Journal of Environment and Earth Science
ISSN 2224-3216 (Paper) ISSN 2225-0948 (Online)
Vol.8, No.5, 2018

Solid Waste Management (SWM) at a University Campus (Part 2/10): Review on Legal Framework and Background to SWM, in-Kenya

Diana Starovoytova
School of Engineering, Moi University, Kenya

Abstract.
This-review is a-second-piece, in-a-series of 10. It-is focused on SWM, at a-Kenyan-context, and it is the-most-comprehensive and up-to-date-coverage (currently-available) on Legal-Foundation/framework, to-SWM, in-Kenya (proving chronological-account for the-last 70 years), and including: Codes, Acts, Regulations, Rules, Policies, Bills, Action-Plans, the-Constitution, Flagship-projects, and a-Product-Ban. This-review have justified, that Kenya, indeed, has made substantial-efforts, at-the-policy-arena, to-oversee, regulate, and promote good-practices, in-SWM. The-relevant-efforts, manifested by Kenya, as: (1) being a-signatory, or a-party-to, the-main-International-Conventions and Treaties; (2) enacting numerous-laws and by-laws; and (3) creating institutions and systems, at-different-levels of governance. The-problem, however, is in the-proper-implementation/enforcement of the-laws. Logically, even most- progressive-laws, are worth absolutely-nothing, and remained-good, *only* on-paper, if *not* implemented. The-task, therefore, remains, for the-national and local-governments, as-well-as other-SWM-stakeholders, to-make-every possible-effort strictly implementing the-existing-laws and regulations. To-achieve this-task the-capacity development in, and financial-sustainability of, MSWM, is necessary. This-study have also-exposed multi-dimensional and complex-nature of the-existent challenge of MSWM, in-the-country. To-achieve the-SDGs and the-Kenya-Vision-2030, Kenya should focus (as a-long-time objective) on a-complete transformation, of the-current unsatisfactory-MWM-system, to *sustainable*-waste and resource- management. Ambitious-target of 100% waste-collection, to *all*-urban-citizens (regardless of income-level, and including: informal-settlements, slums, and peri-urban areas), should-be focused-on. An-innovative Results-Based Financing-model, of SWM; Upgrading of the-current waste-dumping-sites to designed-sanitary-landfills; and Change of habits, and cultural-perceptions, towards waste, was also proposed.
Keywords: Environmental law, local government, good governance, Waste hierarchy, ISWM, capacity development.

1. Introduction.

The-previous-paper (#1), of this-series, has covered *International*-**Protocols, Conventions, A**greements, and commitments to Environmentally-sound-management of wastes, at a-*global*-context. All-types of solid-wastes were also-examined, including radioactive, hazardous/toxic, plastic, oil-waste/spills, e-waste, POPs, as-well-as Municipal-Solid-Waste-Management, although to-a-limited-extend. This-paper, on the-other-hand, will be-focused on the-Kenyan-SWM-laws, by-laws, strategies, etc. Also it will-be limited-to only *Municipal* Solid-Waste-Management practices, challenges, and opportunities.

2. Subject-matter in a-Kenyan-context.

2.1. Kenya: Relevant background information.

2.1.1. Geography.

According to CIA (2012), the-Republic of Kenya is the-world's 47th largest-country (after Madagascar). It spans a-territorial-area of 582,646 km^2, consisting of 571,416 km^2 land-area and 11,230 km^2 of water-surface (KNBS, 2016). Of the-total-land-area, approximately 490,000 km^2 (85%) are classified-as arid and semi-arid-land (ASALs) (UNDP in-Kenya, 2016). BBC: Country-Profile (2017) reported that Kenya is situated on the-equator, on Africa's East-coast; it lies between latitudes 5°N and 5°S, and longitudes 34° and 42°E. It-is bordered by Somalia, to the-East; Ethiopia, to the-North; Sudan, to-the North-West; Uganda, to the West; and Tanzania, to the-South. Two-major water-bodies: the-Indian-Ocean, to the-East; and Lake-Victoria, to the-West, also-help-define Kenya's borders. With only 647 cubic-meters of water, per-capita, per-year, Kenya is classified as a 'water-scarce' country, with the-Falkenmark-index of 4, for water-availability (see Falkenmark & Widstrand, 1989).

2.1.2. Climate

Due to its-large-territory and geography, Kenya's climate varies considerably; and it-is classified into 8 sub-types (see Figure 1).

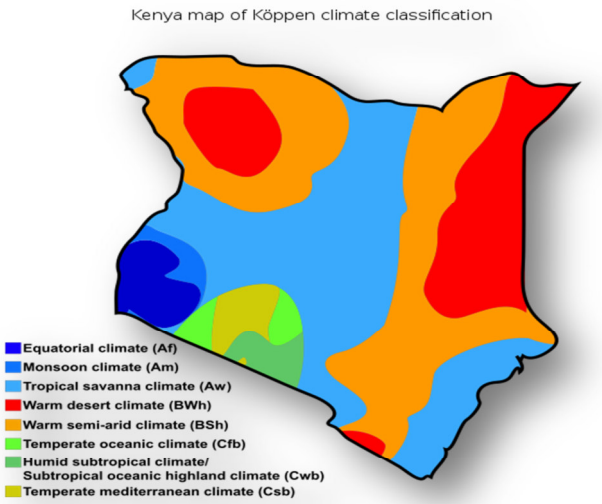

Figure 1: A-Köppen climate-classification-map of Kenya (World Maps of Köppen, 2017).

According to Starovoytova & Namango (2016); and Starovoytova *et al.* (2016a), Kenya is situated at-the-equator, and is subsequently-influenced by the-Inter-Tropical-Convergence-Zone (ITCZ), as-well-as the-El-Nino-Southern-Oscillation (ENSO)-phenomenon. The-ITCZ is a-fluctuating low-pressure-zone, characterized by thunderstorms and heavy-rainfall. ENSO refers to an-unusual-warming (*El-Nino*) and cooling (*La-Nina*) of the-waters, of the-Pacific-Ocean, which occurs in-association-with changes in-atmospheric-pressure, known-as the-Southern-Oscillation. ENSO occurs with a-periodicity of approximately 5 years, and is associated-with seasonal-rainfall-anomalies, in the-tropics, in the-form of droughts, in-some-regions, and floods, in-other-regions. ITCZ and ENSO affect precipitation, in a-wide-belt, in-the-tropics. The-passage of the-ITCZ, results, for Kenya, in two-annual-rain-periods; one-short, in-October-December, and a-longer-one, in-the-period of March-June. According to Malesu *et al.* (2007), an-average-annual-rainfall is relatively-high, *but* rains are poorly-distributed, both; spatially, and temporally, leaving some-areas, of the-country, experiencing dry-spells, while other-areas have occurrences of floods, during the-same-season. For-example, according to Starovoytova (2012), in-the-North-East, rainfall can-average only 30 cm/year, *yet* in the-Lake-Victoria-basin, rainfall is as-high-as 175-200 cm/year.

2.1.3. Population

Kenya is characterized by a-rapidly-growing-population, rapid-urbanization (estimated at 4%, per-annum) and increasing-urban-poverty; approximately 45% of the-population, is living on less-than USD 1.25, per-day. Its-population, according to the-latest-census, of 2014, was estimated at 48.5 million, with an-average-population-density of 80 people, per km^2 (World Bank, 2013).

Population-doubling-time, for Kenya, is about 29 years. The-population is projected to-increase-dramatically, over the-next two-decades, doubling by 2025 (CIA, 2012); Population-under-age of 15 is 42%; Rural/urban split is 78% - 22%. It-is projected that by 2030, about 50% the-Kenyan population will be urban (Kenya National Bureau of Statistics, 2016); Gender-balance (rural) 97 men to 100 women; Gender-differences, by-region, is High; and Illiteracy (rural, 2007) 30% women and 18% men; (Kenya and Gender@ a Glance, 2013).

2.1.4. Economy

Kenya is a-Lower-middle-income (LMI)-country; its-economy-grew by 5.6 %, in-2015, up from 5.3%, in-2014. It also-has the-largest and most-diverse-economy, in-East-Africa; with an-average-annual growth-rate of over 5%, for nearly a-decade (World Bank, 2014); Besides, Kenya ranked 96 (out of 138 countries) on Global-Competitiveness-Index (2016–2017). In-terms of the-Human-Development-Index (HDI), Kenya also ranks among the-highest, in the-East-African-region, with HDI of 0.509, in-2011 (UNDP, 2011). Its-entrepreneurship, human-capital, and the-recent-discovery of oil, and other-mineral-resources, give it huge-potential for further-growth, job-creation, and poverty-reduction.

Kenya had an-estimated national-GDP of USD 60.9 billion, in-2014, and Kenya's Gross- Domestic-Product (GDP), at purchasing-power-parity, is growing, steadily, from USD 136.4 billion (2014 est.) to USD 144.1 billion (2015 est.); and to USD 152.7 billion (2016 est.). The-GDP, *per-capita*, in-Kenya, was last-recorded at USD 1143.10, in-2016 (equivalent to 9 % of the world's-average) (Trading Economics).

Approximately 42% of Kenya's national-GDP is derived from its-natural-resource-sectors (i.e. agriculture, forestry, fishing, water-supply, and energy). The-services-sector (which includes transport and communications, wholesale and retail-trade, and financial and other-services) accounts for about half of GDP. The-industry-sector

(manufacturing, construction, mining, and quarrying) contributes the-remaining 10%. At a-regional-level, a free-trade-area was launched by the East-African-Community (EAC), in-2005, and a-Common-Market, in-July 2010 (World-Bank, 2014).

2.1.5. Political-structure

Kenya is a-unitary-state, with a-multiparty-political-system. In-2013, Kenya introduced a-devolved two-tier governmental-system, consisting of a-national-government and 47 semi-autonomous-county-governments (each headed by a-Governor). Under the-system of devolution, county-governments play a-major-role, in-service-delivery, including, responsibility for waste-management (Kenya Law-Reports, 2010).

2.2. Kenya: Legal-Foundation to SWM.

According to UARK (2016), Kenya has about 77 statutes, which relate to-environmental-concerns. The-following-account, however, reflects statutes, pertinent to-solid-waste and its-management. SWM policy-architecture, in-Kenya (including Codes, Acts, Regulations, Rules, Policies, Bills, Action-Plans, the-Constitution, Flagship-projects, and a-Product-Ban) is summarized, in the-chronological-order, of main-policy-documents. The-timeframe, considered here is from the-very-inception of SWM-policy frameworks, in-Kenya (starting from the-oldest SWM-policy-document, of 1948, to July, 2017). This-coverage makes the-study the-most-up-to-date and comprehensive (in-both; time-scale and details), as compared to-previous-reviews of SWM-policies, in-Kenya (see Haregu *et al.,* 2017; UARK, 2016; and Njoroge *et al.,* 2014; among-others). The-timeframe is as follows:

(1) 1948 *The-Penal-Code*, Chapter 63, which-made-it an-offence, for anyone, to-voluntarily '*vitiate the atmosphere'*, in any-place, to-harm the-health of persons-dwelling, or carrying-on-business, in the-neighborhood, or passing along a-public-way (Section 192); and to '*corrupt or foul the water'* of any public-spring or reservoir, to-render it less-fit for-the-purpose, for-which it-is ordinarily-used (Section 191) (Republic of Kenya, 1948).

(2) 1963 *Local-Government-Act* (Cap 265, Laws of Kenya) deals with kinds of refuse and effluent, and where such-service is established, compels its-use, by persons to-whom the-services is available; which vested in-local-authorities (i.e., municipal/town/urban councils) powers, to-establish and maintain, sanitary- services, for the-removal, and destruction, or management of refuse and effluent (Section 160a) (Republic of Kenya, 1963).

(3) 1977 *The-Factories-Act* (Cap 514, Laws of Kenya) Section 13, makes it mandatory, for every-factory-owner, to-ensure, that the-factory-environment is kept in a-clean-state, free from effluvia, arising from any-drain, sanitary-convenience, or nuisance. Subsections (a) and (b) require accumulations of dirt and refuse to-be removed, daily (Republic of Kenya, 1977).

(4) 1985 *The Radiation-Protection-Act* (Cap 243, Laws of Kenya) – Section 16 (2) prohibits manufacturing, possessing, selling, disposing-off, importing, or exporting any-irradiating-device, or radioactive-material, except under and in-accordance-with a-license, issued. Alternative-action will account to an-offence and liable to-imprisonment for *not* more-than two-years (Republic of Kenya, 1985).

(5) 1986 *Public-Health-Act* (Cap 242, Laws of Kenya) makes provision for securing and maintaining health, including disposing of wastes, appropriately. Section 115, of the-Act, states that *no* person shall-cause a-nuisance, or cause to-exist, on any-land, or premises, any-condition, liable to-harm or endanger human-health. It defines such-nuisance or conditions, under Section 118, as: waste-pipes, sewers, drains, or refuse-pits, whose-condition, placement, or construction, in the-opinion of the-medical-officer of health, would damage health. Other-nuisances are any-accumulation of materials, or refuse, that in-the opinion of the-officer, is likely to-harbor rats or other-vermin (Republic of Kenya, 1986).

(6) 1987 *Building-Code* (Cap 242, Laws of Kenya), Section 239 (1) dealing with the-depositing of debris on streets, states that any-person who (except with the-prior-consent of the-council) deposit any-building-debris, upon any-street, shall be guilty of an-offence (Republic of Kenya, 1987).

(7) 1992 *Food, Drugs and Chemical-Substances-Act* (Cap 254, Laws of Kenya), makes it an-offence to-use, or dispose of any-chemical-substance, in a-manner, likely to-cause contamination of food, or water, for human-consumption, or in a-manner, liable to-be-injurious, or dangerous to-health (Republic of Kenya, 1992).

(8) 1995 *Building-Code* as an enhanced framework and Revised Building Regulation–Draft;

(9) 1996 *Physical-Planning-Act* (PPA) (Cap 286, Laws of Kenya), making provision for development-control, allowing waste-disposal, at designated-sites *only* (Republic of Kenya, 1996).

(10) 1998 *The-Local-Government-Act and amendments* (Chapter 265, Laws of Kenya) governs local-authorities. The-Act spells-out wide-ranging-powers and functions of Local-Authorities, including the-provision of public-services, such-as garbage-collection and waste-management (Republic of Kenya, 1998).

(11) 1999 *Environmental Management and Coordination Act* (EMCA) (Sessional-paper No.8 of 1999), providing a structured-approach to environmental-management in-Kenya. In-particular: (i) Part 12 (a) of the-Second-Schedule of the-Act, states that Environmental-Impact-Assessment (EIA) and Environmental-Audits (EA) shall-be-carried-out, for waste-disposal, including site for solid-waste-disposal; (ii) Part II, Section 3(1)

states, that: "every person in Kenya is entitled to a clean and healthy environment and has the duty to safeguard and enhance the environment"; (iii) Part V Section 57, sub-section 1, provides for taxes and fiscal-incentives, disincentives or fees, to-induce or promote the-proper environmental and natural-resources-management, or the-protection or abatement of environmental-degradation; (iv) Part VIII, Section 87 (1), (4) and (v) of the-Act prohibits dangerous-handling and disposal of waste. In-summary, the-waste should-be-transported by licensed-transporter, to licensed-waste-disposal-site/plant, which operated by licensed-personnel. Licenses are renewable, and should-be-valid. The-Act provides that waste- minimization-measures, such-as: treatment, reclamation, and recycling, should-be-employed and that any-person, contravening the-provisions, is liable to-penalties and imprisonment; and (vi) Sections 88 to 93 give guidelines on hazardous-waste, waste-segregation, incineration and recycling of solid-waste, resource recovery, demolition and reconstruction of waste, and treatment and landfills (Republic of Kenya, 1999).

(12) 2003 The-Environmental (*Impact Assessment and Audit)* Regulations, Legal Notice No 101; *Impact assessment* establishes rules and procedures, for licensing, conducting, and reporting environmental impact-assessments. This-regulation defines 'waste' as any-matter prescribed to-waste and any-matter whether liquid, solid, gaseous, or radioactive, which is discharged, emitted, or deposited, in the-environment, in such-volume, composition, or manner, likely to-cause an-alteration of the-environment. Part II – The-Project-Report, states, that "A proponent shall prepare a project report stating the-materials to-be-used, products, and by-products, including waste, to-be-generated, by the-project, and the-methods of their-disposal. Part IV - The Environmental Impact Assessment Study Report, states, that a- proponent shall submit to-the-Authority, an-environmental-contents of impact-assessment-study-report, incorporating *but* not limited-to the-environmental-information on the-products, by-products, and waste generated project. Part V – Environmental-Audit and Monitoring, states that an-environmental-audit-report shall contain an-indication of the-various-materials, including *non*-manufactured-materials, the-final-products, by-products, and waste-generated (NEMA, 2003).

(13) (a) 2006: The-purpose of the Environmental-Management and Coordination (*Waste Management)* Regulations, Legal Notice No 121 (NEMA, 2006a), is to-provide for guidelines, procedures, and standards for the-environmental-governance, to-ensure compliance. The-regulations also-provide for licensing, monitoring, and enforcement. The-regulations can-be-summarized as-follows: (i) ..."The-Regulations apply to *all* categories of waste including solid waste, industrial waste, hazardous, pesticides and toxics, biomedical waste and radioactive substances."; (ii) "Waste is only disposed at designated waste receptacles" (Section 1, 2 and 3); (iii) "The Waste Management Regulations seek to stop and reverse environmental pollution resulting from solid waste by providing mechanisms for managing solid waste. Such mechanisms include promotion of cleaner production technologies, segregation at sources, recycling and reuse" (Regulation 2; 5; and (iv) "...It is an offence to transport waste without a valid license from NEMA...." (Part 11, Section 10 (1-5), 11, and 12).

(b) 2006 The-Environmental-Management and Co-ordination (*Water-Quality*) Regulations, Legal-Notice No 120: The-purpose of these-Regulations is to-provide for conservation, management, use and control of water-resources. Part II Section 1-2, of the-Regulations, provides, that persons should-refrain from acts that may, directly or indirectly, cause water-pollution. Hence, *no* person is allowed to-throw or cause, to-be-thrown any-pollutant, into the-watercourse. Section 6 (a) prohibits the-discharge of any-effluent, from sewage-treatment-works, or industry, among others, into water-sources, without a-valid effluent-discharge-license (NEMA, 2006b).

(14) (a) 2007 *Kenya-Vision-2030*, is the-long-term development-blueprint, for Kenya, covering the-period 2008-2030, and implemented, through a-series of five-year development-plans. It aims to-transform Kenya into a-newly-industrialized "middle-income country providing a high quality of life to all its citizens by 2030". Vision 2030 is a-living-document, that was first-published, in-2007, and is updated-periodically, in a-web-hosted-version. It aims, among other-things, to-make Kenya a-nation with a-clean, secure, and sustainable-environment, by 2030. One of the-strategies, identified for realization of the-Vision, is improving waste-management, through design and application, of economic-incentives, and the-commissioning of public-private-partnerships (PPPs), for improved-efficiency in-water and sanitation-delivery. In-Vision 2030, one of the-flagship-projects is the-SWM-initiative, which calls-for relocation of the-Dandora-dumpsite, in Nairobi; and the-development of SWM-systems in five municipalities (Mombasa, Kisumu, Eldoret, Nakuru, and Thika). Although this-Strategy will be piloted, in the-above five-cities and towns, it shall-be applied countrywide (Republic of Kenya, 2007c).

(b) 2007 The-Environmental-Management and Coordination (*Controlled Substances)* Regulations, Legal-Notice No 73, describes classification of controlled-substances, and provisions-on licensing, and permit-provision, as-well-as monitoring-provisions for manufacture, packaging, import, and export of controlled-substances (Republic of Kenya, 2007a).

