Solid Waste Management at University Campus (Part 4/10):
Perceptions, Attitudes, and Practices of students and vendors.

Diana Starovoytova* and Saul Namango
School of Engineering, Moi University, Kenya.
*drdsmeld@yahoo.com

Abstract.
This study is a fourth-piece in a series of 10. At a general level, this research can be regarded as a descriptive case-study of the social-perception on solid-waste-management (SWM). The Social Ecological Model (SEM), the Panarchy-framework, and the Pred’s Behavioral-matrix informed the study. The main instruments utilized, are: document-analysis (of over 250 published materials), a-structured questionnaire (sample-size of 374, for students), and an-interview (of 37 vendors). Discrete-Choice Experiment technique, which originated from mathematical-psychology for investigating individual preferences, was employed. A-preliminary-study/testing of both-instruments, for validity and reliability, was conducted according-to ISO 20252:2006 (E): Market, Opinion and Social-Research-Standard. The-data-analysis was done via Minitab and Microsoft Excel-software. The-Statistical-Package for Social-Sciences (SPSS-17, version 22) computer-software-program was used to compute the-Cronbach’s alpha co-efficient. Cronbach’s-alpha-test of internal-consistency was performed, and demonstrated high inter-item-consistency (Cronbach’s for students’ questionnaire a = 0.828; and for the-interview-guide, for vendors a = 0.713). The study revealed, that both; students and vendors: (i) have recognized SWM as a-major-problem, at-the-campus; (ii) perceived the-campus as-dirty and very-dirty; (iii) do not currently pay for WM-services rendered, to-them, but would be willing to-pay, only for drastically-improved SWM-services; (iv) demonstrated relatively-good level of awareness of health and environmental-effects of improper-waste-disposal-behaviors; (v) do recycle few-materials, at-a-limited-extend; majority of recyclers are females; and (vi) exhibit ‘knowing-doing-gap’, which is the-gap, between knowledge and practices, on waste-disposal. The-respondents have also-approximated, that they generate from 0.14 to 1.4 kg/day/ per-student, and 1.7 kg/day/per-vendor, on-average, which is comparable-with estimations for waste-generation-rates, in-sub-Saharan-Africa. It is also-evident, that the-knowledge, attitudes, and practices, of the-respondents, need to-be-improved, requiring significant and sustained-behavioral-change, which can-be achieved by Environmental-Education (EE). The-state of EE in-Kenya, and the-level of Environmental- Sustainability reporting, by Kenyan-universities, was examined. From the-specifics of EE, in-Kenya, it is revealed, that its-main-efforts are directed towards wildlife- and natural-habitat-conservation; in-contrast, SWM is yet to receive due-attention. Several-recommendations were also-made, at-different-levels of the-SEM, via C4D-strategy-approachers, and including areas for further-research. The-study hopefully contributes (in-its small-way) to the-body of knowledge, on the-subject-matter, and may add insight on the-relevance of EE in-SWM. The-findings might also-help in-providing-information that is of practical-value to-policy-makers and planners, such-as NEMA-Kenya, which is beyond the-university boundaries. The-research-findings are also potentially-helpful to the-local-community, as they highlight the-need for the-local-community, to-get involved in-SWM.

Keywords: SEM; C4D strategy; ESD; Environmental Education; Recycling; Performance Contracting; Social norms; Environmental Sustainability reporting; Kenya.

1. Introduction.
1.1. Relevant-context on SWM.
SWM is a global problem; throughout-history and throughout-the-world, cities have-struggled to-manage the-waste, produced by their-citizens (Starovoytova, 2018a; Columbus, 2006; Tsboe & Marbell, 2004). Waste-generation and disposal have, over-the-past-decades, become particularly-problematic, throughout-the-world (see Starovoytova, 2018a), including Kenya. A problem has been created, by mankind, due-to thoughtless-act of consumerism, and bad-attitudes and practices, towards waste (Sebastian, 2010). Inadequate-WM has impacted, adversely, on public-health (Saffron et al., 2003) and has caused environmental-degradation and resource-depletion (Emery et al., 2003).

Recent study, of this-series, by Starovoytova (2018a), concluded, that waste is completely unavoidable in-any, and every-human-activity; however, the-way the-waste is handled, stored, collected, and disposed-off, will-determine the-quality of our-surrounding-environment, to-be-either; clean, pleasant, healthy, and sustainable, or filthy, disgusting, harmful, and wasteful. The-way each-individual, company /organization/government, and society, at-large, deal with their-waste, will-eventually-determine our-own future, as-humans.

Another study, by Starovoytova (2018b), has also-exposed multi-dimensional, and complex-nature of
the-existent-challenge, of MSWM, in-Kenya. The-ever-increasing-amount of waste, produced in-Kenya, alongside-with its-uncontrolled-disposal, needs to-be-seen as part of unsustainable-lifestyles, of its-citizens, and poor-MSWM-attitudes and practices. Besides, Otieno (2010) argues, that if the-issue of sustainable- SWM, in-Kenya, is not considered urgently, all-the-towns, in-the-country, will-be overwhelmed-with-waste and submerged into-it. Widespread-littering, indiscriminate-dumping, and an-open-air burning of waste, were revealed, and therefore recommended to-be-minimized, and gradually, eliminated. This-particular-step will require much-effort, as changing of the-deeply-rooted and currently-prevailing-NIMBY and LULU- attitudes, as-well-as habits, and cultural-perceptions, towards waste, is not easy, but it-is realizable, with determination, application of appropriate-social-instruments, for SWM, and of course, sufficient-resources and time.

Yet another-study, by Starovoytova & Namango (2018) also-revealed that: the-current-SWM system, at-the-university, is largely unacceptable, as it-is characterized as: (a) of Inferior-Quality and accessibility of SWM; (b) Inefficient; (c) of Poor-Legitimacy and social-acceptability; (d) Potentially- damaging-to Health and Environmental-sustainability; and (e) Financially-incapable. In-particular, the-study has justified, that on-overall, the-open and uncontrolled-waste-dumpsite, at-the-university, is making, all: environmental-pollution, health-impacts, and safety-violation, highly-probable. The-study also points-out on the-deficiencies/gaps, that need-to-be bridged, to-meet the-legal-obligations, towards SWM, as there is a-gross non-compliance with the-legal SWM-provisions (both; international and national).

In-particular, the-amount of litter, and indiscriminate-dumping, in-the-campus, suggest that there is a-poor waste-handling-attitude, among campus-residents, workers, and visitors. Negative-attitudes towards waste, and waste-handlers, as-well-as careless-habits, such-as indiscriminate-littering, observed at-the-campus, can be seen as social-cultural-barriers to effective-waste-management (Starovoytova & Namango, 2018). The-possible-causes of littering include: (i) lack of social-pressure to-prevent littering; (ii) absence of realistic-penalties or consistent-enforcement; and (iii) lack of knowledge of the-environmental-effects of littering (Al-Khatib et al., 2009). Other-causes are due-to-the-number of waste-collection-bins, available, on-a-site (McAllister, 2015). Many-studies have been-conducted, in-the-developed-world, to-evaluate and apply, strategies to-reduce-littering, by means of behavioral-interventions (Al-Khatib et al., 2009), but in-developing-countries, including Kenya, little has been done.

As-noted by Wilson et al., 2006; Gyankumah (2004); and Medina (2000), efforts to-address SW-disposal-problems, in-developing-countries, have-failed, due-to the-negative-attitudes and perceptions, people have, towards waste and SW-disposal. It has been-also-suggested, that practices of basic-SWM are often-neglected at-the-individual-level (Licy et al., 2013).

Uncollected solid-waste-disposal and littering, is one of the-most-visible environmental-problems, in-the-university (see Starovoytova, 2018b). Perceptions by a-cross-section of people, in-the-campus, regarding waste-management, might-contribute to such-problems. In-addition, Starovoytova & Namango (2018), proposed further-research on attitudes, perception, and knowledge on waste and its-management, among the-students, and the-local-community, of MU.

1.2. Perceptions, attitudes, believes, and social-norms.

Melissa (2002) sees perception as a-particular-way of understanding, or thinking, about-something. Adekunle et al. (2012) expands the-definition, elaborating, that it-as an-individual-mental-impression of something/a-given-phenomenon, or someone. Perception is the-primary-process, by which human-beings obtain knowledge of the-world. It involves the-actions of our-sense-organs (sight, hearing, touch, taste, and smell), in-responding to-external-stimulation (Barnhart, 2008; Gibson & Tierney, 2006). Perceptions are influenced by-our-knowledge, resources, beliefs, values, and norms, but can-be-created without experience and knowledge, of the-object, or person (Mariwah et al., 2010). It also-involves insights, apprehension, discrimination, and comprehension. Perception is subjective, and it-varies from-person to-person, due-to highly-individual/unique perceptual-systems, and how individuals ‘see’ things, in-terms of one’s awareness, understanding, beliefs, expectations, interpretation, impression, made by others, and knowledge of a-situation or a-phenomenon. Perception is duly-influenced by the-settings, that an-individual find themselves-in, and their-general-upbringing.

Environmental-perception is understood as the-relationship human-beings have with the-environment. This-relationship determines the-attitudes of the-people, in favor of, or against, the-environment (Taboada-González et al., 2011; Leung & Rice, 2002). The-analysis of environmental- perception has-been-approached by means of environmental-behavior (Corraliza & Berenguer, 2000), and environmental-beliefs, or values (Stern, 1992). However, when analyzing the-literature it was found, that the-relationship is not so-simple, as there are several-factors that influence pro-environmental-behavior. Therefore, it-is-important to-understand, which factors promote, or inhibit environmental-behavior, for-example, values and beliefs (Bardi & Schratz, 2003, De Groot & Steg, 2007; Snelgar, 2006), cultural-values (Deng et al., 2006), and environmental-activism (Dono et al., 2010; Fielding et al., 2008), among-others.

Attitude, on-the-other-hand, is a-hypothetical-construct, which represents an-individual’s like, or
dislike, for a-phenomena/an-item/an-activity. Schultz & Zelezy (2000), define attitude as the-deeply rooted-concept in a-person’s self, with a-perception of the-degree of bonding, between self and the-environment. Attitudes are also a-learned-tendency to-evaluate things, in-a-certain-way. Such-evaluations are often positive, or negative, but they can-also-be uncertain (neutral), at times. Warner & Åberg (2006) contends that there is no right or wrong-attitude, except within a-certain-cultural-context. But even within the-same-culture, our-behavior can-be-influenced, by a-number of factors, and these develop-over-time.

Attitude consists of three-basic-components, which include: (i) perception (emotional-impression); (ii) cognition (thought); and (iii) behavioral-tendency-to-act (Mariwah, 2010). According-to Ajzen (2002), human-behavior is guided by three-kinds of consideration/beliefs about: (a) the-likely-outcomes of the-behavior and the-evaluations of these-outcomes (behavioral-beliefs); (b) the-normative-expectations of others, and motivation to-comply with these-expectations (normative-beliefs); and (c) the-presence of factors, that may promote, or hinder, the-performance of the-behavior (control-beliefs).

Attitude has-been-found to be-an-important-predictor, in-explaining intention, or behavior towards-SWM, and the-relationship are significant (Goh et al., 2013; Kumar, 2012; Ifegbesan, 2010; Vicente & Reis, 2008; Klundert & Lardinois, 2005; Bernstein, 2004; Ajzen, 1991).

Bowersox with colleagues, in-particular, argue that waste-generation is conditioned, to-an-important-degree, by people’s attitudes towards-waste: their-patterns of material-use and waste-handling, their-interest in waste-reduction and minimization, the-degree, to-which they separate wastes, and the-extent, to-which they refrain from-indiscriminate-dumping and littering. People’s attitudes influence not only the-characteristics of waste-generation, but also the-effective demand for waste-collection-services (Bowersox et al., 2005).

In-addition, beliefs, both; religious and traditional, as-well-as practices, play a-crucial-role, for the-successful-conservation of the-environment. The-preservation of the-environment has a-direct-link to the-culture of the-people, which they pass it, from-generation-to-generations (Anoliento et al., 2003).

Social-norms refer to-the-perceived-standards, of acceptable-attitudes and behaviors, within formal and informal-networks. These are the ‘unwritten-rules’ that are adhered-to in a-person’s family, or peer-group, and within a-community, or society, at-large. Norms can-generally-be-defined as-those regulating-factors, that determine how a-person-behaves, in-a-particular-context. Individuals may engage in-specific-behaviors, as-a-result of their-perceptions, about: (i) the-consequences of not conforming to-social-norms; (ii) what others, in-their-social-network, are doing, and how-they-are-behaving; and/or (iii) what others, in-their-social-network, think they should-be-doing.

Evidence shows, that strategies, that include social-networks, influencers, collective-behaviors, and social-norms, have large-impact on-social and behavior-change. Changing social-norms, or creating-new-social-norms, requires shifting: (1) people’s paradigms about what they perceive to-be-right or true; and (2) people’s-expectations, regarding normative-behaviors. Social-norms, that are deeply-rooted in one’s beliefs, are the-most-difficult to-change (Kempf & Hilke, 2012). Social-norms are usually understood, by measuring individual-attitudes (positive or negative-feelings, regarding an-idea or behavior), and beliefs (perceptions about what is true or false) (C4D, 2012). On-the-other-hand, efforts are still underway to-develop-ways, to-measure social-norms (Mackie, 2013).

1.3. Previous-studies and purpose of the-research.
In-relating-to-change in-habits, behavior, and participation, ‘what people think about waste’ (Watch, 1999) is a significantly-important-aspect of SWM (Maddox et al., 2011; Babitski, 2011; Pfeffer & Sutton, 2000), which require examination.

