Critical Interconnectedness of Awareness, Waste Management and Infrastructure in Environmental Discourse and Practice

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ABSTRACT

Awareness, waste management (WM) and infrastructure are closely linked issues of environmental sustainability. Perception levels shape household activities which have to do with waste generation, waste collection, waste disposal, and waste recycling. Urban, sub-urban and rural infrastructure in turn impacts WM. Botswana's laudable vision 2036 to transform into a knowledge-based economy has implications for knowledge and for the gaseous, liquid, and solid environment. The objective of this study is to examine a few environmental issues that are germane to having a knowledge-based economy in the twenty-first century. The methodology is qualitative; hence data collection is through the desktop modality to source relevant orthographic and pictorial information from academic journals, books, pictures, and newspapers, etc. The issues are examined from the viewpoints of selected frameworks of environmental education, specifically those of behavioural change, personal change and social change. The procedure is also comparative between Botswana and other cross border urban, semi-urban, and rural geographic settings and experiences in Southern Africa (Durban, Cape Town), East and Central Africa (Rwanda, Uganda, Tanzania), and West Africa (Lagos State, Ogun State, Osun State). The study found that an adequate level of awareness, the formulation and implementation of an effective WM policy, and the provision of basic infrastructure, are important requirements to drive a knowledge-based economy.

Keywords: awareness; waste management; knowledge-based economy

INTRODUCTION

This study proceeds on the basis of three key concepts of environmental education, namely, "awareness", "waste management", and "infrastructure". For the purpose of the exercise, awareness is defined in terms of human connections with the environment, a cognitive condition that is brought about by formal and informal sources of knowledge about the human habitat. A closely related term to awareness is "perception" which has to do with understanding; sometimes these terms are used interchangeably, but for this study awareness is taken to be distinct from perception. While awareness is connected with knowledge, perception is more closely linked to understanding. This separation of terms may be illustrated by using the example of reality where an aspect of reality is deemed a kind of knowledge – the perception or understanding by two individuals of exactly the same reality can differ widely. This is a crucial point in ecological science (Des Jardins, 2005).

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Environmental awareness, as already indicated, is a product of two primary sources of knowledge, namely, formal and informal sources of education. The formal sources of environmental information or knowledge are the schools: pre-school, primary school, high school, college of education, university, etc. The informal sources of environmental information include from intuition, indigenous knowledge, customary lore, radio, television, social media, newspapers, etc. etc. It must be admitted though that the boundary between what is formal and what is informal is getting increasingly blurred (Magni, 2016; Haury, 2005). Studies about the effectiveness of the different sources of environmental knowledge reveal that the informal sources might be as effective as the formal sources of environmental information. A study conducted in the United States of America among students revealed that most of the participants in the study (7 in 10) had received their knowledge about the environment from television rather than from school (Haury, 2005). A recent study among educated women who were civil servants in Osun State, Nigeria, revealed that the informal medium had contributed more to their awareness about the environment than had their formal education which for many of them was up to the tertiary level of the education chain (Oyegoke, 2021). The response by the Osun State participants in the study was comparable by deduction to the awareness experience by women in the adjoining Ogun and Lagos States of Nigeria.

Waste management (WM) is a significant factor in considerations of climate change and environmental sustainability. It is defined as activities involving waste generation, collection, transportation, disposal, and recycling; while the constituent waste can be solid, liquid, or gaseous (Nathanson, 2019). Studies show that perception levels differ with respect to the issue of WM. While majority of the women civil servant participants in the aforementioned Osun State study understood WM to be a process involving waste and the outlined associated activities, some formal studies err in their perception of what WM entails. *Conserve Energy Future* (2020) describes WM as "the collection, transportation, and disposal of garbage, sewage and other waste products" in a definition that leaves out an important aspect of the process, that of waste generation.

In the developing countries, there appears to be a tendency to define WM mostly in terms of waste collection and disposal while giving scant attention to other important aspects of WM which include waste generation and waste recycling (Singh et al., 2018).