(c) 2007 *The-Occupational-Safety and Health-Act* deals with chemical-safety, and the-securing of dangerous-parts of machinery. It requires that a-machine (incinerator), whether; fixed or mobile, shall-be-used for work, which they are designed for, and be-operated by a-competent-person. Part IX, Chemical-Safety, Section 83, Subsection IV, states that the-employer shall-develop a-suitable-system for the-safe-collection,

recycling, and disposal (in an-environmentally-sound-manner) of chemical-wastes, obsolete-chemicals, and empty-containers of chemicals, to-avoid the-risks to-safety, health of employees, and to-the-environment (Republic of Kenya, 2007d).

(d) 2007 *National-Policy on Injection-Safety and Medical-Waste-Management* aimed to-promote safe-injection-practices and proper-management of medical-waste, both; in-health-care-settings, and the- community. For-example, the-policy points-out, that approved-waste-management-systems and disposal sites shall-be a-requirement, for licensing of health-facilities (Republic of Kenya, 2007b).

(15) 2009 Republic of Kenya, *National-Land-Policy* (Sessional-Paper No. 3), Section 3.4.3.3: Urban-Environmental-Management-Principles, clause 140, stipulates, that: To-address urban-environmental problems the-following-measures shall-be-implemented: (i) Prohibit discharge of untreated-solid and liquid-waste, into rivers, lakes, and the-ocean, by providing appropriate-waste management-methods; (ii) Encourage and require waste-segregation and labeling, for easier-management; (iii) Regulate all-quarrying and excavation-activities; (iv) Encourage urban-waste re-use and recycling; and (v) Develop a-framework, for rehabilitation of dumping-sites, and land, that has-been-subjected to environmental-degradation (Republic of Kenya, 2009).

(16) 2010 *The-Constitution of Kenya* – Article 42 of the-Bill of Rights (Chapter 4, of the-2010-Constitution), states that every-person has the-right to a-clean and healthy-environment, which includes the-right to-have the-environment protected, for the-benefit of present, and future-generations, through legislative and other-measures. Article 70, guarantees a-clean-environment, as a-claimable-right, by any-citizen, who-feels, that this-right has-been infringed. In-fact, being-alive, which is a-right, protected under the-Constitution, may-frequently depend-on a-person's-health, and on the-surrounding-environment. Thus, the-mismanagement of the-environment, can-be interpreted as-interference in one's right-to-life. Besides, Part 2 of the-fourth-Schedule, in the-Constitution, also explicitly provides, that the-County- Governments shall-be-responsible for: refuse-removal, refuse-dumps, and solid-waste-disposal (Republic of Kenya, 2010).

(17) 2011 *Urban-Areas and Cities-Act*, NO. 13; Revised-Edition 2016 [2012], First-Schedule (Section 5): Classification of cities and towns by services, states that a-City – (Population at least 500,000); a-Municipality – (Population at least 250,000); and a-Town – (Population at least 10,000), shall-have the-ability to-provide refuse-collection and MSWM-services (Republic of Kenya, 2011).

(18) (a) 2012 *NCCAP*: The-National-Climate-Change Action-Plan: Mitigation (2013-2017), is an-extensive 268-page blueprint, addressing Kenya's priorities and responses to-climate-change-mitigation and adaptation. It states, that although the-share of the-waste-sector, on the country's total GHG-emissions, is low, GHG-emissions, from the-waste-sector are expected to-increase from 0.8 million tCO2e per-year, in-2010, to 2 million tCO2e, in-2030. Kenya hopes to-reduce GHG-emissions to 15%, below 2010-levels, by the-year 2015, and to 70%, by 2030; a-quite-ambitious-target (GoK_NCCAP, 2013). It-is also-noted, in- the-NCCAP, that methane-capture can-go hand-in-hand with proper-management of solid-waste, thereby improving groundwater-quality, local-air-quality, and safety, as-well-as hygienic-conditions (GoK, KenyaLaw, 2013b). In-Chapter 9 on Waste, holistic, sectoral-analysis aims to-inform the-Kenya Climate-Change Action-Plan and provides the-evidence-base, for prioritizing low-carbon-development- options, and developing-proposals for Nationally-Appropriate-Mitigation-Actions (NAMAs) and REDD+actions. In-addition, it-is also-stated, that: *"This is [NCCAP] also subject to international support in the form of finance, investment, technology development and transfer, and capacity-building"* (GoK_INDC, 2015).

(b) 2012 *The-Public-Health-Act*, Section 126, stipulates, that the-Minister, on the-advice of the-board, may make rules, and may-confer powers, and impose duties, in-connation-with the-carrying-out and enforcement, thereof on local-authorities, magistrates, owners, and others, as to: (i) the-drainage of land, streets or premises, the-disposal of offensive-liquids, and the-removal and disposal of rubbish, refuse, manure, and waste-matters. Section 134: Rules for protection of food, pointes-out, that the-Minister, may make-rules regarding all, or any of the-following-matters: the-establishment, locality, supervision, equipment, maintenance, and management of slaughterhouses, and the-disposal of the-waste; Section 118: *What constitutes nuisance*, Section 1, states, that the-following shall-be-deemed to-be nuisances, liable to-be-dealt-with, in-the-manner, provided. Part (c) reads:" any street, road or any part thereof, any stream, pool, ditch, gutter, watercourse, sink, water-tank, cistern, water-closet, earth-closet, privy, urinal, cesspool, soak-away pit, septic tank, cesspit, soil-pipe, waste-pipe, drain, sewer, garbage receptacle, dust-bin, dung-pit, refuse-pit, slop-tank, ash-pit or manure heap so foul or in such a state or so situated or constructed as in the opinion of the medical officer of health to be offensive or to be injurious or dangerous to health"; and Part (e) states that any-noxious-matter, or waste-water, flowing or discharged, from any-premises, wherever situated, into any-public-street, or into the-gutter, or side-channel, of any-street, or into-any of watercourse, irrigation-channel, or bed, thereof *not* approved, for the-reception of such-discharge constitutes to-be a-nuisance (Republic of Kenya, 2012a).

(c) 2012 *Country-Government-Act* – assigns the-specific-task of implementing nationwide-policies, within their-jurisdiction; in-particular, Section 120: Tariffs and pricing of public-services, Sub-section 3, states that a-tariff-policy, adopted under-subsection (i) shall reflect following guidelines; part (h): promotion of the-economic,

efficient, effective and sustainable-use of resources, the-recycling of waste, and other-appropriate-environmental- objectives (Republic of Kenya, 2012b).

(d) 2012 *Birth and Death-Registration-Act* (CAP 149, Laws of Kenya) prohibits burying, cremating, or otherwise disposing of the-body of a-deceased-person, without a-permit (Republic of Kenya, 2012c).

(18) 2013 *National-Environment-Policy* in-Section 6.3 (Waste-management), states that the-Government will: (i) Develop an-integrated national-waste-management-strategy; (ii) Promote the-use of economic-incentives, to-manage waste; and (iii) Promote establishment of facilities and incentives for cleaner-production, waste-recovery, recycling, and re-use. Section 6.4 (radiation) indicates, that the-Government will: (i) Maintain an-inventory of sources, types and quantities of radioactive materials, periodically-monitor status and trends and enhance protection-measures; (ii) Strengthen capacities, for handling and management, of radio-active-waste and ionizing-agents; and (iii) Ensure that telecommunication-equipment and structures, conform to the-international-radiation-standards. Besides, Section 6.5 (toxic and hazardous-substances) indicates, that the-Government will: (i) Develop a-national policy on toxic and hazardous-substances; (ii) Establish appropriate-toxic and hazardous-substances disposal-facilities; and (iii) Collaborate with international-community, in-curbing-dumping of obsolete, or banned, toxic and hazardous-substances (NEMA, 2013).

(19) 2015 *The-National Solid-Waste-Management-Strategy,* by the-National-Environment Management-Authority (NEMA) is the-most-recent government-action, establishing a-common-platform, for-action, between stakeholders, to-systematically-improve waste-management. It introduces a-new approach, for improved-waste-management, in-Kenya, to-create wealth and employment, and reduce pollution of the-environment. This-strategy presents 10 minimum-points, for management of the-existing-waste-management-facilities, so-as to-continuously promote compliance-with the-waste management-regulations, within the 47 counties. This-strategy is to-be-implemented, through 5 key-objectives, to: (i) formulate policies, legislations, and economic-instruments, to-reduce waste-quantities; (ii) inculcate responsible-public-behavior on waste-management; (iii) promote waste-segregation, at-source; (iv) promote resource-recovery, for materials and energy-generation; and (v) establish environmentally- sound-infrastructure and systems, for waste-management. Successful-implementation of this-strategy requires the-involvement of several-actors: (1) Ministry of Environment, Water and Natural-Resources; (2) NEMA; (3) County-Governments; (4) The-National-Treasury; (5) Civil-Society-Organizations (CSOs) and NGOs; (6) Private-Sector; and (7) the-Citizens/Public. For the-detailed-roles of each of the-actors see (NEMA, 2015).

(20) (a) 2017 *The-National Waste-Management-Bill*, for an-Act of Parliament to-establish an-appropriate legal and institutional-framework, for the-efficient and sustainable-management of waste, in the-framework of the-green-economy, the-realization of Kenya-Vision 2030 zero-waste-goal, and the-provision of a-clean and healthy-environment, for all-Kenyans, for connected-purposes. This-Act shall-come into-operation on-such-date, as the-Cabinet-Secretary may, by notice *Gazette*, appoint. It-consists of 7 parts: Part I -- preliminary; Part II--policy coordination and oversight of waste management; Part III-- measures and actions; Part IV-- duties relating to waste management; Part V-- public participation and access to information; Part VI--financial provisions; Part VI-- monitoring and compliance; Part VI-- offences and penalties; and Part VII--miscellaneous provisions (Republic of Kenya, 2017).

(b) 2017 Nationally-Appropriate-Mitigation-Actions (NAMAs) are voluntary, non-binding policy-instruments, that provide a-framework for pursuing a country's socioeconomic and development-goals, while contributing towards global-greenhouse-gas mitigation-efforts. Though not explicitly-mentioned in the-Paris-Agreement, NAMAs are currently the only "framework for non-market approach to sustainable development" (as noted in the-Paris-Climate-Agreement) and are expected to-play an-important-role, in helping developing-countries-plan and execute mitigation-actions. Moreover, the-overall-scope of a-NAMA, i.e., mitigation-action combined-with sustainable-development, leading to-sector transformation, makes it an-ideal-framework to-balance national-development-priorities, with global-climate-actions. NAMAs were first-introduced, at the 13th Conference of Parties, to the-Kyoto Protocol (COP13), in-Bali, in-2007. The-most-relevant-links, between the-NAMA and the-MDGs, are through Goal 1 "Eradicate Extreme Poverty and Hunger" (Targets 1A and 1B), Goal 3 "Promote Gender Equality and Empower Woman" (Target 3.2) and Goal 7 "Ensure environmental sustainability" (Target 7D). SDG-targets and SD-benefits, resulting from the-NAMA, are: SDG Goals/Indicators # 13; 11;12; 3; 4; 9; 17, 8; 16.6; and 17.1. The-NAMA will showcase a-model, for improved-urban-waste-management, in-developing-countries. It will transition Nairobi's waste-sector from a-disposal-driven-one to-one of recycling and composting. This will-have numerous-benefits, such-as: affordable waste-collection-services to all-income-areas; increase in-the-amount of waste, collected and recycled; improved health, at household-levels; reduction in GHG-emissions; and direct and indirect-job-creation. The two-distinct-objectives, of this-NAMA, are: (i) Establish infrastructure, for recycling and reuse, of waste to-substantially reduce the-amount of disposed-waste; and (ii) Establish a-framework for the-private-sector to-participate, in-the-recycling and reuse, of waste. In-particular, under the-NAMA, up-to 600 tons of waste will be-recycled, every-day, (which accounts, for 25% of Nairobi's total-waste). This-will-save more than 800,000 tons in CO_2e emissions (over the-15 years' lifetime

of the-NAMA) and add 1,600 jobs to the-economy. Waste-collection-services will become affordable, to-more than-half a-million low-income-residents, because waste-collection-companies will divert, their-waste from dumpsites, to-recycling-points, thereby reducing their-operating-costs (NAMA, 2016).

And, finally, 2017 (c) most-recent Kenyan-initiative—*Ban on plastic-bags*, is an-important attempt to-reduce SW, in-the-country. Disposal of plastic-bags has been the-biggest-SWM-problem, in-Kenya (see Starovoytova *et al.,* 2016b). According to UNEP, close to 100 million-plastic-bags, are given-out, every-year, in-Kenya, by supermarkets; most of which end-up in-garbage-bins, polluting the-environment. The-Government was attempting twice, before, in-a-decade, to-eliminate what is perceived as the-country's worst-litter-problem. Previous-attempts, to-ban plastic-bags were selective, targeting to-regulate light-weight-carrier-bags, with-thickness of less-than 30 microns, which made monitoring of compliance near-impossible. The-current-ban (the-Legal-Notice took-effect on 28th August, 2017), covers *all*-plastic-carrier-bags (single-use-bags; carrier-bags with-handles, and flat-bags without-handles), which are used as-*secondary*-packages. However, materials, used for industrial-primary packaging, disposal-bags, for handling of biomedical and hazardous-waste, and garbage-bin-liners, are exempted. Kenya joins more-than 40 other-nations, that have enacted similar-laws, but Kenya's is far-more-stringent, than all of the-others, to-date; offenders face a-jail-term of four-years, or a-fine of KES 4 million (USD $40,000). Kenya hopes the-ban will greatly-reduce plastic-pollution, *but* this-goal is estimated to-come at the-expense of around 60,000 jobs-lost (Policy-Monitor, 2017).

2.3. Background to SWM, in-Kenya.

2.3.1. Kenya's Environmental Performance and waste-generation-rates.

Environmental-Performance-Ranking (EPI) of Kenya is 130, out of 180 countries (with Environmental- Health ranked at 42.96, and Ecosystem-Vitality at 50.12); while in-Sub-Saharan-Africa, Kenya is on 14th place (EPR, 2018). In-particular, Environmental-Health-variable includes: Air-Quality, Water & Sanitation, and Heavy-Metals/Lead-Exposure, while Ecosystem-Vitality considers: Biodiversity & Habitat, Forests/Tree-Cover-Loss, Fisheries, Climate & Energy, Air-Pollution, Water-Resources, Wastewater- Treatment, and Agriculture/Sustainable-Nitrogen-Management. The-full-results of the-2018 EPI, including country- and indicator-level-analysis, are available at epi.yale.edu.

In-Kenya, the-number of *urban*-residents is expected-to-increase (from 2002-2225) by 256% reaching 16,952,000.00, while waste-generation, is expected-to-double, reaching 0.6 kg/capita/day (World-Bank, 2012). UNIDO (2009) indicated, that 'there are *no* national-statistics on waste-generation levels, in-Kenya'. Nevertheless, some-limited-data was traced, by-this-study; for-example: according to NEMA (2012), municipal-waste-generation, per-capita, in-urban-areas, of Kenya, is estimated to-range, between 0.29 and 0.66 kg/day. The-figures are compatible with the-overall waste-generation-rate for East-African-Countries urban-centers, which vary, on-average, between 0.26 (low-income) and 0.78 (high-income) kg/cap/day (Scheinberg, 2011; Oberlin, 2011; Okot-Okumu & Nyenje, 2011; Rotich *et al.,* 2006; Kaseva & Mbuligwe, 2005; Kibwage, 2002). Similar-waste-generation-rates have also been reported for developing-countries, of other-regions of the-world (Vidanaarachchi *et al.,* 2006; Achankeng, 2003; Supriyadi *et al.,* 2000).

Moreover, NEMA (2012) stated, that healthcare-waste, generated, in-Kenya, is approximately 909,182 tons/year, with infections-waste comprising 75%. *No* national-figures, however, could-be-found for the-other-categories of waste. For municipal-waste, data for 4-major-towns was-found: Nairobi generates about 2,400 tons waste/day, while Nakuru, Kisumu, and Mombasa, generate 700 tons, 900 tons and 1,500 tons, respectively. About 61% of these-municipal-waste is generated from residential-areas, 21% from industrial-activities, while the-rest comes from hospitals, markets, and other-sources (NEMA, 2012). UNIDO (2009) also-pointed-out, that 'the complexity of waste generated is increasing due to changing production and consumption patterns, increased urbanization, industrial and service activities'. The-average, per-capita, waste generation, in the-main-Kenyan-municipalities, with SW-disposal sites (SWDSs), is approximately 0.46 kg/day; while the-domestic and commercial-waste takes 70% of the-total-waste, generated, while industrial-waste takes the-remaining-percentage (NAMA, 2016).

2.3.2. Practices and challenges.

2.3.2.1. Practices Overview.

Gakungu *et al*. (2011), stated, that the-current WM-situation, in-Kenya, is characterized by the-inability of local-authorities to-collect *all* the-waste-generated. Nationally, it-is estimated, that *only* 40% of the-generated-waste is collected, for disposal, at designated-disposal-sites (NEMA, 2012). This-figure is comparable to other-urban-areas, in-developing-countries (Scheinberg, 2011; Vidanaarachchi *et al*., 2006; Palcznki, 2002; Supriyadi *et al.,* 2000). Besides, in-some-cities/towns, the-collection-rate is lower than the-national-average; for-example, according to Munala (2011) and UN-Habitat (2007), about 500 tons of waste, is generated, per-day, in-Kisumu-city, out of which, *only* 20% is delivered to-dumpsites. Waste-collection and transportation is limited-by: inadequate-equipment, personnel, and financial-resources, facing *all*-local-authorities (NEMA, 2015). For-instance, Otieno (2010), states that up-to 80% of waste collection-transport is out of service, or in-need of repair.

Uncollected-waste is either; burned in-open-air, or buried in the-backyards, or indiscriminately dumped, (Oberlin, 2011; Liyala 2011; Okot-Okumu & Nyenje 2011; Simon, 2007) and left to rot, under hot and moist subtropical/tropical climate.

On-the-other-hand, according CSIR (2011), it-is-considered a-best-practice to-reduce the-generation of waste, at the-source, then recycle and compost (what can*not* be reduced), and finally incinerate, or landfill, the-remainder.

UNIDO (2009), identified, that recycling and composting-technologies, in-Kenya, are very-informal and basic, and account for a-mere 8%. For-example, *only* 21 % of the-technical-institutions, in-Kenya, recycle some of the-wastes while 79 % do *not* recycle (Gakunju *et al.,* 2011). Schultz *et al*. (1995) defines recycling as "the process through which materials previously used are collected, processed, remanufactured, and reused". Recycling, in-Kenya, is practiced informally and selectively; *only* high-value recyclables (such-as: scrap-metal, glass, paper and cardboards), find their-way-to-recycling firms (Karanja, 2005). Besides, rubber, sludge/used-oil, plastics, etc., are also-recycled, at a-limited-expend, however, most-recycling-technologies are very-informal and rudimentary (NEMA, 2006). In-low-income areas, recyclable-materials are used and reused, for domestic-purposes, and *only* thrown-away, when they are *no* longer of any-use to the-owners. In-high-income-areas, domestic-servants will sell these-materials, to-middlemen, to-supplement income, instead of disposing them along-with the-other-refuse. There are a-few-recycling-plants, in-operation in-Kenya. Although much-more-waste is generated, than can-be collected, the-recycling-plants have been-operating under their-full-capacity, for years, because most of the-waste-materials are *not* separated, at the-source (Karanja, 2005), among other-reasons.

Big-companies such-as: Homegrown and Sian, in the-horticultural-industry, undertake their-own vermin-composting-programs. Several other-NGOs and CBOs, are also-using the-same-technology. Except for manure, that finds ready-market in-agriculture, the-greatest-challenges, facing recycling-activities are: (i) accessing appropriate-technologies; (ii) ensuring-quality; and (iii) finding markets for recycled-products (UNIDO, 2009).