Numerous-studies have-been-conducted on-the-subject-matter, all-over-the-world; for-example: Bom et al. (2017), Bernstein (2004), and CED (2003), in-the-U.S.A.; Sessa et al. (2009), in-Italy; Klundert & Lardinois (2005), in-the-Netherlands; Warner & Åberg (2006), in-Norway; Beinstein (2004), and Watch (1999), in-the-U.K.; Vencaatasawmy et al. (2000), in-Sweden; Deng et al. (2006), in-Canada; Al-Khatib et al. (2009), in-Palestine; Desa et al. (2012), in-Malaysia; Kumar & Nandini (2013), in-India; Rahman et al. (2005), in-Bangladesh; Thanh et al. (2012), in-Vietnam; Janmaimool (2017), in-Thailand; Ortiz (2001), and Eveh et al. (2016), in-Philippine; Buenrostro et al. (2014), in-Mexico; Boadi (2016), in-South-Africa; Njagi et al. (2013) in-Kenya; Essuman (2017), Abagale et al.(2012), and Mariwah et al. (2010), in-Ghana; McAllister (2015), in-Botswana; Banga (2013), in-Uganda; as-well-as: Adekunle et al. (2012), Mbalisi & Offor (2012), Dango et al. (2010), Lange et al. (2009), and Banjo et al. (2009), in-Nigeria; among-others.

Review of-the-studies, listed above, revealed lack of research, on-the-attitudes, perceptions, and practices in-SWM, at a university-context. Besides, no topical-reports on studies, at-the-Kenyan universities-context, had, so-far, being-traced, by-the-authors. In-the-view of the-above, this-study is to-explore attitudinal-dimensions, and behaviors, towards waste and its-management, at an-individual-level, among students and vendors, of-the-subject-university.
2.1. Background-information and study-area.
Interested-readers can access the-following-background-information, from the-previous-studies, of-this-series:

Relevant-background-information, on Kenya (including Geography, Climate, Population, Economy, Political-structure; Legal-Foundation to-SWM, in-Kenya; Kenya’s Environmental-Performance and waste-generation-rates) can be-accessed via Starovoytova (2018b).

This-study (as all-studies in-the-series) is conducted at the-Moi-University (MU), situated at Kesses-Constituency, the-Uasin Gishu-County, Kenya (the-geographical-position/maps, on the-subject university, is provided - see Starovoytova & Namango, 2018). MU is the-second-largest-public-university, after the-University of Nairobi. As of 2007, it had over 20,000 students, including 17,086 undergraduates. It operates eight-campuses and two-constituent-colleges (Starovoytova & Cherotich, 2016b). This-study is limited to-the-main-campus, of MU. In-addition, SWOT-analysis of the-current SWM-system, including waste-generators and waste-disposal-practices, in-the-subject-university, is provided in-Starovoytova & Namango (2018).

Analogous to Starovoytova (2017), interested-readers could-refer to Starovoytova et al. (2015) to-find informative-synopsis regarding Kenya, and its-educational-system. Besides, study by Starovoytova & Cherotich (2016a), provides valuable-particulars, on the-MU, where the-study was conducted.

2.2. Research-design.
Research-design is a-plan, for conducting research, which usually-includes specification of the-elements, to-be-examined, and the-procedures, to-be-used (Agbesinya & Anoff, 2010). Research-design helps to seek-information, and to-analyze the-evidence of research-findings, to-answer initial-study-questions.

This-study employed a-cross-sectional study-design; and at a-general-level, the-whole-research can be regarded as a-case-study of the-social-perception on SWM. According to Yi (2010), a-case-study is “an empirical-inquiry that investigates a contemporary-phenomenon, within its real-life context”. The-advantages of case-studies are summarized by Yi (2010), as follows: (1) They may aid the-researcher in-getting a-holistic-view of a-situation, a-view that includes the-context, as-well-as the-details; (2) They are full of details and may, therefore, lead to a-more-complete-understanding of some-aspect of an-event or a-situation. They, consequently, satisfy the-three-parts of a-qualitative-method, i.e. describing, understanding, and explaining; and (3) They may assist in-getting effective-information, that cannot, otherwise, be collected. Case-studies are suited to-situations, where context matters; hence, it-is the-dominant motive, to-use them, in-this-study.

Yin (1994) divides case-studies into three-categories, namely exploratory, descriptive and explanatory; which could-be either; single, or multiple-case-studies. Exploratory-studies are often undertaken as an-introduction to-social-research, and aim to-guide the-development of research-questions and hypotheses (NSEU, 1997). Explanatory-case-studies are suitable for the-study on-causal-relationships. Descriptive-case-studies require that the-investigator begin with a-descriptive-theory. This-study is of case-study-type, which could be labeled as descriptive.

The cross-sectional-study-design was adopted, according to Guidelines for targeted-communities, given by Kaliyaperumal et al. (2004).

2.3. Theoretical-framework.
According to Pickett et al. (2007), the-goal of scientific-theory is to facilitate-understanding. Understanding, in-scientific theory, can-be-defined as: “an objectively determined, empirical match between some set of confirmable, observable phenomena ... and a conceptual construct”. Theorizing is the-process of identifying a-core-set of connectors, within a-topic, and showing how they fit-together. Theoretical framework plays an-important-role in guiding the-entire-process of the-research-study.

Many-theories and models have been formulated to explain complex-human-behavior. For-example: Deterrence-Theory; Diffusion of Innovation (DoI) Theory; Social-Learning-Theory; Huntington’s Political-Institutionalization-Theory; Bolman and Deal’s Four-Frame Organizational-Theory; Neutralization-Theory; Theory of Planned-Behavior (TPB); Piaget’s Theory of Cognitive-Development; Kohlberg’s Theory of Moral-Development; Self-Presentation Theory; Learning-Theory and Behavior Analytic-Theory of change; Theory of Reasoned-Action; The-Health-Belief Model; and Trans-theoretical Model, among-others. For-more-details on each, of the-listed-theories and models, see Starovoytova et al. (2016).

This paper, on-the-other-hand, is guided by the Socio-Ecological-model, which explains people’s perceptions and behaviors, in-SWM.

The-Social-Ecological-model developed out of the-work of a-number of prominent-researchers, such as: (i) Urie Bronfenbrenner’s Ecological-Systems-Theory (1979), which focused on the-relationship, between the-individual and the-environment; (ii) Kenneth McLeroy’s Ecological-Model of Health-Behaviors (1988), which classified five-different-levels of influence on health-behavior; and (iii) Daniel Stokols’s Social-Ecology-Model of Health-Promotion (1992, 2003), identified the-core-assumptions, which underpin the-Social-
Ecological-model (Glanz, 2008). The work of these, and other researchers, has been used and modified, and resulted into what is referred to as the Social-Ecological-model. 

_The-Social-Ecological-Model (SEM)_ is a theory-based-framework, for understanding exploring, and addressing the multifaceted and interactive-social-determinants, of a phenomenon, at many levels (APPP, 2015; Elder, 2007), while ‘ecological’ means multiple levels, beyond the individual. There are five nested, hierarchical levels of the SEM: Individual, interpersonal, community, organizational, and policy-enabling-environment (Figure 1). SEM recognizes individuals as embedded, within larger-social-systems, and describes the interactive characteristics of individuals, and environments, that underlie the outcomes/behaviors (Sallis _et al._, 2008; Stokols, 1992). The model assumes not only that, multiple levels of influence do exist, but also that these levels are interactive and reinforcing (Stokols, 1992).

_Individual_ - is at the centre of the model. Individual factors, which influence people’s action/practices include: knowledge, attitudes, behaviors, beliefs, perceived barriers, motivation, level of education, socio-economic-status, self-efficacy, developmental-history, gender, age, religious identity, racial/ethnic caste identity, sexual-orientation, financial resources, values, goals, expectations, literacy, stigma, and others.

![Figure 1: SEM (modified from APPP (2015), and McLeroy _et al._ (1988)).](image)

_Interpersonal_ - Relationships with others, and effects on social identity, such as formal (and informal) social-networks, and social-support-systems, that can influence individual behaviors, including: family, friends, peers, co-workers, cultural-background, religious-networks, customs, or traditions.

_Community_ - Relationships, among organizations, institutions, and informational-networks, within defined boundaries, including the built-environment (e.g., parks), village associations, community leaders, businesses, and transportation.

_Organizational_ - Organizations or social-institutions, with rules and regulations, for operations, that affect how, or how well, for example, SWM services are provided to an individual, or group; and schools, that include SWM, in the curriculum.

_Policy/Enabling Environment_ - Local, state, national, and global laws and policies, or lack of such legal provisions. In particular, it refers to legislation, regulatory, or policy-making-actions, that have the potential to affect waste-management. Policy includes education-policies, such as mandating time for environmental education-classes, health-policies, environmental policies, and funding policies.

The SEM is based on four core principles (Mwiinga, 2014; and Elder, 2007):

(i) _Multiple factors influence behaviors_ - efforts to change behavior, including SWM behavior, should be based on the understanding of the interrelationship, between the four levels of the SEM: individual, social-environment, physical-environment, and policy;

(ii) _Environments are multidimensional and complex_ - Social or physical environments can be described as containing a variety of features/attributes. Environments can also be described in terms of their...
actual or perceived-qualities. The-variable-nature of environments has a-direct-implication on the-design of initiatives to-promote residents-participation in-SWM. For-example, a-community may have disposal-waste-bins, in-place, however, their perceptions/understanding about health-effects of ill-disposed- waste may prevent them from using this-aspect of their-physical-environment;

(iii) **Human-environment-interactions can be described at varying-levels of organization** (e.g., individual, small-group, organizational, community, or population-levels). The-SEM does *not* just focus on the-individual, but includes multiple-levels of human-interaction with-environments. For-example, interventions, promoting proper-waste-disposal-activity can-be-large, such-as whole-population mass-media campaigns, or may focus on organizations, such-as a-school, or workplace-settings, or may-be-based around a-local-community, which they are tailored-to; and

(iv) **The-interrelationships, between people and their-environment, are dynamic.** There is a-reciprocal-relationship, between people, and their-environments; the-social, physical, and policy- environments influence the-behavior of the-individual, while at-the-same-time, behavior of the-individual, group, or organization, also impact on the-wellbeing of their-environments. The-environment can control, or set-limits to-proper waste-disposal-behavior, that occurs within-it. According to Stokols (1992), making a-change in the-environment can result in a-modification of behavior. For-example, lack of environmental-education, and access-to facilities, such-as waste-collection-services, and waste-bins, limits the-number of people, who will-exhibit proper-waste-disposal-methods (so-called ‘environment influencing behavior’).

On-the-other-hand, Theory-Oriented-Frameworks are the-frameworks, which attempt to-define and connect different-pieces of theory, within the-domain, of a-particular-area of research. There have been a-number of attempts at producing general-frameworks, which either deal-directly with-SES-theory, or with relevant-aspects of related-theories (e.g., see Schwaninger, 2006). This-study is informed by the-*panarchy framework* (Cumming & FitzPatrick, 2014; Holling & Gunderson, 2002; Holling, 2001) which proposes that social-ecological-systems are driven by a-series of interconnected-adaptive-cycles on-different-scales. The-adaptive-cycle offers a-model of the-process of change, in a-generic-SES. The-underlying-philosophy, of the-framework, is one of continual, nonlinear, episodic-change, in linked social-ecological-systems. Panarchy proposes that complex-systems follow adaptive-cycles, interactively, at several-different-scales (Holling & Gunderson, 2002; Gunderson & Holling, 2002; Holling, 2001). Cycles may be-out of synchrony, with-phases, complementing one-another, to-increase system-resilience, or less-commonly, in-synchrony.

2.4. **Main study-instruments: a-questioner and an-interview-guide, and the-steps of the-research.**

The-choice of a *questioner* instrument, was due its-inherent-advantages, of it being-less-expensive and time-consuming, over other-tools, such-as: focus-group-discussion and observations (Sarantakos, 1998). The-semi-structured-questionnaire (for students), and an-interview-guide (for vendors) was constructed, based on the-research-topic, its-objectives, and a-target-group. A-semi-structured-questionnaire included respondent’s demographics, perceptions, attitudes, knowledge, awareness, and practices, in-SWM, at an-individual level. The-study implemented a-style of projective-technique, by asking questionnaire-respondents questions about SWM and associated-issues. Discrete-Choice-Experiment-technique, which originated from mathematical-psychology for investigating individual-preferences (Proefschrift & de Bekker-Grob, 2009), was employed, for some-questions, since it helps to-simulate the-preferences of individuals, through market-based-choices. With-the-vendors, the-data was collected, through face-to-face-interviews, for which an-interview-guide was prepared. By acquiring information, directly from the-students and vendors, the-authors anticipated to-discover their-perceptions, attitudes, and practices on SWM, at-the-subject-university.

**Ethical-considerations** were also taken into-account. Ethics means conforming to-accepted standards and being-consistent-with agreed-principles of correct-moral-conduct (Strydom _et al._, 2005). In-this-regard: (i) the-purpose of the-study was explained to the-potential-respondents; (ii) it was also explicitly-stated, that their-participation is voluntary, and the-data/information will-be-treated confidentially (*no* names or affiliations will-be-revealed); and afterwards (iii) informed-consent was sought, from the-respondents, before the-actual-data-collection.

This-cross-sectional-survey was conducted to-capture the knowledge, attitude, and practices (KAPs) on solid waste management (SWM) from an-undergraduate-students, of MU. Students are particularly-targeted, since they-are-regarded, as the-future of the-nation, and universities are expected to-develop their-potential, as-advocates of sustainable-environment (Ahmad _et al._, 2015).

**Sample-size** answers basic-questions, such-as how-large, or small, must the-sample-be, for it-to-be-representative (Creswell, 2003; Sarantakos, 1998). The-sample-size was determined via Checkmarket survey-sample-size-calculator. Table 1 shows the-relation of Confidence level, Margin error and Population size on sample-size. For this-study, confidence-level of 95%, and margin-error of 5% were adopted.
Table 1: Sample-size-matrix (Checkmarket.com).