To illustrate the problem of misapprehension of terms, Seadon (2010) states that:

Waste management is viewed as part of a generation, collection and disposal system. A systems approach that reveals its relationship to other parts of the system is examined in the light of producing more sustainable practice. The move to a more sustainable society requires greater sophistication to manage waste. A traditional reductionist approach is unsustainable as it lacks flexibility and long term thinking. A sustainable waste management system incorporates feedback loops, is focused on processes, embodies adaptability and diverts wastes from disposal. Transitioning to a sustainable waste management system requires identification and application of leverage points which effect change (p.1639).

Despite that the above submission makes an important case for greater recognition of various technical aspects of WM; its definition of WM is fallacious and reductionist – a word the author uses to criticize certain practices in WM. Seadon, in the above quotation, commits a reductionist fallacy himself by suggesting that the parts of a thing, namely, waste "generation, collection and disposal" are bigger than what they are a part of, which is: waste management. In short, the statement that "waste management is viewed as part of a generation, collection and disposal system" is erroneous in that WM is the system involving waste generation, collection and disposal; it is larger than the processes which make it up. The "part" cannot be greater than the "whole".

In some African countries, WM aspects of collection and disposal are perceived to be enough burdens

without the added dimensions of waste generation and waste recycling. Municipal authorities appear to be overwhelmed by the challenges of keeping the environment clean, healthy and pretty with respect to municipal solid waste (MSW). This seems to be so going by the looks of town and city streets in Lagos, Ibadan, and Osogbo in southwest Nigeria, to cite a few examples (Oyegoke, 2021). These places aptly illustrate what Zhang & Wang (2010, p.2) describe as visual pollution. But as Mohee & Simelane (2015) observe "There are several factors that drive MSW management in a country. It is therefore important to identify these, in order to develop relevant strategies and innovative ways of integrating waste into the development strategies of a city. Devising better management options through the re-use of waste could help Africa achieve the seventh Millennium Development Goal" (p.1).

Significant in WM is the fact that it is also a process of waste collection and disposal that involves burning, dumping, littering, landfills, and incineration with implication for environmental pollution and global warming and by extension human health, animal and vegetal life. Waste collection and disposal have been a major problem in both urban and rural communities in developing countries for economic, social, cultural, and other reasons. As studies have shown, waste disposed indiscriminately results in water, air, and soil pollution (El Nemr, 2010). More specifically, oil poured on productive land pollutes the soil, hinders air circulation through the soil, destroys benign microorganisms in the soil, and hampers beneficial soil activities by macro organisms such as earthworms. The effect of this is that the nutrients in the soil get reduced and this results in low food production as well. That is only an example.

"Infrastructure" is defined in this study as the enabling systemic and material structure which make for effective WM. Singh et al. (2018) declare that "Urban India is now the world's third largest garbage generator. But the amount of waste generated is not as much of an issue as the fact that over 45 million tonnes (or 3 million trucks worth) of garbage is untreated and disposed of by municipal authorities each year in an unhygienic manner" (p.204). Again, the foregoing observation underplays the significance of waste generation in WM. But from the point of view of environmental education and sustainability, the amount of waste generated is an issue that is crucial to WM and is as important as the other aspects of WM.

Poor waste collection and disposal have led to environmental sanitation diseases such as cholera, typhoid, intestinal worms, and others which can lead to significant fatalities among humans. The wastes are usually collected in manually pushed or motor-driven trucks from household and other specified locations by municipal outfits such as WM boards. There can also be street waste pickers, who collect waste from roadsides for organized trucks to the final destinations. These wastes from various sources are emptied into landfills. The dumps produce landfill gas (LFG) – dirty methane. Methane is a major greenhouse gas created from rotting organic matter. Methane from landfill is described as "dirty" because it is contaminated by everything else that reacts with it from the dump.

Nathanson (2019) explains:

Organic material buried in a landfill decomposes by anaerobic microbial action. Complete decomposition usually takes more than 20 years. One of the by-products of this decomposition is methane gas. Methane is poisonous and explosive when diluted in the air, and it can flow long distances through porous layers of soil. If it is allowed to collect in basements or other confined areas, dangerous conditions may arise. In modern landfills, methane movement is controlled by impermeable barriers and by gas-venting systems. In some landfills the methane gas is collected and recovered for use as a fuel (n.p.).

Singh et al. (2018) expatiate on the WM situation: The major causes for the inefficient MSW management systems in Rawalpindi are the unintended invasion of the city, severe weather conditions, lack of social awareness/community involvement, improper resources including improper equipment and lack of funds.