On-the-other-hand, *incineration* is a-method of burning waste, which is combustible, at high-temperatures, in-the-range of 1000^{O}C, to-reduce the-waste to-ashes. Hazardous-waste and healthcare/ medical-waste is mostly-incinerated, however, some of them find their-way into-dumpsites, where they get-mixed with municipal-waste. Therefore, a-lot of *non* bio-medical-mixed-waste is burnt, openly, in-Kenya. Policies, governing the-appropriate-use of incineration, exist, in-Kenya, *but* incinerators mostly consist of ovens, or open-pits, used to-burn bandages and blood-products (Karanja, 2005).

None of the-urban-centers, in-Kenya, operate a-sanitary-landfill. Most of the-generated-waste ends-up in-dumpsites, where *no* waste-compaction and capping (covering waste with soil at the-end of each-day) take-place. It-is estimated, that the-dumpsites, in-Nairobi, handle about 803,000 tons waste/year. Other-major-cities and towns, such-as: Mombasa, Kisumu, and Nakuru, dispose of 1,124 million-tons of waste. Combining with other-smaller-towns, it-is estimated, that 5.26 million-tons of waste are disposed-of, through open-burning and methanation (NEMA, 2012). As there is *no* source-segregation of waste, in-Kenya, most of the-recovery of resources, takes place at these-dumpsites (UNIDO, 2009).

2.3.2.2. Challenges

Sakurai (2000) has identified the-following-categories of problems, common-to WM, in-developing countries, including Kenya, as: (1) *External-problems* (population-explosion, rapid-urbanization, expansion of squatter-settlements; Socio-economic-crisis; insufficient-public-education and community-participation); (2) *Simultaneously external and internal-problems* (rapid-increase in the-volume of municipal and industrial-solid-wastes, lack of waste-reduction- efforts; lack of interest in-solid-waste-problems, among central and local-government-authorities; immature-system of local autonomy; lack of coordination among sectors, organizations and municipalities; lack of a-clear-policy on waste-pickers; lack of capacity in-public cleansing-departments, inadequate-development programs for human-resources; friction, between management and labor, within public-cleansing departments or services; inadequate-legal-systems, insufficient-law-enforcement; weak-financial-base); and (3) *Internal-problems* (Lack of organizational capacity in MWM; lack of short-, medium-, or long-term planning; inadequate-operation and maintenance structure for machinery and equipment, low-utilization-rate; use of technology that is technically, economically or socially inadequate).

According to the-Japan-International-Cooperation-Agency, difficulties, in-SWM, experienced, can-be attributed to the-following-aspects: (i) *Problem-factors* (Population, economic-level, climate, topography, etc.), including: Increases in waste-quantities; Changes in waste-characteristics; Seasonal variations, floods and other-natural-disasters; Underdeveloped-urban-infrastructure; Operational-difficulties; Difficulties in procuring disposal-sites; and Diversification of city-residents; (ii) *Social-aspects:* Inadequate-understanding of waste-issues; Unwillingness to-cooperate; Gaps between rich and poor; Formation of slum-areas; and Disintegration of traditional communities; (iii) *Institutional-aspects*: Lack of policy-objectives; Lack of appropriate-laws, standards or guidelines; Inconclusive decentralization or weak power of municipalities; Inadequate systems concerning organizations in charge of SWM; (iv) *Organizational-aspects*: Opaque-decision-making-process; Lack of a shared-sense of purpose; Frequent personnel-changes; Lack of organizational-management-capacity;

Lack of policymaking capacity; Lack of coordination and partnership with private waste service providers and other organizations; (v) *Financial aspects:* Underdeveloped tax-collection-system; Low-priority for SWM in budget allocation; Lack of financial-management-capacity; Lack of financial-planning in anticipation of equipment renewal, etc.; Inadequate assessment of cost-recovery-performance; and Inappropriate-allocation of collected-fees for other-purposes, than SWM-service; and (vi) *Technical-aspects*: Inadequate-skills; Lack of skilled-human resources; Inadequate policies for human-resources-development (HRD); and Inadequate technical information (JICA, 2009).

In-particular, NEMA (2012) identified the-following-challenges in-MSWM, in-Kenya: Legislative-framework (Lack of SWM-policy; Institutional-arrangements; Gaps in-sector-specific regulations; Lack of Capacity; Inadequate-enforcement); Low-public-awareness; Financial-implications; Level of Economy (high *vs.* low-income-areas); Infrastructure; illegal-structures and informal-settlement; and Planning for collection- centers and disposal/treatment-sites.

In-addition, more-details, on each of the-following-barriers: (i) Regulatory and Policy-Barriers; (ii) Economic/financial-Barriers; (iii) Technical-Barriers; (iv) Awareness; and (v) Training-Barriers; can be accessed *via* 'Kenya-national-profile to assess the chemicals management', by Republic of Kenya (2011).

Besides, according-to the-Pretoria based Basel Convention Regional Centre: (2000-2006), the-rating of WM-capacity, in-Kenya (as at 2001) was '*below-average'*. Table 1 shows more-recent statistics/summary of the-WM-capacity-situation, in-Kenya.

Table 1: Selected-statistical-data, relevant-to SWM, in-Kenya (NEMA, 2012).

Region	*Waste handling Mode*	*No. of Licensed Handlers*	*Type of Waste*
Nairobi	Transporters	48	Municipal/Biodegradable, Used battery, Waste Paper, Plastics, used oil, sludge, sewage, Hazardous/biomedical, Chemicals, Scrap metal
	Incinerators	10	Hazardous/biomedical
	Composters	0	-
	Recyclers	10	Waste paper, oil, sludge, scrap metal, plastics
	Dumpsite	0	-
Coast Region	Transporters	29	Used oil, sludge, municipal/biodegradable,
	Incinerators	2	Hazardous/biomedical
	Composters	0	-
	Recyclers	7	Oil, sludge
	Dumpsite	0	-
Other Regions	Transporters	18	Municipal/biodegradable, scrap metal, Hazardous/biomedical, plastics/polythene, used oil, sludge
	Incinerators	7	Hazardous/biomedical
	Composters	10	Biodegradable, organic, domestic
	Recyclers	9	Plastics, oil, sludge, hazardous
	Dumpsite	2	Non – hazardous

The-provision of SWM-services is, indeed, an-expensive-undertaking, and resources are required to: purchase the-appropriate-equipment and infrastructure, fund the-maintenance and daily-operation of vehicles, and equipment, and train or up-skill personnel, among-others. SWM and street-sweeping is also, often, the-city's single-largest-source of employment (Achankeng, 2003), and hence it contributes to-increase of wage-bill, further straining the-available-finances. In addition-to inadequate-finances (Kain *et al.,* 2016), other-contributing factors, to current-poor-state of WSWM, in-the-country, are: poor-political and institutional-support, low-awareness and poor-community-attitudes, lack of a-systematic-approach to WM, weak-technical capacity, and poor-implementation of waste-policies and bylaws (Gutberlet *et al.,* 2017; Kain *et al.,* 2016).

Specifically, the-scarcity of resources (e.g., financial, technical, and logistical (Liyala, 2011; Kain *et al.,* 2016), is a-major hindrance to-effective-SWM-practices, in-Kisumu-city (Frediani *et al.,* 2013); the-situation is *not* better, and even more-complex, in-other-parts of the-country. For-example, Okalebo and colleagues (2014) pointed-out on-several-challenges, in-SWM, in-Eldoret-town (35 km from the-subject university), as-follows: (1) inadequate-coverage; (2) low-pay and poor-morale; (3) insufficient-staff and resources; (4) lack of the-decision-making-authority, experience, and accountability of the-SWM-staff; (5) the-private-sector and community have-showed little-interest, in-participating, in-SWM; (6) the-policy and implementation-instruments, available to

Eldoret-Municipal-Council (EMC), are limited towards the-adoption of multilevel-governance; (7) crisis-management has become the-normal-mode of action; (8) the-complex human-population-dynamics, in-Eldoret, characterized by population-explosion has further aggravated the-problems; and (9) despite the-stipulations, in the-bylaws of EMC, there is a-strong cultural-attitude --'NIMBY' ('not in my backyard') towards waste. A-different 'spin' to the-NIMBY concept is given by another-new-term LULU (Locally *Unacceptable* Land Use), which gives much-more legitimacy to-often well-founded local-community-concerns (Fagan *et al.,* 2001). Selected-studies, including: ITDG-EA (2004); Kibwage & Momanyi (2002); Kiplagat (1999); and Syagga, (1993), identified similar-factors, that inhibit local-authorities, like EMC, in-MW-operations, in-Kenya.

2.3.2.3. Nairobi as an-illustrative-example of MSWM, in-the-country.

The-problem of WM, in-Nairobi, Kenyan-capital, has reached a-dangerous-level. The-failure of city-authority to-collect and properly-dispose *all*-the-waste, generated, has led to-indiscriminate-dumping, pathetic-sanitary-conditions, and incidences of environment-related health-problems (Ikiara *et al.,* 2004). Nairobi's SWM-situation, which could be-taken to-generally-represent Kenya's status, is largely characterized by: low-coverage of waste-collection; pollution, from uncontrolled-dumping of waste; inefficient-public-services; unregulated and uncoordinated-private-sector; and lack of key-SWM infrastructure (such-as transfer-facilities, sanitary-waste-disposal-facilities, and systems for waste- separation). In-addition, the-sector lacks policy and a-strong reuse and recovery-industry (UNEP, 2005).

For-example, according-to (Kasozi & von Blottnitz, 2010), solid-waste, generated on-daily-basis, in-Nairobi, is about 4,016 tons. The-collection-rate is as-low-as 33% (JICA, 2010), which leaves about 2,690 tons uncollected. According-to more-recent-documentation by CCN (2014), average-waste collection levels, have increased, in-Nairobi, from 33%, in-2010, to 56%, in-2014 (highest in-the-country). However, such-figures hiding-up the-gap, between the 'haves' and 'have-nots' (Wilson *et al.,* 2013).

Where available, waste-collection-services are geographically-skewed, with higher and middle-income residential and commercial-areas better-serviced (Kasozi & von Blottnitz, 2010). Low income-neighborhoods, with poor-infrastructure, are largely-neglected, but when they do receive the-service, although at a-very-limited-extend, it-is free of charge.

A-study by JICA (2010), also-estimated that local-authorities of Nairobi, spend 30% of their-budgets, on-WM and cleansing. Of this, 70% goes to-transportation of waste. To-bridge this-gap, private-sector-involvement, in-WM, is growing. According to NEMA (2015), waste, in-the-central business-districts of Nairobi, is largely-collected by the-County-Governments, while private-operators dominate collection, in-residential-areas, at a-fee. Waste-collection in low-income and informal-settlements is mainly-done by organized-groups and CBOs. NEMA issues annual-licenses to-waste-transporters, in- accordance-with the-provisions of the-waste-management-regulations of 2006. However, some-waste transportation-vehicles operate illegally, as they do *not* meet NEMA-requirements.

The-Nairobi-City-Council collects 500 tons/day, 19 private-licensed-companies collect another 500 tons/day, while waste-recyclers and scavengers collect 350 tons of waste, daily (CCN, 2014). There are over 150 private-sector waste-operators, *independently* involved, in-various-aspects of WM, indicating a-wider-private-sector-involvement in-WM, in-Nairobi. Community-level-initiatives also-play a-critical role, throughout the-WM-process; they can take the-form of: (i) Non-Governmental Organizations (NGOs); (ii) Community-Based-Organizations (CBOs); and (iii) Individual or Household Initiatives (Ferrara *et al.,* 2008). Community-based-organizations (CBOs) and Self-help-Groups operate in high-density residential areas, of the-city, as primary-waste-collectors, where also segregation is done, at a-limited-extend. In-*high*-income-areas, of Nairobi, for-example: an-estimated 200 *registered*-resident associations, are operating, concerned, among others, in-improving city-cleanliness. They contract, organize, and monitor, private-SWM-collection-services (Bahri, 2005; UNEP, 2004).

On-the-other-hand, waste-collection relies on the-government-management of infrastructure (ensuring that the-streets are paved and accessible, and zoning-laws against squatters, enforced) *regardless* of public or private-servicing. Private-firms will *only* be as-good-as the-infrastructure, which supports them. Private-firms have little-incentive (and virtually zero-technical and financial-capacity) to-repair and maintain roads (Thompson, 2010). As a-result, many of Kenya's initial-experiences with decentralization, of the-waste-collection-market, manifested in-the-neglect of lower-income-regions.

With an-increasingly-growing-population, Nairobi's annual-waste-production of 3,121 tons is set-to more-than-double, by 2030, the-year, by which Kenya is supposed to-be a-middle-income-country, consuming-more and, therefore, generating more-waste. As it stands, *only* about 27% of the-SWM, generated-daily, makes it to the-Dandora-dumpsite. This would-explain the-multiple mini-dumpsites, found along the-city's roads and in-open-spaces (Kamunyori, 2013). UNEP (2007) had classified Dandora-dumpsite as-one of the worst-humanitarian-crises, facing the-Nairobi-city. According-to *Grand Health Challenges Blog*:

> Dandora is a health and environmental disaster. At 43 hectares, equivalent to 60 football pitches, it has grown much too vast to be managed and the waste has been contaminating the groundwater for years.

This affects half a million residents living around the dumpsite. A 2007 study by UNEP that examined 328 children living close to the dumpsite uncovered that half had blood lead levels equal to or exceeding the poisoning threshold of 10 micrograms per deciliter of blood. Exposure to such high levels of lead is linked with damage to the nervous system and the brain.

The-uncollected-waste is either; illegally-dumped, or found on the-roadside, dark-corners, or disposed-off, *via* burning (Henry *et al.,* 2005). In-addition-to the-Dandora-dumpsite, more-than 70 *illegal*-dumping-sites, were identified, most of them concentrated in-the-slums (JICA, 2016); and receive mixed-wastes of various-origins, which include: domestic, industrial, medical, and commercial and institutional-wastes.

According to Monyoncho (2013), the-percentage of solid-waste, that is recovered, by the-municipality, in-Nairobi, is *only* about 8% of the-recyclables, and 5% of the-compostable, while private-sector-participation is un-regulated, with private-companies operating in-open-competition with-each-other, purely on a 'willing-buyer-willing seller' basis. Inorganic-waste-network, in-Nairobi, is comprised of licensed-waste-dealers, who buy, from large-groups of unregistered-individual-waste-pickers and neighborhood-based itinerant-waste-traders, who sell, in-bulk, to-large-scale waste-recyclers (Baud *et al,* 2004). According-to Karanja *et al.* (2005), waste-picking, in-Nairobi, is split-into: (i) street-picking, mainly, in small-open-waste-sites, streets, and dustbins; and (ii) waste-dump-pickers, who operate at-large formal or informal-dumpsites, mainly Dandora-dumpsite. At the-Dandora-dumpsite, alone, there are over 2000 pickers and dealers, earning-a-living, from the-recovery, and sell of recyclables (Karanja *et al.,* 2005). For-example, the-Basel-Convention Regional-Centre (2007), estimated monthly-income, earned by waste-scavengers, is at around USD 130. Over 20% of waste-pickers/handlers do reside, at the-dump, itself, as there is a-lot of competition, manifesting in-regular-fights, on who is going to-sort-out newly-arrived, to-the-dump, waste-truck (Kasozi & von Blottnitz, 2010), meaning that it-is-better to-be there (at the-dump) all the-time.

Thompson (2010) defines '*controlled-dumping*' as the-use of landfills, as terminal-endpoints for refuse; controlled-dumping presumes soil-cover, of the-waste, at the-end of each-day. In-most-dumpsites, in-Kenya, however, this is *not* practiced; sanitary-landfills, or engineered-terminal end-sites, for waste-deposition are *non*-existent, in-Nairobi, and in-whole-Kenya, as-well. Besides, there is, frequently, *no* mechanical-equipment, for spreading and compaction, of waste, which means little-reduction in waste-volumes. Fly and rodent-control are, often, neglected, and there-are serious-problems with widespread-littering (Mensah *et al*., 2005). Such-method of disposal has various-negative-impacts, which include severe-health-impacts, mostly to-communities, living in-the-vicinity of the-dump-site (Wakjira, 2007), as-well-as to-waste-handlers, involved.

2.4. Effects of uncontrolled-dumping

"Every day around the world…illnesses related to water supply, *waste disposal*, and garbage kill 30,000 people and constitute 75 percent of the illnesses that afflict humanity" (Davis, 2006).

In-particular: "The occupational health risks to waste pickers in developing countries are high because of manual handling and lack of protective clothing/equipment", exposing the-waste-handlers to-the-hazardous/toxic-elements, present in-the-waste, directly-affecting their-health. For-example, Mexico-City dumpsite-scavengers were reported to-have a-much-shorter-life-expectancy of 39 years, in-comparison-with that of the-general-population of 67 years (Medina, 2002). Besides, the-poorest, in-urban-areas, do suffer-the-most, from life-threatening-consequences of neglected-SW (Thompson, 2010; EPD, 2006; UNEP-IETC, 1996). Moreover: 'Children are at greater risk from environmental hazards because of their physical size, immature-organs, metabolic-rate, behaviors, natural-curiosity, and lack of knowledge' (UNICEF/WHO, 2013). For-example, in-Bangalore, India, an-epidemiological-survey on child-waste-pickers, at uncontrolled-landfill/dumpsite showed, that the-incidences of parasitosis, scabies, bronchial-disease, digestive-disease, and lympho-adenoma, were significantly-higher, than that for other-children, in the-city. In-the-same-accord, health-data of UN-Habitat (2009) shows higher-rates of diarrhea and acute-respiratory-infections, for children living in-vicinity of dumpsites.

NEMA, (2015), declared that in-Kenya: 'Despite the existence of laws and policies guiding waste management, weak implementation and poor practices have led to towns and cities being overwhelmed by their own waste, consequently affecting public health and the environment'. Uncontrolled-dumping is *directly*-affecting the-health, of the-waste-handlers, as-well-as, people, who-live near-dumping-sites. In-addition, heaps of garbage, everywhere, create visual-pollution, and an-environmental-pollution of *all*-environmental-medium (air, water, and soil), furthermore, contributing to Global-warming.

Public-health-impacts, of uncontrolled-waste-disposal include: (1) diarrhea, typhoid, and gastroenteritis, from direct-contact with waste; (2) respiratory-diseases and dioxin-poisoning, linked to-open-air-burning of waste, fine-particulates (including black-carbon) and complex-organic-compounds (including both; carcinogenic and persistent-organic-pollutants (POPs)), which are highly-damaging globally and locally; (3) infectious-outbreaks and spread of vector-borne-diseases (malaria, cholera, dengue-fever), when drains are blocked, by waste; (4) flooding; (5) risks-to animals-feeding and hazardous-substances entering the-food-chain; and (6)

health-impacts from uncontrolled *hazardous* waste-disposal (see UNEP & ISWA, 2015; ISWA, 2015; Sankoh *et al.,* 2013; Chatham-Stephens *et al.,* 2013; Afon, 2012; Binion & Gutberlet, 2012; Nkwocha *et al.,* 2011; UNEP/DTIE, 2010; Baabereyir, 2009; UNEP, 2007). Besides, it-is important to-note, that contaminated-dumpsites can continue-to-be a-health-problem, long-after they have-stopped receiving waste.

Environmental-pollution, include: (1) surface, groundwater, and marine-contamination; (2) greenhouse-gas-emissions; (3) impacts on fisheries and agriculture; (4) loss of biodiversity and amenity-losses, to-residents; and (5) impacts on tourism (see UNEP & ISWA, 2015; ISWA, 2015; Phillips & Thorne, 2011; UNDP/ GEF/SPREP, 2006; UNEP, 2005).

3. Discussion.

3.1. Analysis of the-SWM-Legal framework.

3.1.1. The-Kenyan-laws, relevant-to SWM.

The-Kenyan-laws, relevant-to SWM (highlighted in-section 2.2), are presented, in-Figure 2, in the-chronology-format/milestone-summary.