<table>
<thead>
<tr>
<th>Population size</th>
<th>Confidence level = 95% Margin of error</th>
<th>Confidence level = 99% Margin of error</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5% 2.5% 1%</td>
<td>5% 2.5% 1%</td>
</tr>
<tr>
<td>100</td>
<td>80 94 99</td>
<td>87 96 99</td>
</tr>
<tr>
<td>500</td>
<td>217 377 475</td>
<td>285 421 485</td>
</tr>
<tr>
<td>1,000</td>
<td>278 606 906</td>
<td>399 727 943</td>
</tr>
<tr>
<td>10,000</td>
<td>370 1,332 4,899</td>
<td>622 2,098 6,239</td>
</tr>
<tr>
<td>100,000</td>
<td>383 1,513 8,762</td>
<td>659 2,585 14,227</td>
</tr>
<tr>
<td>500,000</td>
<td>384 1,532 9,423</td>
<td>663 2,640 16,055</td>
</tr>
<tr>
<td>1,000,000</td>
<td>384 1,534 9,512</td>
<td>663 2,647 16,317</td>
</tr>
</tbody>
</table>

At the-time of this-study, the-student-population, at the-main-campus, was approximately 14,000; the-sample-size of 374, with Confidence-level of 95%, and Margin of error 5%, was calculated. For vendors (with approximate-number of 40, at the-main-stage-market), the-sample-size of 37, with Confidence-level of 95%, and Margin of error 5%, was computed.

This-study was superficially-divided into 3 sequential-parts, which shown in-Figure 2.

![Figure 2: Sequential-parts of the-study (Starovoytova & Namango, 2016a).](image)

The subject-sensitivity, relative-position of questions, the-minimization of excess-length, the-visual-impact, and ease of comprehension and completion, were all-considered, when designing the-questionnaire. To-ensure-credibility, a-principle of qualitative-inquiry, for ascertaining that the-analysis and findings, are legitimate, was used, according-to Lincoln & Guba (1985). This-research also-complies with the ISO 20252:2006 (E) Market, Opinion and Social-Research Standard; hence a-preliminary-study testing was conducted at-the-MU, main-campus, using an-initial-version-questionnaire. The-findings from the-preliminary-study were used to-come-up with a-final-version of the-questionnaire, which was designed and administered in-both; English and Swahili-language.

2.5. Methods for Data Analysis.

The data-analysis was conducted using Minitab, and Microsoft-Excel software. Software-validation and post data-entry-checks were conducted to-ensure data-integrity, before analysis. Descriptive-statistics was used to-analyze both; qualitative and quantitative-data; data was represented as: mean, range, relative-frequency, and percentage-values.

The-questionnaire and the-interview-guide were pre-tested, to-ensure their-validity and reliability. The-primary-purpose of pre-testing validity and reliability is to-increase the-accuracy and usefulness of findings, by eliminating, or controlling as many-confounding-variables as-possible, which allow for greater-confidence in the-findings, of a-given-study (Hardy & Bryman, 2004).

Validity indicates the-degree, to-which an-instrument measures what it-is-supposed to-measure. For a-data-collection-instrument to-be considered as valid, content, selected and included in-the- questionnaire, must-be-relevant to the-need or gap-established (Starovoytova, 2018c; Field, 2009). In-order to-demonstrate internal-
validity, in the-questionnaire, it had to-be-constructed, in-such-a-way that the- resulting-data made sense, in-the-context of the-research-questions. Descriptions such-as authenticity, cogency, credibility, and confirm-ability, are amongst the-concepts considered, when confirming internal- validity.

Reliability refers to the-degree of consistency of scores, obtained by a-tool, or consistency the-procedure-demonstrates. The data-collection-instruments were subjected to-statistical-analysis to determine their-reliability. The most-commonly-used technique, to-estimate-reliability, is the-correlation-co-efficient, often termed as reliability-co-efficient or Cronbach’s alpha-co-efficient (Kothari, 2004).

Cronbach’s alpha is the-most-common-method of estimating reliability of an-instrument (Hardy & Bryman, 2004), and it-is useful for the-item-specific-variance in a-unidirectional-test (Cortina, 1993). The-Statistical-Package for Social-Sciences (SPPS-17, version 22) computer software-program was used to-compute the-Cronbach’s alpha co-efficient, for both-instruments.

3. Results and Analysis.

3.1. Validation of the-instruments.

According to ISO 20252:2006(E): Market, Opinion and Social Research, it-is mandatory to-carry-out a-pre-testing of the-self-completion-questionnaires. This helps to-ascertain the-nature of respondents, minimize errors, associated with misinterpretation of questions, and also identify questions, which are less/ more-significant, for the-effectiveness of the-study.

To-fulfill this-mandate, a-preliminary-study, targeting the-identified-stakeholders, at Moi University- main campus, was conducted. The-respondents were randomly-selected, from a-sampling-frame of undergraduate-students, and vendors/shop-keepers, within the-university. From the-validation (so-called “pre-testing”) it was found, that both-instruments have sufficient-information, which would answer all-the-research-questions. The-instruments were found adequate-enough; the-length of the-entire instruments were found appropriate and the-content was logically-organized. The-general-recommendation made, is that the-instruments were acceptable with very-minor-editing. Results from the-preliminary-study were then used as a-basis, for developing the-final-questionnaire and interview-guide, which were used in-the-survey of the-subject-study-area.

After-preliminary-pilot-testing, two-questions (on the-income-range and on the-educational-level) were removed, from the-final-version of the-interview-guide. The-final-questionnaire, hence, consisted of 12 questions, some of which were in-binary-form, while some open-ended.

The-final-interview-guide also consisted of 12 questions. Simple-interview-guide was prepared in-both; English, and Kiswahili-language. Interviews targeted vendors and shopkeepers, who carry-out business, at the-Stage-market-area, of the-campus. Some-vendors have claimed that they are very-busy, hence refused to-participate; a-total of 37 vendors were interviewed; their-answers were recorded, by the-researchers. On-average, an-interview took about 15 minutes. 10 questions (Q1 - Q9; and Q12) were similar-with the-students’ questionnaire, and the-remaining-two-questions were tailored.

The-study targeted a sample-size of 374 respondents; and achieved a response-rate of 100% (as respondents were offered a small-reward, in-exchange-to fully-completed-questionnaire). This-response rate was judged-as excellent and representative, and also conforms to Mugenda & Mugenda (2003) stipulation that: “a response rate of 50% is adequate for analysis and reporting; a rate of 60% is good and a response rate of 70% and over is excellent”.

Questionnaire-data were coded, entered into SPSS and checked for errors. Data were analyzed list-wise, in-SPSS, so that missing-values were ignored. Cronbach (1951) states, that “one validates, not a test, but an interpretation of data arising from a specified-procedure”. Cronbach’s-alpha-test of internal- consistency was performed, demonstrating high inter-item-consistency; Cronbach's $\alpha=0.828 > 0.8$, for the-students-questionnaire, and $\alpha = 0.713 > 0.7$, for the-interview-guide-instrument. Most-authors recommend that a-value of 0.6 to 0.85 as an-acceptable-value for Cronbach’s alpha; values substantially- lower indicate an-unreliable-scale (either the-questioner is too-short, or the-answers have nothing in- common). The-computed-Cronbach’s $\alpha$, for-both-instruments, was deemed acceptable, according to a-standard-scale (see George & Mallery, 2003).

The-questionnaire-surveys and interviews were carried-out, during four-months of 2017 calendar-year.

3.2. Data on the-responses to the-questionnaire.

3.2.1. Demographic-nature of the-respondents (students).

All the-respondents were Moi-University, main-campus undergraduate-students. 57% (213 students) were males, while females account for 43% (161). With the-random-sample-collection, the-distribution of the-sample within-the-years of study is as-follows (from max to min): 3rd year – 127 students (34%); 5th year - 94 (25%); 4th year - 67 (18%); 1st year - 45 (12%); and 2nd year - 41 (11%); the-age-bracket of the-respondents, was 23.4±2.1.
3.2.2. Responses to the-questionnaire.

The-following-narrative presents a-summary on the-major-findings, from the 12 questions, asked.

Q1) First, the-respondents were asked to-indicate three-most-serious-problems, they are faced with, in-the-campus (including social and environmental-issues). This-question was open-ended. WSM was indicated as-the-second-biggest-problem, faced by 76% (284 students), after the-lack of hostel- accommodation-spaces, which was indicated, as the-major-problem, by 91%. 63% (340) indicated that another-significant (interconnected)-problem is power-surges and irregular and slow-internet-connection. The-rest of the-problems (indicated by limited-number of students) include: Lack of hot-water-provision; no kitchen in the-hostels; Noise-pollution, as some-students are inconsiderate of others, playing music very-loudly, even at night-hours; Lack of security, manifesting in theft-cases, especially when students are out of the-hostels, attending classes, studying at the-library, playing sports-games, or dancing at-disco, among other-activities; ‘boring’-menu, in-the-cafeterias; and high-bus-fare from the-campus to the-nearest-town-Eldoret, among-others.

Q2) The-majority of the-respondents (cumulative 88%), perceive the-campus as-dirty (228 students - 61%) and very-dirty 27% (101 students); 45(12%) perceive it as-relative-clean, while none perceive campus as very-clean or clean.

Q3) The-attitude of respondents, towards WM, was also-measured by attitudes, towards deciding whose-responsibility should it-be to-keep campus clean. The-majority of the-respondents 97% (363) thought that the-MU-administration, was solely-responsible to-keep the-campus clean, the-rest provided no answer.

Q4) On-the-question ‘Do you pay any fee for waste-collection?’. Absolute-majority provided a-negative-answer. 54% (202 students) said that they would-be-willing to-pay for the-waste-collection, but only if the-collection-frequency and efficiency will drastically-improve.

Q5) Another-question was on the-awareness of health and environmental-effects of improper-waste-disposal-behaviors; this-question was also-open-ended. Health-effects stated, by the-majority 63% (236), were: cholera, and diarrhea-diseases, particularly during rainy-seasons. Many- respondents 58% (217) also-stated, that solid-waste, which was not properly-disposed-off, makes the-place stinking and visually-unpleasant (eye-sore), and also-attracts flies, cockroaches, and rats, which can transmit many-diseases, and are dangerous and disgusting. Majority of the-respondents, however, found it difficult to-indicate other-environmental-impacts, of improper SWM, implying lack of awareness on the-environmental-effects, of improper waste-disposal-behaviors and waste-management.

Q6) On-the-issue of the-storage of waste, before the-disposal, 100% stated that no dustbins were provided to-them, for storing their-waste, in-their-rooms. Majority 79% (295) reported that they store their-waste in-reused-shopping-bags, 12% (45) – in-cardboard-boxes; while the-rest 9% (34) used metal-tins.

Q7) On-the-question: Approximately how many kilograms of waste do you (personally) generate/dispose-off every week? The-weight of waste, generated per-week was-reported within a-wide-range: from 1kg to 10kg, while 10% (37) indicated ‘I do not know’. The-highest 36% (135 students) indicated that they generate approximately 5kg of waste, per-week; 27% (101) - 3 kg; 14% (52) - 2 kg; 7% (25)-1kg; 2% (8) - 7 kg; and 4% (16) - 10 kg.

Q8) Students were also-asked where is the-waste taken for disposal? Only 18% (67) answered correctly, that the-waste is taken to-the-MU-dumpsite; 32% (120) indicated that the-waste is taken to a-pit for burning; 16% (60) stated that collecting-center is the-destination, while 34% (127) declared ‘I do not know’.

Q9) On-recycling-practices, majority 66% (247) declared that they do not recycle, while the-rest 34% (127) said, do. Out of these, who recycle, 60% (76) were females. Except for glass-bottles, and electronic-waste, students do not segregate/separate waste, and dispose-off it in-a-mixed-form.

Q10) On-the-frequency of waste-collection, majority - 56% (210) stated that waste is collected more-than-twice, per week, but not daily; 14% (52) equally-declared, that waste is collected once-a-week, and twice-a-week, while 16% (60) indicated that ‘I do not know’.

Q11) On-the-question: What do you do about waste you find/see on the-streets of the-university, e.g., outside-your-hostel? Majority of students - 251 (67%) said, that they will do nothing or ignore the-waste, while the-rest 123(33%) indicated, that they will pick it and put it in-a-nearby-waste-container.

Q12) Lastly, the-students were asked to-propose how to-improve the-current SWM-situation, at the-campus. Some of the-answers-given include: Implementation of effective-waste-collection-system; Employ more-workers to-manage the-waste and provide proper-waste-collection-equipment; Waste-sorting; Recycling of waste; Increase the-number of street-dust-bins, within the-school; Renovation of hostels, to-avoid silt and sand-collection, at the-potholes; Outsourcing cleaners from-outside/private-sector; and periodic-cleanliness-awareness-campaigns, and regular-cleaning-exercises.
3.3. Data on the-interviews.

3.3.1. Demographics of the-respondents.

All-the-respondents were Moi-University, main-campus-vendors. Convenience-sampling were utilized to-select the-sample-size of 37 vendors, where 47% (17 vendors) were males, while 20 females account for 53% of the-subject-sample. Age-spectrum, of the-respondents, was as-follows: 25-35 years of age - 7(19%); 35-45 years of age – 22 (60%); 45-55 years of age -7 (19%), and 55-65 years of age- 1 (2%). 90% (33) were married, one identified himself as-single, while the-rest have not indicated their-marital-status. Primary family-size was reported ranging from 12 to 4 people. The-majority (60% - 22 vendors) stated, that this-job/business (at MU) is the-only-income-generating-activity they are involved-in, while the-rest indicated, that they are also involved-in farming, and husbandry. On-the-years of experience, the-range was rather-wide; from a-minimum of 1 year to a-maximum of 27years; two-respondents (5%) even stated, that they are the-second-generation of vendors.