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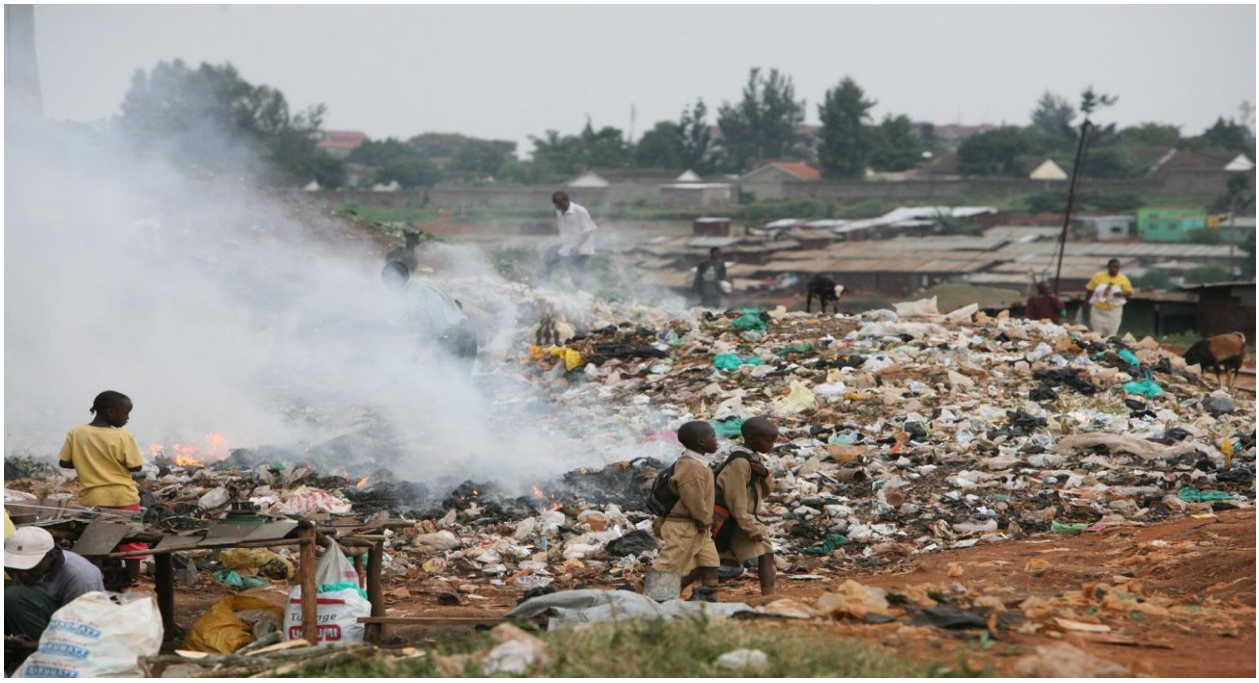
An inefficient MSW management system may create serious negative environmental impacts like infectious diseases, land and water pollution, obstruction of drains and loss of biodiversity (p.379).

Some of the factors outlined above may be found in several developing countries. In a phased study of SWM in 15 fifteen eastern African countries (among them Kenya, Rwanda, Tanzania, Uganda), *UN-HABITAT* (Goodwin, 2012) gives the following report: "The main findings that were considered to be regionally cross-cutting were characterized under one or more of the following SWM assessment issues and considerations: 1) low primacy and priority of solid waste management, 2) non-supportive policy, legal and regulatory environment, 3) unsuitable institutional framework, 4) non-supportive social-economic environment, 5) non-supportive political environment, 6) solid waste management data poverty, 7) inadequate solid waste resources, 8) non-supportive urban planning, and 9) challenging spatial characteristics" (p.iii).

Picture 1. A waste disposal site in Nairobi Kenya.