Besides, recent-review, of SWM-policies, in-Kenya, by UARK (2016), has identified the-following six-categories-sources of SWM-policies, in-Kenya: (1) Generic-policies, that provide broad provisions (e.g., Constitution of Kenya); (2) Integrated-policies, that address many-environmental issues (e.g., Environmental Management and Coordination Act, Environmental Policy); (3) Sector-specific-Acts (e.g., Public-Health-Act, Factories-Act); (4) Issue-specific-regulations (e.g., Water quality-regulations, Waste-management-regulation); (5) Solid-Waste-Management (stand-alone) policies (e.g., National-SWM- Strategy); and (6) External-policies (global and regional-policies), endorsed by the-country.

Figure 2: Chronological-view of Kenyan-environmental-laws, relevant to SWM.

With-regard-to-External-policies, according-to UARK (2016), the-following global-policy frameworks had direct and/or indirect-influence, in-the-evolvement of SWM-policy-framework, in-Kenya, with either the-country is a-signatory, the-policy is cited, or a-relevant-content of it included, or through an-indirect-reference to-another policy-document, which recognized them: (1) 1957 The-Recommendations of the-United Nations-Committee of Experts on the-Transport of Dangerous-Goods (formulated in 1957 and updated biannually) (UNECE, 1957); (2) 1972 Declaration of the-United-Nations-Conference on the-Human-Environment (Stockholm) (UN, 1972); (3) 1982 Basel-Convention on the-Control of Trans- boundary-Movements of Hazardous-Wastes and their Disposal (UNEP, 1982); (4) 1982 World-Charter for Nature, adopted by the-General-Assembly of the-United-Nations, at its 37th session (UN, 1982); (5) 1987 The-Cairo-Guidelines and Principles for the-Environmentally Sound-Management of Hazardous-Wastes, adopted by the-Governing-Council of the-United-Nations Environment- Program (UNEP), by decision 14/30 (UNEP, 1987); (6) 1991 Bamako-Convention on the-Ban of the-Import into Africa and the-Control of Trans-boundary Movement and Management of Hazardous-Wastes, within Africa (Africa-Union, 1991); (7) 1992 United-Nations-Conference on Environment and Development, Rio-Declaration on Environment and Development (UNEP, 1992); (8) 1997 Decision 19/13 C, of the-Governing-Council of the-United Nations Environment-Program to-initiate international-action to-protect human-health and the-environment, through measures which will reduce and/or eliminate emissions and discharges of persistent-organic pollutants (POPs) (UNEP, 1997); (9) 2005 JICA Supporting-Capacity-Development, in-SWM, in-Developing-Countries -- Towards Improving SWM Capacity of Entire-Society (JICA, 2005); and (10) 2007 Stockholm-Convention on POPs (UNEP, 2007).

In-particular, International-conventions and multilateral-agreements (relevant-to-SWM) signed, ratified, and acceded-to, by Kenya, are: Montreal-Protocol (Ratified on 09/11/1988); Vienna-Convention (Ratified on 09/11/1988); UN-Framework-Convention on Climate-Change (Ratified on 30/08/1994); London-Amendment to the-Montreal-Protocol (Ratified on 27/09/1994); Copenhagen-Amendment to the Montreal-Protocol (Ratified on 27/09/1994); Montreal-Amendment to the-Montreal-Protocol (Ratified on 12/07/2000); Cartagena-Protocol on Bio-safety (Signed in-May, 2000); Basel-Convention on the Trans-boundary-Movement of Hazardous-Waste and their-Disposal (Ratified on 01/06/2000); Stockholm- Convention on POPs (Ratified on 24/09/2004); Rotterdam-Convention on Prior-Informed-Consent for Certain-Chemicals and Pesticides, in-International-Trade (Ratified on 03/02/2005); Kyoto-Protocol (Ratified on 25/02/2005); Ban-Amendment to the-Basel-Convention (Acceded on 09/09/2009); Minamata Convention on Mercury (Signed on 10/10/2013); and Beijing-Amendment to the-Montreal-Protocol (Ratified on 09/10/2013). For-more-details on the-major-International-Conventions Protocols/Agreements see Starovoytova (2018).

Global and regional (sub-Saharan-African) conventions, agreements, declarations, policies and strategies, addressing SWM, in-developing-countries, provided some-sort of external-policy pressure/ influence, on the-formulation/shaping of SW-policy-documents, in-Kenya. For-example: NEMA has promulgated the-following-regulations, under EMCA, 1999, to-ensure-protection of human-health and environment, in-line-with the-Basel-Convention, and with-increasing-compliance with the-Stockholm Convention. In-particular, The-Waste Management-Regulations, 2006 (Legal-Notice No.121) establishes a-number of rules, for the-management of municipal-waste, including provisions for licensing of collection, transportation, and operating landfills. Being a-relatively-new-area, there is *no* specific-legislation, in-Kenya, aimed at reducing the-release of unintentionally-produced-POPs. However, there are a-number of regulations, that can-be-modified, to-integrate the-requirements of the-Stockholm Convention on POPs, namely: (i) Waste-incineration: Local-Government-Act, Public-Health-Act, EMCA, Public-nuisance-Act; (ii) Medical-Waste-Incineration subsidiary-legislation, under Public-health-Act, that requires medical- facilities to-separate and segregate medical-waste; (iii) Hazardous-Wastes: the-draft-regulation, under NEMA Pest-Control-Products-Act has a-new-regulation on medical-waste, that prescribes incineration (without specifying detailed-standards for the-equipment). In-addition, Environmental (Impact-Assessment and Audit) Regulations, 2003 and Waste-Management-Regulations, 2006, for sound-waste-management, follow the-Basel Convention; Water-Quality-Regulations, 2006, to-protect water-resources from pollution, follows WHO-guidelines; Controlled-Substances-Regulations, 2007, for Control of Ozone-Depleting-Substances (ODS), follows the-Vienna-Convention and the-Montreal-Protocol; and Air-Quality Regulations (awaiting promulgation), aim to-domesticate the-Stockholm Convention.

In-addition, the-following *draft* regulations, are currently, under-development or approval: (i) Draft Chemicals-management Regulations, finalized awaiting the-due-process of promulgation, is in-accord-with the-Rotterdam, Stockholm, Montreal, and Minamata-Convention on-Mercury; (ii) E-waste-management regulations developed (awaiting promulgation); (iii) Asbestos-handling and disposal-guidelines developed; (iv) Regulations on used-oil, and plastic-wastes, are being developed; and (v) End of life tires regulation (awaiting promulgation).

Kenya has also-developed the-following-documents, related-to safety (of biomedical-waste handling) in the-health-sector: (i) Occupational-Health and safety-guidelines, for health-sector, 2014; (ii) Biosafety and bio-security-guidelines, 2014; (iii) Healthcare-waste-management strategic-plan, 2015-2020 (*yet* to-be-finalized); (iv) Infection-Prevention and Control strategic-plan, 2014- 2019; and (v) Health-sector strategic-Plan III, 2013- 2017.

Besides, Policies and guiding-principles, that direct organizational-goals and objectives, on-various HCW-issues, include: (a) National-Policy on injection-safety and Medical-waste- management; (b) National-Health-Care Waste-Management-plan (2008-2012); (c) National-Health-Care Waste-Management-Guidelines, 2011; (d) Infection-Prevention and Control-Policy; and (e) Infection- Prevention and Control-guidelines.

On-examination of the-chronological- and context-development of SWM-laws, in-the-country, UARK (2016), concluded that: 'There is a magnificent shift from focusing criminalizing offences to promoting Good-practices; from generic-Acts to specific-ones; and from centralized-mandates to more Decentralized-responsibilities' . In-the-same-accord, Haregu *et al.* (2017), pointed-out, that there has been a-shift, in the-main-focus, in-the-development of SWM-policies, in-Kenya. For-example: (1) the-first document--the-Penal Code (1948), is focused on "what *not* to do", regarding SWM; (2) Next, the-Local Government-Act (1998) focused on "*who* will control" SWM-activities, vesting powers to responsible- bodies; (3) The-main-environmental-law--EMCA (1999), and its-regulations, incorporated stipulations on "*what* needs to be done" to-address the-problem of SWM; and (4) The-more-recent policy documents emphasize "*how* to manage/address" the-challenges of SWM.

After the-examination of the-national-SWM-laws, it-is in-order to-look at the-devolution of SWM-policy-frameworks to-county-levels (so-called by-laws). As-expected, the-capital-city-Nairobi (a-county, in-itself), is more-advanced, in-this-area, than other-Kenyan-regions. For-example, the-first-set of City of Nairobi by-laws, that address SWM, emerged in the-1950s and 1960s. These included by-laws on Nursing-Homes and Maternity-Homes (1950); and on Restaurants, Eating-Houses and Snack-Bars (1961); General-Nuisance by-Laws (1960); and Part II of the-City-Council of Nairobi-Conservancy By-Laws (1961). The-next-set of Nairobi-City-County by-laws were published between 2006 and 2007, and included by-laws on medical-facilities (2006); banning polythene-bags (2007); wastewater-conservancy (2007); and more-general-nuisance and SWM by-laws (2007), City-Council of Nairobi (2007); A-comprehensive *plastic waste management strategy* for the City of Nairobi (2006); The *Nairobi Metro 2030 Strategy* (2008); The City of Nairobi's *Integrated Solid Waste Management Plan* (2010-2020); The-Nairobi-City-County *Solid Waste Management Bill* (2014). Besides, in-the-coast, the-Municipal-Council of Mombasa issued its-first Environmental-Management by-laws, in-2008. Besides the-county-specific SWM-policy frameworks, for Nairobi and Mombasa, there are additional-generic-policies with policy-content, primarily-relevant to cities and urban-areas. Among these is the *Urban Areas and Cities Act* (2011), which requires cities to-have the-ability to-effectively-manage and dispose of waste (Civil-Society-Urban Development-Program (2011), and the *County Government Act* (2013)), which identifies SWM as a-devolved-service, under each-county-government, and assigns to-it the-specific-task of implementing nationwide-policies, within its-jurisdiction (Republic of Kenya, 2013). For-more-details, on the-evolution of SWM policy-architecture, at *country*-level (Nairobi and Mombasa), see Haregu *et al.,* (2017).

With-regard to-the-implementation of the-listed-above by-laws, according-to NEMA (2015): 'Solid waste management remains a major challenge in *all* the 47 counties in the country. Over the years most local authorities did not prioritize the establishment of proper waste management systems and hence the County Governments have inherited this state of affairs'.

In-the-author's opinion, the-*overall*-evolvement, of the-SWM-policy-architecture, in-Kenya, seems to-be well-informed, by the-global-policy-dynamics, in-environment and waste-management. According to Haregu *et al.* (2017), however, apart from preliminary-linkage, through closeness of time, of development and endorsement, of the-policies, there is *no* concrete and direct-evidence, about this-influence.

After examination of the-policies, relevant to SWM, it-is logical to-analyze the-bodies, responsible for the-policy-implementation. Next-section, therefore, details the-main-administrative, regulative, research, and capacity-building-bodies/organizations, which play a-significant-role in the-development and operations of the-waste-sector.

3.1.2. Coordination-institutions and mechanisms, for SWM-policies-implementation.

The-institutional-mechanisms, for the-implementation of the-SWM-policies, have also evolved, through several-developmental-stages. Before 1990, the-two main-institutional-mechanisms were: (i) local authorities (municipal/urban/town-councils); and (ii) public-prosecutors (for the-Penal-Code). Between 1990 and 2010, additional-institutional-mechanisms were-established, including: the-National Environmental Management-Authority (NEMA), National-Environment-Council, Provincial and District Environment-Committees, and Public-Complaints-Committee. In the-post-2010 period, other-institutions were-added: the-Environmental and Land-Court; Land, physical planning and environmental-departments (country-level); National-ministries of environment and health; County governments; and the-Kenya National-Cleaner-Production-Centre. More-details on the-institutional-mechanism, with description and responsibilities, can be viewed *via* Haregu *et al.* (2017). On-the-other-hand, the-roles of private-sector-actors in the WM-cycle, are however, *not* clearly-outlined, in the-major policies (Haregu *et al.,* 2017).

In-particular, the-current-major-institutions, in-charge-of environmental-protection and management, in-Kenya, are:

Ministry of Environment and Natural-Resources (MENR) - is the-government-agency, charged-with principal responsibility of protecting Kenya's environmental-resources. The-MENR also has overall-responsibility for coordinating the-work of *all* Lead-Agencies, whose work, directly-impacts on-environment, through the-National-Environment Management-Authority (NEMA). Specific responsibilities, for the-ministry, are to-initiate environmental-policies; coordinate the-activities of sectorial agencies; and advise government on-environmental- issues;

National-Environmental Management-Authority (NEMA) - was established under the Environmental Management and Coordination-Act (EMCA) No. 8 of 1999, as the-principal-instrument, of the-government, in-the implementation of *all*-policies, relating to-the-environment. NEMA has the-mandate to: safeguard, restore, and enhance the-quality of the-environment, through coordination and supervision, of stakeholders, for sustainable-development; e.g., exercise general-supervision and coordination, over *all*-matters, relating to the-environment, and implementation of environmental-law; and supervise and coordinate all-environmental-matters and implement all policies, relating to the-environment, for sustainable-development;

Ministry of Health (MOH): With-specific-reference to the-Health-Care Waste-Management (HCWM) related-activities, the-missions of MOH are: (i) to-establish systems and infrastructure on waste-management; (ii) to- identify provisions of HCW-management equipment, materials, and supplies, to-health-facilities; (iii) to-develop and disseminate standards and guidelines, on HCW-management; (iv) to-promote continuing-professional- development, for health-workers on HCW-management; (v) to-train HCW-handlers, on proper-waste- management; and (vi) to-promote the-segregation, storage, collection, pre-treatment, transportation and proper disposal of such-waste;

County and District-Level Institutions: The-national-institutions, established under the-new Constitution, are required to-decentralize their-functions, by establishing County and District-Officers. Existing-institutions already-have a-presence in the-Counties, and have, or are in-the-process of establishing-offices, in the-new-Districts. The-Constitution of Kenya (2010) creates an ambitious County-Government-structure, based on principles of democracy, revenue-reliability, gender-equity, accountability, and citizen-participation. The-roles allocated to the- County-governments include: the-implementation of national-policies, on environment and natural-resources (including soil and water-conservation, and forestry) and local-tourism, among others;

District Environmental-Committees: The-EMCA also-mandated the-creation of several-institutions, at national, county, and district-levels, to-facilitate the-fulfillment of its-functions. The-District Environment Committee (DEC) is responsible for the-proper-management of the-environment, in-the Districts. They develop the-environment-action-plans, of their-districts, and pass them-on to the-National Environmental-Action-Plan Committee; In-addition:

Kenya-Institute for Public-Policy-Research and Analysis (KIPPRA) has carried-out a-number of studies, in the-above-named-areas. Of special-relevance, to-this-research is the-one on the-use of economic-instruments for MSWM, in-Kenya (Bahri, 2005); and

Kenya-National Cleaner-Production-Centre (KNCPC) is an-autonomous non-profit-institution, established in-July, 2000, as-a-project of the-UNIDO and the-Kenya Industrial-Research and Development-Institute (KIRDI). The-Centre is mandated to-build national-capacity in *preventive* environmental-management-tools, through a-number-approaches, comprising, among-others: technical support, policy-advice, and cleaner-technology-transfer. One of the 'priority sub-sectors' ear-marked by the-Centre, for cleaner-production-strategy and implementation, is the-plastic-industry (KNCPC, 2004).

The-enforcement of the-provisions governing the-SWM, is done, mainly, by NEMA and the-City-Councils/Local-governments. Their-main-responsibilities, as-regards SWM, are: (a) provision of services for collection, transportation, treatment, and disposal; (b) regulating and monitoring the-activities of SW-generators; (c) regulation and monitoring of private-companies, engaged in SWM-activities; (d) formulation and enforcement of relevant-laws and regulations; and (e) formulation and implementation of MSW-policies (CCN, 2005).

3.1.3. Analysis of actors, involved in-*actual*-MSWM-service-delivery.

In-most-developed-countries/cities, the-key-actors, involved in-MSWM, are mostly-limited-to the municipality, and the-private-sector, where both; have clearly-defined-roles and responsibilities (World- Vision-International, 2015). In-contrast, there can be a-very-large-range of actors, involved in MSWM, in-developing-counties/cities. For-example, Figure 3 illustrates the-range of actors, involved in-WM, in some-contexts, alongside-with their-responsibilities/usual-activities.

Figure 3: Network of actors and responsibilities, in SWM (World-Vision-International, 2015).

This-figure clearly-illustrates the-complexities, and potential-ambiguities, regarding responsibility of the-actors, involved. One-wise-idiom/proverb said: 'Too-many-cooks spoil the-broth', is appropriate in this-case. According to the-World-Vision-International (2015), the-main-consequence of this-complexity and lack of coordination, are high-levels of inefficiency, limited-value-addition to the-waste-chain, and inequalities of service, within urban-communities. In-this-regard, it would be-beneficial to-restructure/ lean-up the-current-system (with numerous-actors), involved, in-MSWM, in-the-country.

Next-section will look at the-challenges, experienced, to-deliver efficient MSWM, in-the-country.

3.1.4. Challenges in the-implementation of the-SWM-polices.

The-above-analysis, of the-Kenyan-laws and by-laws, relevant-to MSWM, justified, that Kenya has indeed developed and enacted a-sufficient-number of policies and legal-provisions, as-well-as created institutions and systems, at-different-levels of governance. This-conclusion is in-accord-with Sibanda *et al.,* (2017), that: "In-Kenya, there is sufficient and dynamic-legislation, existing by-laws, policies, and programs, regarding waste-management".

On-the-other-hand, NEMA (2006) concluded, that: 'Existing solid waste management policies clearly state the policy directions in terms of the required outcomes. But explicit articulation of policy strategies and implementation mechanisms is insufficient'. Besides, National-Environment-Policy (2013) stated, that:

> Many sectoral-policies and laws [on the environment], are *not* harmonized with each other and with the Constitution. … In addition, weak enforcement of laws and weak implementation of policies remain a major issue of concern in Kenya's environment sector.

According to Haregu *et al.* (2017), the-legislative and regulatory-context, for SWM, is dispersed, fragmented, and incomplete, and so does *not* tend to-facilitate the-formation of cross-sectoral-partnerships.

Furthermore Haregu *et al.* (2017) criticized, that : (1) "Despite the range of SWM policies developed in Kenya over the last decades, the problems with SWM remain a critical concern", as "The gap between policy and adequate action remains very large"; (2) " …the emphasis has been more on ecological issues, such as cleanliness of the environment, than environmental health outcomes"; (3) "…polices give little indication of how solid wastes can best be used as resources to drive economic development that is compatible with the health of the population and the environment"; and (4) "… the model of public–private partnership, that should be applied for the management of solid waste in Kenya is *not* clear from the reviewed policy frameworks".

In-the-same-accord, UARK (2016), identified the-causes of this-policy-practice gap, including the-following: (i) policy-making-processes highly-driven by government, in a-top-down-approach, with limited-participation and ownership, by the-public and private-sectors; (ii) the deep-rooted-attitude of considering solid-waste, as a-problem, rather than a-resource, which could-be-recycled and used; and (iii) lack of infrastructure, to-recycle solid-wastes. In-addition, Henry *et al.,* (2006), pointed-out that local-authorities lack the-capacity to-implement-the-relevant-laws/by-laws. With regard-to consideration of waste as a-resource, according-to Ferrara *et al.* (2008), recycling and composting are an-accessible-way to-empower communities, generate income, and provide an-excellent-opportunity for initiating waste-minimization programs. Besides, such-methods can reduce environmental-pollution. Makopa, (2006), however, pointed-out, that: (1) there are: "No clear policies that support urban agriculture and the use of compost in farming, unlike that of using fertilizers"; (2) there is *no* mention of compost in any-legislation, moreover in the-Public-health-Act, manure is listed as-a-nuisance; and (3) the-Nairobi City-Council has *never* integrated compost-making, into its-SWM-activities.