3.3.2. Responses to the-interview.

From-the-analysis of the-coded-information, obtained via interviews, it was revealed, that:

Q1) Analogues to-students-questionnaire, the-question on the-problems/difficulties, experienced, while working, as a-vendor, at MU, was asked. The-majority (71% - 26 vendors) have identified the-most-significant-problem as lack of tarmac-roads, inside the-market-area, making it impassable at rainy-seasons, and forcing the-vendors to-come-out the-market, to the-main-road, where students can easily-access and buy the-goods. Lack of water-mains-supply, was the-second-biggest-problem, identified by 56% (21). The-vendors usually buy clean-water in 20 liters plastic-containers, water from the-small bore-hole is dirty, and probably contaminated with human-waste, flowing from the-pit-latrines, build on the-shallow underground-water-table, as several-severes-cases of dysentery and hepatitis, were reported, in-that-area. However no proper-investigations were conducted on the-quality of bore-hole-water, to-confirm such- claims. The-third-problem was indicated by 41% (15), as no regular-waste-collection, so the-waste is regularly burned, to-reduce its-volume. In-addition minor-problems were stated, e.g., No public-toilet at the-stage-market; No power-supply in-the-open-market, so after 7 pm, such-vendors are losing customers, due to poor-visibility, and have no other-alternative, but to-stop their-sales; The-place is poorly planned, and hence very congested; and Lack of storage-space, for keeping their-vegetables and fruits, overnight, among-others.

Q2) The-majority 58% (22), perceived the-campus as-dirty; and 31% (11) perceived it as-relatively clean, and the-rest indicated ‘I do not know’, while none perceive campus as very-clean, clean, or very-dirty.

Q3) It-is-important to-explain, that although the-stage-market is situated within the-MU, it is apparently a-private-property, meaning that MU is actually not responsible for the-waste-collection, from the-premises of the-market, Nevertheless, 87% (32) indicated that MU is solely-responsible to-keep the-campus clean, the-rest said ‘I do not really know’.

Q4) On-the-question ‘Do you pay any fee for waste-collection?’. Absolute-majority provided a-negative-answer. Besides, 68% (25), said that they would-be-willing to-pay for the-waste-collection, by either; an-NGO, or any-other-private-entity.

Q5) Another-question was on the-awareness of health and environmental-effects of improper waste-disposal-behaviors; this-question was also-open-ended. Health-effects stated, by the-majority 73% (27), were: cholera, hepatitis, and diarrhea-diseases. Many-respondents 51% (19) also-stated, that solid-waste, which was not properly-disposed-off, it can block drainage and hence lead to-flooding.

Q6) 100% of the-respondents, stated that they had to-buy their-own-waste-bins, to-store their-waste, before the-disposal. Majority 61% (23) reported that they store their-waste in-the-large plastic-containers, 30% (11) used large-metal (alumina)-tins, while the-rest (3) used large-cardboard-boxes.

Q7) On-the-question: Approximately how many kilograms of waste do you (personally) generate/dispose-off every-week? The-vendors reported, that they generate about 12kg, per-vendor, on-average.

Q8) Vendors were also-asked where is the-waste taken for disposal? Majority 89% (33) stated that they throw their-waste into open-pits, situated all-around-the-stage, Only-small-fraction 8% (3) sell their-biodegradable-waste to-to-pig-farmers, the-rest just throw-it-out, mixed with other-wastes. One-vendor (3%) said, ‘I don’t know exactly, as I pay somebody to-deal with the-waste, produced by my-shop’.

Q9) On-recycling-practices, majority 61% (23) declared that they do not recycle, while the-rest 39% said, that they do some-recycling. Out of these, who recycle, 53% (12) were females.

Q10) 39% (14), of the-respondents, believe, that they can reduce their-waste-generation-rates, hence, improving current-state of the-waste-management, at the-campus. The-majority 53% (20), however, said, that they are already doing their-best, and usually very-busy, to-do any-additional time-consuming- tasks. And the-remaining 3 vendors said ‘I don’t know’.

Q11) On-the-question:’Do you think the residents/traders/market vendors are capable of managing the-waste, they generate without help from the-university waste-management-team?’ 82% (30) vendors said ‘No, that is their-job’, while the-rest said ‘Maybe’. The-respondents, who responded on the-negative, did not believe
that all-the-vendors and shopkeepers could effectively-work-together.

Q12) Lastly, the-vendors were asked, how to-improve the-current SWM-situation. Some of the-answers-given include: Recruit outside-party, to-deal with the-waste, and to-collect modest-waste collection-fee, to-cover the-costs of the-operations.

4. Discussion.

4.1. Analysis of the-research-findings.

The-major-results, presented in-sections 3.2 and 3.3 are analyzed, as-follows:

1. The-issue of what constitute a-problem, varies, from-person-to-person (Suleman et al., 2015), nevertheless, both; students and vendors have-admitted, that WM is one-of the-main-problems, at the-campus. In-particular, SWM was identified by 76% of the-students, as the-second-most-serious-problem, while 41% of vendors acknowledged it as the-third-most-serious-problem, experienced at-the-campus. Identifying/recognizing a-problem is the-first-step to-its-solution, hence, it can be considered as positive-step.

2. The-majority (88% of the-students and 58% of the-vendors), perceived the-campus as-dirty and very-dirty. According to Sun (2016): “We all know the bad things of dirty environment: infectious diseases and public health burden”. Dirty-environment is a-key-factor in-the-pathogenesis of chronic diseases, such-as inflammatory-bowel-diseases (IBD) (Liu, 2015; Sartor, 2008). Now scientists have added new-evidence about the-role of dirty-environment and genetics, in-the-development of the-human immune-system. Interested-readers can access the-details via Sun (2016). Besides, the-effect of living, in an-unhygienic and untidy-environment may lead people to-become demoralized, and less-motivated to-improve-conditions around-them. Similar-to-situation, described by Minn et al. (2010), the-students and vendors, participated in-this-survey, were seems to be almost totally unaware, that the-crisis-SWM-situation in-SWM, was-basically caused by their-behaviors; instead, they saw-themselves as the-victims of that-crisis.

3. The-majority, 97% of the-students and 87% of the-vendors, stated that the-MU-administration, was solely-responsible to-keep the-campus clean. This-finding is an-indicator of the-need for environmental-education (EE), to-change this long-held-belief, that our-waste supposed to-be-managed by somebody-else. To-change this-viewpoint, EE should be-offered to the-people/MU-residents, to-help-them understand-to-see a-problem of SWM, as a-shared-responsibility, of both; individuals in-communities, and the-MU-administration. Proper-waste-management is a-public-obligation, as-well-as a-benefit. It-is, therefore, the-responsibility of every-individual and institutions, to-ensure clean-environment.

4. Absolute-majority of both; students and vendors, have declared, that they do not pay for the-waste-collection and disposal. 54% of the-students said that they would-be-willing to-pay for the-waste-collection, but only if the-collection-frequency and efficiency will drastically-improve. 68% of the-vendors said that they would-pay for the-waste-collection, if it-is provided by either; an-NGO, or any-other-private-entity.

According-to Kumar & Nandini (2013): “People’s perception on waste-collection-services and on waste-disposal is primordial for its-willingness to-pay”. The-willingness of the-students and vendors to-pay, for improved-WM-services, shows that they do value the-environment, they operate-in, and they want it to-be decent/clean. This-result corroborates the-findings of Salequezzaman et al. (2001), in their-study of the-willingness to-pay for community-based SWM, in-Bangladesh. People’s perceptions on fees, waste-collection procedure, and health-effects of ill-disposed-waste, are important for their-willingness to-pay, and even, in-exercising environmentally-friendly waste-behaviors (Mwinga, 2014). On-the-other-hand, unwillingness-to-pay could lead to-elicit-burning, careless-dumping, and indiscriminate-littering.

Willingness to-pay, or not to-pay, for WM-services or facilities, could have direct-impact (positive or negative) on-the-reliability and success of any-SWM-strategy (Rahman et al., 2005; Epp & Mauger, 1989). A-number of models have-been-proposed on this-issue (see Atri & Schellberg, 1995; Jenkins, 1991; Skumatz & Beckinridge, 1990), while a-general-Equilibrium-model have-been-commonly-used to- determine the-optimal-fees for waste-collection (Sigman, 1995; Jenkins, 1991). In-their-models, the-consumers had two-disposal-options; garbage or recycling. The-optimal-fees for waste-collection equal the-direct-resource-costs plus external-environmental-costs. Linderhof et al. (2001), has based household waste-collection-charge on weight-based-pricing, in-Oostzaan, Holland. Such a-pricing, however, cannot be used in-developing-countries where the-actual-volume of household-waste arising is not known (Longe & Ukpebor, 2009).

The-study recommends that a-system of payment of service-charges by the-MU, should be-developed (see for-example Isa et al., 2005; and Majid & McCaffter, 1997). Beside, waste-collection and disposal-fee should be included into fee-structure, for students, as they will have more-rights to-demand for effective-WM. Vendors, on-the-other-hand, should outsource WM-services for a-negotiated-fee.

5. Both, students and vendors, demonstrated relatively-good-level of awareness of health and environmental-effects of improper-waste-disposal-behaviors. When people understand the-connection, between their-behaviors and environmental-harm, they are more-likely to-engage in pro-environmental behaviors (O’Connell, 2011; Dango et al., 2010; Mrayyan & Hamdi, 2006).
(6) The-respondents approximately that they generate from 1 to 10 kg of waste, per-week, per-student (0.14-1.4 kg/day/per-student), and 12 kg, per-week, per-vendor (1.7kg/day/per vendor), on-average. The-respondents were asked to-approximate, making an-error highly-possible, therefore provided-figures could-possibly-reflect other; over or underestimation, on their-waste-generation-rates. Nevertheless, the-generation-rates are comparable with waste-generation, in-sub-Saharan-Africa, per-capita, which is generally-low, with an-average of 0.65 kg/capita/day, but spans a-wide-range, from 0.09 to 3.0 kg/capita/day, depending on-economic-status (see Starovoytova, 2018a). According to Alshuwaikhat & Abubakar (2008), educational-institution are similar to-small-towns, based on their-large-size, population, and wide-range of activities, taking place, within them. MU-main-campus is characterized as a-mixture of residents with different-economic-status, age-groups, gender, diverse-social and ethnic-ethnic; these individually, or cumulatively, may affect their-consumption-patterns and waste-generation-rates.

(7) Students were also-asked where is the-waste taken for disposal? Only 18% answered correctly, that the-waste is taken to-the-MU-dumpsite, pointing-out on lack of awareness on SWM-practices, among the-students. Lack of education and awareness of effective-waste-management-practices is one of the-major issue in-developing-countries (Essuman, 2017). According to McAllister (2015), a-study in-Gaborone, Botswana, found that when people lack interest in-environmental-issues, it means that they are not well-informed, which affect their-actions and also-makes-them feel not included in WM-decision-making. On-the-other-side, only-small-fraction (8%) of vendors sells their-biodegradable-waste to-pig-farmers, the-rest just throw-it-out, mixed with other-wastes; the-mixed-waste is regularly-burned, to-reduce its-volume. These-practices show the-lack of consideration on sustainable-SWM-practices. For-example, burning of wastes, contributes considerably to urban-air-pollution, emitting particulate-matter, and persistent-organic-pollutants (POPs); greenhouse-gases (GHGs), generated from the-landfills and untreated leachate, pose-threat to-humans, as-well-as to the-environment (Hoornweg, 2001), and hence, should-be discouraged.

(8) 34% of the-students reported, that they do recycle some-waste. Out of these, who recycle, 60% (76) were females. Except for glass-bottles, and electronic-waste, students do not segregate/separate waste, and dispose-off it in-a-mixed-form. They have explained that they do not see the-importance of separating-waste, since all-the-waste is dumped at the-MU-dumpsite. Metal-scrap-dealers usually buy metals, by weight/per kg, so students just-throw-away small-metal-waste-items, as they do not have sufficient-storage-space in the-hostel, for the-waste to-accumulate and reach at least 1kg.

39% of the-vendors also do some-recycling, where 53% are females. The-vendors reported that they do not throw-away papers/cardboards, unless it-is heavily-soiled, because they use it, mainly for lighting-charcoal-stoves, and for some-other-purposes, for-example they use cardboards for vehicle carpet-protection, especially during-rainy-seasons. They re-use sound-plastic-containers for many-purposes, such-as: poultry and animal-feeders, water-urns, or as seedlings-pots. They however do commonly-burn broken-plastic-materials containers, as there is no recycling-facility near-by. Empty-Coca-cola- and beer glass-bottles are usually kept by 100% of the-respondents, for deposit-return, when buying a-filled bottle. Glass-containers are usually reused as storage-containers, for many-different-items, such-as: water, milk, sugar, rice, salt, nails, and alike. Metal-scrap are always kept, by the-vendors, and sold to a-third party/scrap-dealer, for further-resell to a-recycling-company. These-findings are-in-line-with a-recent study, by the-study of Banga (2013), in-a-Ugandan-context.

The-deposit-refund-system, for bottles, has been-working very-effectively. All-the-respondents (students and vendors) reported that they never throw-away glass-beverage-bottles. Thus no empty-glass bottles (beer and soda-bottles) are mixed with the-waste-stream, unless broken.

In-this-study, with both; students and vendors, females constituted the-larger-share, of the-people who recycle. Several-findings suggest, that gender-difference could influence people’s perception on SWM (Ehrampoush & Moghadam, 2005). A-study, by Meneses & Palacio (2005), determined that women are more-likely to-be-engaged in-household-recycling, than their-male-counterparts, probably, due-to their- traditional gender-roles. Besides, some-studies demonstrated that, compared to-men, women were more-aware of the-importance of good-behavior towards the-environment (Adeolu et al., 2014; Mapa, 1997). According-to some-authors, such-as Arora-Jonssons (2011) and Guagnano et al. (1995), women are more-environmentally-oriented, than men. This-study is in-accord with such-findings.

Age is expected to-play a-significant-role, as-maturity could affect level of awareness on environmental-health and sanitation (Bradley et al., 1999; Eagles & Demare, 1999). The-data on-the-age, of the-respondents, shows that subjects are matured-adults, whose reasoning-level, as regard household- waste and its-management, is expected to-be-high, and thus facilitate public-involvement, in-SWM-process. On-the-other-hand, even-though, recycling encompasses several-advantages, such-as: economical-rewards, and sustainable-use of natural-resources (Buenrostro et al., 2014; Scheinberg et al., 2011; Hazra & Goel, 2009; Hasnain et al., 2005; Bolaane & Ali, 2004; Ostrom, 2000), the-formal-recycling has not been well-established in-Kenyan-universities, including MU-campus. Youths could be disinterested, in-venturing in-SWM, because they consider it ‘dirty and smelly business’.