Source: Kenya's Waste Management Challenges. Retrieved. 29/02/2024

The above findings are illustrative of the environmental situation of not only East Africa but also in the different parts of the continent including West Africa and southern Africa. Nathanson (2019) gives some pertinent technical details of how public health can be protected and environmental damage minimized in the most used strategy of regulated and unregulated waste disposal:

Land disposal is the most common management strategy for municipal solid waste. Refuse can be safely deposited in a sanitary landfill, a disposal site that is carefully selected, designed, constructed, and operated to protect the environment and public health. One of the most important factors relating to land filling is that the buried waste never comes in contact with surface water or groundwater. Engineering design requirements include a minimum distance between the bottom of the landfill and the seasonally high groundwater table. Most new landfills are required to have an impermeable liner or barrier at the bottom, as well as a system of groundwater-monitoring wells. Completed landfill sections must be capped with an impermeable cover to keep precipitation or surface runoff away from the buried waste. Bottom and cap liners may be made of flexible plastic membranes, layers of clay soil, or a combination of both (n.p.).

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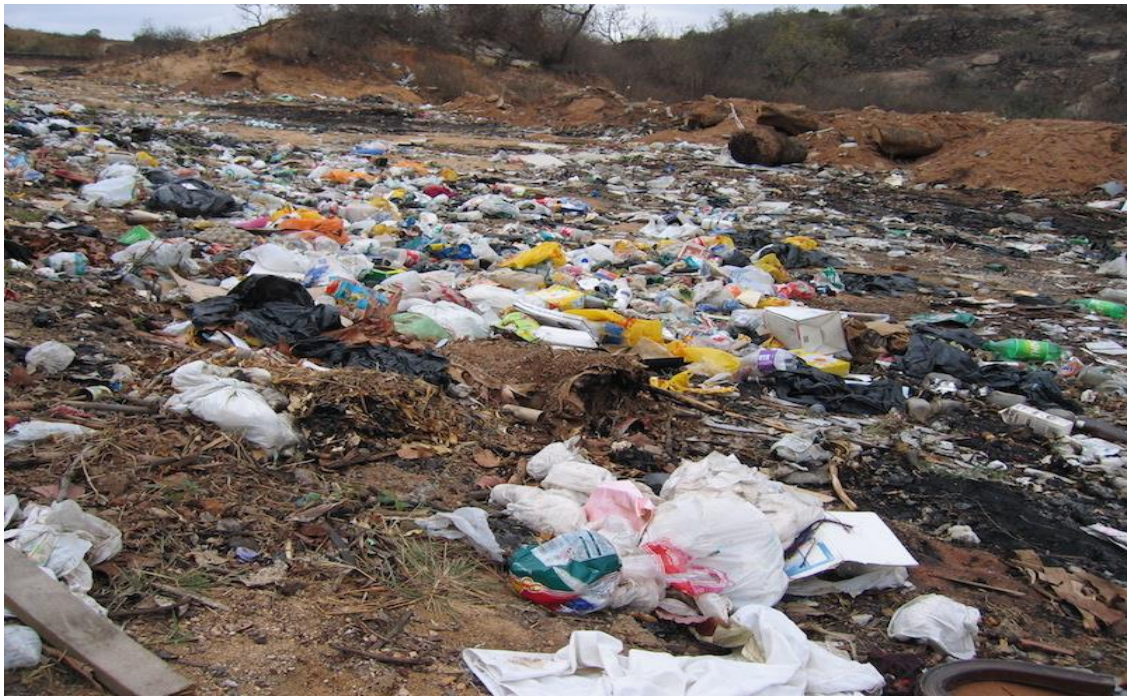
Picture 2. Indiscriminate waste disposal site in South Africa.



Source: In pictures: How Southern Africa manages her waste. Retrieved 29/02/2024

Studies show that Asian countries in general tend to be innovative and proactive with respect to the issues of WM and environmental sustainability. These countries are evolving technologies that would shift the practice of disposal of refuse in open dumps and unsanitary landfills to sanitary landfills that would use the biodegradation of waste to good effect. Chiemchaisri et al. (2010) illustrate an environmentally friendly system in the shape of a sanitary landfill which uses bioreactor technology:

In typical sanitary landfills, the waste is isolated from ground water by a liner system, and rain water is prevented from entering the waste by a land fill cover layer. This method of waste containment land filling minimizes the potential environmental impact of the leachate by reducing the generation of leachate and draining the leachate from the landfill to minimize its contamination to groundwater. Leachate is water that moves through the landfill, which flushes out polluting compounds from the waste. The main purpose of this landfill method is to store solid waste and all pollutants inside the landfill. The storage of solid waste in this manner required land-use restrictions and continued maintenance. If its protection systems such as landfill cover and lining layers fail, uncontrolled leachate could pose serious environmental problems and human health risks (p.576).

