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SUSTAINABILITY PRACTICES IN A MANUFACTURING COMPANY IN TEMA, GHANA

Shine Francis Gbedemah and Nancy Botchway
Department of Development and Environmental Studies, Wisconsin International University College, Ghana, Accra

ABSTRACT

The implementation of an Environmental Management System (EMS) integrates the environmental management strategies of firms and management commitment to sustainability practices but most of the organisations in developing countries of West Africa are slow to adopt this form of management system. The objective of the study is to assess the impact of International Organisation for Standardization (ISO) 14001 EMS certification in terms of water usage and waste generation. Before and after methods of evaluation were used to analyze the data gathered on water usage and scrap waste. In effect, a review was made of annual data for water usage before and after ISO 14001 EMS certification from 2011 to 2016. The finding indicates that the environmental performance of the company in terms of water usage continually improved after the certification to ISO 14001 EMS. The result in terms of scrap waste production is also obvious as less amount of waste was generated over the years after certification to ISO 14001. The conclusion is that, implementation of EMS is helping the firm achieve its sustainability objective of cutting natural resource use and waste generation. It is recommended that more efforts should be put in educating firms on the importance of such management systems.

Keywords: Sustainability, ISO 14001, Environmental Management System, Water Conservation, Scrap Waste, Environmental Performance.

INTRODUCTION

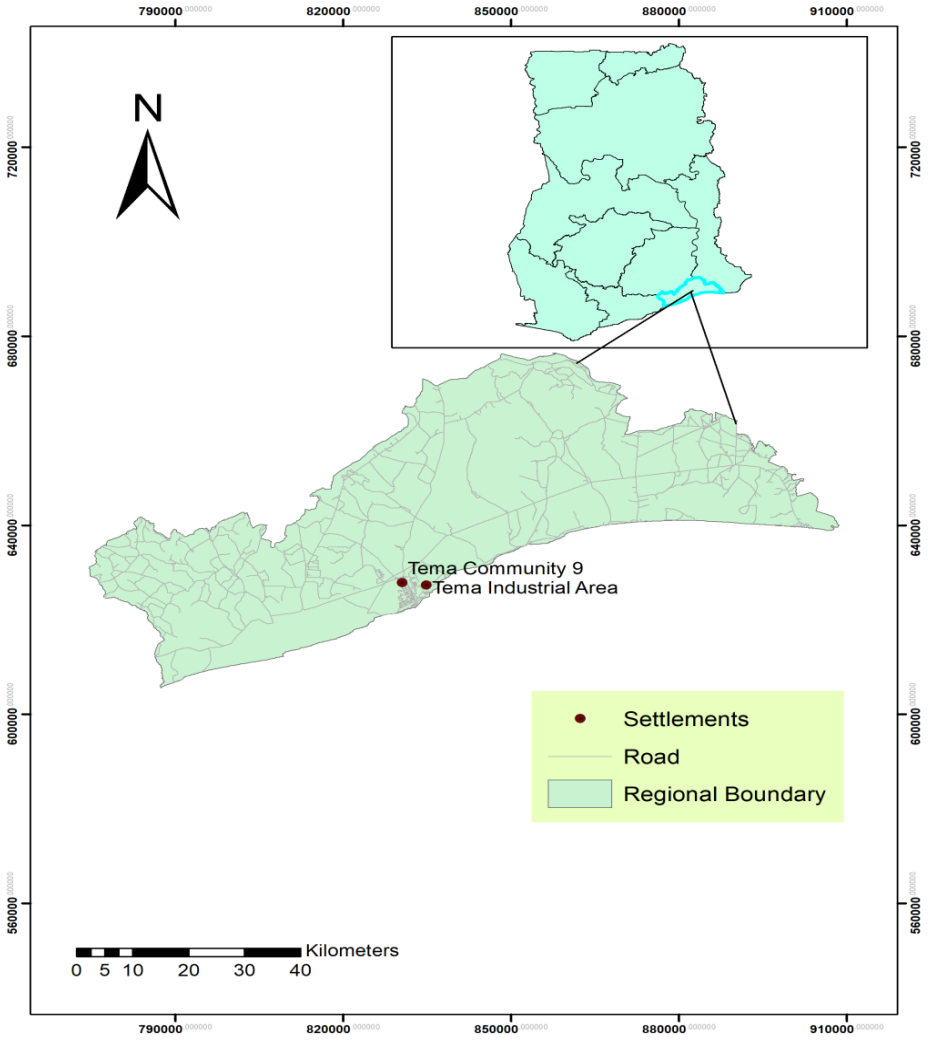
Ghana's population, just like the population of the world is increasing leading to an increase in commercial and industrial activities to cater for the needs of the people. These developments are leading to many environmental problems in the country. The impacts that have been caused by the activities of these business entities are causing local, regional and national environmental changes that the ecosystems cannot easily assimilate. As it is in other parts of the world, business activities and strategies in Ghana are first and foremost geared towards financial performance without much attention being given to sustainability issues (Welford, 1996).