119
Recycling behavior is also strongly influenced “by the knowledge of where, when, and how to recycle” as stated by O’Connell (2011). The findings of a study, conducted in over twenty-two developing countries (Guerrero et al., 2013) suggests, that when citizens receive information about the benefits of recycling, and how to sort the waste, and they participate in the designing of the programs, they are more likely to participate in recycling campaigns. In terms of extrinsic (i.e., social-reinforcement and monetary-reward) and intrinsic motivation (i.e., personal-satisfaction) both; were found to affect recycling behavior. However, having a sufficiently high-level of motivation, itself, and positive attitudes, toward recycling, do not guarantee, that an individual will act accordingly (Aini et al., 2002).

On the other hand, according to Miller & Morris (2018): “there is a commonly held myth that providing individuals or groups with information will lead to appropriate personal and organizational actions and performance, but this is far from true”. Besides, Pfeffer and Sutton, point out, that while information and knowledge are ‘crucial to performance’, but knowledge is often not sufficient to cause-action: “…there is only a loose and imperfect relationship between knowing what to do and the ability to act on that knowledge’. The inability to transfer knowledge of what needs to be done into action, or behavior, which is consistent-with that knowledge, is referred as the ‘knowing-doing-gap’ or the ‘performance-paradox’. While it was believed that the ‘knowing-doing-gap’ was due to a lack of personal-knowledge or skills, research conducted suggests, that while personal-knowledge is important in ensuring action, it is not as important as having management-systems and practices, in-place (Pfeffer & Sutton, 2000).

More-recent-research-findings, on recycling behavior and attitude, suggest that convenience, level of satisfaction, toward recycling services, and economic incentives also influence individual behaviors and attitudes toward recycling. Economic incentives, such-as rebates, from containerized-beverage-deposits, or money, saved from the costs of recycling-disposal, encourage participation. Convenience-factors, such-as proximity to a drop-off-center and frequency of collection-services, are strong-predictors of recycling behavior and attitude (Omran et al., 2009; Saphores et al., 2006). Typically, people are more likely to participate in waste-management-activities, for example, recycling, when they observe others, in their vicinity, recycling (Lumbrañas & Fernández, 2014). Besides, being informed about an issue is even more likely to influence-behavior, when knowledge is gained from first-hand-experience (Mariwah et al., 2010). For example, a survey, done by the Custom Research North America, in 2011, respondents were motivated by family, friends, and neighbors, to-join recycling-efforts in-their-communities. All the above can call for the active-sensitization of communities on the benefits of recycling, of SWM, as an alternative source of livelihood.

(9) Majority of students (67%) said, that they will do nothing or ignore the waste, if they see it, anywhere, in-the-public-places, at-the-campus. In particular, the-majority stated, stated that: ‘I do not care’; ‘Why should I do it?’ ‘My single action cannot change the situation of massive litter all over the campus’; ‘If I pick the waste, in front of me, the-workers, assigned to manage waste, will be doing nothing, and yet receiving their pay’; Some said, they are ‘busy, so they just do not want to waste their precious-time’; Yet some explained, that they ‘do not want to get dirty’; some said that ‘this is unusual behaviors and they do not want to be ridiculed labeled as Waco/strange-person’. This finding is not in agreement with (Klundert & Lardinios, 2005; Bernstein, 2004), that people are more concerned, about waste when it is at their immediate-environments. This study is more in accord-with the studies, which have also shown, that students exhibit moderate to unsatisfactory practice-level on waste management (Desa et al., 2011; Adeolu et al., 2014; Ahmad et al., 2015).

Some researchers blame these negative attitudes on poverty. It is quite understandable, that improved incomes allow people to invest more in waste collection (Telfer, 2002). However, without demeaning the poor, one does not have to wait for income improvement, before avoiding the habits of littering, or ignoring the waste ‘under one’s nose’. Besides, generally, people, who own property, have the incentive to take good care of it, unlike the one, owned by a large-number of people, or where there is non-ownership, like public places. This appears to be a ‘tragedy of the commons’ issue (Hardin, 1968), is applicable to this study.

This situation is explained by the socio-ecological theory, which stipulated, that all levels of society must be addressed, if peoples’ attitudes towards SWM can be improved. With highly-supportive structural conditions, even individuals with negative attitudes tend to behave in an environmentally sound way, while highly-restrictive. In contrast, at MU, conditions were able to discourage even the individuals with positive-environmental attitudes, as the waste collection services were not provided regularly and universally, in all residential areas. This is in accord with the study by Edema et al. (2012).

The majority of the residents also did not realize the risky effect of their waste disposal etiquette, and did not have a sense of accountability. While littering, on public spaces, was widely practiced, it was not necessarily proper, within personal household space. This, therefore, would imply, that the waste, left in public areas was not perceived as a public health hazard. This finding is in accord with (Mwiinga, 2014); and

(10) Finally, both; students and vendors have provided some reasonably practical suggestions, in order to improve current situation on SWM, at the campus.

Analysis of the research findings, revealed, that despite the relatively satisfactory level of awareness,
expressed by the students and vendors, concerning the effects on improper-SWM, their behavior, practices, and their willingness to act towards the alleviation of those problems, are largely inadequate, manifesting in so-called ‘knowing-doing-gap’. The gap, between knowledge and practices, on household-wastes, was also indicated in the studies, done by Eweth et al. (2016); Ortiz (2001); Olli et al. (2001); and Inglehart (1995).

It is also evident, that their knowledge, attitudes, and practices need to be improved, which require significant and sustained behavioral change. Although many students have already developed principal-attitudes and habits, before entering the university, campus is the first time many students are living on their own, making their own behavioral choices, where they are not regulated by their parents/guardians. Many habits, that students create, during their time in university, will continue into their adult lives. The university, hence, has a unique opportunity to influence such behaviors, towards responsible environmental behavior.

Behavioral scientists, such as Gagne and Skinner (see Curzon, 2003), explain that behaviors, opinions, and attitudes, which are rewarded and reinforced, are likely to be repeated and, ultimately, incorporated into personal value-set and routine behavior. The wise use of rewards and reinforcements increases the chance, that the individual will repeat the desirable attitude and may serve also as an example, for others, to adopt the attitude as well. The study, hence, recommends to introduce some competitions, for example for the cleanest-hostel, or the floor/level, in a multi-story-hostel, etc., where students will be rewarded, for their efforts, by means of public acknowledgement of the winner, and even by some tangible rewards (subject to sponsorship).

4.2. The need for Environmental awareness and education.

Since cultural derivatives, beliefs, perceptions, and attitudes, are learned response-sets, they can be changed through education (Evison & Read, 2001). In the past, Environmental Education (EE) and behavior, were thought to have a linear relationship. However, recent studies have proven that although knowledge-based education is a key-factor for environmental behavior, the relationship, between the two, is relatively weak. Other factors including: personality traits, empowerment, knowledge of action-strategies, and situational factors, all influence an individual’s behavior (Boadi, 2016; Sessa et al., 2009; and Hungerford & Volk, 1990).

Regarding the analysis of environmental behavior, variables such as: the unselshish-behavior, have been used, i.e., recycling, saving energy, or other activities, based on personal rules, economic considerations, and feelings of moral obligation (Brehm & Eisenhauer, 2006; Portinga et al., 2004; Thanh et al., 2012). However, self-efficacy is also important, because it involves the extent that an individual believes how much their actions will matter (Ewerth et al., 2005).

According to McAllister (2015); Hoornweg & Bhada-Tata (2012); and Aini et al. (2002), it is important to create sustainable waste systems, as well as promoting environmental citizenship, amongst community members, through improved public awareness and community participation in waste management. Findings of previous studies by Olli et al., (2001), and Diekmann & Preisendorfer (1998), also suggest that the level of consistency, between environmental attitudes and behavior is affected by a person’s knowledge and awareness, public verbal commitment, and their sense of personal responsibility. The best way to promote environmental awareness issues and raise up environmentally responsible citizens, is through increased access to EE (Taylor et al., 2009).

Fearon & Adraki, 2014; Mwiinga, 2014; Minn et al., 2010; and Kasapoglu & Turan (2008), have also revealed the importance of public awareness, for better management of waste. Moreover, Kamara (2006), and Garmer (2001), state that success in waste management and disposal directly relate to the success of EE. In addition, Mamatha (2011), states, that without proper education, orientation, and public awareness, at all levels of society, it would be difficult to effectively manage solid waste. Besides, increasing numbers of people, who are knowledgeable, about the health effects of ill disposed solid waste, may influence their behavior. The WM behaviors, of citizens, can play an important role, in solving WM problems, by minimizing the volume of solid waste, and effectively eliminating waste, and in turn, minimizing potential impacts on the environment (Xiao et al., 2017; Budică et al., 2015; James & Moseley, 2014; US-EPA, 2013; Castagna et al., 2013; Matsui et al., 2007). Several environmental problems (e.g., air-pollution, water-pollution, and odors), caused by improper waste disposal, are consequences of human behaviors; therefore, citizens’ engagement in sustainable waste management behaviors (SWMBs) should be widely promoted (Wiwanitkit, 2016; 2014; Chinda et al., 2012; Muttamara et al., 2002).

On the other hand, according to Kenya Country Report (2005-2012) and NEMA (2008; 2004), Kenya is facing many environmental challenges, such as: droughts, natural disasters, floods, conflict and insecurity, infrastructure use, food insecurity, soil erosion and land degradation on the farmlands, desertification, acute water shortages, climate change and variability, loss of biodiversity, proliferation of slums, human wildlife conflicts in the conservation areas, the loss of forest cover, and poor waste management systems. Moreover, about 88% of the country’s total surface area is comprised of arid and semi-arid lands (ASALs), while desertification is on the increase as a result of the fragility of ecosystems. These problems are a reflection of a crisis, which cannot be resolved by law alone. There is need, for a change, from within; in so far as attitudes towards the
4.3. Education to create awareness, and change attitudes.

4.3.1. Education for Sustainability.

UNESCO declared 2005-2014 as the UN-Decade of Education for Sustainable Development (ESD) (UNESCO, 2005), with the goal to strengthen formal, informal, and non-formal education, and learning processes, for sustainability. The purpose of ESD is to re-orient education, in order to contribute to a sustainable future, for the common-good, of present and future generations. The decade was formed to scale-up the work, linked to the Agenda 21 document, from the Rio Summit (Agenda 21, 1992).

Education for Sustainability is often positioned, as additional, or even ignored, in national educational reforms, and revisions of frameworks, for education (Wals, 2012), which instead tend to push for cognitive and academic knowledge transmission (Inoue, 2014), and the primary task for early childhood education is often summarized as 'readiness for school' (Barratt et al., 2014; UNESCO, 2014a).

ESD recognizes the environmental, social/cultural, economic, and political dimensions of the learning processes involved (UNESCO, 2005) and aims at creating change, focusing on rethinking and re-making educational programs and pedagogies, to support social and cultural transformations, towards sustainable development. Therefore, ESD can be considered to represent an attempt to provide equity with, to and for future generations (Hagglund & Johansson, 2014).

The OMEP world project is placed within a child-oriented perspective (Somer et al., 2010) and is designed to especially invite child participation. This child perspective is of special interest, within education for sustainability, which strives to elevate also the children's rights, as citizens (Hagglund & Johansson, 2014; Dahlberg & Moss 2005). Young children should be recognized as rights holders and rights partners, in a broader societal perspective, that also includes collective, inter-generational, and rights, beyond those held by humans (Davis, 2009).

The term 'Education for sustainability' or 'sustainability education' complements a number of other fields, such as: environmental education, global education, economics education, conservation education, development education, multicultural education, outdoor education, global change education, and others.

4.3.2. Environmental education (EE).

Education has been recognized, as one of the important tools, for conserving the environment, through the cultivation of knowledge, skills, values, and positive attitudes, towards the environment (Burer, 2014).

According to NEMA (2008) and Muthoka et al. (1998), environmental education (EE) is a process of learning about the environment, in order to benefit from it, sustainably. EE aims at developing environmentally literate citizens (citizens with skills, knowledge, and inclinations, to make informed choices, concerning the environment). EE has also been defined, as the learning, that occurs in habitats, that include wildlife parks, nature centers, museums, aquaria, arboretums, wildlife refuges, camps, and many others. It includes the mass media, such as: television, radio, newspaper, and magazines, when used away from schools, to disseminate information on environmental issues (Howe & John, 1988). Besides, the International Union for the Conservation of Nature (IUCN) defines EE as a process of recognizing values, and clarifying concepts, in order to develop skills and attitudes, necessary to understand, and appreciate, the inter-relatedness, among people, their culture, and biophysical surroundings (Panneerselvam & Ramakrishnan, 2005). According to UNESCO (2014a), EE refers to organized efforts to teach how natural environments function, and particularly, how human beings can manage behavior and ecosystems, to live sustainably.

EE has been defined differently, by several scholars and organizations; however, the UNESCO (2005) definition is appropriate for this study, which states, that EE is a process of achieving environmental and ethical awareness, values and attitudes, skills, and behavior, consistent with sustainable development, and for effective public participation, in solving environmental problems. According to Mwinga (2014), EE, therefore, refers to any education, aimed at behavioral change, to reduce SWM problems.

EE is interrelated with multiple other disciplines of education, which do complement EE, yet have their unique philosophies. For example: Citizen Science (CS) (see Bonney et al., 2009); Education for Sustainable Development (ESD) (see UNESCO, 2014b); Climate Change Education (CCE) (see Chang, 2014; and Beatty, 2012); Science Education (SE) (see Wals et al., 2014); Outdoor Education (OE) (see Clarke & McPhie, 2014); Experiential Education (ExE) (see AEE, 2002; and ERIC, 2002); Garden-based learning (GBL); and Inquiry-based Science (IBS) (see Walker, 2015).