Haregu *et al.* (2017), also stated, that: 'SWM remains a critical concern and a major challenge … as a result of weak institutional structures and capacity, weak enforcement of regulatory frameworks, and the control of the sector by criminal cartels'. Poor-coordination, between numerous- institutions and agencies, dealing with

the-issues, of environmental-protection, and the-implementation of adopted-regulations and laws, was also-cited by Obradovi *et al.,* (2014). According-to Guerrero *et al.* (2013); Nyandika (2007); and Mogaka (2006), the-problems in-implementation, is due-to: lack of vigilance and enforcement; lenient-penalties; corruption; political-interference; lack of motivation to-comply; as-well-as inefficient-prosecution-system. In-addition, lack of public-commitment and awareness, and poor-financing were cited by McAllister (2015); and Okot-Okumu (2012).

A-straightforward, transparent, unambiguous, legal and regulatory-framework, including functioning-inspection and enforcement-procedures, at the-national, provincial, and local-levels, is essential to the-proper-functioning of MSWM-strategies (Marshall & Farahbakhsh, 2013). On-the other-hand, an-interview, with NEMA-officials established, that the-authority is currently severely-understaffed, having *only* 10 inspectors, hence, NEMA finds it difficult to-send its-inspectors to-the-field, regularly, as required by the-law. The-City-Council of Nairobi, on the-other-hand, finds it difficult to-enforce its-by-Laws, since it acts as a-regulator and a-service-provider, at the-same-time (Haregu *et al.,* 2017).

In-addition to-the-poor-policy-implementation, Baabereyir (2009), cites that the-City's inability to-implement existing-bylaws, on waste-disposal, results in a 'throw-it-where-you-like' attitude (for-example: throwing waste from the-windows, of moving-cars, busses, trains, etc., is a-norm, in-Kenya), pointing at general-disregard of waste-disposal-regulations. This is also pointing-out on archaic-attitudes and erroneous-behaviors, towards waste, by majority of its-citizens.

In-the-face of growing MSW-generation, in-Nairobi-city, due, partly-to rapid-urbanization, the-Nairobi-City Council (NCC)-by-laws, have-been rendered outdated, and too-weak, in their-penalty, to-deter-offenders (Nema News, 2005). Although NCC-by-laws prohibit illegal-disposal of waste, specify storage and collection-responsibilities, for SW-generators, and indicate the-Council's right to-collect MSWM-charges, all of these are *not* adequately-implemented (Ng'era, 2014; Rotich & Zhao, 2005; UNEP, 2004).

On-the-other-hand, implementation of some-polices can create new/emerging-problems/hazards, never experienced before; next-section provides one-such-example.

3.1.5. New-issues/risks emerging, due-to the-plastic-ban, 2017.

With-regard to-policy-*implementation*, and in-particular, on the-latest-ban on-plastic-bags, 2017, the-researcher observed, severally, and in-different-areas of Kenya, that street-food venders, do package their-food, for customers, using old-newspapers, due-to the-recent-ban on plastic-bags, 2017. These-products include: popular-cut-vegetables 'sukuma-wiki'; fruits, fried and boiled-maize, fried-sausages and fish, and even, chips, among-other-food-stuff.

Such-practice is potentially-dangerous, to the-customers (Conter *et al.,* 2012; Scott, 2003). For-example, Zhou *et al.* (2012) stated that foods, contaminated by newspaper-ink, raise specific-health concerns, due-to the-multiple-bioactive-materials, present in-inks, with known-negative health-effects. Naphthylamine and amoratic-hydrocarbons are the-major-concerns (Zhou & Stanley, 2011) of lung-cancer, and bladder-cancer (Konety & Carroll, 2008), with significantly-higher-risk for bladder-cancer, in-men (Al-Zoughool *et al.,* 2006). Besides, since the-complex-mixture of chemicals, from newspaper-ink can-contain both; CYP1A-inhibitors and AhR-agonists, the-exposure to-such an-extract, on a-chronic-basis, could-lead to AhR-dependent-toxicity (Bohonowych *et al.,* 2008). The-direct-contact, between the-food and the-newspaper, increases the-risk of newspaper-ink and chemicals, being-absorbed by the-food, if the-food is hot, and if it-is fried; the-cooking-oil (lipid) acts as a-good-medium, for the-transfer of ink-ingredients (Redmond & Griffith, 2003).

The-above-account exposed that the-harm of using newspapers, as packaging material, is apparent. On-the-other-hand, it seems that enforcement of the-plastic-ban, in-the-country, was initiated *without* providing several-affordable-alternatives, to-plastic-bags, particularly for street-vendors. In-the-view, of the-above-narrative, the-study on the-prevalence of use of newspaper as-packaging-material, for food-stuff, should-be conducted.

To-address the-above-mentioned-challenges, in-implementation of SWM-laws and by-laws, as-well-as challenges, in *actual*-MSWM-service-delivery, the-following-sections will provide some-details on the-capacity-development and governance-issues, in-SWM.

Developing-countries, and Kenya, in-particular, require assistance, in-order-to-mobilize their-*own* capacity, to-deal with their-own-situation, which is referred-to-as '*capacity-development'* (CD). The-next-section provides CD-details.

3.2. Capacity-development.

The-UNDP defines CD as the-process, by-which, individuals, organizations, institutions, and societies, develop 'abilities' (individually and collectively) to-perform-functions, solve-problems, and set and achieve-objectives. This-is a-widely-used-concept, although the-definition of CD varies-slightly, from-donor to-donor. The-approaches of conventional-development-assistance and cooperation-programs, for urban waste-problems, in-developing-countries, can be classified into the-following-three-categories: (1) *Hardware-approach* (since the 1970s): input of equipment and other hardware as a part of urban-environmental-improvement. This approach

based on the supply of 'hardware' does not have a lasting effect in terms of overseas development assistance unless it is accompanied by an appropriate scheme for the development of technical skills and a management system; (2) *Software-approach* (since the late 1980s): assistance in the-planning of solid waste management system and emphasis on input of non-physical The success of an approach based on the software or operational expertise depends on the capacity and level of ownership of the recipient; and (3) *Capacity development approach* (since the 1990s): assistance for capacity-development (that can be divided into two-steps of flow, namely, assistance-to building-up organizations and systems-institution-development, in the-narrow-sense, and emphasis on recipient's initiatives and social-aspect). In other-words, it-is an-approach, in-which the-first-step is to-help-improve the-capacity, and then to-develop the-physical and *non*-physical-types of assistance, in a-comprehensive way, and in-accordance-with the-recipient's resulting-capacity.

According to JICA (2009), in-the-last 10 years, the-capacity-development assistance, has been the-mainstream of international-trend.

On-the-other-hand, there is a-considerable-body of scientific and professional-literature on-technologies, necessary for waste-collection and waste-disposal (see for-example: Coffey& Coad, 2010; Rushbrook & Pugh, 1999; Daniel, 1996; McBean *et al.,* 1995), where WM is considered in-engineering terms, as a-technical-problem with a-technical-solution. *No* technology, on its-own, however, can solve the-problems, related to sustainability of WM-activities; the-governance-aspects of the-necessary actions need to-be-duly considered.

3.3. Good-governance in SWM

Figure 6 distinguishes, between the-physical-components (the 'What' dimension of a-SWM-system), and the-governance (the 'How' and the 'Who' dimensions of a-SWM-system). Besides, the-state of WM, in a-city/town can be used as an-indicator to-monitor the-success of good-governance-programs (Whiteman *et al*., 2001). For-example: where WM is working-well, it-is likely, that the-city has also tackled underlying issues, relating to-management-structures, contracting-procedures, labor-practices, accounting, cost- recovery, and corruption, among-others. The-3-categories of policy-instruments/Key-governance-aspects, adopted in-this-paper, are presented, in-Table 2.

Table 2: Key-governance-aspects of extending waste collection to *all* and securing-controlled-disposal

Class of Policy Instruments	Goal 1: Waste Collection to All	Goal 2: Controlled Disposal	Necessary Condition	Enabling/Facilitating Factor
Direct regulation	Legal framework for inclusion of both public and private, and both formal and informal, service providers	Strong regulations requiring controls to protect the environment, *and* credible and consistent enforcement	Construction of facilities in parallel to the regulations	Institutional capacities to *both* enforce law *and* to work with various service providers
Economic instruments	Sustainable financing—securing funding for collection services, including some contribution from direct charges	Sustainable financing—securing funding for facilities, *both* capital costs *and* the continuing costs of operation	Affordability for service users	Availability of national and/or international funding, including EPR [I]
Social instruments	Awareness raising for behaviour change and clear instructions on new services, to avoid dumping and be willing to pay	Awareness raising for behaviour change, to avoid dumping	Collaboration with civil society including media	Authorities engaging with the public and leading by example

Key: I EPR—Extended Producer Responsibility; Source: Rodi'c & Wilson (2017).

Besides, Bemelmans-Videc *et al.* also group policy-instruments into 3-equivalent-categories, namely 'sticks' (for direct-regulation), 'carrots' (for economic-instruments), and 'sermons' (representing communication and information-based-instruments). Other-authors do *not* explicitly classify policy- instruments (Finnveden *et al.,* 2013).

It-is-important and beneficial, to-ensure coherence of policy-goals and cohesion, among the-instruments, applied to-achieve-them (Nilsson *et al.,* 2012; Howlett & Rayner, 2007).

The-following-sections elaborate on each of the-instruments, in the-above-Table.

3.3.1. Direct-regulation for MSWM.

Table 2 shows that there should be an-inclusion of public, private, formal and informal SWM-service providers.

Public-private partnership (PPPs) or Private-sector-participation (PSP) is being-promoted in the-SWM-sector, either as an-option to-complement public-services, or to-increase the-efficiency of service-delivery. It is

seen, by the-World-Bank and European-Bank for Reconstruction and Development (EBRD), as a-key-component of the-institutional-arrangements in-SWM-service-delivery (Wilson, 2007).

Advantages of PPP include: (i) The-private-sector can provide a-more-efficient, or cost-effective-service, because it-is under-the-pressure, of market-forces, to-achieve profitability, and pay greater-attention-to customer-satisfaction; (ii) The-private-sector often has-better-access to capital financing; and (iii) The-private-sector may have easier-access-to specialist-skills/expertise. The-evidence shows, however, (UN-HABITAT, 2010) that the-waste-collection-coverage, and quality of services, are *not* necessarily related to-the-type of service-provider (public or private).

Besides, in some-cases, where city-authorities failed-to-provide adequate-services, other-actors took the-initiative, and organized services, in-their-neighborhoods themselves, either as an-enterprise or a-cooperative. *Community-based* solid-waste-management (CBSWM) is the-approach, whereby members of a-community, themselves, manage such-activities-as waste-collection, resource-recovery (e.g., composting), and sale of recycled-products. Examples include educated, *but* unemployed-youth in-Mombasa, Kenya, provided the-much-needed-services, in-the area, and also-managed to-create jobs, and a-source of income for themselves (Rodic & Wilson, 2017). According to JIKA (2016), this-approach is recently attracting much-attention of donors.

In-addition, a-*micro and small-enterprise (MSE*) can take the-form of a-small-private-enterprise, cooperative, community-based-enterprise, or labor-contract, by a-group, or social-organization. MSEs, however, can*not* provide large-scales-services or take-advantage of economies of scale. Despite these-limitations, MSEs have the-following- advantages, in-terms of the-WM-business-aspects: (i) MSEs can provide services at a-low-cost, due-to such-factors- as: low-capital-cost with the-use of handcarts, etc. and lower-wages of MSE-workers, compared-with workers, hired by municipal-counterparts; (ii) Because of their-small-size, MSEs can better-cope with-different-types of housing and access-roads; (iii) Since MSEs are usually based in-the-neighborhood, they serve, they favor community- participation and control; (iv) MSEs are labor-intensive, and, thus, can create more-employment, than large- enterprises; and (v) The-involvement of a-number of MSEs creates environment of competition among-them. They also-can play a-role, in-recycling-promotion, and other-public-environmental-education.

The-best-approach would be when the-public, private, and informal-sectors, do *all* work-together with-the-community, to-improve SWM (Liyala 2011; Oberlin 2011; Okot-Okumu & Nyenje 2011; Tukahirwa, 2011; Chakrabrati 2009). Besides, the-World-Bank has set-out 3-key-principles, that *must*-be-met, for successful PPPs/PSPs, in-WM: competition, transparency, and accountability (Cointreau 2000). In-addition, the-municipality needs to-retain *responsibility* for providing the-service, while delegating service *provision* to-the-private-sector. GTZ have published a-critical-review of experiences in-PSP, in-WM, including 23 case-studies (Coad, 2005).

Currently, there is *no* particular-legal-framework, on inclusion of PPPs, in-SWM-activities, in-Kenya. Also, in-Table 2, it-is stated, that the-necessary-condition, for achieving the-universal waste-collection, is that construction of facilities should-be-done, in-parallel-with the-legislation. In-this-regard, dumpsites, in-Kenya, should be upgraded to sanitary-landfills, and in-parallel, the-appropriate-legislation should-be established, to streamline the-MSWM-operations.

3.3.2 Economic-instruments for MSWM.

At policy-level, command and control-strategies, alongside-with economic-instruments, have been proposed, as-effective-tools, to-manage-wastes (UNEP, 2004). The-United-Nations defines *economic instruments* as-tools or actions, which have the-purpose of affecting the-behavior of economic-agents, by changing their-financial-incentives. Economic-instruments can-be-grouped-into two-categories (UNEP, 2004): (i) revenue-raising instruments (licenses, user-charges); and (ii) *non*-revenue-instruments (performance-based management contracting, clean-neighborhood-competitions, privatization). Economic instruments can-work harmoniously-with traditional-regulatory-mechanisms, as-well-as help to-provide the-necessary-funds, for supporting sound-environmental-management-initiatives, such-as recycling and waste-disposal-facilities (UNEP, 2004).

A-number of provisions, for relevant-economic-instruments, to-address different-aspects of SWM-chain, does exist in-several-legislations, in-Kenya. Such-provisions advocate for the-employment of financial-disincentives (fine, levy, surcharges, and penalty) for *non*-compliance with the-provisions, governing the-proper SWM.

Economic-incentives such-as: subsidies, tax-rebates, and exercise-waiver, are also-captured in some-provisions of the-legislations, relevant to the-SWM, such-as EMCA. For-example, Section 57(1) of the-Act empowers the-Minister for Finance to-make-proposals to-government-tax and other-fiscal- incentives, disincentives, or fees, to-induce, or promote the-proper-management of the-environment and natural-resources, or the-prevention, or abatement of environmental-degradation. The-tax, fiscal-incentives, disincentives, or fees, to-be-proposed by the-minister, are specified in-section 57(2) paragraphs (a), (b),(c) and (d) of the-Act. Another-example could-be found in-Section 10(1) of the-City-Council of Nairobi's Solid-Waste-Management by-Laws, which mandates the-Council to-issue directions on waste-collection charges. Such-provisions could-be-used to-

discourage bad-SWM-practices, hence, promoting good-ones.

Besides, provisions on: recycling, re-use, and material-recovery, are *yet* to-be developed, and according to the-World-Vision-International (2015), the-few, that have-been-developed have *not* been implemented-successfully, due-to many-factors, such-as: lack of awareness, among the-stakeholders, about such-tools, and the-fact, that most of the-stakeholders in the SWM-sector are *not* usually involved in the-process of coming-up with such-economic-tools.

In-addition, there are also voluntary-economic-instruments in-existence, employed, mostly, in-the-industrial and institutional-sectors. Examples include: Certifications (such-as ISO 1400), and the-Company of the-Year Award (COYA). The-ISO 14000-standards, in-particular, are designed to-cover environmental-management-systems, environmental-auditing, environmental-performance-evaluation, environmental labeling, life-cycle-assessment, and environmental-aspects, in-production-standards. The ISO 14000 is, therefore, can-be-considered as an-economic-instrument, as when awarded to a-particular company, it makes it advantageous, in that-market. The-problem with these-economic instruments is that they lack a-legal-barking.

At-the-implementation-level, the-barriers to-improving WM-practices, including high-capital investment, and high-operating-costs, are often governance-issues. Modern-WM, in the-developing world, is expensive, often costing USD 75 or more, per-capita, per-year (Wilson *et al.,* 2012; Brunner & Fellner, 2007). According-to Liyala (2011), WM is poorly-financed, in-Kenya, because it-is *not* a-prioritized activity, in all-urban-councils. Funds, for the-operation, of the-urban-councils, are mainly from external sources (over 50 %), like the-Central-government, and donors, in-the-form of grants (which are *not* guaranteed). As a-result, financial-sustainability is possibly the-most-challenging-issue, for cities/towns in-developing-countries.

Securing-financial-sustainability, of the-service-provision is an-essential governance-aspect (Rodic & Wilson, 2017). Due-to the-difficulties, in-securing-funding, for WM, alternative-financing-methods can be used. Donor-funding was used, for the-capital-costs of new-landfills (for-example, in-Lusaka, Zambia), or for major-upgrading of the-existing-dumpsites (for-instance, in-Dhaka, Bangladesh) (UN-HABITAT, 2010).

Besides, funding of landfill-operations, was provided, through the-Clean Development Mechanism (CDM), introduced-under the-Kyoto-Protocol. The-CDM enabled carbon-credits, to-be-obtained, based on the-evidence of capture and use of landfill-gas. This provided an-annual 'revolving-fund', paid upon presenting the-evidence, which then, provided funding to-the city, for the-next year's proper-operation, and so-on. As the-payments were-directly-related to-landfill-gas-capture, this-constituted a-*direct* financial incentive, for cities, in-Kenya, to-upgrade their-dumpsites to sanitary-landfills, and operate them accordingly. Currently, the-replacement (and potentially more-flexible) financing-mechanism, Nationally Appropriate-Mitigation-Actions (NAMAs), is expected to-provide similar-incentives (UNFCC-Focus).

Capital-costs are often addressed by seeking international-development-aid-funding. Foreign-aid to SWM, in-developing-countries, can be obtained through:

(1) *International organizations and agencies*: (a) *World Bank and regional development-banks*, such-as: the-Inter-American Development-Bank (IDB); Asian-Development-Bank (ADB); The-European Bank for Reconstruction and Development (EBRD); Japan-Bank for International Cooperation (Yen-Loans); and The African Development-Bank (AfDB); and (b) *United Nations organizations* that render assistance to SWM, in developing-countries are: World Health Organization (WHO), United Nations Environment Program (UNEP), through its International Environmental Technology Centre (IETC); United Nations Development Program (UNDP), and United Nations Centre for Human Settlements (UNCHS-Habitat);

(2) *Bilateral-cooperation* (Multilateral donors, bilateral donors and international NGOs are independently developing cooperation out of their-respective-positions. For-example: *Japan* (through JICA); *Germany* (through GTZ); *The-Netherlands* (through Urban Waste Expertise Program (UWEP), and a-non-profit NGO, called WASTE); *Switzerland* (through Swiss Agency for Development and Cooperation (SDC), and NGO, called SKAT (Swiss Center for Development Cooperation in Technology and Management); and *U. S.A*. (through USAID). In-addition, to the-countries mentioned-above, Norway, Denmark, Canada, and France, extend technical-cooperation in-SWM; and

(3) *International-NGOs:* International Solid Waste Association (ISWA); The Water, Engineering and Development Centre (WEDC)-a research and education center of UK's Loughborough University; and The Collaborative Working Group for the Promotion of Solid Waste Management in Lowand Medium-Income Countries (CWG), among-others.