Sustainability is a concept that has many definitions depending on the background of the one defining it (Cazeri, et al, 2018). The concept can be said to date back to Robert Malthus (1798) who points out that whilst population was growing at a geometric rate, food production was increasing at an arithmetic rate. The concept was however made popular by the United Nations Environmental Programme (UNEP) in the work called our Common Future (WCED, 1987). This work defined sustainable development as "*development that meets the needs of the present without compromising the ability of future generations to meet their own needs*" (WCED, 1987, p. 43).

In Ghana, environmental regulation requirements on firms by the Ghana Environmental Protection Agency (GEPA) are increasing but stakeholders are also demanding better environmental performance. Environmental costs, which were not factored into firm's activities in Ghana, have become very important factor for businesses as a result of the awareness that communities, NGOs and the GEPA are making in the country. Indeed, these costs cannot be compared to what is happening in North America, Europe and some parts of Asia but the awareness and the realization is now emerging.

International Organisation for Standardization (ISO) formed a Technical Committee in 1992 on Environmental Management (TC 207) to provide standardization in the field of environmental management (Anderson, 1997). ISO introduced the ISO 14000 series in 1996 and it specifies the requirements for an EMS (Brorson and Larsson, 1999). It is to enable an Organisation to develop and implement a policy and objectives which take into account legal requirements of the country and information about significant environmental aspects. The overarching aim of ISO 14001 is to support environmental protection, prevention of pollution and ensure achievement of sustainable development. Areas firms can achieve sustainability include raw material sourcing, product design, packaging, energy consumption, emissions, discharges, transportation, water consumption and waste minimization. The aim of this paper is to assess the benefits of certifying to ISO 14001 in terms of water consumption and waste generation of a cable manufacturing firm in Tema, Ghana. Figure 1 is a map showing the study area of Tema, Ghana.

Figure 1: The Study Area: Tema, Greater Accra Region, Ghana



MATERIALS AND METHODS

Two types of environmental impacts were analysed in this study. They are impact on the use of natural resources (water consumption) and impact of releases onto the environment in the form of waste. The research was undertaken by using a mixed method approach (Creswell and Plano Clark, 2017). Mixed methods research finds its roots in the 1960s as a concept of combining quantitative and qualitative research methods within the same study (Leech and Onwuegbuzie, 2009). The study population included all workers, both management and non-management staff of the company. The company has a total population of one hundred and eleven (111) staff.

Interview guide was also used to gather data from managers. Purposive sampling technique was used to select the following managers for the interview: manager in charge of environmental management, manager in charge of utilities, ISO 14001 internal auditors, health safety and environment representatives, machine operators and some administrative staff. These people were used because it was clearly confirmed that all of them are responsible for the continuous improvement of the ISO 14001 EMS and are in the best position to respond to the research questions. To further investigate water usage and scrap waste generation of the company, the managers in charge of Quality, Health, Safety and Environment (QHSE), Maintenance and Performance provided values for water usage, and production scrap before and after ISO 14001 EMS (2011 to 2016) certification. It should also be noted that, the company undertook expansion project in 2013 thus increasing its production capacity to about 50 per cent. This increase in production capacity of the firm is expected to increase the use of resources like water and production of waste.