EE plays a critical role, in enhancing movement upward along the Waste Hierarchy, from mere disposal dumping, through recycling, and re-use, to prevention (Kamara, 2006), towards achieving and

The-challenge of EE is to-close-the-gap, between knowledge and ethics, to-internalize environmental-knowledge, so that it will-be-reflected in new-behavioral-norms (EPOSW, 1995).

4.3.3. EE in-Kenya.

4.3.3.1. Level of environmental-awareness.

Components of environmental-awareness can-be-classified into two-aspects: (a) the-perception of environmental-problems; and (b) the-behavioral-inclination to-protect the-environment. The-perception of environmental-problems involves people’s objective-knowledge, opinion and environmental-realities. It includes two-major-aspects: (i) Perception of environment-protection (EP), which includes the-perception of EP-efforts and scientific-knowledge of EP; and (ii) Perception of environmental-conditions, which includes the-perception of general and local environmental-conditions and perception of various specific environmental-problems (Desa et al., 2011).

Data on levels of environmental-awareness, in-Kenya, is scarce. But, going by recent-responses, by the-Kenyan-citizens to-various-environmental-issues, one can conclude, that some-achievements have-been-made; for-instance, over 35,000 people appended their-signatures in a-bid to-petition the-Minister of Environment, against the-proposed-excision of natural-forests, in-various-parts of the-country. Besides, the-formation of Neighborhood-Associations, in-the-urban-centers, to-look at environmental-issues, among other-things, is an-index of heightened-awareness to-protect the-environment. People are also-participating more in-resisting-actions, either by the-government, private-sector or individuals, which are seen to-be a-threat to the-environment. This is especially in-the-fight against-grabbing-public-land, or other-such-land, that is deemed to-be-ecologically or otherwise-significant (Kahumbu, 2014).

4.3.3.2. Organizations, focused directly and indirectly on the-Environment, and providing EE, at-different-levels.

Both; the-developed and developing-nations are implementing strategies, in-order-to-educate the-public about environmental-issues and concerns. Educating people, about the-environment, takes-place in-both; formal-settings (e.g., within the-structure of the-school-environment), as-well-as non-formal-settings (e.g., out in the-fields, within local-organizations) (Unger, 1993).

The-account on organizations, which focused on the-environment, and on the-participation, in-EE and in-SDE, in-Kenya, should definitely start-with the-Professor Wangari Maathai, who was an-internationally-renowned Kenyan-environmental-political-activist and Nobel-laureate. She was awarded the-2004 Nobel-Peace-Prize for her ‘contribution to sustainable development, democracy and peace’. She became the-first-African-woman, and the-first-environmentalist, to-win the-prize. In-1977, Maathai founded the-Green-Belt-Movement, an-environmental-non-governmental-organization, focused on the-planting of trees, environmental-conservation, and women’s-rights (www.greenbeltmovement.org.)

In-addition-to GBM, there are a-number of organizations, which focused on the-environment, in-Kenya, The-selected-list is as-follows (Peralta, 2014; Kahumbu, 2014; Flood, 2014):

- The-African-Conservation-Centre -- a-non-governmental-organization, based in-Kenya, founded in-1995. In-2007, it received a USD 200,000 grant from the-Ford-Foundation. Their-work has focused on-capacity-building ‘to conserve wildlife through sound-sciences, local-initiatives and good governance’. One of its-projects, the-Shompole Group-Ranch, won the-2006 Equator-Initiative-Award, for community-driven biodiversity-based-business, from the-UNEP;

- The David Sheldrick Wildlife Trust operates the-world’s most-successful orphan-elephant-rescue and rehabilitation-program, and is one of the-pioneering conservation-organizations, for wildlife and habitat-protection, in-East-Africa;


- The-Kenya Wildlife-Service (KWS) is a-Kenyan-state-corporation, that was established in-1989, to-conserve and manage Kenya’s wildlife, and protect and conserve the-flora and fauna;

- The-Ishaqbini-Hirola-Conservancy is a-community-based conservation-area, located in-Garissa-County, Kenya. The-conservancy covers approximately 72 km². It-is located along the-eastern-bank of the-Tana-River, and borders the-former Tana-River-Primate-Reserve (1976-2007). Despite its-small-size, the-conservancy is a-core-refuge and breeding-ground, for the-endemic and critically-endangered Hirola-antelope. Together with the-Arawale-National-Reserve, the-conservancy forms a-key-part of the- Hirola’s-habitat;

- Men of the-Trees is an-international, non-profit, non-political, conservation-organization, involved in planting, maintenance, and protection of trees;
**The-Tsavo-Trust** is a non-profit wildlife-conservation-organization, which covers Tsavo-East National-Park, Tsavo-West National-Park, and Chyulu-Hills National-Park, in-Kenya;

**WildlifeDirect** is a-Kenya and U.S.A. registered-charitable-organization, founded and chaired by African-conservationist Richard Leakey, who is credited with putting an-end to the-elephant-slaughter, in-Kenya, in-the-1980s. Its-main-office is located in Nairobi, Kenya [www.gorillawildlifedirect.org];

**The William-Holden Wildlife-Foundation (WHWF)** is a non-profit-organization, based in California, U.S.A., whose principal-project is the-William-Holden Wildlife-Education-Center, located near Nanyuki, Kenya. The-Education-Center is dedicated to wildlife-conservation and environmental-studies, for local-people, with occasional-visits from international-groups;

**NEMA**, Kenya is a-lead National-implementing-agency, for the-government, on-all-issues, related to the-environment. It has collaborated with the-private-sector, formal, and non-formal-education institutions, NGOs, CBOS, and religious-groups, among-others. In-addition, substantial-efforts, have-been made by several-UN-organizations, based in-Kenya, such-as:

**UNESCO** has participated in-the-development of the-national ESD-implementation-strategy in Kenya, and the-ESD implementation-guidelines, for the-provincial and district-level;

**UNEP’s Directorate of Environmental Education**. ESD-activities focuses on-higher-education, and works-through universities. It has three-main-programs: education, networking, and training. In-education, the-UNEP inspires universities to-re-orient their-curricula towards-sustainability, by provision of tools – higher-Education-curriculum re-orientation guidelines, support workshops and provision of resource-people. **UNEP** is also-repackaging the-concept of ‘greening-universities’, as a-reference-point for teaching and a-living-laboratory. The-networking-program provides a-platform for sharing-knowledge, expertise, and resources. It also facilitates the-MESA-program, whose membership comprises six-Kenyan public-universities. Training is mainly on scheduled-courses for university-dons, conducted in-selected 10 universities in-the-World. **UNEP** also supports EE-activities in-Kenyan-schools and universities. It is involved-in and provides-support to-community-education, for the-Nairobi-river rehabilitation and restoration-project. There are number of publications on ESD, including: (i) Higher Education curriculum re-orientation-guidelines; (ii) Greening-University tool-kit; and (iii) Graduate curriculum-development source-book on: (a) for ecosystem-management, and (b) green-economy;

**UNU (United Nations University)**, Education for Sustainable-Development for Africa Project (ESDA) is jointly implemented UNU-Institute for Sustainability and Peace (ISP), and Kenyatta-University, in-Kenya.

**UN-HABITAT** is a-member of the-ESDA-joint-project (between UNU-ISP and Kenyatta-University). It also-provides technical-support on urban-issues;

**Waste management Association of Kenya (WEMAK)** is the-industry-umbrella-group, for waste-collection-companies, in-Nairobi. The-NAMA will support WEMAK, through capacity building-workshops, operational-support, in-the-form of funding core-staff, as-well-as providing GPS- trackers to its-members; and

**The National Climate Change Secretariat (NCCS)** was established by the-Ministry of Environment and Natural-Resources (MENR) to-help it gather and collate input, and advice, from key change-stakeholders, for its-use in the-coordination of Kenya’s climate-change-activities.

On-the-other-hand, EE-centers, complement school-programs and provide students with an-opportunity to-study particular-aspects of environment-sustainability, in-the-areas, where the-centers are located (Ballantyne, et al. 2008). Conservation-education-centers, in-particular, provide the-necessary information that enables building-up of the-crucial-support for conservation (Packer & Wade, 2008; Indakwa, 2002). Some of such-institutions, in-Kenya, included: Nairobi-animal-orphange, the-Butterfly Centre, Kisumu-Impala-Park, Mamba-Animal-Village in-Mombasa, National-Museums of Kenya, and the Elsamere (Gathuku, 2013). Other-organizations include:

**The-African-Fund for Endangered-Wildlife** - Kenya (AFEW-K), popularly-known-as the-Giraffe Centre, is a-charitable not for profit-making-organization, whose main-objective is to-educate the-Kenyan youth on-the-importance of conserving-wildlife and the-environment. The-Centre was founded in-1979, as a-breeding-Centre for the-endangered Rothchild’s-giraffes, and in-1984 conservation-education-programs were launched, with-the-main-target being the-school-students (AFEW-K, 2010). This-program is of immense-popularity, with the-number of school-children, visiting the-centre, having risen from 800 in-1983 to 57,514 students, in-2008 (AFEW-K, 2009), while in-2011 the-numbers rose to 61,986 (AFEW-K, 2011).

**Wildlife Clubs of Kenya (WCK)** provides conservation-education to-youths, and support wildlife-clubs, through training, information-sharing and advocacy. This is supported through (i) a-teacher training-program; and (ii) an-annual-student-competition, on ESD-best-practices. WCK has also-published and distributed a-number of ESD-related-materials, including thematic-pack on: conservation of forests, energy, water, wildlife, and on combating climate-change. As part of awareness-creation, WCK carries-out an-annual community-conservation-day and support radio-programs on-Environment and the-Youth. WCK also has a-mobile-education environmental-outreach-program to-schools and tertiary-institutions.

**Lake Victoria Catchment Environmental Education Program** is coordinated by World-Wide-Fund for
Nature (WWF), the-program aims to empower catchment-communities, schools, and regional-partners, in sustainable-use and management of natural-resources. This is done through a-whole-school-approach, looking at heath, sanitation, nutrition, and children-right-to-education, which is infused-through-training.

African Fund for Endangered Wildlife (AFEW) -- provides support for environmental-education programs on wildlife-conservation, with a-special-emphasis on endangered-species. It has also established a-resource-centre and developed a-program, for training-trainers.

Jacaranda Designs – Chanuka-Express is an-ESD-mobile-outreach-program on safety, peace, health, hygiene and sanitation, environment, youth, and community-development, for young-people, run by Jacaranda Designs, in-collaboration-with UNESCO.

More-details, on each of the-listed-organizations, can be-obtained via their-respective-official-web-sites.

In-addition, more and more NGOs and CBOs, which are focusing exclusively on the-environment, have been registered, in-Kenya. These are: Eco-News; Uvumbuzi-Club; Mazingira-Institute; Kenya Organization of Environmental-Education (KOEE); East-African Wildlife-Society; Wildlife-Clubs of Kenya (WCK); Society for Protection of Environment in-Kenya (SPEK); Undugu-Society of Kenya; Kenya Consumer-organization; Sustainable-Community Development-Services (SCODE); Kenya-Institute of Organic-Farming (KIFO); Forest-Action-Network (FAN); Friends of the-Mangrove; Friends of Nairobi Arboretum (FONA); Learning and development, Kenya (LDK); World-Vision-Kenya (WV-K); Maendeleo-Ya-Wanawake Organization (MYWO); Kenya-Association of Adult-Learners (KALA); CARE Kenya; Intermediate-Technology Development-Group (ITDG); Kenya-Association of Adult-Education (KAEA); and Sustainable-Community Development-Services (SCODE), among-others. For-details, on-each, of the-listed-NGOs, see KOEE (2002).

4.3.3.3. Specific-efforts-of-the-educational-sector.

Unger in-his-1993-study, on the-EE, in-Kenya: stated that:"EE, world-wide, is increasingly-seen as a-necessity". This-statement is still-valid-today, after 25 years of its-first-proclamation, meaning, that EE is paramount as-never-before. In-Kenya, several-attempts have been-made to ‘environmentalize’ the- curriculum, at-different-levels of education. In-particular:

Kenya Organization for Environmental Education (KOEE) is mainstreaming ESD into-the primary and secondary-school-curriculum, based-on an-environmental action-learning-approach in the-Eco-Schools Program, and ESD-teacher-training-programs. KOEE is also-working-with Faith-Based-Organizations (FBO), in-raising-awareness and building-capacity on ESD. At early-childhood-education-level, EE is integrated in-the-curriculum, using a-thematic-approach. At the-primary and secondary-school-level, environmental-issues are mainstreamed in the-existing-subjects, using a-multidisciplinary-approach. Besides, all teacher-training-colleges are currently-offering courses in-EE. On-the-other-hand, Kenyan- universities are yet-to-implement a 'greening' university-campus.

The-Ministry of Education has-already-initiated the-process of reviewing the-curriculum through; it-is hoped that appropriate-messages on the-environment will-be-incorporated in-each teaching-subject, to-make environmental-education, in-schools, a-reality. KIE in-collaboration-with PEEPSEA has developed textbooks, for primary-schools, on the-subject of environment, while teachers’ guides, on-the-subject, have also-been-developed. In-addition the-Kenya-Organization of Environmental-Education (KOEE), has introduced a-new-approach of inculcating environmental-knowledge, known as Environmental-Action- Learning (UNEP & KOEE, 2000).

EE at tertiary-level: This-sub-sector is composed of Teacher-Education, Polytechnics, Technical-Institutes, Institutes of Technology, and Universities. The-overall-goal of this-sub-sector is to-train environmental-experts.

EE is offered in the-Kenya-polytechnic and Kenya-Science-teachers-college. Some-elements of EE are taught in-specialized-training-institutions, such-as: Naivasha-Wildlife and Fisheries-Institute, Water Training-Institute, Londiani-Forest-College, Medical-Training-Institute, and Agricultural-Colleges and Institutes.