It-is important to-note, that development-assistance, provided by donors, should-focus-on the-provision of incentives and opportunities, while ensuring-ownership, by the-recipients. It-is also important to-note, that capacity-development, for the-foreign-aid, requires the-shift of the-perspective to 'emphasize the recipient's own initiative', therefore, city-Councils/town-municipalities should be proactive, in preparing justifiable-proposals for development-funding.

Moreover, most-aid-agencies will *not* contribute to-ongoing-operating-costs, therefore some-cost recovery have to-be-done. Waste-service-fees are just one of several-sources, used to-recover the-costs of the-SWM-

system (see Wilson *et al.,* 2012; Rodic *et al.,* 2010; and Scheinberg *et al.,* 2010a). In-some-cities/towns, the-charges are deliberately kept-low (UN-HABITAT, 2010), however, if the-charges do *not* entirely-cover the-costs-entailed, the-remainder is provided, from municipal-property, or a-similar tax, or from budgets, allocated by the-national-government, the-charges therefore should-be optimum.

In-addition, paid-services are classified-into 4 systems: (1) 'specific-rate'- the-fee increases, as the-waste-volume increases, in this-system; (2) "pay-for-large-volume-only"- *no* fee charged, until certain waste-quantity is reached, in this-system; (3) 'fixed-charge'- a-fixed-fee, regardless of waste-volume, in this-system; and (4) 'comparative-specific-fee'- waste-fee is linked to-metered electricity-consumption, in this-system.

Benefits of switching to-paid-services, are-said-to-be: (i) reduction of waste-generation; (ii) promotion of recycling; (iii) more-equitable cost-sharing would become a subject of discussion in case of 'specific rate system'; (iv) prevention of contamination by business-related urban wastes; (v) securing revenue; and (vi) increase of people's awareness. On the other hand, concerns are raised such as: (i) double-taxation; (ii) regressive to-income-level; (iii) increase of illegal-dumping; and (iv) *not* conducive to-changing the-economic-structure of mass-production/mass-consumption.

Appropriate-forms of funding are essential, to-secure financial-sustainability of the-SWM-services, under the-local-conditions of affordability and willingness to-pay. In-order-to-secure some-form of financial-sustainability for the municipal-SWM-service, it is likely that direct-charges to-the-users will need to-be-supplemented by other, indirect-sources of funding. More-details on financing-models, and their-use, for municipal-SWM, can be-found in Sections 5.4 through 5.9, of the-GWMO (Wilson *et al.,* 2015).

3.3.3. Social-instruments for SWM.

JICA-IFIC argued, that SW-problems is a-social-phenomena, closely-related-to urban and economic problems (especially poverty). Low-standard of living (poor-pay), education (high-illiteracy levels) and the-economy (low-GDP, per-capita), are influencing-factors, that cause low-levels of willingness to-participate in-public-management-matters. Largely-negative-attitudes, towards waste, and some-cultural believes and habits, have prevented public-participation, in-some-cases (see Rotich *et al.,* 2006; Kaseva & Mbuligwe 2005; Palczynski, 2002). Therefore, in-addition-to legal, technical, and economic-aspects, the-necessary-behavioral-change, is an-important-aspect, that requires focused-attention (Wilson *et al.,* 2015).

The-need to-increase public-awareness of, and community-participation-in, WM has been widely-recognized; for-instance, the-World-Bank has included this-aspect in their-guidelines, for the-Mediterranean-region (METAP, 2005), while UNICEF initiated a-national-campaign, in-Brazil, in-1999, involving Waste and Citizenship-Forums (Dias, 2006). Mbeng *et al.,* (2009) suggested making-awareness programs, simple and accessible, to-change the-mindset, of urban-residents, to-perceive waste as-resource, rather than something with *no* value.

Campaigns, to-raise environmental-awareness, and impart new-behaviors, can take various-forms, such-as: (1) informative-posters; (2) educational street theatre; (3) electronic messaging services, through social media; (4) radio-drama; (5) promotional-events. Other-social-instruments include: popularly-known 'name and fame' campaigns, whereby best-performing-neighborhoods, cities, or companies/institutions are given publicity, in the-media, public-praise, and prizes. Alternatively, 'name and shame' campaigns are used to-expose poor-practices. Local-culture, customs, and habits, have to-be-taken in-consideration, when selecting the appropriate-forms of social-instruments (Rodic & Wilson, 2017).

4. Synopsis of the-way-forward.

4.1 SWM and SDGs.

SWM is a-crosscutting-issue, which affects and impacts, various-areas of sustainable-development, in-each of the-three sustainability-domains: ecology, economy, and society. The-affected-areas include: living- conditions, sanitation, public-health, marine and terrestrial-ecosystems, access to decent-jobs, as-well-as the-sustainable-use of natural-resources. Accordingly, out of 17 Sustainable-Development-Goals (SDGs) of the-2030-Agenda, for Sustainable-Development, adopted by the-193 UN-Member-States, in-September, 2015 (UN-SDG, 2015), at least 12 SDGs and their-pertinent-targets, have a-direct-link to-SWM. *Not* being a-high-level-SDG, in-its-own-right, could-potentially-threaten to-reduce the 'visibility' of SWM, as a-political-priority; however, recent Global-Waste-Management-Outlook (GWMO), by UNEP , argued, that the-crosscutting-nature of SWM, and its-impact on *not* just one, but on 12 SDGs, should *only* emphasize the-importance and increase the-political-priority of SWM (Wilson *et al.,* 2015).

In-addition, SDG Target 11.6 states: "By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management". SDG 6 on water and sanitation, explicitly addresses the-problem of waste-dumping, in its-Target 6.3: "By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally". Besides, Target 12.4 states, that: "By 2020, achieve the environmentally sound management of

chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment" (UN-SDG, 2015).

To-contribute to-the-achievement of the-SDGs, as-well-as the-Kenyan-Vision-2030, SWM, in-Kenya, requires overall-transformation.

4.2. Overall-transformation required.

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-practices. 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.

Kenya should focus (as a-long-time-objective) on the-transformation of the-current-system/status of MWM, to sustainable-waste and resource-management. Wider-benefits to-society and the-economy, from sustainable-waste and resource-management, are: (1) Broader-benefits of a-clean-city; (2) Social and political-consensus, and community-cohesion; (3) Business-benefits of resource-efficiency and waste- prevention; (4) Public-benefits of resource-efficiency and waste-prevention; (5) Increased-resource-security; (6) Green-jobs; (7) Improved-livelihoods and cleaner-working conditions for the-informal-sector; (8) Reduction in greenhouse-gas (GHG) emissions, from waste-disposal; (9) Reduction in-GHG-emissions from recycling and waste-prevention; (10) Reducing food-waste – improving food-security; (11) Reduction in air and water-pollution, by-transfer of contaminants to-solid-waste, for proper-management; and (12) Energy-recovery by using waste to-generate-energy. For-more-details, on-each of the-listed benefits, see UNEP & ISWA (2015).

In-addition, according-to UNEP & ISWA (2015), SWM can*not* be viewed in-isolation – a-holistic approach is required, for residuals-management, pollution-control, and environmental-management. Residuals include: emissions to-air, generation of wastewater, and generation of waste.

The-following-sections detail some-widely-accepted-best-practices, as-well-as an-innovative method of financing, for MSWM.

4.2.1 The-waste-hierarchy.

There is a-considerable-body of scientific and professional-literature on-technologies, necessary for waste collection and waste-disposal (see for-example: CSIR, 2011; Coffey& Coad, 2010; Rushbrook & Pugh, 1999; Daniel, 1996; McBean *et al.,* 1995), where WM is considered in-engineering-terms, as a-technical problem with a-technical-solution. However, for better-understanding, the-ranking (preferences) of technologies is important.

The so-called *waste hierarchy* is widely-accepted as a-normative-guide to-best-SWM-practice (Fagan *et al.,* 2001). The-waste-hierarchy takes-into-account the-impact of the-different WM-options on: climate-change, air-quality, water-quality, and resource-depletion (WRAP, 2011). Figure 4 shows the-*waste hierarchy*.

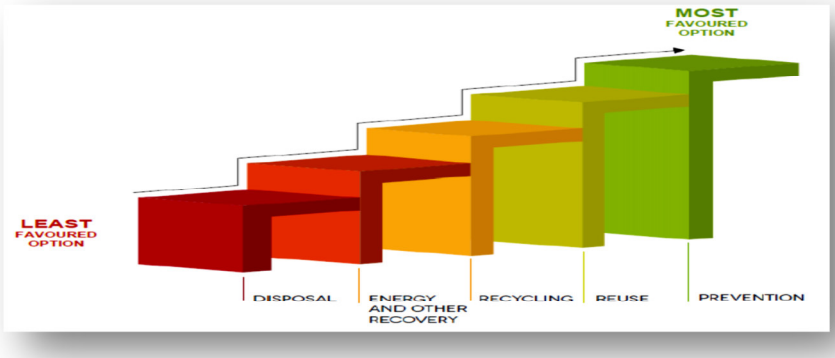

Figure 4: The-Waste-hierarchy (modified from WASTECOSMART, 2015).

The-most-preferable-option 'prevention' is at the-top, and there is a-range of other-options, which should-be-applied, wherever-possible, before the-least-preferable-option of 'disposal', at the-bottom. Figure 5 elaborates further on each-of-the-options.

Besides, the-waste-management-hierarchy, according to Lardinois & Furedy (1999) involve the-following-steps: (1) Prevent the-creation of waste, in-product-design and packaging; (2) Reduce the-toxicity, or negative-impacts of the-waste, that is generated; (3) Reuse, in-their-current-forms the-materials, recovered from the-waste-stream; (4) Recycle, compost, or recover, materials for use, as direct or indirect-inputs to-new-products; (5) Recover energy, by incineration, anaerobic-digestion or similar-processes; and (6) Dispose of waste in an-environmentally sound- manner, generally in-sanitary landfills.

Figure 5: The-Waste-hierarchy specifics (WRAP, 2011).

4.2.2. Integrated-Solid-Waste-Management (ISWM).

Integrated-Solid-Waste-Management (ISWM) refers to a-strategic-initiative, for the-sustained-management of solid-waste, through the-use of a-comprehensive-integrated-format, generated through sustained, preventive, and consultative-approach, to the-complementary-use of a-variety of practices, to-handle solid-waste, in a-safe and effective-manner. ISWM is a-frame of reference, for designing and implementing new-WM-systems, and for analyzing and optimizing existing-systems. It-is based on the-concept, that *all* aspects of a-WM-system (technical and non-technical) should-be-analyzed together, since they are, in-fact, interrelated, and developments in-one-area frequently affect practices, or activities, in-another-area (UNEP, 2009). Integrated-Solid-Waste-Management (ISWM), is also-called Integrated-Waste-Management, or Sustainable-Waste-Management.

ISWM-novel-approach, essentially, is built-upon the-holistic, all-inclusive, comprehensive-notion of sustainability, on multiple-levels. It distinguishes between three-principal-dimensions, each denoted by a-question, shown in-Figure 6, as one-side of a-cube (Wilson *et al.,* 2013): (1) *What?* – the-scope, which includes the-physical-components of a-waste-system, *but* goes much-further, by identifying a-number of other-planning and management-issues, that need to-be-addressed, such-as: strategic-planning, public participation, financial-management, etc.; (2) *Who?* – focuses on the-stakeholders or actors; and (3) *How?* – how strategic-objectives and issues should-be-addressed, introduces for the-first-time a-series of strategic- aspects: political, institutional, social, financial, economic, and technical.

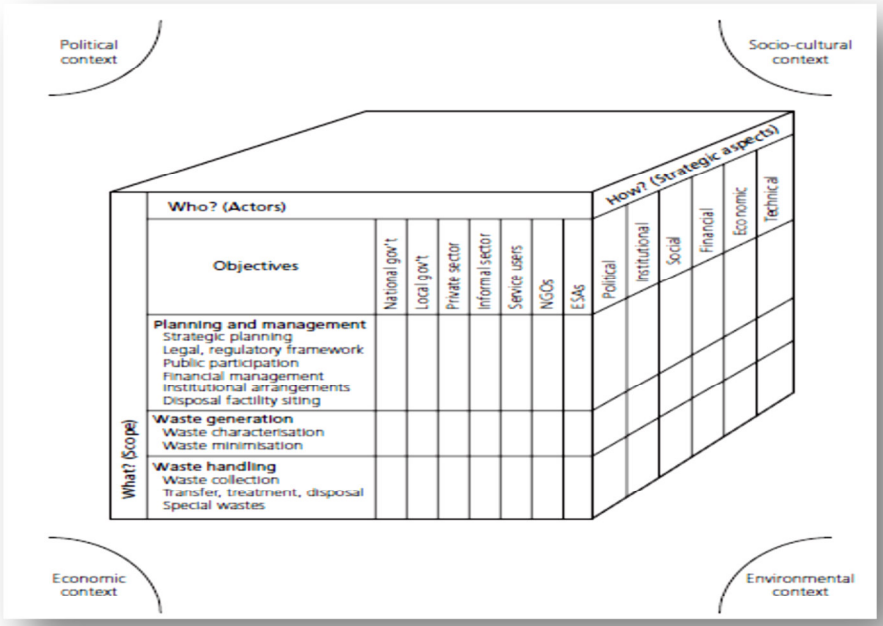

Figure 6: The-conceptual-framework, for integrated-municipal-solid-waste-management, in low-income-countries (Schubeler *et al.,* 1996).

Besides, Figure 7 shows 'Two triangles'-representation of ISWM (concept adapted-from Scheinberg *et al.,* 2010).

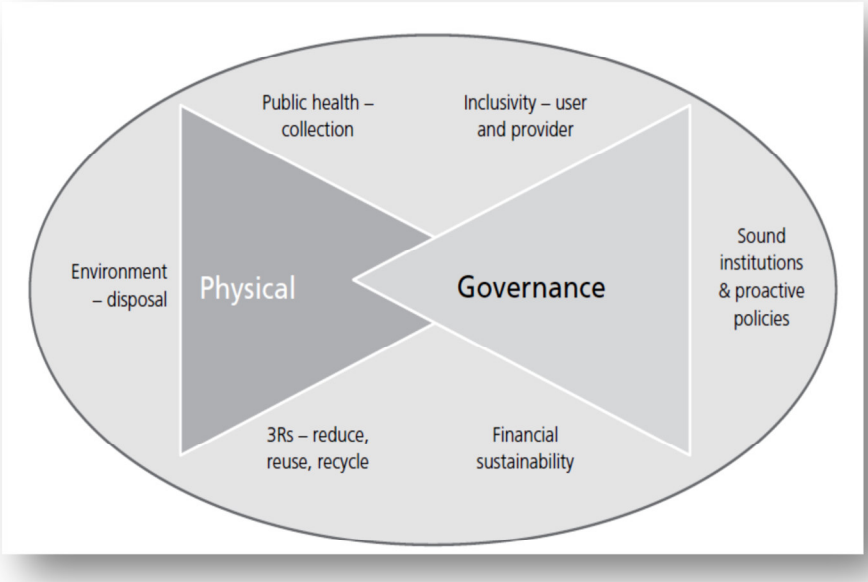

Figure 7: 'Two triangles'-representation of ISWM (concept adapted-from Scheinberg *et al.*, 2010).

The-left-triangle, in-Figure 7, comprises the-three key-physical-elements – linked to the-key drivers for SWM (Wilson, 2007) – that all need-to-be-addressed, for an-ISWM-system, to-work-well and to-work-sustainably, over the long-term: (1) public-health (linked-primarily to waste-collection); (2) environment (protection of the-environment, throughout the-waste-chain, especially during treatment and disposal); and (3) 3Rs – reduce, reuse, recycle (driven by resource-values and more-recently by 'closing the-loop' and returning both; materials and nutrients, to beneficial-use). The-right-triangle focuses on ISWM 'software' – the-governance-strategies, that all need-to-be-addressed, to-deliver a-well-functioning- system. The-system, as a-whole, needs to: (i) be inclusive, allowing stakeholders to-contribute as users, providers and enablers; (ii) be financially-sustainable, which means cost-effective and affordable; and (iii) rest on a-base of sound-institutions and proactive-policies.

Besides, some of the-major-features of ISWM are as-follows (van de Klundert & Anschütz, 2001): (1) Holistic-approach to *all* waste-streams, thus maximizing synergetic-benefits in: collection, recycling, treatment, and disposal; (2) Maximize the-opportunities, for resource-recovery, at *all* stages – from generation to final-disposal; (3) Accommodate aspirations of *all* stakeholders – from waste-generators to-waste-management and service-providers; (4) Facilitate life-cycle-view of products and materials; thus, promoting greater-resource-use-efficiency; (4) Integrate different-response-functions, such-as: technical, managerial, financial, policy, etc.; and (5) Greater local-ownership and responsibilities participation, through a-consultative-approach.

According to UNEP (2009):" Despite the remaining challenges, evidence of recent improvements suggests that sustainable solid waste and resources management is feasible for developing countries", hence it should-be considered for Kenya, as a-long-time-goal.

4.2.3. Innovative-financing.

Sustainable-financing is a-major-obstacle for many-municipalities, in-developing-countries, including Kenya, seeking to-improve its-MSWM. Municipalities are caught in a-vicious-cycle; they are *unable* to-generate the-necessary fee-collection-rate, until they improve service and, conversely, people are unwilling to-pay for poor-service (World-Bank, 2014). Policymakers need innovative-financing mechanisms, to-increase cost-recovery-levels, and improve service-delivery, and outcomes, in-this-basic and critical-sector.

One of such-innovative-financing-mechanisms is *Results-based-financing* (RBF), for MSW, which is a-financial-mechanism, through which, the-payment for solid-waste-services, is conditioned to-the achievement and verification, of pre-agreed-targets. RBF focuses greater-attention on measurable outputs, in-basic-service-delivery, and changes in-human-behavior. RBF is to-improve SW-service-delivery and fee-collection, to-promote recycling and source-separation, and to-strengthen waste-collection and transport, in under-served communities. In the-Kenyan-MWM-sector, which faces ever-increasing waste-generation rates, low-waste-collection, and budget-constraints, RBF appears as a-valuable-tool, to-ensure that public-funds are used efficiently and transparently. Report by World-Bank (2014), presents valuable- lessons, from the-custom-made-design and preparation-phase, of eight-MSWM-projects, in-developing countries. RBF, however, is *not* a-panacea, for the SW-sector, and is more-efficient, when associated-with other-instruments such-as: infrastructure-investment, policy-reform, and technical-assistance.

5. Conclusions

The-above-analysis on the-legal-foundation, have justified, that Kenya, indeed, has made substantial-efforts, at-the-policy-arena, to-oversee, regulate, and promote good-practices, in-SWM, as-well-as to-safeguard human-health and the-living-environment, from the-consequences of uncontrolled-waste-disposal. The-relevant-efforts, manifested-by-Kenya, as: (1) being a-signatory, or a-party-to, the-main *International* Conventions and Treaties; (2) enacting numerous-laws and by-laws, relevant-to SWM; and (3) creating institutions and systems, at-different-levels of governance.

Notwithstanding the-existing-legal-framework, Kenyans, do continue-witnessing, day-after-day, an-overwhelming-number of cases of *non*-compliance, with the-set-performance-standards and regulations, on SWM. It has-been-said, that WM is a-mirror-reflection on the-state of a-society, itself (Kunitoshi, 2000). The-reflection, of the-current-Kenyan SWM-scenario, is varied, between and within: (i) Rural and urban-settlements; (ii) the-status of the-city/town (e.g. capital-city, city, town-municipality, etc.); and (iii) high-income *vs*. low-income-areas. This-study have also-exposed multi-dimensional and complex-nature of the-existent-challenge of MSWM, in-the-country. In-particular: *only* small-fraction, of the-generated-waste, is collected, in-Kenya, and mostly dumped, or burned, in an-uncontrolled-manner, while hazardous toxic-waste is often-mixed-with *non*-hazardous. Beside, the-principles of 3R (waste reduction, re-use, and recycle) are hardly-prioritized, by the-municipalities, for effective and sustainable-WM. In-addition, the-study identified, an-overcrowded, poorly-coordinated, and largely-unregulated-network, of actors, involved in *actual*-SWM-service-delivery.