In terms of evaluation method, a no comparison method is used for this study. This takes the form of a before and after design (Campbell and Harper, 2012). This design simply takes a measure of the situation before a policy intervention (ISO certification) has been introduced. Here monthly measurements of water consumption were taken and compared to the situation after the intervention. The initial measurements before the certification (2011, 2012, and 2013) are the baseline years against which subsequent measures will assess the changes. The water consumed every month in liters was calculated from 2011 to 2016. In terms of production scrap waste management practices, field visits and investigations were conducted in all the plants, laboratories and waste dump sites to assess and weight scrap waste that has been generated and management practices put in place to ensure sustainability.

RESULTS AND DISCUSSIONS

In this section, the data gathered from the field is analyzed and discussed. The data were gathered and processed in line with water consumed every month/years by the firm and the scrap metal waste produced over the months/years. We first present the results in terms of water consumption.

Water Consumption

Insufficient management of water resources is regarded as a major constraint to sustainable economic and social development (Scheele and Malz, 2007). The UN describes the development of water supply as the biggest challenge of the 21st century (UNESCO, 2005). In the northern sectors of Ghana, the major uses to which water resources are put into are for human consumption, agricultural purposes in the form of irrigation and livestock watering. In the most densely populated areas of the south, domestic and industrial water supplies are based almost entirely on surface water (Owusu et al., 2016). Water shortage is very common within the Accra Tema Metropolitan Area (ATMA) (Twerefou, Tutu, Botchway and Darkwah, 2015). Any activity undertaken to conserve water (whether treated or not) will thus be very welcomed in the country.

Table 1 below indicates the monthly water use of the company from 2011 to 2016. The total water usage by the company for the year 2013 (a year before the ISO 14001 EMS certification) was 2,347,000 litres. This represents a decrease of about 12.9 % from the 2011 volume of 2,693,000 litres. In 2016 (two years after the ISO 14001 EMS certification) the company's total

water usage was 2,598,000 litres which represents a decrease of 40.0% from 2014 volume of 4,331,000 litres. The minimum water usage was recorded in November and December 2016. The maximum water usage was recorded in October 2014. The reasons for the high usage of water can be explained.

In the third week of December every year, the factory shuts down its operation for the Christmas festivities which led to a decreased in production. The firm resumes production in the first week of January. Upon resumption of production activities for the new year, demand for products are always high. Production is always increased during this time of the year to either complete the orders received just after the shutdown in December and work on the production orders for January accounting for the increase in water consumption in January and low water consumption in December.

Table 1: Monthly Water Usage in Litres (2011-2016)

	2011	2012	2013	2014	2015	2016
Month	**Water Usage/Litres**	**Water Usage/Litres**	**Water Usage/Litres**	**Water Usage/Litres**	**Water Usage/Litres**	**Water Usage/Litres**
Jan	242,000	145,000	152,000	299,000	257,000	232,000
Feb	441,000	173,000	173,000	295,000	160,000	328,000
Mar	318,000	216,000	131,000	319,000	264,000	316,000
Apr	470,000	185,000	190,000	297,000	277,000	302,000
May	242,000	212,000	193,000	518,000	410,000	328,000
Jun	168,000	244,000	184,000	176,000	263,000	328,000
Jul	141,000	274,000	229,000	321,000	344,000	172,000
Aug	168,000	188,000	240,000	438,000	294,000	248,000
Sep	168,000	239,000	173,000	371,000	169,000	247,000
Oct	109,000	124,000	271,000	731,000	252,000	63,000
Nov	116,000	221,000	264,000	286,000	337,000	17,000
Dec	110,000	115,000	147,000	280,000	154,000	17,000
Total	2,693,000	2,336,000	2,347,000	4,331,000	3,181,000	2,598,000
Maximum	**470,000**	**274,000**	**271,000**	**731,000**	**410,000**	**328,000**
Minimum	**109,000**	**115,000**	**131,000**	**176,000**	**154,000**	**17,000**
Mean	**224,417**	**194,667**	**195,583**	**360,917**	**265,083**	**216,500**

Source: Field work, 2017

The findings from table 1 below can be said to agree with earlier published results by Di-Noia and Nicoletti (2016) that ISO 14001 EMS certification can lead to less water consumption by firms. The water that has been saved are channeled by the Ghana Water Company Limited (GWCL) to domestic use which is also under supplied. For instance, it was estimated that just a quarter of Accra's population has 24-hour access to a piped water supply (WaterAid, 2005) and this estimate has not changed despite much growth and development of Greater Accra over the last decade (Stoler, Tutu and Winslow, 2015).