Administrations or governments have an input in the success of the sanitary landfill in that informed policy must be in place to determine land use, and there must be appropriate protocols to ensure that laws to the effect are implemented. The phrase “continued maintenance” in the above quotation no doubt refers to the importance of treating WM with the seriousness it deserves so that the landfill receives consistent attention from designated officials to prevent it from becoming inefficient and contaminating other parts of the environment such as groundwater. When leachate contaminates groundwater it endangers human and animal health. Chiemchaisri et al. (2010) describe the bioreactor process as follows:

A bioreactor landfill is a system that enhances degradation of waste by microorganisms. Microbial degradation can be promoted by adding nutrients, oxygen and moisture, and controlled by factors such as temperature and pH. The most widely used and understood method of creating a landfill bioreactor is

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leachate recirculation, as the moisture content is one of the important factors that limits microbial activity in a landfill. The recirculation of leachate increases moisture content of the waste in the landfill and, therefore, promotes microbial degradation (p.577).

The bioreactor landfill system is clearly imaginative in the proverbial sense of using what is available (and potentially threatening) to obtain salutary benefits to human, animal and crop life, and environmental sustainability. By contrast, West Africa, in particular Nigeria, still operates a culture of WM that depends on open dumps and unregulated landfills which are deleterious to human and animal health, and are an eyesore, and a threat to environmental sustainability (Nzeadibe, 2015). Mohee & Simelane (2015) examines different aspects of infrastructure such as road network, trucks, containers, landfills, etc., in the African experience.

OBJECTIVE OF THE STUDY

This study examines the crucial interlink between awareness, waste management, and infrastructure in environmental education and the implication for global warming and environmental sustainability.

Outcomes of enhanced awareness

Notions of awareness are central to the major frameworks of environmental education. In general, environmental discourse tends to aspire to one or another of three models of behavioural change or environmental citizenship, personal change, and social change. The idea of change is common to all three models because environmental sustainability and the survival of the human habitat depend on it. The first model is concerned with attitudinal or behavioural change at macro levels of human interaction, the second deals with individual or personal change at micro levels of choices or preferences, while the third deals with larger factors that impact on segments of society or the society as a whole.

These three models are well-studied but remain imperfect, separately, in providing a solution to the slow and steady despoliation of the human habitat (Des Jardins, 2005). But all three models have contributed immensely to our understanding of the condition of the environment and the threat to the survival of the human habitat because of a relentless and sometimes ruthless exploitation, even over-exploitation, of the earth's human, natural and material resources. The social change model draws attention to the rapacity of capitalism in that it takes from the Earth more than it returns to the Earth barring the enormous injection of gaseous, liquid and solid waste pollutants into it to the detriment of the future. A lot of what humans take out of the Earth are irreplaceable, some are replaceable up to a certain level (for example, forests, some flora and fauna – some of which have gone into extinction as a result of human action).

Ecology attempts to give the picture through scientific findings with mostly facts and figures about the planet, while environmental education seeks to disseminate the intellectual content to drive the change that is needed to save the planet. For its purpose, environmental education relies on the findings by ecological science; for its effectiveness, the quality of awareness of environmental issues must be upgraded at all levels of education so that the resultant enhanced perception levels can bring about change that is favourable to environmental sustainability. Environmental education is therefore crucial to the needs of societies as societies democratize more and more and fundamental human rights are upheld more across the globe. For example, studies in eco-psychology show that heightened awareness about WM does not guarantee a positive change of behaviour or choices about WM (Kollmuss & Agyeman, 2002).

But as the level of environmental awareness has hiked in recent times so too have the responses been diverse and exacerbated by different attitudes. Kovel's (2011) summarization of the development is apt:"Sixteen times the ponderous UN climate bureaucracy has cranked out an annual 'Conference of the Parties'in the

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vain hope of finessing the menace of climate change while making a lot of money at the same time…And so, the 'Conference of Polluters' is to be confronted by the multitude of those who have suffered pollution" (Bond, 2011, pp.1-2).