Moreover, widespread-*uncontrolled* waste-disposal, and open-air-burning, of uncollected-waste, in-Kenya, is *directly*-affecting the-health, of the-waste-handlers, as-well-as, people who live near-the waste-dumping-sites. In-addition-to public-health-risks, such-practices do create both; environmental- pollution and visual-pollution. Besides, on-a-long-run, enduring-poor-state of MSWM (manifesting in decomposing, smelling-heaps of garbage, ubiquitously), can influence the-perception of the-next generation, of Kenyans, that this-situation is unchangeable- and even, normal/acceptable-state of affairs, and consequently, the 'status-quo' of Kenyan-garbage-misery, continues. Therefore, some-timely-changes, towards proper- sustainable SWM-practices, in-Kenya, should-be in-order.

The-study also points-out, that the-existing, in-Kenya, policy-framework, relevant-to SWM, is probably, *not* a-problem, in-itself; the-problem, rather, is in-the-proper-implementation/enforcement, of the-laws. Logically, even most-progressive and dynamic-laws, are worth absolutely-nothing, and remained-good, *only* on-paper, if *not* properly-implemented. The-task, therefore, remains, for the-national and local-governments, as-well-as other-SWM-stakeholders, to-make-every-possible-effort strictly implementing the-existing-laws and regulations.

This-task is colossal, *but* it have-to-be systematically and meticulously-executed, to-protect human-health and the-environment; this will necessitate the-capacity development in, and financial-sustainability of, MSWM.

To-achieve the-SDGs and the-Kenya-Vision-2030, Kenya should also-focus (as a-long-time objective) on a-complete transformation of the-current insufficient-MWM-system, to sustainable-waste and resource-management. This will improve overall-livability, urban-resilience, cities/towns-competitiveness, as-well-as create jobs, and provide income-generation-opportunities, to-local-citizens. Widely-accepted Waste-Hierarchy, in-conjunction-with-both; the-Integrated-SWM (where waste is considered as-a-resource) and RBF-innovative-financing, should-be the-best-option, for Kenya. One, however, needs-to-be-realistic, and start with small-steps, fixing initially, what is the-most-obvious and essential. That would-be the-stinking decomposing-heaps, of uncollected-garbage, that have remained a-*permanent*-feature, and a-painful-eyesore, in-most-parts of Kenyan-urban-centers.

Hence, first and foremost, proper/regular waste-collection-services should be-offered, by providing good-governance, and creating public-private-partnerships (PPPs). Ambitious-target of 100% waste collection, to *all*-urban-citizens (regardless of income-level, and including: informal-settlements, slums, and peri-urban-areas), should-be focused-on. This-is, again, a-huge-undertaking, for Kenya (as currently the-national-waste-collection is *only* at-an-average of 40%), therefore, this-challenge needs to-be *recognized*, and treated, as a-priority by: the-national and local-governments, as-well-as *all*-other stakeholders, including the-international-community. Secondly, to-assist waste-collection-services becoming more-sustainable, this-study recommends, to-consider an-innovative Results-Based Financing model, in-order-to-increase the-proceeds form the-collection of waste-collection disposal-fee. In-addition, the-city-Councils/town-municipalities should use the-information (provided in-this-paper) on the-International-development-donors, and be-proactive, in-formulating justifiable-proposals for the-development-funding, of their-SWM-operations. Thirdly, the-current waste-dumping-sites should-be ungraded to-designed-sanitary-landfills; this-will-reduce *not* only environmental-pollution, but also enable local-authorizes to-obtain carbon-credits, which in-turn, can-be converted to-money, for WM-operations. Lastly, widespread-littering, an-open-air indiscriminate-dumping, and burning of waste, should-be minimized, and gradually, eliminated. This-particular-step will require much-effort, as changing of the-deeply-rooted and currently-prevalent-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.

6. Acknowledgment.
The-author is very-grateful to the-Graduate-assistants, SOE, for the-technical-support, provided, while conducting-this-research.

References.

Achankeng, E. (2003). Globalization, Urbanizations and Municipal Solid Waste Management in Africa. African Studies Association of Australia and the Pacific. Conference Proceedings-Africa on a Global Stage.

Afon, A. (2012). "A survey of operational characteristics, socioeconomic and health effects of scavenging activity in Lagos, Nigeria", *Waste Management and Research*, 30(7).

Africa-Union (1991). Bamako-Convention on the-Ban of the-Import into Africa and the-Control of Trans-boundary Movement and Management of Hazardous-Wastes, within Africa.

Al-Zoughool, M.; Succop, P.; Desai, P.; Vietas, J. and Talaska, G. (2006). "Effect of N-glucuronidation on urinary bladder genotoxicity of 4-aminobiphenyl in male and female mice", *Environmental Toxicology and Pharmacology,* 22 (2).

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

Bahri, G. (2005). Sustainable Waste Management of Plastic Bag Waste: Case of Nairobi, Kenya. Available [online]: http/www.lup.lub.lu.se/download?func=downloadFile&recordOld. (16/02/2018).

Baud, I.; Post, J. and Furedy, C. (2004)(*eds.*). Solid Waste Management and Recycling: Actors, Partnerships and Policies in Hyderabad, India and Nairobi, Kenya. Kluwer Academic Publishers, Dordrecht, the-Netherlands.

BBC News (2017). Kenya Country profile (31 October 2017). Available [online]: http://www.bbc.com/news/world-africa-13681341. (22/03/2018).

Bemelmans-Videc, M..; List, R. and Vedung, E. (*Eds.*) (1998). Carrots, Sticks and Sermons: Policy Instruments and Their Evaluations; Transaction Publishers: London, UK.

Binion, E. and Gutberlet, J. (2012). "The effects of handling solid waste on the wellbeing of informal and organized recyclers: A review of the literature", *International Journal of Occupational and Environmental Health*, 18(1).

Bohonowych, J.; Zhao, B.; Timme-Laragy, A.; Jung, D.; Giulio, R. and Denison, M. (2008). "Newspapers and

Newspaper Ink Contain Agonists for the Ah Receptor", *Toxicological Sciences,* 102(2).
Brunner, P. and Fellner, J. (2007). "Setting priorities for waste in developing countries", *Waste Management & Research*, 25(3).
CCN (2014). City Council of Nairobi: *Nairobi City County Solid Waste Management Bill*, Nairobi.
Coffey, M. and Coad, A. (2010). Collection of Municipal Solid Waste in Developing Countries; Prepared for United Nations Settlement Program (UN-HABITAT); Gutenberg Press: Tarxien, Malta.
Cointreau, S. (2000). *Guidance Pack – Private Sector Participation in Municipal Solid Waste Management.* SKAT, St Gallen. Available [online]: http://rru.worldbank.org/Toolkits/SolidWasteManagement/ (April 12, 2018).
Coad, A. (2005) *Private Sector Involvement in Solid Waste Management –Avoiding Problems and Building on Successes*. GTZ, Eschborn. Available [online]: http://www.cwgnet.net/ (April 11, 2018).
Chakrabrati, S.; Majumder, A. and Chakrabrati, S. (2009). "Public-community participation in household management in India: An operational approach", *Habitat International,* 33.
Chatham-Stephens, K.; Caravanos, J.; Ericson, B.; *et al.* (2013). "Burden of Disease from Toxic Waste Sites in India, Indonesia, and the Philippines in 2010", *Environmental Health Perspectives*, 121 (7).
CIA (2012). Central Intelligence Agency: The World Fact-book: Kenya. Available [online]: https://upload.wikimedia.org/wikipedia/commons/thumb/d/de/Kenya_map_of_K%C3%B6ppen_climate_classification.svg/600px-Kenya_map_of_K%C3%B6ppen_climate_classification.svg.png. (9/02/2018).
CCN (2007). City Council of Nairobi: *Solid Waste Management By-Laws*, Nairobi.
Conter, M; Pojani, L.; Cortimiglia, C.; Di Ciccio, P.; *et al*., (2009). "Domestic food handling practices and food safety", *Ann. Fac. Medic. Vet. Di Parma*, XXXIX 33 8.
CSIR (2011). Municipal-Waste-Management: Good Practices. First-Edition; CSIR, Pretoria.
Daniel, D. (*Ed*.) (1996). Geotechnical Practice for Waste Disposal; Chapman & Hall: London, UK.
Davis, M. (2006). Planet of the Slums. New York: Verso.
Dias, S. (2006). *Waste & Citizenship Forums – Achievements and Limitations*. Paper No. 11. In: Proc. CWG-WASH Workshop, 1–5 February, Kolkata, India. Collaborative Working Group on Solid Waste Management in Low and Middle Income Countries (CWG).
ELCI (2005). Community Guide to Environmental Issues and to the Environmental Management and Coordination Act, 1999: Nyanza Province. ELCI, Nairobi.
EPD (2006). Meeting Basic Needs in a Rapidly Urbanizing community: A Water, Sanitation, and Solid Waste Assessment in Ruiru, Kenya. SIPA, Columbia University. May 2006.
Fagan, H.; O'Hearn, D.; McCann, G. and Murray, M. (*Amended Version*) (2001). Waste Management Strategy: A Cross-Border Perspective. National Institute for Regional and Spatial Analysis (NIRSA).
Falkenmark, M. &Widstrand, C. (1989). Macro-scale water scarcity requires micro-scale Approaches. *Natural resources forum,* 13.
Ferrara, G.; Gutierrez, A.; Markel, E. and Slater, Y. (2008). Opportunities in Waste: *From Cape Town to Ruiru.* Economic and Political Development Final Workshop Report School of International and Public Affairs Columbia University, New York, NY.
Frediani, A.; Walker, J. and Butcher, S. (2013). Participatory informal settlement upgrading and well-being in Kisumu, Kenya. MSc Social Development Practice Student Report. Development Planning Unit, The Bartlett, University College London.
Finnveden, G.; Ekvall, T.; Arushanyan, Y.; Bisaillon, M.; Henriksson, G.; Östling, U.; Söderman, M.; Sahlin, J.; Stenmarck, Å.; Sundberg, J.; *et al.* (2013). **"**Policy instruments towards a sustainable waste management", *Sustainability*, 5.
Gakunju, N.; *et al.* (2011). "Solid Waste Management In Kenya: A Case Study of Public Technical Training Institutions", *Icastor Journal of Engineering,* Vol. 5, No.3.
Global-Competitiveness-Index (2016–2017). Available [online]: *http://www3.weforum.org/docs/GCR2016-2017/05FullReport/TheGlobal/*(16/02/2018).
Government of Kenya (GoK) (2013). National Climate Change Action Plan, 2013-2017. Available [online]: *http://www*cdkn. org/wp-content/uploads/Kenya-National-Climate-Change-Action-Plan.pdf. (12/02/2018).
GoK, NCCAP (2013). Kenya-Vision 2030. Available [online]: http://cdkn.org/wp-content/uploads/2013/03/Kenya- National-Climate-Change-Action-Plan.pdf. (11/02/2018).
GoK, INDC (2015). Kenya's Intended Nationally Determined Contribution. Available [online]: http://www4.unfccc.int/submissions/INDC/Published%20Documents/Kenya/1/Kenya.pdf. (19/02/2018).
GoK,KenyaLaw (2013). Vol. CXV, No. 65. Available [online]: http://www.kenyalaw.org/kl/index.php?id=3560. (12/03/2018).
Guerrero, L.; Maas, G. and Hogland, W. (2013). "Solid waste management challenges for cities in developing countries", *Waste Management*, 33(1).
Gutberlet, J., Kain, J.; Nyakinya, B., Oloko, M., Zapata, P. and Campos, M. J. Z. (2017). "Bridging weak links

of solid waste management in informal settlements", *Journal of Environment & Development Policy Review*, 26(1).

Haregu, T.; Ziraba, A.; Aboderin, I.; Amugsi, D.; Muindi, K. and Mberu, B. (2017). "An assessment of the evolution of Kenya's solid waste management, policies and their implementation in Nairobi and Mombasa: analysis of policies and practices", *Environment & Urbanization*, International Institute for Environment and Development (IIED), Vol. 29(2).

Henry, R.; *et al.* (2005). Municipal Solid Waste Management Challenges in Developing Countries: Kenyan Case Study. Available [online]: http/www.ncbi.nlm.nih.gov/pubmed/16006111. (22/01/2018).

Henry, R.; Yongsheng, Z. and Jun, D. (2006). "Municipal solid waste management challenges in developing countries- ‐ Kenyan case study", *Waste management*, 26(1).

Howlett, M. and Rayner, J. (2007). **"**Design principles for policy mixes: Cohesion and coherence in 'New Governance Arrangements", *Policy Soc*., 26.

Ikiara, M. M., Karanja, A. M. and Davies, T. C. (2004). "*Collection, Transportation and Disposal of Urban Solid Waste in Nairobi*", JICA.

ISWA (2015). Wasted Health – The tragic case of dumpsites. A. Mavropoulos ISWA STC Chair, with contributions from D. Newman, ISWA President. Vienna.

ITDG-EA (2004). Intermediate Technology Development Group Regional Waste Management – Experiences, challenges and opportunities of Waste Management in East African Urban Centres. Nairobi, Kenya: ITDG-EA Workshop – Report.

JICA (2016). Japan-International-Corporation-Agency Official-Website. Available [online]: http://www.jica.go.jp/english/ index.html. (16/04/2018).

JICA (2005). Japan-International-Corporation-Agency: Capacity Development in-SWM, in-Developing-Countries—Towards Improving SWM Capacity of Entire Society.

JICA (2010). Japan-International-Corporation-Agency: *Preparatory Survey for Integrated Solid Waste management in Nairobi City in the Republic of Kenya*, Final-Report.

JICA (2009). Japan International Cooperation Agency, Global Environment Department: Thematic Guidelines on Solid Waste Management.

Kain, J.; Nyakinya, B.; Odhiambo, N.; Oloko, M.; Omolo, J.; Otieno, S.; *et al*. (2016). "Translating policies into informal settlements' critical services: reframing, anchoring and muddling through", *Public Administration and Development*, 36(5).

Kamunyori, S. (2013). Can Recycling Help Nairobi Cut its waste: African Centre for Cities. University of Cape Town. Available [online]: www.urbanafrica.net/news/2013. (26/03/2018).

Karanja, A. (2005). Solid Waste Management in Nairobi: A Situation Analysis. Available [online]:
http/www.unep.or.jp/ietc/GPWM/…/IS_6_1_Nairobi_SWM_Situation Analysis. (19/02/2018).

Kaseva, M. and Mbuligwe, S. (2005). "Appraisal of solid waste collection following private sector involvement in Dar es Salaam", *Habitat International*, (29).

Kasozi, A. and von Blottnitz, H. (2010). Solid-Waste-Management in-Nairobi: A-Situation-Analysis.
University of Cape-Town, for the-City-Council of Nairobi, on contract for the-United-Nations Environment-Program.

Kenya and Gender @ a Glance (2013). Kenya's National-Gender-Context and its-Implications for Conservation a-Gender-Analysis: The-Nature-Conservancy Central-Science.

Kibwage, J. and Momanyi, G. (2002). Recycling Waste into Fuel Briquettes, The Role of Community Composting Groups in-Nairobi. Nairobi, Kenya: Format.

Kiplagat, W. (1999). Towards sustainable solid waste management alternatives for Eldoret municipality, Eldoret, Kenya: School of Environmental Studies, Moi University, Master-Thesis, Kibwage.

KNBS (2016). Kenya National Bureau of Statistics: *Kenya Population and Housing Census Report,* KNBS. Available [online]: http://www.knbs.go.ke/ (26/02/2018).

Konety, B. and Carroll, P. (2008). "Urothelial carcinoma: cancers of the bladder, ureter, & renal pelvis".

Kenya Law Reports (2010). The Constitution of Kenya, 2010. The National Council for Law Reporting with the Authority of the Attorney General. Available [online]: http://www.kenyaembassy.com/pdfs/the%20 constitution%20of%20kenya.pdf. (11/02/2018).

Kunitoshi, S. (2000). "Urban waste management in developing nations: Strategies for effective international
cooperation", *Journal of the Japan Society of Material Cycles and Waste Management*, 11.

Lardinois, I. and Furedy, C. (1999). Separation at Source. Gouda, the-Netherlands: WASTE.

Laws of Kenya, County Government Act (2012). The-National-Council for Law Reporting, Available [online]: www.kenyalaw.org (16/02/2018).

Laws of Kenya, Public-Finance-Management-Act (2012). The National Council for Law Reporting, Available [online]: www.kenyalaw.org (16/02/2018).

Laws of Kenya, The-Constitution of Kenya (2010). The-National-Council for Law Reporting, Available [online]:

www.kenyalaw.org (16/02/2018).
Laws of Kenya, Urban Areas and Cities Act (2011). The-National-Council for Law Reporting, Available [online]: www.kenyalaw.org (16/02/2018).
Laws of Kenya, Water Act Chapter 372, the National Council for Law Reporting, Available [online]: www.kenyalaw.org (16/02/2018).
Liyala, C. (2011). Modernising solid waste management at municipal level: institutional arrangements in urban centres of East-Africa (Doctoral Dissertation). Wageningen University.
Makopa, J. (2006). Composting of Municipal Solid Waste: Solid Waste Recycling in Nairobi. University of Nairobi.
Malesu, M.; Odour, R. and Odhiambo, J. (2007). Green Water Management Handbook, Rainwater harvesting for agricultural production and ecological sustainability. World-Agro-forestry-Centre.
Marshall, R. and Farahbakhsh, K. (2013). "Systems approaches to integrated solid waste management in developing countries", *Waste Management*, 33(4).
Mbeng, L.; Phillips, P. and Fairweather, R. (2009). "Developing Sustainable Waste Management Practice: Application of Q Methodology to construct new Strategy Component in Limbe- Cameroon", *The Open Waste Management Journal*, 2.
METAP (2005). *Solid Waste Management Centre*. Web-portal. Mediterranean Environmental Technical Assistance Program (METAP). Available [online]: http://www.metap-solidwaste.org/index.php?id=1 (April 17, 2018).
McBean, E.; Rovers, F. and Farquhar, G. (1995). Solid Waste Landfill Engineering and Design; Prentice Hall PTR: Upper Saddle River, NJ, USA.
McAllister, J. (2015). Factors influencing solid-waste management in the developing world (Master-Thesis of Science in-Geography). Utah: Utah-State-University.
Medina, M. (2002). *Globalisation, development and municipal solid waste management in Third World Cities.* Tijuana, Mexico: El Colegio de la Frontera Norte.
Mensah, A.; *et al.* (2005). Solid Waste Disposal in Ghana. Available [online]: www.iboro.ac.uk. (22/04/2018).
Mogaka, G. (2006). "Municipal solid waste source-separated collection in Kenya: a comparative analysis", *Urban Sanitation*, 8 (11).
Monyoncho, G. (2013). A Research Study in partial fulfillment of PGD in Housing Administration (University of Nairobi): Solid Waste Management in Urban Areas Kenya: A case study of Lamu Town.
Munala, G. (2011). The Need for Integrated Solid Waste Management in Kisumu. Available [online]:
http/www.elerning.jkuat.ac.ke/journals/ojs/index.php/jagst/article/download/…/139. (12/01/2018).
National-Environment-Management-Authority (2003). Environmental *(Impact Assessment and Audit)* Regulations, Nairobi.
National-Environment-Management-Authority (2014). *National Solid Waste Management Strategy*, Nairobi.
NAMA (2016). Nationally Appropriate Mitigation Action on a Circular Economy: Solid Waste Management Approach for Urban Areas in Kenya. Ministry of Environment and Natural Resources, Nairobi, Kenya.
Nilsson, M.; Zamparutti, T.; Petersen, J. ; Nykvist, B.; Rudberg, P. and McGuinn, J. (2012). **"**Understanding Policy Coherence: Analytical Framework and Examples of Sector-Environment Policy Interactions in the EU", *Environ. Policy Gov.*, 22.
NEMA (2003). National Environment Management Authority: Environmental *(Impact Assessment and Audit)* Regulations, Nairobi.
NEMA (2006). *Waste Recyclers & Transfer Stations.*
NEMA (2006a). The Environmental Management and Coordination (*Waste Management)* Regulations, Legal-Notice No 121.
NEMA (2006b). The Environmental Management and Co-ordination (*Water-Quality*) Regulations, Legal-Notice No 120.
NEMA (2012). *Waste management in Kenya.* Available [online]: http://www.nema.go.ke/index.php?option=com_content&view=article&id=311:waste-managementin-kenya&catid=120&Itemid=659. (11/02/2018).
NEMA (2013). *National Environment Policy.*
NEMA (2015). *The National Solid Waste Management Strategy*. Nairobi: National Environment Management Authority (NEMA).
Ng'era, K. (2014). Master-Thesis in Environmental-Science: "Challenges and opportunities of inorganic solid waste reuse and recycling in Thika town, Kiambu county", Kenyatta University.
Njoroge, B.; Kimani, M. and Ndunge, D. (2014). "Review of municipal solid waste management: a case study of Nairobi, Kenya", *Research Inventory: International Journal Of Engineering And Science*, 4(2).
Nkwocha, E.; Ejejuru, E.; Pat-Mbano, A.; *et al.* (2011). "Proximity of municipal waste dumpsites to residential neighborhoods and rate of hospitalization for malaria", *International Journal of Advanced Biotechnology*