The term water use efficiency describes another concept and considers the potential of water savings in the industrial sector (Scheele and Malz (2007: 98). To these authors, efficiency is the ratio between the minimum of water needed for a certain kind of production process and the quantity of water currently used in this process. The Assistant Maintenance Manager opined that, "to monitor the usage of water for production processes, the company monitors and reports on the water usage per production output (Litres/kg) at the end of every month". Every reduction in water use leads to an improvement in the water that will be made available for domestic or other uses.

It is imperative to note from table 1 above that, less water was used from 2011 to 2013. For instance, in 2011, 2,693,000 liters of water was used compared to 3,181,000 liters in 2015 under certification. Also, mean yearly production figures shows that 2012 recorded 194,667 liters, a figure that is less than that of the 2013 figure of 360, 917 liters. This can be explained in terms of the operating capacity of the firm. Around those years (2011-2013), the company was operating with only three major production halls but to improve on the capacity of the company, various expansion projects which involved the installation of one extrusion line to add up to the already existing two and the installation of two new drawing machines in addition to the already existing two drawing machines. These major expansions of production processes done in 2013 and 2014 use water for the drawing and cooling process which in the long run will lead to more water being used to produce.

However, as can be observed in Table 2, the maximum water use per production output was recorded in 2014. The minimum water use per unit production output of 1.14 Ltr/kg recorded in November 2014 decreased by 94.73% (0.06 Ltr/kg) in November 2016 (two years after the ISO 14001 EMS certification). Table 2 also indicates that, the maximum water usage per production output of 3.17 Ltr/kg recorded in October 2014 decreased by 56.78% in June 2016 (1.37 Ltr/kg). The minimum and maximum water usage per production output indicates that the company has made a lot of savings in water used between 2014 to 2016 in compliance with ISO 14001 EMS requirements.

The firm uses life cycle analysis to manage resources. Life cycle assessment (LCA) is also being used by the firm "to help evaluate the impacts and best practice at each stage in the provision of services, or in manufacturing or consumption (from raw materials to end-of-life disposal or recycling of products and decommissioning of a factory or other facility)" (Barrow, 2006, p. 185). Water audit is carried out by the firm to measure the quantity of water inputs and production outputs within a defined boundary. It consists of a single process or set of processes operating at a steady-state (Sturman, Ho and Mathew, 2004). One of the most useful outcomes of the water audit by the firm is the creation of a water flow diagram. This is an easy to understand representation of usually complex production process systems. A water flow diagram gives an idea of how much water is being used by each process including the volume of waste water being generated.

Table 2: Monthly Water Usage Per Production Output (Litres/kg)

Month	2011	2012	2013	2014	2015	2016
	Water use (L/kg)	Water use (L/kg)	Water use (L/kg)	Water use (L/kg)	Water use (L/kg)	Water use (L/kg)
January	1.14	0.67	0.81	1.94	1.34	1.12
February	2.76	0.75	0.81	1.33	0.86	1.18
March	1.99	1.57	0.76	1.18	1.11	1.13
April	2.83	0.99	0.79	1.56	1.56	1.10
May	1.18	0.87	1.26	2.94	2.15	1.31
June	0.76	1.05	0.71	2.14	1.4	1.37
July	0.82	0.96	0.63	1.15	2.28	0.73
August	0.71	0.72	0.64	2.43	1.27	0.85
September	1.04	0.98	0.65	1.49	1.02	1.08
October	0.56	0.48	0.98	3.17	0.86	0.27
November	0.76	1.3	0.79	1.14	1.34	0.06
December	0.63	0.73	0.79	1.36	1.37	0.07
Minimum	**0.56**	**0.48**	**0.63**	**1.14**	**0.86**	**0.06**
Maximum	**2.83**	**1.57**	**1.26**	**3.17**	**2.28**	**1.37**
Mean	**1.26**	**0.92**	**0.80**	**1.82**	**1.38**	**0.86**