At the-level of universities, EE is offered at both; undergraduate and graduate-level; as a- full-course, in-some-universities, and as a-unit, in-others. For-example: at the-University of Eldoret (former Moi-University) and Kenyatta-University, fully-fledged-Schools, focusing on EE, planning, and management, have been-established. Private-Universities are also-offering environmental-courses (KOEE, 2002). In-addition, EE is being-taught as a-full-three-unit-course in-Moi and Kenyatta-Universities. At Kenyatta-University, students pursuing Bachelor of education-degree must take a-core-cause in-EE. At Moi University, at the-School of Engineering, EE-courses are taught at undergraduate-level at the-department of Chemical & Process Engineering; Civil & Structural-Engineering, and Manufacturing, Industrial & Textile Engineering. Besides, Jomo-Kenyatta-University of Agriculture and Technology (JKUAT) has developed an-ESD-policy to-guide its-programs and operations, assisted by the-Environmental-Program-Support (EPS), within NEMA, and funded by the- Danish-Development-Agency (DANIDA) and the-Swedish International-Development-Cooperation-Agency (SIDA) (MOEST, 2005a; 2005b).
4.3.3.4. Initiatives and approaches.
Two-key higher-education-initiatives, in-Kenya, include the-network of Mainstreaming-Environment & Sustainability into African-Universities (MESA), and the-Education for Sustainable-Development in-Africa Project (ESDA). Besides, Nairobi-City Council-Directorate of Environment has-developed a-SWM strategy, based on community-training on sustainable-SWM, including waste for wealth-creation. The-project is expected to-connect with the-ESDA-training, that will-take-place at the-Kenyatta-University (NEMA, 2008a; 2008b).

Moreover, according to UNESCO, some-organizations and universities, such-as the-UNU; Sustainability Institute for Community-Development, at the-Kenyatta-university; the-Commonwealth Scholarship Commission-East; African-Breweries-Limited; SIDA; and different-governmental-ministries offer scholarships for MSc. degree-courses, in-the-area of sustainable-development and ESD. UNESCO and DANIDA have both-provided-funding for the ‘Eco-schools Program’ in Kenya, in-its-ESD-work with-schools. The-UNESCO, Nairobi-Office supported the-establishment and subsequent-launch of RCEGN, in-2007. Testing of an ‘ESD-Media-Training-Kit’ also received both; technical and financial-support from UNESCO. Since then, the-media has undertaken some-activities, including critical- advocacy and public-awareness-campaigns. UNEP is also-supporting the-World-Environment-Day activities (UNESCO, 2011).

The-Higher-Education Sustainability-Initiative (HESI) was created as a-partnership of UN-entities (UNESCO, UN-DESA, UNEP, Global Compact, and UNU), in-the-run-up to the-United-Nations Conference on Sustainable-Development.

At a-local-context, in-Uasin-Gishu-County (where subject-university is positioned), the-following initiatives, started by various-groups, to-promote EE-programs: (i) An-environmental-group, called Itinerant-Group for Environmental-Amelioration (IGEA) has been involved with about 10 schools, in-Ntonyiri and Igembe-regions, in-nursery-establishment and tree-planting-programs; (ii) Various-schools, both; secondary and primary, have-initiated clubs, like Wildlife-Clubs of Kenya, 4K clubs, and Environmental-clubs, to-promote-conservation of the-environment, in and around-their- schools. There are over 50 schools with such-initiatives, and the-District-Environment-Officer is co-coordinating their- activities; and (iii) University of Eldoret, which is based in the-district, offers a-several-degree-programs in Environmental-studies at Masters’ and PhD-level (Burer, 2014).

Reporting of Performance-Contracting (PC) for Environmental-Sustainability, by public universities:
PC- targets, for Environmental-Sustainability, for Kenyan-Public-Universities, were introduced in-the-2012/2013 financial-year. The-objective of PC is ‘to ensure that performance is measured using international best practices and that performance targets are grown to the extent of placing the country on the cutting edge of global competitiveness’ (Republic of Kenya, 2014). Tertiary-institutions are required to-submit-quarterly performance-reports to the-government, for the-purposes of monitoring-progress of performance, and for annual-evaluation of performance.

The-performance-criteria consist of seven-broad-areas, each with several-sub-categories. Environmental-sustainability is a-sub-category, within the ‘Non-financial category’, of the-performance criteria. Environmental-sustainability-reporting is done-through the-National-Environment Management Authority (NEMA), which provides guidelines to-universities on-environmental-sustainability-targets in-each annual-cycle. The-Authority also-analyzes the-submitted-reports and gives-feedback to-the reporting institutions and the-Ministry of Devolution and National-Planning. The-universities and other-tertiary- institutions were required to-select four out of eight-environmental-sustainability-targets, for implementation, during the-annual PC-cycles. The-government, through NEMA, prescribed the-activities, for each-focal-area, and the-indicators, for verifying the-degree of achievement, of each-target (Kobia & Mohammed, 2006).

Although a-good-start to-encourage-universities to-embark sustainability-initiatives, the-proposed indicators were rather-general, but more-importantly, it was not clear how incremental-environmental outcomes would-be-achieved.

A-recent-study by Mungai (2017), on 22 public universities, in-Kenya, for the-three-years, since the-introduction of PC, revealed that: (i) only 10-16 universities were submitting their-quarterly-reports; (ii) Besides, the-response-rate for submission of quarterly-reports, by the-universities, has-been-declining, from an-average of 60.2% in-2012/2013 to 44.3% in-2014/2015; and (iii) The-last four-targets (see Table 2), including waste-management-initiatives, were-selected by less than 41% of the-public-universities.
In addition, Climate change mitigation and adaptation initiatives involve installation of low-energy consumption-devices, installation of rainwater-harvesting-structures, and installation of alternative-sources of green-energy. The-likely-cost-implications, in-selecting this-target could have-discouraged most-universities. Target on waste-management-initiatives involved adoption of the 7Rs, installation of waste-bins, and segregation of waste, waste-collection, by service-providers, who are licensed by NEMA, and procurement of goods and services, that are environmentally-friendly. Some of the-measures, reported to-have-been-undertaken, included introduction of waste-segregation-bins, handling of electrical and electronic-waste, and reducing and reusing-waste. The-requirement on installation of waste-segregation-bins is in-line-with best-practice, but it needs to-be-supported, by requisite-policy and resource-recovery and recycling-infrastructure, which are underdeveloped, in-the-country (Mungai, 2017).

It is also-clear, that few-universities have a-budget-line for environmental-sustainability-initiatives. Most-universities lack baselines and continuity of initiated-activities. Hence, the-impacts of these-activities are difficult to-assess and report-on. The-level of involvement of students, and other-stakeholders, is weak, in-almost-all-universities. That-study also recommended expansion of the-scope of the environmental sustainability PC-targets, to-address the-post-2015 global-sustainability-agenda, by aligning them-with the Sustainable-Development-Goals (Mungai, 2017). Besides, it was also-pointed-out, that the environmental-sustainability PC-targets, have-so-far, being-directed only to-the-public-universities yet, according to Starovoytova et al. (2015), Kenya has 14 Chartered-Private-universities and 12 universities with Letter of Interim-Authority (LIA); some of which, are probably undertaking sustainability-initiatives, and hence, should be included in-the-PC-process.

From the-specifics of EE, in-Kenya, it is revealed, that its-main-efforts are directed towards wildlife- and natural-habitat conservation. This however, is not at-all, a-surprise, as Kenya is one of the-top-tourist-destination, in-Africa. The direct contribution of Travel & Tourism to GDP was KES 294.6bn (USD 2,847.5mn), 3.7% of total. The total contribution of Travel & Tourism to GDP was KES 769.1bn (USD 7,432.9mn), 9.7% of GDP in-2017, and is forecast to-rise by 5.5% in-2018, and to rise by 5.1% pa to KES 1,338.3bn (USD 12,933.6mn), 9.1% of GDP in-2028. In-2017 Travel & Tourism directly supported 429,500 jobs (3.4% of total-employment). This is expected to-rise by 2.8% in-2018 and rise by 2.7% p.a. to 574,000 jobs (3.2% of total-employment), in-2028. Visitor-exports generated KES 194.5bn (USD 1,879.8mn), 18.1% of total-exports in-2017. Travel & Tourism investment in-2017 was KES 84.9bn, 5.7% of total-investment (USD 820.1mn). It should rise by 7.1% in 2018, and rise by 4.4% pa over the next ten-years to KES 139.3bn (USD 1,345.9mn) in-2028, 5.5% of total (WTTC, 2018). In-contrast, SWM is given little, if any-attention, in-EE, in-Kenya.

On-the-other-hand, according to the-Kenya-Organization for Environmental-Education (KOEE): “both; the-formal and non-formal-sectors, in-Kenya, have-clearly-lacked a-strategy, to-guide the-proper-implementation of EE” (KOEE, 2005). The-following-actions/the-way forward have also-been proposed, by the-KOEE: (i) Review the-education-policy, with a-view to-strengthening EE, in-the-formal curriculum, and in-the-national-examinations; (ii) Involve the-mass-media in-providing environmental- information; Develop an-appropriate-communication- strategy, that includes: radio, TV, documentary-films, newspapers, magazines, and posters, to-disseminate information, emanating from environmental-activities; Produce newsletters and magazines, to-promote networking on EE and training; (iii) Formulate a-national-environmental education-strategy; and (iv) Develop specific environmental-education-curricula for all levels of education.

<table>
<thead>
<tr>
<th>Target</th>
<th>Frequency</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planting trees</td>
<td>16</td>
<td>72.7</td>
</tr>
<tr>
<td>Environmental policy</td>
<td>14</td>
<td>63.6</td>
</tr>
<tr>
<td>Environmental awareness</td>
<td>14</td>
<td>63.6</td>
</tr>
<tr>
<td>Working with stakeholders to protect and conserve the environment</td>
<td>10</td>
<td>45.4</td>
</tr>
<tr>
<td>Climate change mitigation and adaptation measures</td>
<td>9</td>
<td>40.9</td>
</tr>
<tr>
<td>Waste management initiatives</td>
<td>8</td>
<td>36.4</td>
</tr>
<tr>
<td>Pollution</td>
<td>5</td>
<td>22.7</td>
</tr>
<tr>
<td>Protection of river banks</td>
<td>4</td>
<td>18.2</td>
</tr>
</tbody>
</table>
Notwithstanding the efforts, already made, at the National-level, the SWM-situation, at the MU, should change, dramatically, and this will defiantly require EE, in one-form or the-other. If people have negative-perception, about SW, and it’s-disposal, little or no attention, will be given to it and vice-versa.

4.4. Behavioral-change.
People have succeeded, indeed, during the last 30-40,000 years, in re-structuring many-ecosystems (e.g., through the use of fire, to alter assemblages of plants; by the domestication of animals; and by the harnessing of various kinds of energy). But, today, we are operating in a ‘no analogue’ unprecedented state, in which human-actions have driven major-planetary support-systems beyond the bounds, of what is observable in the paleo-climatic- record (Steffen et al., 2004; Crutzen & Stoermer, 2000; McNeill, 2000), manifesting as Global-warming.

The-contribution, of the indiscriminate waste-dumping, massive-littering habits, open-burning of waste, and unsatisfactory MU-dumpsite, to the Global-warming, may be perceived as negligible and even inconsequential, but there are many such dumpsites and similar practices, all over the developing-countries, and their cumulative effect could be rather significant, therefore the situation should be changed/improved, at every one of even presumably insignificant contributors, to the Global-warming.

Moreover, to avoid dramatic increase in Global-warming, and impacts of indiscriminate-dumping and littering of waste, our-behaviors should change, starting at individual-level, requiring individuals to develop the attitudes, which will guide them to environmentally-supportive behavior (Ahmed & Mohammed Al-Mekhlafi, 2009). Since individuals exist in a social-ecological-system, changing individual level-behaviors, and creating new-social norms, collectively, requires creating a supportive and an enabling environment, that is, an environment that is conducive to and facilitative of change, and removes bottlenecks, that inhibit change at the household, community, organizational, and policy-levels.

Besides, many researchers have argued, that the waste problem is caused by human-behavior, and therefore, the solution lies in changing that behavior (Milea, 2009; Zhu et al., 2008). Formation and change of attitude are interwoven; people are always adopting, modifying, and relinquishing attitudes, to fit the ever-changing needs and interests. Often our attitudes about the environment come from information and persuasive communications/education (Johnston, 2010).

Perceptions and attitudes, towards waste and its disposal, according to Njagi et al., 2013; Browne & Allen (2007); Bernstein, 2004; and Kaseva & Mbuligwe, 2003, may be positively influenced, through awareness-campaigns, and education, on the negative impacts of inadequate waste collection, with regard to public health and the environment, and also on the potential value of waste. Attitude, however, cannot be changed by simple-education. Acceptance of new attitude depends on who is presenting the knowledge, how it is presented, how the person is perceived, the credibility of the communicator, and the conditions, by which the knowledge was received. Research has shown that with a knowledge on a topic, people may change their attitudes, but the step to improved behaviors and practices is depending on a complex set of social and psychological factors (Desa et al., 2011).

For example, incentives, both economic and socio-psychological, can be incredible tools, to help change behavior, and are considered an effective social intervention, in developing countries (see Bolaane, 2006; Mrayyan & Hamdi, 2006; Milea, 2009; O’Connell, 2011). Socio-psychological incentives are referred to as incentives that change attitudes and behavior, through disseminating information, persuasion by relating waste minimization to the achievement of valued goals, and making use of social-pressure, among others (Milea, 2009; Bolaane, 2006).

The following section details on the approaches to behavioral-change.

4.5. Approaches to change the behavior: Communication for Development (C4D).
C4D is a systematic, planned, and evidence-based approach, to promote positive and measurable behavioral and social change. C4D is an approach that engages communities and decision-makers at local, national, and regional levels, in dialogue toward promoting, developing, and implementing policies and programs, which enhance the quality of life, for all. C4D approaches and tools facilitate dialogues between those who have rights to claim, and those who have the power to realize these rights (UNICEF C4D Position Paper, 2009).