and Research, 2(1).
Nyaluogo, K. (2016). A study of solid waste management: a case study of Kisumu City (Bachelor of Science in Civil Engineering). Nairobi: University of Nairobi.
Nyandika, R. (2007). "Municipal solid waste management in Kenya: problems, issues and challenges", *Journal of Waste Management,* 26.
Oberlin, A. (2011). The Role of Households in Solid Waste Management in East Africa Capital Cities. PhD-Thesis. Environmental Policy Series. Wageningen University. The Netherlands.
Obradovi, M.; Kalambura, S.; Smolec, D. and Jovi, N. (2014). "Dumping and Illegal Transport of Hazardous Waste, Danger of Modern Society", *Coll. Antropol*., 38(2).
Okalebo, S.; Opata, G. and Mwasi, B. (2014). " An analysis of the household solid waste generation patterns and prevailing management practices in Eldoret town, Kenya", *International Journal of Agricultural Policy and Research*,Vol.2 (2).
Okot-Okumu, J. (2012). Solid waste management in African cities—East Africa. In L. F. Marmolejo Rebellon (Ed.), Waste management—an integrated vision. Available [online]: http://www.intechopen.com/books/waste-management-an-integrated-vision/solid-waste-management/. (16/02/2018).
Okot-Okumu, J. (2017). Chapter 1: Solid Waste Management in African Cities – East Africa**,** In the book 'Waste Management - An Integrated Vision, published by INTECH.
Okot-Okumu, J. and Nyenje. R. (2011). "Municipal solid waste management under decentralisation in Uganda", *Habitat International*,(35).
Otieno, T. (2010). Storm clouds of our solid waste may blow us away if we don't act now; Daily Nation Newspaper, 25 October 2010.
Palczynski, J. (2002). Study on Solid Waste Management Options for Africa. African Development Bank.
Phillips, W. and Thorne, E. (2011). Municipal solid waste management in the Caribbean – A benefit cost analysis. United Nations UN ECLAC Sub-regional headquarters for the Caribbean.
Policy Monitor (2017). "Ban on Plastic Bags Finally Takes Effect in Kenya" By John Nyangena, Augustus Muluvi, and Ann Gitonga, issue 9 (10). Published by KIPPRA.
Redmond, E. and Griffith, C. (2003)." Consumer food handling in the home: a review of food safety study", *J Food Prot*, 66.
Republic of Kenya (1948). *Penal Code: An Act of Parliament to establish a code of criminal law*, Nairobi.
Republic of Kenya (1963). *The Local Government Act: Chapter 265*, National Council for Law Reporting, Nairobi.
Republic of Kenya (1977). Cap 514, Laws of Kenya: *The Factories Act.*
Republic of Kenya (1985). *Radiation Protection Act: Chapter 243*, Nairobi 1985.
Republic of Kenya (1986). *Public Health Act: Chapter 242*, National Council for Law Reporting, Nairobi.
Republic of Kenya (1987). *Factories Act*, Nairobi.
Republic of Kenya (1992). *Food, Drugs and Chemical Substances Act: Chapter 254*, Nairobi.
Republic of Kenya (1995). *Building Code 95*, Nairobi.
Republic of Kenya (1996). *Physical Planning Act: Chapter 286*, Kenya National Council for Law Reporting, Nairobi.
Republic of Kenya (1999). *Environmental Management and Co-ordination Act, 1999 No 8 of 1999 EMCA*. Kenya Gazette Supplement No 74 (Acts No 5).
Republic of Kenya (2006a). *Waste Management Regulations*, Nairobi.
Republic of Kenya (2006b). *Environmental Management and Coordination (Water Quality) Regulations*, Nairobi.
Republic of Kenya (2007a). *Environmental Management and Coordination (Controlled Substances) Regulations*, Nairobi.
Republic of Kenya (2007b). *Environmental Management and Coordination (Hazardous Substances) Regulations*, Nairobi.
Republic of Kenya (2007c), "Kenya Vision 2030", in *Kenya Population and Housing Census*, Nairobi.
Republic of Kenya (2007d). *Occupational Safety and Health Act*, Nairobi.
Republic of Kenya (2007b). *National Policy on Injection Safety and Medical Waste Management.*
Republic of Kenya. (2008).City council of Nairobi: Solid waste management bylaws. Nairobi: Government printer.
Republic of Kenya (2009). *National-Land-Policy.* Sessional-Paper No. 3.
Republic of Kenya (2009a). *Environmental Management and Coordination (Noise and Excessive Vibration Pollution) Regulations*, Nairobi.
Republic of Kenya (2009b). *Environmental Management and Coordination (Air Quality) Regulations*, Nairobi.
Republic of Kenya (2010). *Constitution of Kenya*, National Council for Law Reporting, Nairobi.

Republic of Kenya (2011). Ministry Of Environment and Mineral Resources: Kenya national profile to assess the chemicals management. UNITAR & SAICM.
Republic of Kenya (2012a). *The-Public-Health-Act.*
Republic of Kenya (2012b). *Country-Government-Act.*
Republic of Kenya (2012c). *Births and Deaths Registration Act: Chapter 149*, Nairobi.
Republic of Kenya (2013). *County Government Act*, Nairobi.
Republic of Kenya (2017). *The-National Waste-Management-Bill.*
Rodic, L.; Scheinberg, A. and Wilson, D. (2010). Comparing solid waste management in the world's cities. Proceedings of ISWA World Congress 2010 – Urban Development and Sustainability – A Major Challenge for Waste Management in the 21st Century. International Solid Waste Association (ISWA), Hamburg, Germany.
Rodic, L. and Wilson, D. (2017). "Resolving Governance Issues to Achieve Priority Sustainable Development Goals Related to Solid Waste Management in Developing Countries", *Sustainability*, 9.
Rotich, H.; Yongsheng, Z. and Jun, D. (2006). "Municipal solid waste management challenges in developing countries: Kenyan case study", *Waste Management*, 26 (1).
Rushbrook, P. and Pugh, M. (1999). Solid Waste Landfills in Middle- and Lower-Income Coutnries. A Technical Guide to Planning, Design, and Operation. The World Bank: Washington, DC, USA,
Rotich, K. and Zhao,Y, (2005). Municipal solid waste management challenges in developing countries, Kenyan Case Study, Jilin-University, China.
Sakurai, K. (2000)."Urban waste management in developing countries – for more effective international assistance in urban waste management field", *Waste Management Research*, 11.
Sankoh, F.; Yan, Q. and Tran, Q. (2013). "Environmental and Health Impact of Solid Waste Disposal in Developing Cities: A Case Study of Granville Brook Dumpsite, Freetown, Sierra Leone", *Journal of Environmental Protection*, 4.
Scheinberg A, Wilson DC and Rodic L (eds) (2010) Solid Waste Management in the World's Cities. Earthscan for UN-Habitat, London, UK.
Schubeler, P.; Wehrle, K. and Christen, J. (1996). Conceptual Framework for Municipal Solid Waste Management in Low income Countries. SKAT, St Gallen, Switzerland. UMP/SDC Collaborative Program on Municipal Solid Waste Management in Developing Countries, Urban Management Program (UMP) working paper series no. 9.
Scheinberg, A.; Simpson, M.; Gupt, Y.; *et al.* (2010). Economic Aspects of the Informal Sector in Solid Waste Management. WASTE, SKAT, and city partners for GTZ, Germany.
Scheinberg, A. (2011). Value Added: Modes of Sustainable Recycling in the Modernisation of waste Management Systems. PhD Thesis. Wageningen University. The Netherlands.
Simon, A. (2008). Analysis of Activities of Community Based Organizations Involved in Solid waste Management, Investigation Modernized Mixtures Approach. The Case of Kinondoni Municipality, Dar es Salaam. MSc Thesis. Wageningen University.
Supriyadi, S.; Kriwoken, L. and Birley, I. (2000). "Solid waste management solutions for Semarang, Indonesia", *Waste Manage Res*, (18).
Schultz, P.; Oskamp, S.. and Mainieri, T. (1995). "Who Recycles and When? A Review of Personal and Situational Factors", *Environmental Psychology,* Vol.15.
Scott, E. (2003). "Food safety and food-borne disease in 21st century homes", *Can J Infect Dis*, 14(5).
Sibanda, L.; Obange, N. and Awuor, O. (2017). "Challenges of Solid Waste Management in Kisumu, Kenya", *Urban Forum*, 28.
Starovoytova, D. (2012). Kenya's Perspective on Ecosan, *Journal of Agriculture, Pure and Applied Science and Technology (JAPAST)*, 13, 10-23, ISSN 2073-8749.
Starovoytova, D. and Namango, S. (2016). "Potential of Roof Rain Water Harvesting at an Industrial Setup", USA, *Journal of Environment and Earth Science (U.S.A.)*, ISSN 2224-3216 (Paper), ISSN 2225-0948 (Online), Vol.6, No.7, 2016.
Starovoytova, D.; Namango, S. and Katana, H. (2016a). "Prospective of Roof Rain Water Harvesting (RRWH) in Kesses Constituency, Uasin Gishu County, Kenya", *Journal of Environment and Earth Science*, *(U.S.A.)*, ISSN 2224-3216 (Paper) ISSN 2225-0948 (Online), Vol.6, No.7, 2016.
Starovoytova, D.; Namango, S. and Wetaka, C. (2016b). "Consumer-Perception on Polyethylene-Shopping-Bags", *Journal of Environment and Earth Science (U.S.A.)*, ISSN 2224-3216(Paper) ISSN 2225-0948 (Online);
Starovoytova, D. (2018). "Solid Waste Management (SWM) at a University Campus (Part 1/10): Comprehensive-Review on Legal Framework and Background to Waste Management, at a Global Context", *Journal of Environment and Earth Science*, ISSN (Paper) 2224-3216, ISSN (Online) 2225-0948, Vol. 8 (4).
Syagga, P. (1993). Background Paper on Waste Management in Central and Eastern African Region. Nairobi,

Kenya: University of Nairobi, Department of Land Development.
Thompson, I. (2010). Domestic Waste Management Strategies in Accra, Ghana and Other Urban Cities in Tropical Developing Nations. Available [online]:
http/www.cwru.edu/med/epidbio/mphp439/Waste Mgmt Accra.pdf. (8/03/2018).
Tukahirwa, J. (2011). Civil Society in Urban sanitation and Solid waste Management. PhD Thesis. Wageningen University. The Netherlands.
UNDP/GEF/SPREP (2006). Final evaluation of the project RAS/02/G35, *Pacific Islands Renewable Energy Project (PIREP),* Advisory Services on Climate, ENergy and Development ISsues (ASCENDIS). Available [online]: 1058%20PIMS%202164%20-%20REG.%20Pacific%20Islands%20TE. (23/03/2018).
UNDP (2011). Human Development Report. Available [online]:http://www.undp.org/content/undp/en/home/librarypage/hdr/human_developmentreport2011.htm(03/04/2018).
UARK (2016). Integration of Solid Waste Management Policies in Kenya: Analysis of coherence, gaps and overlaps. Working Paper #8.
UNDP in Kenya (2016). Adaptation to Climate Change in Arid and Semi-Arid Lands (KACCAL). Available [online]: http://www.ke.undp.org/content/kenya/en/home/operations/projects/environment_and_energy/Adaptation_to_Climate_Change.html (16/02/2018).
UNECE (1957). The Recommendations of the United Nations Committee of Experts on the Transport of Dangerous Goods.
UNEP and ISWA (2015). United Nations Environment Program (UNEP) and International Solid Waste Association (ISWA): Global Waste Management Outlook. UNEP International Environment Technology Centre: Osaka.
UNEP (2005). Selection, Design and Implementation of Economic Instruments in the Solid Waste Management Sector in Kenya: The Case of Plastic Bags.
UN (1972). United Nations: Declaration of the United Nations Conference on the Human Environment (Stockholm).
UNEP (1982). Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal.
UN (1992). United Nations: World Charter for Nature, adopted by the General Assembly of the United Nations at its 37th session.
UNEP (1997). Decision 19/13 C, of the-Governing-Council of the-United Nations Environment-Program to-initiate international-action to-protect human-health and the-environment.
UNEP (2004). Report: Selection, Design and Implementation of Economic Instruments in the Solid Waste Management Sector in Kenya. The Case of Plastic Bags. Available [online]:
http/www.unep.ch/etb/publications/economist/Kenya.pdf (29/02/2018).
UNEP-IETC (1996). International Source Book on Environmentally Sound Technologies for Municipal Solid Waste Management, United Nations Environment Program (UNEP), International Environmental Technology Centre (IETC).
UNEP (2009). Developing Integrated Solid Waste Management Plan Training Manual Volume 4, ISWM Plan.
UNEP (2007). Environmental Pollution and Impacts on Public Health, Implications of the Dandora Municipal Dumping Site in Nairobi, Kenya.
UNEP (2005). Standardized Toolkit for Identification and Quantification of Dioxins and Furan Releases.
UNICEF/WHO (2013), Joint Monitoring Program (JMP): Kenya country info.
UNEP/DTIE (2010). Chemicals Branch: First results on dioxins and Furans under the Stockholm Convention on POPs 2010, presented at Dioxin Symposium in Barcelona by Heidelore Fiedler.
UN-HABITAT (2007). *City of Nairobi Environment Outlook.* Nairobi, Kenya.: United Nations Environment Program (UNEP) & United Nations Human Settlements Program (UN Habitat), Kenya. Available [online]: http://www.unep.org/DEWA/Africa/docs/en/NCEO. (20/01/2018).
UN-HABITAT (2009). State of the World's Cities 2008/2009. Harmonious Cities. Earthscan for UN-Habitat, London, UK.
UNFCC Focus: Mitigation—NAMAs. Available [online]: http://unfccc.int/focus/mitigation/items/7172.php(20/04/2018).
UN-HABITAT (2010). Solid Waste Management in the World's Cities; Third Edition in UN-HABITAT's State of Water and Sanitation in the World's Cities Series; Scheinberg, A., Wilson, D.C., Rodic, L., Eds.; Earthscan: London, UK.
UN, SDG (2015). Sustainable Development Goals. Available [online]: http://www.un.org/sustainabledevelopment/sustainable-development-goals/(20/01/2018).
UNEP (2005), Solid Waste Management Vol. I &II
UNIDO (2009). Integrated assessment of present status of Environmentally sound management of wastes in

Africa. Sixth Session of the Committee on Food Security and Sustainable Development (CFSSD-6)/Regional Implementation Meeting (RIM) for CSD-18 Addis Ababa, Ethiopia, 27-30 October 2009, United Nations Economic and Social Council, E/ECA/CFSSD/6/15.

van de Klundert, A. and Anschütz, J. (2001). Integrated Sustainable Waste Management - the Concept. Tools for Decision-makers Experiences from the Urban Waste Expertise Program (1995-2001). The-Netherlands, ISBN number of the series: 90-76639-02-7.

Vidanaarachchi, C.; Yuen, S. and Pilapitiya, S. (2006). "Municipal solid waste management in the southern province of Sri Lanka: Problems, issues and challenges", *Waste Management*, 26.

Wakjira, A. (2007): Household solid waste generation rate and composition analysis in two selected kebeles of Adama Town, MSc. thesis Addis Ababa University.

WASTECOSMART (2015). Optimization of Integrated Solid Waste Management Strategies for the Maximizations of Resource Efficiency "Joint Action Plan including common R&D and innovation agenda".

Wilson, D.; Rodic, L.; Scheinberg, A.; *et al.* (2012). "Comparative analysis of solid waste management in 20 cities", *Waste Management & Research*, 30(3).

Wilson, D.; Velis, C. and Rodic, L. (2013). "Integrated sustainable waste management in developing countries", Proceedings of the Institution of Civil Engineers: Waste and Resource Management, 166 (2). ISSN 1747-6526

Wilson, D.C.; Rodic, L.; Modak, P.; Soos, R.; Carpintero Rogero, A.; Velis, C.; Iyer, M.; Simonett, O. (2015). Global Waste Management Outlook; Prepared for United Nations Environment Programme (UNEP) and International Solid Waste Association (ISWA); UNEP International Environment Technology Centre (IETC): Osaka, Japan,

Wilson, D.; Kanjogera, J. ; Soos, R.; Briciu, C.; Spies, S.; Ölz, B.; Whiteman, A. and Smith, S. (2017). Operator models for delivering municipal solid waste management services in developing countries: Part A—The evidence base.

Wilson, D. (2007). "Development drivers for waste management", *Waste Management & Research*, (25), ISSN 0734–242X.

Whiteman, A.; Smith, P. and Wilson, D. (2001). Solid waste management as an indicator of good governance. DFID, presented to the global Habitat Conference on Urban Development, New York, June, 2001.

Wolsink, M. **(2010). "**Contested environmental policy infrastructure: Socio-political acceptance of renewable energy, water, and waste facilities", *Environ. Impact Assess. Rev*., 30.

Wilson, D.; Velis, C. and Rodic, L. (2013).Integrated sustainable waste management in developing countries, Waste and Resource Management, Volume 166, Issue WR2.

Wilson, D. (2007). Development drivers for waste management. Waste Management & Research, 25(3).

World Bank (2012). What a waste: A Global Review of Solid Waste Management. Urban Development Series. World Bank Group, USA.

World-Bank (2013). Fact-Sheet: The World Bank and Energy in Africa. "Global Waste on Pace to Triple by 2100." The World Bank Group.

World-Bank (2014). Results-based Financing for Municipal Solid Waste. Global Urban and DRM Unit, World Bank.

World Maps of Köppen (2017). Available [online]: http://koeppen-geiger.vu-wien.ac.at/ (20/01/2018).

World Vision International (2015). Urban Centre of Expertise: Urban Thinkers Campus: Healthy and Just Cities for Children and Youth, Wednesday October 28th, International Environment House Geneva.

WRAP (2011). Waste Hierarchy Guide. Applying the waste hierarchy: A guide to business.

Zhou, R. and Stanley, R. (2011). "Food risks associated with newspaper ink and contaminated recycled fibre materials", *Journal of Hygiene Science*, Issue 7(10).

Zhou, R.; Stanley, R. and Le, M. (2012). "Contamination of food with newspaper ink: An evidence-informed decision making (EIDM) case study of homemade dessert", Environmental Health Review, 5563-69.