Source: Field Work, 2017

The main reasons for the decrease in water usage per production output can be attributed to the following: daily check and instant report of leakages, checking at planned intervals float limit switches on all extruder lines since it is the only production process where water is used for cooling insulated conductors. This has helped to conserve water during production. The firm uses water footprint to measure the amount of water used to produce each of the products. During audit, a number of irregularities in water use, mostly associated with employees' work practices, were detected and this was communicated to the entire staff and they (staff) themselves device measures to curb the waste. This finding on water conservation by a cable manufacturer is in line with other studies which show that EMS implementation leads to environmental performance (Gbedemah, 2004; Ho and Law, 2015; Ho, Law and Lim, 2017).

Waste Management Strategies

Solid waste management is understood as supervised handling of waste materials from source through recovery processes to disposal. It involves control of generation, storage, collection, transportation, processing and disposal of solid waste with the aim of protecting environmental quality, human health and preservation of natural resources (Daskalopoulos, Badr and Probert., 1999). Solid waste management is a very huge environmental problem in Ghana as most landfill sites have been

closed due to their small nature, insanitary practices, over dumping and over use of the sites (Owusu, Nketiah-Amponsah, Codjoe and Afutu-Kotey, 2014). Other communities are also not ready to allow landfill sites to be constructed or sited in their environs. A display of "not in my backyard" (NIMBY) syndrome, which can be said to be appropriate response to inappropriate development (Feldman and Turner, 2010).

The Assistant QHSE Manager explained that, copper wire off-cuts, aluminium metal pieces, broken wood cores, spilled polyethylene and polyvinylchloride granules, polyvinylchloride sacks, rubber waste, plastic bottles and paper cartons of the firm are segregated at the waste segregation yard. The office/kitchen wastes are stored in waste bins, disposed in a garbage bin at the waste segregation yard for clearance by Gamma Beta Limited (a private garbage haulage company in Tema) and finally disposed at the only surviving landfill in the ATMA, Kpone landfill site. It was revealed by the environmental manager that the copper off-cuts, aluminium metal pieces, steel wire, waste polyethylene and polyvinylchloride which are classified here as production scrap are reused by the firm. It was also discovered that, waste oil from machines are sold to certified waste oil dealers for recycling or disposal.

Table 3 indicates the monthly production scrap rate from 2011 to 2016. The mean production scrap rate for 2013 was 2.63 metric tonnes. This represents an increase of 15.24% of 2014 production scrap rate (3.03). The recorded production scrap rate for 2016 (3.24) represents a decrease of 0.38% of the 2015 recorded scrap rate (3.62). The scrap quantity is in tons but the scrap rate is in per cent (Monthly scrap quantity/Monthly production output) × 100%)**.**

Table 3: Monthly Scrap Rate in Percentage

	2011	**2012**	**2013**	**2014**	**2015**	**2016**
	Production scrap rate (%)	Production scrap rate (%)	Production scrap rate (%)	Production scrap rate (%)	Production scrap rate (%)	Production scrap rate (%)
Jan	1.39	3.24	3.10	3.35	2.8	3.71
Feb	2.16	2.14	3.30	2.71	3.24	2.76
Mar	2.57	2.72	2.40	3.02	2.8	2.56
Apr	3.36	2.55	2.90	2.90	3.28	2.50
May	3.37	3.71	2.90	2.52	4.40	2.48
Jun	2.60	3.02	2.90	3.70	4.76	2.72
Jul	2.06	2.97	3.10	2.70	2.93	2.52
Aug	1.96	2.83	2.10	5.00	2.57	2.39
Sep	1.96	3.57	2.60	2.56	3.82	2.45
Oct	2.21	2.57	2.50	2.66	3.26	2.99
Nov	2.74	2.71	1.90	2.56	4.12	7.72
Dec	3.46	2.33	1.83	2.65	5.49	4.10
Mean	**2.49**	**2.86**	**2.63**	**3.03**	**3.62**	**3.24**

Source: Field work, 2017

Further analysis of the increase in production scrap rate from 2014 to 2016 can be attributed to the fact that, during 2011 to 2013, the firm was not using steel wire waste in its calculation but the company was requested by the corporate office to include steel wire waste in its calculation of scrap waste rate. For this reason, the production scrap rate for the company was reviewed twice in 2016. Despite this addition, one can observe an improvement in scrap rate in 2016 figures. The table above shows an improvement in production scrap performance due to the implementation of scrap management strategies after the ISO 14001 EMS certification and also business strategies in compliance with ISO 9001 standard requirements.