Figure 3 shows the communication approaches that make up the C4D strategy: (1) Behavior change-communication (BCC); (2) Social mobilization (including strengthening an enabling media and communication environment); (3) Social change-communication; and (4) Advocacy. These strategies do correspond to specific levels of the SEM, where they are most effective (shown in the Figure 3, in the same background color). It is important to note that the different approaches (right-side tabs) can apply to levels, other than the one, they are next to. For example, the advocacy approach can also be used at the community or organizational levels.
The following-C4D-approaches are interrelated and interactive, and using them in a well-planned-program produces a synergistic-effect (C4D, 2009):

**Advocacy** focuses on policy-environment and seeks to-develop or change laws, policies, and administrative-practices; and works-through coalition-building, community-mobilization, and communication of evidence-based-justifications for programs; There are three-common-types of advocacy: (i) Policy-advocacy, to-influence policymakers and decision-makers, to-change legislative, social, or infrastructural-elements of the-environment, including the-development of equity-focused programs and corresponding-budget-allocations; (ii) Community-advocacy, to-empower-communities to-demand policy, social, or infrastructural-change, in-their environment; and (iii) Media-advocacy, to-enlist the-mass-media to-push-policymakers and decision-makers toward changing the-environment;

**Social-Mobilization** focuses on uniting-partners, at the-national and community-levels, for a common-purpose; Emphasizes-collective-efficacy and empowerment, to-create an-enabling-environment; and works-through dialogue, coalition-building, group/organizational-activities;

**Social Change Communication** focuses on enabling groups of individuals, to-engage in a participatory-process to-define their-needs, demand their-rights, and collaborate, to-transform their-social system; Emphasizes public and private-dialogue to-change-behavior, on a-large-scale, including norms and structural-inequalities; and works-through interpersonal-communication, community-dialogue, mass and digital-social-media;

**Behavior Change Communication** focuses on individual knowledge, attitudes, motivations, self-efficacy, skills-building, and behavior-change; and works-through interpersonal-communication, mass and digital-social-media. BCC is the-strategic use of communication, to-promote positive-outcomes. BCC is a-theory-based, research-based, interactive-process, to-develop tailored-messages and approaches, using a-variety of population-appropriate communication-channels, to-motivate sustained individual- and community-level-changes in-knowledge, attitudes, and behaviors. Using the-BCC-approach can help to: (i) Stimulate-community-dialogue and raise-awareness about-the-problem; (ii) Increase-knowledge and promote attitude-change, for-example, about the-health and environmental effects of indiscriminate littering and improper waste-disposal; and (iii) Reduce-stigma (Perry, 2012), for-example, around waste-scavengers/pickers; among-others.

**Media** (radios, televisions, newspapers, posters, magazines, etc.), can play an-important-role in-increasing public-participation and awareness, and can-serve as an-instrument for many-socio psychological-incentives. For-example, a-study conducted, in-Cuba (Mosler et al., 2008) found that mass-media-involvement, through the-use of advertisement and campaigns, geared towards recycling and reusing products, was seen as a-useful-incentive, to-public-participation, in waste-management. In particular, posters, leaflets, and handouts, can be-distributed, among the-residents, and also can be displayed in-visible/prominent positions. The-materials should-use catchy-words and slogans, to-convey their-message. Posters must-be-attractive, with good-photographs, and short-messages, that are readable, from a-distance. Pamphlets and handouts can give
instructions, in very-simple, understandable-language, showing actions, through-photographs and requesting public-participation, and they can-be-circulated, throughout the-community.

Developing a-C4D-strategy, to-influence, or reinforce, social and behavior-change, is a-step- wise-process, that begins-with a-solid-understanding of the-problem, and population of interest, in-order-to-ensure more-efficient-use of resources, and greater-behavior-change-impact. In-addition, particular-emphasis in-preparation for awareness-building-campaigns, should-be given to-the-quality of information, given, and on-the-messenger-choice (according to different-target-audience).

4.6. Quality of information.
Behavioral-change does not happen overnight, and requires a-long-term and comprehensive-strategy, which, in-turn requires effective-communication and quality-information, to-be-disseminated to the-community, on a-regular-basis. According-to Storey et al. (2015): ‘the key issue here is pursuing incremental but meaningful changes in behavior and perception in order to achieve tangible results for waste management’.

Boadi (2016), pointed-out, that the Pred’s Behavioral-Matrix is useful, in-examining the-quality and quantity of information, available to-people, regarding SW-disposal, and hence, it will be elaborated upon, further (see Figure 4).

![Figure 4: Pred's Behavioral-Matrix (Pred, 1967).](image)

Pred’s stipulates, that a-decision-making-situation is a-function of the-quantity and quality of information, available in-a-given-environment. That is, the-readiness of residents, to-practice proper-solid waste-disposal depends on the-quantity and quality of information they have, regarding proper-waste disposal. For-example, if residents have poor-quality-information about SW-disposal, such-as wastes are not harmful, or dirty-environment cannot make them sick, then they will-practice improper-waste-disposal, irrespective of their-educational-level. The-model also explains, that some-residents may-make good-use of the-quality of information, based on the-quality of information they have (Bnn). However, those-residents without quality-information may not be able to-make rational-decisions (B11, B1 2, B13). On the-other hand, others may not have adequate-information, but would-be-able to-make rational-decisions (B1n, B2n), while others may-obtain optimal-information, but make irrational-decisions (Bn1, Bn2, Bn3). According-to Pred, in-between these-groups are a-countless of combinations of decision-makers, based on the-quality and quantity, of information, available to-them.

4.7. Messenger-Choice.
Scientists, environmental, non-governmental organizations (NGOs), and the-media, have dominated Climate-change-communication, in the-past, resulting in a-perception of Global-Warming as a-scientific, (still) highly-uncertain, and controversial-environmental-issue. To-alter that-perception, effective-communication should match the-messenger with the-message, and with the-audience. Different-audiences need to-be-addressed, in-audience- specific-ways, which match frame, message-content, and a-language that resonates, with their-specific-information-needs, pre-existing-knowledge, and concerns. ‘People like us’ (or PLUs) are important for an-audience’s personal-comfort, identity, and group-internal-norms and cohesion. Often, PLUs (especially if we know and trust them personally) have greater-credibility and legitimacy, than someone, who does not know an-audience’s circumstances as-well (The-encyclopedia of Earth, 2008).
For example, for majority of the 42-communities/tribes, in-Kenya, traditional knowledge is inseparable from their-ways of life, and their-environment, natural-resources, cultural-values, spiritual beliefs, and customary-legal-systems (Dei, 2002). The-Indigenous-knowledge is handed-down from one-generation to another, through: symbols, art, oral-narratives, proverbs, and performance, such as songs, storytelling, wise-sayings, riddles, and dances (Turay, 2002; Dei, 2002; Semali, 1999). In-most rural, arid, and semi-arid-parts of Kenya, especially in-communities, where formal-education has had insignificant impact, oral-art remains the most-important-means, of transmitting knowledge and skills, as a-way of maintaining societal-continuity, from one-generation-to-the-next.

To-reach different-audiences (for example students or vendors), it is important to-carefully-select the-messenger. As-such, at the-level of communities, what has been termed the ‘symbol-type’ replaces the-genotype, as the-carrier of information to the-next-generation (Wilson et al., 2013; Costanza, 2013). Symbol-types are occurring at-multiple-levels of organization, from the-specific-rules and norms, to the-basic ‘world views’, which guide the-behavior of entire-cultures. Selection, likewise, occurs, at-multiple-levels, both; within-levels and between-levels.

From the research-findings, it is revealed, that there is a need to-increase public-sensitivity to-the Environment, to-foster a-sense of personal-environmental-responsibility, greater-motivation and commitment, towards sustainable-environment and development.

SWM-interventions are more-likely-to-be-successful, when they target multiple-components of the-SEM. According to Schultz & Zelezy (2000), a combination of socio-psychological and economic incentives, along-with educational-awareness-campaigns, and increased-community-involve, may just be the-winning-combination, for success, in many-developing-countries. People’ awareness, about environmental-problems and solutions, can be increased, through EE (Maddox et al., 2011; Ballantyne et al., 2006). EE, therefore, should be incorporated, in every-level of formal-education, in-Kenya, starting from early-childhood. For example, Salhofer & Isaac (2002), recommended to-communicate the-information, to young-children via paintings of cartoons, and story-telling. In-the-university, it is expected, that SWM-activities, involve the-students, as part of their-learning-process via EE and interactive-sustainability trainings (Kelly et al., 2006; GfK, 2011). The-particular-skills and knowledge, gained from EE, would help in changing human-behavior, towards WM and the-environment, at large. Other-strategies, hence, should include: community-education, support-groups, awareness-programs, workplace-incentives, to participation in proper-waste-disposal.

In addition, awareness-building-measures, as noted by Johansson (2006) and Bowersox et al. (2005), should be coordinated with improvements in waste-collection-services. For example, the-SEM, is of the-view, that strategies, focusing on the-physical-environment e.g., sufficient-number of waste-bins are put in-place, before education or community-awareness-initiatives should be done first. For example, campaigns, which encourage people to-exhibit proper waste-disposal behavior, will not be effective, in communities, where there are no waste receptacles/bins (C4D, 2012; Sallis et al, 1998). Besides, Thrift (2007), however, suggests, that such-campaigns should inform people of their responsibilities, as waste generators, and of their-rights, as citizens, to WM-services.

5. Conclusion and Recommendations.
In summary, the study revealed, that both; students and vendors: (i) have recognized SWM as a major problem, at-the-campus; (ii) perceived the-campus as dirty and very dirty; (iii) do not currently pay for WM-services rendered, to them, but would-be willing to pay, only for drastically-improved SWM-services; (iv) demonstrated relatively-good-level of awareness of health and environmental-effects of improper waste disposal-behaviors; (v) do recycle few-materials, at a limited-extend; majority of recyclers are females (vii) exhibit ‘knowing-doing gap’, which is the gap, between knowledge and practices, on household-wastes. The respondents also, approximated, that they generate from 0.14 to 1.4 kg/day per-student, and 1.7 kg/day per-vendor, on-average, which is comparable with estimations for waste-generation-rates in sub-Saharan Africa. It is also, evident, that their knowledge, attitudes, and practices, need to be improved, requiring significant and sustained-behavioral-change, which can be achieved by Environmental-Education.

It is only logical, that the authors, of this-paper, representing all-stakeholders in-SWM, see the campus, in-the-very-near-future, as spotless, with effective, and sustainable-SWM-practices. Predicting the future, accurately and precisely, however, is easier said than done, due to complex-network of numerous-uncertainties. According to Costanza (2013), it is even impossible to predict the future; but we can help guide and model, the evolutionary-process, to create the future we want.

In this regard, the study proposes/recommends:

1) EE should be incorporated in every-level of formal-education, in Kenya, starting from early-childhood;
2) The Chartered private universities and universities, with Letter of Interim Authority (LIA), should be included in the Reporting of Performance Contracting (PC) for Environmental Sustainability, by the Kenyan universities;

3) To develop awareness campaigns, for the active sensitization of campus residents communities on negative impacts of indiscriminate waste disposal, on public health, and on the Environment, and on the benefits, of SWM, as an alternative source of livelihood. Design of the message (quality, and level of difficulty of information; and language, in which the message will be delivered), as well as the selection of a messenger, for different target groups, should be considered;

4) A system of payment, of SWM service charges, should be developed by the MU, and waste collection and disposal fee should be included into fee structure, for students, as they will have more rights to demand for effective WM. Vendors, on the other hand, should outsource WM services for a negotiated fee;

5) To introduce some competitions, for example for the cleanest hostel, or the cleanest floor level, in a multi-storey hostel, etc.; and

6) Further studies on Characterization and Quantification of the solid waste, at the campus. The study findings may add insight on the relevance of EE in SWM, by highlighting ways of how EE can be used to facilitate proper SWM. The findings might also help in providing information, that is of practical value, to policy makers and planners, such as NEMA, Kenya, which is beyond the university boundaries. The findings are also potentially helpful to the local community, as it may highlight the need, for the local community, to get involved in SWM. It is also hoped that results of this survey will be helpful in leading to greater levels of public engagement in SWM, through campaigns to create awareness, in a scientific manner, among the campus residents, to foster a sense of personal environmental responsibility, and greater motivation and commitment, towards sustainable development, which is very much needed, for making the campus clean, green, and sustainable.

6. Acknowledgment.
The author wishes to thank Research Assistants, MIT, SOE, MU, Oyuga Victor Otieno and Ogelo Jared Ongidi, for their help in data collection.

References.


Al-Khatib, I.; Arafat, H.; Daoud, R. and Shwahne, H. (2009). “Enhanced solid waste management by understanding the effects of gender, income, marital status, and religious convictions on attitudes and
practices related to street littering in Nablus – Palestinian territory”, Waste Management, 29(1).


Division, C4D Section.


Cumming, G. and FitzPatrick, P. (2014). Theoretical Frameworks for the Analysis of Social-Ecological Systems Institute, University of Cape Town, Cape Town, South Africa, doi : 10.1007/978-4-311-54910-9_1


Gathuku, G. (2013). Contributions of Conservation Education Centres Towards Sustainable Environmental Awareness In Schools, A Case Of Giraffe Centre Nairobi County. Master of Science (Environmental Education) In the School of Environmental Studies of Kenyatta University.


Gyankumah, F. (2004). Management of solid waste in Ghana: Case study of Accra Metropolitan Assembly, B.S.C (Planning) Special Study Submitted to the Department of Planning, University of Science and Technology, Kumasi.


from Turkey”, International Journal of Environmental Studies, 65(2).


Bulletin, 52(2).


Sebastian, K. (2010). A study on the entrepreneurial traits and characteristics of waste pickers and their contributions to the economy and ecology. MPhil Thesis, the-Christ-University, Bangalore.


Sun, J. (2016). “Dirty environment for adult life: The bad, the good, the unknown”, Genes & Diseases, 3.


Scientific Research and Essays, Vol. 6(2).