The discourse cited comes more from the perspective of the framework of environmental education described as social change which seeks to draw attention to underlying socio-economic factors behind human behaviour in general. On the relevant publication on the issue, Bond (2011) expatiates that it "is devoted to exploring two interlocking scales of political ecology: local eco-social conditions and environmental justice campaigning in Durban, South Africa and climate justice advocacy against market-based 'false solutions' at the global scale" (p.3).

The concept of physical environment includes both the indoor and outdoor surroundings, the quality of air and water, for instance. A physical environment includes the water systems (rivers/seas/oceans), natural vegetation, flora and fauna, landforms and rocks, weather and climate. Climate change is a product of human activities which impact negatively on the environment. A case in point is the recent experience of Cape Town in South Africa which was hit by potable water shortages a result of climate change and erratic rainfall patterns. Environmental degradation is the deterioration of the environment through despoliation and depletion of resources such as air, water and soil; it involves destruction of the ecosystems and natural habitats and endangering of wildlife to the point of extinction of some species. Environmental degradation is also aggravated by high and increasing human populations.

Environmental sustainability means the maintenance of certain factors and human practices which contribute to the quality of the environment on a consistent and long-term basis. It allows for the needs of humanity to be met without jeopardizing the ability of future generations of humanity to meet their own needs. It is a condition of balance, resilience and inter connectedness which allows the human society to satisfy its needs while not exceeding its capacity of supporting the ecosystems to continue to regenerate the services and outcomes that are necessary to meet those needs and while not by acts of omission and commission diminishing the natural biological diversity (Steffen et al., 2015).

Schubeler (1996) outlined an organogram and made infrastructural suggestions that could be adopted by low-income countries as follows:

1. Effective MSWM depends on an appropriate distribution of responsibilities, authority and revenues between national, provincial and local governments. In metropolitan areas, where MSWM tasks extend across several local government units, inter-municipal co-operation is essential.
2. Decentralization of responsibility for MSWM requires a corresponding distribution of powers and capacities. It normally calls for revised organizational structures, staffing plans and job descriptions of the local agencies concerned.
3. Private sector involvement in MSWM implies a shift in the role of government institutions from service provision to regulation. Essential conditions for successful private sector involvement include: competitive bidding, technical and organizational capacity, regulatory instruments and monitoring and control systems (p.10).

The above suggestions have been largely ignored, or, at best, the adoption has been haphazard and erratic countrywide. South Africa is a multinational country from both an economic and a cultural perspective comprising features of both First and Third World economies and infrastructure in mutual coexistence: "For example, the pricing of socio-ecological services has been extreme when applied to carbon sequestration, and Durban is a leading site. More generally, the tendency to commodify nature has become the defining philosophical stance behind global environmental governance, with inevitable conflicts, of which Durban's

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are emblematic… The struggle over the price of water and sanitation has led to South Africa's famous water wars" (Bond, 2011, p.3).

WM is an issue in South Africa the continent's foremost economy. But unlike Nigeria the second largest economy, South Africa has a comprehensive officially documented WM policy, namely, South Africa's Department of Environmental affairs' *National Waste Management Strategy* (NWMS) (2011) with 8 Goals of which the first is to: "Promote waste minimisation, re-use, recycling and recovery of waste – Focuses on implementing the waste management hierarchy, and with the ultimate aim of diverting waste from landfill." Chimuka & Ogola (2015) postulate that: "In order for these strategies to be properly implemented and become successful, the role of communities also needs to be considered. Research into urban SWM can also add value to the implementation of the strategies. Composition and the changing patterns of MSW and its generation rates per person, greater willingness on the part of communities to participate in waste-management practices, as well as willingness by population groups in terms of age and gender, etc., to participate in waste strategies, can be determined through research" (p.178).

Picture 3. Inform waste sector recovering sold waste from an open landfill.

Source: In pictures: How Southern Africa manages its waste. Retrieved 29/02/2024

Rodseth, Notten & Von Blottnitz (2020) point out in their study that SWM data in South Africa is unreliable, or at best incomplete, because it derives mostly from the formal sector while leaving out the informal and unregulated sectors of the less developed communities in the lopsided geo-political legacy of apartheid. Many of the sub-Saharan African countries have neither an effective WM policy nor usable WM data. There is therefore a general resort, among the populace, to arbitrary litter-dropping, refuse dumping in sewage works, open drains along the highways, and open landfills. Few African countries have sanitary landfills because of the relative availability of land space for open dumps and a general lack of resources for proper WM.

