Anagnostopoulou, E., & Gidarakos, E. (2007). Hospital waste management and toxicity evaluation: a case study. *Waste management*, *27*(7), 912-920.

Tudor, T., Noonan, C., & Jenkin, L. (2005). Healthcare waste management: a case study from the National Health Service in Cornwall, United Kingdom. *Waste Management*, 25(6), 606--615

Tudor, T. L., Barr, S. W., & Gilg, A. W. (2007). Linking intended behaviour and actions: A case study of healthcare waste management in the Cornwall NHS. *Resources, Conservation and Recycling*, 51(1), 1-23.

UNEP (2003). Technical guidelines on the environmentally sound management of biomedical and healthcare wastes (Y1;Y3). Geneva, United Nations Environment Programme. Retrieved from http://www.basel.int/TheConvention/Publications/TechnicalGuidelines/tabid/2362/Default.aspx.

UNEP (2009a). Developing Integrated Solid Waste Management Plan Training Manual: ISWM Plan. United Nations Environmental Programme, 4. Retrieved from www.unep.org. Accessed November 1st 2012.

UNEP (2009d). Developing Integrated Solid Waste Management Plan Training Manual: Targets and Issues of Concern for ISWM. United Nations Environmental Programme, 3:1-44. Retrieved from www.unep.org. Accessed November 1st 2012.

Vagias, W. M. (2006). Likert-type Scale Response Anchors. Clemson International Institute for Tourism. *& Research Development, Department of Parks, Recreation and Tourism Management, Clemson University*.

Vidanaarachchi, C. K., Yuen, S. T., and Pilapitiya, S. (2006). Municipal solid waste management in the Southern Province of Sri Lanka: Problems, issues and challenges. *Waste management*, 26(8), 920-930.

Visvanathan, C., & Glawe, U. (2006). Domestic solid waste management in South Asian countries–a comparative analysis. *Promoting Reduce, Reuse, and Recycle in South Asia*, 27.

Walmsley, J. (2002). Framework for measuring sustainable development in catchment systems. *Environmental management*, 29(2), 195-206.

WHO. (2004). Practical Guidelines for Infection Control in Health Care Facilities (pp.22 24). New Delhi: World Health Organization

WHO. (2005). Management of Solid Health-Care Waste at Primary Health-Care Centres A Decision-Making Guide (1st ed.). Geneva: World Health organization. Retrieved from http://www.who.int/water_sanitation_health/medicalwaste/decisionmguide_rev_oct06.pdf

WHO. (2007). Wastes from healthcare activities. WHO fact sheet No. 253, Retrieved from http://www.who.int/mediacentre/factsheets/fs253/en/

WHO. (2011). Health-care Waste Management. Rapid Assessment Tool for Country level. Retrieved from http://www.who.int/water_sanitation_health/facilities/waste/hcwmtool/en/

Williams, P. (2005). Waste treatment and disposal (1st ed.). Chichester, West Sussex, England: Wiley.

Wilson, A. (1991). Environmental risk (1st ed.). Chelsea. MI: Lewis Publishers.

Wilson, J. (2014). Essentials of business research: A guide to doing your research project: Sage.

Yin, R. K. (1994). Case study research: design and methods. 2nd: Thousand Oaks, CA: Sage.

Yong, Z., Gang, X., Guanxing, W., Tao, Z., & Dawei, J. (2009). Medical waste management in China: a case study of Nanjing. Waste management, 29(4), 1376-1382.

Yuan, H., Shen, L., and Wang, J. (2011). Major obstacles to improving the performance of waste management in China's construction industry. *Facilities*, 29(5/6), 224-242.

Yunus, R., and Yang, J. (2014). Improving ecological performance of industrialized building systems in Malaysia. *Construction Management and Economics*, 32(1-2), 183-195.

Zahedi, F. (1986). The analytic hierarchy process: a survey of the method and its applications. *Interfaces*, 96-108.

Zaimastura, I. (2005). Management and disposal of medical waste: Case study: Hospital Universiti Kebangsaan Malaysia. Universiti Teknologi Malaysia. Retrieved from www.efka.utm.my

Zamalia M. (2008). Handbook of Research Methodology: A Simplified Version. Shah Alam: University Publication Centre.

Zikmund, W. (2003). The research process: an overview. Business Research Methods. South-Western: Cengage Learning.