The Assistant Manager in charge of Technical and Process Control points out that "the company established a Technical section in charge of tooling and cost reduction projects where some projects are to reduce raw material consumption and scrap reduction". Some of the projects are: redesign to Cost (RDTC) project; replacement of outmoded and inefficient equipment (such as pay-off, thermocouples, traverse, spark testers); and bill of material review (BOM). The Performance and Technical Manager also revealed that, "the insulated copper scrap and aluminum scrap are recycled and the steel, raw polyethylene and polyvinylchloride granules are sold to EPA certified scrap dealers (Hsienh's Plastic Recycling and Nawobeni Company Limited) in Ghana". It is important to note that there is a yearly reporting of data through the EMP (Environmental Management Plan) in January for the previous year total weight of scrap waste per family.

CONCLUSION

The Sustainable Development Goals (SDGs) set targets for universal water and sanitation coverage. This target set out by the SDGs requires an entirely different level of planning, resource allocation and management if it is to be achieved (Monney and Ocloo, 2017). This paper shows that there has been an improvement in the environmental performance (water usage, and waste generation and subsequently its management by the firm by comparing data before and after the ISO 14001 EMS certification. The main conclusion of this study is that, the environmental performance of the company in water and waste generation and management are continually improving after the certification of ISO 14001 EMS. The water conservation practice of this firm is helpful in the sense that communities will be assured of access to water due to the savings. The waste generated onsite (production scrap) is managed daily until final clearance or shipment for recycling. The huge waste that will have been dumped in the only functioning landfill site in the ATMA is averted as a result of the certification to ISO 14001. The findings of this study support studies by Ho and Law (2015) and Ho, Law and Lim (2017) that points out that ISO 14001 EMS is a driver for sustainability and environmental performance improvement. It is thus recommended that the firm should communicate its success in ISO 14001 certification to stakeholders. This reporting can be done in the company's brochure or website. This can continually provide more market opportunities and encourage other organisations to implement the ISO 14001 Environmental Management System.

REFERENCES

Anderson, L. (1997). *Wood in Our Future Proceedings of a Symposium Environmental Implications of Wood as a Raw Material for Industrial Use*, Washington, D.C. National Academy Press.

Barrow, C. K. (2006). *Environmental management for sustainable development* (2nded). London: Routledge.

Brorson, T. and Larsson, G. (1999). *Environmental management: How to implement an environmental management system within a company or other organization*, EMS AB, Stockholm.

Campbell, S. and Harper, G. (2012). *Quality in policy impact evaluation: Understanding the effects of policy from other influences* (supplementary Magenta Book guidance). London; HR Treasury/Department of Energy and Climate Change/Department for Environment Food and Rural Affairs.

Cazeri, G.T., Anholon, R., da Silva, D., Ordoñez, R.E.C., Quelhas, O.L.G., Leal-Filho,W. and de Santa-Eulalia, L.A. (2018). An assessment of the integration between corporate social responsibility practices and management systems in Brazil aiming at sustainability in enterprises. *Journal of Cleaner Production* 182, 746–754.

Creswell, J. W. and Plano-Clark, V. L. (2017). *Designing and Conducting Mixed Methods Research (3rd Ed).* London, SAGE Publications.

Daskalopoulos, E. Badr, O. and Probert, S. (1996). *A methodology for predicting the quantities of municipal solid waste arisings and their compositions in Europe and the USA*. Paper presented at the World 96 Environmental Congress, 26–29 Cincinnati, Ohio, USA, proceedings in preparation.