In a review of the WM situation in Botswana, Mmereki (2018) observes:

Waste management practices in Botswana are affected by: lack of effective implementation of national

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waste policy, fragmented tasks and overlapping mandates among relevant institutions; lack of clear guidelines on the responsibilities of the generators and public authorities and on the associated economic incentives; and lack of consistent and comprehensive solid waste management policies; lack of intent by decision-makers to prepare national waste management plans and systems, and design and implement an integrated sustainable municipal solid waste management system. Due to these challenges, there are concerns over the growing trend of the illegal dumping of waste, creating mini dumping sites all over the country, and such actions jeopardize the efforts of lobbying investors and tourism business (p.555).

In a recent development about the issue of WM in the country, the Assistant Minister of Local Government and Rural Development Mr Mabuse Pule told Parliament of the inability of local authorities to develop SWM plans owing to "inadequate skills capacity and financial resources". He submitted further that "Development of waste management plans by local authorities is a statutory requirement as stipulated under Section 9 of the Waste Management Act of 1998. Waste Management Plan is a tool which could be used to improve solid waste management". He added that an Integrated Waste Management Policy would be presented to Parliament by the Ministry of Environment, Natural Resources Conservation and Tourism, to create an enabling environment for effective waste management planning (*DailyNews*, Monday August 2, 2021, No.139, p.8). This is evidence of awareness at high levels of administration. It is also indicative of a willingness to implement United Nations protocols on pollution, climate change, and environmental sustainability.

Picture 4: Open landfill in Gaborone, Botswana

Solid Waste Management Site in Gaborone, Botswana. Retrieved 29/02/2024

Sanitary landfills are not a common feature of sub-Saharan Africa for socio-economic reasons although open dumps and landfills can be ubiquitous. Still, some of the countries have given greater thought to WM than others, for example, Botswana, Rwanda, South Africa (Bond, 2011; Goodwin, 2012; Mohee & Simelane, 2015). Tourism has an important place in Botswana's economy and it accounts for the comparative high level of awareness shown by the country. The informal sector is responsible for a high amount of the information about the environment. Apart from the television and radio, the newspapers are a source of regular supply of information about the environment on issues ranging from the swelling numbers of elephants and the debates whether or not to cull the elephants, farmers and the greenhouse factor, etc. (Chube, 2019; "Climate", 2019).

There can be a confluence of formal and informal channels of environmental awareness, the type described

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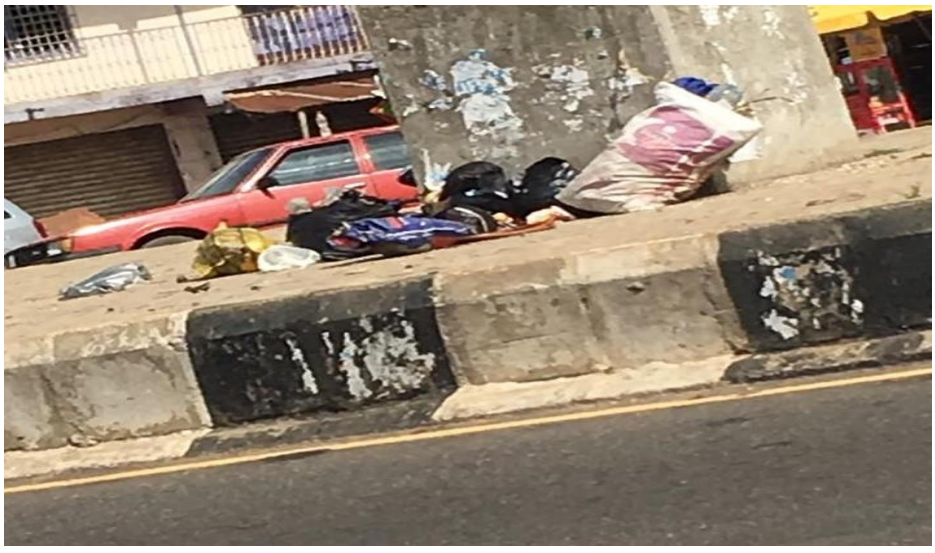
by Chimuka & Ogola (2015) above in their recommendation for South Africa. *DailyNews* carried the story of Marang Junior Secondary School (JSS) having an Environmental Club that assisted Green habitat Botswana with converting food waste into compost (*DailyNews* Tuesday August 3, 2021 No. 140, p.9). The collaboration is a form of WM that converts waste into natural fertilizer, something useful to agriculture and ultimately beneficial to the environment. In terms of outcome, the process is a miniature version of the sanitary landfill system described by Chiemchaisri et al. (2010). The goal is to convert material that is discarded, and therefore constitutes waste and a potential health hazard, into something benign and useful to the agricultural economy. Organic manure helps to produce organic crops that when eaten are more beneficial to human health than are those crops raised on artificial fertilizers (Greger, 2018).