Di-Noia, A. E. and Nicoletti, G. M. (2016). ISO 14001 certification: benefits, costs and expectations for organization. *Studia Oeconomica Posnaniensia 4 (10):94-109.*

Feldman, S. and Turner, D. (2010). Why Not NIMBY? *Ethics, Place and Environment* 13 (3): 251–266.

Gbedemah, F.S. (2004). *Environment management system (ISO 14001) certification in manufacturing companies in Ghana: Prospects and challenge.*, MSc dissertation, Lund University, Lund, Sweden. Retrieved from http://www. lumes. lu. se/database/alumni/03.04/theses/gbedemah_francis. pdf) on 23/07/2018.

Ho, L. L. and Law, P. L. (2015). Impact of implementation of ISO 14001 environmental management systems on environmental performance: A case study. *International Journal of Engineering Research and Science & Technology*, 4(1):80-90.

Ho, L. L., Law, P.L. and Lim, S. F. (2017). Environmental management systems (EMS) adoption in Sarawak (Malaysia): Implementation motivations. *Journal of Social, Technological and Environmental Science* 6 (2): 198-216.

International Organization for Standardization (ISO 14001). (1996). *Environmental Management Systems*. Annex A. Guidance and the Use of the Specification. ISO.

Leech, N. L. and Onwuegbuzie, A. J. (*2009).* A typology of mixed methods research designs. Quality & Quantity. *International Journal of Methodology*, 43(2): 265–275.

Monney, I. and Ocloo, K. (2017). Towards sustainable utilization of water resources: A comprehensive analysis of Ghana's National Water Policy. *Water Policy* 19 (3): 377-389

Owusu, P. A., Asumadu-Sarkodie, S., Ameyo, P. and Dubey, S. (2016). *A review of Ghana's water resource management and the future prospect*, Cogent Engineering, 3:1, DOI: 10.1080/23311916.2016.1164275

Owusu, G. Nketiah-Amponsah, E. Codjoe, S. N. A. and Afutu-Kotey, R. L. (2014). How do Ghana's landfills affect residential property values? A case study of two sites in Accra. *Urban Geography* 35(8): 1140–1155, http://dx.doi.org/10.1080/02723638.2014.945261

Scheele, U. and Malz ,S. (2007). *Water demand and water use in the domestic and industrial sectors - An overview*. In: Lozán, J. L., H. Grassl, P. Hupfer, L.Menzel and C.-D. Schönwiese. Global Change: Enough water for all? WissenschaftlicheAuswertungen, Hamburg. 384 S. Online: www.klima-warnsignale.uni-hamburg.de

Stoler, J., Tutu, R. A. and Winslow, K. (2015). Piped water flows but sachet consumption grows: The paradoxical drinking water landscape of an urban slum in Ashaiman, Ghana. *Habitat International* 47: 52-60.

Sturman, J., Ho, G., and Mathew, K. (2004). *Water auditing and water conservation*. IWA Publishing, Cornwall, UK.

Twerefou, D.K., Tutu, K.A., Botchway, E. and Darkwah, S. (2015). Willingness-to-pay for potable water in the Accra-Tema metropolitan area of Ghana. *Modern Economy*, 6: 1285-1296. http://dx.doi.org/10.4236/me.2015.612122

United Nations Educational, Scientific, and Cultural Organization (UNESCO). (2005). Sound of Our Water: Water Problems. http://unesco.uiah.fi/water/material/05_water_problem_html.

WaterAid. (2005). *National water sector assessment: Ghana*. London, UK

Welford, R.J. (1996). *Corporate environmental management: Systems and strategies*. Earthscan: London.

Wilson, W.G. and Sasserville, D.R. (1999). *Sustaining environmental management success: best business practice from industry leaders*, USA; John Wiley and Sons, Inc.

World Commission on Environment and Development (WCED) (1987). Our Common Future. (1st Ed). Oxford University Press, Oxford.

ABOUT THE AUTHORS:

Shine Francis Gbedemah is the Head of Department of the Quality Assurance Unit at Wisconsin International University College, Ghana. He is a lecturer in the Department of Development and Environmental Studies, Accra, Ghana.

Nancy Botchway was an MSc student at the Department of Development and Environmental Studies, Wisconsin International University College, Ghana.