INFRASTRUCTURE

The more deplorable WM sites in sub-Saharan Africa are to be found in West Africa because, apart from a generally low level of awareness, there is pervasive infrastructural underdevelopment. For example, the road network in Nigeria is not proportionate to the country's galloping demographics and it therefore impacts negatively on the attitude to WM, according to studies (Oyegoke, 2021; Nzeadibe, 2010). Homeowners resort to stashing up waste in their backyards and burning them periodically, or they take the waste to the designated waste collection sites and there is no collection for weeks or months and the abandoned waste attracts the activities of mice, stray cats, dogs, and goats. The waste is then strewn by animal and wind activities all over the place creating not only a health hazard but also aesthetic pollution and an eyesore (Zhang & Wang, 2010).

Refuse dumps along the highways were common landmarks in Nigeria until there was private sector interest in some types of waste, mainly, plastic waste and metallic rejects from foundries and the frequent road accidents caused by dangerous road conditions in rural, sub-urban and urban settings (Nzeadibe, 2010). The development reduced the volume of debris and was a respite for the much abused environment. The private and unregulated sector removed the waste for sale to recycling firms which were located mostly outside the country because of the frequent electrical outages and the erratic power supply, the poor road network apart (Oyegoke, 2021). The low level of environmental awareness has led to massive deforestation of the equatorial rain forest and reckless destruction of wildlife, and, coupled with the general absence of good infrastructure, resulted in a failure of tourism in some West African countries. Much of the human activities, including WM, continue to do violence to the human habitat and to animal and vegetal life.

Picture 5: Waste disposed at the center of the road in a state capital in Nigeria



Source: Oyegoke, 2021

It is more or less the same pattern in most African countries; awareness, WM and infrastructure correlate in varying degrees such that the environmental impact differs only in intensity while being essentially similar in negativity. Botswana is a relatively clean environment for demographic reasons; a low population density translates into a lower volume of waste generated per surface area, among other (variable) factors. Another important reason is respect for the rule of law which the country is known for; for example, the laws discouraging arbitrary tree-felling and protecting certain species of wildlife, such as monkeys, baboons, elephants. Still, as the country aspires to become a knowledge-based economy while boosting tourism, it must do much more for WM and the environment in part to realize the laudable vision.

CONCLUSION AND RECOMMENDATIONS

This paper has established that there is critical interconnection between awareness, WM and infrastructure in the interesting field of environmental education. The study assumes that there are other correlates, such as between demographics and the type and volume of waste generated, between the quality of infrastructure and good governance in each socio-political context, etc. but these are not strictly the concern of the present paper. This study has shown that informal sources of environmental information can be as effective as any other, and that enhanced environmental awareness at all levels of society, including administrations, can impact the volume and quality of infrastructure which in turn can affect all the processes involved in WM. All three features are therefore vital to the attainment of environmental sustainability which ecological science says is not a measurable state of being although it is a fact of life (Johnson & Mappin, 2005). The countries with an official environmental standpoint are better placed to affect the human habitat more positively than those countries that do not have one. The condition of the environment will assume increasing importance in private and public discourse with the passage of time (Bond, 2011). It is reasonable to expect that Africa will not to be left out of these global developments. This is so because environmental sustainability must be the concern of all countries in line with the United Nations standpoint.

Declaration of Conflict of Interest

We declare no conflict of interest in the conduct of this study,

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